

STORMWATER SUMMARY

FOR



NEW JERSEY INC.

PENNS NECK CENTRAL OFFICE
PROPOSED EMERGENCY GENERATOR
BLOCK 6 TAX LOT 72
TOWNSHIP OF WEST WINDSOR
MERCER COUNTY, NEW JERSEY

Owner & Applicant:

VERIZON NEW JERSEY, INC.
1 VERIZON WAY
BASKING RIDGE, NEW JERSEY 07920

NOVEMBER 9, 2021
REVISED MARCH 2022
REVISED APRIL 2022

Prepared By:



575 ROUTE 28, SUITE 110
RARITAN, NEW JERSEY 08869

A handwritten signature in blue ink, appearing to read "Adonis E. Crispo".

Adonis E. Crispo, P.E.
N.J.P.E. Lic. No. 44152

I Project Summary

The subject property is known as Block 6, Lot 72 located at 138 Washington Road, West Windsor, Mercer County, New Jersey. The property is approximately 1.85 acres and with site improvements consisting of a large office building including paved parking and driveway. The property is owned and occupied by Verizon.

Verizon proposes to install an emergency generator onsite. The generator will be installed in the rear section of the property; in an open space area between the paved parking and wooded area abutting the adjoining residential lot. The proposed generator pad including underground duct banks and hand holes has been designed to preserve existing/mature trees.

On-site soil is identified as Galestown loamy sand, 0 to 5% slopes (GadB) and Birdsboro gravelly solum variant soils, 0 to 6% slopes (BHSGB) per Mercer County Soils Map. This soil belongs to hydrologic soil group (HSG) A.

II Stormwater Summary

Under existing conditions, the front section of the site drains into Washington Road drainage system and rear section drains towards the adjoining property, Lot 28.01, Block 6. Site runoff from the rear is conveyed by a grass swale and drains into the adjoining lot.

The proposed generator installation will result in an increase of 1,863 SF of new impervious surfaces; including a concrete pad, raised curb and perimeter stone between concrete pad and curb.

To minimize stormwater impact to the adjoining property, the proposed site improvements will include the installation of a drywell system. The drywell has been designed per consultation with the Township Engineer as follows:

1. 24-hr runoff depth: 2-yr storm, 3.31" along with the routings for the 10 and 100-year storm.
2. Drywell: Provide minimum storage to capture the 2-yr runoff volume from new impervious surfaces.

Proposed New Impervious: 1,925 SF

24-hr Storm Design Depth: 3.31"

Runoff Volume: 531 CF

Proposed Drywell Effective Volume: 549 CF > 531 CF

(below Primary & Secondary Outlets)

Total Volume: 632 CF (HydroCAD Routed Storage Volume)

To intercept surface runoff, the proposal includes the construction of a lawn inlet along the existing grass swale to convey runoff into the drywell system. The proposed drywell outlet consists of an 8" pipe (primary) that will daylight into the existing swale and a 3" pipe (secondary) that will tie-in to existing 8" roof drain that is connected to the Washington Road drainage system.

Stormwater routings for 2-, 10- and 100-yr storm events were performed to verify the post development impact on Lot 28.01 and, also to the existing Washington Road drainage system. For the drywell design, a design permeability rate of 1 inch/hr was used per recommendation by the Township Engineer. The subgrade at approximately 7' to 8.5' deep that was reported in the MTA soil logs as yellow-brown clayey silt, some fine to medium sand will be replaced with clean/medium aggregate concrete sand. Exfiltration was included in drywell routing for the design storms.

To determine impact to the Washington Road drainage system, the combined drywell outflow and onsite runoff taken at the common lot line on Lot 28 and secondary outflow from the same drywell were included in the model. The results show that the proposed peak flow rates for the 2-, 10- and 100-yr quantity storm events are less than existing peak flow rates.

Summary: Existing and Proposed Peak Flow Rates

Storm Event	Existing (CFS) Lot 28.01	Proposed(CFS) Lot 28.01	Bypass (CFS) to Washington Rd	Exfiltration (CFS)	Comb HYD (CFS) Washington Rd
2-yr	0.67	DA2 _{Byp} = 0 DW _{Outflow} = 0.39 COM _{HYD} = 0.39	0.32	0.01	0.62
10-yr	1.03	DA2 _{Byp} = 0.02 DW _{Outflow} = 0.79 COM _{HYD} = 0.79	0.33	0.01	0.98
100-yr	2.24	DA2 _{Byp} = 0.46 DW _{Outflow} = 1.72 COM _{HYD} = 1.98	0.34	0.01	2.21

Notes: Prop. drywell 3" PVC secondary outlet pipe connects to the existing 8" roof drain tributary to the Washington Road drainage system. Abbreviations: DW – Drywell; BYP – Bypass; COM – Combined; HYD - Hydrographs

The runoff parameters were computed using the methodologies outlined in the Natural Resource Conservation Service's Technical Release No. 55. Time of concentration was computed using the McCuen-Spiess limitation of flow length as outlined in NEC Handbook, Chapter 15, May 2010. The HydroCAD modeling software was used to compute the existing and developed runoff hydrographs utilizing local NOAA Atlas 14, Volume 2, Version3, 24-hr rainfall depths, Storm Curve 'C'. All input and the HydroCAD output data are attached.

Pipe calculations for the existing 8" roof drain including the 3" outlet pipe (secondary/bypass) connection from the proposed drywell was performed to verify conveyance capacities for the 10- and 100-yr storm events. The pipe calculations also include existing roof tributaries, see drainage map DA-2 for reference. Due to limited pipe information, the following data were used in the calculations:

Pipe material: PVC, n=0.010
Pipe slope: 1.0%

The last two (2) downstream pipe segments, connection to existing storm MH at Washington Road, will be under surcharge conditions for both the 10- and 100-yr storm events. However, the HGL is lower than the clean-out cover elevations. The Hydraflow software was used for pipe calculations, see attached output data.

The onsite soil belongs to HSG A, consisting of sandy underlying subsoils that are highly permeable.

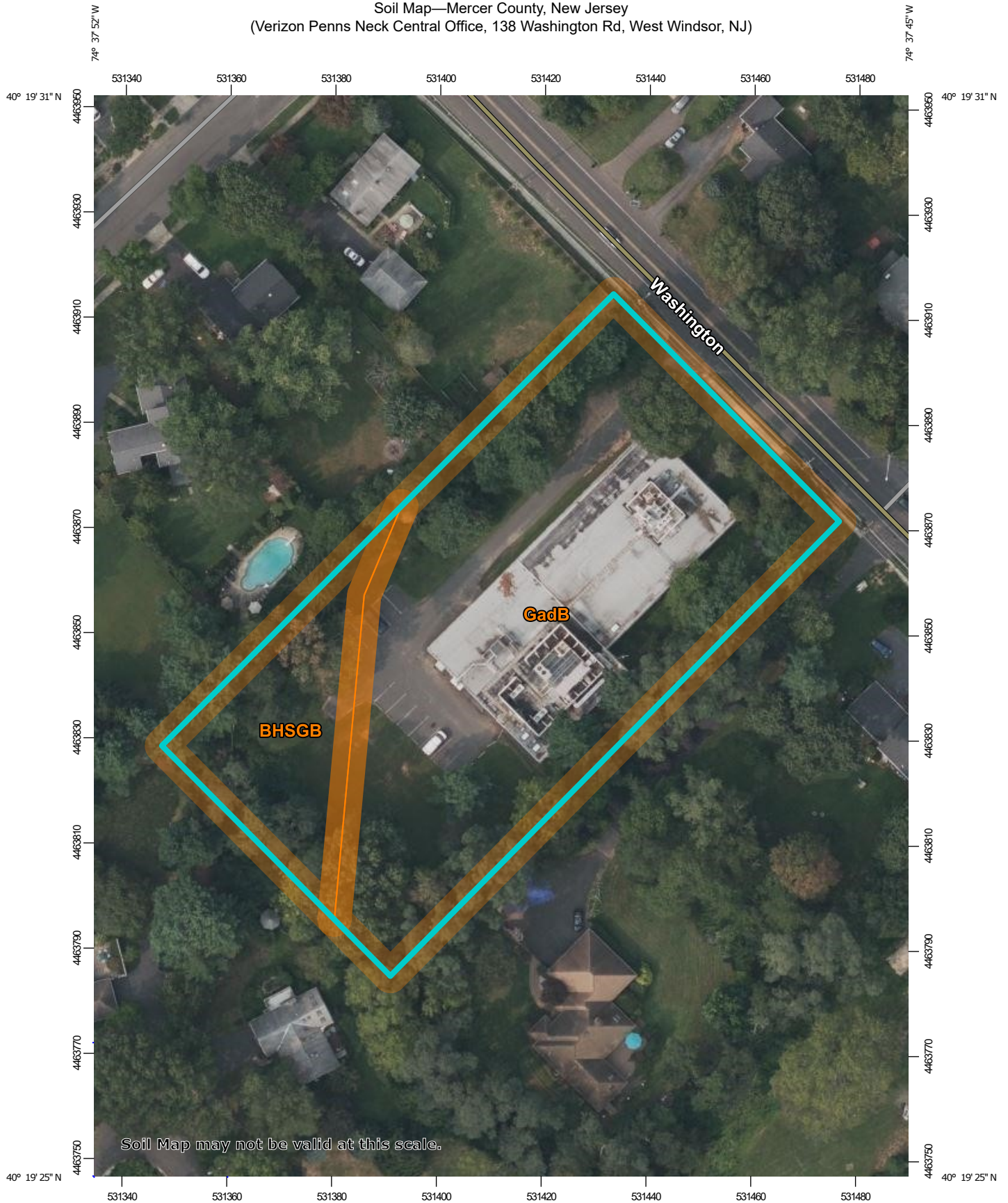
III Engineer's Statement

The installation of a generator pad will result in a slight increase in surface runoff onsite. The proposed drywell system has been designed to capture and infiltrate the increase in runoff volume. As such, surface runoff from the rear of the property will remain at pre-construction conditions.

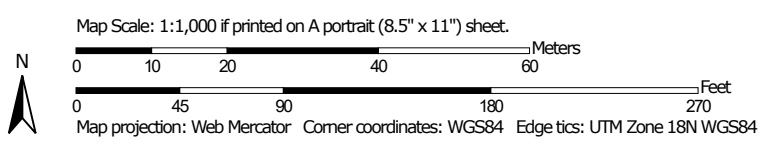
Attachments:

Mercer County Soil Map
HydroCAD Output Data – Existing and Proposed Conditions including Drainage Maps
Hydraflow Output Data – Pipe Conveyance Calculations
Drywell Drain Time Calculation
Reduced Site Plan & Drywell Details
Soil Logs by Melick-Tully & Associates

Soil Map—Mercer County, New Jersey
(Verizon Penns Neck Central Office, 138 Washington Rd, West Windsor, NJ)



Soil Map may not be valid at this scale.







MAP LEGEND



















Area of Interest (AOI)








 Area of Interest (AOI)

Soils


 Soil Survey Areas
 Soil Map Unit Polygons
 Soil Map Unit Lines
 Soil Map Unit Points

Special Point Features






 Blowout
 Borrow Pit
 Clay Spot
 Closed Depression
 Gravel Pit
 Gravelly Spot
 Landfill
 Lava Flow
 Marsh or swamp
 Mine or Quarry
 Miscellaneous Water
 Perennial Water
 Rock Outcrop
 Saline Spot
 Sandy Spot
 Severely Eroded Spot
 Sinkhole
 Slide or Slip

 Sodic Spot
 Spoil Area
 Stony Spot
 Very Stony Spot
 Wet Spot
 Other
 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Mercer County, New Jersey
 Survey Area Data: Version 17, Aug 31, 2021

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

Date(s) aerial images were photographed: Sep 6, 2020—Sep 21, 2020

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BHSGB	Birdsboro gravelly solum variant soils, 0 to 6 percent slopes	0.3	17.9%
GadB	Galestown loamy sand, 0 to 5 percent slopes	1.5	82.1%
Totals for Area of Interest		1.9	100.0%

NOAA Atlas 14, Volume 2, Version 3
Location name: Princeton Junction, New Jersey,
USA*



Latitude: 40.3201°, Longitude: -74.6235°
Elevation: 66.02 ft**



* source: ESRI Maps
 ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.338 (0.305-0.374)	0.403 (0.365-0.447)	0.478 (0.432-0.530)	0.534 (0.482-0.591)	0.602 (0.540-0.666)	0.652 (0.582-0.721)	0.702 (0.623-0.777)	0.748 (0.660-0.830)	0.805 (0.704-0.898)	0.849 (0.737-0.951)
10-min	0.539 (0.487-0.598)	0.644 (0.583-0.714)	0.766 (0.692-0.848)	0.854 (0.770-0.945)	0.960 (0.861-1.06)	1.04 (0.927-1.15)	1.12 (0.990-1.23)	1.19 (1.05-1.32)	1.27 (1.11-1.42)	1.34 (1.16-1.50)
15-min	0.674 (0.609-0.747)	0.810 (0.733-0.898)	0.969 (0.875-1.07)	1.08 (0.974-1.20)	1.22 (1.09-1.35)	1.32 (1.17-1.45)	1.41 (1.25-1.56)	1.50 (1.32-1.66)	1.60 (1.40-1.79)	1.68 (1.46-1.88)
30-min	0.924 (0.835-1.02)	1.12 (1.01-1.24)	1.38 (1.24-1.53)	1.57 (1.41-1.73)	1.80 (1.62-1.99)	1.98 (1.77-2.19)	2.16 (1.92-2.39)	2.33 (2.06-2.58)	2.55 (2.23-2.85)	2.72 (2.36-3.05)
60-min	1.15 (1.04-1.28)	1.40 (1.27-1.56)	1.77 (1.59-1.96)	2.04 (1.84-2.26)	2.40 (2.15-2.65)	2.68 (2.40-2.97)	2.97 (2.64-3.29)	3.27 (2.88-3.62)	3.66 (3.20-4.08)	3.97 (3.44-4.45)
2-hr	1.40 (1.27-1.56)	1.71 (1.54-1.90)	2.17 (1.96-2.40)	2.52 (2.27-2.79)	3.01 (2.69-3.32)	3.41 (3.03-3.76)	3.81 (3.37-4.22)	4.23 (3.71-4.69)	4.82 (4.18-5.38)	5.28 (4.54-5.92)
3-hr	1.55 (1.39-1.73)	1.89 (1.70-2.11)	2.39 (2.15-2.67)	2.79 (2.50-3.11)	3.35 (2.98-3.73)	3.80 (3.36-4.23)	4.27 (3.75-4.76)	4.76 (4.15-5.32)	5.45 (4.69-6.11)	6.01 (5.10-6.77)
6-hr	1.96 (1.76-2.21)	2.38 (2.13-2.68)	3.02 (2.70-3.38)	3.54 (3.15-3.96)	4.29 (3.78-4.79)	4.91 (4.31-5.48)	5.58 (4.85-6.24)	6.31 (5.42-7.05)	7.36 (6.21-8.26)	8.23 (6.86-9.28)
12-hr	2.38 (2.13-2.71)	2.88 (2.57-3.27)	3.67 (3.27-4.16)	4.35 (3.85-4.92)	5.35 (4.69-6.03)	6.22 (5.41-7.00)	7.17 (6.16-8.07)	8.23 (6.97-9.28)	9.81 (8.15-11.1)	11.2 (9.12-12.7)
24-hr	2.73 (2.50-3.01)	3.31 (3.03-3.64)	4.24 (3.87-4.66)	5.03 (4.59-5.53)	6.23 (5.63-6.83)	7.27 (6.51-7.96)	8.42 (7.48-9.21)	9.70 (8.52-10.6)	11.6 (10.1-12.8)	13.3 (11.3-14.7)
2-day	3.17 (2.89-3.49)	3.84 (3.51-4.23)	4.91 (4.48-5.41)	5.82 (5.29-6.40)	7.15 (6.46-7.84)	8.29 (7.43-9.09)	9.54 (8.48-10.5)	10.9 (9.60-12.0)	13.0 (11.2-14.3)	14.7 (12.6-16.3)
3-day	3.36 (3.08-3.68)	4.06 (3.73-4.46)	5.18 (4.74-5.68)	6.10 (5.58-6.68)	7.46 (6.77-8.15)	8.60 (7.76-9.39)	9.85 (8.82-10.8)	11.2 (9.94-12.3)	13.2 (11.6-14.5)	14.9 (12.9-16.4)
4-day	3.55 (3.27-3.87)	4.29 (3.96-4.69)	5.44 (5.01-5.94)	6.39 (5.86-6.96)	7.76 (7.09-8.45)	8.91 (8.09-9.70)	10.2 (9.15-11.0)	11.5 (10.3-12.5)	13.5 (11.9-14.7)	15.1 (13.2-16.6)
7-day	4.16 (3.84-4.54)	5.00 (4.61-5.45)	6.23 (5.74-6.80)	7.25 (6.66-7.91)	8.73 (7.98-9.51)	9.96 (9.05-10.8)	11.3 (10.2-12.3)	12.7 (11.4-13.8)	14.8 (13.1-16.1)	16.5 (14.4-18.0)
10-day	4.74 (4.41-5.13)	5.67 (5.27-6.14)	6.96 (6.45-7.54)	8.02 (7.42-8.68)	9.51 (8.75-10.3)	10.7 (9.84-11.6)	12.0 (11.0-13.0)	13.4 (12.1-14.5)	15.3 (13.7-16.7)	16.9 (15.0-18.5)
20-day	6.41 (6.02-6.83)	7.61 (7.15-8.11)	9.11 (8.54-9.72)	10.3 (9.64-11.0)	11.9 (11.1-12.7)	13.2 (12.3-14.0)	14.5 (13.4-15.4)	15.8 (14.6-16.9)	17.6 (16.1-18.8)	19.0 (17.2-20.4)
30-day	7.98 (7.56-8.43)	9.42 (8.93-9.96)	11.1 (10.5-11.7)	12.3 (11.6-13.0)	14.0 (13.2-14.8)	15.3 (14.4-16.1)	16.6 (15.5-17.5)	17.8 (16.6-18.8)	19.4 (18.0-20.6)	20.7 (19.1-22.0)
45-day	10.2 (9.67-10.7)	12.0 (11.4-12.6)	13.8 (13.1-14.6)	15.3 (14.5-16.0)	17.1 (16.2-18.0)	18.4 (17.4-19.4)	19.7 (18.6-20.8)	21.0 (19.7-22.1)	22.6 (21.1-23.9)	23.8 (22.1-25.2)
60-day	12.2 (11.6-12.8)	14.3 (13.6-15.0)	16.4 (15.6-17.2)	17.9 (17.1-18.8)	19.8 (18.9-20.8)	21.3 (20.2-22.3)	22.6 (21.4-23.7)	23.8 (22.5-25.1)	25.4 (23.9-26.8)	26.5 (24.8-28.0)



¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

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Project Reports

- 1 Routing Diagram

2-Year West Windsor Event

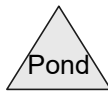
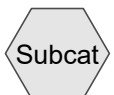
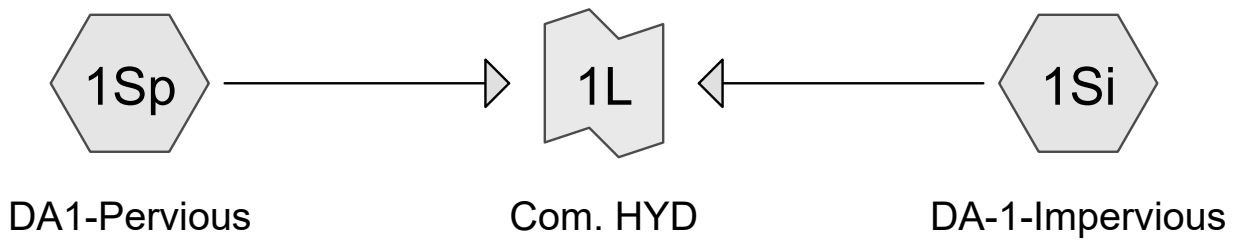
- 2 Node Listing
- 3 Subcat 1Si: DA-1-Impervious
- 4 Subcat 1Sp: DA1-Pervious
- 5 Link 1L: Com. HYD

10-Year West Windsor Event

- 6 Node Listing
- 7 Subcat 1Si: DA-1-Impervious
- 8 Subcat 1Sp: DA1-Pervious
- 9 Link 1L: Com. HYD

100-Year West Windsor Event

- 10 Node Listing
- 11 Subcat 1Si: DA-1-Impervious
- 12 Subcat 1Sp: DA1-Pervious
- 13 Link 1L: Com. HYD



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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

Subcatchment 1Si: DA-1-Impervious

Runoff Area=8,372 sf 100.00% Impervious Runoff Depth=3.08"
 Flow Length=273' Tc=6.0 min CN=0/98 Runoff=0.67 cfs 0.049 af

Subcatchment 1Sp: DA1-Pervious

Runoff Area=32,187 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=262' Tc=11.6 min CN=39/0 Runoff=0.00 cfs 0.000 af

Link 1L: Com. HYD

Inflow=0.67 cfs 0.049 af
 Primary=0.67 cfs 0.049 af

Total Runoff Area = 0.931 ac Runoff Volume = 0.049 af Average Runoff Depth = 0.64"
79.36% Pervious = 0.739 ac 20.64% Impervious = 0.192 ac

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Summary for Subcatchment 1Si: DA-1-Impervious

Existing pavement and proposed generator

Runoff = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 3.08"
 Routed to Link 1L : Com. HYD

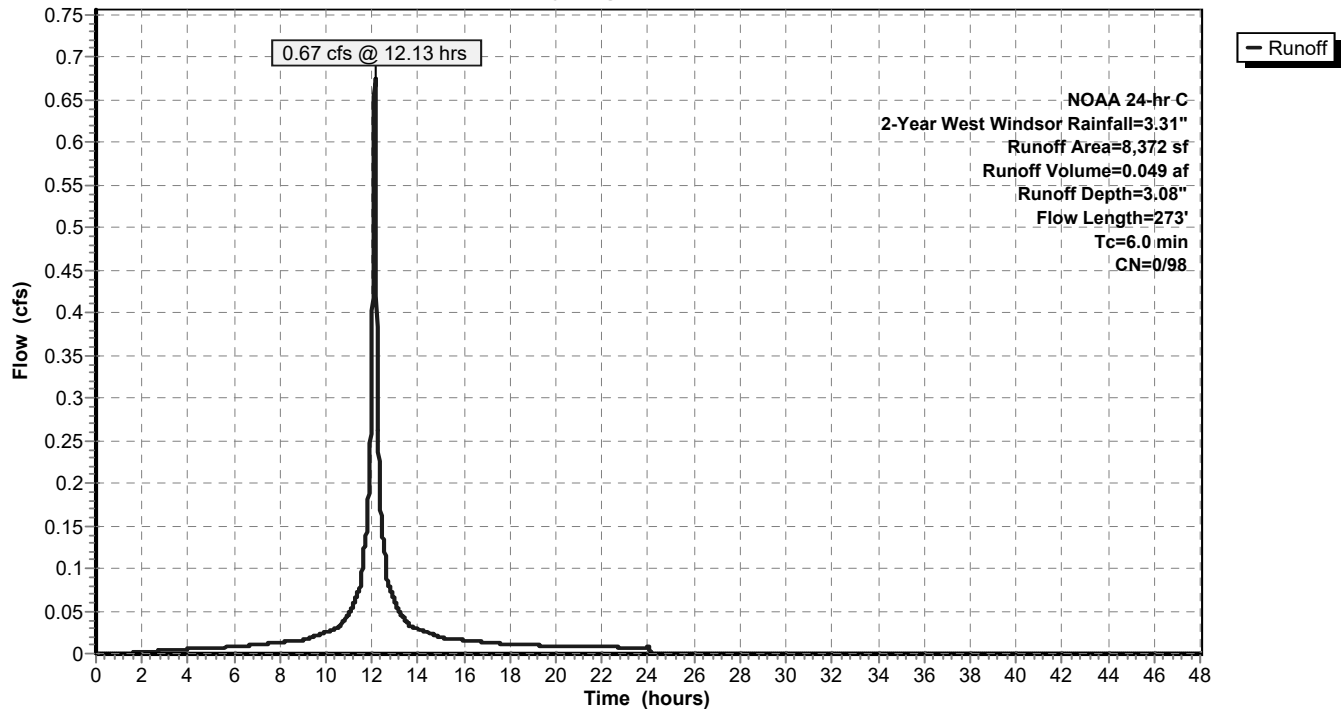
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Area (sf)	CN	Description
8,372	98	Paved parking, HSG A
8,372	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.31"
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	61	0.0230	2.56	7.67	Channel Flow, Area= 3.0 sf Perim= 12.0' r= 0.25' n= 0.035 Earth, dense weeds
3.0	273	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1Si: DA-1-Impervious

Hydrograph



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Summary for Subcatchment 1Sp: DA1-Pervious

Existing pavement and proposed generator

Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 1L : Com. HYD

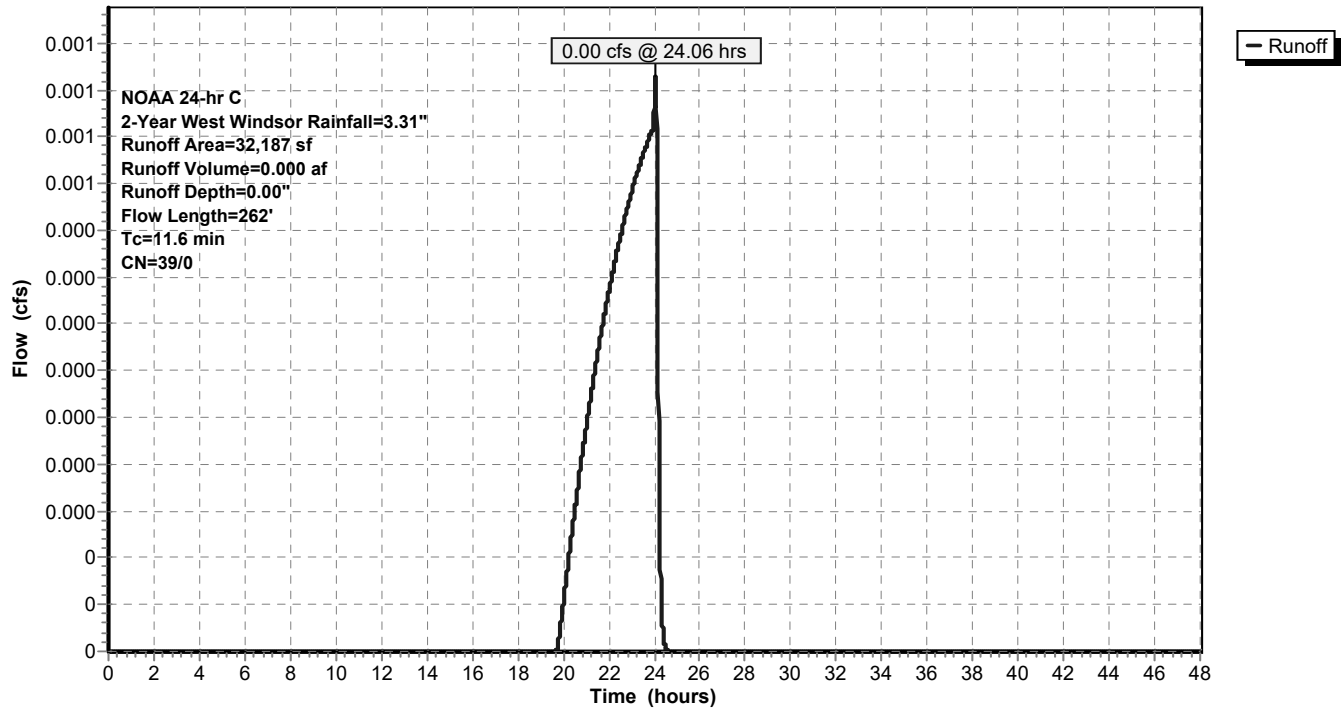
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Area (sf)	CN	Description
32,187	39	>75% Grass cover, Good, HSG A
32,187	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
2.3	210	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	262	Total			

Subcatchment 1Sp: DA1-Pervious

Hydrograph



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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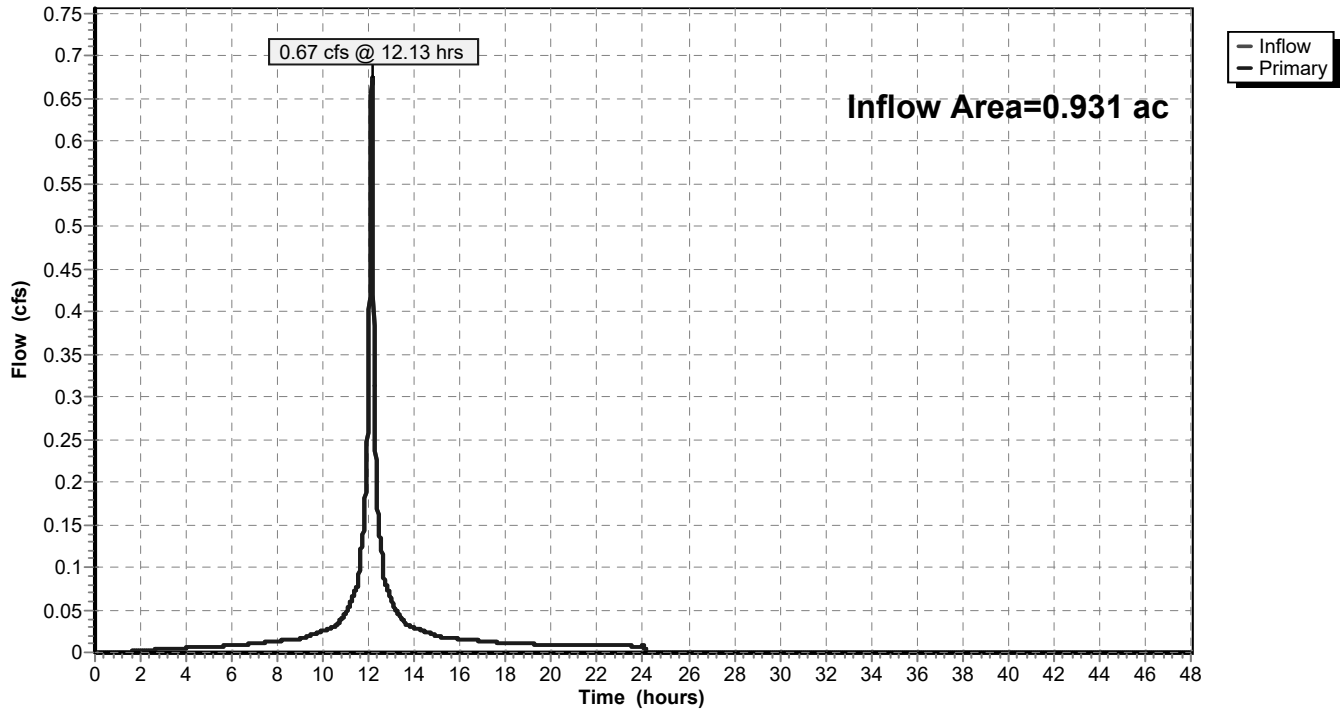
Summary for Link 1L: Com. HYD

Inflow Area = 0.931 ac, 20.64% Impervious, Inflow Depth = 0.64" for 2-Year West Windsor event
Inflow = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af
Primary = 0.67 cfs @ 12.13 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Com. HYD

Hydrograph



20-010 EXISTING R0

NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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

Subcatchment 1Si: DA-1-Impervious

Runoff Area=8,372 sf 100.00% Impervious Runoff Depth=4.79"
 Flow Length=273' Tc=6.0 min CN=0/98 Runoff=1.03 cfs 0.077 af

Subcatchment 1Sp: DA1-Pervious

Runoff Area=32,187 sf 0.00% Impervious Runoff Depth=0.21"
 Flow Length=262' Tc=11.6 min CN=39/0 Runoff=0.03 cfs 0.013 af

Link 1L: Com. HYD

Inflow=1.03 cfs 0.089 af
 Primary=1.03 cfs 0.089 af

Total Runoff Area = 0.931 ac Runoff Volume = 0.089 af Average Runoff Depth = 1.15"
79.36% Pervious = 0.739 ac 20.64% Impervious = 0.192 ac

20-010 EXISTING R0

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Summary for Subcatchment 1Si: DA-1-Impervious

Existing pavement and proposed generator

Runoff = 1.03 cfs @ 12.13 hrs, Volume= 0.077 af, Depth= 4.79"
Routed to Link 1L : Com. HYD

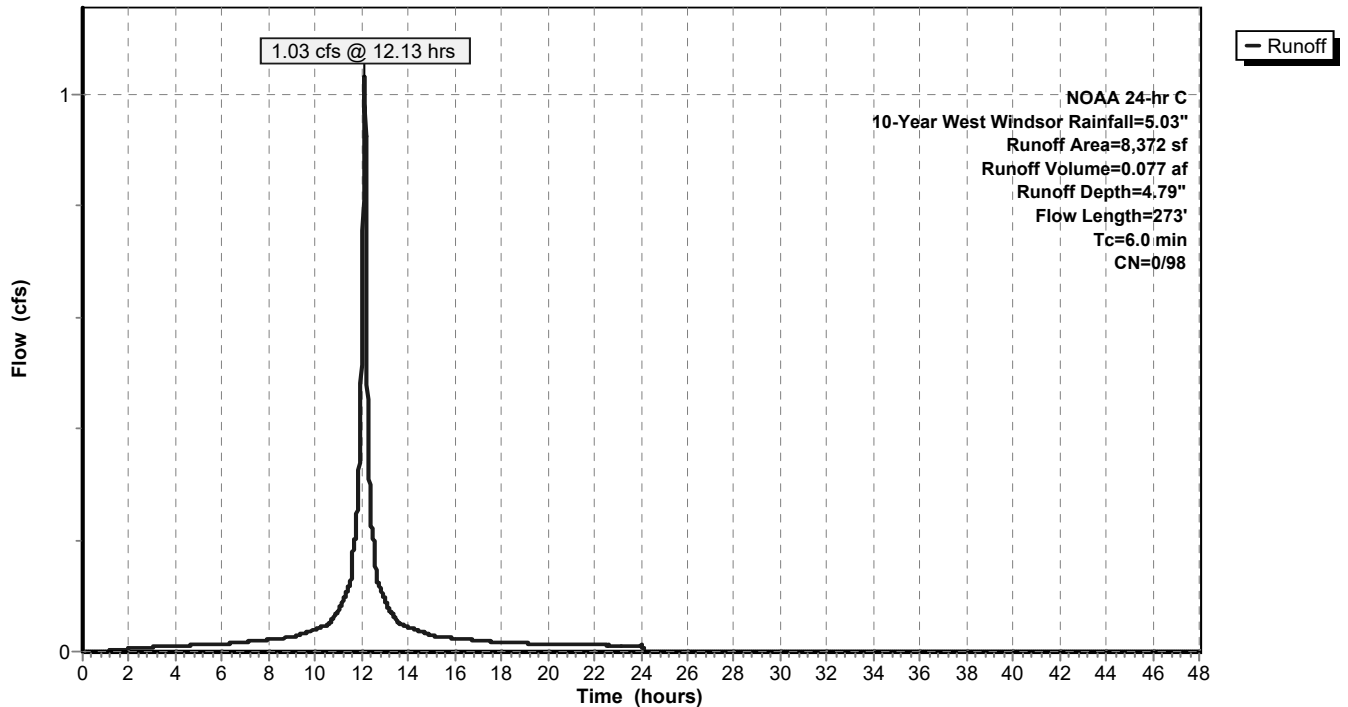
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

Area (sf)	CN	Description
8,372	98	Paved parking, HSG A
8,372	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.31"
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	61	0.0230	2.56	7.67	Channel Flow, Area= 3.0 sf Perim= 12.0' r= 0.25' n= 0.035 Earth, dense weeds
3.0	273	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1Si: DA-1-Impervious

Hydrograph



20-010 EXISTING R0

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Summary for Subcatchment 1Sp: DA1-Pervious

Existing pavement and proposed generator

Runoff = 0.03 cfs @ 12.62 hrs, Volume= 0.013 af, Depth= 0.21"
Routed to Link 1L : Com. HYD

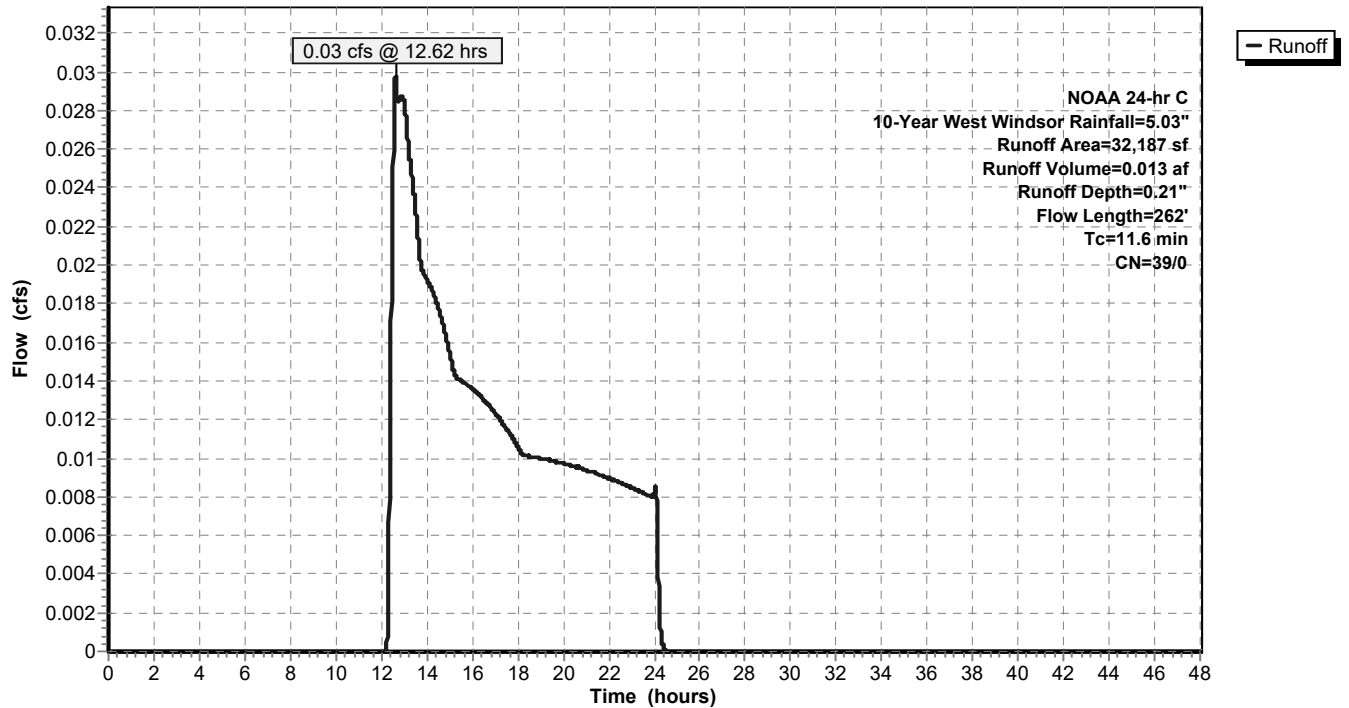
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

Area (sf)	CN	Description
32,187	39	>75% Grass cover, Good, HSG A
32,187	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
2.3	210	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	262	Total			

Subcatchment 1Sp: DA1-Pervious

Hydrograph



20-010 EXISTING R0

NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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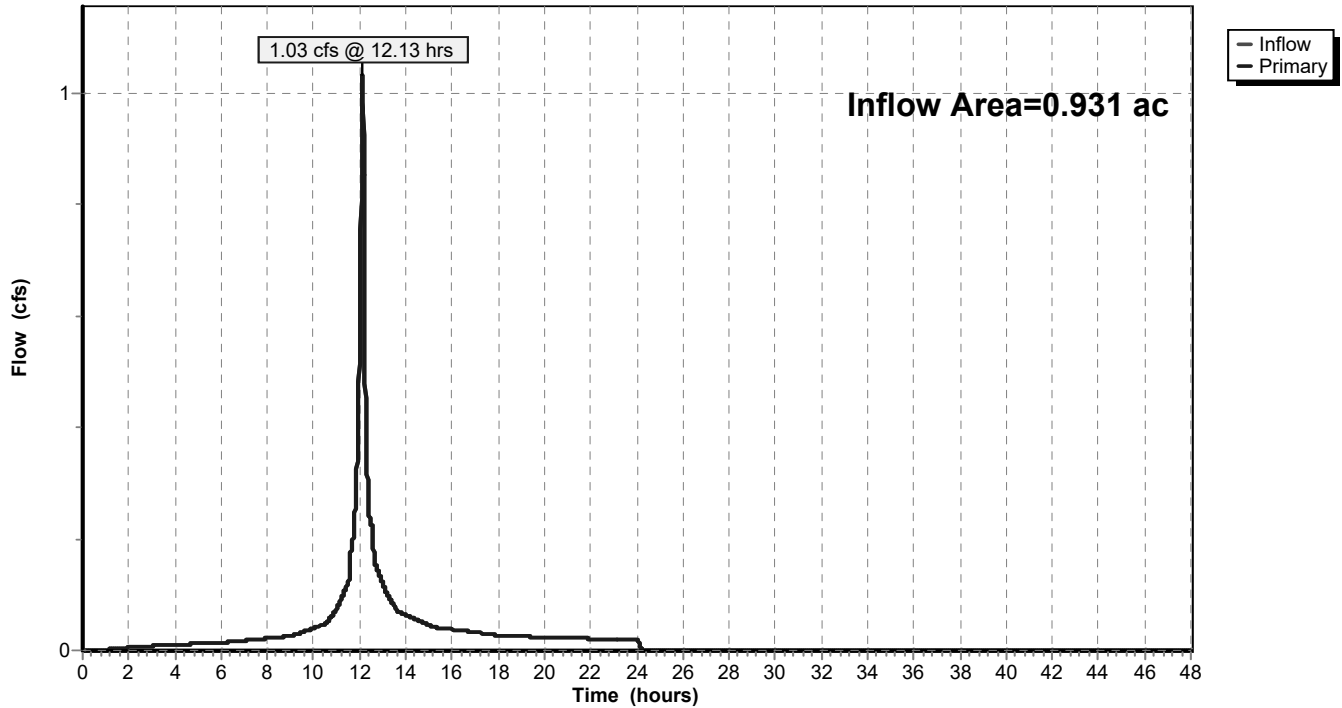
Summary for Link 1L: Com. HYD

Inflow Area = 0.931 ac, 20.64% Impervious, Inflow Depth = 1.15" for 10-Year West Windsor event
Inflow = 1.03 cfs @ 12.13 hrs, Volume= 0.089 af
Primary = 1.03 cfs @ 12.13 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Com. HYD

Hydrograph



20-010 EXISTING R0

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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

Subcatchment 1Si: DA-1-Impervious

Runoff Area=8,372 sf 100.00% Impervious Runoff Depth=8.18"
 Flow Length=273' Tc=6.0 min CN=0/98 Runoff=1.73 cfs 0.131 af

Subcatchment 1Sp: DA1-Pervious

Runoff Area=32,187 sf 0.00% Impervious Runoff Depth=1.34"
 Flow Length=262' Tc=11.6 min CN=39/0 Runoff=0.78 cfs 0.082 af

Link 1L: Com. HYD

Inflow=2.24 cfs 0.213 af
 Primary=2.24 cfs 0.213 af

Total Runoff Area = 0.931 ac Runoff Volume = 0.213 af Average Runoff Depth = 2.75"
79.36% Pervious = 0.739 ac 20.64% Impervious = 0.192 ac

20-010 EXISTING R0

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Summary for Subcatchment 1Si: DA-1-Impervious

Existing pavement and proposed generator

Runoff = 1.73 cfs @ 12.13 hrs, Volume= 0.131 af, Depth= 8.18"
 Routed to Link 1L : Com. HYD

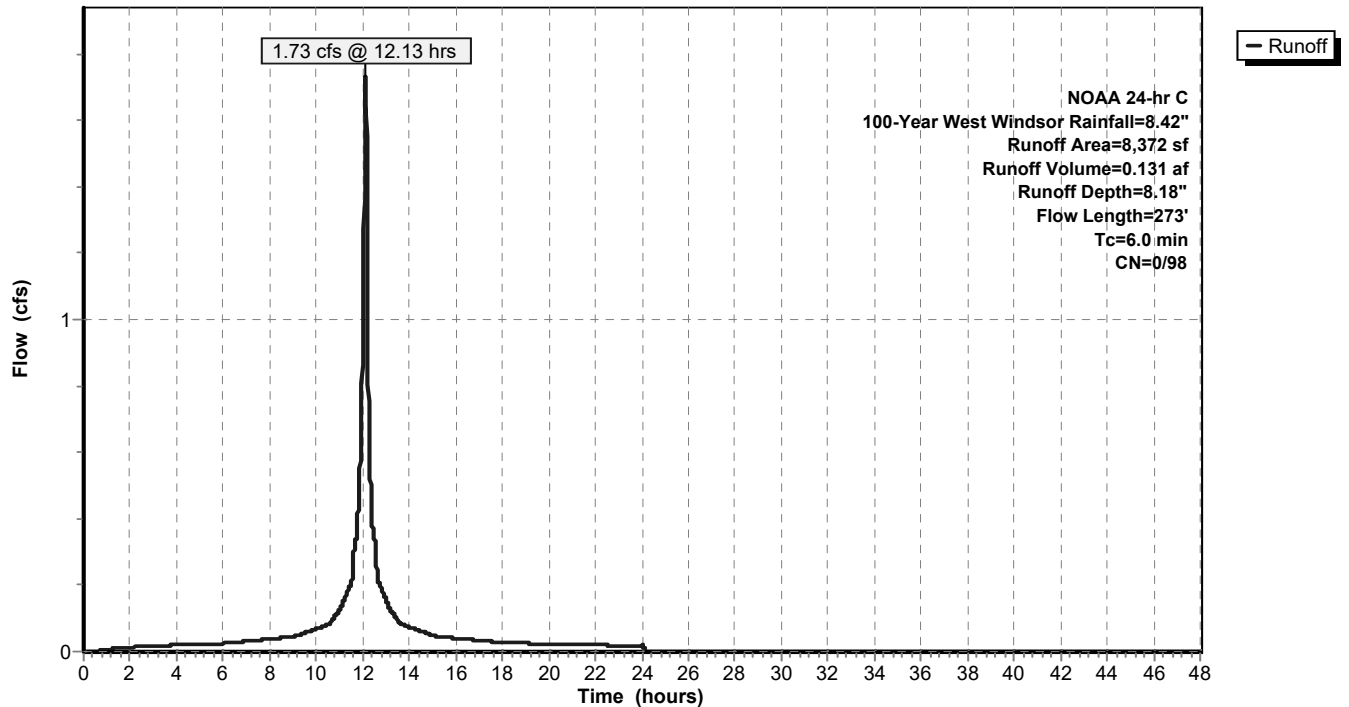
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Area (sf)	CN	Description
8,372	98	Paved parking, HSG A
8,372	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.31"
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	61	0.0230	2.56	7.67	Channel Flow, Area= 3.0 sf Perim= 12.0' r= 0.25' n= 0.035 Earth, dense weeds
3.0	273	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1Si: DA-1-Impervious

Hydrograph



20-010 EXISTING R0

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Summary for Subcatchment 1Sp: DA1-Pervious

Existing pavement and proposed generator

Runoff = 0.78 cfs @ 12.22 hrs, Volume= 0.082 af, Depth= 1.34"
 Routed to Link 1L : Com. HYD

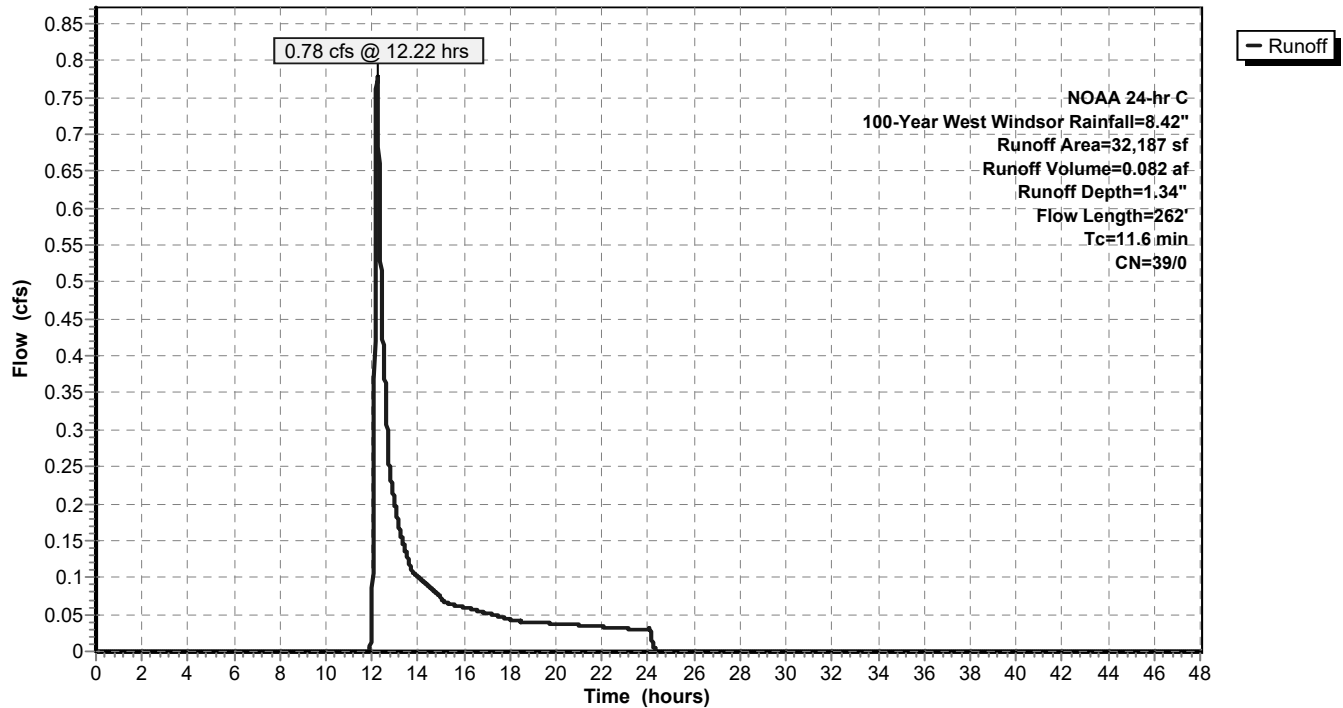
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Area (sf)	CN	Description
32,187	39	>75% Grass cover, Good, HSG A
32,187	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
2.3	210	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	262	Total			

Subcatchment 1Sp: DA1-Pervious

Hydrograph



20-010 EXISTING R0

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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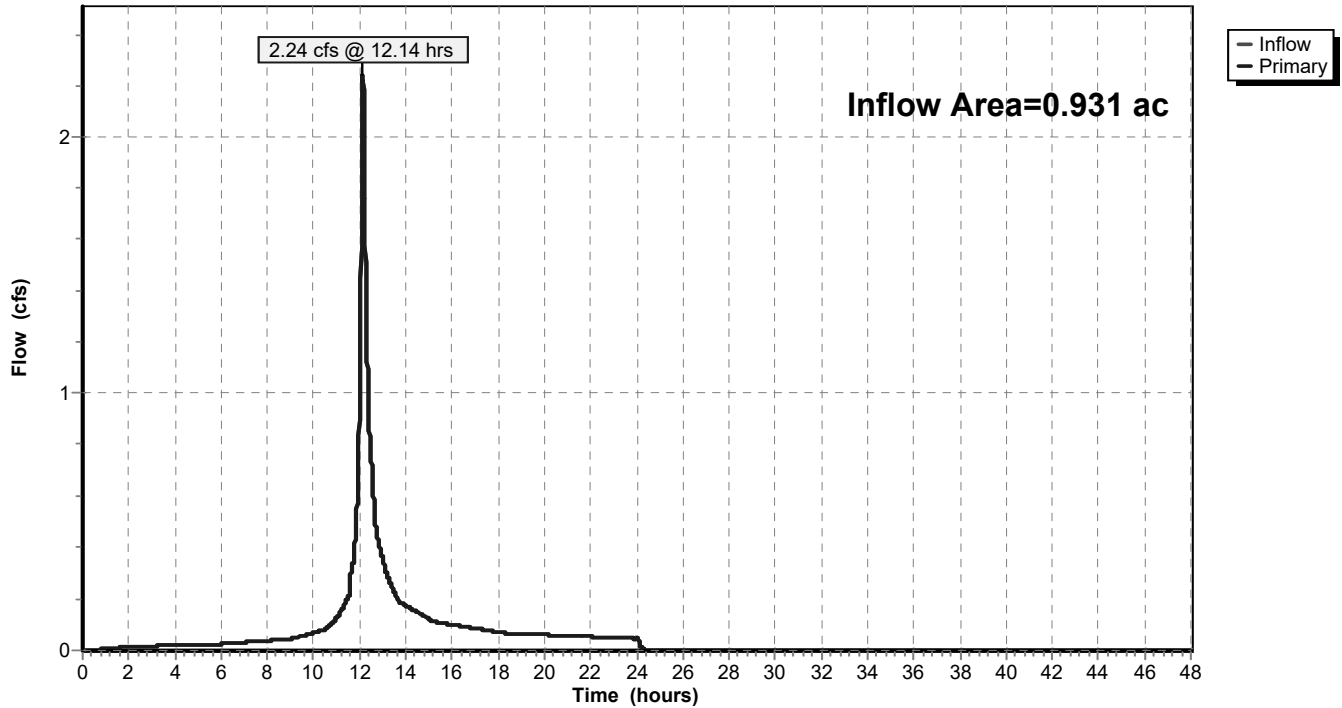
Summary for Link 1L: Com. HYD

Inflow Area = 0.931 ac, 20.64% Impervious, Inflow Depth = 2.75" for 100-Year West Windsor event
Inflow = 2.24 cfs @ 12.14 hrs, Volume= 0.213 af
Primary = 2.24 cfs @ 12.14 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.0 min

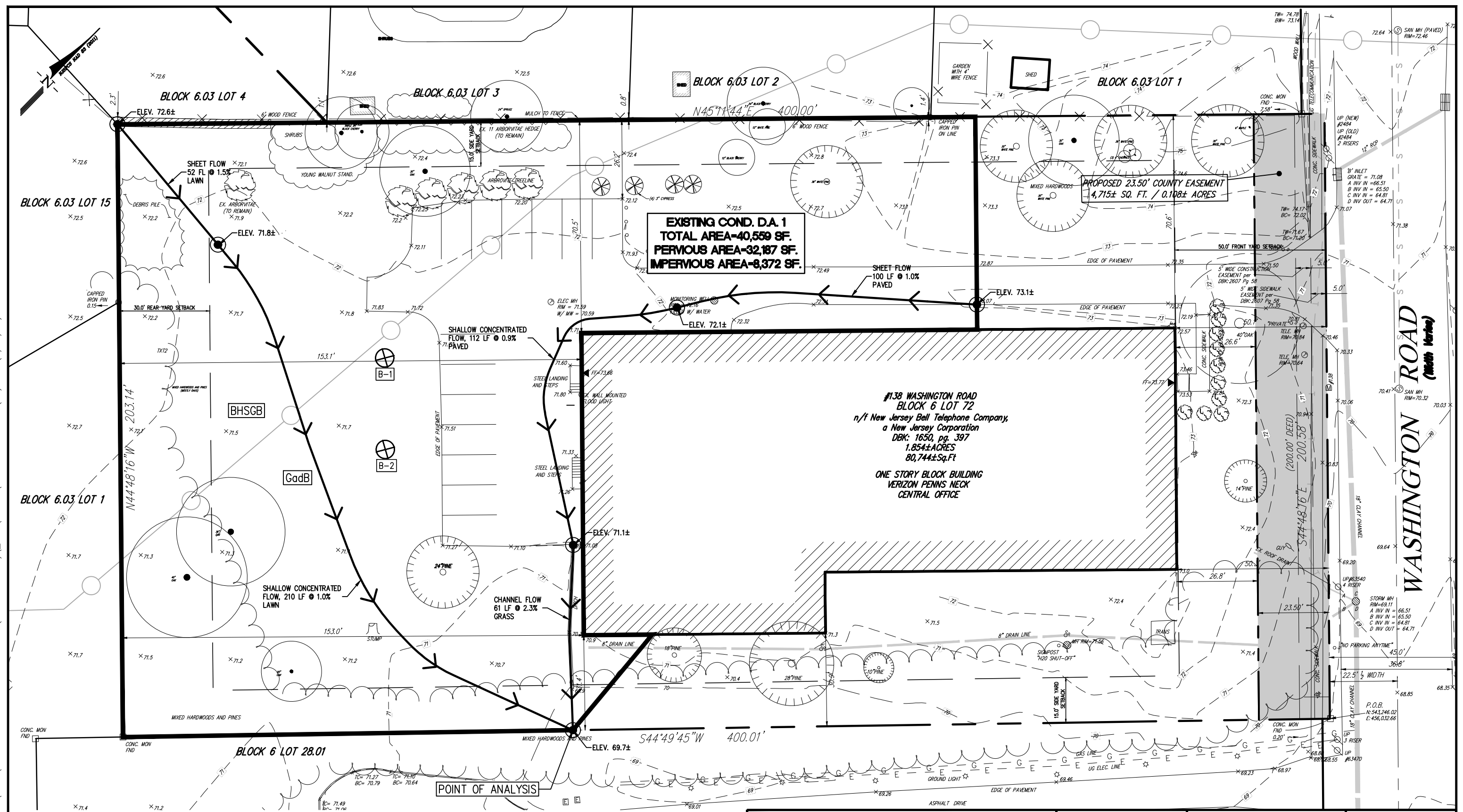
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 1L: Com. HYD

Hydrograph

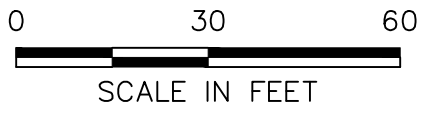


J:\ENGINEERING PROJECTS\2020\20-010 - PENNS NECK VERIZON (WEST WINDSOR)_CAD\DESIGN\20-010 DRAINAGE (RO).DWG-(4/20/22)



SOILS: BHSGB - BIRDSBORO GRAVELLY SOLUM VARIANT SOILS
 GadB - GALESTOWN LOAMY SAND

⊕ TEST PITS LOCATION



RG The Reynolds Group, Inc.
 State of New Jersey
 Certificate of Authorization
 Number 240A27969200
 21MH0004500
 Engineers
 Landscape Architects
 Land Surveyors
 Planners
 575 Route 28, Suite 110
 Marlton, N.J. 08059
 Tele 908-722-1500
 Fax 908-722-7035
 F. Mitchel Ardman, P.E., P.P.
 Jeffrey D. Reynolds, P.L.A.

SCALE: 1"=30' TRG Job No.: 20-010 Date: 03/08/22

Project: PENNS NECK VERIZON PROPOSED GENERATOR
 BLOCK 6, LOT 2
 TOWNSHIP OF WEST WINDSOR
 MERCER COUNTY, NEW JERSEY
 Sheet No.: DA-1

20-010 PROPOSED R1

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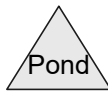
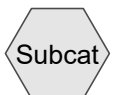
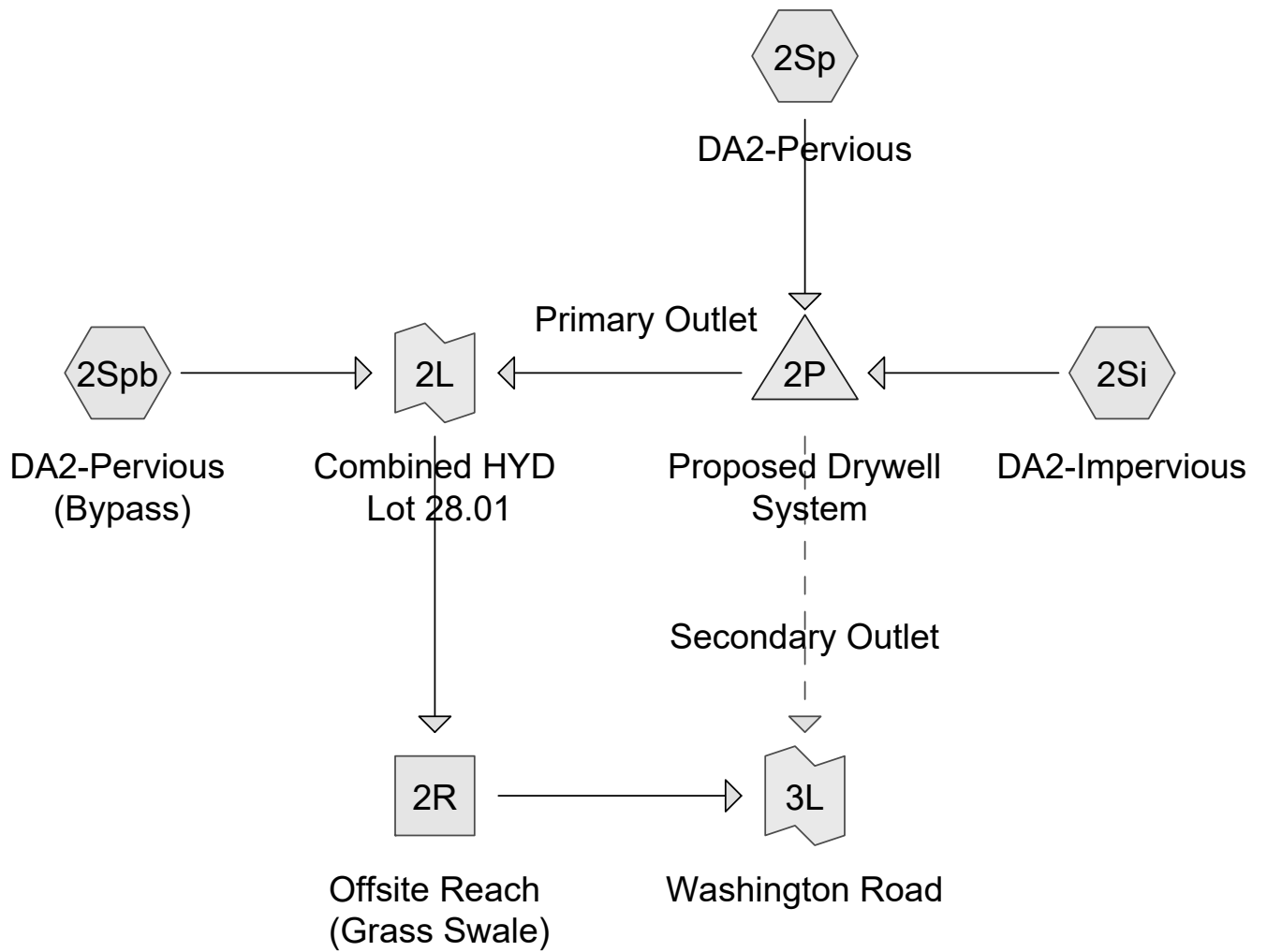
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20-010 PROPOSED R1

NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Prepared by The Reynolds Group, Inc.

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Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 2Si: DA2-Impervious Runoff Area=10,297 sf 100.00% Impervious Runoff Depth=3.08"
 Flow Length=212' Tc=6.0 min CN=0/98 Runoff=0.75 cfs 0.061 af

Subcatchment 2Sp: DA2-Pervious Runoff Area=10,693 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=199' Tc=10.6 min CN=39/0 Runoff=0.00 cfs 0.000 af

Subcatchment 2Spb: DA2-Pervious (Bypass) Runoff Area=19,569 sf 0.00% Impervious Runoff Depth=0.00"
 Flow Length=262' Tc=11.6 min CN=39/0 Runoff=0.00 cfs 0.000 af

Reach 2R: Offsite Reach (Grass Swale) Avg. Flow Depth=0.15' Max Vel=0.88 fps Inflow=0.39 cfs 0.006 af
 n=0.030 L=300.0' S=0.0067 '/' Capacity=3.84 cfs Outflow=0.30 cfs 0.006 af

Pond 2P: Proposed Drywell System Peak Elev=70.31' Storage=630 cf Inflow=0.75 cfs 0.061 af
 Discarded=0.01 cfs 0.024 af Primary=0.39 cfs 0.006 af Secondary=0.32 cfs 0.031 af Outflow=0.72 cfs 0.061 af

Link 2L: Combined HYD Lot 28.01 Inflow=0.39 cfs 0.006 af
 Primary=0.39 cfs 0.006 af

Link 3L: Washington Road Inflow=0.62 cfs 0.037 af
 Primary=0.62 cfs 0.037 af

Total Runoff Area = 0.931 ac Runoff Volume = 0.061 af Average Runoff Depth = 0.78"
74.61% Pervious = 0.695 ac 25.39% Impervious = 0.236 ac

20-010 PROPOSED R1

NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Prepared by The Reynolds Group, Inc.

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Summary for Subcatchment 2Si: DA2-Impervious

Existing pavement and proposed generator

Runoff = 0.75 cfs @ 12.11 hrs, Volume= 0.061 af, Depth= 3.08"
 Routed to Pond 2P : Proposed Drywell System

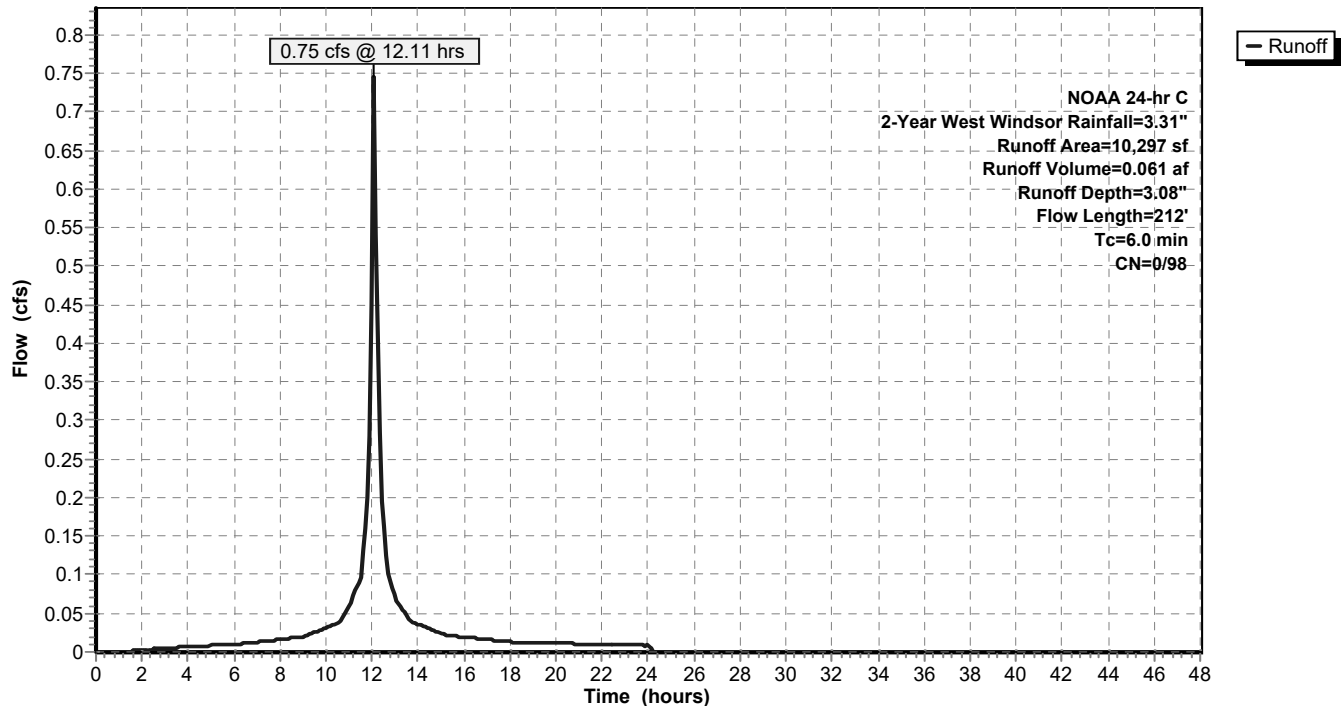
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Area (sf)	CN	Description
8,372	98	Paved parking, HSG A
* 1,925	98	Gen pad & sidewalks, HSG A
10,297	98	Weighted Average
10,297	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.31"
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.6	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2Si: DA2-Impervious

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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Summary for Subcatchment 2Sp: DA2-Pervious

Existing pavement and proposed generator

Runoff = 0.00 cfs @ 23.98 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Pond 2P : Proposed Drywell System

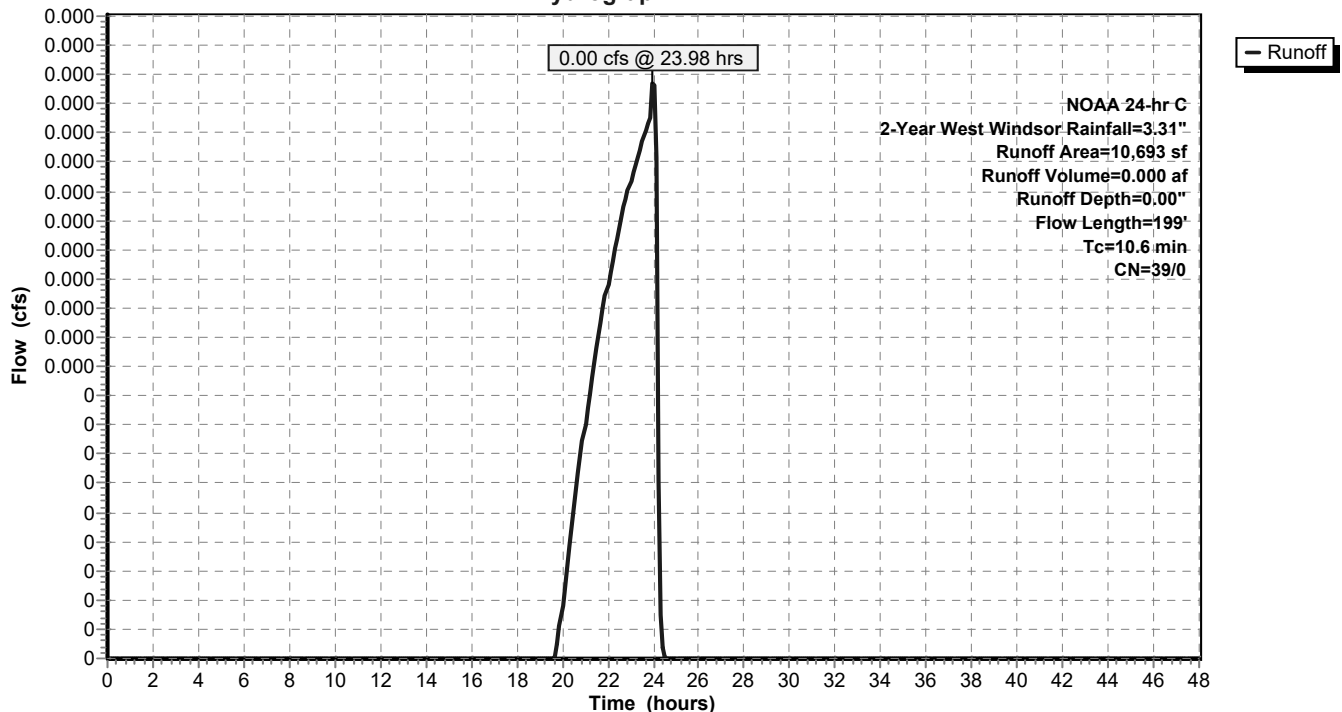
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Area (sf)	CN	Description
10,693	39	>75% Grass cover, Good, HSG A
10,693	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
0.1	12	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	23	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.6	199	Total			

Subcatchment 2Sp: DA2-Pervious

Hydrograph



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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Summary for Subcatchment 2Spb: DA2-Pervious (Bypass)

Existing pavement and proposed generator

Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Depth= 0.00"
 Routed to Link 2L : Combined HYD Lot 28.01

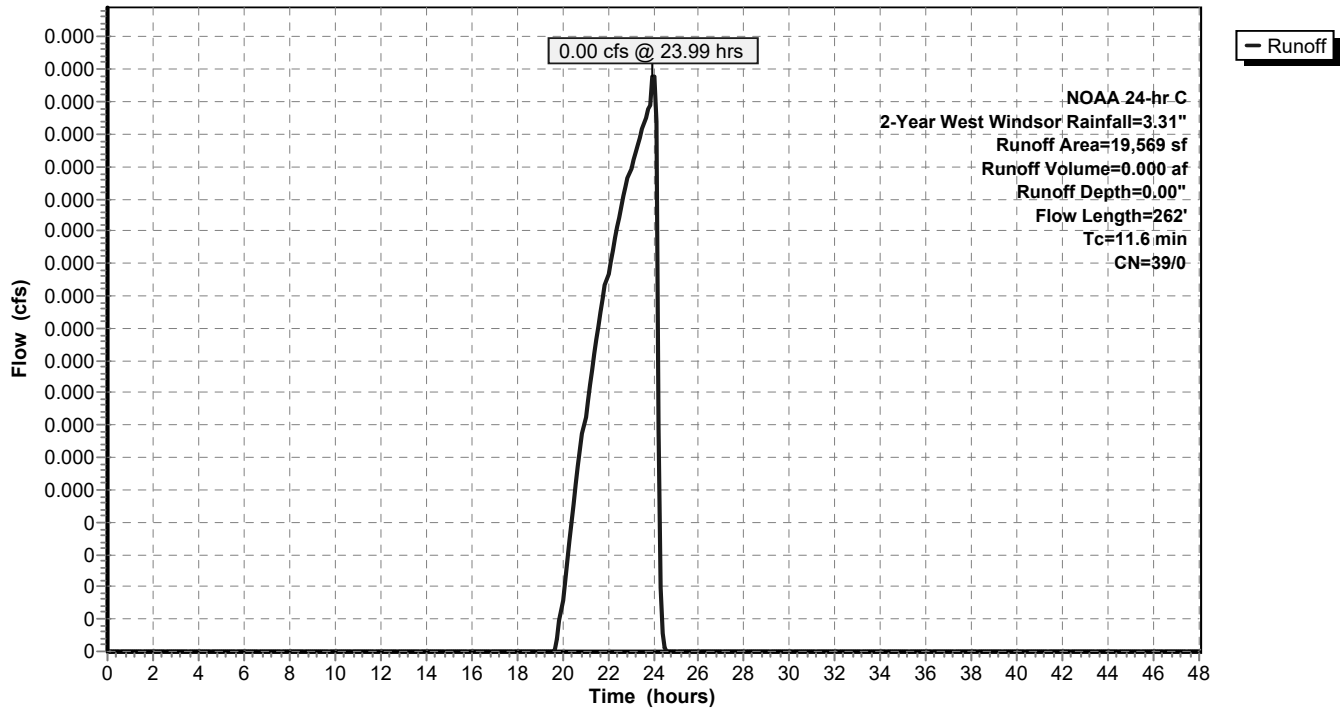
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

Area (sf)	CN	Description
19,569	39	>75% Grass cover, Good, HSG A
19,569	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
2.3	210	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	262	Total			

Subcatchment 2Spb: DA2-Pervious (Bypass)

Hydrograph



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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Summary for Reach 2R: Offsite Reach (Grass Swale)

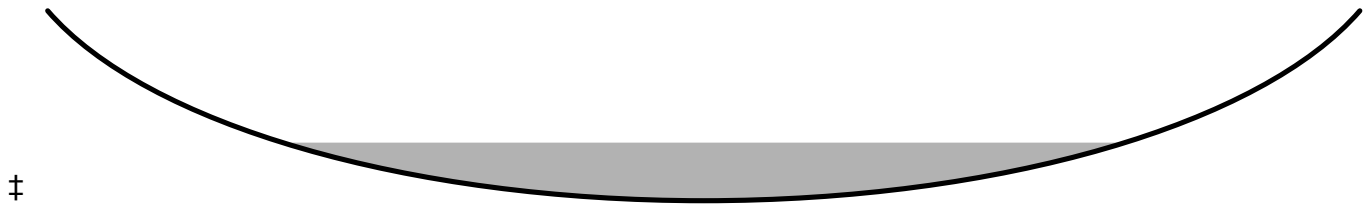
Estimated time of travel from point of analysis on Lot 28.01 to Washington Road; routing is included to evaluate drainage impact on . Routing is shown to evaluate impact at County Drainage System.

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 0.08" for 2-Year West Windsor event
 Inflow = 0.39 cfs @ 12.11 hrs, Volume= 0.006 af
 Outflow = 0.30 cfs @ 12.19 hrs, Volume= 0.006 af, Atten= 25%, Lag= 4.7 min
 Routed to Link 3L : Washington Road

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 Max. Velocity= 0.88 fps, Min. Travel Time= 5.7 min
 Avg. Velocity = 0.13 fps, Avg. Travel Time= 38.6 min

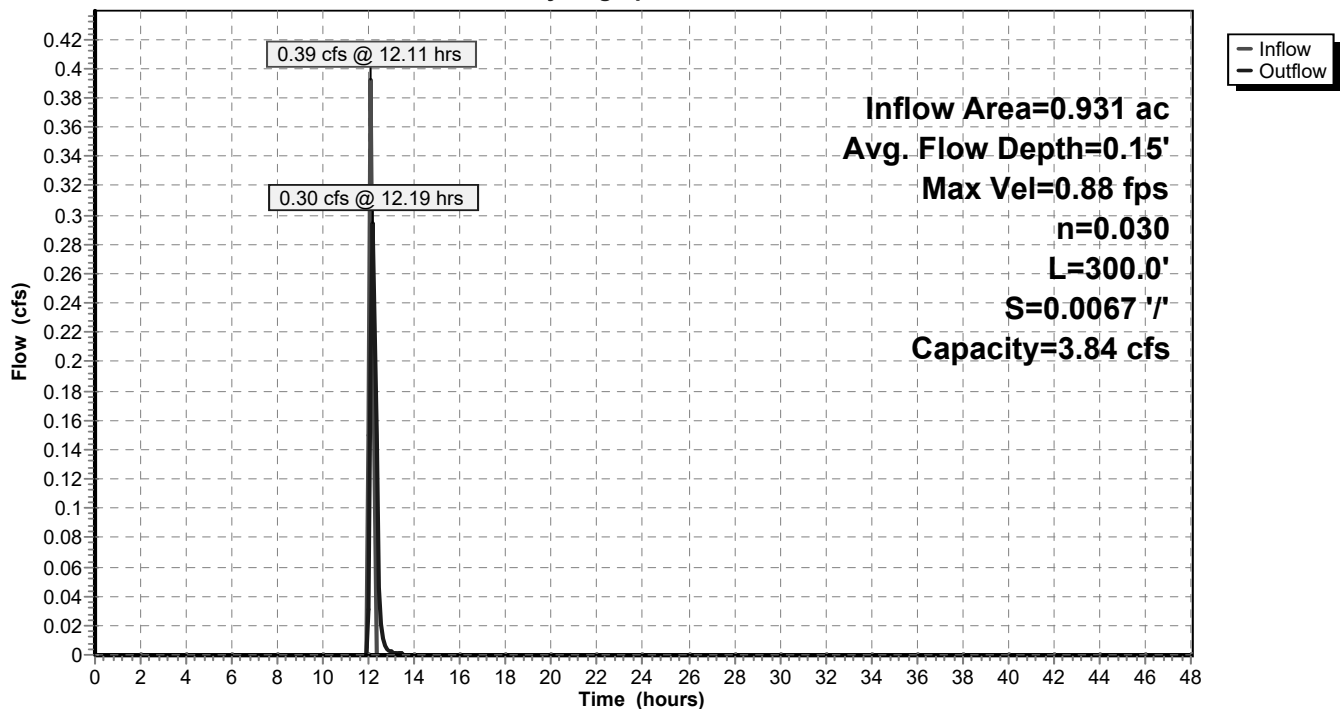
Peak Storage= 101 cf @ 12.19 hrs
 Average Depth at Peak Storage= 0.15' , Surface Width= 3.31'
 Bank-Full Depth= 0.50' Flow Area= 2.0 sf, Capacity= 3.84 cfs

6.00' x 0.50' deep Parabolic Channel, n= 0.030
 Length= 300.0' Slope= 0.0067 '/'
 Inlet Invert= 69.90', Outlet Invert= 67.90'



Reach 2R: Offsite Reach (Grass Swale)

Hydrograph



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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Summary for Pond 2P: Proposed Drywell System

Inflow Area = 0.482 ac, 49.06% Impervious, Inflow Depth = 1.51" for 2-Year West Windsor event
 Inflow = 0.75 cfs @ 12.11 hrs, Volume= 0.061 af
 Outflow = 0.72 cfs @ 12.11 hrs, Volume= 0.061 af, Atten= 3%, Lag= 0.1 min
 Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.024 af
 Primary = 0.39 cfs @ 12.11 hrs, Volume= 0.006 af
 Routed to Link 2L : Combined HYD Lot 28.01
 Secondary = 0.32 cfs @ 12.11 hrs, Volume= 0.031 af
 Routed to Link 3L : Washington Road

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 3
 Peak Elev= 70.31' @ 12.11 hrs Surf.Area= 172 sf Storage= 630 cf

Plug-Flow detention time= 324.7 min calculated for 0.061 af (100% of inflow)
 Center-of-Mass det. time= 335.3 min (1,092.6 - 757.2)

Volume	Invert	Avail.Storage	Storage Description
#1	61.66'	223 cf	9.00'W x 18.00'L x 7.50'H Prismaoid 1,215 cf Overall - 539 cf Embedded = 676 cf x 33.0% Voids
#2	62.16'	396 cf	6.00'D x 7.00'H HD Seepage Pit x 2 Inside #1 539 cf Overall - 6.0" Wall Thickness = 396 cf
#3	69.16'	13 cf	2.50'D x 1.34'H Riser x 2
		632 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	70.20'	12.0" Horiz. Orifice C= 0.600 Limited to weir flow at low heads
#2	Secondary	68.33'	3.0" Round Bypass Pipe L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 68.33' / 65.50' S= 0.1179 ' / ' Cc= 0.900 n= 0.010, Flow Area= 0.05 sf
#3	Discarded	61.66'	1.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 55.00'

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=70.31' (Free Discharge)
 ↑**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.36 cfs @ 12.11 hrs HW=70.31' (Free Discharge)
 ↑**1=Orifice** (Weir Controls 0.36 cfs @ 1.07 fps)

Secondary OutFlow Max=0.32 cfs @ 12.11 hrs HW=70.31' (Free Discharge)
 ↑**2=Bypass Pipe** (Inlet Controls 0.32 cfs @ 6.55 fps)

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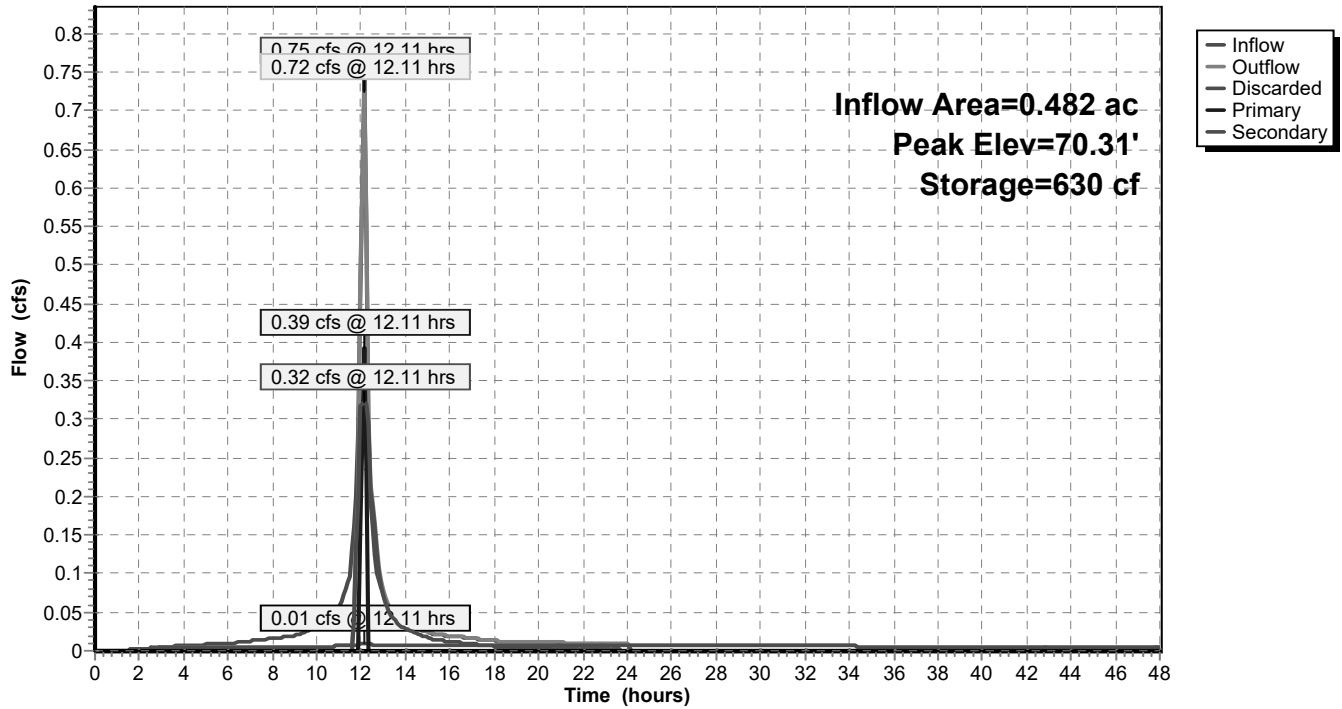
NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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Pond 2P: Proposed Drywell System

Hydrograph



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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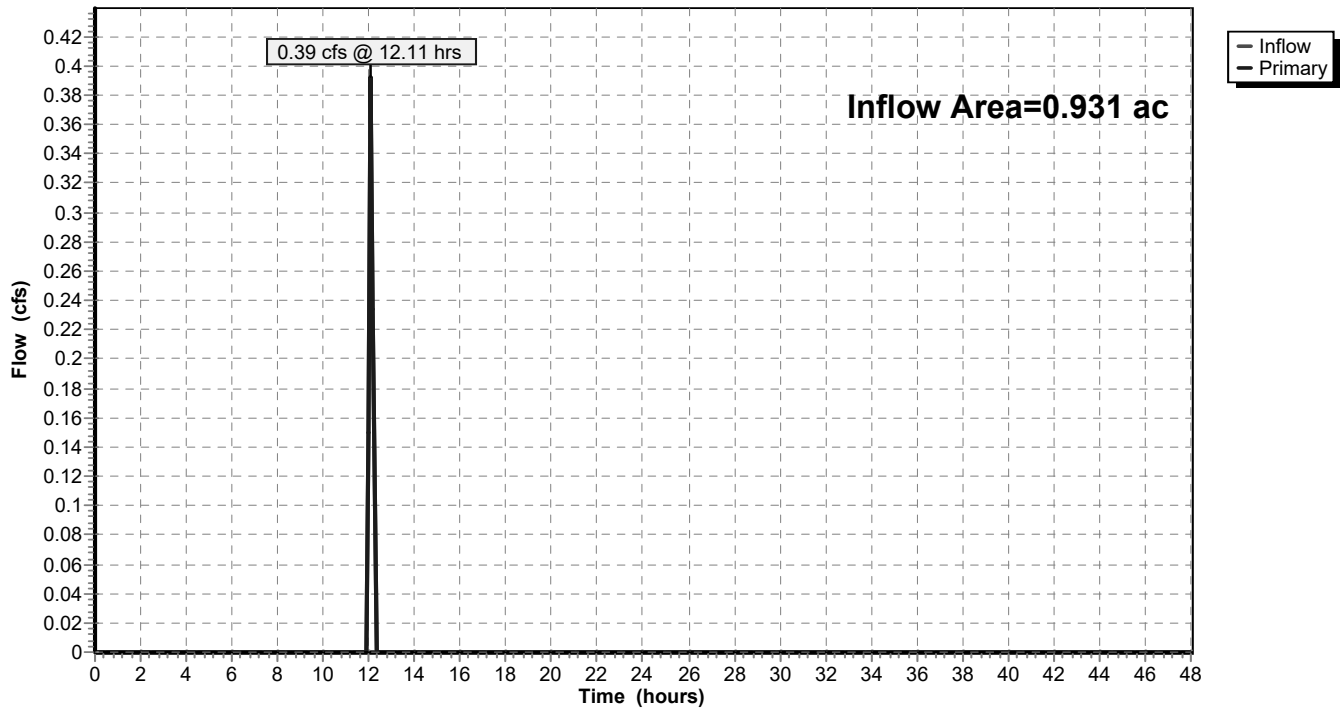
Summary for Link 2L: Combined HYD Lot 28.01

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 0.08" for 2-Year West Windsor event
Inflow = 0.39 cfs @ 12.11 hrs, Volume= 0.006 af
Primary = 0.39 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2R : Offsite Reach (Grass Swale)

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

Link 2L: Combined HYD Lot 28.01

Hydrograph



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NOAA 24-hr C 2-Year West Windsor Rainfall=3.31"

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Summary for Link 3L: Washington Road

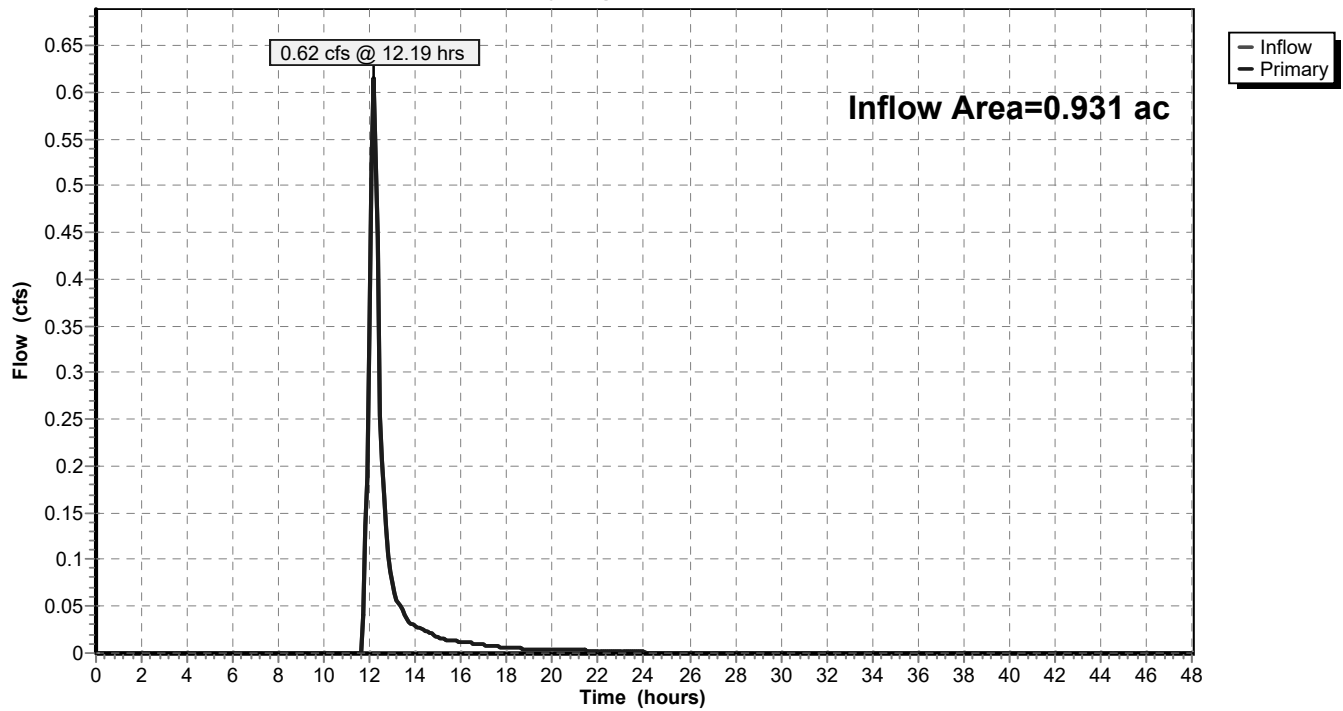
Combined Hydrographs: Secondary outflow from proposed drywell and routed flow from Lot 28.01 (point of analysis).

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 0.48" for 2-Year West Windsor event
 Inflow = 0.62 cfs @ 12.19 hrs, Volume= 0.037 af
 Primary = 0.62 cfs @ 12.19 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

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

Link 3L: Washington Road

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 2Si: DA2-Impervious Runoff Area=10,297 sf 100.00% Impervious Runoff Depth=4.79"
 Flow Length=212' Tc=6.0 min CN=0/98 Runoff=1.14 cfs 0.094 af

Subcatchment 2Sp: DA2-Pervious Runoff Area=10,693 sf 0.00% Impervious Runoff Depth=0.21"
 Flow Length=199' Tc=10.6 min CN=39/0 Runoff=0.01 cfs 0.004 af

Subcatchment 2Spb: DA2-Pervious (Bypass) Runoff Area=19,569 sf 0.00% Impervious Runoff Depth=0.21"
 Flow Length=262' Tc=11.6 min CN=39/0 Runoff=0.02 cfs 0.008 af

Reach 2R: Offsite Reach (Grass Swale) Avg. Flow Depth=0.22' Max Vel=1.11 fps Inflow=0.79 cfs 0.023 af
 n=0.030 L=300.0' S=0.0067 '/' Capacity=3.84 cfs Outflow=0.66 cfs 0.023 af

Pond 2P: Proposed Drywell System Peak Elev=70.38' Storage=631 cf Inflow=1.14 cfs 0.099 af
 Discarded=0.01 cfs 0.025 af Primary=0.79 cfs 0.015 af Secondary=0.33 cfs 0.058 af Outflow=1.13 cfs 0.099 af

Link 2L: Combined HYD Lot 28.01 Inflow=0.79 cfs 0.023 af
 Primary=0.79 cfs 0.023 af

Link 3L: Washington Road Inflow=0.98 cfs 0.081 af
 Primary=0.98 cfs 0.081 af

Total Runoff Area = 0.931 ac Runoff Volume = 0.106 af Average Runoff Depth = 1.37"
74.61% Pervious = 0.695 ac 25.39% Impervious = 0.236 ac

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Summary for Subcatchment 2Si: DA2-Impervious

Existing pavement and proposed generator

Runoff = 1.14 cfs @ 12.11 hrs, Volume= 0.094 af, Depth= 4.79"
Routed to Pond 2P : Proposed Drywell System

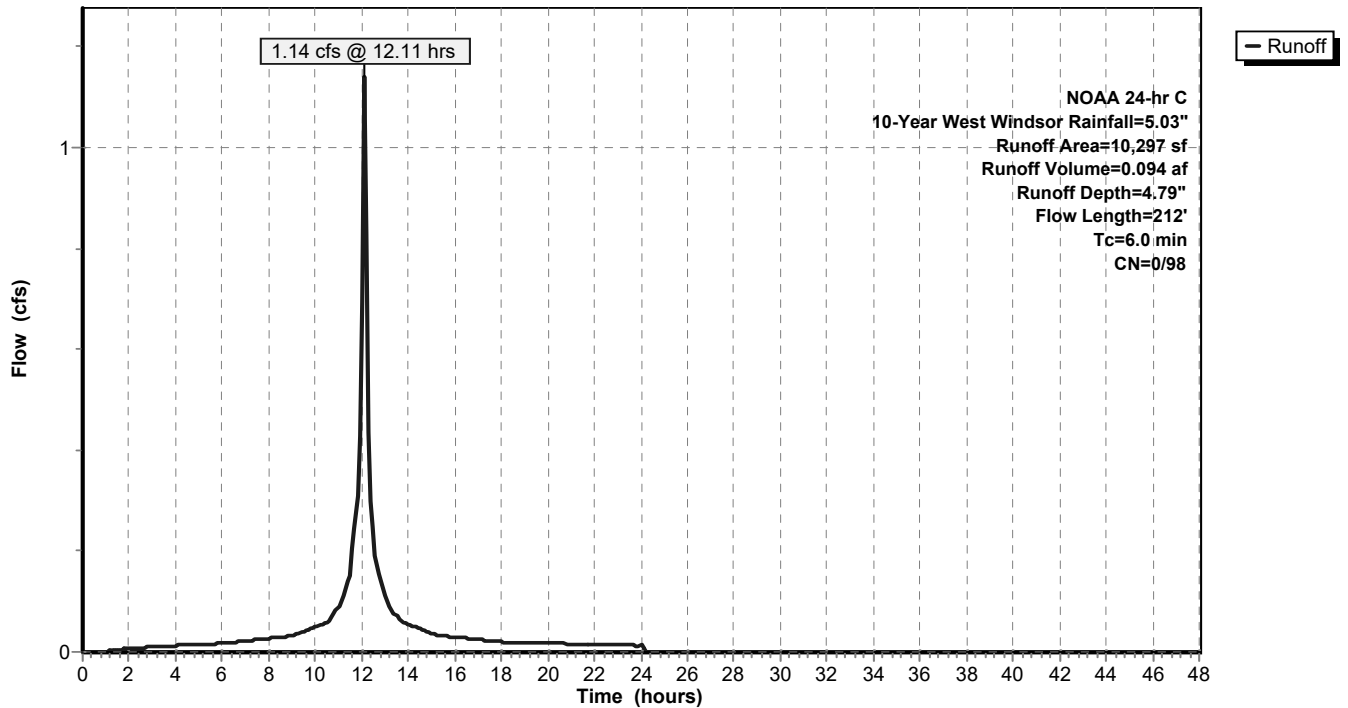
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

Area (sf)	CN	Description
8,372	98	Paved parking, HSG A
* 1,925	98	Gen pad & sidewalks, HSG A
10,297	98	Weighted Average
10,297	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.31"
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.6	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2Si: DA2-Impervious

Hydrograph



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Summary for Subcatchment 2Sp: DA2-Pervious

Existing pavement and proposed generator

Runoff = 0.01 cfs @ 12.63 hrs, Volume= 0.004 af, Depth= 0.21"
Routed to Pond 2P : Proposed Drywell System

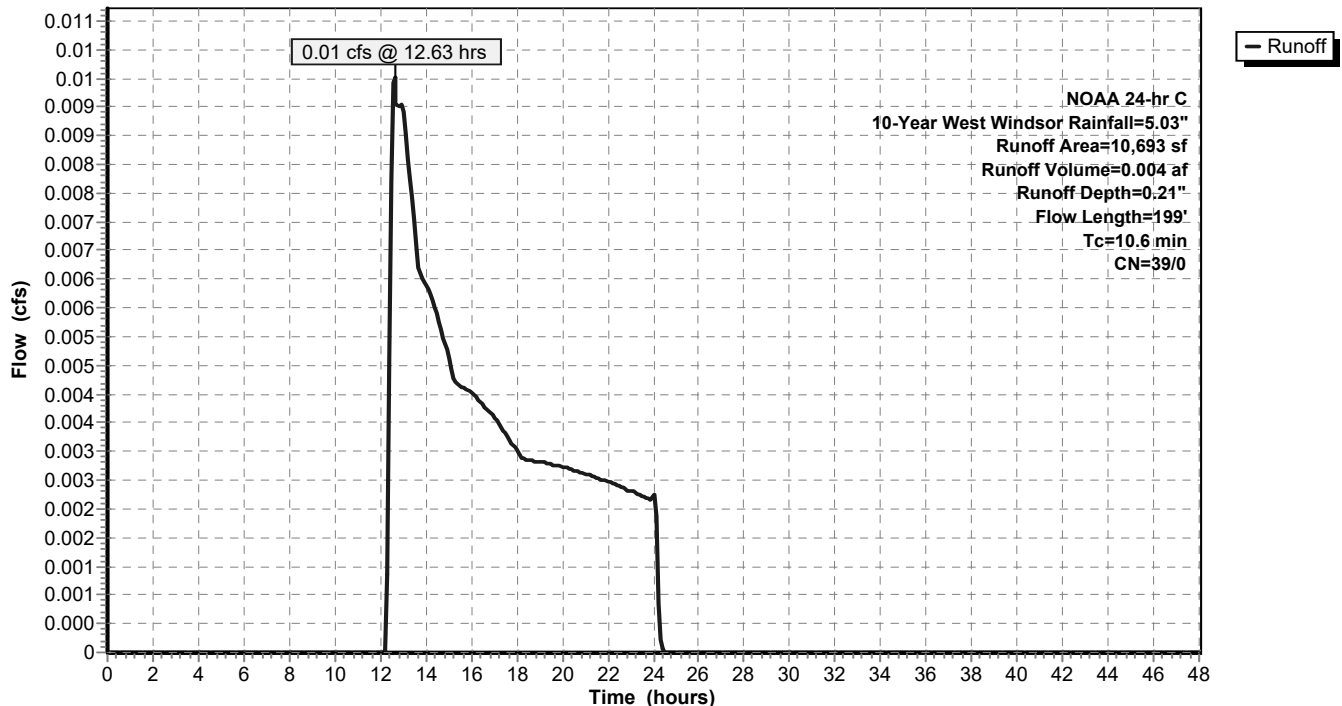
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

Area (sf)	CN	Description
10,693	39	>75% Grass cover, Good, HSG A
10,693	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
0.1	12	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	23	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.6	199	Total			

Subcatchment 2Sp: DA2-Pervious

Hydrograph



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NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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Summary for Subcatchment 2Spb: DA2-Pervious (Bypass)

Existing pavement and proposed generator

Runoff = 0.02 cfs @ 12.60 hrs, Volume= 0.008 af, Depth= 0.21"
 Routed to Link 2L : Combined HYD Lot 28.01

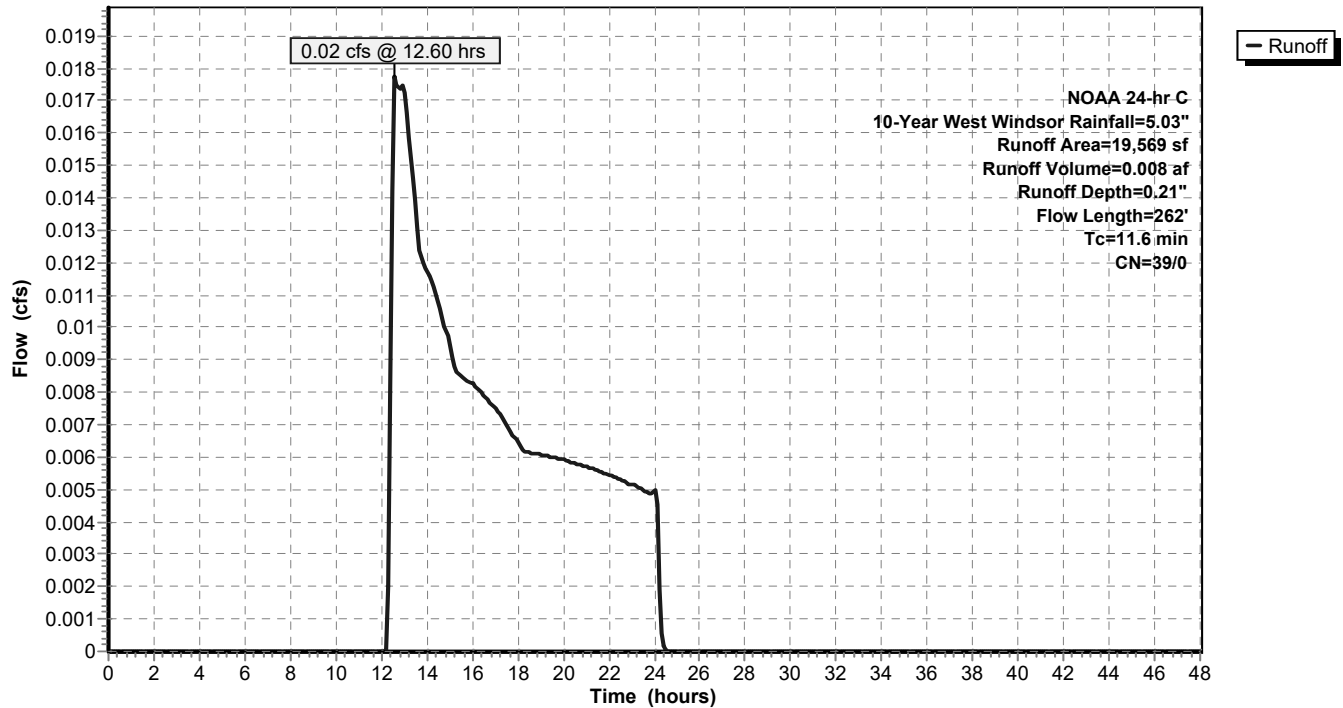
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

Area (sf)	CN	Description
19,569	39	>75% Grass cover, Good, HSG A
19,569	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
2.3	210	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	262	Total			

Subcatchment 2Spb: DA2-Pervious (Bypass)

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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Summary for Reach 2R: Offsite Reach (Grass Swale)

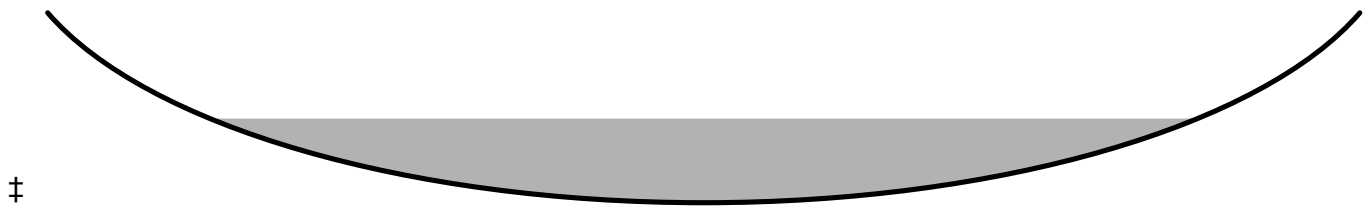
Estimated time of travel from point of analysis on Lot 28.01 to Washington Road; routing is included to evaluate drainage impact on . Routing is shown to evaluate impact at County Drainage System.

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 0.30" for 10-Year West Windsor event
 Inflow = 0.79 cfs @ 12.11 hrs, Volume= 0.023 af
 Outflow = 0.66 cfs @ 12.18 hrs, Volume= 0.023 af, Atten= 17%, Lag= 4.0 min
 Routed to Link 3L : Washington Road

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 Max. Velocity= 1.11 fps, Min. Travel Time= 4.5 min
 Avg. Velocity = 0.26 fps, Avg. Travel Time= 19.0 min

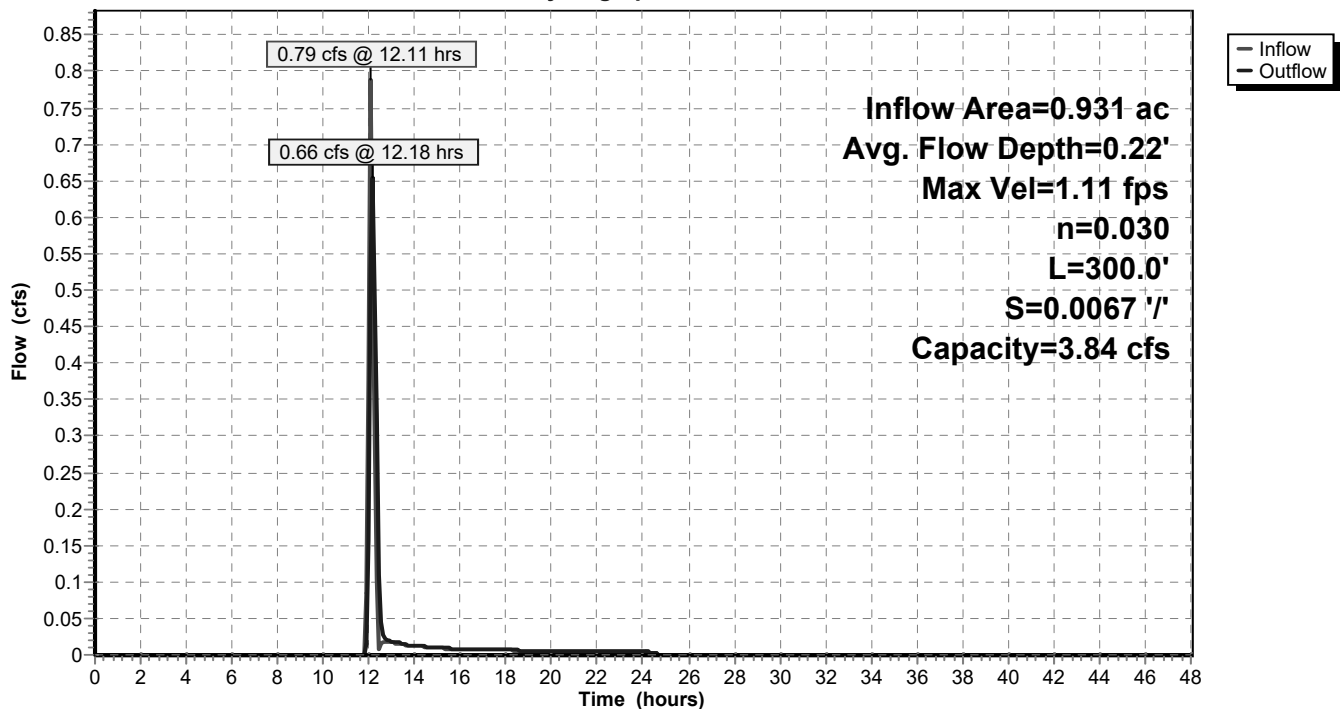
Peak Storage= 176 cf @ 12.18 hrs
 Average Depth at Peak Storage= 0.22' , Surface Width= 3.99'
 Bank-Full Depth= 0.50' Flow Area= 2.0 sf, Capacity= 3.84 cfs

6.00' x 0.50' deep Parabolic Channel, n= 0.030
 Length= 300.0' Slope= 0.0067 '/'
 Inlet Invert= 69.90', Outlet Invert= 67.90'



Reach 2R: Offsite Reach (Grass Swale)

Hydrograph



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NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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Summary for Pond 2P: Proposed Drywell System

Inflow Area = 0.482 ac, 49.06% Impervious, Inflow Depth = 2.46" for 10-Year West Windsor event
 Inflow = 1.14 cfs @ 12.11 hrs, Volume= 0.099 af
 Outflow = 1.13 cfs @ 12.11 hrs, Volume= 0.099 af, Atten= 1%, Lag= 0.1 min
 Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.025 af
 Primary = 0.79 cfs @ 12.11 hrs, Volume= 0.015 af
 Routed to Link 2L : Combined HYD Lot 28.01
 Secondary = 0.33 cfs @ 12.11 hrs, Volume= 0.058 af
 Routed to Link 3L : Washington Road

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 3
 Peak Elev= 70.38' @ 12.11 hrs Surf.Area= 172 sf Storage= 631 cf

Plug-Flow detention time= 222.2 min calculated for 0.098 af (100% of inflow)
 Center-of-Mass det. time= 224.0 min (984.4 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1	61.66'	223 cf	9.00'W x 18.00'L x 7.50'H Prismaoid 1,215 cf Overall - 539 cf Embedded = 676 cf x 33.0% Voids
#2	62.16'	396 cf	6.00'D x 7.00'H HD Seepage Pit x 2 Inside #1 539 cf Overall - 6.0" Wall Thickness = 396 cf
#3	69.16'	13 cf	2.50'D x 1.34'H Riser x 2
		632 cf	Total Available Storage

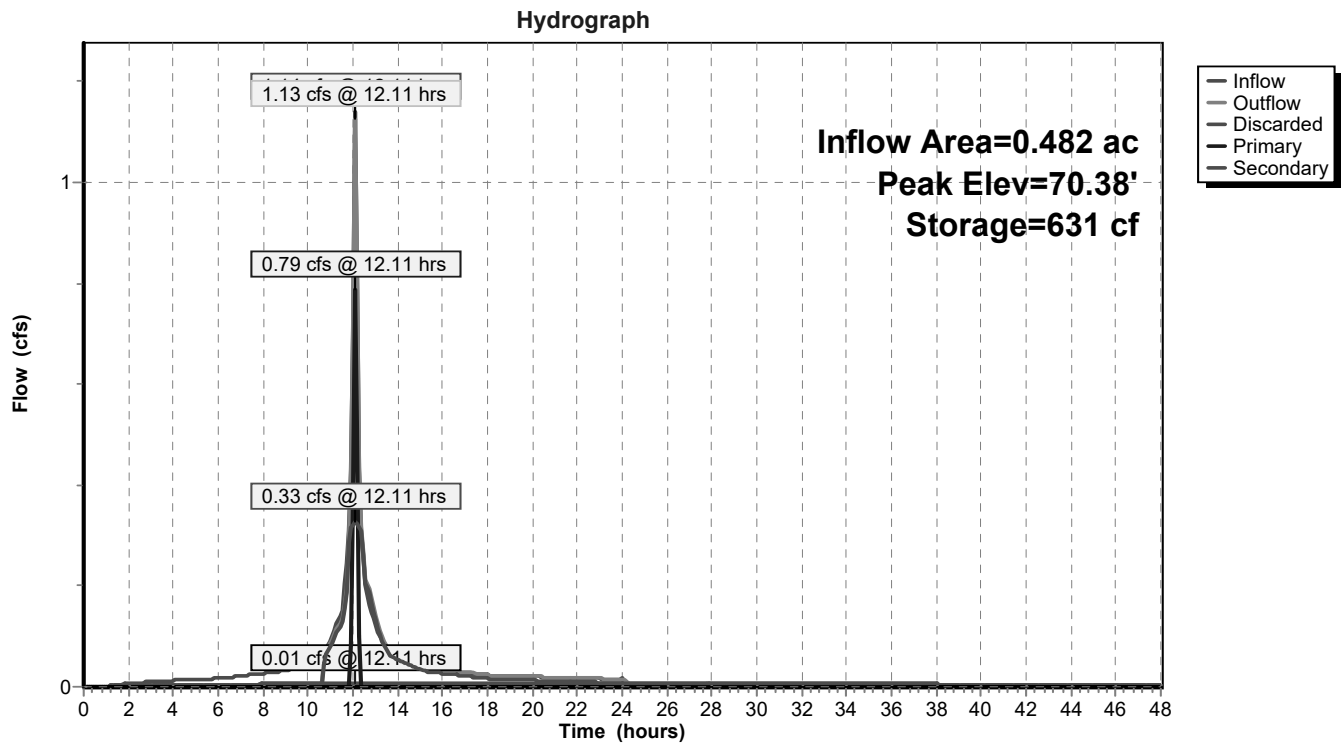
Device	Routing	Invert	Outlet Devices
#1	Primary	70.20'	12.0" Horiz. Orifice C= 0.600 Limited to weir flow at low heads
#2	Secondary	68.33'	3.0" Round Bypass Pipe L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 68.33' / 65.50' S= 0.1179 ' / ' Cc= 0.900 n= 0.010, Flow Area= 0.05 sf
#3	Discarded	61.66'	1.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 55.00'

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=70.37' (Free Discharge)
 ↑**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.74 cfs @ 12.11 hrs HW=70.37' (Free Discharge)
 ↑**1=Orifice** (Weir Controls 0.74 cfs @ 1.36 fps)

Secondary OutFlow Max=0.33 cfs @ 12.11 hrs HW=70.37' (Free Discharge)
 ↑**2=Bypass Pipe** (Inlet Controls 0.33 cfs @ 6.67 fps)

Pond 2P: Proposed Drywell System



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NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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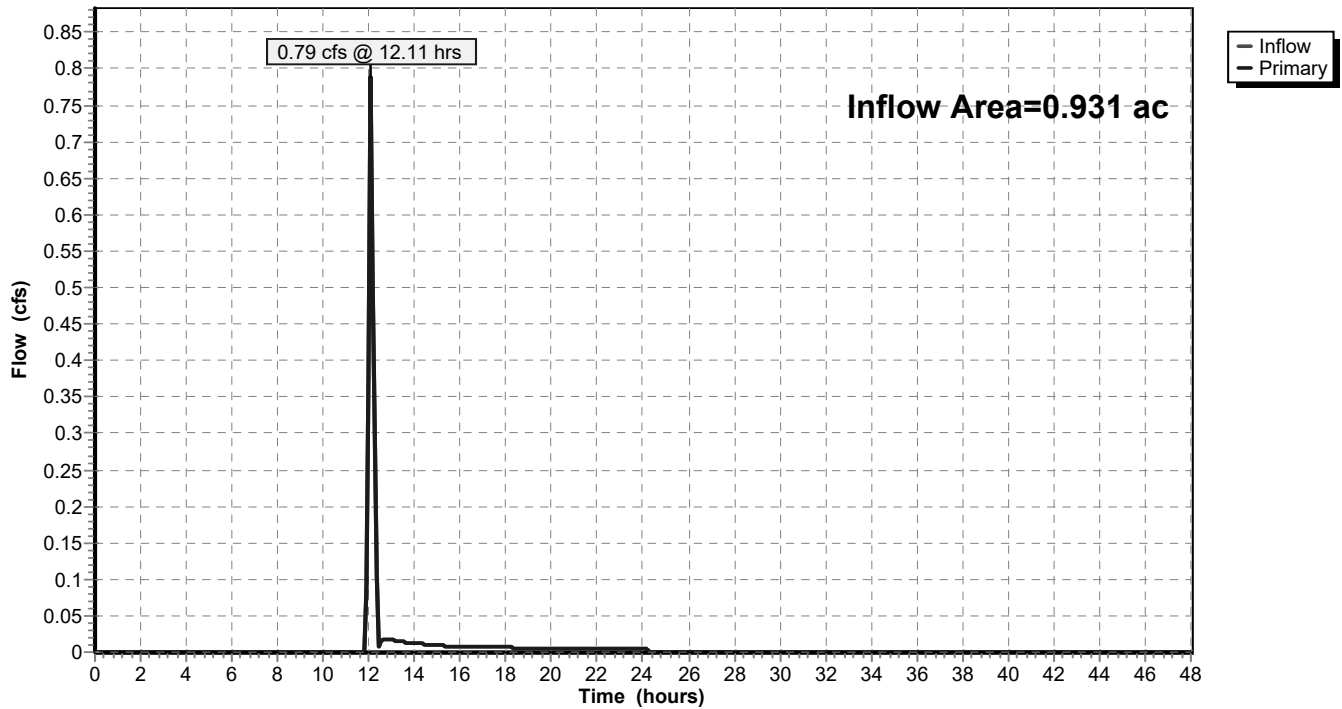
Summary for Link 2L: Combined HYD Lot 28.01

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 0.30" for 10-Year West Windsor event
Inflow = 0.79 cfs @ 12.11 hrs, Volume= 0.023 af
Primary = 0.79 cfs @ 12.11 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2R : Offsite Reach (Grass Swale)

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

Link 2L: Combined HYD Lot 28.01

Hydrograph



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NOAA 24-hr C 10-Year West Windsor Rainfall=5.03"

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Summary for Link 3L: Washington Road

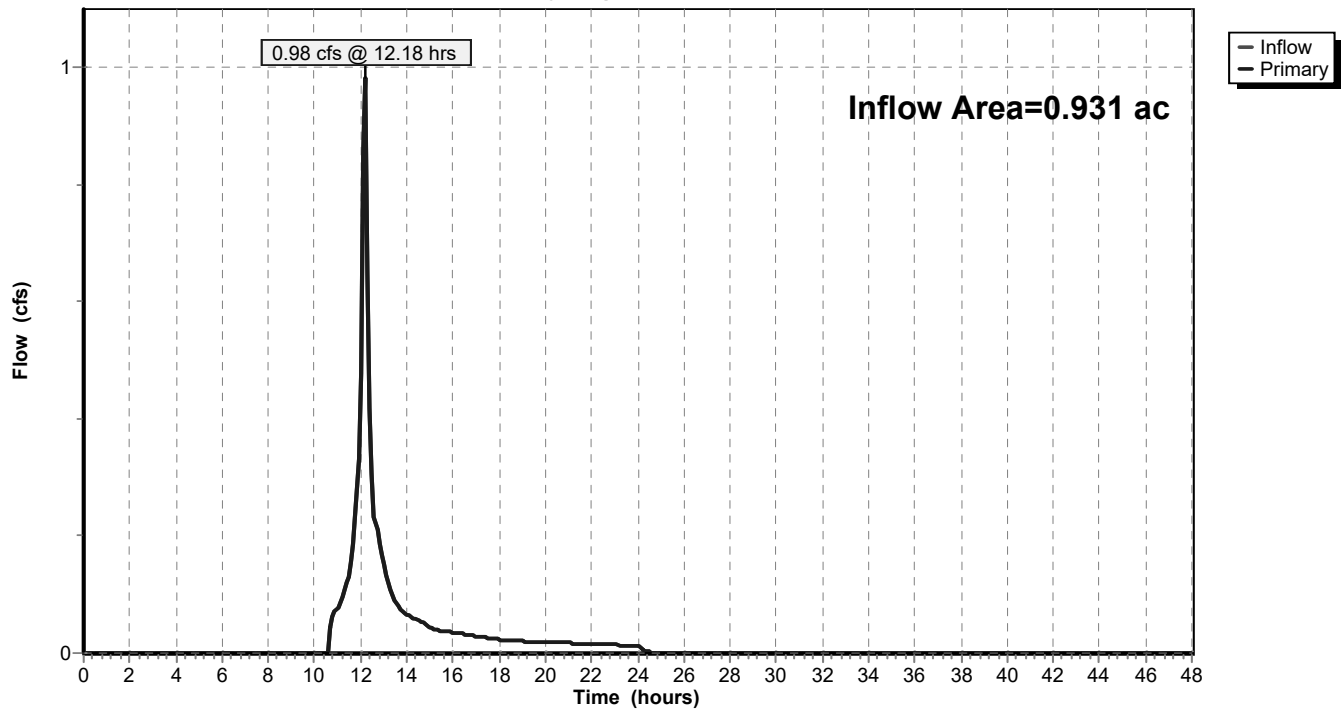
Combined Hydrographs: Secondary outflow from proposed drywell and routed flow from Lot 28.01 (point of analysis).

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 1.05" for 10-Year West Windsor event
Inflow = 0.98 cfs @ 12.18 hrs, Volume= 0.081 af
Primary = 0.98 cfs @ 12.18 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min

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

Link 3L: Washington Road

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 2Si: DA2-Impervious Runoff Area=10,297 sf 100.00% Impervious Runoff Depth=8.18"
 Flow Length=212' Tc=6.0 min CN=0/98 Runoff=1.92 cfs 0.161 af

Subcatchment 2Sp: DA2-Pervious Runoff Area=10,693 sf 0.00% Impervious Runoff Depth=1.34"
 Flow Length=199' Tc=10.6 min CN=39/0 Runoff=0.26 cfs 0.027 af

Subcatchment 2Spb: DA2-Pervious (Bypass) Runoff Area=19,569 sf 0.00% Impervious Runoff Depth=1.34"
 Flow Length=262' Tc=11.6 min CN=39/0 Runoff=0.46 cfs 0.050 af

Reach 2R: Offsite Reach (Grass Swale) Avg. Flow Depth=0.36' Max Vel=1.54 fps Inflow=1.98 cfs 0.098 af
 n=0.030 L=300.0' S=0.0067 '/' Capacity=3.84 cfs Outflow=1.87 cfs 0.098 af

Pond 2P: Proposed Drywell System Peak Elev=70.50' Storage=632 cf Inflow=2.06 cfs 0.189 af
 Discarded=0.01 cfs 0.026 af Primary=1.72 cfs 0.048 af Secondary=0.34 cfs 0.114 af Outflow=2.07 cfs 0.188 af

Link 2L: Combined HYD Lot 28.01 Inflow=1.98 cfs 0.098 af
 Primary=1.98 cfs 0.098 af

Link 3L: Washington Road Inflow=2.21 cfs 0.212 af
 Primary=2.21 cfs 0.212 af

Total Runoff Area = 0.931 ac Runoff Volume = 0.239 af Average Runoff Depth = 3.07"
74.61% Pervious = 0.695 ac 25.39% Impervious = 0.236 ac

20-010 PROPOSED R1

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Summary for Subcatchment 2Si: DA2-Impervious

Existing pavement and proposed generator

Runoff = 1.92 cfs @ 12.11 hrs, Volume= 0.161 af, Depth= 8.18"
Routed to Pond 2P : Proposed Drywell System

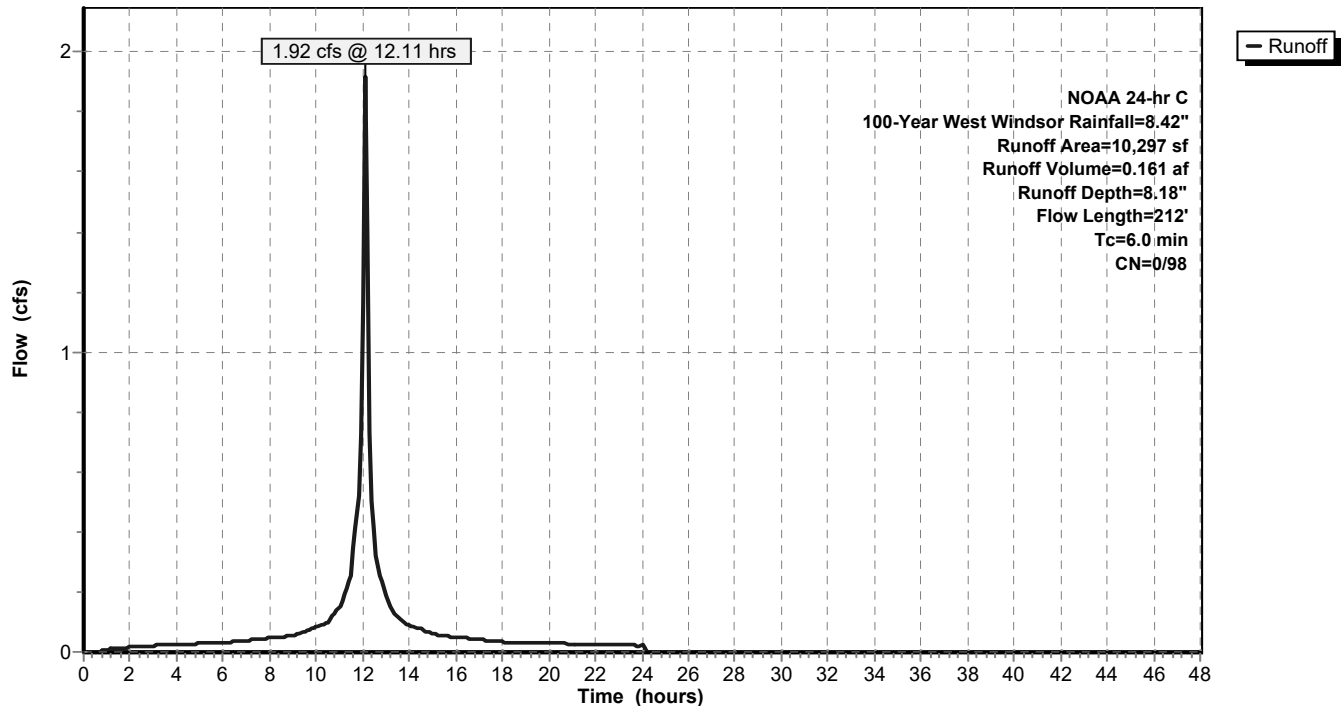
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Area (sf)	CN	Description
8,372	98	Paved parking, HSG A
* 1,925	98	Gen pad & sidewalks, HSG A
10,297	98	Weighted Average
10,297	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.06		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.31"
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.6	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2Si: DA2-Impervious

Hydrograph



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NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Summary for Subcatchment 2Sp: DA2-Pervious

Existing pavement and proposed generator

Runoff = 0.26 cfs @ 12.22 hrs, Volume= 0.027 af, Depth= 1.34"
 Routed to Pond 2P : Proposed Drywell System

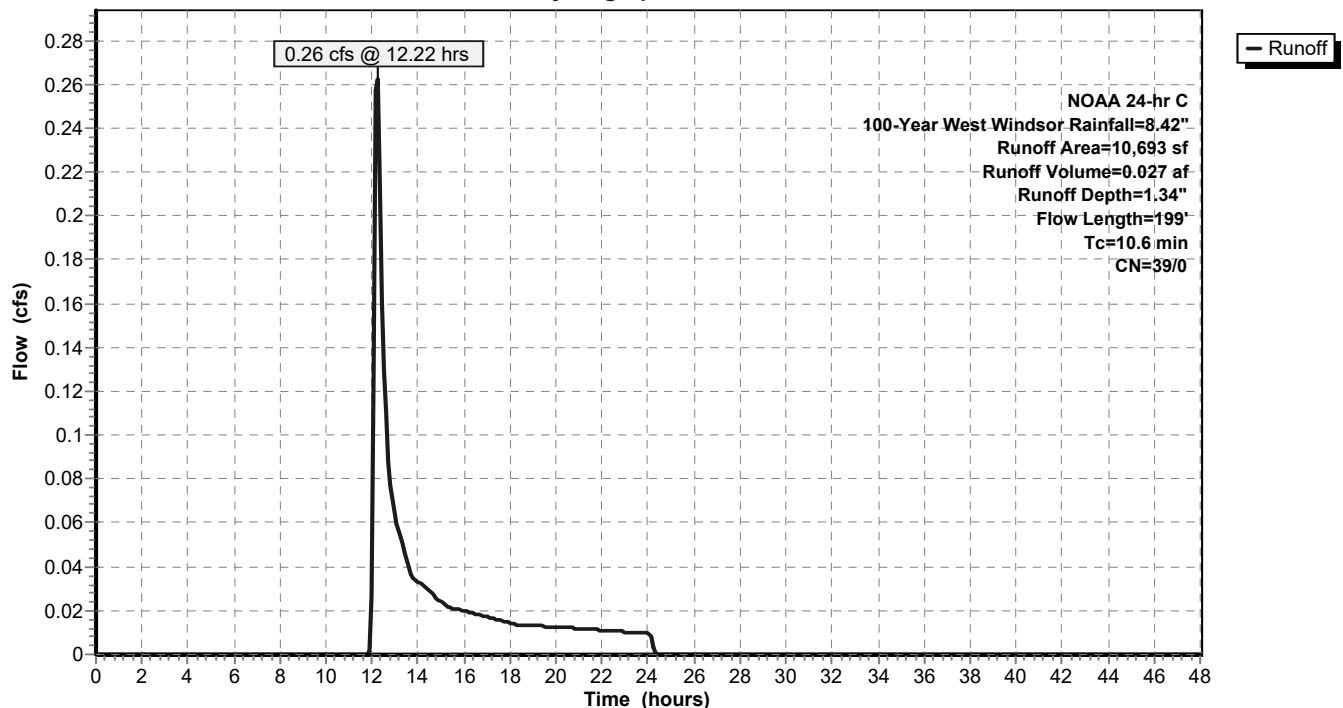
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Area (sf)	CN	Description
10,693	39	>75% Grass cover, Good, HSG A
10,693	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
0.1	12	0.0090	1.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.2	23	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.0	112	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
10.6	199	Total			

Subcatchment 2Sp: DA2-Pervious

Hydrograph



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NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Summary for Subcatchment 2Spb: DA2-Pervious (Bypass)

Existing pavement and proposed generator

Runoff = 0.46 cfs @ 12.24 hrs, Volume= 0.050 af, Depth= 1.34"
 Routed to Link 2L : Combined HYD Lot 28.01

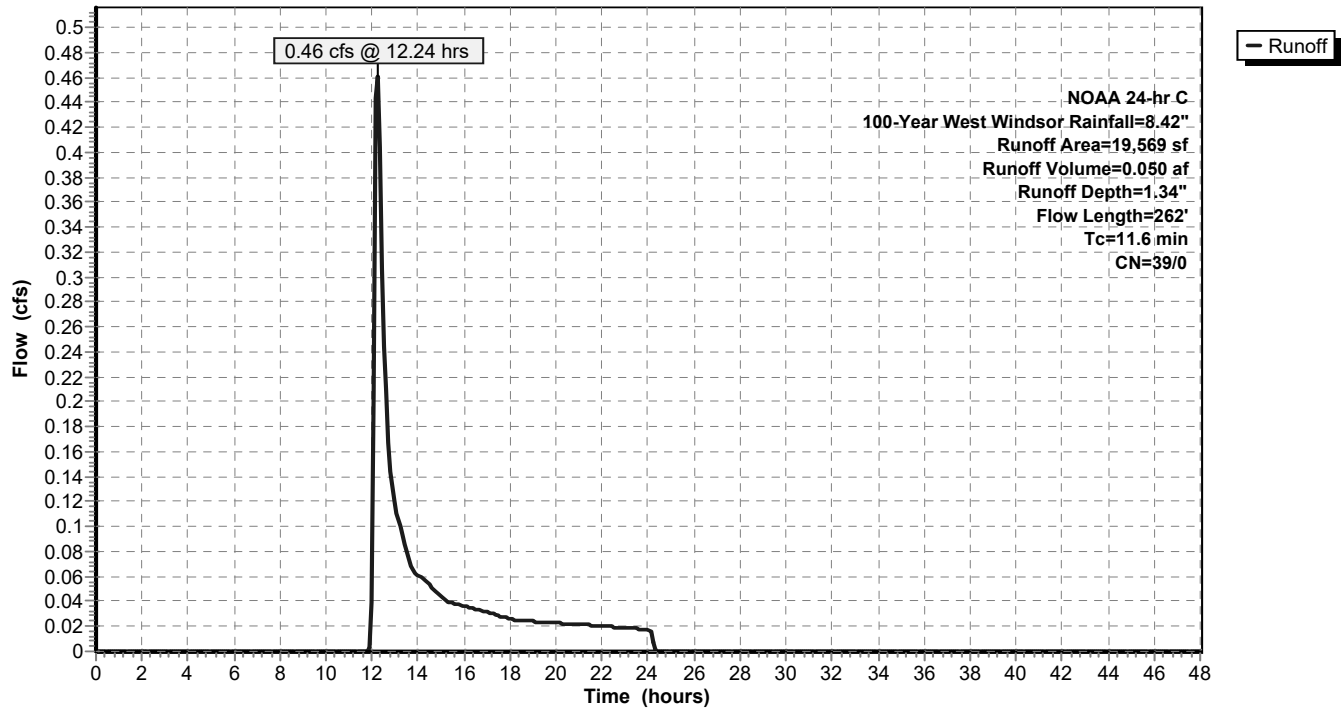
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Area (sf)	CN	Description
19,569	39	>75% Grass cover, Good, HSG A
19,569	39	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	52	0.0150	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.31"
2.3	210	0.0100	1.50		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
11.6	262	Total			

Subcatchment 2Spb: DA2-Pervious (Bypass)

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Summary for Reach 2R: Offsite Reach (Grass Swale)

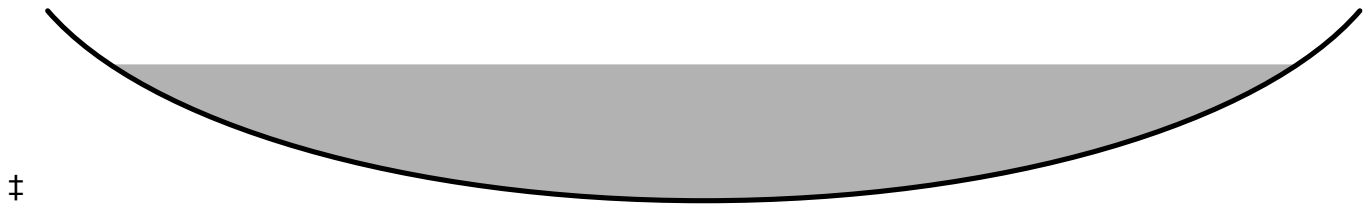
Estimated time of travel from point of analysis on Lot 28.01 to Washington Road; routing is included to evaluate drainage impact on . Routing is shown to evaluate impact at County Drainage System.

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 1.27" for 100-Year West Windsor event
 Inflow = 1.98 cfs @ 12.14 hrs, Volume= 0.098 af
 Outflow = 1.87 cfs @ 12.19 hrs, Volume= 0.098 af, Atten= 5%, Lag= 3.5 min
 Routed to Link 3L : Washington Road

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
 Max. Velocity= 1.54 fps, Min. Travel Time= 3.2 min
 Avg. Velocity = 0.40 fps, Avg. Travel Time= 12.4 min

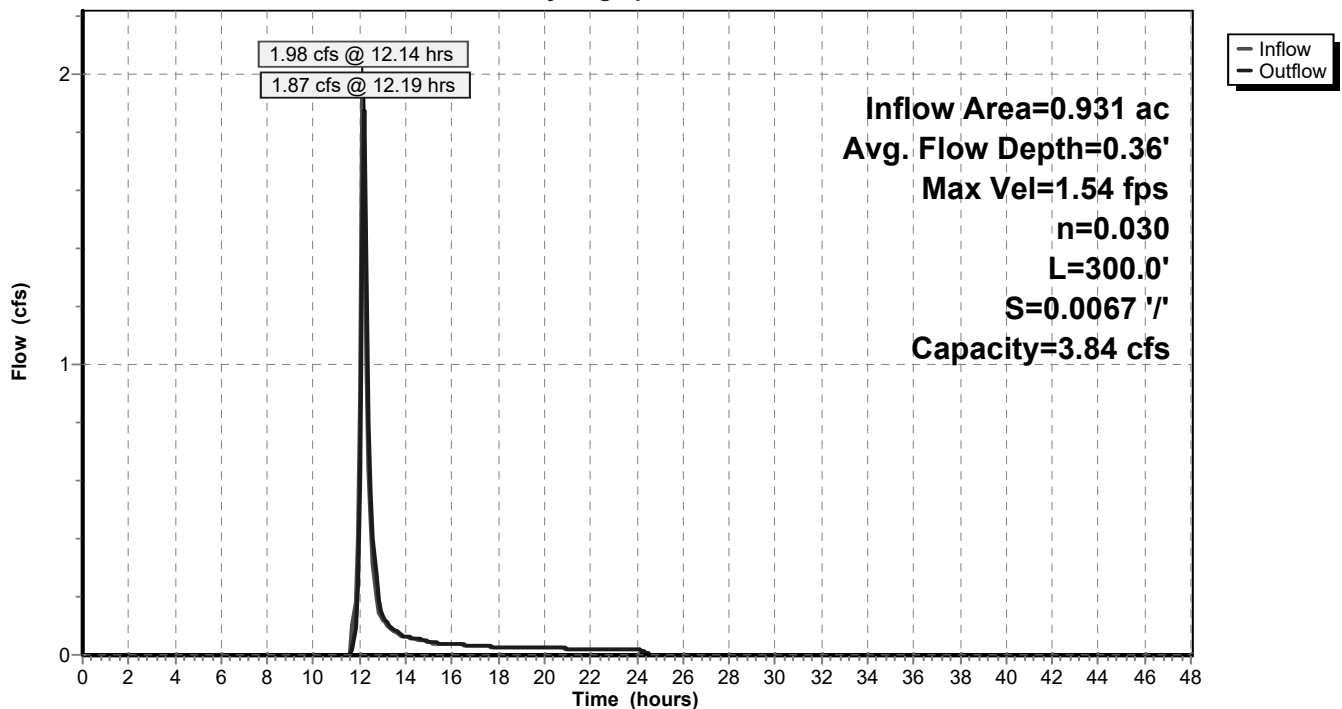
Peak Storage= 364 cf @ 12.19 hrs
 Average Depth at Peak Storage= 0.36' , Surface Width= 5.08'
 Bank-Full Depth= 0.50' Flow Area= 2.0 sf, Capacity= 3.84 cfs

6.00' x 0.50' deep Parabolic Channel, n= 0.030
 Length= 300.0' Slope= 0.0067 '/'
 Inlet Invert= 69.90', Outlet Invert= 67.90'



Reach 2R: Offsite Reach (Grass Swale)

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

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Summary for Pond 2P: Proposed Drywell System

Inflow Area = 0.482 ac, 49.06% Impervious, Inflow Depth = 4.69" for 100-Year West Windsor event
 Inflow = 2.06 cfs @ 12.12 hrs, Volume= 0.189 af
 Outflow = 2.07 cfs @ 12.12 hrs, Volume= 0.188 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.01 cfs @ 12.12 hrs, Volume= 0.026 af
 Primary = 1.72 cfs @ 12.12 hrs, Volume= 0.048 af
 Routed to Link 2L : Combined HYD Lot 28.01
 Secondary = 0.34 cfs @ 12.12 hrs, Volume= 0.114 af
 Routed to Link 3L : Washington Road

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs / 3
 Peak Elev= 70.50' @ 12.12 hrs Surf.Area= 172 sf Storage= 632 cf

Plug-Flow detention time= 129.2 min calculated for 0.188 af (100% of inflow)
 Center-of-Mass det. time= 128.8 min (895.2 - 766.4)

Volume	Invert	Avail.Storage	Storage Description
#1	61.66'	223 cf	9.00'W x 18.00'L x 7.50'H Prismaoid 1,215 cf Overall - 539 cf Embedded = 676 cf x 33.0% Voids
#2	62.16'	396 cf	6.00'D x 7.00'H HD Seepage Pit x 2 Inside #1 539 cf Overall - 6.0" Wall Thickness = 396 cf
#3	69.16'	13 cf	2.50'D x 1.34'H Riser x 2
		632 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	70.20'	12.0" Horiz. Orifice C= 0.600 Limited to weir flow at low heads
#2	Secondary	68.33'	3.0" Round Bypass Pipe L= 24.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 68.33' / 65.50' S= 0.1179 ' / ' Cc= 0.900 n= 0.010, Flow Area= 0.05 sf
#3	Discarded	61.66'	1.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 55.00'

Discarded OutFlow Max=0.01 cfs @ 12.12 hrs HW=70.49' (Free Discharge)
 ↑**3=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.62 cfs @ 12.12 hrs HW=70.49' (Free Discharge)
 ↑**1=Orifice** (Weir Controls 1.62 cfs @ 1.77 fps)

Secondary OutFlow Max=0.34 cfs @ 12.12 hrs HW=70.49' (Free Discharge)
 ↑**2=Bypass Pipe** (Inlet Controls 0.34 cfs @ 6.87 fps)

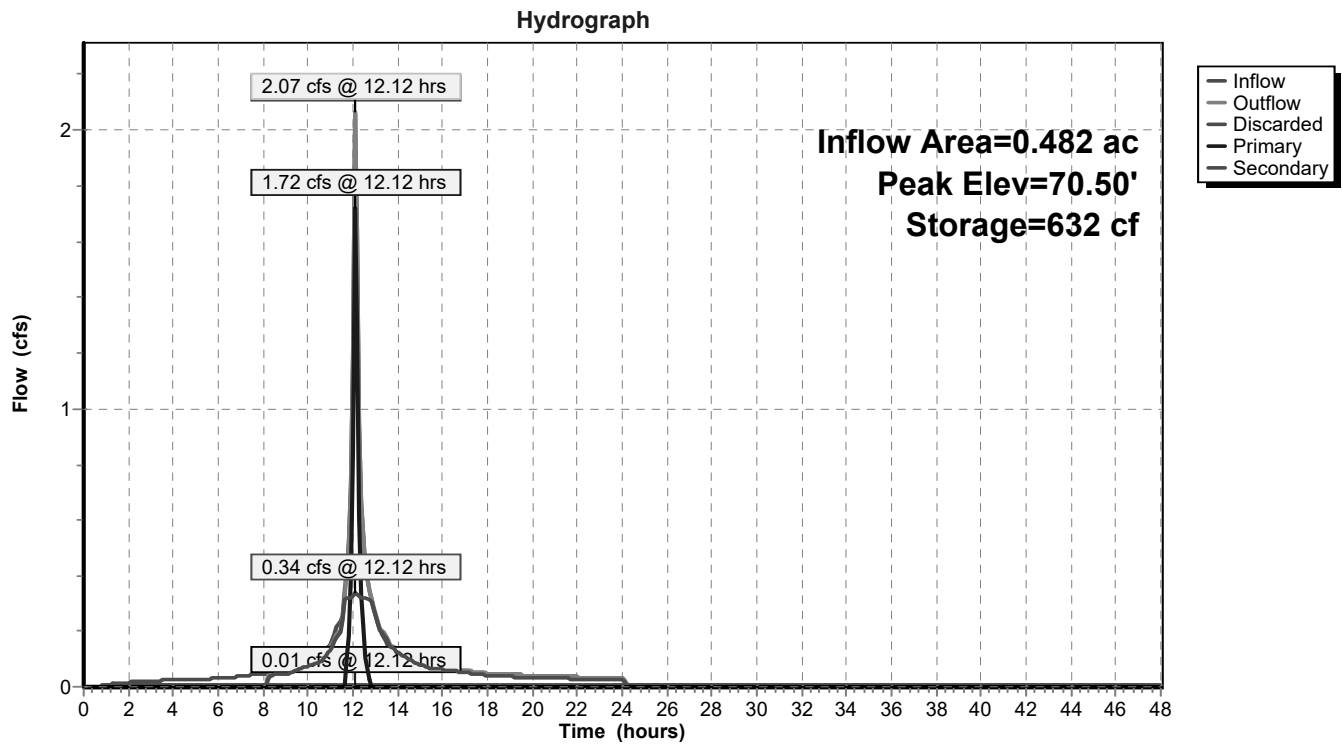
20-010 PROPOSED R1

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Prepared by The Reynolds Group, Inc.

HydroCAD® 10.10-6a s/n 03506 © 2020 HydroCAD Software Solutions LLC

Pond 2P: Proposed Drywell System



20-010 PROPOSED R1

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Prepared by The Reynolds Group, Inc.

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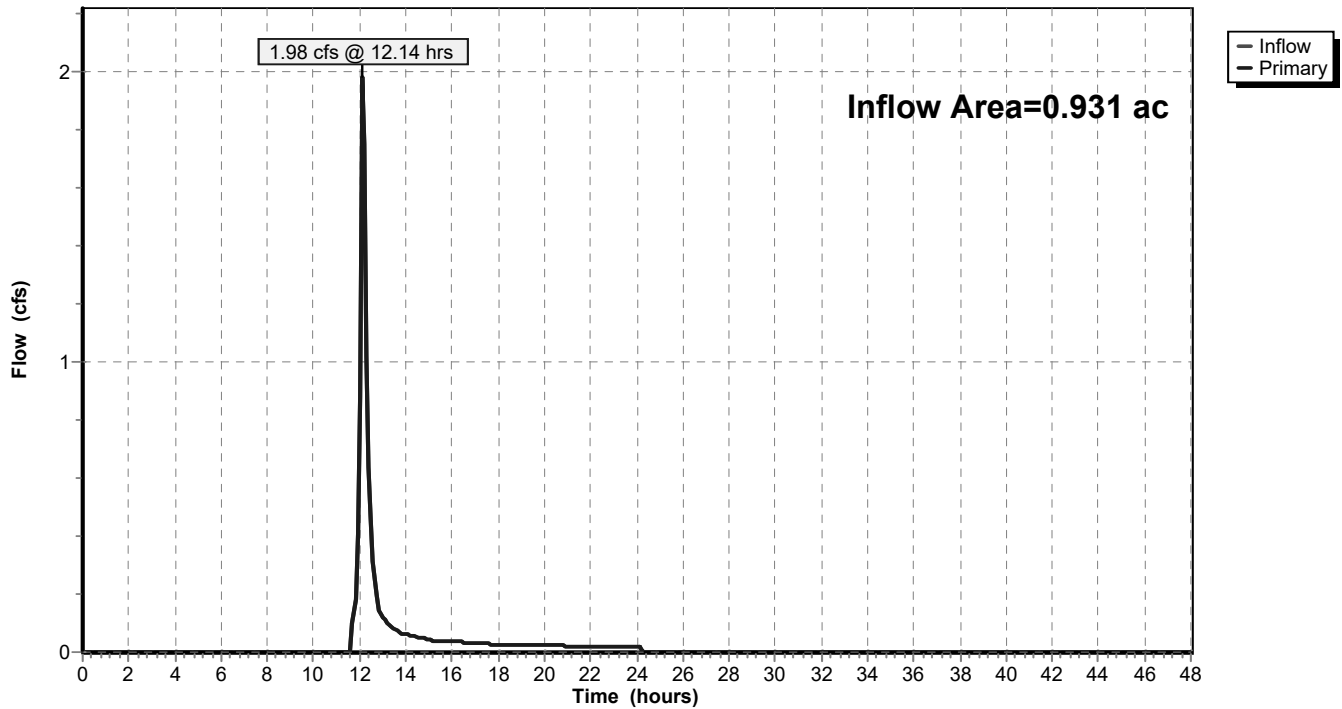
Summary for Link 2L: Combined HYD Lot 28.01

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 1.27" for 100-Year West Windsor event
Inflow = 1.98 cfs @ 12.14 hrs, Volume= 0.098 af
Primary = 1.98 cfs @ 12.14 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 2R : Offsite Reach (Grass Swale)

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

Link 2L: Combined HYD Lot 28.01

Hydrograph



20-010 PROPOSED R1

NOAA 24-hr C 100-Year West Windsor Rainfall=8.42"

Prepared by The Reynolds Group, Inc.

HydroCAD® 10.10-6a s/n 03506 © 2020 HydroCAD Software Solutions LLC

Summary for Link 3L: Washington Road

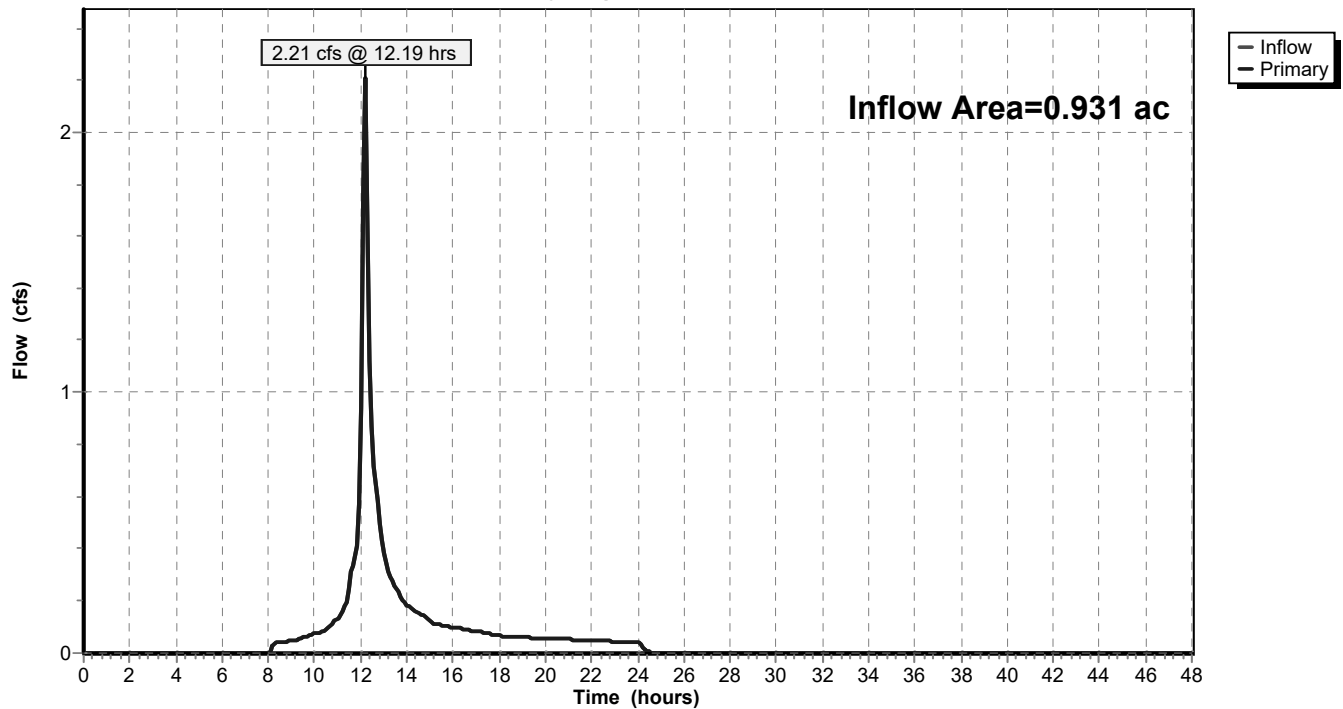
Combined Hydrographs: Secondary outflow from proposed drywell and routed flow from Lot 28.01 (point of analysis).

Inflow Area = 0.931 ac, 25.39% Impervious, Inflow Depth = 2.74" for 100-Year West Windsor event
Inflow = 2.21 cfs @ 12.19 hrs, Volume= 0.212 af
Primary = 2.21 cfs @ 12.19 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min

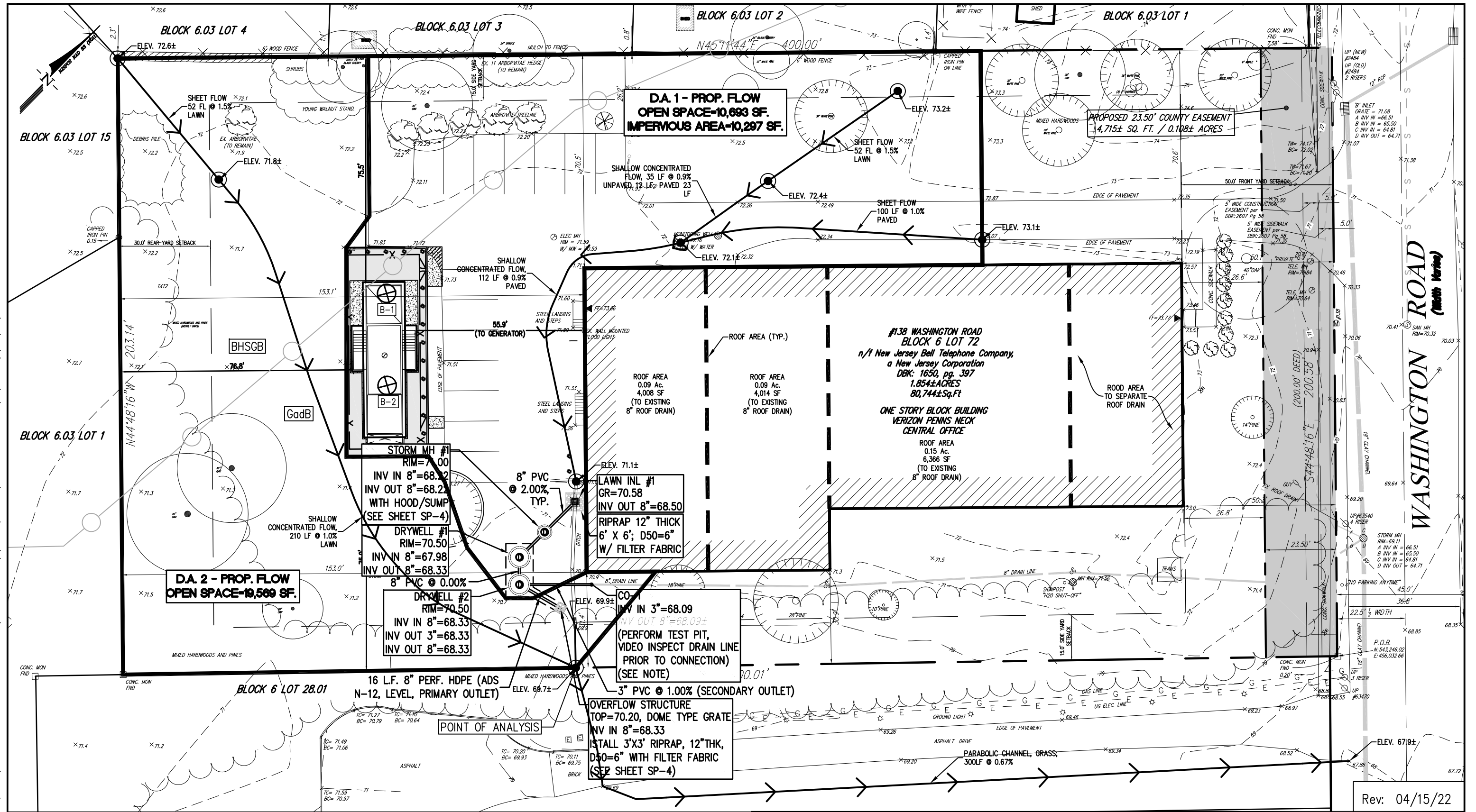
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 3L: Washington Road

Hydrograph



J:\ENGINEERING PROJECTS\2020\20-010 - PENNS NECK VERIZON (WEST WINDSOR)\CAD\DESIGN\20-010 DRAINAGE (RO).DWG-(4/20/22)



SOILS: BHSGB - BIRDSBORO GRAVELLY SOLUM VARIANT SOILS
 GadB - GALESTOWN LOAMY SAND

⊕ TEST PITS LOCATION



The Reynolds Group, Inc.
 State of New Jersey
 Certificate of Authorization
 Number 24CA27969200
 21MWD00043500
 Engineers
 Landscape Architects
 Land Surveyors
 Planners
 575 Route 28, Suite 110
 Raritan, N.J. 08869
 Tel: 908-722-1500
 Fax: 908-722-7035
 F. Mitchel Ardan, P.E., P.P.
 Jeffrey D. Reynolds, P.L.A.

SCALE: 1"=30'	TRG Job No.: 20-010	Date: 03/08/22
Project: PENNS NECK VERIZON PROPOSED GENERATOR		Sheet No.: DA-2

Rev: 04/15/22

NOAA Atlas 14, Volume 2, Version 3
Location name: Princeton Junction, New Jersey,
USA*



Latitude: 40.3201°, Longitude: -74.6235°
Elevation: 66.02 ft**



* source: ESRI Maps
 ** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

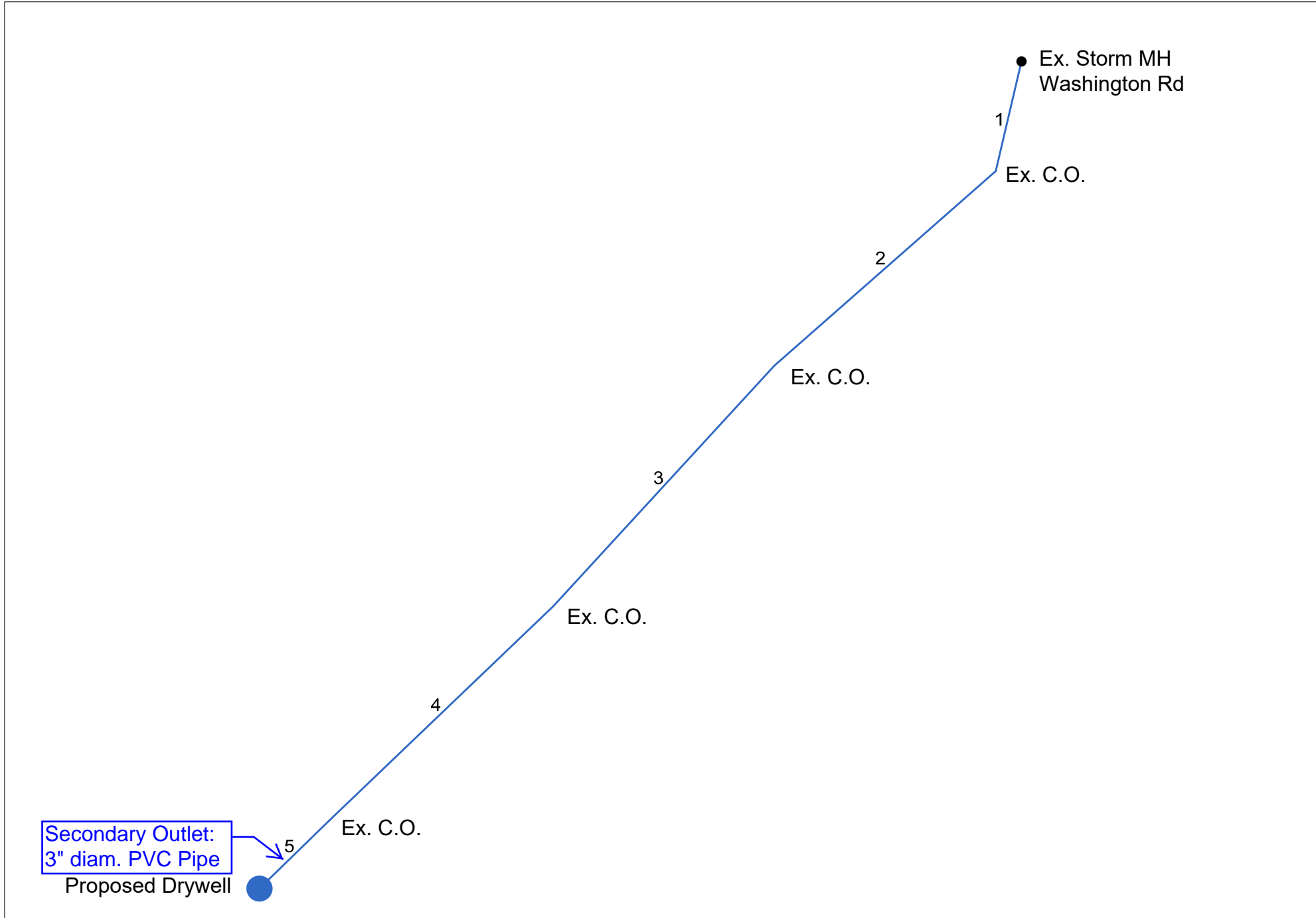
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.06 (3.66-4.49)	4.84 (4.38-5.36)	5.74 (5.18-6.36)	6.41 (5.78-7.09)	7.22 (6.48-7.99)	7.82 (6.98-8.65)	8.42 (7.48-9.32)	8.98 (7.92-9.96)	9.66 (8.45-10.8)	10.2 (8.84-11.4)
10-min	3.23 (2.92-3.59)	3.86 (3.50-4.28)	4.60 (4.15-5.09)	5.12 (4.62-5.67)	5.76 (5.17-6.37)	6.23 (5.56-6.89)	6.69 (5.94-7.40)	7.11 (6.28-7.89)	7.64 (6.68-8.53)	8.02 (6.96-8.99)
15-min	2.70 (2.44-2.99)	3.24 (2.93-3.59)	3.88 (3.50-4.29)	4.32 (3.90-4.78)	4.87 (4.37-5.38)	5.26 (4.70-5.81)	5.64 (5.00-6.24)	5.98 (5.28-6.64)	6.41 (5.61-7.15)	6.71 (5.82-7.52)
30-min	1.85 (1.67-2.05)	2.24 (2.03-2.48)	2.75 (2.49-3.05)	3.13 (2.82-3.47)	3.60 (3.23-3.99)	3.96 (3.54-4.38)	4.32 (3.83-4.78)	4.66 (4.11-5.17)	5.10 (4.46-5.69)	5.43 (4.72-6.09)
60-min	1.15 (1.04-1.28)	1.40 (1.27-1.56)	1.77 (1.59-1.96)	2.04 (1.84-2.26)	2.40 (2.15-2.65)	2.68 (2.40-2.97)	2.97 (2.64-3.29)	3.27 (2.88-3.62)	3.66 (3.20-4.08)	3.97 (3.44-4.45)
2-hr	0.702 (0.633-0.780)	0.855 (0.772-0.949)	1.09 (0.978-1.20)	1.26 (1.13-1.40)	1.50 (1.35-1.66)	1.70 (1.51-1.88)	1.91 (1.68-2.11)	2.11 (1.86-2.35)	2.41 (2.09-2.69)	2.64 (2.27-2.96)
3-hr	0.515 (0.463-0.575)	0.628 (0.565-0.701)	0.797 (0.716-0.890)	0.929 (0.832-1.04)	1.12 (0.993-1.24)	1.26 (1.12-1.41)	1.42 (1.25-1.59)	1.59 (1.38-1.77)	1.82 (1.56-2.04)	2.00 (1.70-2.26)
6-hr	0.328 (0.294-0.369)	0.398 (0.356-0.447)	0.504 (0.450-0.565)	0.591 (0.526-0.661)	0.716 (0.631-0.800)	0.820 (0.719-0.915)	0.932 (0.809-1.04)	1.05 (0.904-1.18)	1.23 (1.04-1.38)	1.37 (1.15-1.55)
12-hr	0.197 (0.176-0.225)	0.239 (0.213-0.272)	0.305 (0.271-0.346)	0.361 (0.319-0.408)	0.444 (0.390-0.500)	0.516 (0.449-0.581)	0.595 (0.512-0.670)	0.683 (0.579-0.771)	0.814 (0.677-0.923)	0.927 (0.757-1.05)
24-hr	0.114 (0.104-0.125)	0.138 (0.126-0.152)	0.177 (0.161-0.194)	0.210 (0.191-0.230)	0.260 (0.235-0.285)	0.303 (0.271-0.332)	0.351 (0.311-0.384)	0.404 (0.355-0.443)	0.485 (0.419-0.533)	0.555 (0.472-0.611)
2-day	0.066 (0.060-0.073)	0.080 (0.073-0.088)	0.102 (0.093-0.113)	0.121 (0.110-0.133)	0.149 (0.134-0.163)	0.173 (0.155-0.189)	0.199 (0.177-0.218)	0.227 (0.200-0.250)	0.270 (0.234-0.298)	0.306 (0.262-0.339)
3-day	0.047 (0.043-0.051)	0.056 (0.052-0.062)	0.072 (0.066-0.079)	0.085 (0.077-0.093)	0.104 (0.094-0.113)	0.119 (0.108-0.130)	0.137 (0.122-0.149)	0.156 (0.138-0.170)	0.183 (0.161-0.201)	0.207 (0.179-0.228)
4-day	0.037 (0.034-0.040)	0.045 (0.041-0.049)	0.057 (0.052-0.062)	0.067 (0.061-0.073)	0.081 (0.074-0.088)	0.093 (0.084-0.101)	0.106 (0.095-0.115)	0.120 (0.107-0.131)	0.140 (0.124-0.153)	0.157 (0.138-0.172)
7-day	0.025 (0.023-0.027)	0.030 (0.027-0.032)	0.037 (0.034-0.040)	0.043 (0.040-0.047)	0.052 (0.047-0.057)	0.059 (0.054-0.065)	0.067 (0.061-0.073)	0.076 (0.068-0.082)	0.088 (0.078-0.096)	0.098 (0.086-0.107)
10-day	0.020 (0.018-0.021)	0.024 (0.022-0.026)	0.029 (0.027-0.031)	0.033 (0.031-0.036)	0.040 (0.036-0.043)	0.045 (0.041-0.048)	0.050 (0.046-0.054)	0.056 (0.050-0.061)	0.064 (0.057-0.070)	0.071 (0.063-0.077)
20-day	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.021 (0.020-0.023)	0.025 (0.023-0.026)	0.027 (0.026-0.029)	0.030 (0.028-0.032)	0.033 (0.030-0.035)	0.037 (0.033-0.039)	0.040 (0.036-0.042)
30-day	0.011 (0.010-0.012)	0.013 (0.012-0.014)	0.015 (0.015-0.016)	0.017 (0.016-0.018)	0.019 (0.018-0.020)	0.021 (0.020-0.022)	0.023 (0.022-0.024)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.029 (0.026-0.031)
45-day	0.009 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.021)	0.021 (0.020-0.022)	0.022 (0.020-0.023)
60-day	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.012 (0.012-0.013)	0.014 (0.013-0.014)	0.015 (0.014-0.015)	0.016 (0.015-0.016)	0.017 (0.016-0.017)	0.018 (0.017-0.019)	0.018 (0.017-0.019)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
 Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical

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



Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	28.000	0.00	0.33	0.00	0.00	0.33	0.0	11.2	4.9	1.93	1.57	5.53	8	1.00	65.50	65.78	66.31	66.73	69.11	69.50	Ex C.O.-Ex MH
2	1	73.000	0.15	0.33	0.99	0.15	0.33	10.0	11.0	4.9	1.94	1.57	5.57	8	1.00	65.78	66.51	67.03	68.15	69.50	71.67	Existing C.O.
3	2	81.000	0.09	0.18	0.99	0.09	0.18	10.0	10.6	5.0	1.22	1.57	3.50	8	1.00	66.51	67.32	68.23	68.72	71.67	70.85	Existing C.O.
4	3	77.000	0.09	0.09	0.99	0.09	0.09	10.0	10.0	5.1	0.79	1.57	2.25	8	1.00	67.32	68.09	68.75	68.94	70.85	70.80	Existing C.O.
5	4	24.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.33	0.11	6.72	3	1.00	68.09	68.33	68.95	70.93	70.80	70.40	Drywell-Ex C.O.

Secondary Outlet

HydroCAD W.S.E. in the Drywell is Elev. 70.37 < Rim @ Elev. 70.50; no surcharge. See HydroCAD output data, page 29.

Note: Pipes between lines 1 and 2 are under surcharge conditions (minor) HGL are below C.O. cover/rim elevations.

Project File: 20-010 Drywell R1.stm

Number of lines: 5

Run Date: 4/18/2022

NOTES: Intensity = 62.75 / (Inlet time + 12.50) ^ 0.81; Return period = Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	28.000	0.00	0.33	0.00	0.00	0.33	0.0	11.0	6.4	2.44	1.57	6.99	8	1.00	65.50	65.78	66.31	66.99	69.11	69.50	Ex C.O.-Ex MH
2	1	73.000	0.15	0.33	0.99	0.15	0.33	10.0	10.8	6.5	2.45	1.57	7.03	8	1.00	65.78	66.51	67.47	69.25	69.50	71.67	Existing C.O.
3	2	81.000	0.09	0.18	0.99	0.09	0.18	10.0	10.5	6.5	1.50	1.57	4.31	8	1.00	66.51	67.32	69.36	70.11	71.67	70.85	Existing C.O.
4	3	77.000	0.09	0.09	0.99	0.09	0.09	10.0	10.0	6.6	0.93	1.57	2.67	8	1.00	67.32	68.09	70.15	70.42	70.85	70.80	Existing C.O.
5	4	24.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.34	0.11	6.93	3	1.00	68.09	68.33	70.44	72.55	70.80	70.40	Drywell-Ex C.O.

Secondary Outlet

HydroCAD W.S.E. in the Drywell is Elev. 70.49 < Rim @ Elev. 70.50; no surcharge. See HydroCAD output data, page 38.

Note: Pipes between lines 1 to 3 are under surcharge conditions (minor) HGL are below C.O. cover/rim elevations.

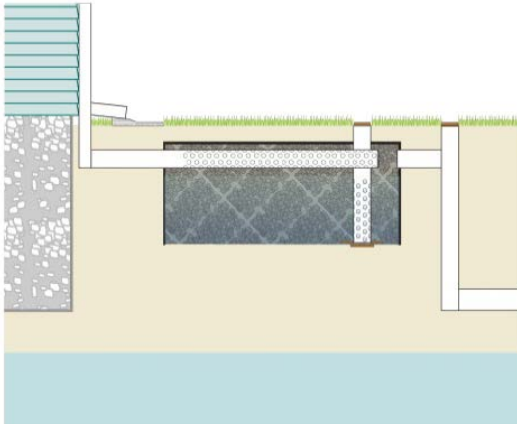
Project File: 20-010 Drywell R1.stm

Number of lines: 5

Run Date: 4/18/2022

NOTES: Intensity = 45.11 / (Inlet time + 9.00) ^ 0.65; Return period = Yrs. 100 ; c = cir e = ellip b = box

PROPOSED Dry Well



ESTIMATED DRAIN TIME:

Design Data:

Volume below: 549 CF

8" Primary & 3" Secondary Outlets

Basin Bottom Surface Area: 162 SF

Design Permeability Rate: 1.0 in/hr

Test Boring Logs B-1 & B-2 (Reference: Melick-Tully Associates report)

Permeability Class K4: Use Field Permeability rate @ 2.0 inch/hr per Township Engineer
Design Permeability Rate @ 1.0 inch/hr

100-YEAR STORM DATA:

Peak Volume: 632 CF

Peak Stage: 70.49', discharge via primary 8" pipe with 12" overflow riser (Horz. Orifice)

Peak Time: **12.12 hours**

Elapsed Time for WSE in drywell to be below the 8" outlet, Elev. 68.33; **24.35 hours**

Drain time: 12.23 hours

$$\text{Drain Time} = \frac{\text{Water Quality Design Storm Runoff Volume}}{\text{Surface Area} \times \text{Subsoil Design Permeability Rate}}$$

$$\text{Drain Time} = \frac{549 \text{ cu. ft.}}{162 \text{ sq. ft.} \times 1.0 \frac{\text{inch}}{\text{hr}} \times \frac{1 \text{ ft}}{12 \text{ inches}}}$$

$$\text{Drain Time} = 40.67 \text{ hours, infiltration}$$

$$\text{Total Drain Time} = 52.9 \text{ hours}$$

revisions		
no.	date	description
1	03/15/22	PER TOWNSHIP COMMENTS
2	04/15/22	PER TOWNSHIP COMMENTS

LEGEND	
	GAS VALVE
	GAS METER
	WATER VALVE
	HYDRANT
	WATER METER
	CURB STOP
	FIRE DEPT. CONNECTION
	DRAINAGE MH
	CURB INLET
	LAWN INLET
	SANITARY MH
	CLEANOUT
	BOLLARD
	SIGN
	LIGHT
	MAIL BOX
	GUY WIRE
	UTILITY POLE
	ELECTRIC MH
	CONIFEROUS TREE
	DECIDUOUS TREE
	FENCE
	RAILING
	WALL
	GATE POST
	WATER LINE
	GAS LINE
	ELECTRIC LINE
	SANITARY LINE
	OVERHEAD WIRES

Engineers
Landscape Architects
Land Surveyors
Planners

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Raritan, N.J. 08869
908-722-1500
Fax 908-722-7035
www.reynoldsgroup.com

The Reynolds Group Inc.

State of New Jersey
Certificate of Authorization
Number 240A2789200
21MH00004300

F. Mitchel Ardman, P.E., P.P.
Jeffrey D. Reynolds, P.L.A.

F. Mitchel Ardman
F. MITCHEL ARDMAN
N.J. PROFESSIONAL ENGINEER U.C. NO. 34317

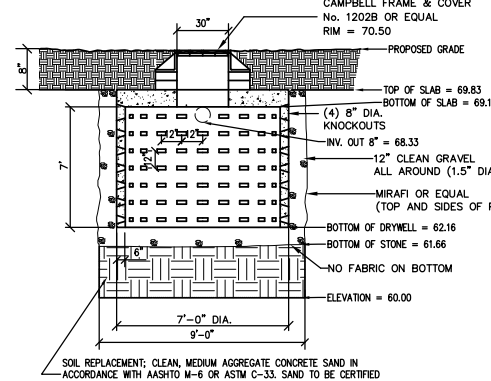
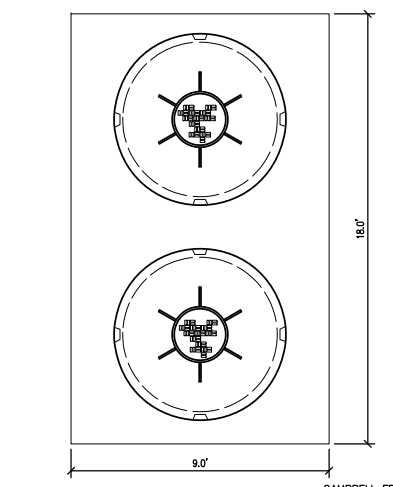
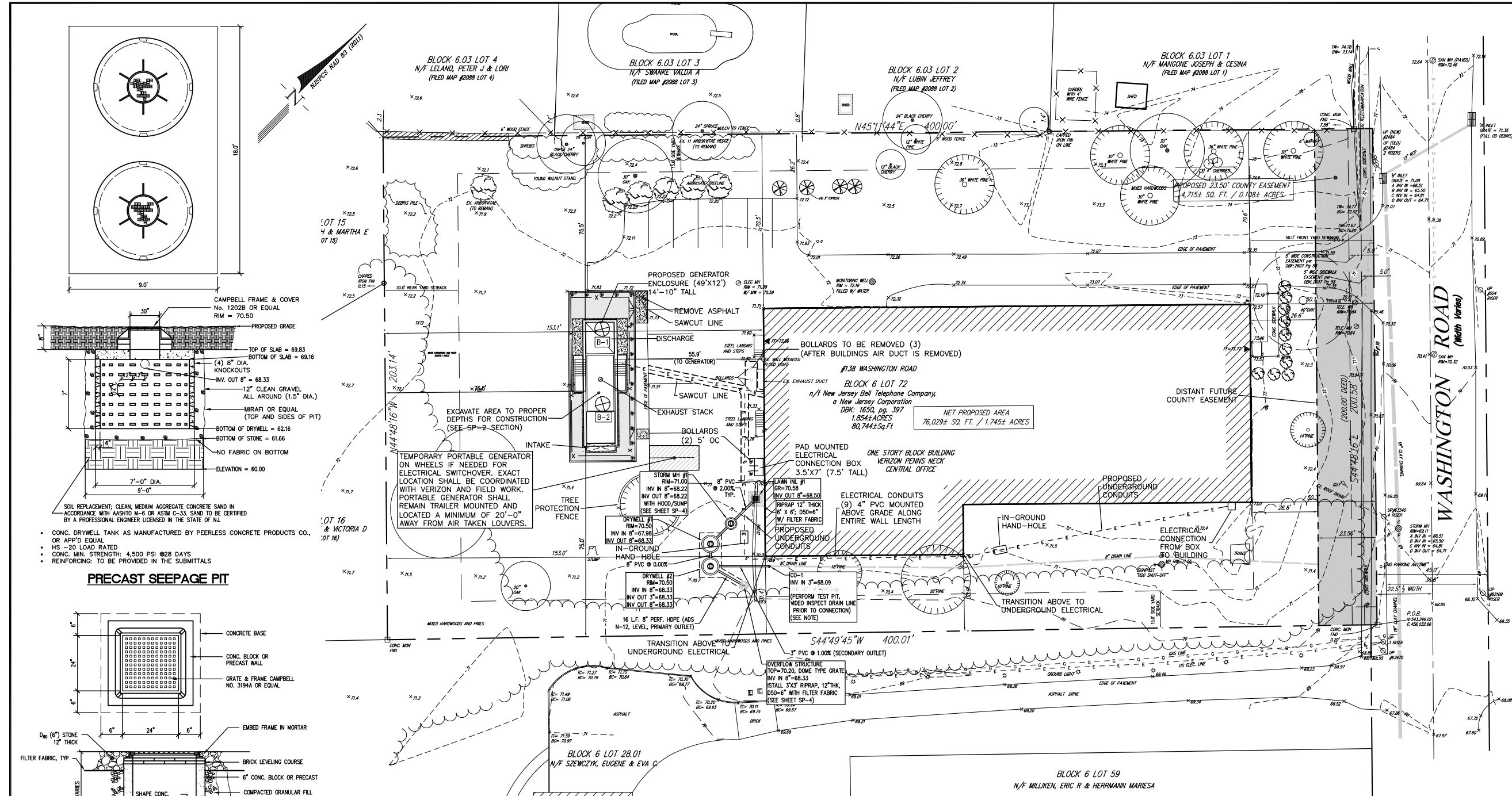
PENNS NECK VERIZON PROPOSED GENERATOR

BLOCK 6, LOT 72
TOWNSHIP OF WEST WINDSOR
MERCER COUNTY, NEW JERSEY

OVERALL/STORMWATER & SELECTIVE DEMOLITION PLAN

job number	20-010
drawing number	
scale	1"=20'
checked by	FMA
drawn by	AR
date	07/22/20

SP-1



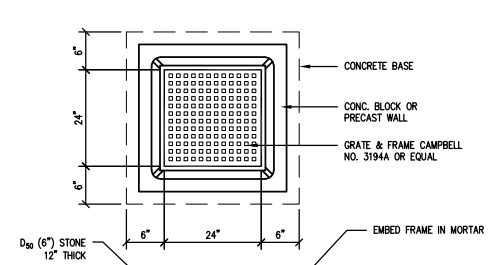
PRECAST SEEPAGE PIT

CONC. DRYWELL TANK AS MANUFACTURED BY PEERLESS CONCRETE PRODUCTS CO., OR APP'D EQUAL

HS -20 LOAD RATED

CONC. MIN. STRENGTH: 4,500 PSI @28 DAYS

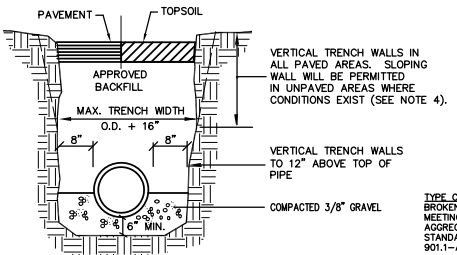
REINFORCING: TO BE PROVIDED IN THE SUBMITTALS



2' X 2' LAWN INLET W/ OPEN BOTTOM

NOTES:

- ALL INLETS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CURRENT NJDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION AND ITS AMENDMENTS.
- IF BLOCK INLETS PROVIDED, SHALL BE MULTIPLEX BLOCK WITH STAGGERED, MORTARED JOINTS. INTERIOR AND EXTERIOR WALLS SHALL ALSO BE PLASTERED WITH 1/2" MORTAR.
- PROVIDE POLYPROPYLENE STEPS AT 12" O.C.



TYPICAL STORM LINE TRENCH

NOTE:

- IN PAVED AREAS, WIDTH OF PAVEMENT TO BE REMOVED SHALL BE 12" BEYOND EDGE OF TRENCH. SAWCUT EXISTING PAVEMENT TO FULL DEPTH PRIOR TO EXCAVATION. EXISTING PAVEMENT TO REMAIN SHALL BE PROTECTED FROM BREAKAGE DURING PIPE INSTALLATION AND TRENCH BACKFILL.
- IF CONTRACTOR INCREASES TRENCH WIDTH, HE IS TO RECOMPUTE AND SUBMIT FOR APPROVAL BY THE ENGINEER ALL PIPE CLASSES. ANY ADDITIONAL COST NECESSITATED BY THE INCREASE IN TRENCH WIDTH IS TO BE BORNE BY THE CONTRACTOR.
- ALL EXCAVATION, TRENCHING, SHEETING AND BRACING SHALL CONFORM TO THE REQUIREMENTS OF THE "CONSTRUCTION SAFETY CODE OF THE BUREAU OF ENGINEERING AND SAFETY OF THE NEW JERSEY DEPARTMENT OF LABOR AND INDUSTRY".
- SLOPE OF THE TRENCH SHALL NOT EXCEED O.S.H.A. REQUIREMENTS. WHERE SUCH SLOPE WILL CAUSE TOP WIDTH OF TRENCH TO PROTRUDE BEYOND THE ACQUIRED EASEMENT (PERMANENT AND TEMPORARY), THE CONTRACTOR SHALL USE SHEETING.

CCTV NOTES:

- VIDEO 8" DRAIN PIPE.
- SUBMIT VIDEO TO ENGINEER WITH SUMMARY OF FINDINGS.
- DRAIN LINE DEFECTS IN PIPE TO BE REPLACED.

DEMOLITION NOTES:

- A PERMIT IS REQUIRED TO BE OBTAINED BY THE CONTRACTOR FROM THE OFFICE OF THE TOWNSHIP ENGINEER PRIOR TO BEGINNING ANY WORK.
- THE REYNOLDS GROUP INC. IS NOT RESPONSIBLE FOR THE SPECIFICATIONS FOR THE REMOVAL OF ANY CONTAMINATED SOIL ENCOUNTERED DURING EXCAVATION.
- PROVIDE TEMPORARY BARRICADES AND OTHER FORMS OF PROTECTION AS REQUIRED TO PROTECT OWNER'S PERSONNEL AND GENERAL PUBLIC FROM INJURY DUE TO SELECTIVE DEMOLITION WORK.
- PROVIDE PROTECTIVE MEASURES AS REQUIRED TO PROVIDE FREE AND SAFE PASSAGE OF OWNER'S PERSONNEL AND GENERAL PUBLIC AROUND CONSTRUCTION SITE.
- REMOVE INTERIOR AND EXTERIOR SHORING, BRACING, OR SUPPORT TO PREVENT MOVEMENT, SETTLEMENT, OR COLLAPSE OF ELEMENT TO BE DEMOLISHED, AND ADJACENT FACILITIES OR WORK TO REMAIN.
- REMOVE PROTECTIONS AT COMPLETION OF PROJECT OR AT AN APPROPRIATE TIME PRIOR.
- PROMPTLY REPAIR DAMAGES CAUSED TO ADJACENT FACILITIES BY DEMOLITION WORK AT NO COST TO OWNER.
- CONDUCT SELECTIVE DEMOLITION OPERATIONS AND DEBRIS REMOVAL IN A MANNER TO INSURE MINIMUM INTERFERENCE WITH ROADS, STREETS, WALKS AND OTHER ADJACENT OCCUPIED OR USED FACILITIES. DO NOT CLOSE, BLOCK OR OTHERWISE OBSTRUCT STREET, WALKS OR OTHER OCCUPIED OR USED FACILITIES WITHOUT WRITTEN PERMISSION FROM AUTHORITIES HAVING JURISDICTION. PROVIDE ALTERNATE ROUTES AROUND CLOSED OR OBSTRUCTED TRAFFIC WAYS IF REQUIRED BY GOVERNING AUTHORITIES.
- MAINTAIN EXISTING UTILITIES INDICATED TO REMAIN, KEEP IN SERVICE, AND PROTECT AGAINST DAMAGE DURING DEMOLITION OPERATIONS.
- USE WATER SPRINKLING AND OTHER SUITABLE METHODS TO LIMIT DUST AND DIRT RISING AND SCATTERING AIR TO LOWEST PRACTICAL LEVEL. COMPLY WITH GOVERNING REGULATIONS PERTAINING TO ENVIRONMENTAL PROTECTION.

TREE NOTES:

ALL EXISTING LIVING TREES ARE TO REMAIN.

DRYWELL NOTES:

- CONTRACTOR SHALL IMMEDIATELY AFTER THE NEW GENERATOR, CONDUITS ARE INSTALLED AND ACTIVATED.
- REMOVE TEMPORARY GENERATOR AND SAFETY FENCE ENCLOSURE.
- CONTRACTOR SHALL PERFORM TEST PIT TO LOCATE EXISTING 8" STORM PIPE. PROVIDE DATA TO ENGINEER FOR REVIEW.
- CONTRACTOR TO VIDEO INSPECT AND CLEAN DRAIN PIPE TO STORM MANHOLE OUTFLOW. CONTRACTOR TO MAKE REPAIRS AS NECESSARY PRIOR TO MAKING STORM LINE CONNECTION.
- LAWN INLET SHALL BE INSTALLED WITH A 12" SUMP AND OPEN BOTTOM, SEE DETAIL.
- PVC PIPE SHALL BE SOH 40.

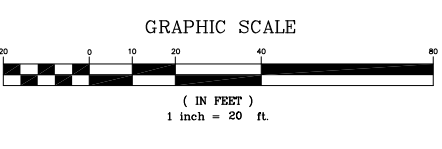
SOIL LOGS BY MELICK-TULLY & ASSOCIATES

DRYWELL NOTES:

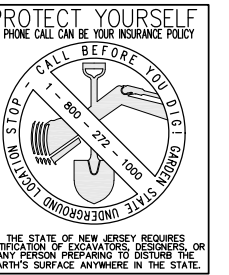
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- LAWN INLET SHALL BE INSTALLED WITH A 12" SUMP AND OPEN BOTTOM, SEE DETAIL.
- PVC PIPE SHALL BE SOH 40.

SURVEY REFERENCE:

SURVEY INFORMATION SHOWN TAKEN FROM A PLAN ENTITLED "BOUNDARY AND TOPOGRAPHIC SURVEY OF BLOCK 6, LOT 72, TOWNSHIP OF WEST WINDSOR, MERCER COUNTY, NEW JERSEY, PREPARED BY THE REYNOLDS GROUP, INC. DATED 7/9/2020.



ENGINEERING PROJECTS 2020-20-010 - PENNS NECK VERIZON (WEST WINDSOR) LANDSCAPE ARCHITECTURE (03/15/22) (4/20/22)





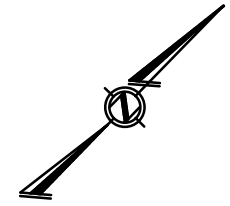
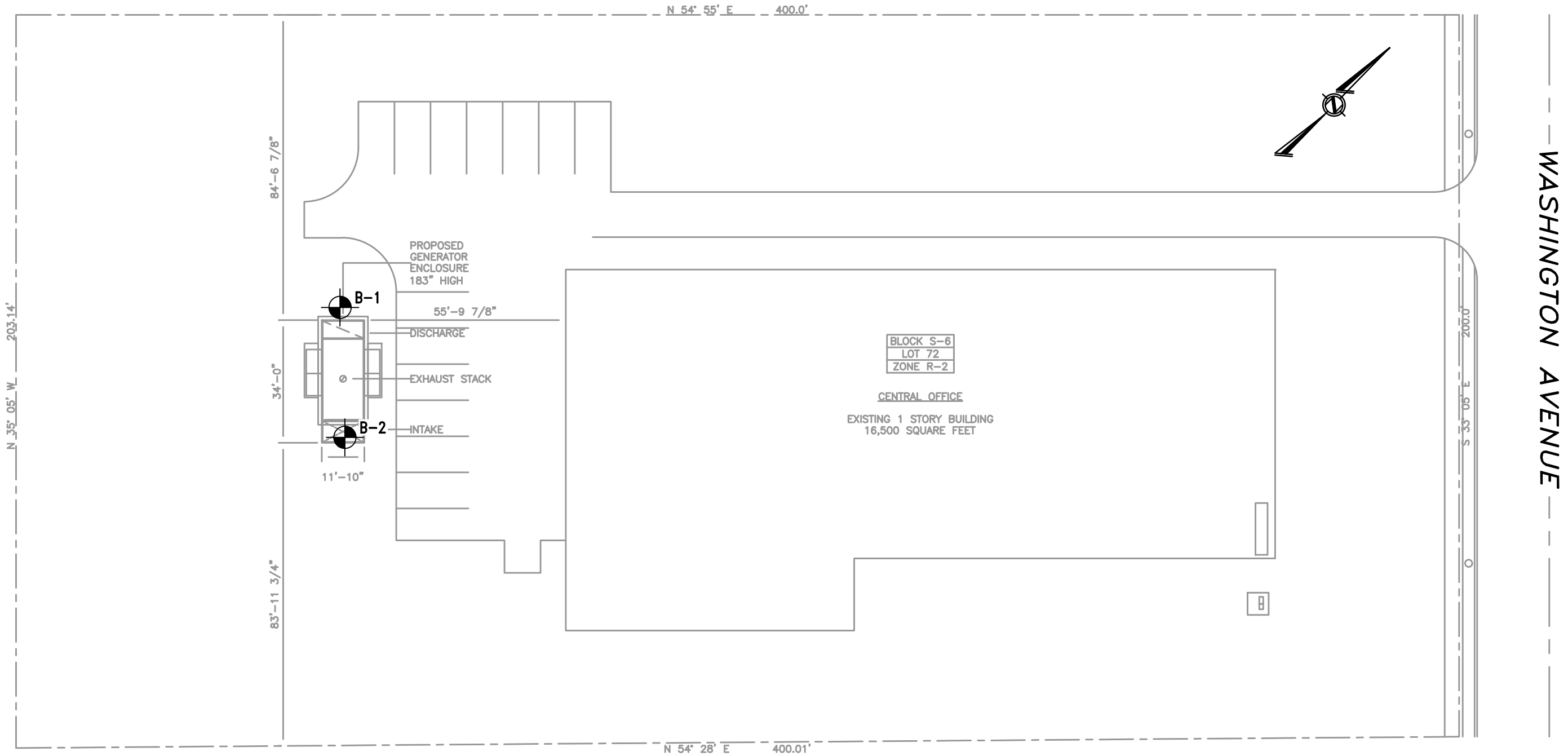
Aerial Photo courtesy of Google Earth Pro



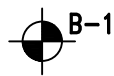
MELICK-TULLY AND ASSOCIATES
A Division of GZA
 Geotechnical Engineers & Environmental Consultants
 117 Canal Road
 South Bound Brook, New Jersey 08880
 (732) 356-3400

SITE LOCATION MAP
GENERATOR REPLACEMENT
WEST WINDSOR, NEW JERSEY
VERIZON

JOB NO. 26.0092184.00	FILE NO. —	DR. BY VJD	CHK. BY CDM	DATE 9/16/20	SCALE 1"=2,000'	PLATE 1
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KEY:



NUMBER AND APPROXIMATE LOCATION OF BORINGS PERFORMED FOR THIS STUDY

NOTES:

1. This drawing is part of Melick-Tully and Associates, a Division of GZA, Report No. 26.0092184.00 and should be read together with the report for complete evaluation.
2. General layout was obtained from a drawing prepared by M&E Eng., entitled "Site Plan" dated 3/26/20 (revised 8/7/20), scale 1"= 20'.

PLOT PLAN				
PROPOSED GENERATOR PAD WEST WINDSOR, NEW JERSEY VERIZON				
		MELICK-TULLY AND ASSOCIATES <i>A Division of GZA</i> Geotechnical Engineers & Environmental Consultants 117 Canal Road South Bound Brook, New Jersey 08880 (732) 356-3400		
JOB NO. 26.0092184.00		FILE NO. -		
DR. BY VJD	CHK. BY CDM	DATE 9/16/20	SCALE 1"= 30'	PLATE 2

TEST BORING LOG



MTA, a Division of GZA
GeoEnvironmental, Inc
Engineers and Scientists

Verizon
 West Windsor, NJ

EXPLORATION NO.: B-1
SHEET: 1 of 1
PROJECT NO: 26.0092184.00
REVIEWED BY: Chris McLaughlin

Logged By: John Shoudt
Drilling Co.: GDI
Driller: Mike/Matt/Joe

Type of Rig: Truck
Rig Model: Mobile D-61
Drilling Method: HSA

Boring Location: See Plan **Final Boring Depth (ft.):** 27
Ground Surface Elev. (ft.): NA
Date Start - Finish: 9/11/2020 - 9/11/2020

Hammer Type: Safety Hammer

Hammer Weight (lb.): 140

Hammer Fall (in.): 30

Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/11/20		16	

Depth (ft)	Sample				Symbol	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
	No.	Depth (ft.)	Blows (per 6 in.)	SPT Value					
	S1	0-2	2 1 1 1	2		8" Topsoil		18.3	
	S2	2-4	4 3 7 8	6	ML	Brown silt, little fine to coarse sand (wet)(soft) - grading (medium)		23.4	
5	S3	4-6	12 14 11 9	20	SP/SM	Orange-brown fine to medium sand, little silt, trace fine gravel (moist)(medium dense)	5	6.4	
	S4	6-8	7 10 7 5	16	ML	Yellow-brown clayey silt, some fine to medium sand (moist)(very stiff)			
10	S5	8-10	5 3 3 2	10		Orange-brown fine to medium sand, little silt (moist)(medium dense)	10		
	S6	10-12	4 4 4 4	6		- grading (loose)			
15	S7	12-14	4 5 3 2	8		- grading with trace fine gravel (wet)	15		
	S8	15-17	4 5 5 5	6					
20	S9	17-19	5 5 4 6	10	SM		20		
	S10	20-22	7 6 4 7	13		- grading (medium dense)			
25	S11	25-27	7 7	14			25		
						End of exploration at 27 feet. Groundwater encountered @ 16'			

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3A

TEST BORING LOG



MTA, a Division of GZA
GeoEnvironmental, Inc
Engineers and Scientists

Verizon
 West Windsor, NJ

EXPLORATION NO.: B-2
SHEET: 1 of 1
PROJECT NO: 26.0092184.00
REVIEWED BY: Chris McLaughlin

Logged By: John Shoudt
Drilling Co.: GDI
Driller: Mike/Matt/Joe

Type of Rig: Truck
Rig Model: Mobile D-61
Drilling Method: HSA

Boring Location: See Plan **Final Boring Depth (ft.):** 27
Ground Surface Elev. (ft.): NA
Date Start - Finish: 9/11/2020 - 9/11/2020

Hammer Type: Safety Hammer

Hammer Weight (lb.): 140

Hammer Fall (in.): 30

Auger or Casing O.D./I.D Dia (in.): 4.25/4

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/11/20		16	

Depth (ft)	Sample				Symbol	Sample Description and Identification	Depth (ft)	Water Content (%)	Remark
	No.	Depth (ft.)	Blows (per 6 in.)	SPT Value					
5	S1	0-2	2 1 2 3	3		12" Topsoil	5	16.2	
	S2	2-4	2 3 3 4	6	ML	Brown silt, little fine to medium sand (moist)(soft) - grading (medium)			
5	S3	4-6	6 10 11 8	21	SM	Orange-brown fine to medium sand, little silt, trace fine gravel (moist)(medium dense)	5	6.0	
	S4	6-8	7 9 8 8	17	ML	Light brown silt, some fine sand (moist)(very stiff)			
10	S5	8-10	6 7 6 6	13		Orange-brown fine to medium sand, little silt (moist)(medium dense)	10		
	S6	10-12	5 3 4 5	7		- grading (loose)			
15	S7	12-14	5 5 4 6	9			15		
	S8	15-17	3 4 4 5	8	SM	- grading (wet)			
20	S9	20-22	3 2 3 4	5			20		
	S10	22-24	4 6 6 7	12		- grading (medium dense)			
25	S11	25-27	4 5 5 5	10			25		
30	End of exploration at 27 feet. Groundwater encountered @ 16'								

REMARKS

See Log Key for exploration of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Plate No.: 3B

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than 50% of material is LARGER than No. 200 Sieve	GRAVEL & GRAVELLY SOILS More than 50% of coarse fraction RETAINED on No. 4 Sieve	CLEAN GRAVELS (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS More than 50% of coarse fraction PASSING a No. 4 Sieve	CLEAN SAND (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly-graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS More than 50% of material is SMALLER than No. 200 Sieve	SILTS AND CLAYS Liquid limit LESS than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS Liquid limit GREATER than 50		MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils with high organic contents.

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

GRADATION*	COMPACTNESS*	CONSISTENCY*
% Finer by Weight	Relative Density	Range of Shearing Strength in Pounds per Square Foot

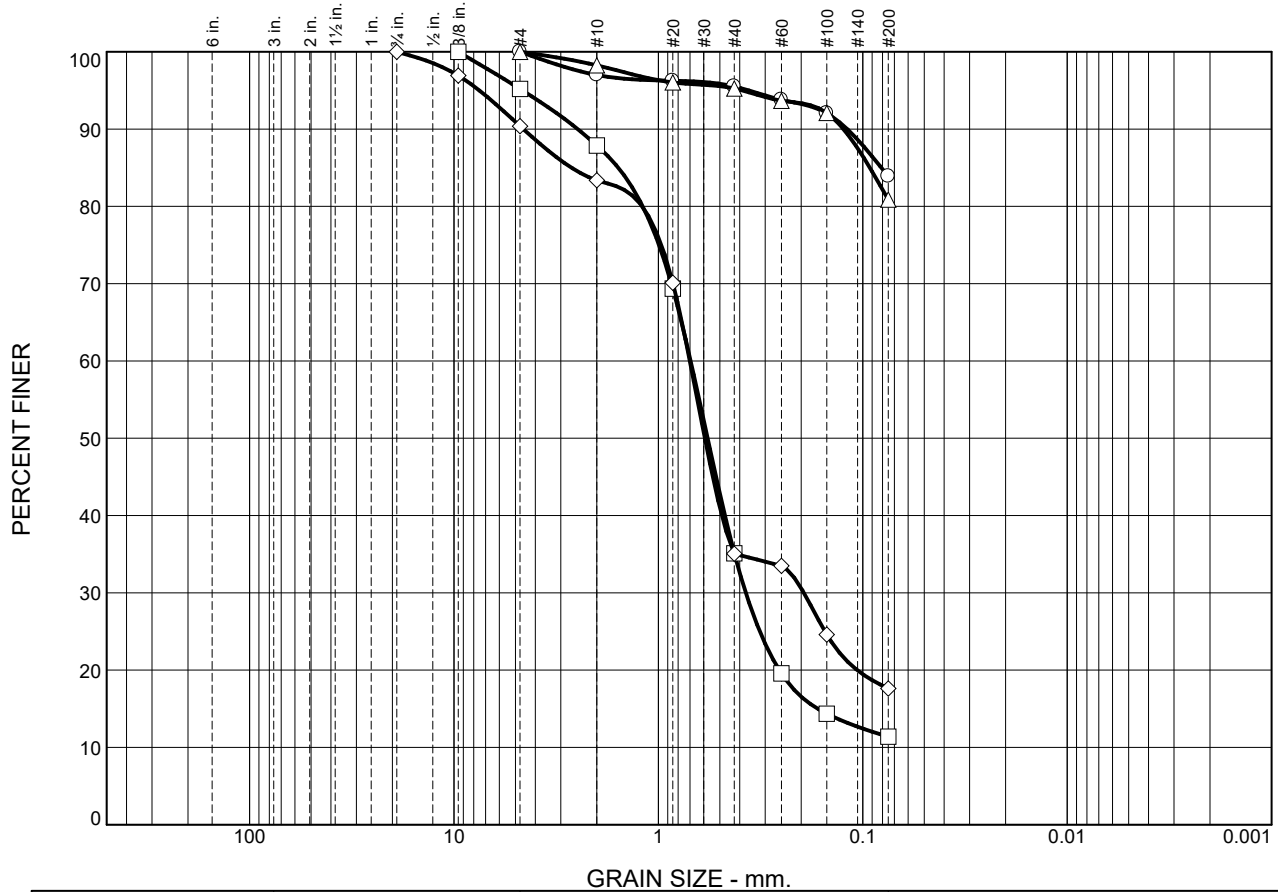
Trace	0% to 10%	Loose	0% to 40%	Very Soft	less than 250
Little	10% to 20%	Medium Dense	40% to 70%	Soft	250 to 500
Some	20% to 35%	Dense	70% to 90%	Medium	500 to 1000
And	35% to 50%	Very Dense	90% to 100%	Stiff	1000 to 2000
				Very Stiff	2000 to 4000
				Hard	Greater than 4000

*Values are from laboratory or field test data, where applicable. When no testing was performed, values are estimated.

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

Gradation Curve(s)



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	3.0	1.5	11.6	83.9	
□	0.0	0.0	4.8	7.3	52.8	23.7	11.4	
△	0.0	0.0	0.0	1.8	3.0	14.3	80.9	
◇	0.0	0.0	9.6	7.0	48.3	17.5	17.6	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	B-1	S-2	2-4	Silt, little fine to coarse Sand (MC=23.4%)	ML
□	B-1	S-3	4-6	Fine to medium Sand, little Silt, trace fine Gravel (MC=6.4%)	SP-SM
△	B-2	S-2	2-4	Silt, little fine to medium Sand (MC=10.8%)	ML
◇	B-2	S-3	4-6	Fine to medium Sand, little Silt, trace fine Gravel (MC=6.0%)	SM

Melick-Tully & Associates
a Division of GZA GeoEnvironmental, Inc.
South Bound Brook, NJ

Client: Verizon
Project: Proposed Generator Pad - West Windsor, NJ
Project No.: 26.0092184.00