



Stormwater Management Report

for

UNA VOCE, LLC
Amended Site Plan

414 White Horse Pike
Block 37, Lot 8
Haddon Heights, Camden County, NJ

Prepared by
IRVING DESIGN GROUP

A handwritten signature in dark ink, appearing to read 'Brian N. Myers', is positioned above a horizontal line. Below the line, the text 'Brian N. Myers, NJPE #43753' is printed in a small, black, sans-serif font.

February 2024

IDG Project #: HILL-22-003

irving design group, llc

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

1.0 INTRODUCTION

UNA Voce (Applicant), has constructed an apartment building located at the intersection of White Horse Pike (NJSH Rt. 30) and Haddon Street in the Borough of Haddon Heights, Camden County, New Jersey. The project entailed the renovation of the existing structure and new construction of a 2,186 sf apartment complex, 12 stall proposed parking lot, lighting and landscaping which have all been previously approved.

This report has been prepared to accompany the latest amended minor site plan application for the project.

2.0 PROJECT DESCRIPTION

2.1 Pre-Existing and Existing (As-Built) Conditions

The project is in Haddon Heights, New Jersey, at the intersection of the White Horse Pike (NJSH Rt. 30) and Haddon Street. The property can be found on the United States Geological Survey (USGS) 7.5- minute topographic quadrangle for Camden and Runnemede, New Jersey.

The subject property is located on a parcel identified on the Haddon Heights tax map as Block 37, Lot 8.

The pre-existing site generally consisted of three (3) space paved parking area and an existing 2 ½ story home. The surface coverage was 0.10 acres of existing impervious surfaces and 0.36 acres of existing pervious surfaces. The "site" was defined as the tax map property boundaries. For pre-existing condition runoff calculations, the "site" was previously analyzed as one Existing Drainage Area (EDA-1).

The pre-existing stormwater from the site collectively drained toward an existing inlet and storm conveyance system located approximately 170' south of the site on Haddon Street where it intersects East Atlantic Avenue.

2.2 Previously Approved-As-Built Conditions

The previously approved, now constructed, project consists of the existing 2 ½ story home, 15-space parking area (total), a now completed 2,186 sf apartment building, lighting and landscaping. The previously approved, now constructed, surface coverage consists of 0.26 acres of impervious surfaces and 0.20 acres of pervious surfaces. The as built conditions have not increased impervious surface coverage by more than 0.25 acres. The previously approved, now constructed, runoff calculations for the site were analyzed as one Proposed Drainage Area (PDA-1) which was previously submitted by RWD CONSULTANTS a division of PENNONI and approved.

3.0 SOIL SURVEY AND PERMEABILITY INFORMATION

A review of soil information provided in the USDA Web Soil Survey Map Database Report for Camden County indicated the soils on the subject property consist of Freehold-Downer-Urban Land complex (FrpB) (Figure 1 within appendix 4: RWD/PENNONI 2017 Log).

3.1 Soil Permeability (Attached)

On November 16, 2017; Pennoni conducted one Test Pit (TP-1) onsite and tested soil permeability utilizing the Double Ring infiltrometer method (ASTM D 3385) field test. This test was completed by Josh Holderer of Pennoni. Soil Boring Log information was completed by Larissa Elder of Pennoni. The site did not show signs of previous soil disturbance in the area of testing. The weather was partly cloudy at the time of soil testing. Soil Permeability testing was conducted at approximately 6ft (72 inches).

3.2 Conclusion / Findings

USDS Soil Maps showed the area of the subject property to contain Freehold-Downer-Urban Land complex (FrpB) soil type. This soil type is considered to be Well Drained. Soil Boring Logs from the site visit on November 16, 2017 by Pennoni show the soil to contain layers of mostly silty loam with some clay layers present. The Soil Boring Log is provided as Figure 2 within appendix 4: RWD/PENNONI 2017 Log.

During the excavation, no water table or seasonal high water table was encountered. Most of the soil layers observed were dry or slightly damp.

Soil permeability testing resulted in an Infiltration Rate of 0.56cm/hr or 0.22in/hr. The Double Ring Field Data Sheet is provided in Figure 3 within appendix 4: RWD/PENNONI 2017 Log.

3.3 Underwood Soils Investigation of December 2023 (Attached)

Due to the failure of the open bioretention basin a new soils investigation was performed by Underwood Engineering Company on December 26, 2023. The Underwood findings confirmed the RWD/PENNONI findings with similar marginally better infiltration rates at depths approximately 12.4 feet lower than the RWD/PENNONI investigation in 2017 and 18 feet below the as-built bottom of the basin.

The soils at the bottom of the Underwood excavation (20.4 feet deep from pre-existing surface grade) yielded a low infiltration rate of 0.6in/hr compared to 0.2 in/hr (RWD/PENNONI 2017 investigation: 8 feet deep from pre-existing surface grade).

3.3a Investigation

Geotechnical Boring – (TB-1) One continuous geotechnical boring was completed at the stormwater basin location on December 26th, 2023. The test boring was carried out to a depth of approximately 18 feet below ground surface (BGS). All standard penetration testing (SPT) and split-barrel sampling of soils was performed in accordance with ASTM D-1586.

The soils encountered at the boring location TB-1 consisted generally of very soft loams underlain by medium dense sandy loams and stiff to very stiff loams. Groundwater was not encountered in TB-1. There were no seasonal high water indicators observed in the borehole.

Samples of the soils recovered during drilling operations were sealed in glass jars and

transported to the Underwood Soil Laboratory for Hydrometer and Sieve analysis per ASTM D-422 and will be stored for a period of no less than 30 days.

3.3b Findings

The soils tested were identified by visual classification in the field and confirmed by laboratory analysis. The soils tested consisted of sandy loams and loams. The permeability class ratings ranged from K2, or 0.6 to 2 inches per hour, to K3, or 2 to 6 inches per hour. A table containing the test location, depth, soil classification and laboratory permeability class ratings are provided in the table below: Results of permeability testing is contained in the table below:

PERMEABILITY RESULTS		
TEST #	TEST DEPTH (FT)	SOIL DESCRIPTION & TEXTURE PERMEABILITY CLASS RATING
TB-1A	4 - 6	SANDY LOAM K3 (2 – 6 IN/HR)
TB-1B	6 - 8	LOAM K2 (0.6 – 2.0 IN/HR)
TB-1C	8 - 10	LOAM K2 (0.6 – 2.0 IN/HR)

*Depths taken below existing ground surface elevations at test pit locations.

Note: It is anticipated that the field infiltration rates will be much slower than the laboratory rates due to the in place stiff consistency of the soils and the fine plus very fine sand contents (60-75%) of the soils.

4.0 DESIGN CRITERIA

In New Jersey, projects resulting in over one (1) acre of land disturbance, or 0.25 acres of new impervious surfaces are required to comply with the NJDEP's stormwater management rules at N.J.A.C. 7:8. The project is **NOT** considered a "major development" as the project will not disturb more than one (1) acre of land and the project will **NOT** increase impervious area by 0.25 acres.

4.1 Groundwater Recharge

Pursuant to N.J.A.C. 7:8-5.4(a)2, the groundwater recharge standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The previously approved now constructed project has not increased impervious surface coverage by more than 0.25 acres and has not disturbed more than one (1) acre of land. Therefore, the groundwater recharge standards **do not apply**.

4.2 Stormwater Quantity

Pursuant to N.J.A.C. 7:8-5.4(a)3, the runoff quantity standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The previously approved now constructed has not increased impervious surface coverage by more than 0.25 acres and will not disturb more than one (1) acre of land. Therefore, the water quantity standards **do not apply**. However,

both an underground infiltration system and an open bioretention basin were designed and previously approved. As a result of poor subsurface soil conditions and at the request of Bach Associates this amended site plan application to remedy the current open bioretention basin which has failed.

4.3 Water Quality

The previously approved project did not increase impervious surface coverage by more than 0.25 acres. Therefore, water quality treatment is **not required** pursuant to N.J.A.C. 7:8-5.5.

5.0 METHODOLOGY

Stormwater for the proposed site was evaluated using the NRCS Technical Release 20/55 method of calculating runoff volume and rate. The site specifics were input into the HydroCAD Stormwater Modeling System program by HydroCAD Software Solutions LLC. Impervious and pervious areas were calculated as separate areas without weighted curve numbers (CNs).

The site is made up of the Freehold-Downer-Urban Land complex soils classification (FrpB) – (HYDROLOGIC SOIL GROUP ‘B’), and slopes generally toward Haddon Street.

As this site has been previously approved and amended, criteria previously reviewed and approved to create hydrographs, flow rates, and volumes are utilized in the amended design. Specifically, the time of concentration (Tc) was determined to be a minimum of 6 minutes and the following table represents the rainfall data utilized in the calculations, based on the 24-hour, Type III, county rainfall amounts provided by NRCS:

RAINFALL DEPTH INFORMATION	
STORM FREQ. (YEAR)	NOAA NWS PFDS RAINFALL DEPTH (INCHES)
2	3.31
10	5.06
25	6.28
100	8.52

It should be noted that the original calculations and approval did not include the 25-year storm event, but at the request of Bach Associates, it has been included.

6.0 RAIN GARDEN/VEGETATIVE FILTER STRIP

With the failure of the bioretention basin, due to poor subsurface soil conditions, a rain garden/vegetative filter strip is proposed to replace the bioretention basin. The rain

garden/vegetative filter strip is provided with an underdrain, that is connected to an outlet structure, which is connected to a proposed inlet on Haddon Street. The proposed inlet on Haddon Street is connected to an existing inlet located approximately 180 feet to the south. The proposed outlet structure, inlet, and connections provide a positive discharge to the existing downstream inlet located along Haddon Street.

Due to the existing topography and layout of the site, 8,389 sq.ft. of the site is captured and directed towards the rain garden/vegetative filter strip. The remaining 11,611 sq.ft. is uncaptured and continues with the existing overland flow towards Haddon Street. However, the uncaptured site runoff is collected in the gutter with the proposed inlet.

Currently, all the site runoff flows along the street gutter to the existing inlet approximately 170' to the south on Hadden Street. With the underdrain, and proposed inlet, all site runoff will be collected with a positive discharge connection to the downstream inlet, resulting in no site runoff flowing along the gutter in front of the neighboring property to the south.

7.0 SITE ANALYSIS

As a result of poor subsurface soil conditions, the site was re-evaluated for the use of a rain garden/vegetative filter strip in the area of the failed bioretention basin as an amended site plan application.

To avoid the use of hydrographs and data generated across different software modeling platforms (RWD/PENNONI utilized Pondpack V8i by Bentley while Irving Design Group utilized HydroCAD Software Solutions LLC) new hydrographs were generated for evaluation. It should be noted that there are differences in the modeling results. Most likely some of the difference can be attributed to large units of measure utilized in the PondPack software, even though it is a small site. The HydroCAD software modeling utilized small units of measure, which better defines the site.

Additionally, standard comparisons of predevelopment and post development volume and rate information do not appropriately provide evaluation of the site, especially since this site is not a major development and those requirements are not applicable.

The rain garden/vegetative filter strip is provided with an outlet structure, with a weir elevation of 67.00 and grate elevation of 67.5. Berm contouring and existing contours along the neighboring property line provide the lowest elevation of 68.0, near the right-of-way of Haddon Street.

Hydrographs are provided for the various storm events and provide a maximum water elevation for the 100-year storm event of 67.59, which is below the lowest neighboring property and therefore indicates no impact to the adjoining property.

RAIN GARDEN/VEGETATIVE FILTER STRIP	
STORM FREQ. (YR)	MAX WATER ELEVATION (FT)
2	67.28
10	67.50
25	67.56
100	67.59

8.0 STORM SEWER DESIGN

A positive discharge connection from the underdrain of the rain garden is proposed to connect to a proposed inlet on Haddon Street, which will connect to the existing downstream inlet via a proposed 180' length of 15-inch diameter Class IV Reinforced Concrete Pipe (RCP).

The pipe was evaluated for the various storm events to ensure sufficient capacity for post development runoff from the captured site (rain garden/vegetative filter strip) as well as the uncaptured site area. Since the uncaptured site flows to Hadden Street and the gutter, it would be discharged to the proposed inlet and connecting pipe. Therefore, the two flows were routed through the inlet and result in the following maximum water elevations in the pipe:

PROPOSED HADDEN STREET INLET AND CONNECTION PIPE		
STORM FREQ. (YR)	PIPE VELOCITY (FPS)	MAX WATER ELEVATION IN PIPE (FT)
2	2.17	64.61
10	2.51	64.75
25	2.87	64.91
100	3.23	65.12

The proposed inlet is designed with an invert of 64.2, which means the maximum flow depth for the 100-year storm event that is attributable to the site is approximately 11 inches. This means that there is reserve capacity in the pipe for offsite flow, and that no site runoff would flow along the gutter of the neighboring property.

9.0 SOIL EROSION AND SEDIMENT CONTROL

The project complied with the minimum design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.

10.0 CONCLUSION

The project is not considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres. Therefore, the project is not required to address groundwater recharge, water quantity and water quality requirements of N.J.A.C. 7:8-5.4 and 7:8-5.5.

As described above, a rain garden/vegetative filter strip has been provided in the area where the bioretention basin failed due to poor soil conditions. As demonstrated with the hydrographs, there is no detrimental impact to the neighboring property.



Pre-Development
Summaries & Hydrographs

irving design group, llc

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414 WHP Pre Developmentnt

Prepared by Brian Myers

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year Storm	NOAA 24-hr	C	Default	24.00	1	3.31	2
2	10-Year Storm	NOAA 24-hr	C	Default	24.00	1	5.06	2
3	25-Year Storm	NOAA 24-hr	C	Default	24.00	1	6.28	2
4	100-Year Storm	NOAA 24-hr	C	Default	24.00	1	8.52	2

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NOAA 24-hr C 2-Year Storm Rainfall=3.31"

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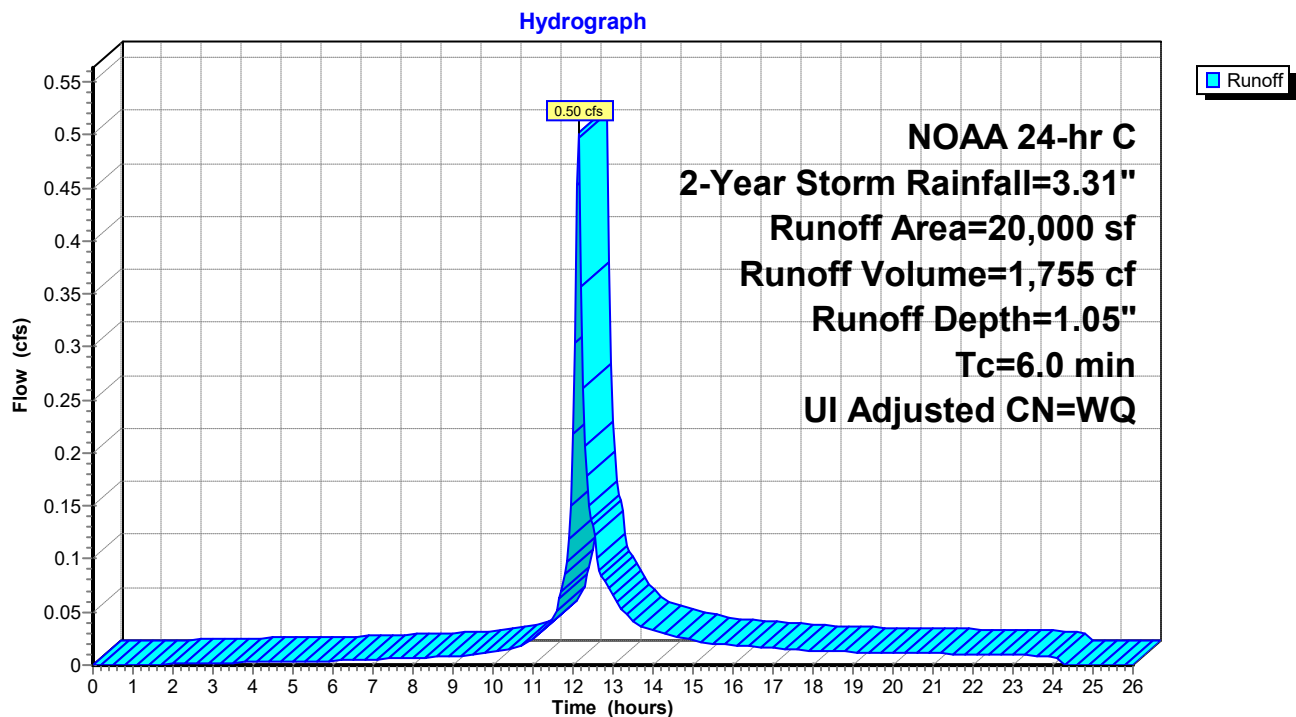
Summary for Subcatchment 4S: Pre-Development to Rain Garden

Runoff = 0.50 cfs @ 12.14 hrs, Volume= 1,755 cf, Depth= 1.05"
Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Storm Rainfall=3.31"

Area (sf)	CN	Adj	Description
15,644	61	61	>75% Grass cover, Good, HSG B
3,247	98	98	Paved parking, HSG B
1,109	98	98	Unconnected roofs, HSG B
20,000			Weighted Average
15,644	61	61	78.22% Pervious Area
4,356	98	98	21.78% Impervious Area
1,109			25.46% Unconnected

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

Subcatchment 4S: Pre-Development to Rain Garden

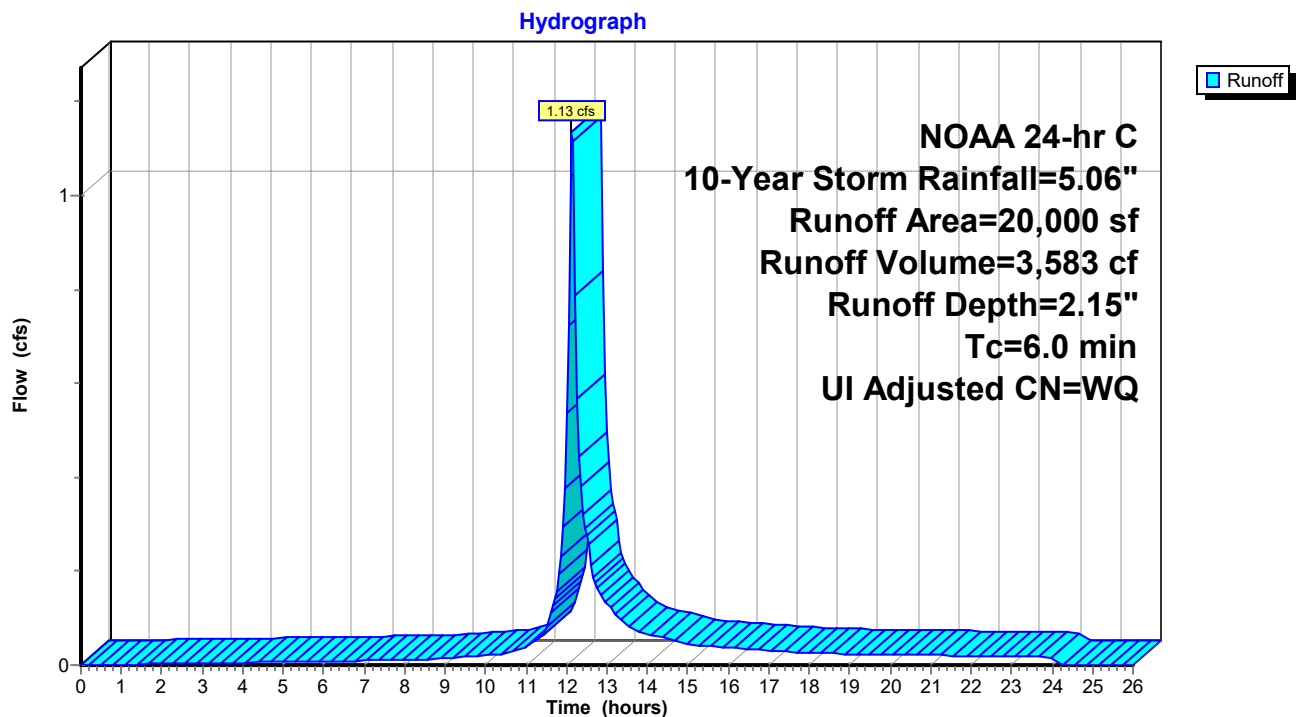
Summary for Subcatchment 4S: Pre-Development to Rain Garden

Runoff = 1.13 cfs @ 12.13 hrs, Volume= 3,583 cf, Depth= 2.15"
 Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 10-Year Storm Rainfall=5.06"

Area (sf)	CN	Adj	Description
15,644	61	61	>75% Grass cover, Good, HSG B
3,247	98	98	Paved parking, HSG B
1,109	98	98	Unconnected roofs, HSG B
20,000			Weighted Average
15,644	61	61	78.22% Pervious Area
4,356	98	98	21.78% Impervious Area
1,109			25.46% Unconnected

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

Subcatchment 4S: Pre-Development to Rain Garden

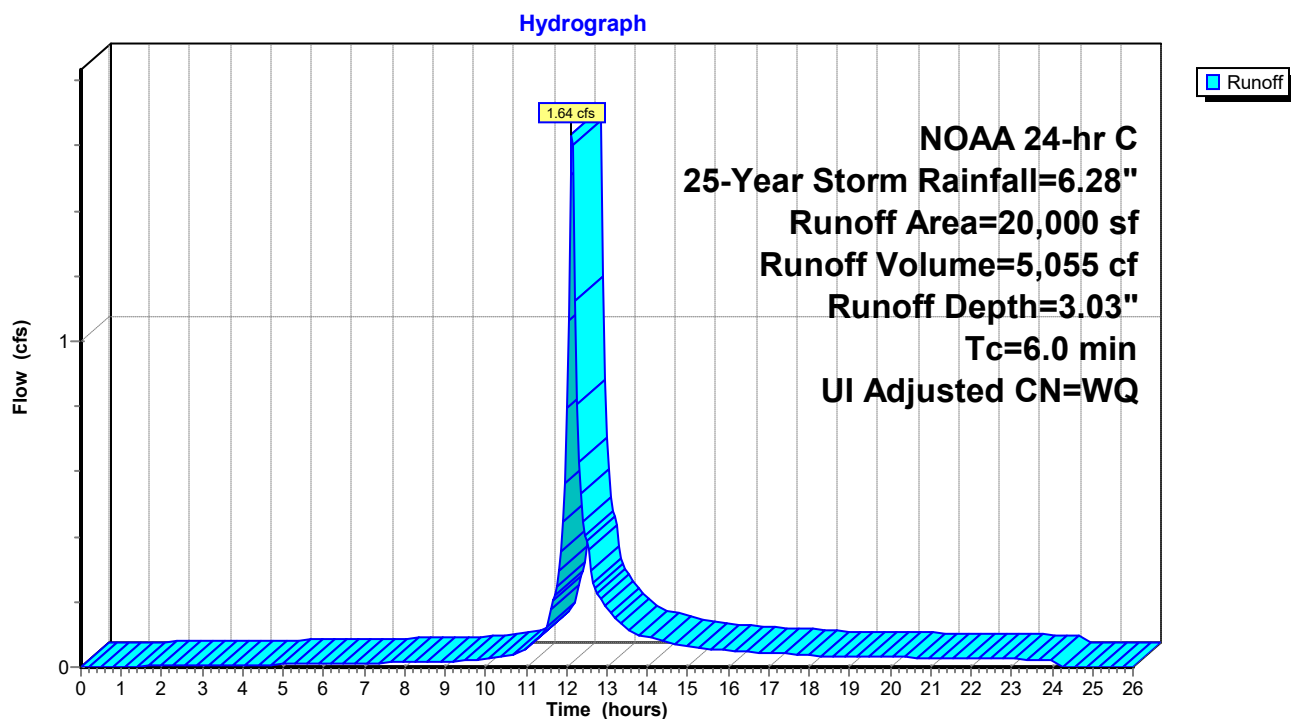
Summary for Subcatchment 4S: Pre-Development to Rain Garden

Runoff = 1.64 cfs @ 12.13 hrs, Volume= 5,055 cf, Depth= 3.03"
 Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 25-Year Storm Rainfall=6.28"

Area (sf)	CN	Adj	Description
15,644	61	61	>75% Grass cover, Good, HSG B
3,247	98	98	Paved parking, HSG B
1,109	98	98	Unconnected roofs, HSG B
20,000			Weighted Average
15,644	61	61	78.22% Pervious Area
4,356	98	98	21.78% Impervious Area
1,109			25.46% Unconnected

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

Subcatchment 4S: Pre-Development to Rain Garden

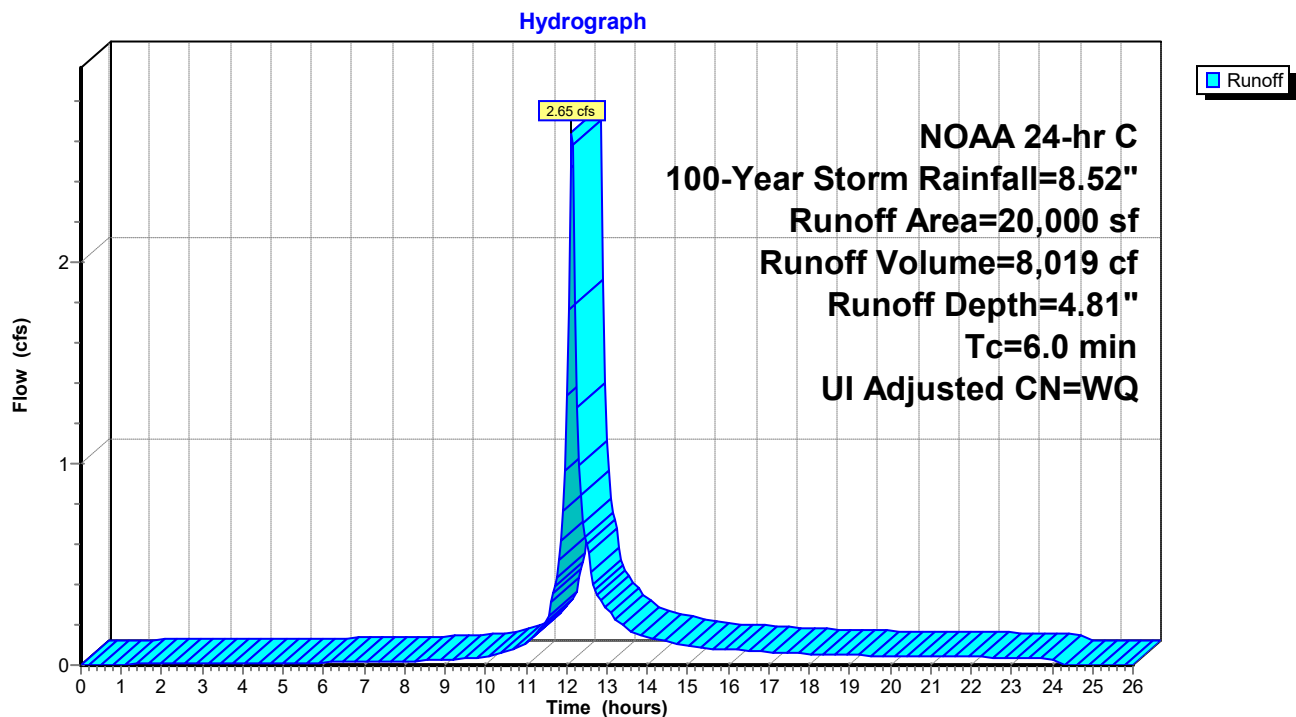
Summary for Subcatchment 4S: Pre-Development to Rain Garden

Runoff = 2.65 cfs @ 12.13 hrs, Volume= 8,019 cf, Depth= 4.81"
 Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 100-Year Storm Rainfall=8.52"

Area (sf)	CN	Adj	Description
15,644	61	61	>75% Grass cover, Good, HSG B
3,247	98	98	Paved parking, HSG B
1,109	98	98	Unconnected roofs, HSG B
20,000			Weighted Average
15,644	61	61	78.22% Pervious Area
4,356	98	98	21.78% Impervious Area
1,109			25.46% Unconnected

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

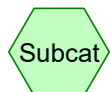
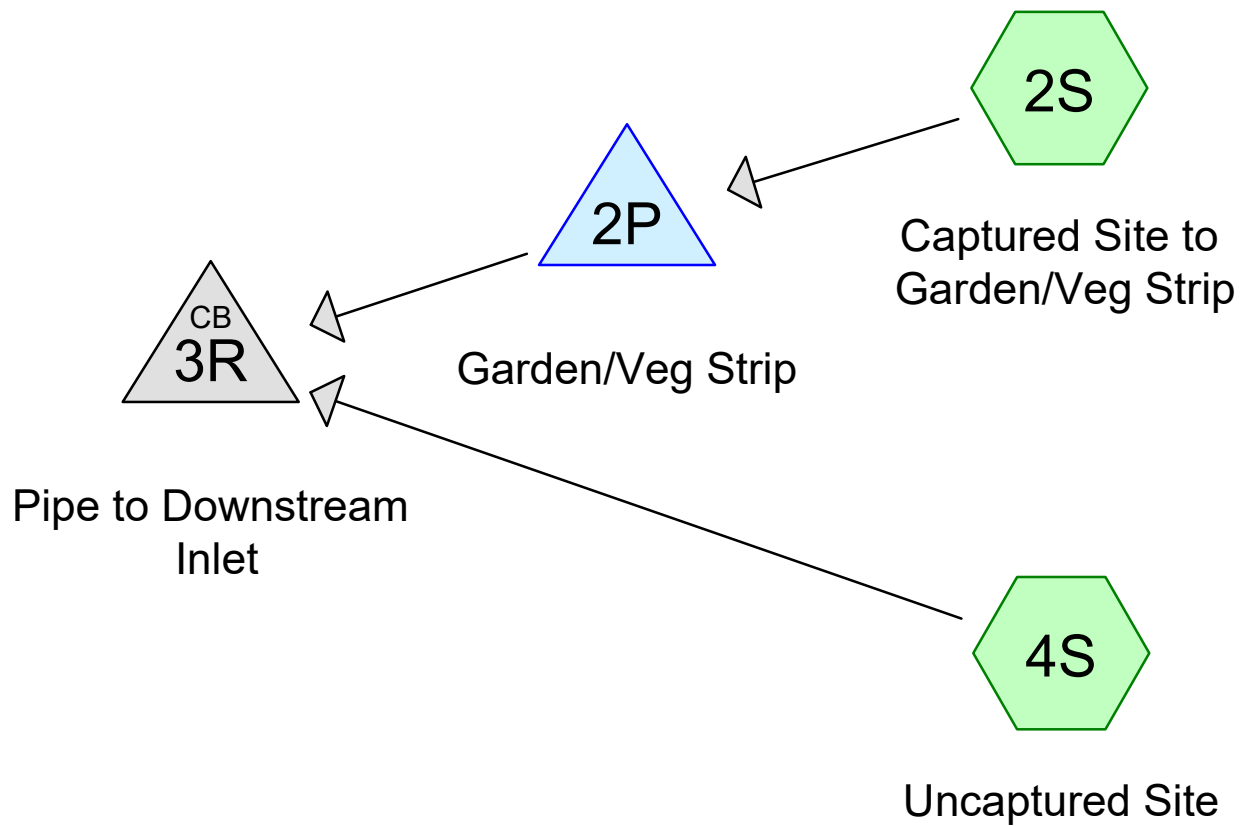
Subcatchment 4S: Pre-Development to Rain Garden



Post Development
Summaries & Hydrographs

irving design group, llc

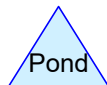
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Subcat



Reach



Pond



Link

Routing Diagram for 414 WHP 022124 Analysis

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414 WHP 022124 Analysis

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year Storm	NOAA 24-hr	C	Default	24.00	1	3.31	2
2	10-Year Storm	NOAA 24-hr	C	Default	24.00	1	5.06	2
3	25-Year Storm	NOAA 24-hr	C	Default	24.00	1	6.28	2
4	100-Year Storm	NOAA 24-hr	C	Default	24.00	1	8.52	2

414 WHP 022124 Analysis

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NOAA 24-hr C 2-Year Storm Rainfall=3.31"

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Summary for Subcatchment 2S: Captured Site to Garden/Veg Strip

Runoff = 0.47 cfs @ 12.13 hrs, Volume= 1,555 cf, Depth= 2.22"
Routed to Pond 2P : Garden/Veg Strip

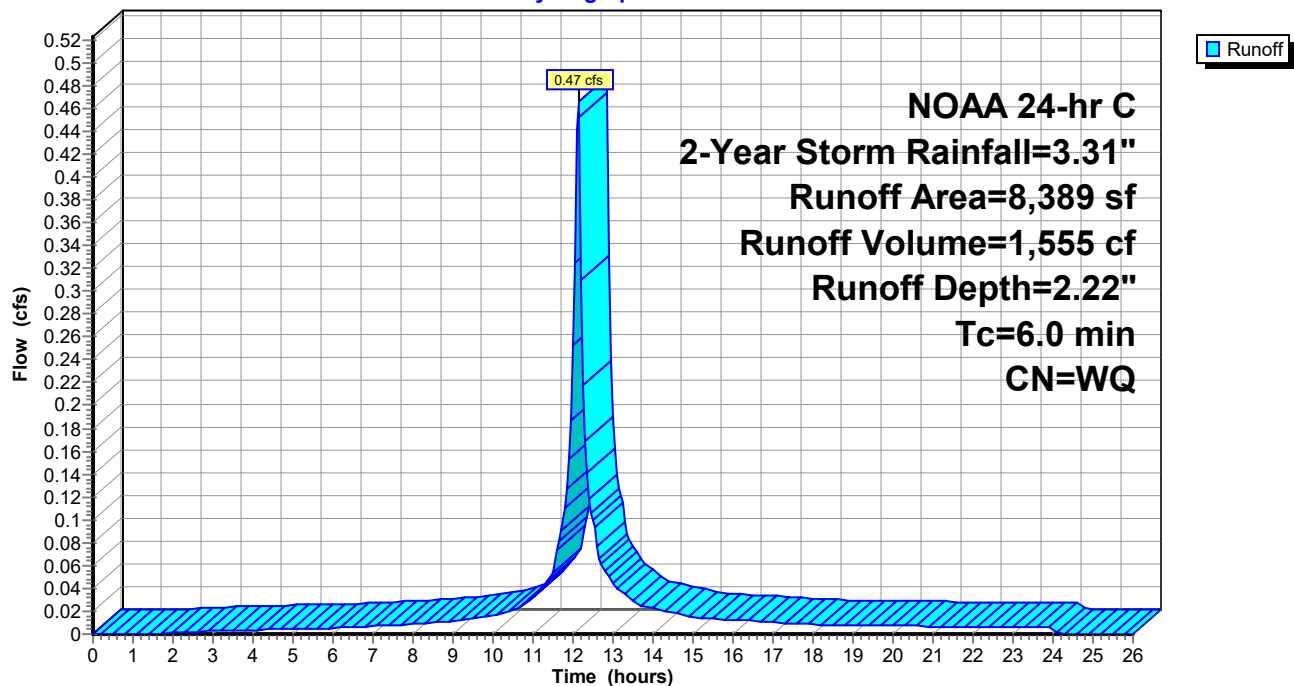
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Storm Rainfall=3.31"

Area (sf)	CN	Description
2,766	61	>75% Grass cover, Good, HSG B
3,935	98	Paved parking, HSG B
1,688	98	Unconnected roofs, HSG B
8,389		Weighted Average
2,766	61	32.97% Pervious Area
5,623	98	67.03% Impervious Area
1,688		30.02% Unconnected

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

Subcatchment 2S: Captured Site to Garden/Veg Strip

Hydrograph



414 WHP 022124 Analysis

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NOAA 24-hr C 2-Year Storm Rainfall=3.31"

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Summary for Subcatchment 4S: Uncaptured Site

Runoff = 0.43 cfs @ 12.13 hrs, Volume= 1,473 cf, Depth= 1.52"
Routed to Pond 3R : Pipe to Downstream Inlet

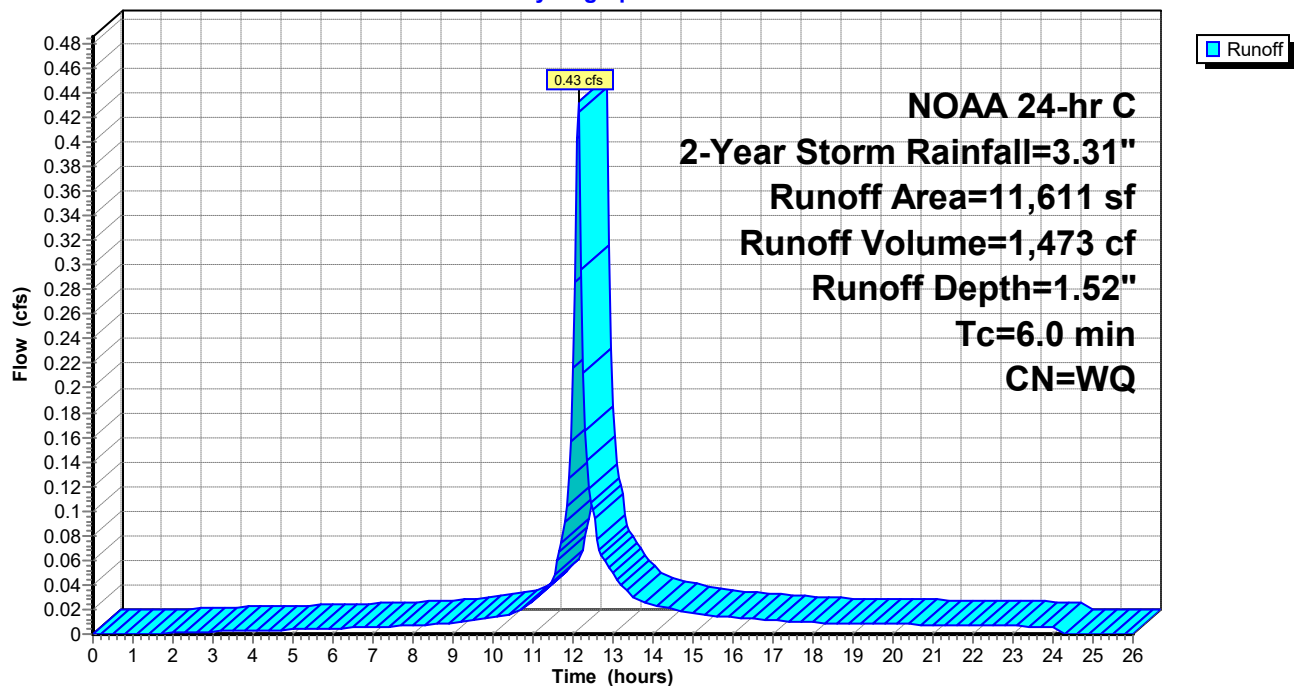
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Storm Rainfall=3.31"

Area (sf)	CN	Description
6,975	61	>75% Grass cover, Good, HSG B
2,206	98	Paved parking, HSG B
2,430	98	Unconnected roofs, HSG B
11,611		Weighted Average
6,975	61	60.07% Pervious Area
4,636	98	39.93% Impervious Area
2,430		52.42% Unconnected

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

Subcatchment 4S: Uncaptured Site

Hydrograph



414 WHP 022124 Analysis

NOAA 24-hr C 2-Year Storm Rainfall=3.31"

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Summary for Pond 2P: Garden/Veg Strip

Inflow Area = 8,389 sf, 67.03% Impervious, Inflow Depth = 2.22" for 2-Year Storm event
 Inflow = 0.47 cfs @ 12.13 hrs, Volume= 1,555 cf
 Outflow = 0.35 cfs @ 12.19 hrs, Volume= 1,330 cf, Atten= 24%, Lag= 3.7 min
 Primary = 0.35 cfs @ 12.19 hrs, Volume= 1,330 cf
 Routed to Pond 3R : Pipe to Downstream Inlet

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.28' @ 12.19 hrs Surf.Area= 513 sf Storage= 353 cf

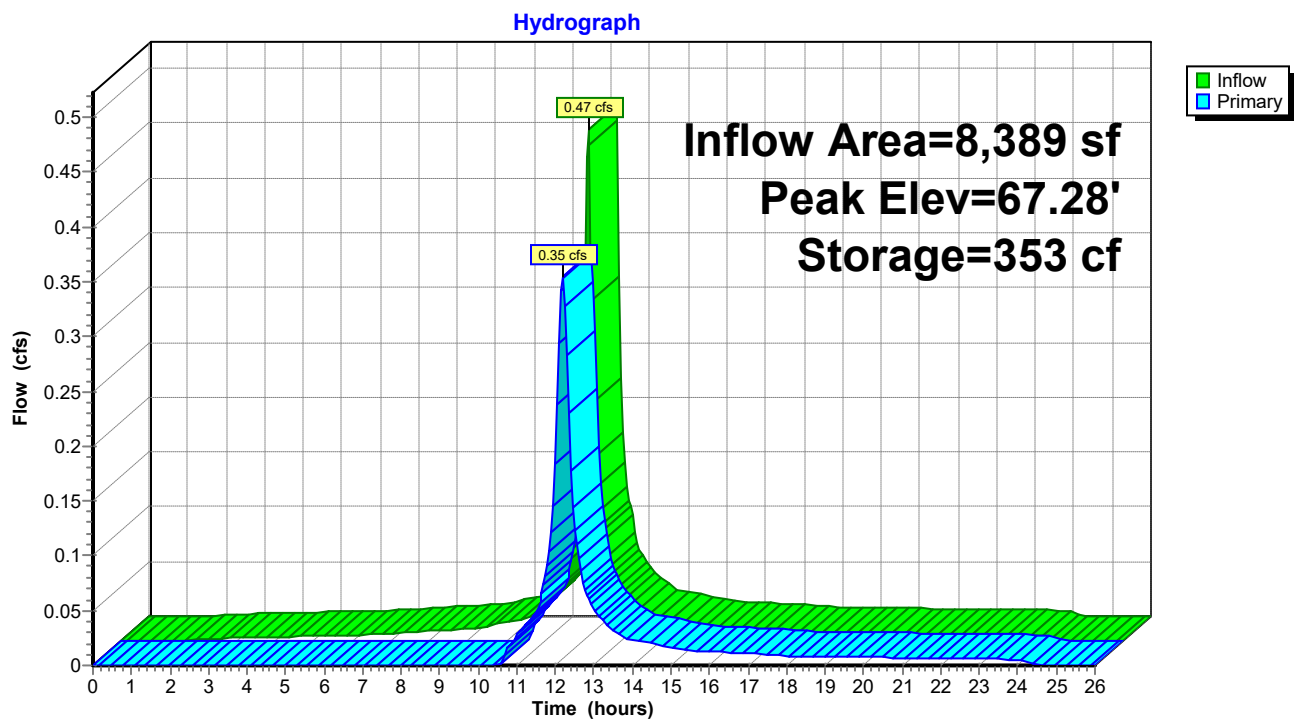
Plug-Flow detention time= 128.2 min calculated for 1,330 cf (86% of inflow)
 Center-of-Mass det. time= 60.4 min (828.7 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	825 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	100	0	0
66.50	200	75	75
67.00	400	150	225
67.50	600	250	475
68.00	800	350	825

Device	Routing	Invert	Outlet Devices
#1	Primary	64.30'	15.0" Round Culvert L= 16.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 64.30' / 64.20' S= 0.0062 ' / Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	67.00'	12.0" W x 2.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	67.50'	10.0' long Top Grate Overflow 0 End Contraction(s)

Primary OutFlow Max=0.35 cfs @ 12.19 hrs HW=67.28' (Free Discharge)

- 1=Culvert (Passes 0.35 cfs of 11.39 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.35 cfs @ 2.11 fps)
- 3=Top Grate Overflow (Controls 0.00 cfs)

Pond 2P: Garden/Veg Strip

414 WHP 022124 Analysis

Prepared by Brian Myers

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NOAA 24-hr C 2-Year Storm Rainfall=3.31"

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Summary for Pond 3R: Pipe to Downstream Inlet

Inflow Area = 20,000 sf, 51.30% Impervious, Inflow Depth = 1.68" for 2-Year Storm event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 2,803 cf
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 2,803 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.14 hrs, Volume= 2,803 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

Peak Elev= 64.61' @ 12.14 hrs

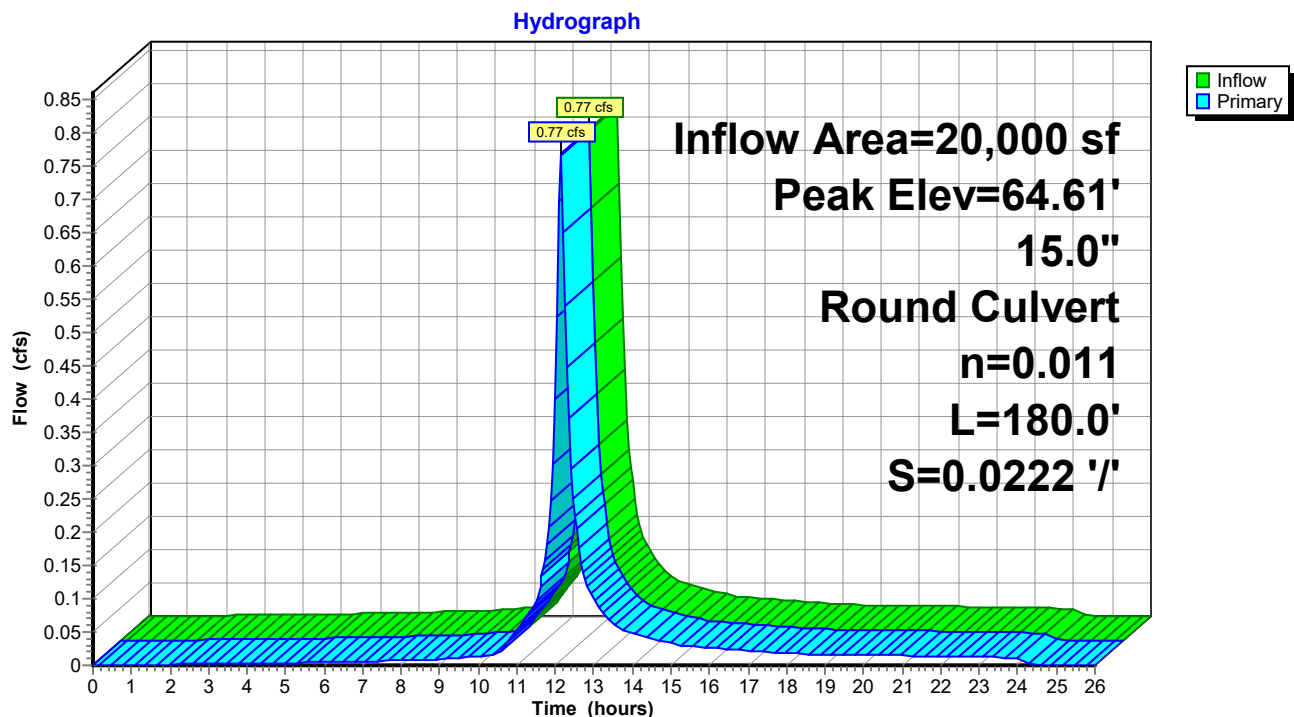
Flood Elev= 67.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.20'	15.0" Round Culvert L= 180.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.20' / 60.20' S= 0.0222 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=0.76 cfs @ 12.14 hrs HW=64.61' (Free Discharge)

↑1=Culvert (Inlet Controls 0.76 cfs @ 2.17 fps)

Pond 3R: Pipe to Downstream Inlet



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NOAA 24-hr C 10-Year Storm Rainfall=5.06"

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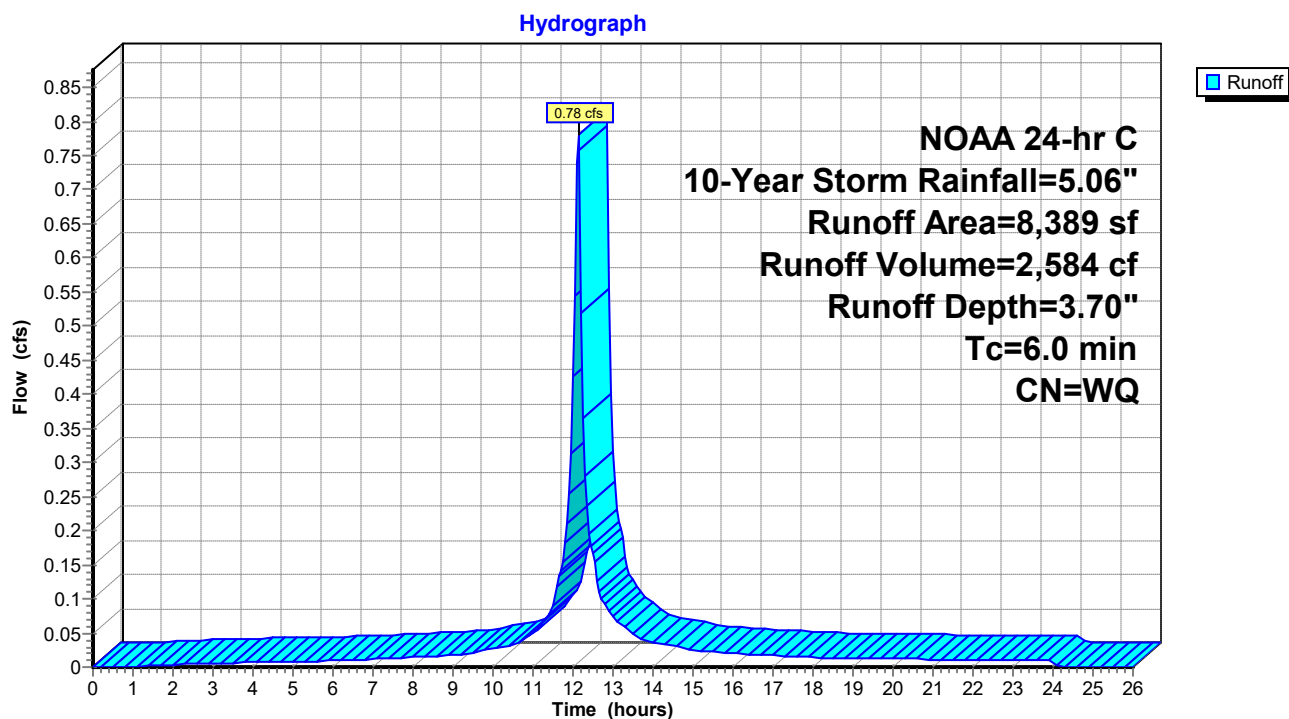
Summary for Subcatchment 2S: Captured Site to Garden/Veg Strip

Runoff = 0.78 cfs @ 12.13 hrs, Volume= 2,584 cf, Depth= 3.70"
Routed to Pond 2P : Garden/Veg Strip

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Storm Rainfall=5.06"

Area (sf)	CN	Description
2,766	61	>75% Grass cover, Good, HSG B
3,935	98	Paved parking, HSG B
1,688	98	Unconnected roofs, HSG B
8,389		Weighted Average
2,766	61	32.97% Pervious Area
5,623	98	67.03% Impervious Area
1,688		30.02% Unconnected

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

Subcatchment 2S: Captured Site to Garden/Veg Strip

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NOAA 24-hr C 10-Year Storm Rainfall=5.06"

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Summary for Subcatchment 4S: Uncaptured Site

Runoff = 0.83 cfs @ 12.13 hrs, Volume= 2,680 cf, Depth= 2.77"
Routed to Pond 3R : Pipe to Downstream Inlet

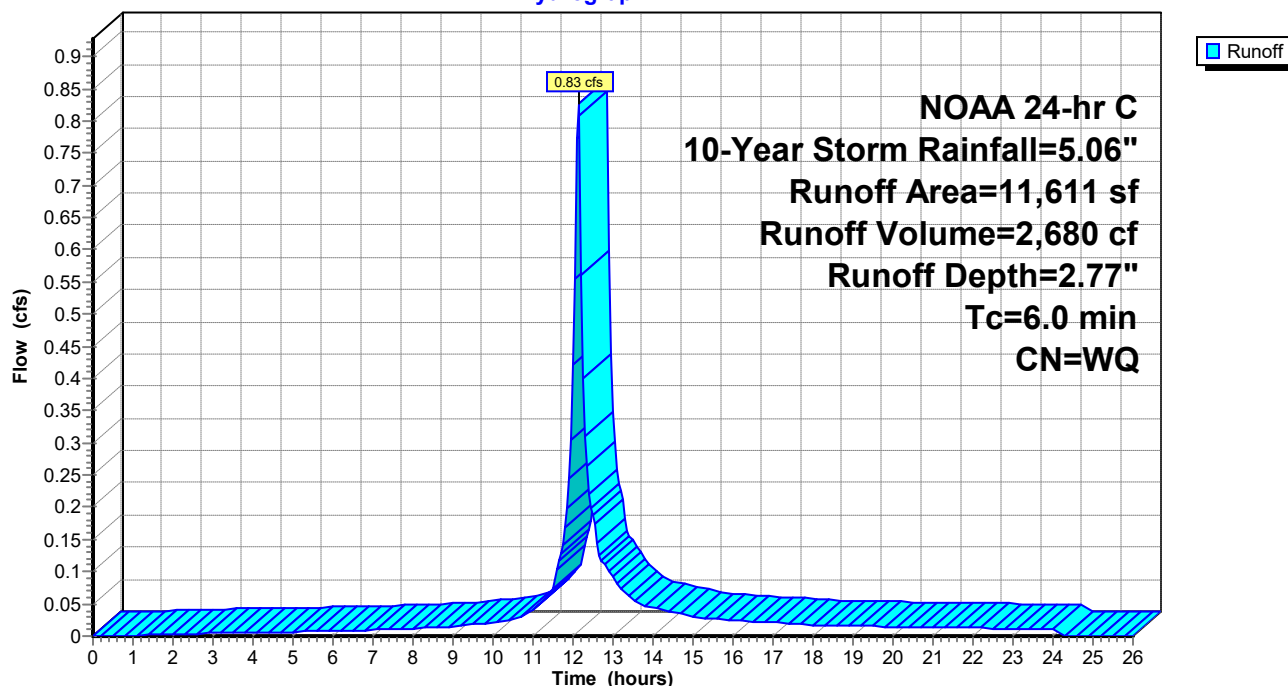
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10-Year Storm Rainfall=5.06"

Area (sf)	CN	Description
6,975	61	>75% Grass cover, Good, HSG B
2,206	98	Paved parking, HSG B
2,430	98	Unconnected roofs, HSG B
11,611		Weighted Average
6,975	61	60.07% Pervious Area
4,636	98	39.93% Impervious Area
2,430		52.42% Unconnected

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

Subcatchment 4S: Uncaptured Site

Hydrograph



Summary for Pond 2P: Garden/Veg Strip

Inflow Area = 8,389 sf, 67.03% Impervious, Inflow Depth = 3.70" for 10-Year Storm event
 Inflow = 0.78 cfs @ 12.13 hrs, Volume= 2,584 cf
 Outflow = 0.52 cfs @ 12.21 hrs, Volume= 2,359 cf, Atten= 34%, Lag= 4.8 min
 Primary = 0.52 cfs @ 12.21 hrs, Volume= 2,359 cf
 Routed to Pond 3R : Pipe to Downstream Inlet

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.50' @ 12.21 hrs Surf.Area= 600 sf Storage= 475 cf

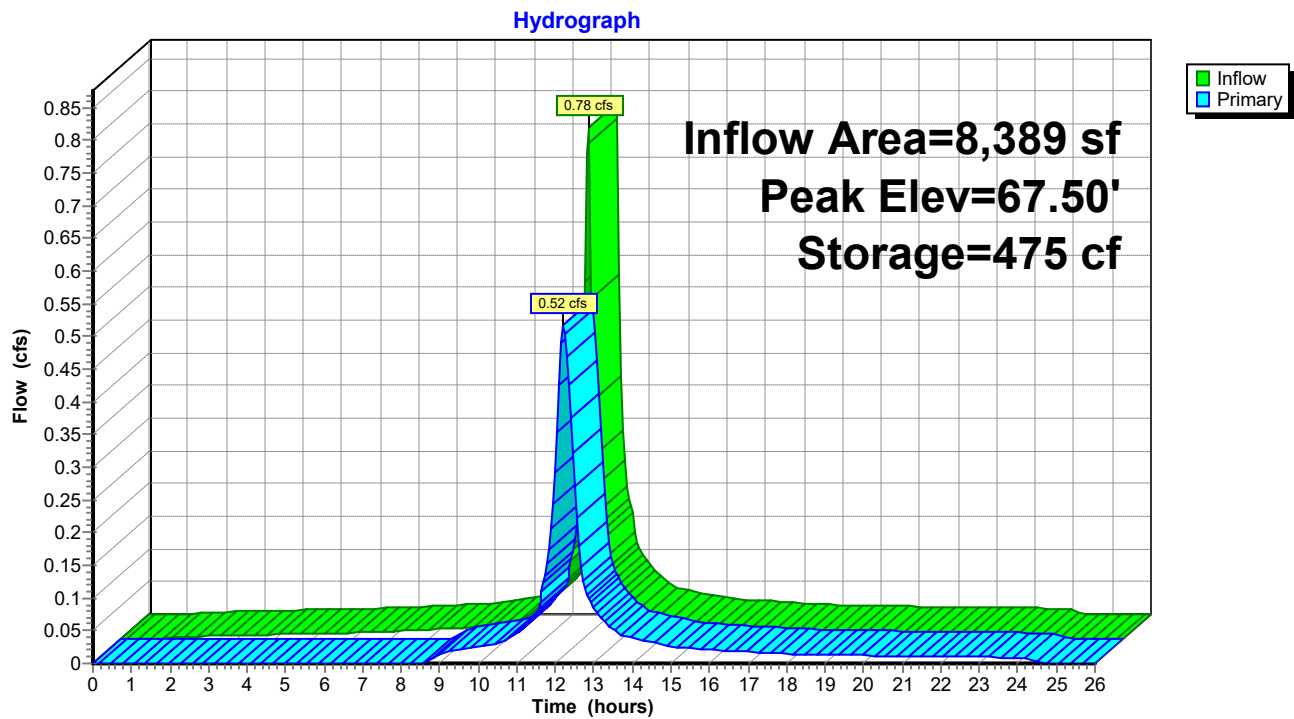
Plug-Flow detention time= 95.2 min calculated for 2,359 cf (91% of inflow)
 Center-of-Mass det. time= 47.8 min (812.3 - 764.5)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	825 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	100	0	0
66.50	200	75	75
67.00	400	150	225
67.50	600	250	475
68.00	800	350	825

Device	Routing	Invert	Outlet Devices
#1	Primary	64.30'	15.0" Round Culvert L= 16.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 64.30' / 64.20' S= 0.0062 ' / Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	67.00'	12.0" W x 2.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	67.50'	10.0' long Top Grate Overflow 0 End Contraction(s)

Primary OutFlow Max=0.51 cfs @ 12.21 hrs HW=67.50' (Free Discharge)

- 1=Culvert (Passes 0.51 cfs of 12.05 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.51 cfs @ 3.09 fps)
- 3=Top Grate Overflow (Controls 0.00 cfs)

Pond 2P: Garden/Veg Strip

Summary for Pond 3R: Pipe to Downstream Inlet

Inflow Area = 20,000 sf, 51.30% Impervious, Inflow Depth = 3.02" for 10-Year Storm event
 Inflow = 1.30 cfs @ 12.14 hrs, Volume= 5,039 cf
 Outflow = 1.30 cfs @ 12.14 hrs, Volume= 5,039 cf, Atten= 0%, Lag= 0.0 min
 Primary = 1.30 cfs @ 12.14 hrs, Volume= 5,039 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

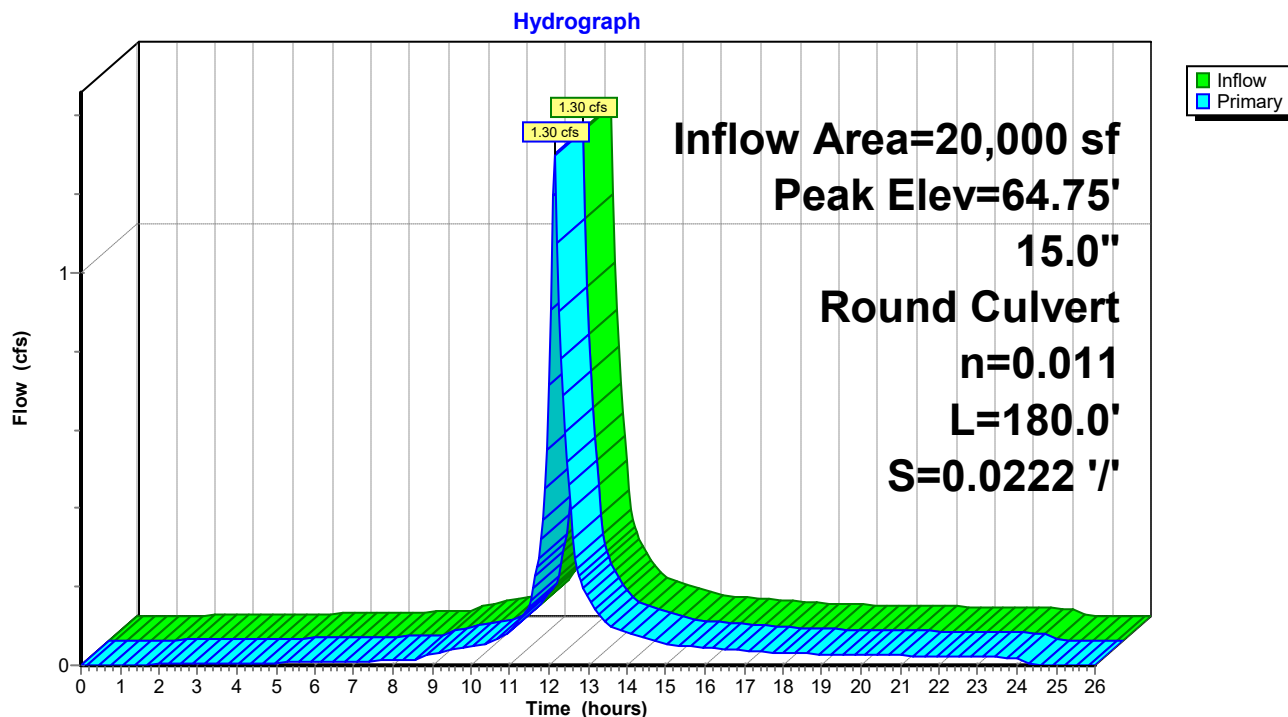
Peak Elev= 64.75' @ 12.14 hrs

Flood Elev= 67.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.20'	15.0" Round Culvert L= 180.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.20' / 60.20' S= 0.0222 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=1.28 cfs @ 12.14 hrs HW=64.74' (Free Discharge)

↑1=Culvert (Inlet Controls 1.28 cfs @ 2.51 fps)

Pond 3R: Pipe to Downstream Inlet

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NOAA 24-hr C 25-Year Storm Rainfall=6.28"

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Summary for Subcatchment 2S: Captured Site to Garden/Veg Strip

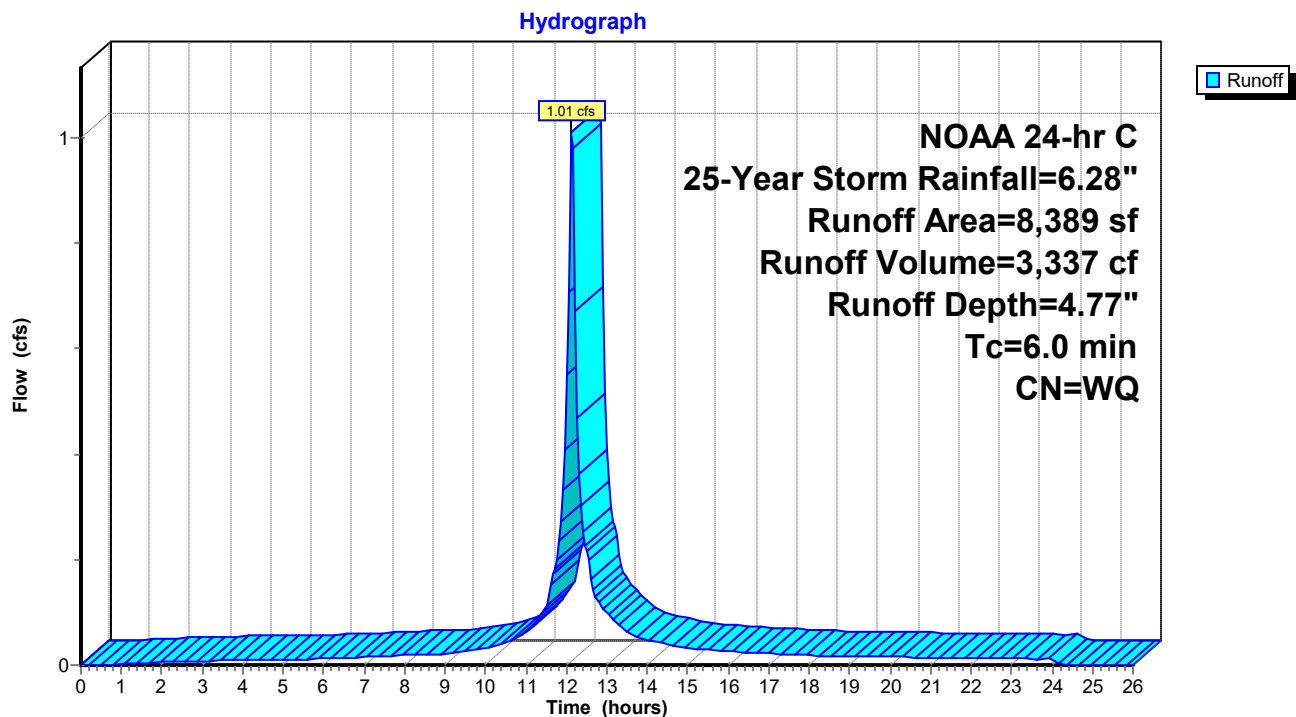
Runoff = 1.01 cfs @ 12.13 hrs, Volume= 3,337 cf, Depth= 4.77"

Routed to Pond 2P : Garden/Veg Strip

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Storm Rainfall=6.28"

Area (sf)	CN	Description
2,766	61	>75% Grass cover, Good, HSG B
3,935	98	Paved parking, HSG B
1,688	98	Unconnected roofs, HSG B
8,389		Weighted Average
2,766	61	32.97% Pervious Area
5,623	98	67.03% Impervious Area
1,688		30.02% Unconnected

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

Subcatchment 2S: Captured Site to Garden/Veg Strip

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NOAA 24-hr C 25-Year Storm Rainfall=6.28"

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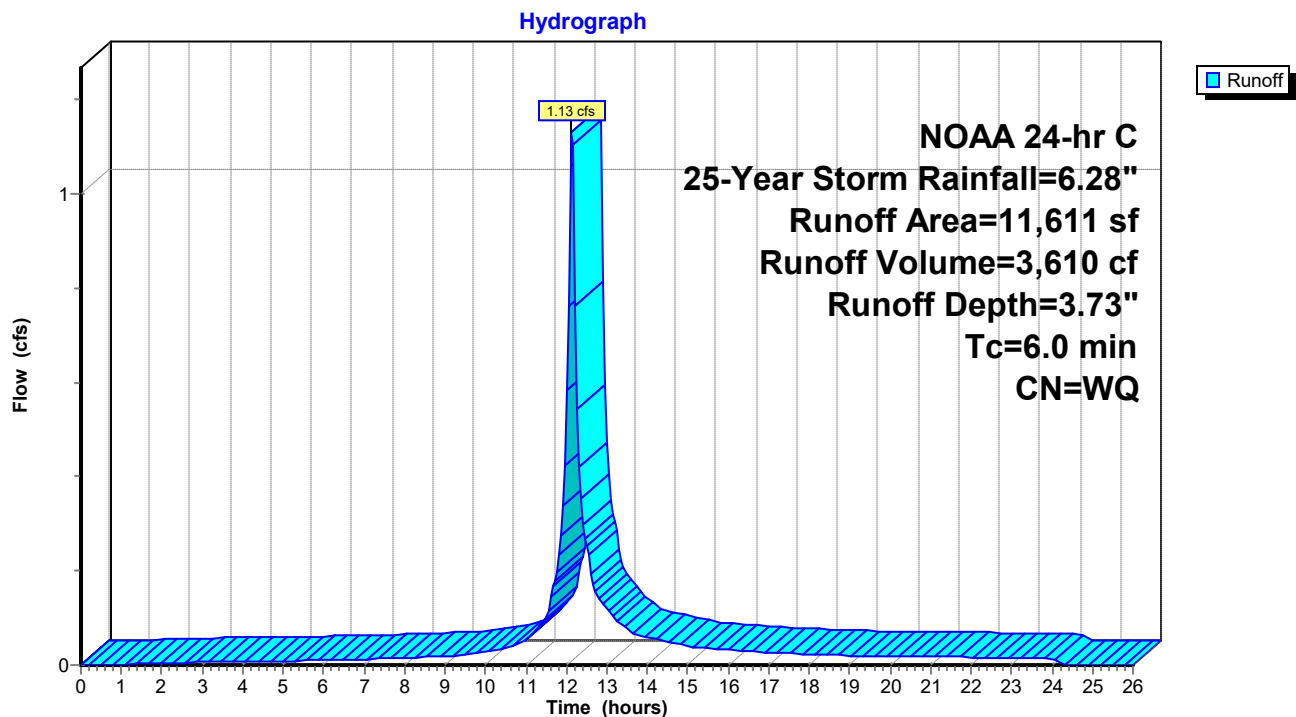
Summary for Subcatchment 4S: Uncaptured Site

Runoff = 1.13 cfs @ 12.13 hrs, Volume= 3,610 cf, Depth= 3.73"
Routed to Pond 3R : Pipe to Downstream Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 25-Year Storm Rainfall=6.28"

Area (sf)	CN	Description
6,975	61	>75% Grass cover, Good, HSG B
2,206	98	Paved parking, HSG B
2,430	98	Unconnected roofs, HSG B
11,611		Weighted Average
6,975	61	60.07% Pervious Area
4,636	98	39.93% Impervious Area
2,430		52.42% Unconnected

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

Subcatchment 4S: Uncaptured Site

Summary for Pond 2P: Garden/Veg Strip

Inflow Area = 8,389 sf, 67.03% Impervious, Inflow Depth = 4.77" for 25-Year Storm event
 Inflow = 1.01 cfs @ 12.13 hrs, Volume= 3,337 cf
 Outflow = 0.97 cfs @ 12.16 hrs, Volume= 3,112 cf, Atten= 4%, Lag= 2.0 min
 Primary = 0.97 cfs @ 12.16 hrs, Volume= 3,112 cf
 Routed to Pond 3R : Pipe to Downstream Inlet

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.56' @ 12.17 hrs Surf.Area= 623 sf Storage= 510 cf

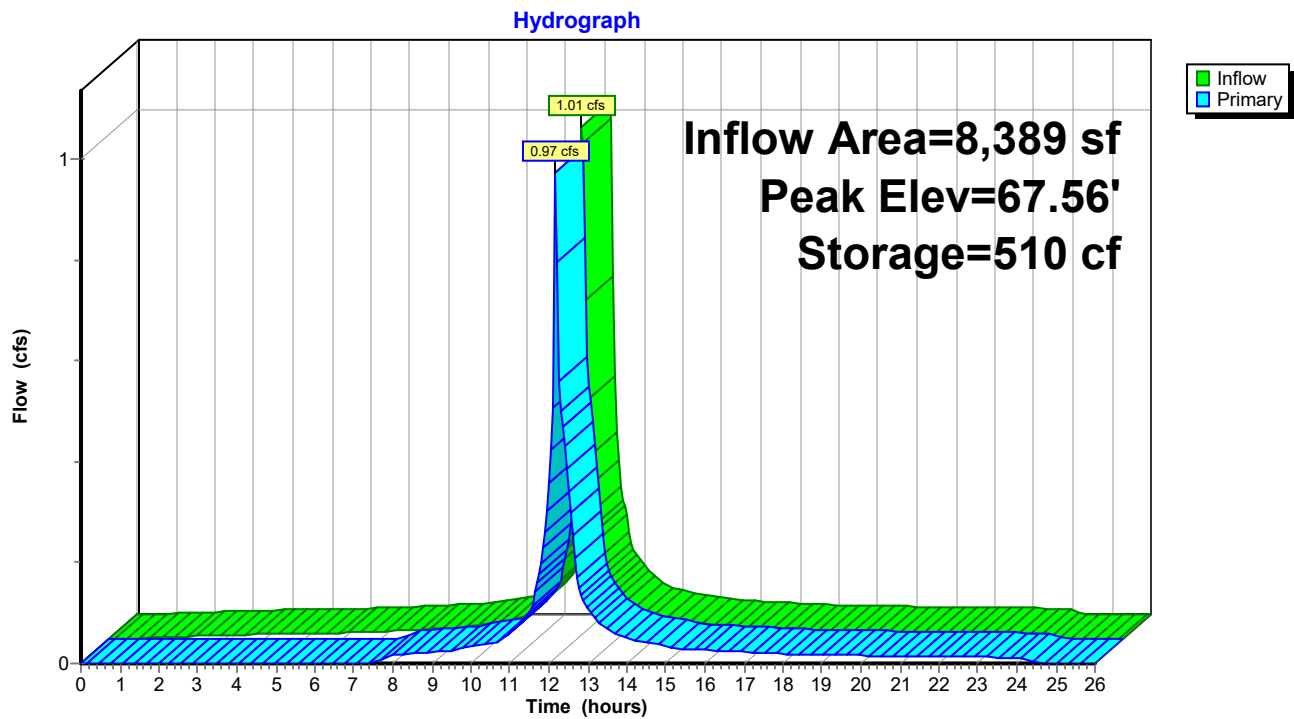
Plug-Flow detention time= 79.5 min calculated for 3,106 cf (93% of inflow)
 Center-of-Mass det. time= 41.5 min (804.2 - 762.7)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	825 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	100	0	0
66.50	200	75	75
67.00	400	150	225
67.50	600	250	475
68.00	800	350	825

Device	Routing	Invert	Outlet Devices
#1	Primary	64.30'	15.0" Round Culvert L= 16.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 64.30' / 64.20' S= 0.0062 ' S= 0.0062 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	67.00'	12.0" W x 2.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	67.50'	10.0' long Top Grate Overflow 0 End Contraction(s)

Primary OutFlow Max=0.91 cfs @ 12.16 hrs HW=67.55' (Free Discharge)

1=Culvert (Passes 0.91 cfs of 12.20 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.55 cfs @ 3.28 fps)
 3=Top Grate Overflow (Weir Controls 0.36 cfs @ 0.73 fps)

Pond 2P: Garden/Veg Strip

Summary for Pond 3R: Pipe to Downstream Inlet

Inflow Area = 20,000 sf, 51.30% Impervious, Inflow Depth = 4.03" for 25-Year Storm event
 Inflow = 2.06 cfs @ 12.15 hrs, Volume= 6,722 cf
 Outflow = 2.06 cfs @ 12.15 hrs, Volume= 6,722 cf, Atten= 0%, Lag= 0.0 min
 Primary = 2.06 cfs @ 12.15 hrs, Volume= 6,722 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

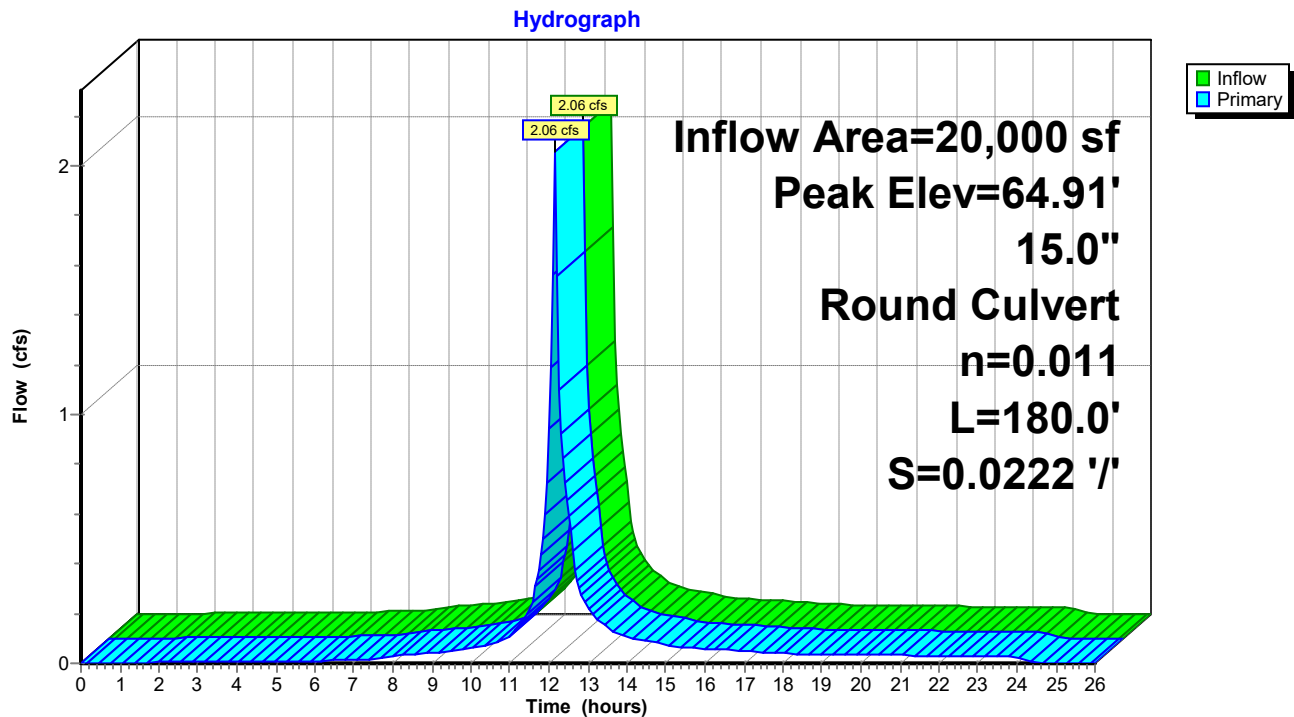
Peak Elev= 64.91' @ 12.15 hrs

Flood Elev= 67.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.20'	15.0" Round Culvert L= 180.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 64.20' / 60.20' S= 0.0222 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=2.06 cfs @ 12.15 hrs HW=64.91' (Free Discharge)

↑1=Culvert (Inlet Controls 2.06 cfs @ 2.87 fps)

Pond 3R: Pipe to Downstream Inlet

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NOAA 24-hr C 100-Year Storm Rainfall=8.52"

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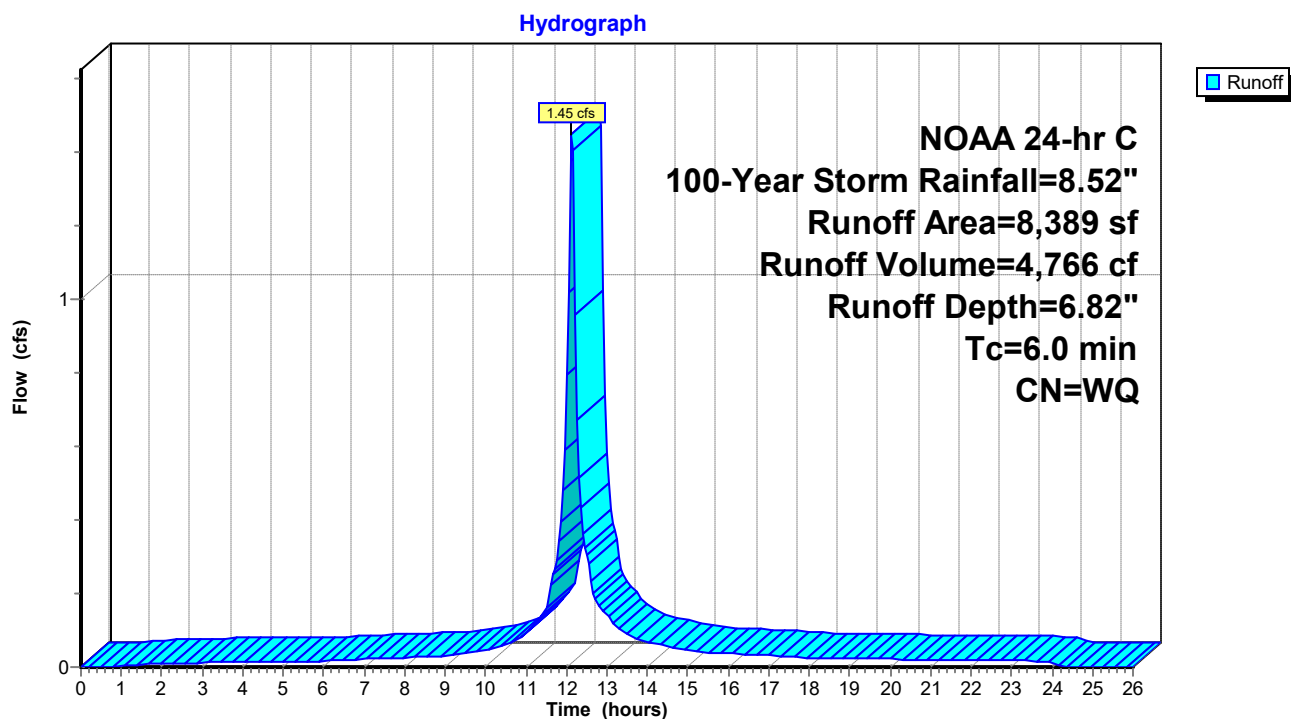
Summary for Subcatchment 2S: Captured Site to Garden/Veg Strip

Runoff = 1.45 cfs @ 12.13 hrs, Volume= 4,766 cf, Depth= 6.82"
Routed to Pond 2P : Garden/Veg Strip

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Storm Rainfall=8.52"

Area (sf)	CN	Description
2,766	61	>75% Grass cover, Good, HSG B
3,935	98	Paved parking, HSG B
1,688	98	Unconnected roofs, HSG B
8,389		Weighted Average
2,766	61	32.97% Pervious Area
5,623	98	67.03% Impervious Area
1,688		30.02% Unconnected

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

Subcatchment 2S: Captured Site to Garden/Veg Strip

414 WHP 022124 Analysis

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NOAA 24-hr C 100-Year Storm Rainfall=8.52"

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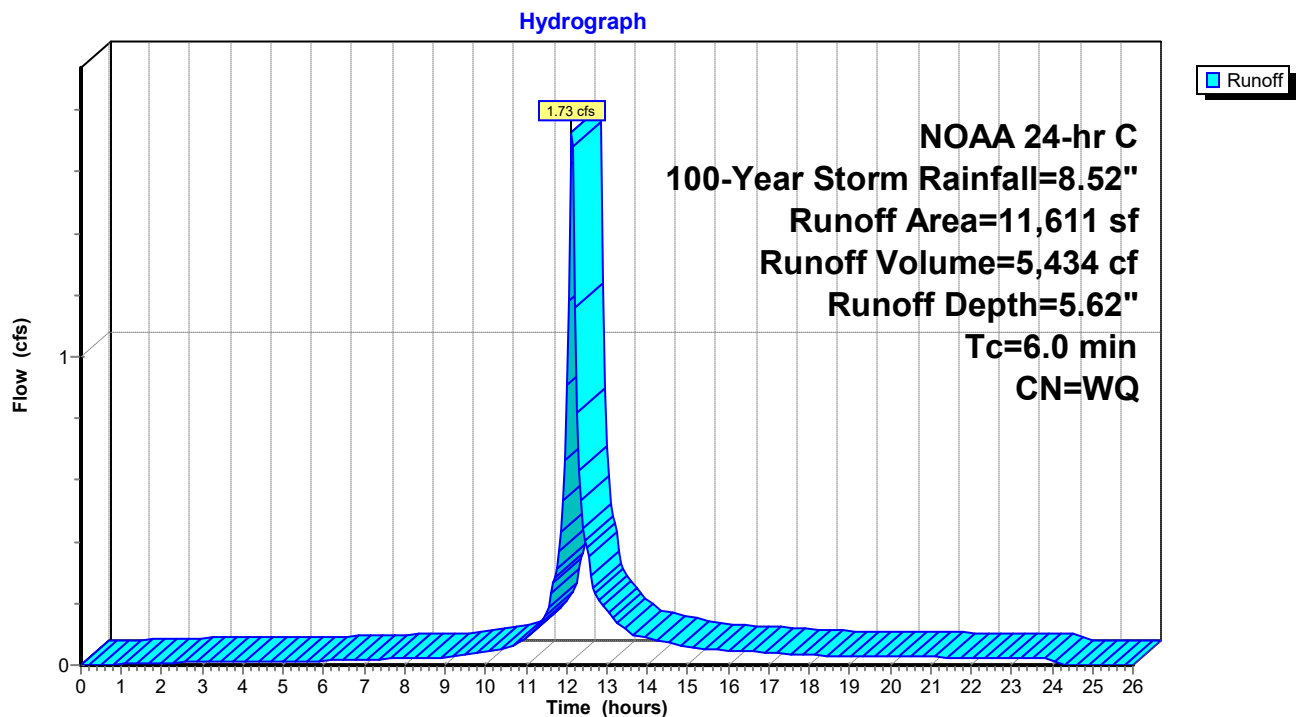
Summary for Subcatchment 4S: Uncaptured Site

Runoff = 1.73 cfs @ 12.13 hrs, Volume= 5,434 cf, Depth= 5.62"
Routed to Pond 3R : Pipe to Downstream Inlet

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-Year Storm Rainfall=8.52"

Area (sf)	CN	Description
6,975	61	>75% Grass cover, Good, HSG B
2,206	98	Paved parking, HSG B
2,430	98	Unconnected roofs, HSG B
11,611		Weighted Average
6,975	61	60.07% Pervious Area
4,636	98	39.93% Impervious Area
2,430		52.42% Unconnected

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

Subcatchment 4S: Uncaptured Site

Summary for Pond 2P: Garden/Veg Strip

Inflow Area = 8,389 sf, 67.03% Impervious, Inflow Depth = 6.82" for 100-Year Storm event
 Inflow = 1.45 cfs @ 12.13 hrs, Volume= 4,766 cf
 Outflow = 1.43 cfs @ 12.13 hrs, Volume= 4,541 cf, Atten= 2%, Lag= 0.4 min
 Primary = 1.43 cfs @ 12.13 hrs, Volume= 4,541 cf
 Routed to Pond 3R : Pipe to Downstream Inlet

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.59' @ 12.13 hrs Surf.Area= 635 sf Storage= 530 cf

Plug-Flow detention time= 61.4 min calculated for 4,533 cf (95% of inflow)
 Center-of-Mass det. time= 33.4 min (793.5 - 760.2)

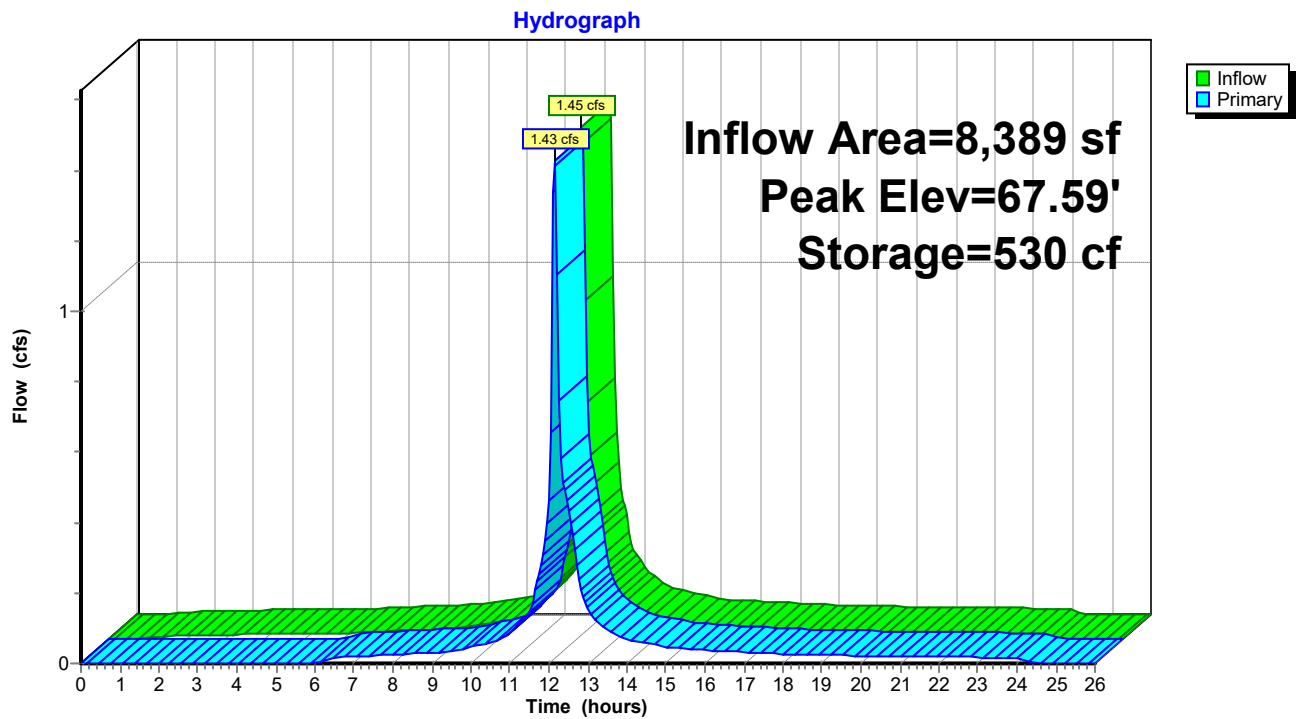
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	825 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	100	0	0
66.50	200	75	75
67.00	400	150	225
67.50	600	250	475
68.00	800	350	825

Device	Routing	Invert	Outlet Devices
#1	Primary	64.30'	15.0" Round Culvert L= 16.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 64.30' / 64.20' S= 0.0062 ' / Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Device 1	67.00'	12.0" W x 2.0" H Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	67.50'	10.0' long Top Grate Overflow 0 End Contraction(s)

Primary OutFlow Max=1.38 cfs @ 12.13 hrs HW=67.59' (Free Discharge)

- ↑ **1=Culvert** (Passes 1.38 cfs of 12.31 cfs potential flow)
- ↑ **2=Orifice/Grate** (Orifice Controls 0.57 cfs @ 3.41 fps)
- ↑ **3=Top Grate Overflow** (Weir Controls 0.82 cfs @ 0.96 fps)

Pond 2P: Garden/Veg Strip



Summary for Pond 3R: Pipe to Downstream Inlet

Inflow Area = 20,000 sf, 51.30% Impervious, Inflow Depth = 5.99" for 100-Year Storm event
 Inflow = 3.15 cfs @ 12.13 hrs, Volume= 9,975 cf
 Outflow = 3.15 cfs @ 12.13 hrs, Volume= 9,975 cf, Atten= 0%, Lag= 0.0 min
 Primary = 3.15 cfs @ 12.13 hrs, Volume= 9,975 cf

Routing by Stor-Ind method, Time Span= 0.00-26.00 hrs, dt= 0.05 hrs

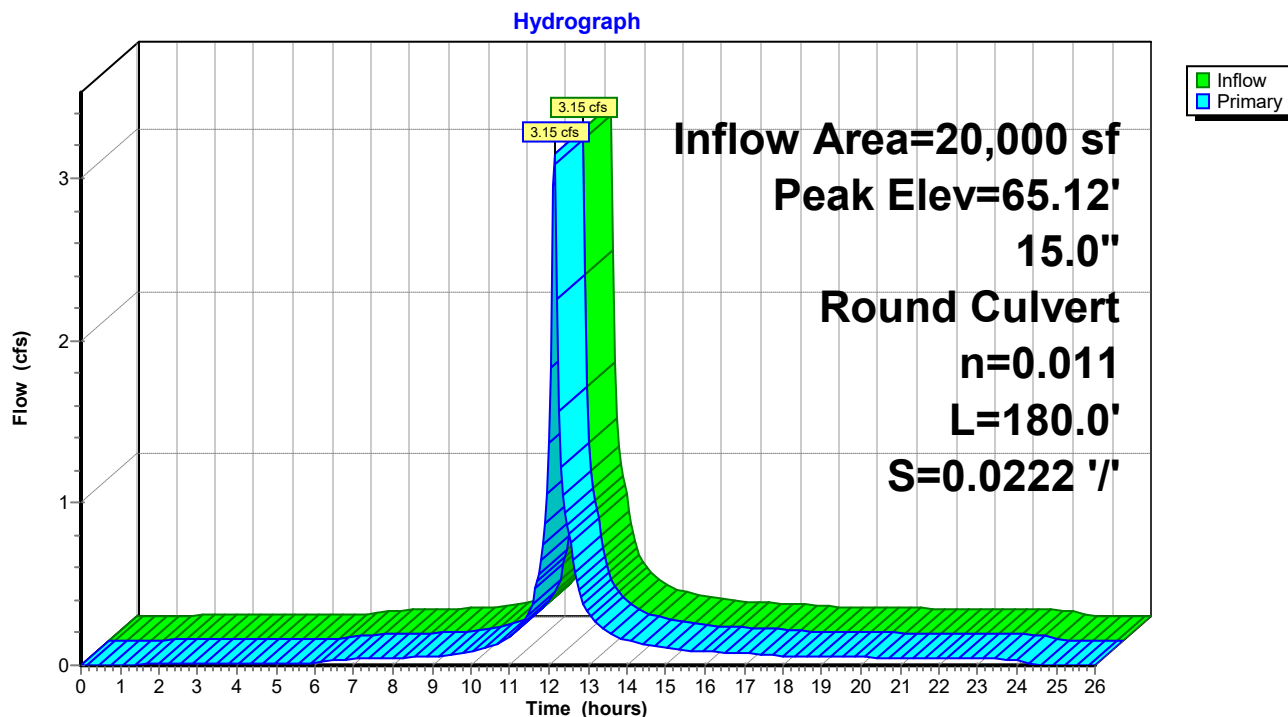
Peak Elev= 65.12' @ 12.13 hrs

Flood Elev= 67.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	64.20'	15.0" Round Culvert
			L= 180.0' RCP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 64.20' / 60.20' S= 0.0222 '/' Cc= 0.900
			n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf

Primary OutFlow Max=3.04 cfs @ 12.13 hrs HW=65.10' (Free Discharge)

↑1=Culvert (Inlet Controls 3.04 cfs @ 3.23 fps)

Pond 3R: Pipe to Downstream Inlet



Previous Pennoni
Stormwater Report (abbreviated)

irving design group, llc

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

TECHNICAL REPORT
STORMWATER MANAGEMENT REPORT
HADDON HEIGHTS APARMENT COMPLEX
414 WHITE HORSE PIKE
BLOCK 37, LOT 8
HADDON HEIGHTS
CAMDEN COUNTY, NEW JERSEY



Prepared For:

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Prepared By:

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T: 856-668-8600

A handwritten signature in blue ink, appearing to read 'J. Raday', with a long horizontal stroke extending to the right.

Joseph Raday, PE
New Jersey License No. 24GE043768

Proj. No. UNAV1701

REV. 8-30-18
March 2, 2017
May 10, 2017

STORMWATER SUMMARY

1.0 INTRODUCTION

UNA Voce (Applicant), is proposing to construct an apartment building located at the intersection of White Horse Pike (NJSH Rt. 30) and Haddon Street in the Borough of Haddon Heights, Camden County, New Jersey. The project entails the construction of a 2,698 sf apartment complex, 12 proposed parking spaces, lighting and landscaping.

This report has been prepared to accompany the preliminary/final minor site plan application for the project.

2.0 PROJECT DESCRIPTION

2.1 Existing Conditions

The project is in Haddon Heights, New Jersey, at the intersection of the White Horse Pike (NJSH Rt. 30) and Haddon Street. The property can be found on the United States Geological Survey (USGS) 7.5- minute topographic quadrangle for Camden and Runnemede, New Jersey. A copy of the USGS map is provided as Figure 1.

The subject property is located on a parcel identified as Block 81.05, Lot 1. A copy of the Tax map is provided as Figure 2.

The existing site generally consists of three (3) space paved parking area and an existing 2 ½ story home. The surface coverage consists of 0.10 acres of existing impervious surfaces and 0.36 acres of existing pervious surfaces. The "site" is defined as the tax map property boundaries. For existing condition runoff calculations, the "site" was analyzed as one Existing Drainage Area (EDA-1).

The stormwater from the site collectively drains towards an existing inlet and storm conveyance system located approximately 170' south on Haddon Street.

2.2 Proposed Conditions

The proposed project consists of an existing 2 ½ story home, 15-space parking area (total), a proposed 2,698 sf apartment building, lighting and landscaping. The proposed surface coverage consists of 0.26 acres of impervious surfaces and 0.20 acres of pervious surfaces. The proposed conditions will **not** increase impervious surface coverage by more than 0.25 acres. For proposed condition runoff calculations, the site was analyzed as one Proposed Drainage Area (PDA-1).

3.0 SOIL SURVEY INFORMATION

A review of soil information provided in the USDA Web Soil Survey Map Database Report for Camden County indicates that the soils on the subject property consist of Freehold-Downer-Urban Land complex (FrpB) (Figure 3).

4.0 DESIGN CRITERIA

The design of stormwater was performed in accordance with the New Jersey administrative code ("NJAC") chapter 7:8 stormwater requirements utilizing the New Jersey Department of Environmental Protection ("NJDEP") Best Management Practices ("BMP") Design Manual.

In New Jersey, projects resulting in over one (1) acre of land disturbance or 0.25 acres of new impervious surfaces are required to comply with the NJDEP's stormwater management rules at N.J.A.C. 7:8. The project is **not** considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres.

4.1 Groundwater Recharge

Pursuant to N.J.A.C. 7:8-5.4(a)2, the groundwater recharge standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The proposed project **will not** increase impervious surface coverage by more than 0.25 acres and will not disturb more than one (1) acre of land. Therefore, the groundwater recharge standards do not apply.

4.2 Stormwater Quantity

Pursuant to N.J.A.C. 7:8-5.4(a)3, the runoff quantity standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The proposed project **will not** increase impervious surface coverage by more than 0.25 acres and will not disturb more than one (1) acre of land. Therefore, the water quantity standards do not apply. However, a rain garden has been incorporated into the project design to capture roof runoff leaving the site (See table 1 Pre-Developed vs. Post-Developed Total Site Discharge Comparison). The rain garden will reduce the rate of runoff for the 100-year storm event.

4.3 Water Quality

The proposed project **will not** increase impervious surface coverage by more than 0.25 acres. Therefore, water quality treatment is not required pursuant to N.J.A.C. 7:8-5.5.

5.0 TECHNIQUES OF ANALYSIS

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.6, the quantity (volume and rate) of stormwater runoff for pre- and post-developed conditions is calculated based on the USDA NRCS methodology as described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June 1986.

Due to the area being mostly impervious, time of concentration (TC) was determined to be a minimum of 6 minutes.

Curve numbers (CN) for the drainage areas are based on the hydrologic soil group and land use. The developed area is made up of Freehold-Downer-Urban Land complex (FrpB), Type B soils, therefore CN's of 61 for lawn and landscaped areas, and 98 for impervious areas were utilized.

The impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the N.J. Best Management Practices Manual Chapter 5.

Using the drainage areas, the TCs and CNs as input data, the hydrologic/hydraulic software program Pondpack V8i by Bentley, was utilized to generate the runoff volumes and rates.

6.0 KEY HYDROLOGIC PRINCIPALS

A 24-hour, Type III storm distribution was utilized with the following rainfall amounts, within Camden County for each storm analyzed. The DelMarVa unit hydrograph was utilized in the calculations. NRCS 24 hr. design storm rainfall depths for New Jersey, as revised September 2004, are used in the calculation.

2 year	3.31 inches
10 year	5.06 inches
100 year	8.51 inches

7.0 PRE-DEVELOPED VS. POST-DEVELOPED RUNOFF COMPARISON

The proposed project will generate a minimal increase in the total runoff leaving the site for the 2, 10, 25 and 100-year storm events. Hydrographs generated for the pre- and post-developed drainage areas and are provided in Appendices A and B respectively. The results are detailed in Table 1 below. The pre- and post-developed drainage area boundaries are depicted on sheets CS9001 and CS9002 in Appendix D.

TABLE 1 – PRE-DEVELOPED VS. POST-DEVELOPED TOTAL SITE DISCHARGE COMPARISON

Storm Event	Pre-Developed Total Site Discharge (cfs)	Pre-Developed Total Site Runoff Volume (cf)	Post-Developed Total Site Discharge (cfs)	Post-Developed Total Site Runoff Volume (cf)	Runoff Increase From Pre-Developed (cfs)
2	0.34	1,742	0.44 0.57	2,178 2,786	+0.10 +0.23
10	0.77	3,572	0.83 1.05	3,964 4,944	+0.06 +0.28
25	1.09	4,966	1.53 1.40	7,100 6,477	+0.56 +0.31
100	1.81	8,015	1.73 2.14	9,017 9,772	-0.08 +0.33

The project will incorporate the use of a subsurface basin to store the volume difference between the pre-and post-developed 25-year storm event. Table 2 below summarizes the volume difference between the pre- and post-developed 25 year storm event.

TABLE 2 – PRE-DEVELOPED VS. POST-DEVELOPED 25-YEAR STORM RUNOFF VOLUME DIFFERENCE

Storm Event	Pre-Developed Total Site Runoff Volume (cf)	Post-Developed Total Site Runoff Volume (cf)	Volume Increase From Pre-Developed (cf)
25	4,966	7,100 6,477	2,134 1,511

The subsurface basin consists of ~~fourteen~~ ¹² (14) rows of 18" HDPE pipe, this will provide a storage volume of ~~2,170~~ ^{1,605} CF (excluding stone voids). See Appendix B for subsurface basin sizing worksheet.

8.0 STORM SEWER DESIGN

The runoff from the site drains to an existing stormwater inlet located approximately 170' south on within Haddon Street.

9.0 SOIL EROSION AND SEDIMENT CONTROL

The project will comply with the minimum design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules. Anticipated erosion control measures to be included in the Soil Erosion and Sediment Control Plan will likely include: minimizing the area of disturbance, placement of silt fencing around the limit of disturbance and a stabilized construction entrance (see Dwg. CS8001).

The project will be submitted to the Camden County Conservation District for certification of a Soil Erosion and Sediment Control Plan prior to commencement of construction.

10.0 CONCLUSION

As described above, the proposed project will generate a minimal increase in the total runoff leaving the site for the 2 and 10-year storm events and provide a reduction in the 100-year storm runoff rate. The project is not considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres. Therefore, the project is not required to address groundwater recharge, water quantity and water quality requirements of N.J.A.C. 7:8-5.4 and 7:8-5.5. The project has incorporated a subsurface basin to store the volume difference between the pre-and post-developed 25-year storm event.

PRE

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (hours)	Peak Flow (ft ³ /s)
EDA-1 perv	2 year	2	638.000	12.150	0.10
EDA-1 perv	10 year	10	1,832.000	12.150	0.41
EDA-1 perv	25year	25	2,791.000	12.150	0.65
EDA-1 perv	100 year	100	5,005.000	12.150	1.20
EDA-1 Imp	2 year	2	1,116.000	12.100	0.24
EDA-1 Imp	10 year	10	1,749.000	12.100	0.37
EDA-1 Imp	25year	25	2,161.000	12.100	0.46
EDA-1 Imp	100 year	100	2,998.000	12.100	0.63

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (hours)	Peak Flow (ft ³ /s)
POI-1	2 year	2	1,753.000	12.150	0.34
POI-1	10 year	10	3,580.000	12.150	0.77
POI-1	25year	25	4,952.000	12.150	1.09
POI-1	100 year	100	8,003.000	12.100	1.81

POST

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (hours)	Peak Flow (ft ³ /s)
PDA-1 perv	2 year	2	443.000	12.150	0.07
PDA-1 perv	10 year	10	1,272.000	12.150	0.28
PDA-1 perv	25 year	25	1,938.000	12.150	0.45
PDA-1 perv	100 year	100	3,476.000	12.150	0.83
PDA-1 Imp	2 year	2	1,227.000	12.100	0.27
PDA-1 Imp	10 year	10	1,923.000	12.100	0.41
PDA-1 Imp	25 year	25	2,377.000	12.100	0.50
PDA-1 Imp	100 year	100	3,298.000	12.100	0.69
proposed roof	2 year	2	1,116.000	12.100	0.24
proposed roof	10 year	10	1,749.000	12.100	0.37
proposed roof	25 year	25	2,161.000	12.100	0.46
proposed roof	100 year	100	2,998.000	12.100	0.63

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft ³)	Time to Peak (hours)	Peak Flow (ft ³ /s)
POI-1	2 year	2	2,786.000	12.100	0.57
POI-1	10 year	10	4,944.000	12.100	1.05
POI-1	25 year	25	6,477.000	12.100	1.40
POI-1	100 year	100	9,772.000	12.100	2.14



THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS
Version 7.9

Enter or Select values in the Yellow fields ONLY

UNITS	
Unit of Measure	Imperial (ft. in) Metric (mm, m)
Joint Type	Plan End ST
Design Storage Volume	2134 CF
Average Cover Height ⁴	1.50 FT

Project Name:	Haddon Heights Apartment Complex
Location (City, State):	Haddon Heights, New Jersey
Prepared For:	
Date Prepared:	
Engineer:	
Contractor:	
Regional Engineer:	
Area Sales Representative:	
Surface Application:	

HEADER		LATERALS		BACKFILL	
		Lateral Diameter (in)	Lateral Length (ft)	# of Sticks / Lateral	Approx. Length of End Stick
Header Diameter	18				
Number of Headers	2		82	5	4-ft
Perforate Headers?	Yes		0	0	0-ft
Include Header(s) in Storage Volume?	Yes		0	0	0-ft

Perforate Laterals? Yes ☐ No ☐

Stone Porosity? %
*Enter "0" to not include the backfill in the storage volume

Additional Stone Layer Allowing Storage (ASV)? in.

STORAGE VOLUME			APPROXIMATE SYSTEM SIZE			EXCAVATION			
Component	Stone (CF)	ASV (CF)	Width (FT)	Length (FT)	Pipe Diameter (IN)	Disturbed Surface Area (SYD)	Excavation ² (CYD)	Estimated Backfill ³ (CYD)	ASV (CYD)
Group 1	2,170	0	40	87	18	415	498	418	69
Group 2	0	0	0	0	18	0	0	0	0
Group 3	0	0	0	0	18	0	0	0	0
TOTALS	2,170	0	40	87	18	415	498	418	69

101.7% of the required storage

NOTES

- 1 - Full Stick: Assumed a standard lay length of 19'-8".
- 2 - Excavation: Based on manufacturer's recommended trench width and bedding depth. Estimated volumes assume a flat system based on the user-entered Average Cover Height.
- 3 - Backfill: Does not account for pipe corrugations - calculated for conservative quantities. Not for use with take-offs or ordering purposes.
- 4 - Cover Height: For traffic installations, 1-ft of minimum cover is required for diameters 12-36", 2-ft for 42-60". Maximum cover shall not exceed 8'-0" without consulting Applications Engineering.
- 5 - Bill of Materials: Does not differentiate between ST and WT fittings or between A and H profile connections. Determined on a project-specific basis.
- 6 - Quantities: Assumes all Groups are same diameter. Run separate calculations to determine quantities and costs for different Group diameters.

This Excel spreadsheet is provided for rough estimating purposes only. This tool is intended to assist the design engineer in sizing stormwater management systems using ADS pipe and manifold components. As with any calculation aid, this tool should be used for estimating only; the engineer must verify the assumptions and methods to ensure they satisfy the project and local design criteria.

STORMWATER RETENTION / DETENTION PIPE SYSTEM SIZING WORKSHEET

OLD DESIGN



THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS
Version 7.9

Enter or Select values in the Yellow fields ONLY

UNITS	
Unit of Measure	Imperial (ft, in) <input checked="" type="radio"/> Metric (mm, m)
SYSTEM	
Joint Type	Plain End ST <input checked="" type="radio"/>
Design Storage Volume	1511 CF
Average Cover Height ⁴	1.50 FT

STORMWATER RETENTION / DETENTION PIPE SYSTEM SIZING WORKSHEET

Project Name:	Haddon Heights Apartment Complex
Location (City, State):	Haddon Heights, NJ
Prepared For:	
Date Prepared:	8/30/2018
Engineer:	JR/BM
Contractor:	
Regional Engineer:	
Area Sales Representative:	
Surface Application:	

HEADER	LATERALS			BACKFILL		
	Lateral Diameter (in)	Lateral Length (ft)	Number of Laterals	# of Sticks / Lateral	Approx. Length of End Stick	A non-perforated system has been selected
Header Diameter	18	70	12	4	11.7-ft	
Number of Headers	2			0	0-ft	
Perforate Headers?	No			0	0-ft	
Include Header(s) in Storage Volume?	Yes		0			

Perforate Laterals? ☒ No ☐ Yes

STORAGE VOLUME			APPROXIMATE SYSTEM SIZE			EXCAVATION				
Product Volume (CF)	Stone (CF)	ASV (CF)	Total System (CF)	Width (FT)	Length (FT)	Pipe Diameter (IN)	Disturbed Surface Area (SYD)	Excavation ² (CYD)	Estimated Backfill ³ (CYD)	ASV (CYD)
Group 1	1,605	0	1,605	34	75	18	309	371	311	0
Group 2	0	0	0	0	0	18	0	0	0	0
Group 3	0	0	0	0	0	18	0	0	0	0
TOTALS	1,605	0	1,605.00				309	371	311	0

106.2% of the required storage

NOTES

- 1 - Full Stick: Assumed a standard lay length of 19'-8".
- 2 - Excavation: Based on manufacturer's recommended trench width and bedding depth. Estimated volumes assume a flat system based on the user-entered Average Cover Height.
- 3 - Backfill: Does not account for pipe corrugations - calculated for conservative quantities. Not for use with take-offs or ordering purposes.
- 4 - Cover Height: For traffic installations, 1-ft of minimum cover is required for diameters 12-36", 2-ft for 42-60". Maximum cover shall not exceed 8-ft without consulting Applications Engineering.
- 5 - Bill of Materials: Does not differentiate between ST and WT fittings or between A and H profile connections. Determined on a project-specific basis.
- 6 - Quantities: Assumes all Groups are same diameter. Run separate calculations to determine quantities and costs for different Group diameters.

This Excel spreadsheet is provided for rough estimating purposes only. This tool is intended to assist the design engineer in sizing stormwater management systems using ADS pipe and manifold components. As with any calculation aid, this tool should be used for estimating only; the engineer must verify the assumptions and methods to ensure they satisfy the project and local design criteria.



Soils Information

irving design group, llc

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

SOIL PERMEABILITY
STORMWATER BASIN SOIL BORING LOG
HADDON HEIGHTS APARMENT COMPLEX
414 WHITE HORSE PIKE
BLOCK 37, LOT 8
HADDON HEIGHTS
CAMDEN COUNTY, NEW JERSEY



Prepared For:

UNA VOCE
417 White Horse Pike
Suite E
Haddon Heights, New Jersey 08035

Prepared By:

RWD Consultants
A Division of Pennoni
2 Aquarium Drive, Suite 320
Camden, New Jersey 08103
T: 856-668-8600

A handwritten signature in blue ink, likely belonging to Joseph Raday, PE.

Joseph Raday, PE
New Jersey License No. 24GE043768

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2.0 PROJECT DESCRIPTION.....	1
2.1 EXISTING CONDITIONS.....	1
2.2 Proposed Conditions.....	1
2.3 Soil Survey Information	1
3.0 Site Visit Information.....	2
4.0 Conclusion / Findings	2

EXHIBITS

FIGURE 1 – SOIL MAP

FIGURE 2 - SOIL BORING LOG

FIGURE 3 – DOUBLE RING FIELD DATA SHEET

SOIL PERMEABILITY TEST SUMMARY

1.0 INTRODUCTION

UNA Voce (Applicant), is proposing to construct an apartment building located at the intersection of White Horse Pike (NJSH Rt. 30) and Haddon Street in the Borough of Haddon Heights, Camden County, New Jersey. The project entails the construction of a 2,698 sf apartment complex, 12 proposed parking spaces, lighting and landscaping.

This report has been prepared to accompany the preliminary/final minor site plan application for the project.

2.0 PROJECT DESCRIPTION

2.1 Existing Conditions

The project is in Haddon Heights, New Jersey, at the intersection of the White Horse Pike (NJSH Rt. 30) and Haddon Street. The subject property is located on a parcel identified as Block 81.05, Lot 1.

The existing site generally consists of three (3) space paved parking area and an existing 2 ½ story home. The surface coverage consists of 0.10 acres of existing impervious surfaces and 0.36 acres of existing pervious surfaces. The “site” is defined as the tax map property boundaries. For existing condition runoff calculations, the “site” was analyzed as one Existing Drainage Area (EDA-1).

The stormwater from the site collectively drains towards an existing inlet and storm conveyance system located approximately 170’ south on Haddon Street.

2.2 Proposed Conditions

The proposed project consists of an existing 2 ½ story home, 15-space parking area (total), a proposed 2,698 sf apartment building, lighting and landscaping. The proposed surface coverage consists of 0.26 acres of impervious surfaces and 0.20 acres of pervious surfaces. The proposed conditions will **not** increase impervious surface coverage by more than 0.25 acres. For proposed condition runoff calculations, the site was analyzed as one Proposed Drainage Area (PDA-1).

2.3 Soil Survey Information

A review of soil information provided in the USDA Web Soil Survey Map Database Report for Camden County indicates that the soils on the subject property consist of Freehold-Downer-Urban Land complex (FrpB) (Figure 1).

3.0 SITE VISIT INFORMATION

On November 16, 2017; Pennoni conducted one Test Pit (TP-1) onsite and tested soil permeability utilizing the Double Ring infiltrometer method (ASTM D 3385) field test. This test was completed by Josh Holderer of Pennoni. Soil Boring Log information was completed by Larissa Elder of Pennoni. The site did not show signs of previous soil disturbance in the area of testing. The weather was partly cloudy at the time of soil testing. Soil Permeability testing was conducted at approximately 6ft (72 inches).

4.0 CONCLUSION / FINDINGS

USDS Soil Maps showed the area of the subject property to contain Freehold-Downer-Urban Land complex (FrpB) soil type. This soil type is considered to be Well Drained. Soil Boring Logs from the site visit on November 16, 2017 by Pennoni show the soil to contain layers of mostly silty loam with some clay layers present. The Soil Boring Log is provided as Figure 2.

During the excavation, no water table or seasonal high water table was encountered. Most of the soil layers observed were dry or slightly damp.

Soil permeability testing resulted in an Infiltration Rate of 0.56cm/hr or 0.22in/hr. The Double Ring Field Data Sheet is provided in Figure 3.

Figure 1:

Soil Map

Soil Map—Camden County, New Jersey



Map Scale: 1:552 if printed on A landscape (11" x 8.5") sheet.

0 5 10 20 30 Meters

0 25 50 100 150 Feet

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




**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

2/8/2017
Page 1 of 3


MAP LEGEND


Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 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 1:12,000.

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: Camden County, New Jersey

Survey Area Data: Version 10, Sep 28, 2016

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

Date(s) aerial images were photographed: Jun 15, 2014—Jun 24, 2014

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

Camden County, New Jersey (NJ007)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FrpB	Freehold-Downer-Urban land complex, 0 to 5 percent slopes	0.5	100.0%
Totals for Area of Interest		0.5	100.0%

Figure 2:

Soil Boring Log

SOIL BORING LOG

Project Site:	Haddon Heights Apartment Complex				Date:	11-16-2017
Applicant/Owner:	UNA VOCE				County:	Camden County
Investigator(s):	Larissa Elder and Josh Holderer				State:	New Jersey
Do normal conditions exist on the site?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Community ID:	
Is the site significantly disturbed?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Transect ID:	TP-1
Is the area a potential Problem Area?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Plot ID:	B1
Remarks: Basin Soil Boring #1 Soil Sample taken at 72" (6ft) The soil boring was conducting in an area that currently was a maintained lawn area. The site did not appear to have been disturbed. No evidence of lower layer disturbance was found or anticipated.						

SOILS

Soil Series and Phase:	Freehold-Downer-Urban land (0 to 5 percent slopes) - FrpB					
Soil Drainage Class:	Well drained					
Taxonomy (Subgroup):						
Field Observations Confirm Mapped Type?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>		
Soil Series and Phase:						
Soil Drainage Class:						
Taxonomy (Subgroup):						
Field Observations Confirm Mapped Type?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
Soil Profile Description						
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Textures, Concretions, Structures, etc.	
0-12		Topsoil 10YR 4/2			Dark grayish brown / Dry	
12-36		10YR 7/6			Yellow/ Silty Loam / Dry	
36-48		10YR 7/2	10YR 6/4		Light Grey with slight light yellowish brown mottles/ Clay / Dry	
48-84		7.5YR 7/8			Redish Yellow/ Sandy Loam with some Medium Size Pebbles present / Dry	
84-108		10YR 5/3			Brown / Silty Clay / Slightly Damp	
108-144		GLE Y 2 3/5B			Very Dark Bluish Gray / Clay / Slightly Damp	
Field Observations						
Seasonal High Water Table (inches):			NEVER REACHED			
Depth to Free-Standing Water in Pit (inches):			NEVER REACHED			
Depth to Saturated Soil (inches):			NEVER REACHED			

Figure 3:

Double Ring Field Data Sheet

Project Identification: UNAV1701

Test Location: TP-1

Liquid Used: Mun. Water pH: ~ 7.0

Tested By: JWH

Depth to Water Table: Not Encountered

Constraints	Area (sq. cm)	Depth of Liquid (cm)	Liquid No.	Containers (cm ³ /cm)
Inner Ring	729.3	7.6	-	182.32
Annular Space	2,188	7.6	-	182.32

Liquid level maintained using: ☒ X Flow Valve; ☐ Float Valve; ☐ Mariotte Tube

Penetration of Rings: Inner 5.1 (cm); Outer 10.2 (cm)

Trial Number	Start/ End	Date	Time (hh:mm)	Elapsed Time Δ/(total) (mins)	Flow Readings				Liquid Temp °F	Incremental Infiltration Rate		Ground Temp = <u>61°F</u>
					Inner Ring		Annular Space			Inner (cm/hr)	Annular (cm/hr)	Depth of <u>6.0</u> ft
					Reading (cm)	Flow (cm ³)	Reading (cm)	Flow (cm ³)				Remarks: Weather, etc.
1	S	11/27/2017	10:43	15	30	117	30.0	117	57	0.64	0.21	Partly cloudy
	E	11/27/2017	10:58	(15)	29.36		29.4		57			
2	S	11/27/2017	10:58	15	29.36	117	29.4	117	57	0.64	0.21	
	E	11/27/2017	11:13	(30)	28.72		28.7		57			
3	S	11/27/2017	11:13	15	28.72	117	28.7	117	57	0.64	0.21	
	E	11/27/2017	11:28	(45)	28.08		28.1		57			
4	S	11/27/2017	11:28	15	28.08	117	28.1	117	57	0.64	0.21	
	E	11/27/2017	11:43	(60)	27.44		27.4		57			
5	S	11/27/2017	11:43	30	27.44	233	27.4	226	57	0.64	0.21	
	E	11/27/2017	12:13	(90)	26.16		26.2		57			
6	S	11/27/2017	12:13	30	26.16	233	26.2	226	57	0.64	0.21	
	E	11/27/2017	12:43	(120)	24.88		25.0		57			
7	S	11/27/2017	12:43	60	24.88	407	24.9	365	57	0.56	0.17	
	E	11/27/2017	13:43	(180)	22.65		22.9		57			
8	S	11/27/2017	13:43	60	22.65	407	22.9	361	57	0.56	0.17	
	E	11/27/2017	14:43	(240)	20.42		20.9		57			

Infiltration Rate

0.56 cm/hr or 0.22 in./hr



CTL

CERTIFIED TESTING LABORATORIES, INC.

CLIENT: Herman's Trucking
 181 Jacobstown-Cookstown Road
 Wrightstown, New Jersey 08562

DATE: 3/10/23

LAB NO.: B-807-23

PROJECT: Quality Control

REPORT NO.: AG-5

ON SAMPLE OF: Soil Material

SAMPLED BY: Client

RECEIVED: 2/23/23

Revised: 6/30/23

MARKED: Bioretention Soil

EXAMINED WITH THE FOLLOWING RESULTS:

1. Hydrometer Analysis (ASTM D422) with Grain Size Analysis

Sieve Size	% Passing		
3/4"	100	% Gravel:	7.9
3/8"	100	% Sand (2.00 to 0.050mm):	90.9
#4	96.8	% Silt (0.050 to 0.005 mm):	6.1
#10	92.1	% Clay (0.005 to smaller):	3.0
#40	52.6	% Fine:	17.3
#60	30.2	% Very Fine:	6.2
#100	19.6	% Fine & Very Fine:	23.5
#200	8.8		<25%
#270	8.4		

2. pH Value (ASTM D4972):	5.8	5.5-6.5
3. % Organics (ASTM D2974):	6.8	3.0-7.0
4. Soluble Salts:	2.10 ppm	≤ 500ppm

TK/Kd

Respectfully Submitted,
 Certified Testing Laboratories, Inc.

Terry Kifer
 Terry Kifer, General Manager

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 155 US Route 130 • Bordentown, NJ 08505 • Phone (609) 298-3255 • Fax (609) 298-7288

UNDERWOOD ENGINEERING COMPANY

1 KEYSTONE AVENUE, SUITE 300
CHERRY HILL, NJ 08003

856-933-1818

Fax 856-933-3123

Christopher T. Koss, P. E.

CLIENT: Una Voce
315 4th Avenue
Haddon Heights, NJ 08035

PROJECT: 8 Unit Apartments
414 White Horse Pike
Haddon Heights, NJ

REQUIREMENT: Professional Engineering Services

LOCATION: Locations Provided by Client

DATE: 1/7/2024

UE REF. NO.: 5198-20251-2 WO#24-0150

ATTENTION: Paul DeMartini email: demartini80@yahoo.com

PURPOSE

The purpose of this report is to present the findings of the continuous geotechnical soil boring and laboratory testing conducted at the 8 Unit Apartments project. The supplemental boring location was provided by the client.

INVESTIGATION

Geotechnical Boring – (TB-1) One continuous geotechnical boring was completed at the stormwater basin location on December 26th, 2023. The test boring was carried out to a depth of approximately eighteen feet below ground surface (BGS). All standard penetration testing (SPT) and split-barrel sampling of soils was performed in accordance with ASTM D-1586.

The soils encountered at the boring location TB-1 consisted generally of very soft loams underlain by medium dense sandy loams and stiff to very stiff loams.

Groundwater was not encountered in TB-1. There were no seasonal high water indicators observed in the borehole.

Samples of the soils recovered during drilling operations were sealed in glass jars and transported to the Underwood Soil Laboratory for Hydrometer and Sieve analysis per ASTM D-422, and will be stored for a period of no less than 30 days.

FINDINGS

The soils tested were identified by visual classification in the field and confirmed by laboratory analysis. The soils tested consisted of sandy loams and loams. The permeability class ratings ranged from K2, or 0.6 to 2 inches per hour, to K3, or 2 to 6 inches per hour. A table containing the test location, depth, soil classification and laboratory permeability class ratings are provided in the table below:

Results of permeability testing is contained in the table below:

Test #	Test Depth (ft.)	Soil Description & Texture	Permeability Class Rating
TB-1A	4-6	SANDY LOAM	K3 (2 – 6 in/hr)
TB-1B	6-8	LOAM	K2 (0.6 – 2.0 in/hr)
TB-1C	8-10	LOAM	K2 (0.6 – 2.0 in/hr)

*Depths taken below existing ground surface elevations at test pit locations.

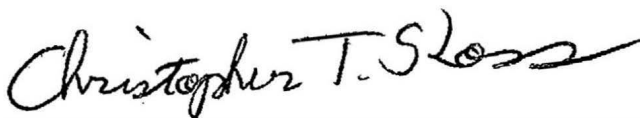
Note: It is anticipated that the field infiltration rates will be much slower than the laboratory rates due to the in place stiff consistency of the soils and the fine plus very fine sand contents (60-75%) of the soils.

QUALIFICATIONS

Findings are based on the above investigation. No other conclusions are to be drawn other than those specifically stated. This report does not reflect any variations, which may be encountered during construction. Underwood Engineering Company will not be responsible for variations in subsurface soils encountered in areas other than those tested.

Respectfully submitted,

UNDERWOOD ENGINEERING COMPANY



Christopher T. Koss, P.E.





Google Earth

Kings Run at Haddon Heights

414 White Horse Pike

White Horse Pike

Glading Hill Memorials

Nicholas J Cinquino Ac

TD Bank

Billows Electric Supply

Haddon St

Haddon St

CLIENT: Una Voce
PROJECT: 8 Unit Apartments
414 White Horse Pike
Haddon Heights, NJ

DATE: 12/26/2023

BORING No.: TB-1

UNDERWOOD ENGINEERING COMPANY

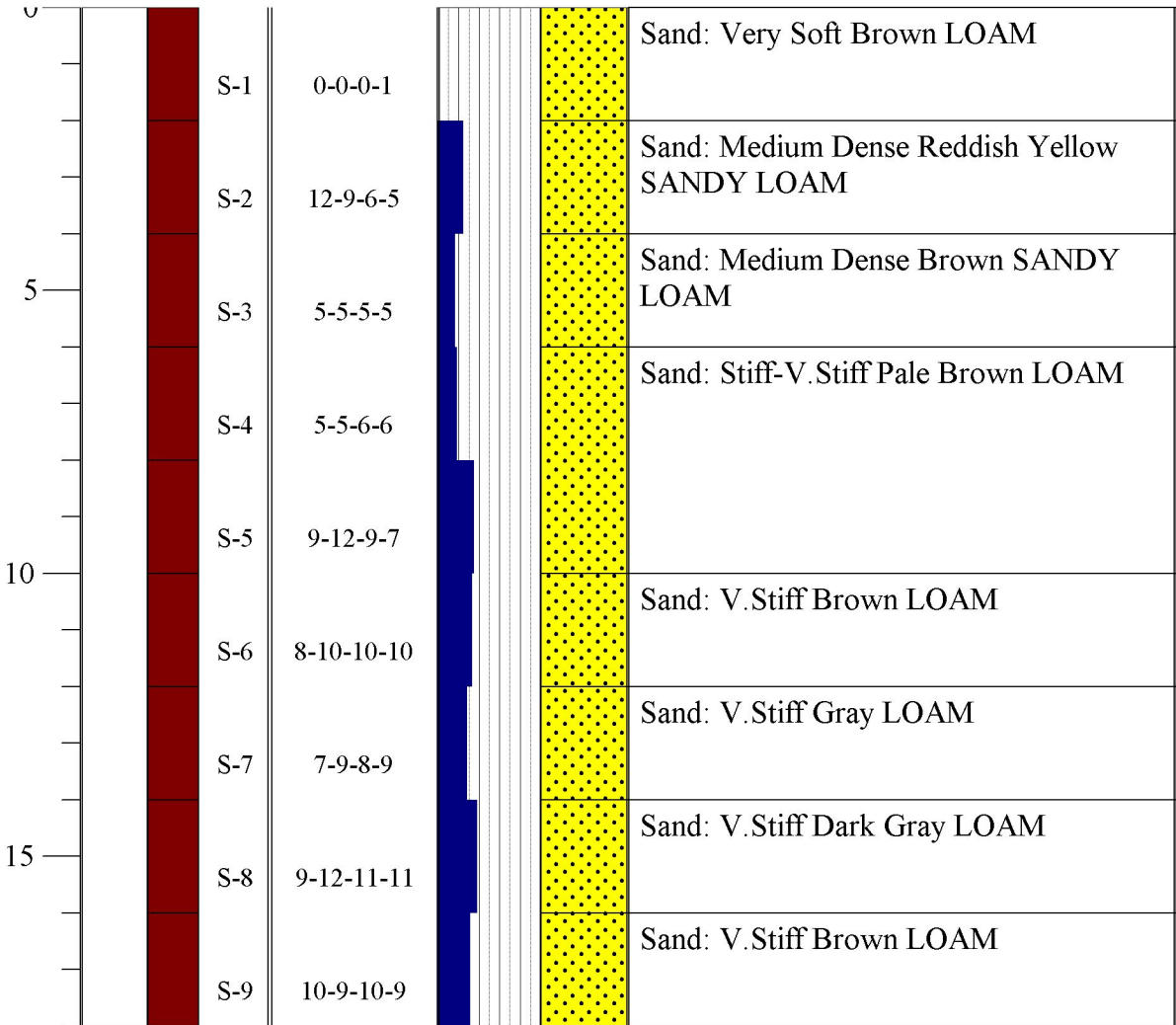
1 Keystone Avenue, Suite 300, Cherry Hill, NJ 08003
Ph.# 856.933.1818 Fx.# 856.933.3121
Christopher T. Koss, P.E.

GROUND SURFACE ELEVATION: NA

GROUNDWATER DATA	
DEPTH	Hours After Completion
NA	Groundwater Not Encountered

METHOD OF ADVANCING BORING	DEPTH (FT.)
CONTINUOUS SPLIT SPOON SAMPLE	0 to 18 ft
AUGERS	10 to 16 ft
2" O.D. SPLIT SPOON	16 to 18 ft

Depth (ft)	Groundwater	Sampling Interval	Sample #	Blows	N-Values	Lithology	Soil Description*	Notes:
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*FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.

Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Una Voce

Project: 8 Unit Apartments

Requirement: Hydrometer & Sieve Analysis

Date Performed: 1/3/2024

Location: TB-1 at 4ft to 6ft

Test Number: 1

Project No:

ASTM D-422 HYDROMETER AND SIEVE ANALYSIS

A. COARSE FRAGMENT CONTENT

Total dry sample wt. = 250.0 Wt. retained #10 sieve (2mm) = 6.4 % Coarse fragments = 2.6

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 97.4

Temperature = 70 °C

a = 1.0 based on specific gravity of soil particles = 2.65 from Table 1 of ASTM D-422

w, weight used for hydrometer analysis/percent passing #10 x 100 = 102.6

L, value of effective depth, Table 2 of ASTM D-422 = see table below

k, based on specific gravity of soil particle and temperature = 0.01217

Time, t (minutes)	Hydrometer reading, r	Percent in suspension, $P=100ra/w$	L (cm)	Soil particle diam.(mm), $D = k \sqrt{L/t}$
2	38	37.0	11.4	0.02906
5	35	34.1	11.4	0.01838
15	30	29.2	11.4	0.01061
30	27	26.3	11.9	0.00766
60	20	19.5	13.0	0.00566
250	19	18.5	13.2	0.00280
1440	15	14.6	13.8	0.00119

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 35.2 Wt retained #300 sieve (0.045mm) = 58.2

% Fine plus very fine sand = 60.5

D. SOIL MORPHOLOGY

Structure : Blocky

Consistence : Friable

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 58.2

%Silt = 25.3

%Clay = 16.5

Soil Texture: SANDY LOAM

Soil Permeability Class Rating: K3

Underwood Engineering Company

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(856) 933-1818 • Fax (215) 259-2372

Client: Una Voce

Project: 8 Unit Apartments

Requirement: Hydrometer & Sieve Analysis

Date Performed: 1/3/2024

Location: TB-1 at 6ft to 8ft

Test Number: 1

Project No:

ASTM D-422 HYDROMETER AND SIEVE ANALYSIS

A. COARSE FRAGMENT CONTENT

Total dry sample wt. = 250.0 Wt. retained #10 sieve (2mm) = 8.1 % Coarse fragments = 3.2

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 96.8

Temperature = 70 °C

a = 1.0 based on specific gravity of soil particles = 2.65 from Table 1 of ASTM D-422

w, weight used for hydrometer analysis/percent passing #10 x 100 = 103.3

L, value of effective depth, Table 2 of ASTM D-422 = see table below

k, based on specific gravity of soil particle and temperature = 0.01217

Time, t (minutes)	Hydrometer reading, r	Percent in suspension, $P=100ra/w$	L (cm)	Soil particle diam.(mm), $D = k \sqrt{L/t}$
2	48	46.5	11.4	0.02906
5	43	41.6	11.4	0.01838
15	32	31.0	11.4	0.01061
30	28	27.1	11.7	0.00760
60	20	19.4	13.0	0.00566
250	18	17.4	13.3	0.00281
1440	17	16.5	13.5	0.00118

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 8 Wt retained #300 sieve (0.045mm) = 48.1

% Fine plus very fine sand = 16.6

D. SOIL MORPHOLOGY

Structure : Subangular Blocky

Consistence : Friable

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 48.1

%Silt = 33.5

%Clay = 18.4

Soil Texture: LOAM

Soil Permeability Class Rating: K2

Underwood Engineering Company

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William R. Underwood, P.E., President

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Client: Una Voce

Project: 8 Unit Apartments

Requirement: Hydrometer & Sieve Analysis

Date Performed: 1/3/2024

Location: TB-1 at 8ft to 10ft

Test Number: 1

Project No:

ASTM D-422 HYDROMETER AND SIEVE ANALYSIS

A. COARSE FRAGMENT CONTENT

Total dry sample wt. = 250.0 Wt. retained #10 sieve (2mm) = 7.1 % Coarse fragments = 2.8

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 97.2

Temperature = 70 °C

a = 1.0 based on specific gravity of soil particles = 2.65 from Table 1 of ASTM D-422

w, weight used for hydrometer analysis/percent passing #10 x 100 = 102.9

L, value of effective depth, Table 2 of ASTM D-422 = see table below

k, based on specific gravity of soil particle and temperature = 0.01217

Time, t (minutes)	Hydrometer reading, r	Percent in suspension, $P=100ra/w$	L (cm)	Soil particle diam.(mm), $D = k \sqrt{L/t}$
2	42	40.8	11.4	0.02906
5	38	36.9	11.4	0.01838
15	34	33.0	11.4	0.01061
30	30	29.2	11.4	0.00750
60	25	24.3	12.2	0.00549
250	22	21.4	12.7	0.00274
1440	18	17.5	13.3	0.00117

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 36.5 Wt retained #300 sieve (0.045mm) = 48.9

% Fine plus very fine sand = 74.6

D. SOIL MORPHOLOGY

Structure : Subangular Blocky

Consistence : Friable

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 48.9

%Silt = 29.2

%Clay = 21.9

Soil Texture: LOAM

Soil Permeability Class Rating: K2