

STORMWATER MANAGEMENT REPORT

**PROPOSED SELF-STORAGE FACILITY
BLOCK 172.02, LOTS 8.01 & 8.03
955 PLEASANT VALLEY WAY (COUNTY ROUTE 636)
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NEW JERSEY**

PREPARED FOR:

955 PLEASANT VALLEY WAY, LLC

PREPARED BY:

STONEFIELD ENGINEERING & DESIGN, LLC

LAST REVISED: MAY 7, 2021

T-19153

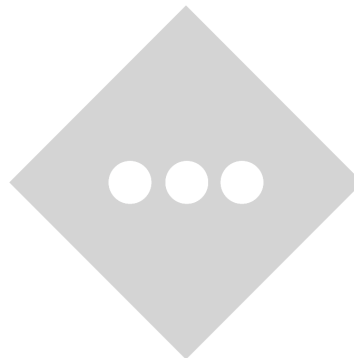


PROJECT ENGINEER PE, PP, CME, LEED AP
NEW JERSEY PROFESSIONAL ENGINEER LICENSE # 47290



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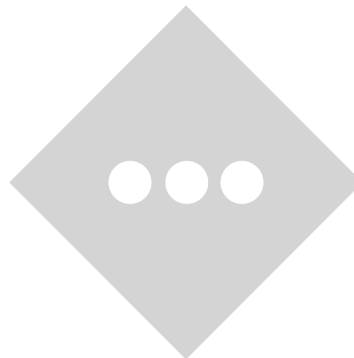
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1.0 PROJECT DESCRIPTION

955 Pleasant Valley Way, LLC is proposing the construction of a two-story self-storage facility with two cellars and a building footprint of 18,585 SF with 745 SF dedicated to office operations. Additional improvements include parking facilities, landscaping, utility services, site lighting, and a stormwater conveyance system. The subject property is designated Block 172.02, Lots 8.01 & 8.03, commonly known as 955 Pleasant Valley Way (County Route 636), West Orange, New Jersey (herein referred to as the “project site”).

The property is within the General Business Zone (B-2). The proposed development has single-family residential uses to the north, east, and southeast with commercial uses to the southwest and west. The site will be accessed via one right-only ingress and one right-only egress along Pleasant Valley Way (County Route 636).

The total project area is 70,131 SF (1.61 acres), the total area of new impervious surfaces is 4,057 SF (0.09 acres), and the total area of disturbance is 59,141 SF (1.36 acres). Project Figures can be found in Appendix A of this Report.

This Stormwater Management Report has been prepared to analyze the potential stormwater runoff impacts of the proposed project and discuss the measures proposed to conform to the stormwater management requirements set forth by the Township of West Orange, the Hudson – Essex – Passaic Soil Conservation District, the New Jersey Administrative Code (NJAC), and the New Jersey Department of Environmental Protection (NJDEP).

2.0 EXISTING CONDITIONS

The project site is currently developed with one (1) one-story block retail building and a vacant area that was originally developed with one-story block building that has since been demolished. Access to the vacant lot is provided via three full-movement driveways along Pleasant Valley Way (County Route 636) while access to the retail building is provided via one full-movement driveway along Pleasant Valley Way (County Route 636). There are single-family residences to the north, west, and northwest of the site as well as a one-story retail building to the southwest and a one-story office building to the southeast.

2.1 EXISTING DRAINAGE AREAS

Under existing conditions, the site is comprised of one (1) drainage area, and therefore, one (1) *Point of Interest* (POI). The POI discharges to the County stormwater conveyance system within Pleasant Valley Way (County Route 636). The lowest points of the site are toward the middle adjacent to the stormwater inlets within Pleasant Valley Way (County Route 636), and therefore, the northern and southern portions of the site slope toward the center. The existing areas to the west are steeply sloped with an average grade of 78% while the eastern portion is flatter with slopes averaging around 3.0%.

TABLE 1: EXISTING DRAINAGE AREAS

Drainage Area	Description	Area Extents (SF)	Impervious Area (SF)	Time of Concentration (Min)
E-1	Existing Drainage to Pleasant Valley Way	43,370	27,163	6.0*

* The minimum time of concentration was utilized. Refer to Section 4.0 for more information regarding design parameters.

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

2.2 PROJECT SOILS

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

TABLE 2: NRCS PROJECT SOILS

Soil Unit Code	Soil Description	Approximate Project Coverage	Hydrologic Soil Group
DuuB	Dunellen – Urban Land Dunellen Substratum Complex, 0% to 8% slopes	100%	A

The hydrologic soil group classifications above have been utilized in the landcover data for the stormwater analysis performed on the project. Overall, the soil drains well, and any remaining runoff flows overland directly to respective discharge points.

3.0 PROPOSED CONDITIONS

The one (1) single-story block building will be demolished along with all surrounding site features, including the vacant pavement that was previously developed. Proposed improvements include a two-story self-storage facility with two cellars and a building footprint of 18,585 SF with 745 SF dedicated to office operations. The proposed development includes the construction of associated parking, utilities, landscaping, lighting, and stormwater management facilities. The building is collected via roof leaders and sent to an underground detention basin consisting of twelve (12) StormTrap SingleTrap stormwater detention vaults, each with an internal height of 42". The back of the site is collected via a 6' riprap swale along the back of the building (DS-2) that is sent to another 6' riprap swale along the right side of the building (DS-3). The remainder of the back of the site is collected via a 6' riprap swale along the left side of the building (DS-1). All stormwater conveyed within the riprap swales is collected via catch basins and routed to the catch basins within Pleasant Valley Way (County Route 636) via one 12" solid HDPE pipe and one 15" solid HDPE pipe. The drainage toward the front of the building sheet flows overland to Pleasant Valley Way (County Route 636) where it is collected via existing catch basins and discharged into the County stormwater conveyance system.

3.1 PROPOSED DRAINAGE AREAS

Under proposed conditions the site is comprised of one drainage area which discharges into the County stormwater conveyance system within Pleasant Valley Way (County Route 636). The drainage area consists of two sub-areas with the roof being collected and sent to the underground detention basin (P-1A) and the remainder of the site discharging directly into the County stormwater conveyance system (P-1B) within Pleasant Valley Way (County Route 636).

TABLE 3: PROPOSED DRAINAGE AREAS

Drainage Area	Description	Area Extents (SF)	Impervious Area (SF)	Time of Concentration (Min)
P-1A	Proposed Roof Drainage	24,065	24,065	6.0*
P-1B	Proposed Direct Drainage to Pleasant Valley Way	19,305	7,094	6.0*

* The minimum time of concentration was utilized. Refer to Section 4.0 for more information regarding design parameters.

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

4.0 ANALYSIS METHODOLOGY & DESIGN PARAMETERS

4.1 HYDROLOGIC & HYDRAULIC ANALYSES

The existing and proposed drainage areas have been analyzed utilizing a modified version of the NRCS SCS TR-20 method. The analysis program “HydroCAD” Version 9.10 by HydroCAD Software Solutions LLC was used to calculate and plot the runoff hydrographs. The program incorporates the time of concentration, CN values, 24-hour rainfall events, and project drainage areas to calculate the runoff characteristics. Key variables utilized include the SCS Unit Hydrograph, a minimum time of concentration of 6 minutes, separate runoff calculations for impervious and pervious areas, and dynamic storage and conveyance routing to account for any variable tailwater conditions.

4.2 NEW JERSEY STORMWATER DESIGN PARAMETERS

The project is proposing to disturb 1.36 acres of land. Per the applicable stormwater standards, the project is classified as a Major Development and is subject to stormwater quantity and groundwater recharge regulations. The subject property is located within an Urban Redevelopment Area defined by the NJDEP as the Metropolitan Planning Area (PA-I), therefore per NJAC 7:8-5.4 and the City Ordinances, groundwater recharge requirements do not apply. Additionally, the project will add 0.09 acres of new impervious areas and will thus not be subject to stormwater quality regulations.

TABLE 4: PROJECT STORMWATER DESIGN INTENT SUMMARY TABLE

Design Parameters	Design Intent for Compliance
Stormwater Quantity	Design stormwater management measures so that the post-construction peak runoff rates for the 2, 10, and 100-year storm events are 50%, 75%, and 80%, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post- construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed.
Groundwater Recharge	This project is exempt from groundwater recharge requirements as the project site is located within State Planning Area PA-I (Metropolitan).
Stormwater Quality	This project is exempt from stormwater quality requirements as the project site increases the impervious area on site by less than ¼ acres.

4.3 SUBSURFACE STORMWATER INVESTIGATION

A subsurface stormwater investigation was conducted by Underwood Engineering Company on March 24, 2020. A total of eight tests were performed in compliance with the soil testing standards outlined within Appendix E of the NJDEP Best Management Practices (BMP) Manual. All proposed stormwater facilities meet or exceed the minimum separation depth from seasonal high groundwater. The full investigation report and testing results can be found in **Appendix D** of this Report.

5.0 PROJECT ANALYSIS RESULTS

5.1 STORMWATER QUANTITY CONTROL

Runoff is controlled through the implementation of twelve (12) StormTrap SingleTrap stormwater detention vaults. To analyze runoff quantities between the existing and proposed drainage areas, one point of interest was selected. The following tables summarize the results for the 2-year, 10-year, 25-year, and 100-year storm events for each project point of interest:

TABLE 5: PEAK DISCHARGE TO PLEASANT VALLEY WAY

Storm Event	Pre-Development Peak Discharge	Reduction Required	Post-Development Peak Discharge	Reduction Achieved
2-Year	2.03 CFS	50.0%	1.00 CFS	50.7%
10-Year	3.10 CFS	25.0%	1.96 CFS	36.8%
25-Year	3.83 CFS	-	2.70 CFS	29.5%
100-Year	5.18 CFS	20.0%	3.92 CFS	24.3%

As shown in the tables above, peak stormwater discharge rates are reduced by at least the required amount for each storm event. Project hydrographs and more detailed data can be found in **Appendix C** of this Report.

5.2 GROUNDWATER RECHARGE

As indicated in the City Ordinance and NJAC 7:8-5.4, the project site is exempt from groundwater recharge requirements as the site is located within the Metropolitan Planning Area (PA-I) per the State Plan Policy Map and thus qualifies as an Urban Redevelopment Area (which is exempt from groundwater recharge requirements).

5.3 STORMWATER QUALITY CONTROL

As indicated in the City Ordinance and NJAC 7:8-5.5, the project site is exempt from stormwater quality control requirements as the site increases impervious coverage by less than one-quarter acre on the proposed project site.

5.4 SOIL EROSION & SEDIMENT CONTROL

A Soil Erosion & Sediment Control Plan has been prepared in accordance with the latest edition of the Standards for Soil Erosion and Sediment Control in New Jersey. This plan can be found within the Preliminary & Final Major Site Plans prepared by Stonefield Engineering & Design in conjunction with this report. Proposed temporary measures during construction include silt fencing, stabilized construction entrances, inlet filters, and cover for soil stabilization. Permanent post-construction measures include rip-rap lined swales. No land disturbance will occur until a permit has been obtained from the Hudson – Essex – Passaic Soil Conservation District and the New Jersey Department of Environmental Protection (NJDEP).

5.5 PERMANENT DIVERSION SWALES

The proposed post-construction measures consist of permanent diversion swales located along the northern (DS-3), southern (DS-1), and western (DS-2) lengths of the proposed building. The proposed permanent diversion swales have been designed to safely convey the 25-year (24-hour) storm event with a minimum of four inches of freeboard in accordance with the NJ SESC Manual. Proposed swales DS-1 and DS-3 will be lined with 3" of stone and proposed swale DS-2, which will convey a majority of the discharge through the site, will be lined with 12" of stone. The proposed swale velocities are well within the permissible velocity requirements outlined within the NJ SESC Manual. The below table provides a summary of the key parameters. Detailed information regarding the proposed swale design can be found in **Appendix F** of this report.

TABLE 6: PERMANENT DIVERSION SWALES

Diversion Number	Tributary Drainage Area	Approximate Location	Discharge Point	Lining (Cover)
DS-1	2,345 SF	Southern side of proposed building	D-202	Riprap
DS-2	79,999 SF	Western side of proposed building	DS-3	Riprap
DS-3	136 SF	Northern side of proposed building	D-103	Riprap

5.6 STORMWATER OPERATIONS & MAINTENANCE

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

6.0 CONCLUSIONS

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

APPENDIX A

PROJECT FIGURES

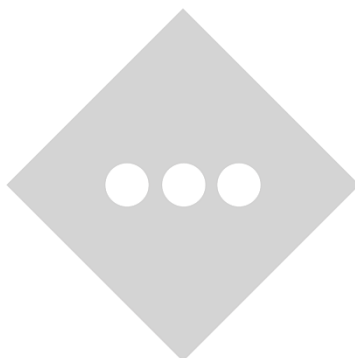
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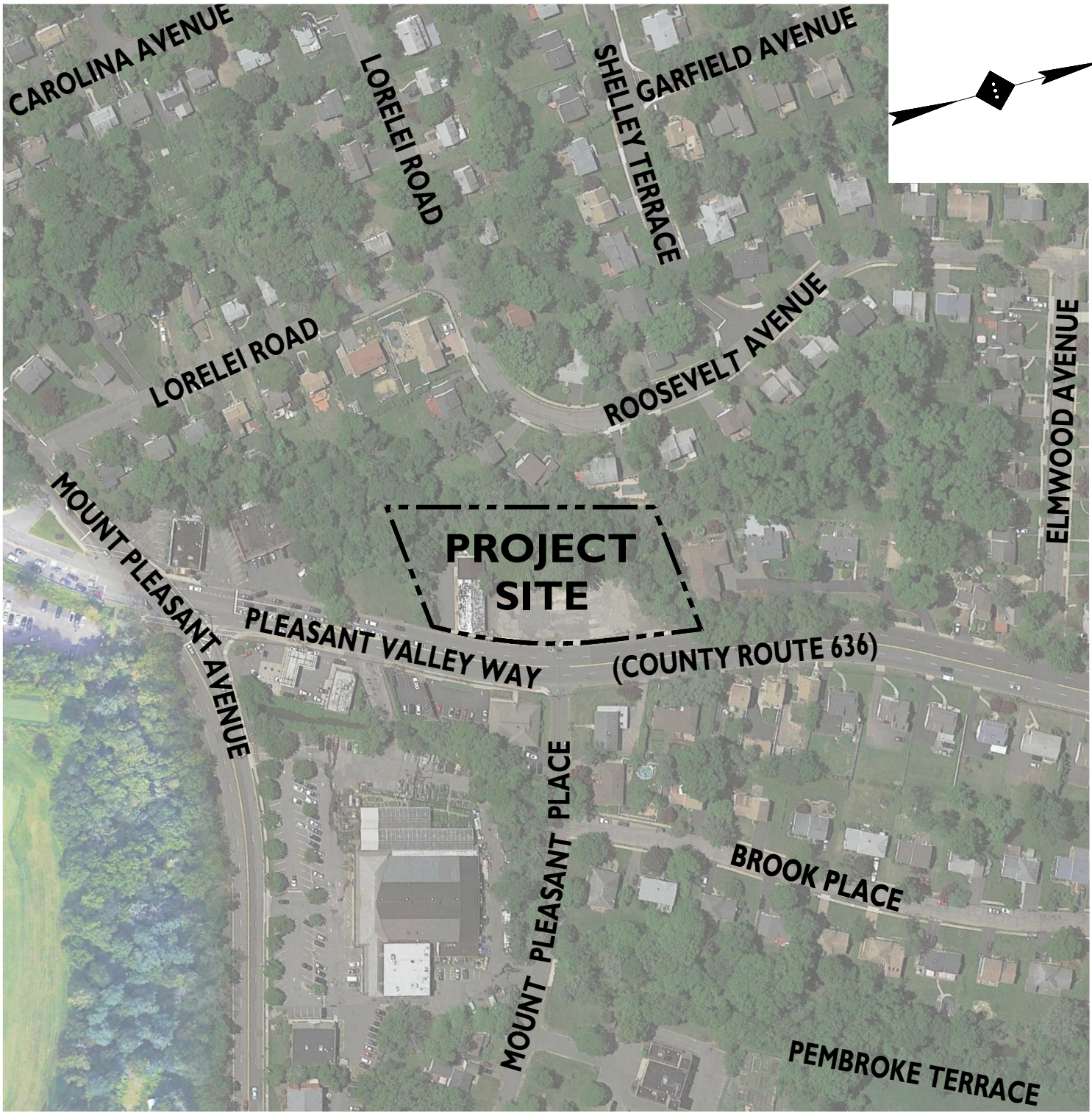
USGS LOCATION MAP

TAX MAP

AERIAL MAP

FEMA MAP





GRAPHIC SCALE IN FEET
1" = 200'

AERIAL MAP

SOURCE: GOOGLE EARTH PRO IMAGERY, DATE RETRIEVED 05/23/2018

SOLOMON BUILDERS PROPOSED SELF-STORAGE FACILITY

BLOCK 172.02, LOT 8.01 & 8.03
955 PLEASANT VALLEY WAY
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NJ

DRAWN BY:	RO
CHECKED BY:	JHK
DATE:	04/13/2020
SCALE:	1" = 200'
PROJECT ID:	T-19153

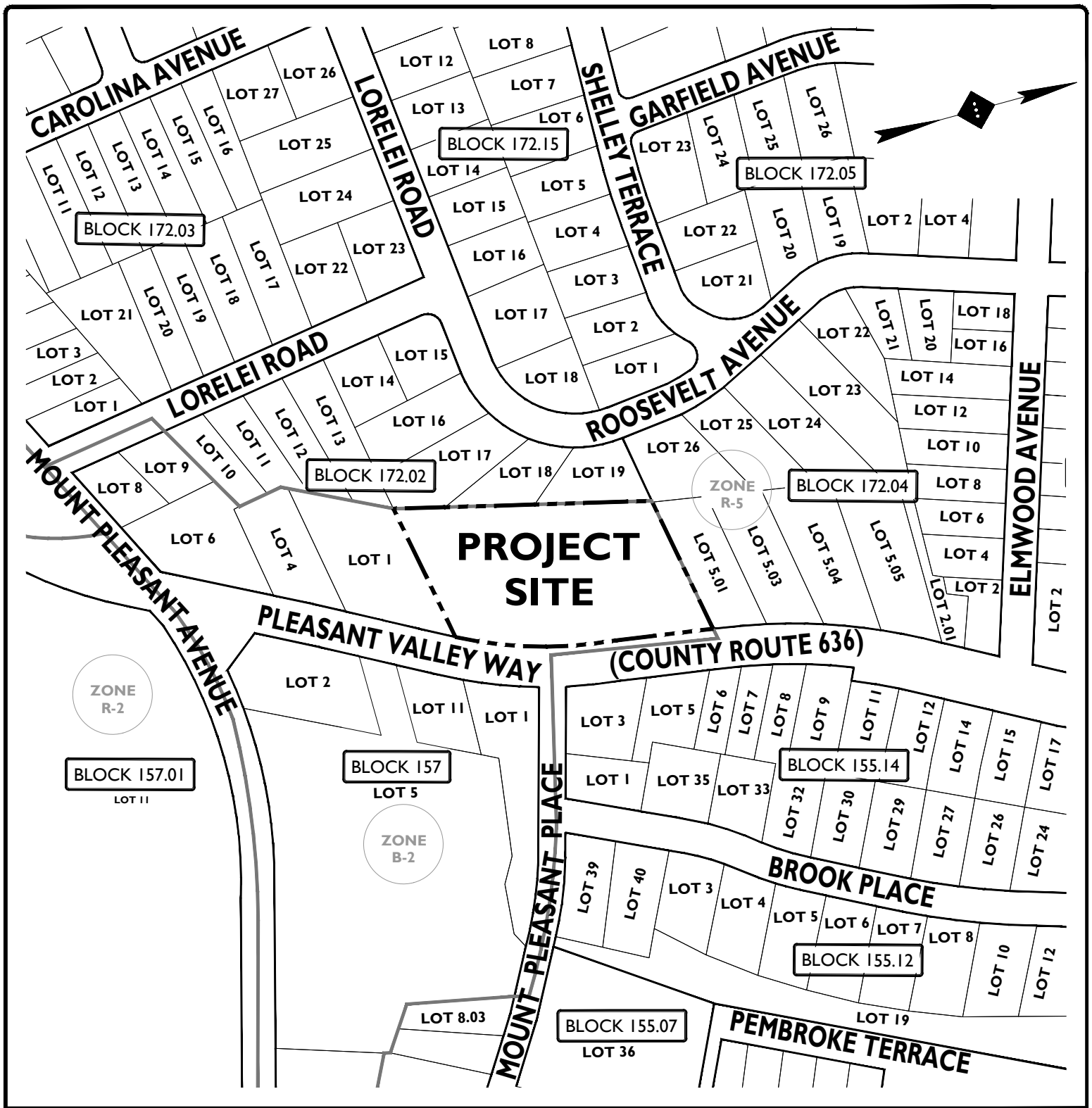


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engineering & design

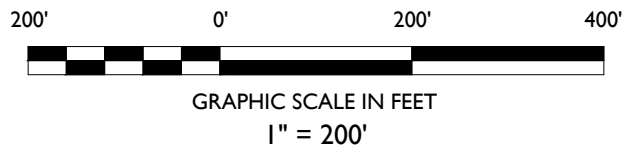
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Headquarters: 92 Park Avenue, Rutherford, NJ 07070
Phone 201.340.4468 · Fax 201.340.4472

T:\2019\T-19153 Solomon Builders - 955 Pleasant Valley Way, West Orange, NJ\CADD\Exhibits\2020-04-13, Project Map.dwg



TAX & ZONING MAP



SOURCE: TOWNSHIP OF WEST ORANGE TAX MAPS, SHEETS 87, 90, 116, & 117 DATED JUNE 2011 AND TOWNSHIP OF WEST ORANGE ZONING MAP DATED NOVEMBER 2006

SOLOMON BUILDERS PROPOSED SELF-STORAGE FACILITY

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955 PLEASANT VALLEY WAY
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NJ

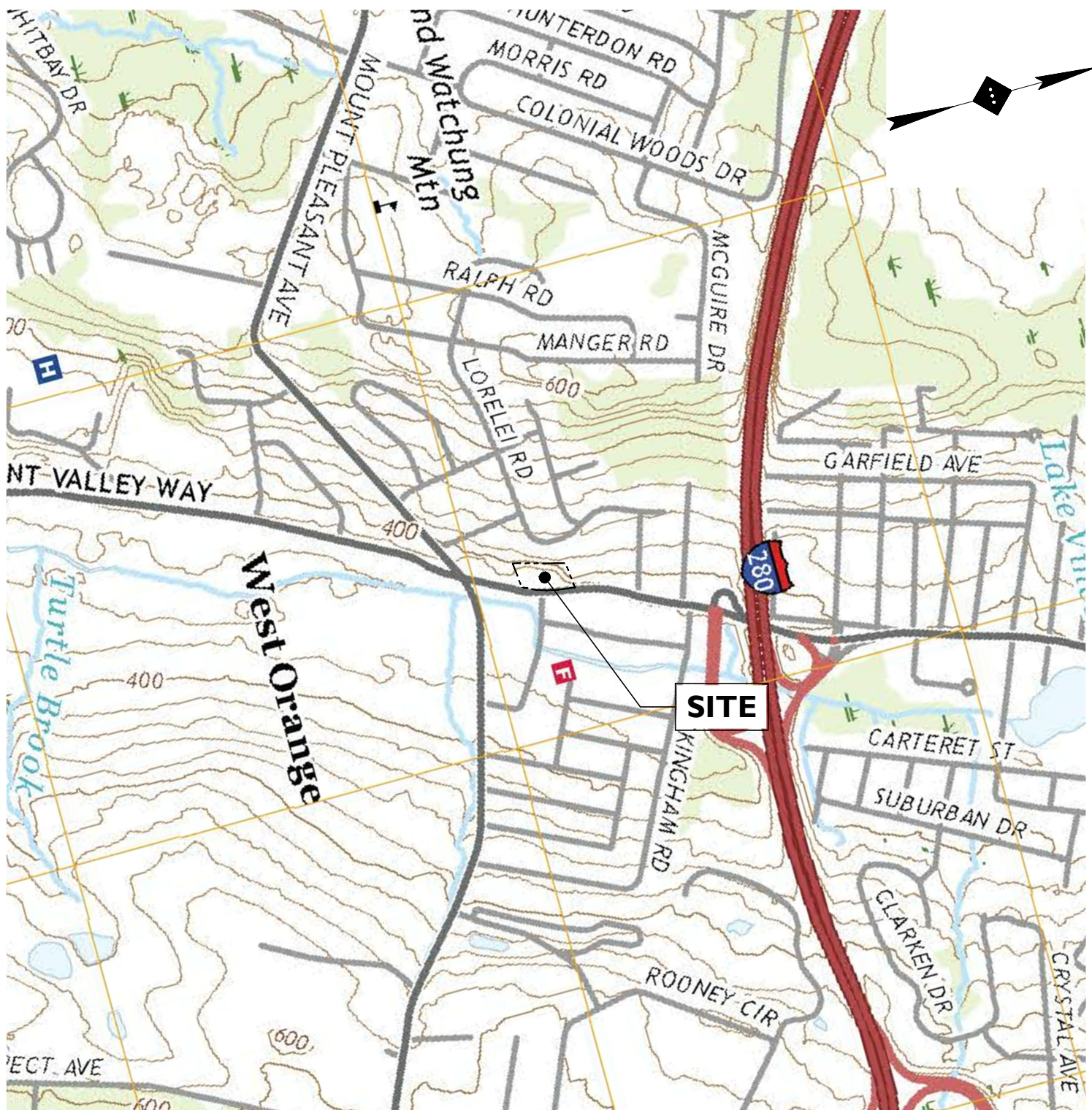
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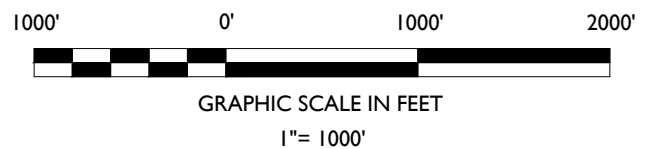
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USGS QUADRANGLE MAP



SOURCE: USGS QUADRANGLE MAP 7.5 MINUTE SERIES, CALDWELL, NJ, DATED 2019

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ESSEX COUNTY, NJ

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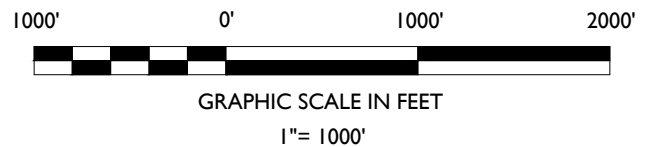
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FEMA EFFECTIVE MAP



SOURCE: FEMA FLOOD INSURANCE MAP #34013C0092F & #34013C0091F, DATED 06/04/2007

SOLOMON BUILDERS PROPOSED SELF-STORAGE FACILITY

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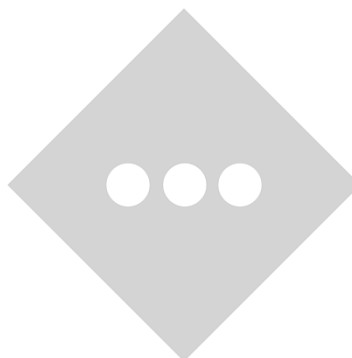


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APPENDIX B

NRCS COUNTY SOIL SURVEY





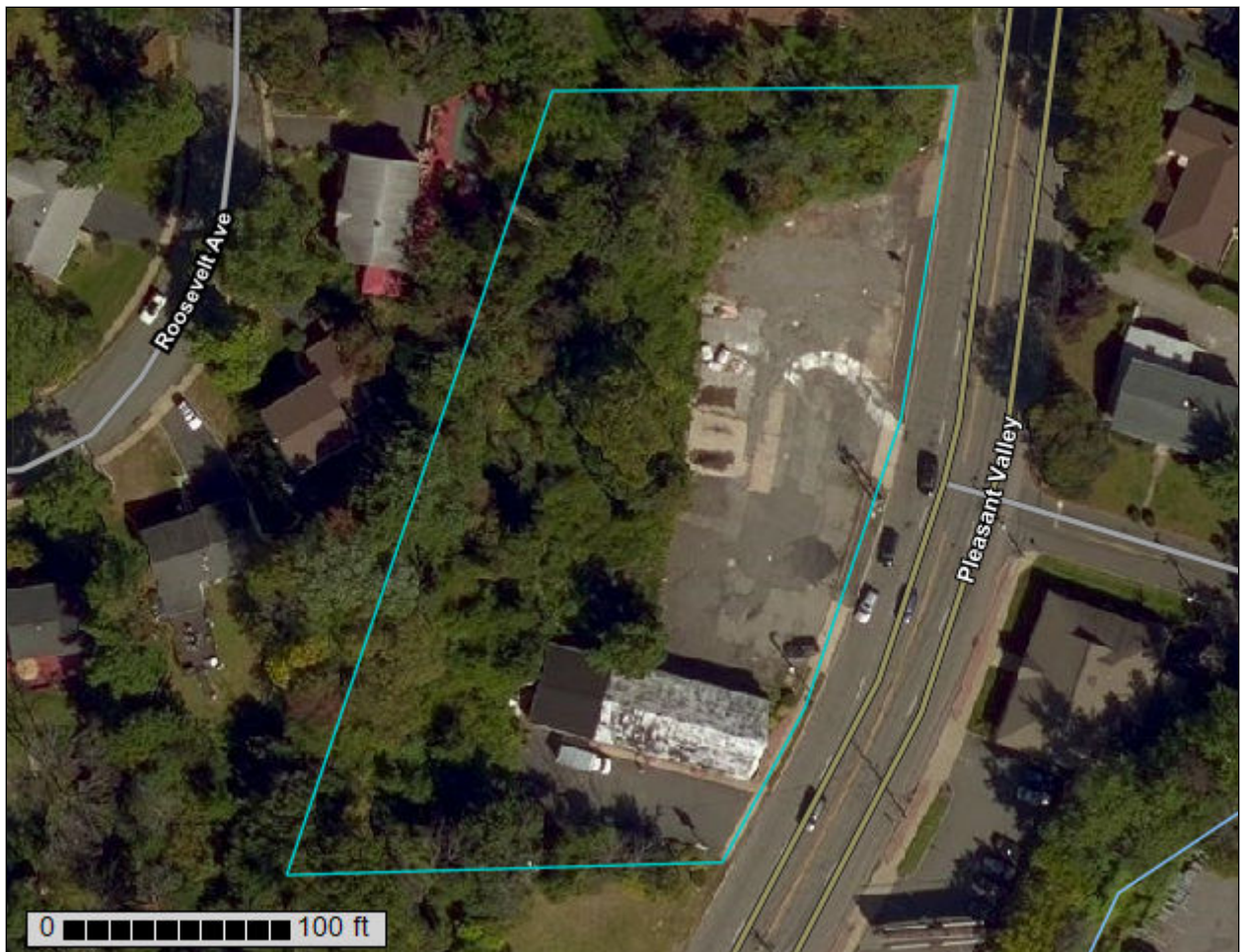
United States
Department of
Agriculture

NRCS

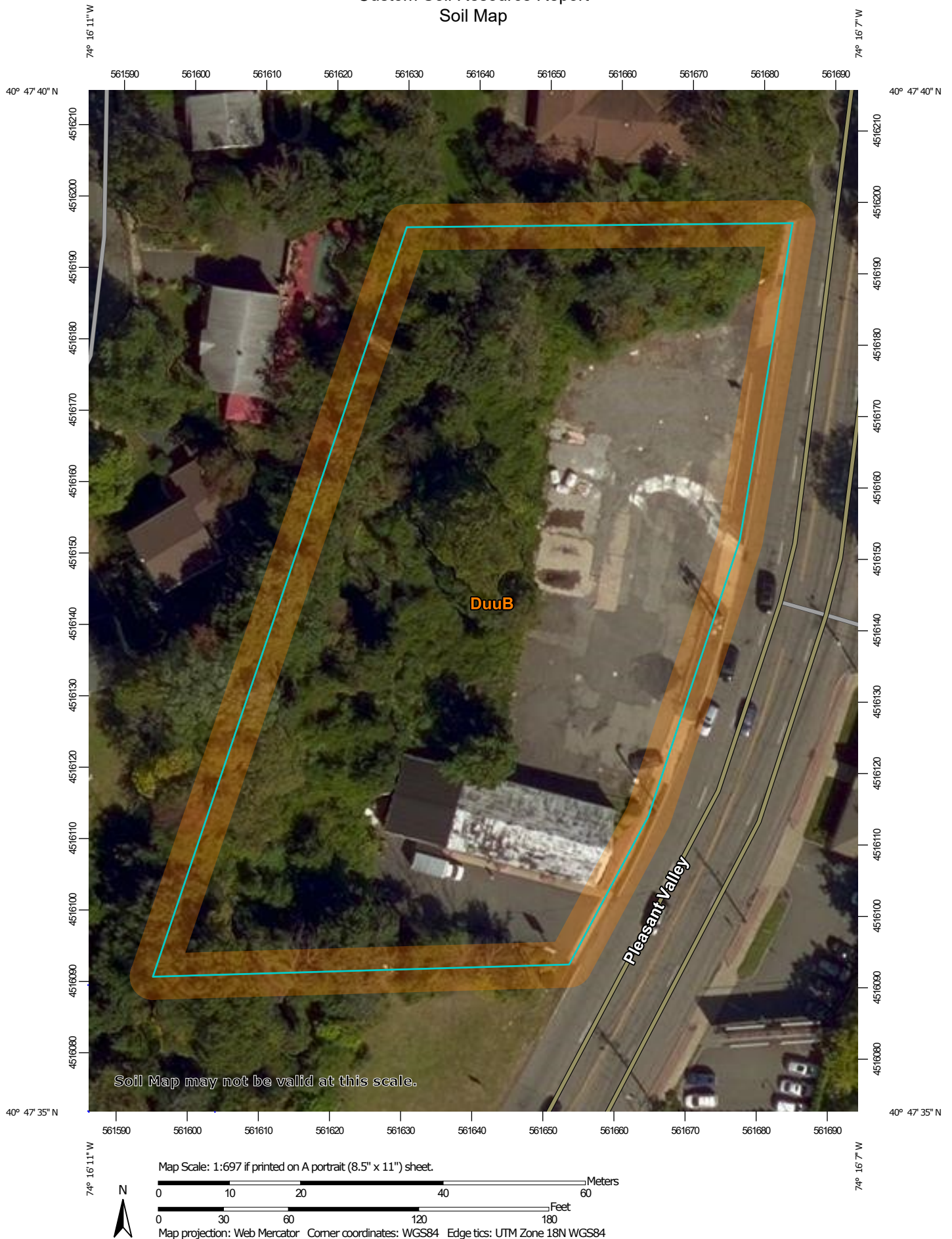
Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Essex County, New Jersey



Custom Soil Resource Report Soil Map



Essex County, New Jersey

DuuB—Dunellen - Urban land, Dunellen substratum complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: njzf
Elevation: 50 to 150 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Dunellen and similar soils: 60 percent
Urban land, dunellen substratum: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dunellen

Setting

Landform: Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy outwash derived from sandstone

Typical profile

A1 - 0 to 8 inches: sandy loam
A2 - 8 to 14 inches: sandy loam
BA - 14 to 20 inches: sandy loam
Bt - 20 to 31 inches: sandy loam
C - 31 to 42 inches: sandy loam
2C - 42 to 70 inches: stratified gravelly sand to sand to loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Urban Land, Dunellen Substratum

Setting

Landform: Outwash plains

Landform position (three-dimensional): Lower third of mountainflank

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Typical profile

H1 - 0 to 12 inches: material

H2 - 12 to 31 inches: sandy loam

2C - 31 to 42 inches: sandy loam

3C - 42 to 70 inches: loamy sand

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8s

Hydric soil rating: Unranked

Minor Components

Udorthents, dunellen substratum

Percent of map unit: 10 percent

Landform: Outwash plains

Landform position (three-dimensional): Lower third of mountainflank

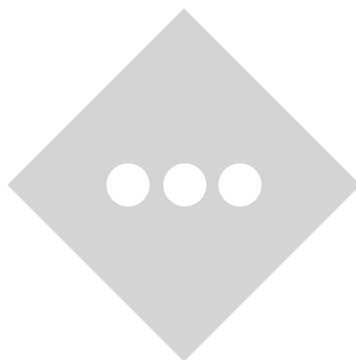
Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

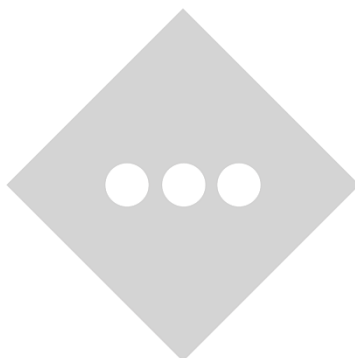
APPENDIX C

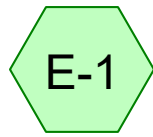
DESIGN CALCULATIONS & DIAGRAMS



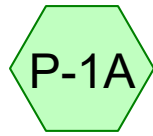
APPENDIX C-I

HYDROCAD ROUTING DIAGRAM

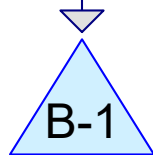




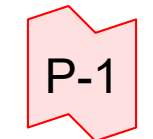
Existing Drainage to
Pleasant Valley Way



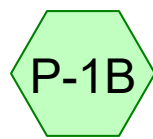
Proposed Roof
Drainage



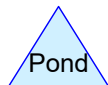
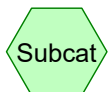
Underground StormTrap
Basin



Proposed Drainage to
Pleasant Valley Way

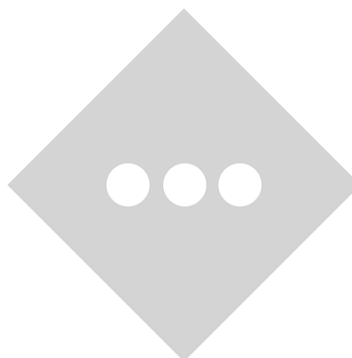


Proposed Direct
Drainage to Pleasant
Valley Way



APPENDIX C-2

2-YEAR STORM EVENT HYDROGRAPHS



2021-05-07_HydroCad Calculations

NOAA 24-hr D 2-Year Rainfall=3.44"

Prepared by {enter your company name here}

Printed 5/6/2021

HydroCAD® 10.00-26 s/n 10626 © 2020 HydroCAD Software Solutions LLC

Page 2

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Existing Drainage to Runoff Area=43,370 sf 62.63% Impervious Runoff Depth=2.01"
Tc=6.0 min CN=30/98 Runoff=2.03 cfs 7,259 cf

Subcatchment P-1A: Proposed Roof Runoff Area=24,065 sf 100.00% Impervious Runoff Depth=3.21"
Tc=6.0 min CN=0/98 Runoff=1.80 cfs 6,431 cf

Subcatchment P-1B: Proposed Direct Runoff Area=19,305 sf 36.75% Impervious Runoff Depth=1.25"
Tc=6.0 min CN=47/98 Runoff=0.53 cfs 2,010 cf

Pond B-1: Underground StormTrap Basin Peak Elev=368.03' Storage=1,510 cf Inflow=1.80 cfs 6,431 cf
Outflow=0.55 cfs 6,427 cf

Link P-1: Proposed Drainage to Pleasant Valley Way Inflow=1.00 cfs 8,437 cf
Primary=1.00 cfs 8,437 cf

Total Runoff Area = 86,740 sf Runoff Volume = 15,700 cf Average Runoff Depth = 2.17"
32.76% Pervious = 28,418 sf 67.24% Impervious = 58,322 sf

2021-05-07_HydroCad Calculations

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NOAA 24-hr D 2-Year Rainfall=3.44"

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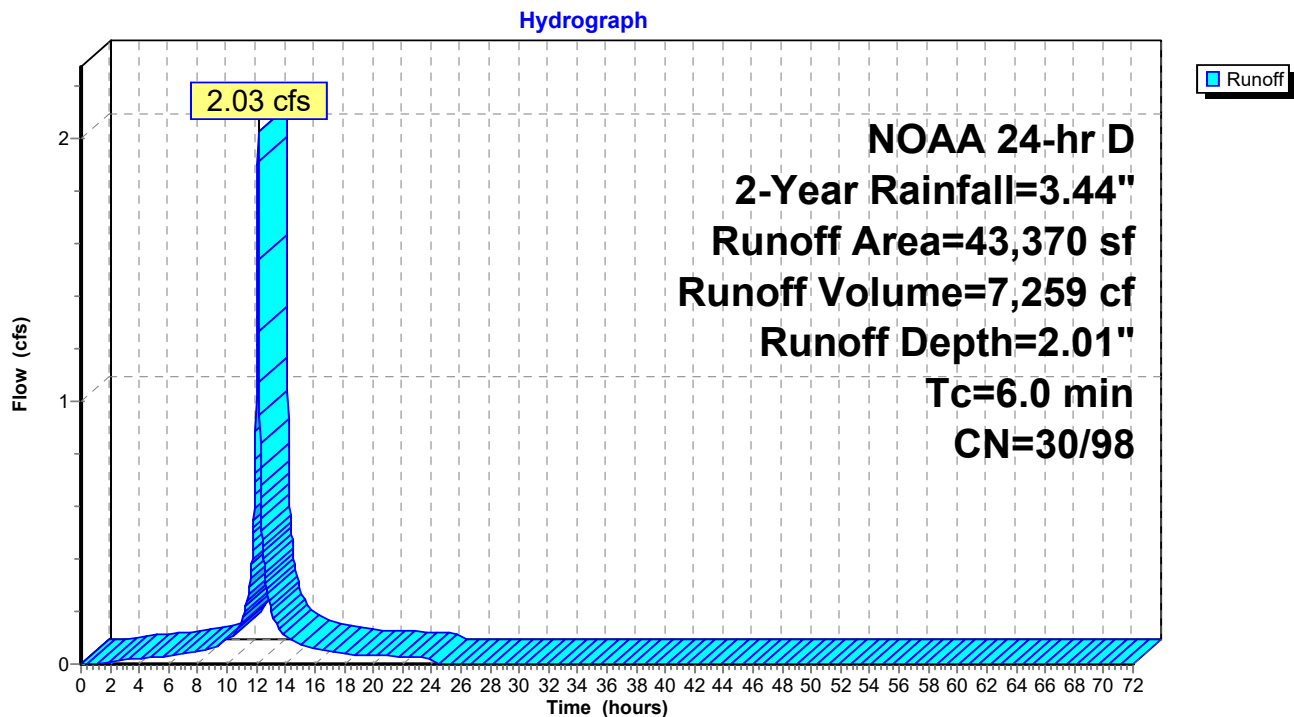
Summary for Subcatchment E-1: Existing Drainage to Pleasant Valley Way

Runoff = 2.03 cfs @ 12.13 hrs, Volume= 7,259 cf, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	27,163	98	Impervious Surfaces
	15,739	30	Woods, Good, HSG A
	468	39	>75% Grass cover, Good, HSG A
	43,370	73	Weighted Average
	16,207	30	37.37% Pervious Area
	27,163	98	62.63% Impervious Area

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

Subcatchment E-1: Existing Drainage to Pleasant Valley Way

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NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Subcatchment P-1A: Proposed Roof Drainage

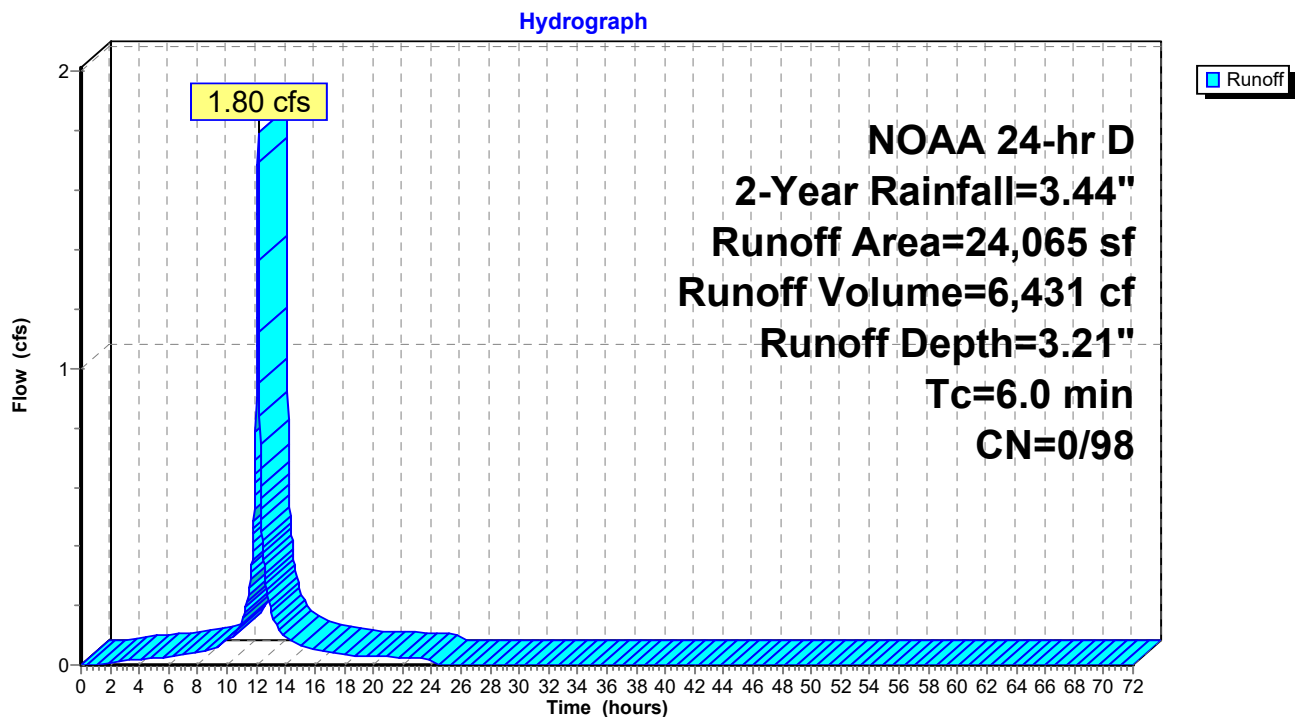
Runoff = 1.80 cfs @ 12.13 hrs, Volume= 6,431 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	24,065	98	Impervious Surfaces
	24,065	98	100.00% Impervious Area

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

Subcatchment P-1A: Proposed Roof Drainage



2021-05-07_HydroCad Calculations

NOAA 24-hr D 2-Year Rainfall=3.44"

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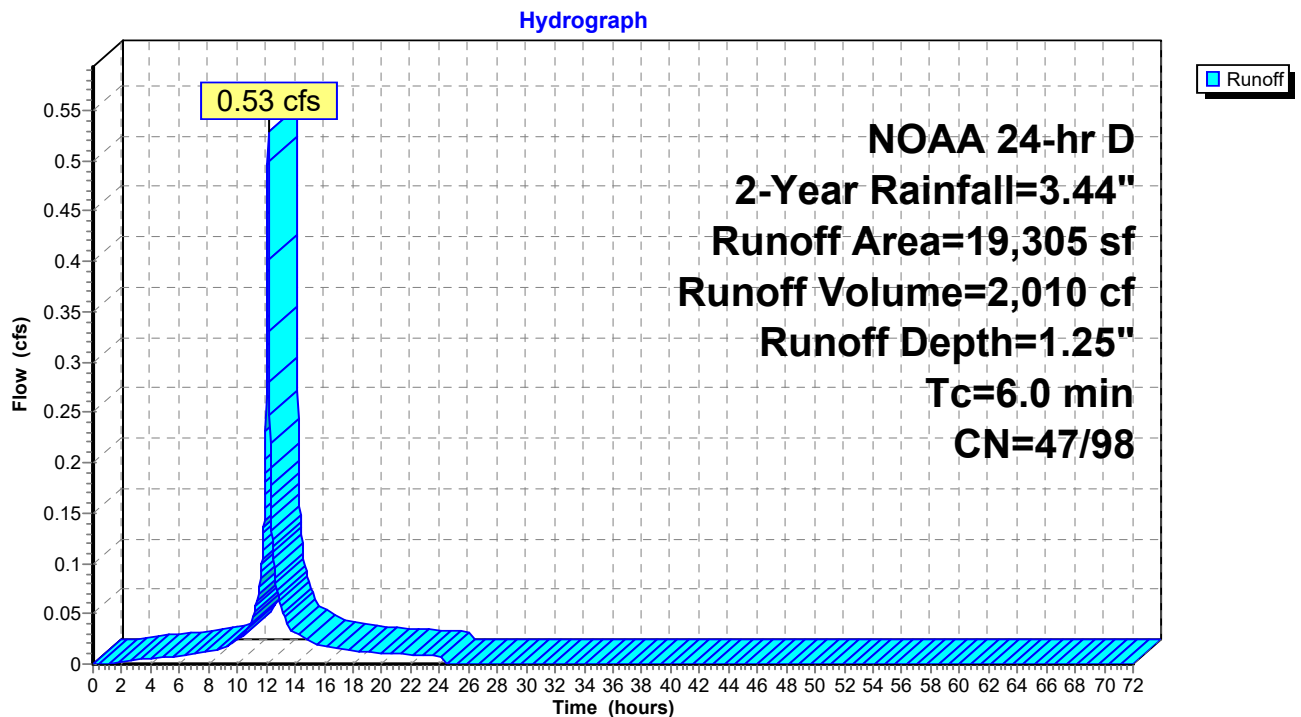
Summary for Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way

Runoff = 0.53 cfs @ 12.13 hrs, Volume= 2,010 cf, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 2-Year Rainfall=3.44"

	Area (sf)	CN	Description
*	7,094	98	Impervious Surfaces
	2,835	72	Dirt roads, HSG A
	9,376	39	>75% Grass cover, Good, HSG A
	19,305	66	Weighted Average
	12,211	47	63.25% Pervious Area
	7,094	98	36.75% Impervious Area

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

Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way

2021-05-07_HydroCad Calculations

NOAA 24-hr D 2-Year Rainfall=3.44"

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Summary for Pond B-1: Underground StormTrap Basin

Inflow Area = 24,065 sf, 100.00% Impervious, Inflow Depth = 3.21" for 2-Year event
 Inflow = 1.80 cfs @ 12.13 hrs, Volume= 6,431 cf
 Outflow = 0.55 cfs @ 12.33 hrs, Volume= 6,427 cf, Atten= 70%, Lag= 12.0 min
 Primary = 0.55 cfs @ 12.33 hrs, Volume= 6,427 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 368.03' @ 12.33 hrs Surf.Area= 1,164 sf Storage= 1,510 cf

Plug-Flow detention time= 45.4 min calculated for 6,427 cf (100% of inflow)
 Center-of-Mass det. time= 45.0 min (801.7 - 756.7)

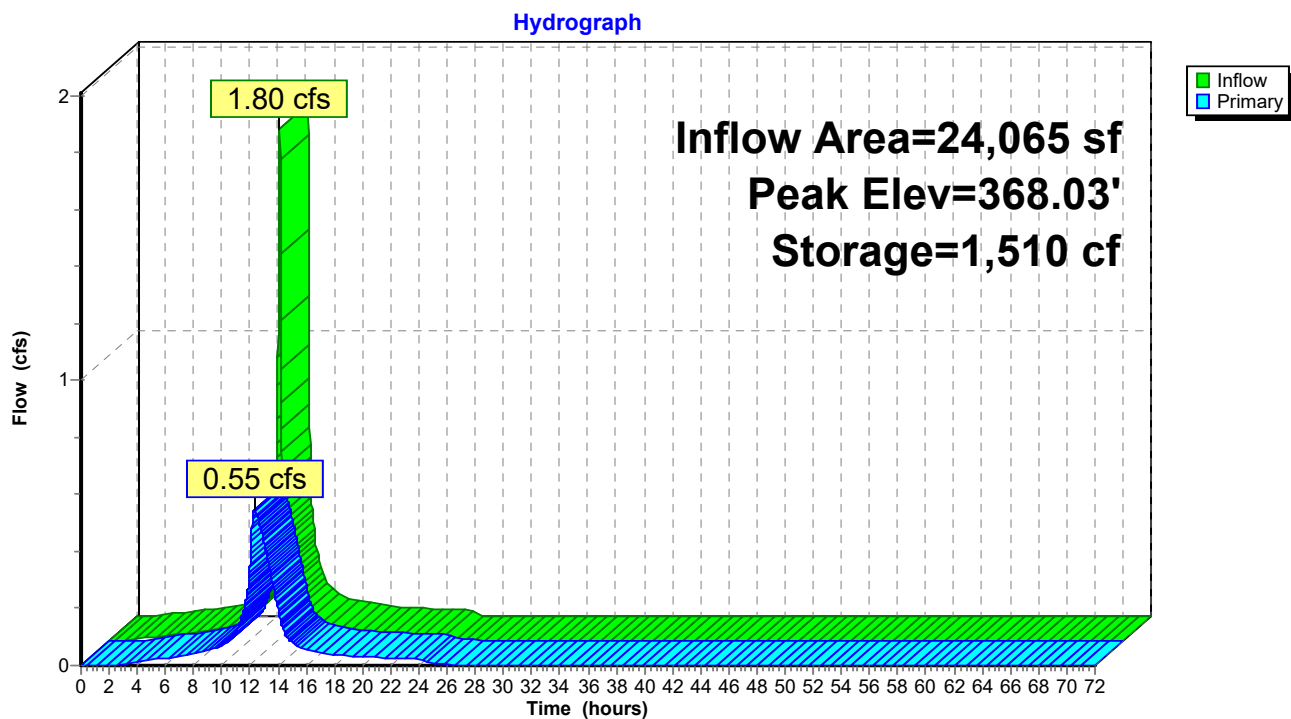
Volume	Invert	Avail.Storage	Storage Description
#1	366.52'	3,510 cf	StormTrap ST1 SingleTrap 3-6 x 12 Inside= 82.7"W x 42.0"H => 20.80 sf x 14.06'L = 292.5 cf Outside= 82.7"W x 50.0"H => 28.73 sf x 14.06'L = 404.1 cf

Device	Routing	Invert	Outlet Devices
#1	Primary	366.52'	15.0" Round 15" Culvert L= 27.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 366.52' / 366.45' S= 0.0026 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	366.52'	4.0" W x 3.5" H Vert. 4.0 x 3.5" Slot C= 0.600
#3	Device 1	368.03'	6.0" Vert. 6.0" Orifice C= 0.600
#4	Device 1	370.02'	4.0' long x 0.5' breadth 4 Foot Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.55 cfs @ 12.33 hrs HW=368.03' TW=0.00' (Dynamic Tailwater)

- 1=15" Culvert (Passes 0.55 cfs of 4.42 cfs potential flow)
- 2=4.0 x 3.5" Slot (Orifice Controls 0.55 cfs @ 5.61 fps)
- 3=6.0" Orifice (Controls 0.00 cfs)
- 4=4 Foot Weir (Controls 0.00 cfs)

Pond B-1: Underground StormTrap Basin

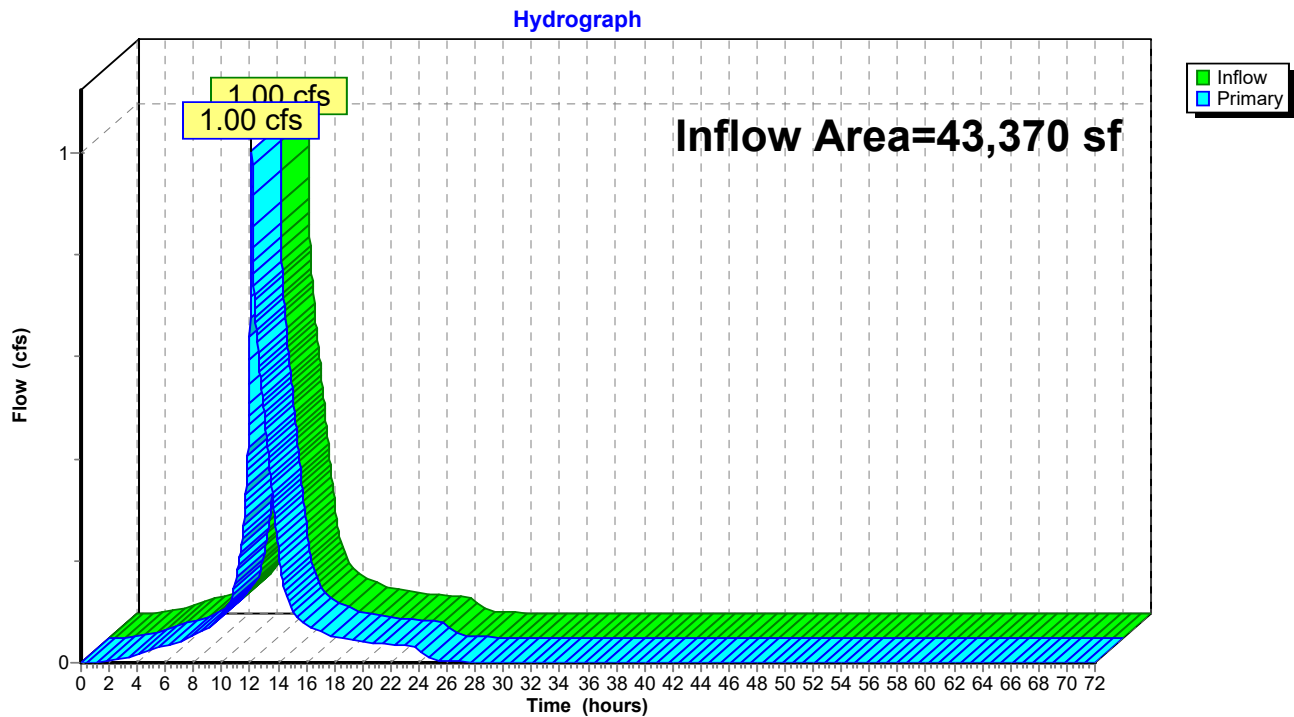


Summary for Link P-1: Proposed Drainage to Pleasant Valley Way

Inflow Area = 43,370 sf, 71.84% Impervious, Inflow Depth = 2.33" for 2-Year event
 Inflow = 1.00 cfs @ 12.14 hrs, Volume= 8,437 cf
 Primary = 1.00 cfs @ 12.14 hrs, Volume= 8,437 cf, Atten= 0%, Lag= 0.0 min

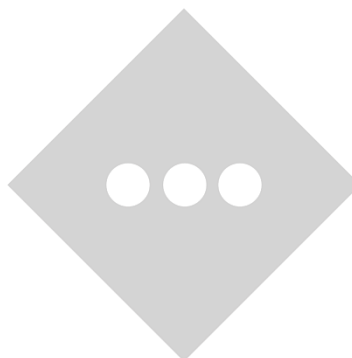
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Link P-1: Proposed Drainage to Pleasant Valley Way



APPENDIX C-3

10-YEAR STORM EVENT HYDROGRAPHS



2021-05-07_HydroCad Calculations

NOAA 24-hr D 10-Year Rainfall=5.22"

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Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Existing Drainage to Runoff Area=43,370 sf 62.63% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=30/98 Runoff=3.10 cfs 11,296 cf

Subcatchment P-1A: Proposed Roof Runoff Area=24,065 sf 100.00% Impervious Runoff Depth=4.98"
Tc=6.0 min CN=0/98 Runoff=2.74 cfs 9,993 cf

Subcatchment P-1B: Proposed Direct Runoff Area=19,305 sf 36.75% Impervious Runoff Depth=2.22"
Tc=6.0 min CN=47/98 Runoff=0.92 cfs 3,574 cf

Pond B-1: Underground StormTrap Basin Peak Elev=368.69' Storage=2,174 cf Inflow=2.74 cfs 9,993 cf
Outflow=1.27 cfs 9,989 cf

Link P-1: Proposed Drainage to Pleasant Valley Way Inflow=1.96 cfs 13,563 cf
Primary=1.96 cfs 13,563 cf

Total Runoff Area = 86,740 sf Runoff Volume = 24,863 cf Average Runoff Depth = 3.44"
32.76% Pervious = 28,418 sf 67.24% Impervious = 58,322 sf

2021-05-07_HydroCad Calculations

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NOAA 24-hr D 10-Year Rainfall=5.22"

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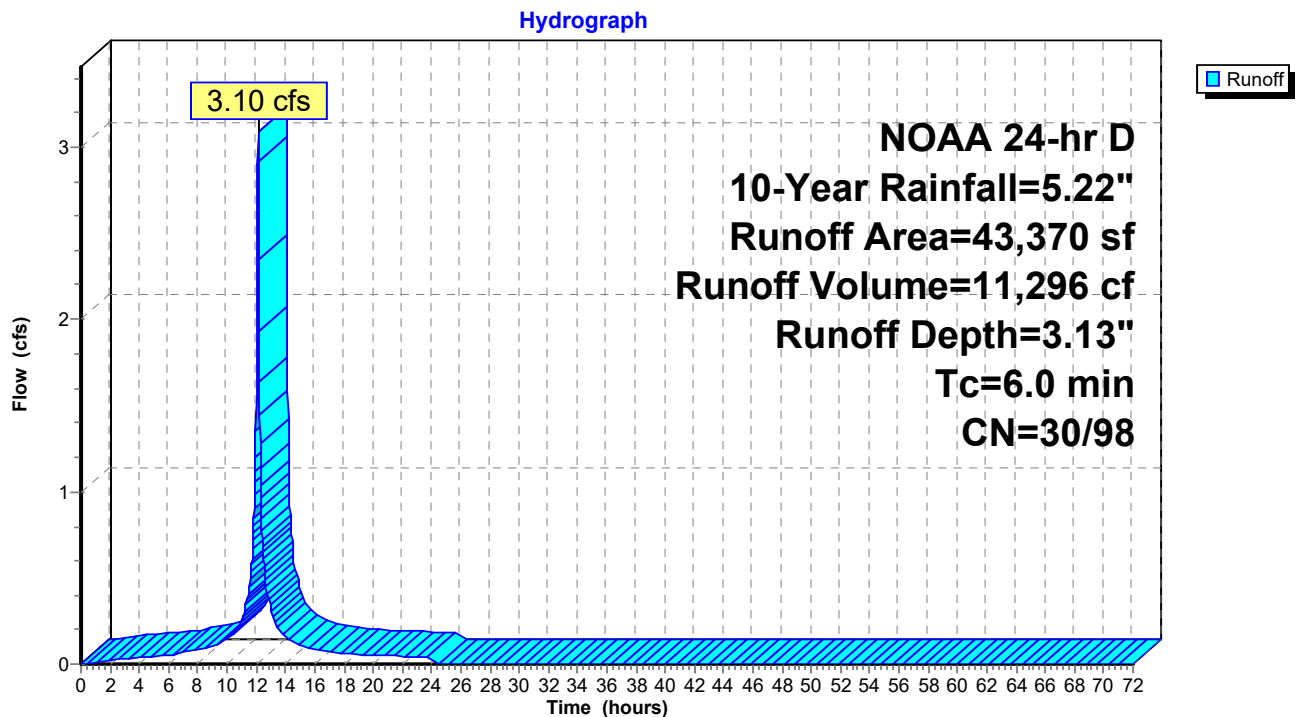
Summary for Subcatchment E-1: Existing Drainage to Pleasant Valley Way

Runoff = 3.10 cfs @ 12.13 hrs, Volume= 11,296 cf, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

	Area (sf)	CN	Description
*	27,163	98	Impervious Surfaces
	15,739	30	Woods, Good, HSG A
	468	39	>75% Grass cover, Good, HSG A
	43,370	73	Weighted Average
	16,207	30	37.37% Pervious Area
	27,163	98	62.63% Impervious Area

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

Subcatchment E-1: Existing Drainage to Pleasant Valley Way

2021-05-07_HydroCad Calculations

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NOAA 24-hr D 10-Year Rainfall=5.22"

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Summary for Subcatchment P-1A: Proposed Roof Drainage

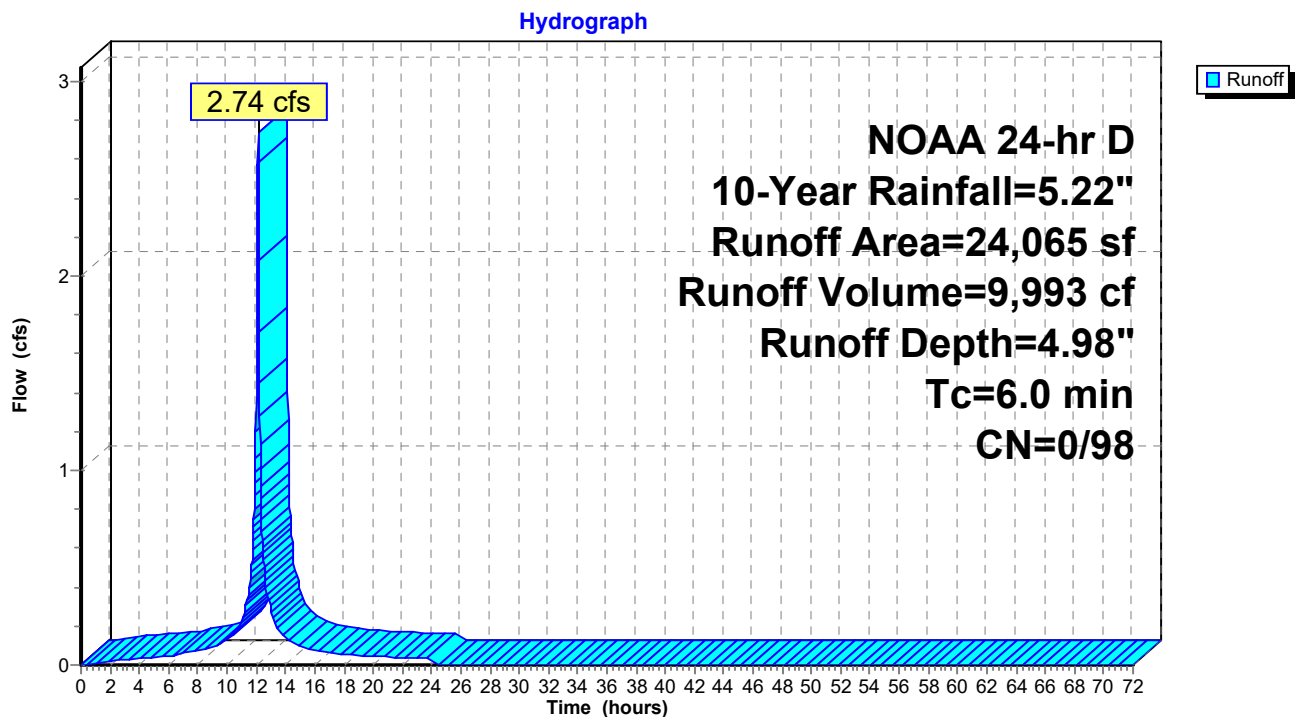
Runoff = 2.74 cfs @ 12.13 hrs, Volume= 9,993 cf, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

	Area (sf)	CN	Description
*	24,065	98	Impervious Surfaces
	24,065	98	100.00% Impervious Area

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

Subcatchment P-1A: Proposed Roof Drainage



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NOAA 24-hr D 10-Year Rainfall=5.22"

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Summary for Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way

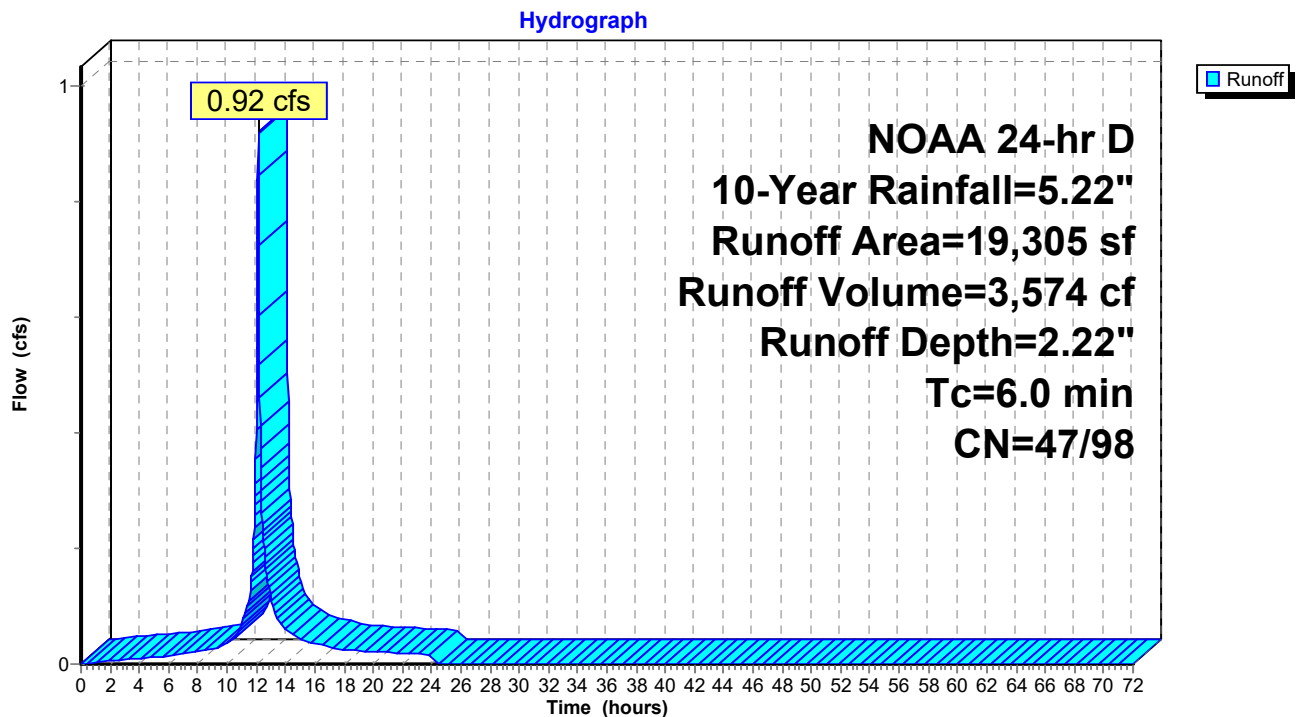
Runoff = 0.92 cfs @ 12.13 hrs, Volume= 3,574 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 10-Year Rainfall=5.22"

	Area (sf)	CN	Description
*	7,094	98	Impervious Surfaces
	2,835	72	Dirt roads, HSG A
	9,376	39	>75% Grass cover, Good, HSG A
	19,305	66	Weighted Average
	12,211	47	63.25% Pervious Area
	7,094	98	36.75% Impervious Area

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

Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way



2021-05-07_HydroCad Calculations

NOAA 24-hr D 10-Year Rainfall=5.22"

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Summary for Pond B-1: Underground StormTrap Basin

Inflow Area = 24,065 sf, 100.00% Impervious, Inflow Depth = 4.98" for 10-Year event
 Inflow = 2.74 cfs @ 12.13 hrs, Volume= 9,993 cf
 Outflow = 1.27 cfs @ 12.24 hrs, Volume= 9,989 cf, Atten= 54%, Lag= 6.9 min
 Primary = 1.27 cfs @ 12.24 hrs, Volume= 9,989 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 368.69' @ 12.24 hrs Surf.Area= 1,164 sf Storage= 2,174 cf

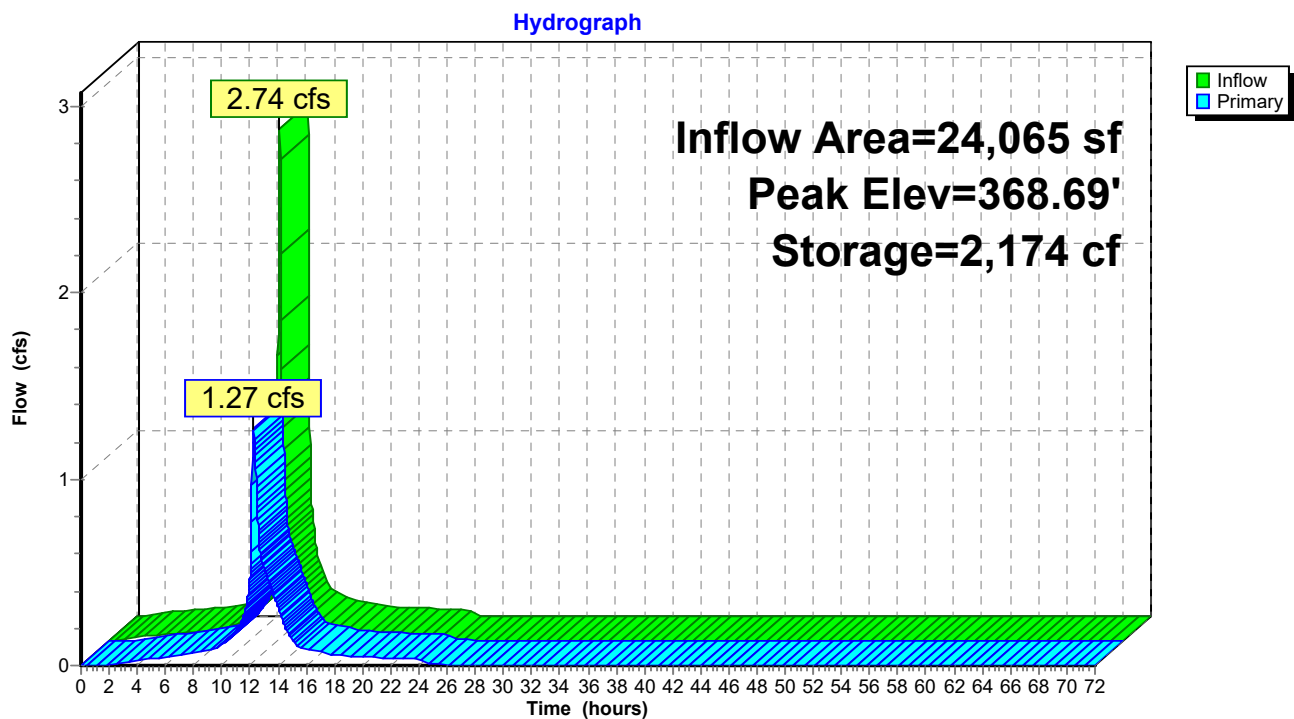
Plug-Flow detention time= 39.3 min calculated for 9,986 cf (100% of inflow)
 Center-of-Mass det. time= 39.6 min (788.2 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1	366.52'	3,510 cf	StormTrap ST1 SingleTrap 3-6 x 12 Inside= 82.7"W x 42.0"H => 20.80 sf x 14.06'L = 292.5 cf Outside= 82.7"W x 50.0"H => 28.73 sf x 14.06'L = 404.1 cf

Device	Routing	Invert	Outlet Devices
#1	Primary	366.52'	15.0" Round 15" Culvert L= 27.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 366.52' / 366.45' S= 0.0026 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	366.52'	4.0" W x 3.5" H Vert. 4.0 x 3.5" Slot C= 0.600
#3	Device 1	368.03'	6.0" Vert. 6.0" Orifice C= 0.600
#4	Device 1	370.02'	4.0' long x 0.5' breadth 4 Foot Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.27 cfs @ 12.24 hrs HW=368.69' TW=0.00' (Dynamic Tailwater)

- 1=15" Culvert (Passes 1.27 cfs of 6.71 cfs potential flow)
- 2=4.0 x 3.5" Slot (Orifice Controls 0.67 cfs @ 6.84 fps)
- 3=6.0" Orifice (Orifice Controls 0.60 cfs @ 3.07 fps)
- 4=4 Foot Weir (Controls 0.00 cfs)

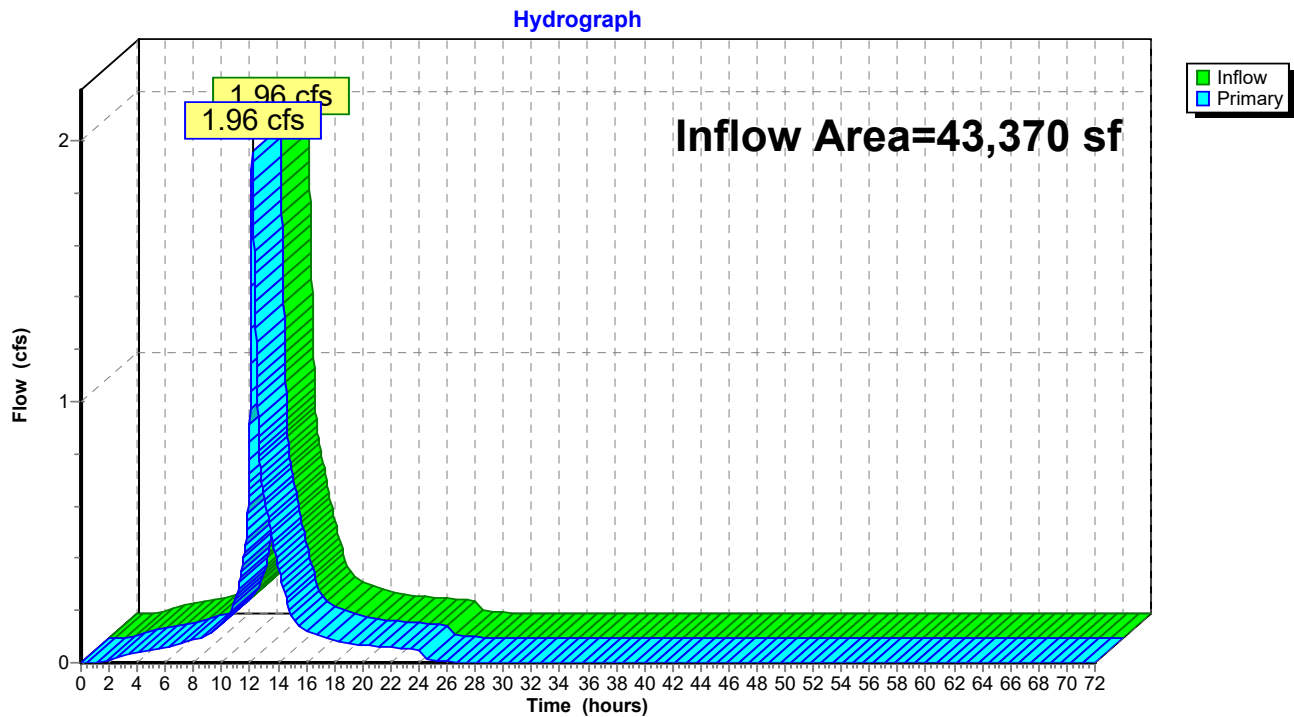
Pond B-1: Underground StormTrap Basin

Summary for Link P-1: Proposed Drainage to Pleasant Valley Way

Inflow Area = 43,370 sf, 71.84% Impervious, Inflow Depth = 3.75" for 10-Year event
 Inflow = 1.96 cfs @ 12.16 hrs, Volume= 13,563 cf
 Primary = 1.96 cfs @ 12.16 hrs, Volume= 13,563 cf, Atten= 0%, Lag= 0.0 min

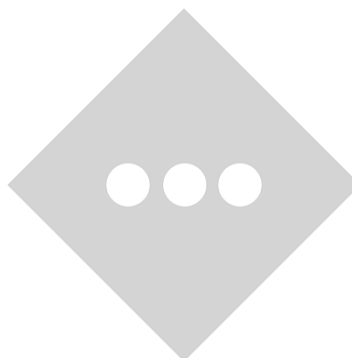
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Link P-1: Proposed Drainage to Pleasant Valley Way



APPENDIX C-4

25-YEAR STORM EVENT HYDROGRAPHS



2021-05-07_HydroCad Calculations

NOAA 24-hr D 25-Year Rainfall=6.44"

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Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Existing Drainage to Runoff Area=43,370 sf 62.63% Impervious Runoff Depth=3.93"
Tc=6.0 min CN=30/98 Runoff=3.83 cfs 14,207 cf

Subcatchment P-1A: Proposed Roof Runoff Area=24,065 sf 100.00% Impervious Runoff Depth=6.20"
Tc=6.0 min CN=0/98 Runoff=3.39 cfs 12,436 cf

Subcatchment P-1B: Proposed Direct Runoff Area=19,305 sf 36.75% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=47/98 Runoff=1.30 cfs 4,819 cf

Pond B-1: Underground StormTrap Basin Peak Elev=369.14' Storage=2,629 cf Inflow=3.39 cfs 12,436 cf
Outflow=1.61 cfs 12,433 cf

Link P-1: Proposed Drainage to Pleasant Valley Way Inflow=2.70 cfs 17,251 cf
Primary=2.70 cfs 17,251 cf

Total Runoff Area = 86,740 sf Runoff Volume = 31,462 cf Average Runoff Depth = 4.35"
32.76% Pervious = 28,418 sf 67.24% Impervious = 58,322 sf

2021-05-07_HydroCad Calculations

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NOAA 24-hr D 25-Year Rainfall=6.44"

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Summary for Subcatchment E-1: Existing Drainage to Pleasant Valley Way

Runoff = 3.83 cfs @ 12.13 hrs, Volume= 14,207 cf, Depth= 3.93"

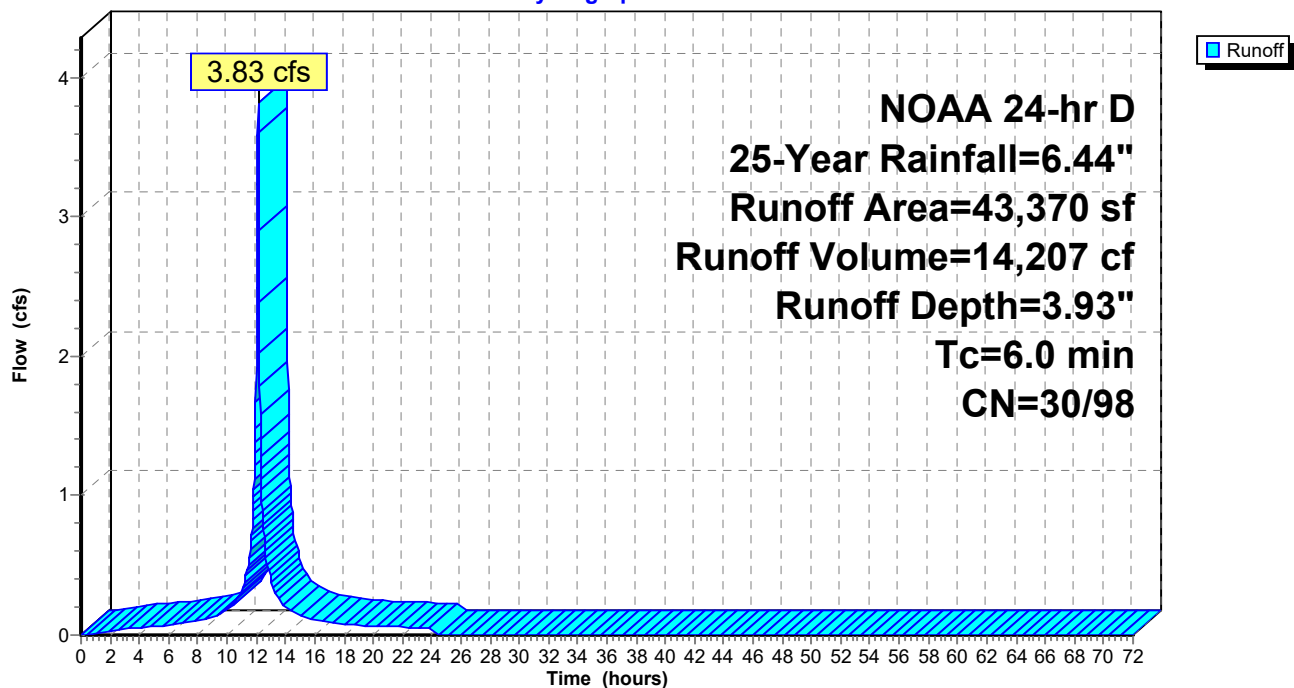
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.44"

	Area (sf)	CN	Description
*	27,163	98	Impervious Surfaces
	15,739	30	Woods, Good, HSG A
	468	39	>75% Grass cover, Good, HSG A
	43,370	73	Weighted Average
	16,207	30	37.37% Pervious Area
	27,163	98	62.63% Impervious Area

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

Subcatchment E-1: Existing Drainage to Pleasant Valley Way

Hydrograph



2021-05-07_HydroCad Calculations

Prepared by {enter your company name here}

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NOAA 24-hr D 25-Year Rainfall=6.44"

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Summary for Subcatchment P-1A: Proposed Roof Drainage

Runoff = 3.39 cfs @ 12.13 hrs, Volume= 12,436 cf, Depth= 6.20"

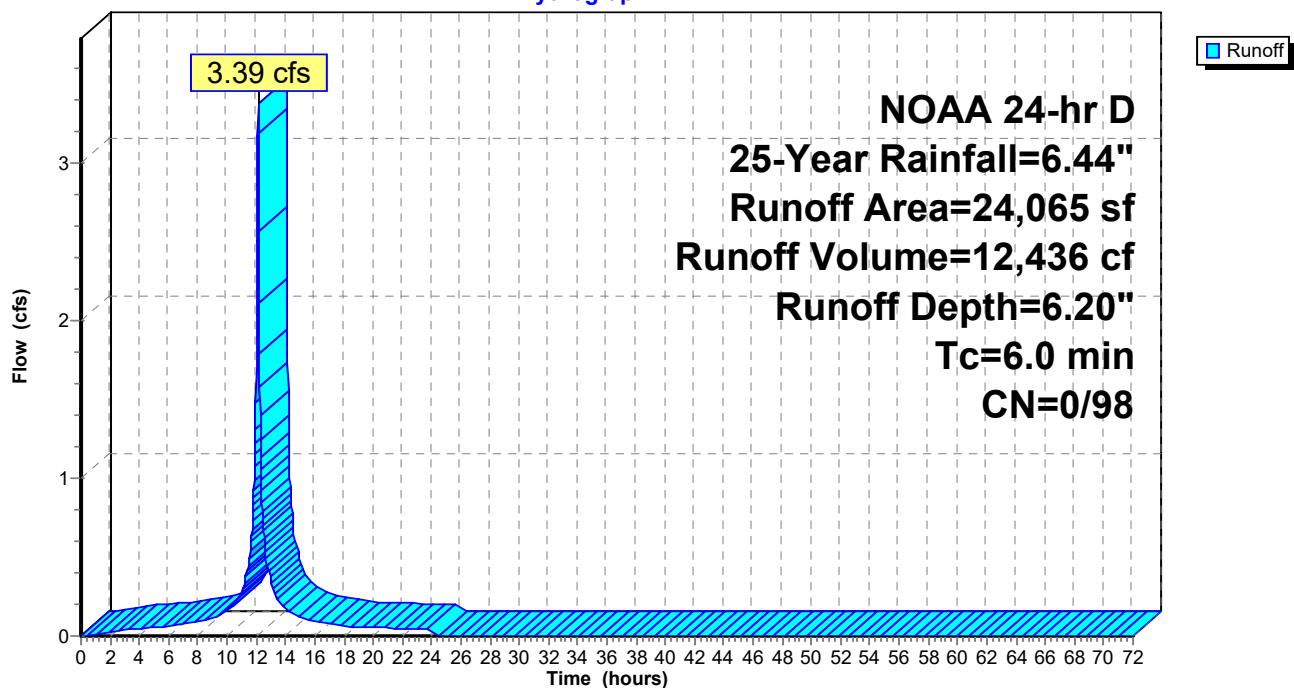
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.44"

	Area (sf)	CN	Description
*	24,065	98	Impervious Surfaces
	24,065	98	100.00% Impervious Area

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

Subcatchment P-1A: Proposed Roof Drainage

Hydrograph



2021-05-07_HydroCad Calculations

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NOAA 24-hr D 25-Year Rainfall=6.44"

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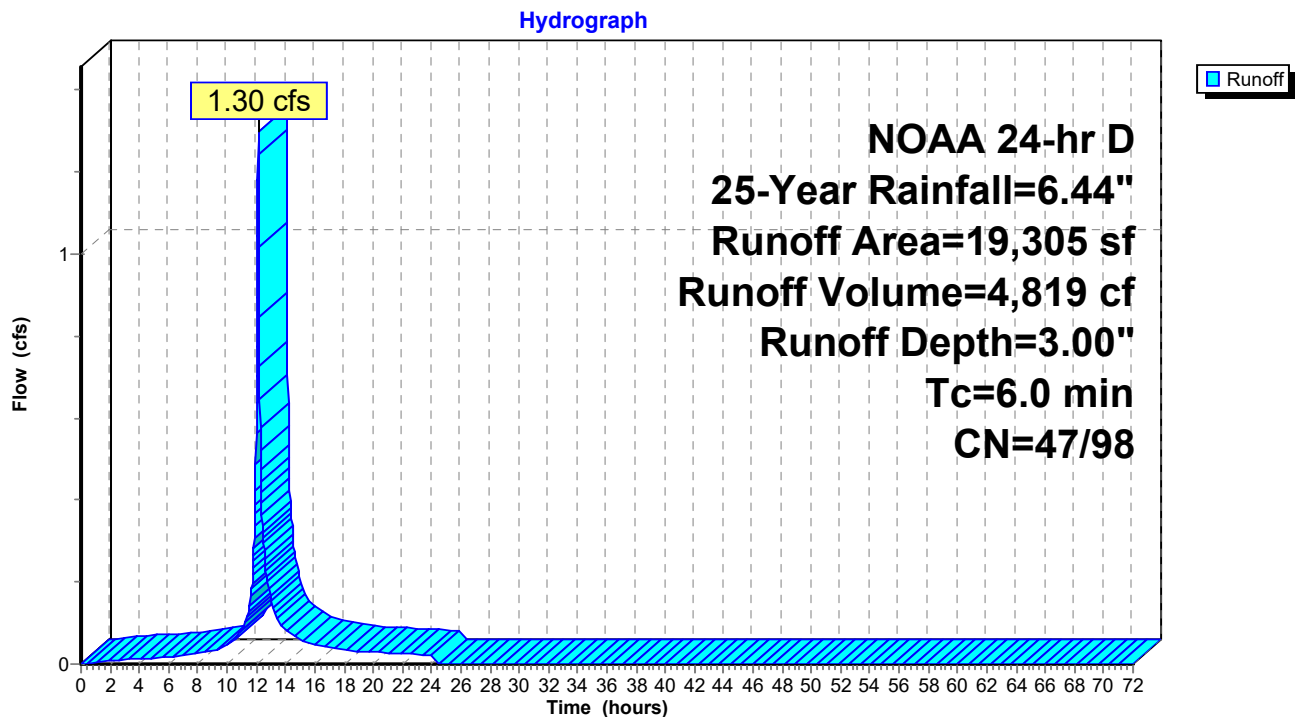
Summary for Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way

Runoff = 1.30 cfs @ 12.13 hrs, Volume= 4,819 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 25-Year Rainfall=6.44"

	Area (sf)	CN	Description
*	7,094	98	Impervious Surfaces
	2,835	72	Dirt roads, HSG A
	9,376	39	>75% Grass cover, Good, HSG A
	19,305	66	Weighted Average
	12,211	47	63.25% Pervious Area
	7,094	98	36.75% Impervious Area

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

Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way

2021-05-07_HydroCad Calculations

NOAA 24-hr D 25-Year Rainfall=6.44"

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Summary for Pond B-1: Underground StormTrap Basin

Inflow Area = 24,065 sf, 100.00% Impervious, Inflow Depth = 6.20" for 25-Year event
 Inflow = 3.39 cfs @ 12.13 hrs, Volume= 12,436 cf
 Outflow = 1.61 cfs @ 12.24 hrs, Volume= 12,433 cf, Atten= 52%, Lag= 6.6 min
 Primary = 1.61 cfs @ 12.24 hrs, Volume= 12,433 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 369.14' @ 12.24 hrs Surf.Area= 1,164 sf Storage= 2,629 cf

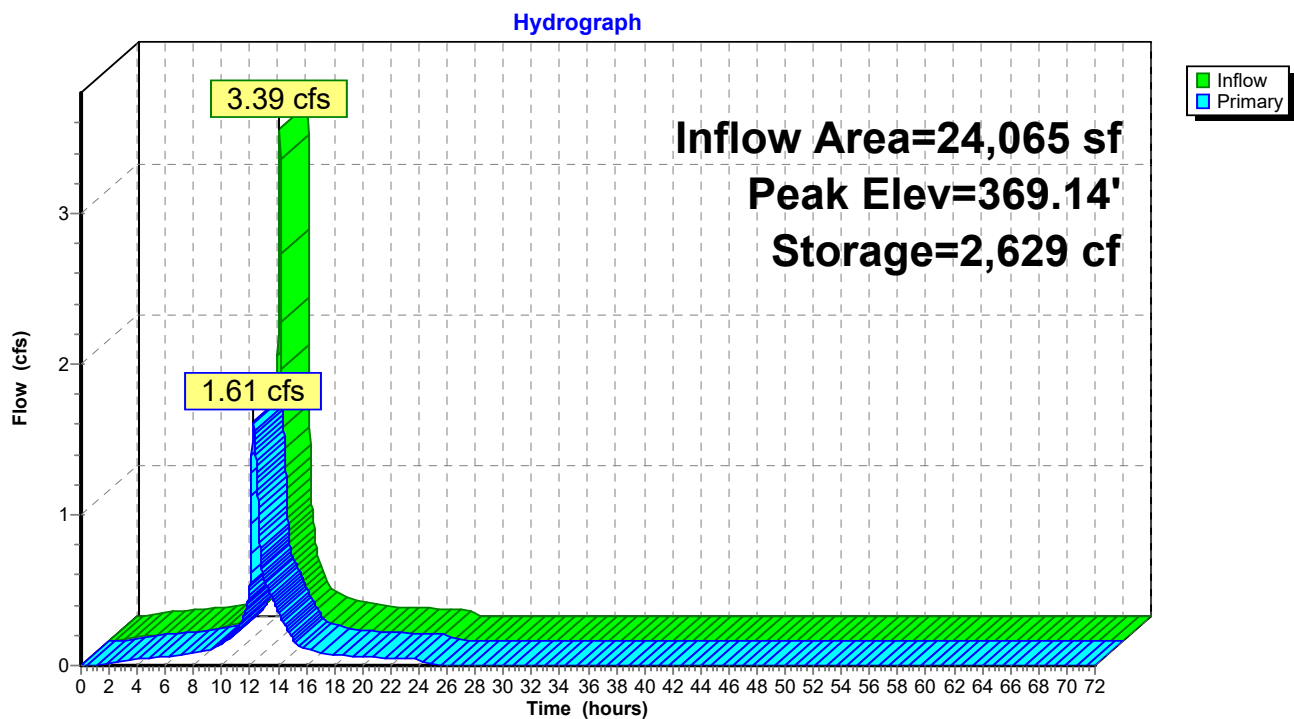
Plug-Flow detention time= 36.9 min calculated for 12,429 cf (100% of inflow)
 Center-of-Mass det. time= 37.2 min (782.3 - 745.1)

Volume	Invert	Avail.Storage	Storage Description
#1	366.52'	3,510 cf	StormTrap ST1 SingleTrap 3-6 x 12 Inside= 82.7"W x 42.0"H => 20.80 sf x 14.06'L = 292.5 cf Outside= 82.7"W x 50.0"H => 28.73 sf x 14.06'L = 404.1 cf

Device	Routing	Invert	Outlet Devices
#1	Primary	366.52'	15.0" Round 15" Culvert L= 27.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 366.52' / 366.45' S= 0.0026 ' / ' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	366.52'	4.0" W x 3.5" H Vert. 4.0 x 3.5" Slot C= 0.600
#3	Device 1	368.03'	6.0" Vert. 6.0" Orifice C= 0.600
#4	Device 1	370.02'	4.0' long x 0.5' breadth 4 Foot Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.61 cfs @ 12.24 hrs HW=369.14' TW=0.00' (Dynamic Tailwater)

- 1=15" Culvert (Passes 1.61 cfs of 8.10 cfs potential flow)
- 2=4.0 x 3.5" Slot (Orifice Controls 0.74 cfs @ 7.57 fps)
- 3=6.0" Orifice (Orifice Controls 0.88 cfs @ 4.47 fps)
- 4=4 Foot Weir (Controls 0.00 cfs)

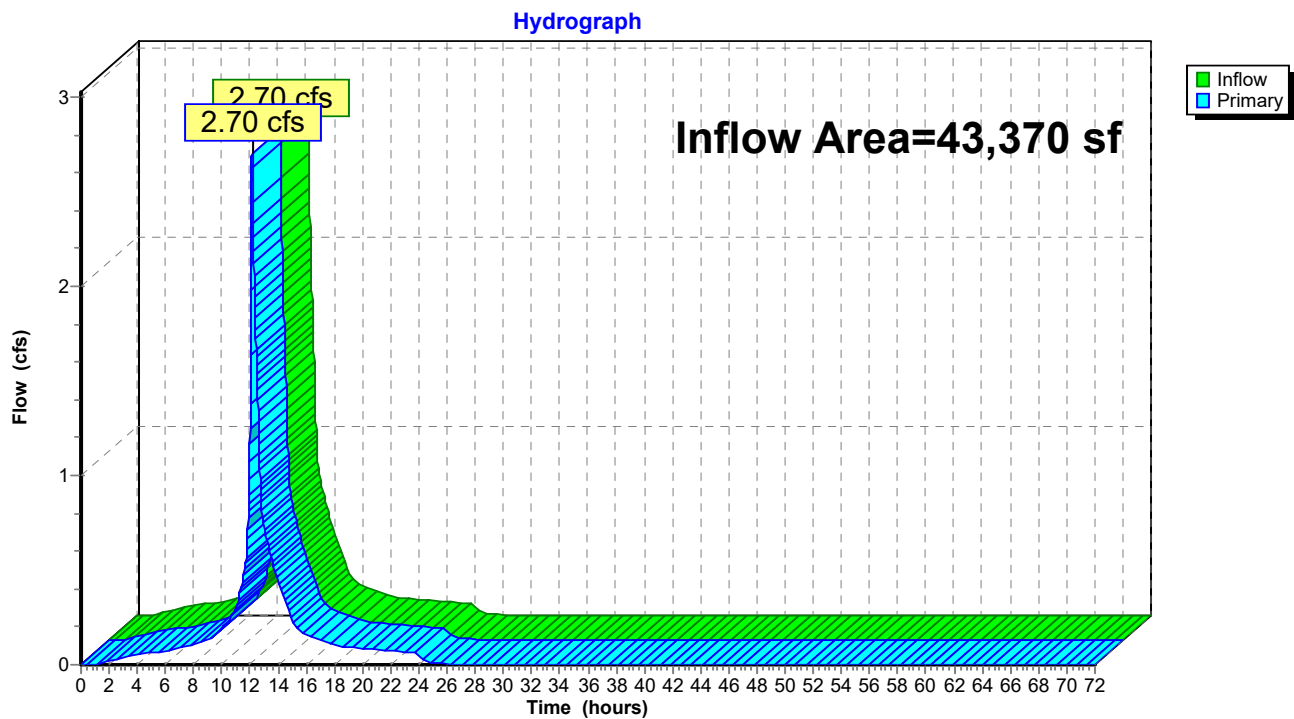
Pond B-1: Underground StormTrap Basin

Summary for Link P-1: Proposed Drainage to Pleasant Valley Way

Inflow Area = 43,370 sf, 71.84% Impervious, Inflow Depth = 4.77" for 25-Year event
 Inflow = 2.70 cfs @ 12.15 hrs, Volume= 17,251 cf
 Primary = 2.70 cfs @ 12.15 hrs, Volume= 17,251 cf, Atten= 0%, Lag= 0.0 min

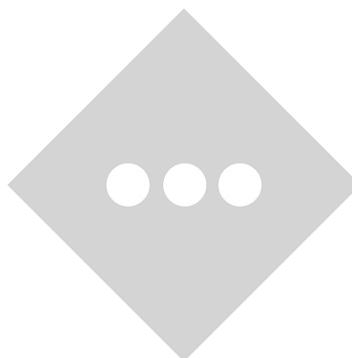
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Link P-1: Proposed Drainage to Pleasant Valley Way



APPENDIX C-5

100-YEAR STORM EVENT HYDROGRAPHS



2021-05-07_HydroCad Calculations

NOAA 24-hr D 100-Year Rainfall=8.66"

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Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Existing Drainage to Runoff Area=43,370 sf 62.63% Impervious Runoff Depth=5.49"
Tc=6.0 min CN=30/98 Runoff=5.17 cfs 19,847 cf

Subcatchment P-1A: Proposed Roof Runoff Area=24,065 sf 100.00% Impervious Runoff Depth=8.42"
Tc=6.0 min CN=0/98 Runoff=4.56 cfs 16,885 cf

Subcatchment P-1B: Proposed Direct Runoff Area=19,305 sf 36.75% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=47/98 Runoff=2.06 cfs 7,338 cf

Pond B-1: Underground StormTrap Basin Peak Elev=370.00' Storage=3,490 cf Inflow=4.56 cfs 16,885 cf
Outflow=2.09 cfs 16,882 cf

Link P-1: Proposed Drainage to Pleasant Valley Way Inflow=3.92 cfs 24,220 cf
Primary=3.92 cfs 24,220 cf

Total Runoff Area = 86,740 sf Runoff Volume = 44,071 cf Average Runoff Depth = 6.10"
32.76% Pervious = 28,418 sf 67.24% Impervious = 58,322 sf

2021-05-07_HydroCad Calculations

NOAA 24-hr D 100-Year Rainfall=8.66"

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Summary for Subcatchment E-1: Existing Drainage to Pleasant Valley Way

Runoff = 5.17 cfs @ 12.13 hrs, Volume= 19,847 cf, Depth= 5.49"

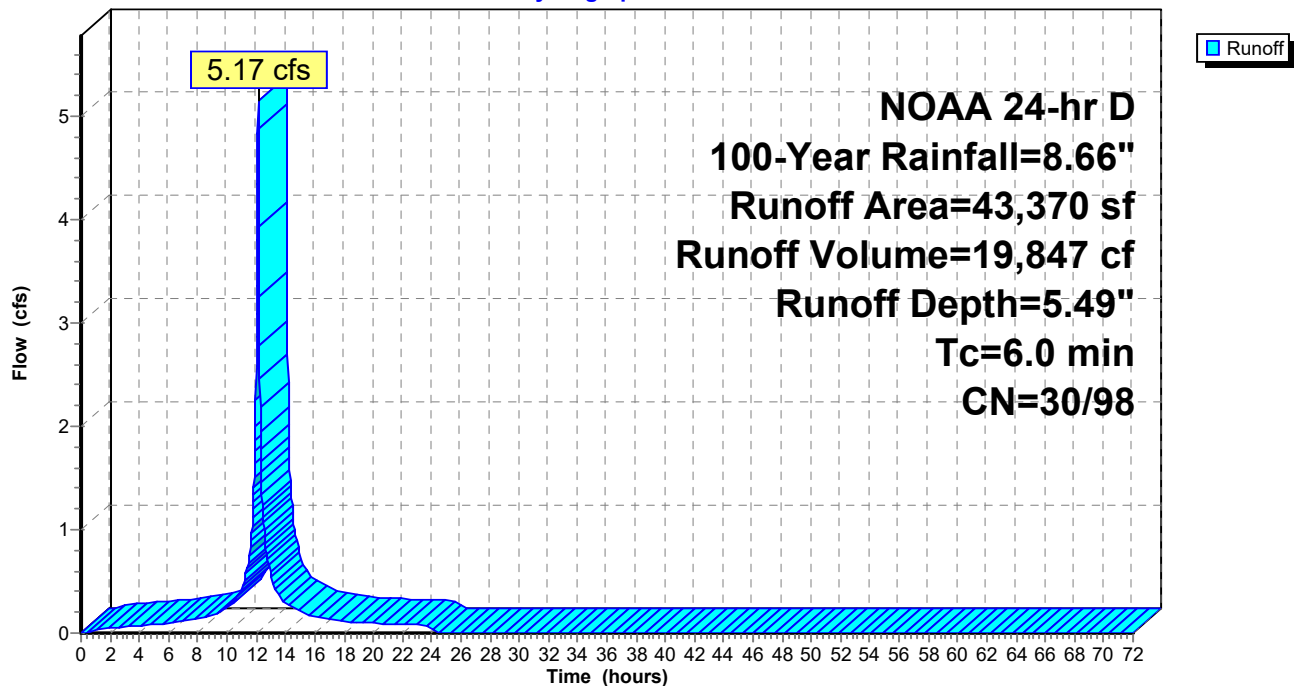
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

	Area (sf)	CN	Description
*	27,163	98	Impervious Surfaces
	15,739	30	Woods, Good, HSG A
	468	39	>75% Grass cover, Good, HSG A
	43,370	73	Weighted Average
	16,207	30	37.37% Pervious Area
	27,163	98	62.63% Impervious Area

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

Subcatchment E-1: Existing Drainage to Pleasant Valley Way

Hydrograph



2021-05-07_HydroCad Calculations

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NOAA 24-hr D 100-Year Rainfall=8.66"

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Summary for Subcatchment P-1A: Proposed Roof Drainage

Runoff = 4.56 cfs @ 12.13 hrs, Volume= 16,885 cf, Depth= 8.42"

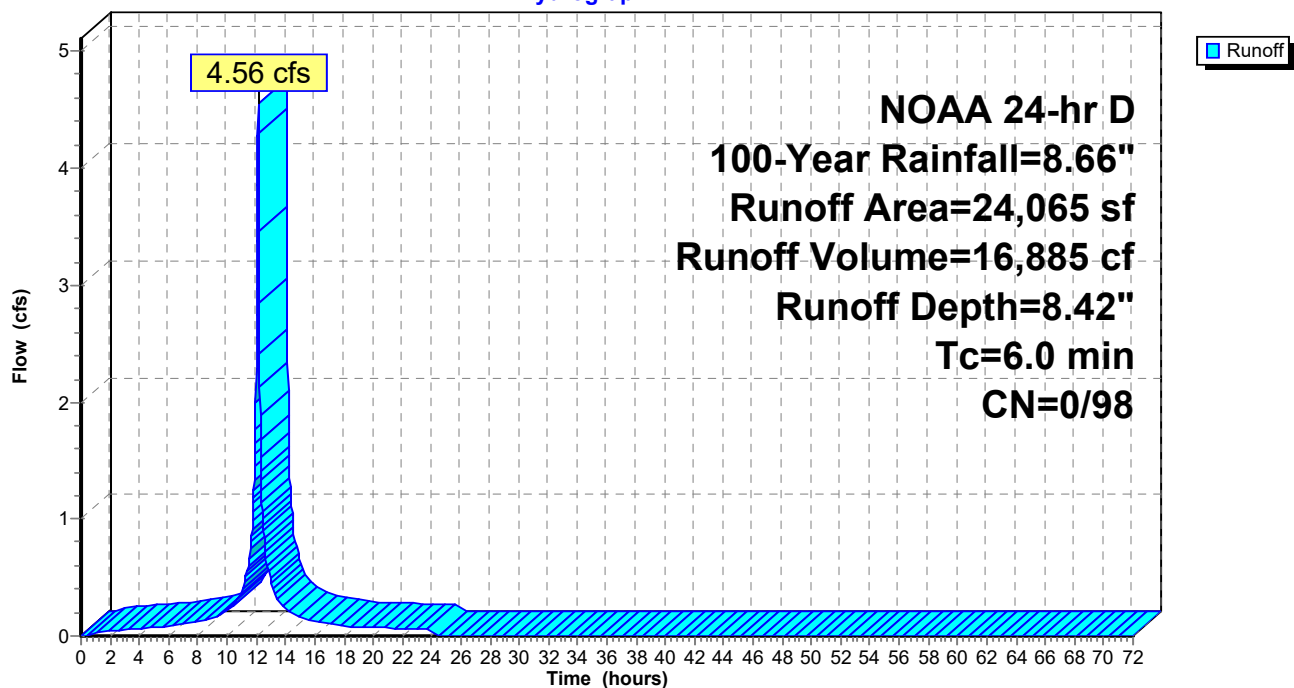
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

	Area (sf)	CN	Description
*	24,065	98	Impervious Surfaces
	24,065	98	100.00% Impervious Area

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

Subcatchment P-1A: Proposed Roof Drainage

Hydrograph



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NOAA 24-hr D 100-Year Rainfall=8.66"

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Summary for Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way

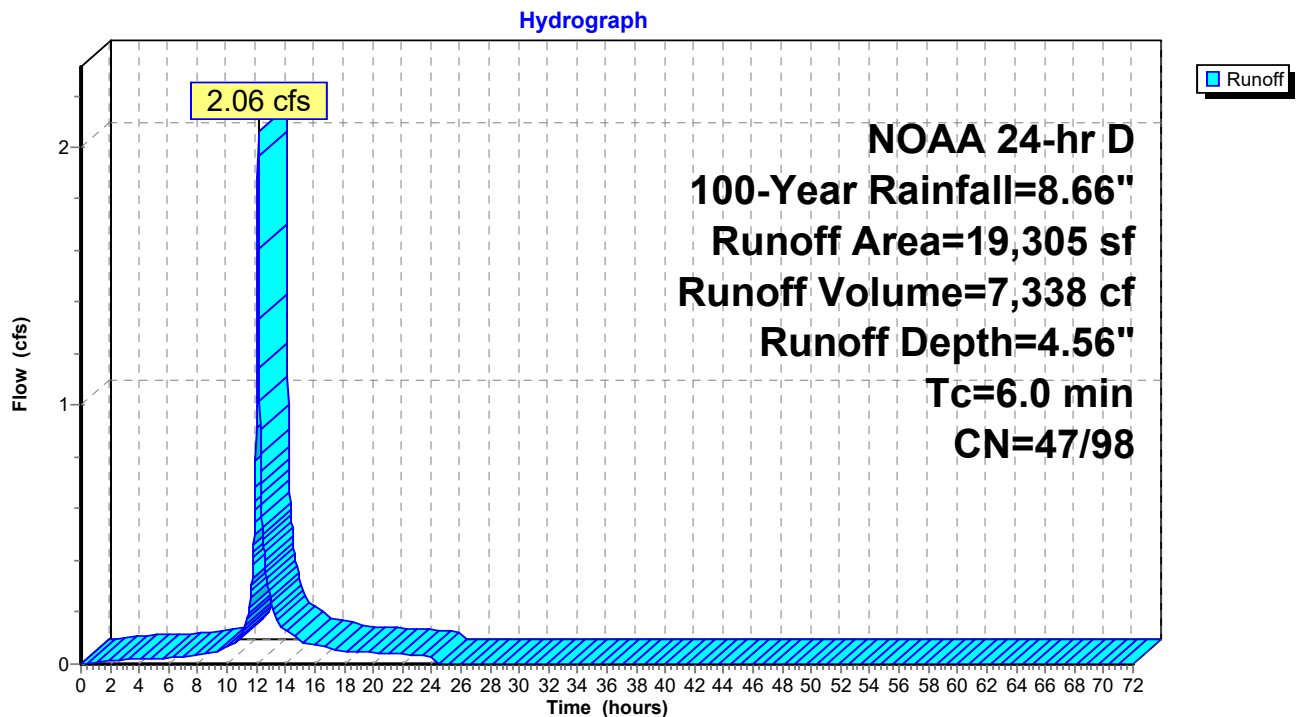
Runoff = 2.06 cfs @ 12.13 hrs, Volume= 7,338 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NOAA 24-hr D 100-Year Rainfall=8.66"

	Area (sf)	CN	Description
*	7,094	98	Impervious Surfaces
	2,835	72	Dirt roads, HSG A
	9,376	39	>75% Grass cover, Good, HSG A
	19,305	66	Weighted Average
	12,211	47	63.25% Pervious Area
	7,094	98	36.75% Impervious Area

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

Subcatchment P-1B: Proposed Direct Drainage to Pleasant Valley Way



Summary for Pond B-1: Underground StormTrap Basin

Inflow Area = 24,065 sf, 100.00% Impervious, Inflow Depth = 8.42" for 100-Year event
 Inflow = 4.56 cfs @ 12.13 hrs, Volume= 16,885 cf
 Outflow = 2.09 cfs @ 12.24 hrs, Volume= 16,882 cf, Atten= 54%, Lag= 6.9 min
 Primary = 2.09 cfs @ 12.24 hrs, Volume= 16,882 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 370.00' @ 12.24 hrs Surf.Area= 1,164 sf Storage= 3,490 cf

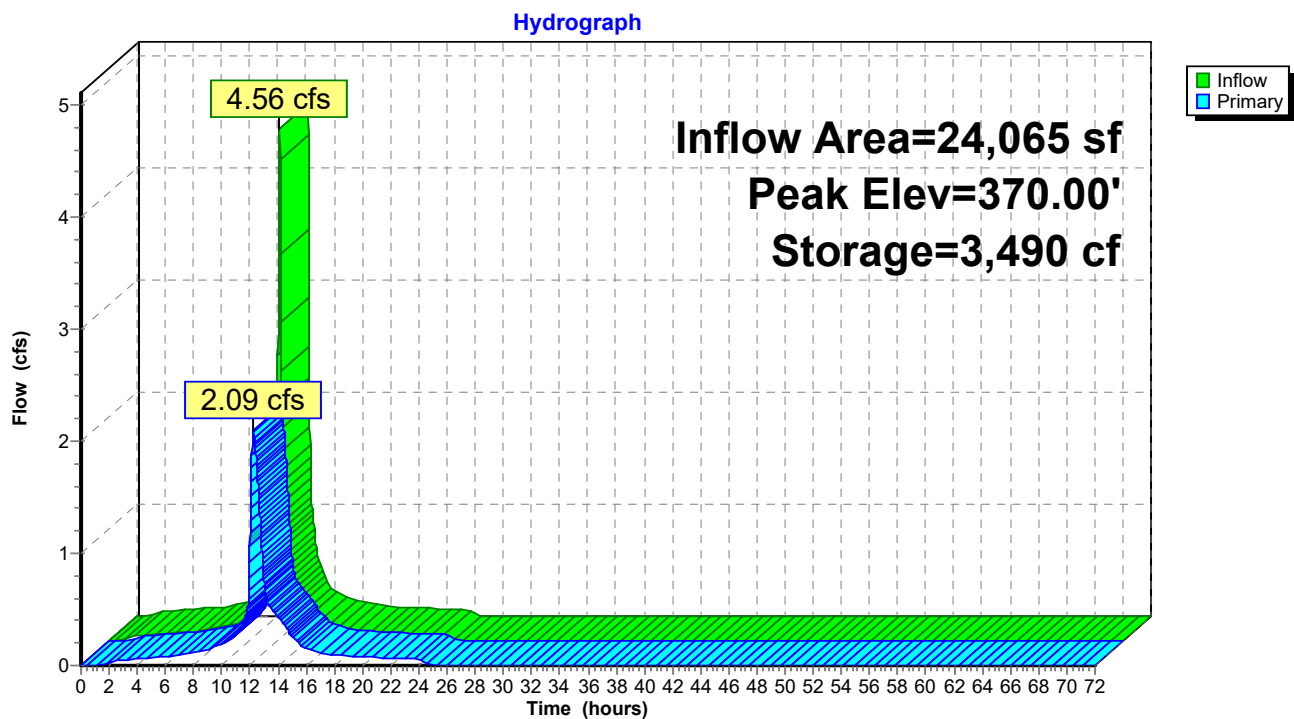
Plug-Flow detention time= 34.4 min calculated for 16,877 cf (100% of inflow)
 Center-of-Mass det. time= 34.7 min (775.7 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1	366.52'	3,510 cf	StormTrap ST1 SingleTrap 3-6 x 12 Inside= 82.7"W x 42.0"H => 20.80 sf x 14.06'L = 292.5 cf Outside= 82.7"W x 50.0"H => 28.73 sf x 14.06'L = 404.1 cf

Device	Routing	Invert	Outlet Devices
#1	Primary	366.52'	15.0" Round 15" Culvert L= 27.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 366.52' / 366.45' S= 0.0026 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	366.52'	4.0" W x 3.5" H Vert. 4.0 x 3.5" Slot C= 0.600
#3	Device 1	368.03'	6.0" Vert. 6.0" Orifice C= 0.600
#4	Device 1	370.02'	4.0' long x 0.5' breadth 4 Foot Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.09 cfs @ 12.24 hrs HW=370.00' TW=0.00' (Dynamic Tailwater)

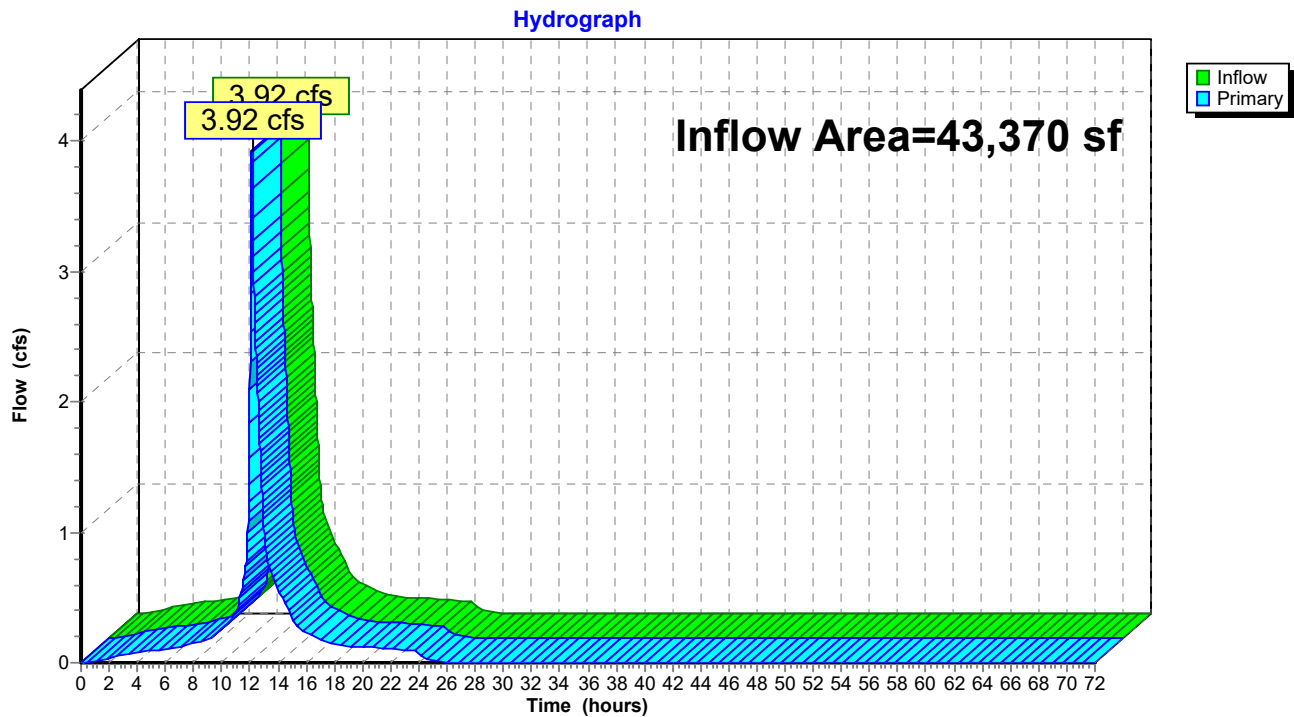
- 1=15" Culvert (Passes 2.09 cfs of 9.98 cfs potential flow)
- 2=4.0 x 3.5" Slot (Orifice Controls 0.85 cfs @ 8.79 fps)
- 3=6.0" Orifice (Orifice Controls 1.24 cfs @ 6.31 fps)
- 4=4 Foot Weir (Controls 0.00 cfs)

Pond B-1: Underground StormTrap Basin

Summary for Link P-1: Proposed Drainage to Pleasant Valley Way

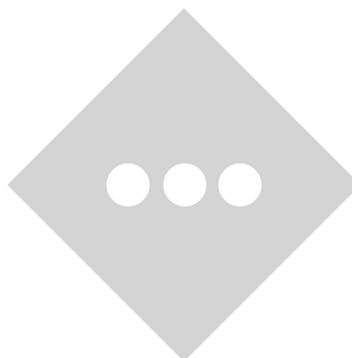
Inflow Area = 43,370 sf, 71.84% Impervious, Inflow Depth = 6.70" for 100-Year event
Inflow = 3.92 cfs @ 12.14 hrs, Volume= 24,220 cf
Primary = 3.92 cfs @ 12.14 hrs, Volume= 24,220 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Link P-1: Proposed Drainage to Pleasant Valley Way

APPENDIX C-6

BMP DISCHARGE & STORAGE TABLES



Summary for Pond B-1: Underground StormTrap Basin

Inflow Area = 24,065 sf, 100.00% Impervious, Inflow Depth = 8.42" for 100-Year event
 Inflow = 4.56 cfs @ 12.13 hrs, Volume= 16,885 cf
 Outflow = 2.09 cfs @ 12.24 hrs, Volume= 16,882 cf, Atten= 54%, Lag= 6.9 min
 Primary = 2.09 cfs @ 12.24 hrs, Volume= 16,882 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 370.00' @ 12.24 hrs Surf.Area= 1,164 sf Storage= 3,490 cf

Plug-Flow detention time= 34.4 min calculated for 16,877 cf (100% of inflow)
 Center-of-Mass det. time= 34.7 min (775.7 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1	366.52'	3,510 cf	StormTrap ST1 SingleTrap 3-6 x 12 Inside= 82.7"W x 42.0"H => 20.80 sf x 14.06'L = 292.5 cf Outside= 82.7"W x 50.0"H => 28.73 sf x 14.06'L = 404.1 cf

Device	Routing	Invert	Outlet Devices
#1	Primary	366.52'	15.0" Round 15" Culvert L= 27.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 366.52' / 366.45' S= 0.0026 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	366.52'	4.0" W x 3.5" H Vert. 4.0 x 3.5" Slot C= 0.600
#3	Device 1	368.03'	6.0" Vert. 6.0" Orifice C= 0.600
#4	Device 1	370.02'	4.0' long x 0.5' breadth 4 Foot Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.09 cfs @ 12.24 hrs HW=370.00' TW=0.00' (Dynamic Tailwater)

- 1=15" Culvert (Passes 2.09 cfs of 9.98 cfs potential flow)
- 2=4.0 x 3.5" Slot (Orifice Controls 0.85 cfs @ 8.79 fps)
- 3=6.0" Orifice (Orifice Controls 1.24 cfs @ 6.31 fps)
- 4=4 Foot Weir (Controls 0.00 cfs)

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NOAA 24-hr D 100-Year Rainfall=8.66"

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Stage-Discharge for Pond B-1: Underground StormTrap Basin

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
366.52	0.00	367.05	0.29	367.58	0.45	368.11	0.58
366.53	0.00	367.06	0.29	367.59	0.45	368.12	0.59
366.54	0.00	367.07	0.30	367.60	0.45	368.13	0.60
366.55	0.00	367.08	0.30	367.61	0.45	368.14	0.60
366.56	0.00	367.09	0.30	367.62	0.46	368.15	0.61
366.57	0.01	367.10	0.31	367.63	0.46	368.16	0.62
366.58	0.01	367.11	0.31	367.64	0.46	368.17	0.63
366.59	0.01	367.12	0.31	367.65	0.46	368.18	0.64
366.60	0.02	367.13	0.32	367.66	0.47	368.19	0.65
366.61	0.02	367.14	0.32	367.67	0.47	368.20	0.66
366.62	0.02	367.15	0.32	367.68	0.47	368.21	0.67
366.63	0.03	367.16	0.33	367.69	0.47	368.22	0.68
366.64	0.04	367.17	0.33	367.70	0.48	368.23	0.70
366.65	0.04	367.18	0.33	367.71	0.48	368.24	0.71
366.66	0.05	367.19	0.34	367.72	0.48	368.25	0.72
366.67	0.06	367.20	0.34	367.73	0.48	368.26	0.73
366.68	0.07	367.21	0.34	367.74	0.48	368.27	0.75
366.69	0.07	367.22	0.35	367.75	0.49	368.28	0.76
366.70	0.08	367.23	0.35	367.76	0.49	368.29	0.78
366.71	0.09	367.24	0.35	367.77	0.49	368.30	0.79
366.72	0.10	367.25	0.36	367.78	0.49	368.31	0.80
366.73	0.10	367.26	0.36	367.79	0.50	368.32	0.82
366.74	0.11	367.27	0.36	367.80	0.50	368.33	0.83
366.75	0.12	367.28	0.37	367.81	0.50	368.34	0.85
366.76	0.13	367.29	0.37	367.82	0.50	368.35	0.86
366.77	0.13	367.30	0.37	367.83	0.50	368.36	0.88
366.78	0.14	367.31	0.37	367.84	0.51	368.37	0.89
366.79	0.15	367.32	0.38	367.85	0.51	368.38	0.91
366.80	0.16	367.33	0.38	367.86	0.51	368.39	0.92
366.81	0.17	367.34	0.38	367.87	0.51	368.40	0.94
366.82	0.18	367.35	0.39	367.88	0.52	368.41	0.95
366.83	0.18	367.36	0.39	367.89	0.52	368.42	0.97
366.84	0.19	367.37	0.39	367.90	0.52	368.43	0.98
366.85	0.19	367.38	0.39	367.91	0.52	368.44	1.00
366.86	0.20	367.39	0.40	367.92	0.52	368.45	1.01
366.87	0.21	367.40	0.40	367.93	0.53	368.46	1.03
366.88	0.21	367.41	0.40	367.94	0.53	368.47	1.04
366.89	0.22	367.42	0.41	367.95	0.53	368.48	1.06
366.90	0.22	367.43	0.41	367.96	0.53	368.49	1.07
366.91	0.23	367.44	0.41	367.97	0.53	368.50	1.08
366.92	0.23	367.45	0.41	367.98	0.54	368.51	1.09
366.93	0.24	367.46	0.42	367.99	0.54	368.52	1.10
366.94	0.24	367.47	0.42	368.00	0.54	368.53	1.11
366.95	0.25	367.48	0.42	368.01	0.54	368.54	1.12
366.96	0.25	367.49	0.42	368.02	0.54	368.55	1.13
366.97	0.26	367.50	0.43	368.03	0.55	368.56	1.14
366.98	0.26	367.51	0.43	368.04	0.55	368.57	1.15
366.99	0.26	367.52	0.43	368.05	0.55	368.58	1.17
367.00	0.27	367.53	0.43	368.06	0.56	368.59	1.18
367.01	0.27	367.54	0.44	368.07	0.56	368.60	1.19
367.02	0.28	367.55	0.44	368.08	0.56	368.61	1.20
367.03	0.28	367.56	0.44	368.09	0.57	368.62	1.21
367.04	0.28	367.57	0.44	368.10	0.58	368.63	1.22

2021-05-07_HydroCad Calculations

NOAA 24-hr D 100-Year Rainfall=8.66"

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Stage-Discharge for Pond B-1: Underground StormTrap Basin (continued)

Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)	Elevation (feet)	Primary (cfs)
368.64	1.22	369.17	1.63	369.70	1.94	370.23	3.28
368.65	1.23	369.18	1.64	369.71	1.95	370.24	3.37
368.66	1.24	369.19	1.65	369.72	1.95	370.25	3.46
368.67	1.25	369.20	1.65	369.73	1.96	370.26	3.55
368.68	1.26	369.21	1.66	369.74	1.96	370.27	3.64
368.69	1.27	369.22	1.66	369.75	1.97	370.28	3.73
368.70	1.28	369.23	1.67	369.76	1.97	370.29	3.83
368.71	1.29	369.24	1.68	369.77	1.98	370.30	3.92
368.72	1.30	369.25	1.68	369.78	1.98	370.31	4.02
368.73	1.31	369.26	1.69	369.79	1.99	370.32	4.12
368.74	1.32	369.27	1.70	369.80	1.99	370.33	4.23
368.75	1.32	369.28	1.70	369.81	2.00	370.34	4.33
368.76	1.33	369.29	1.71	369.82	2.00	370.35	4.44
368.77	1.34	369.30	1.71	369.83	2.01	370.36	4.55
368.78	1.35	369.31	1.72	369.84	2.01	370.37	4.66
368.79	1.36	369.32	1.73	369.85	2.02	370.38	4.77
368.80	1.37	369.33	1.73	369.86	2.02	370.39	4.89
368.81	1.37	369.34	1.74	369.87	2.03	370.40	5.01
368.82	1.38	369.35	1.74	369.88	2.04	370.41	5.12
368.83	1.39	369.36	1.75	369.89	2.04	370.42	5.24
368.84	1.40	369.37	1.76	369.90	2.05	370.43	5.37
368.85	1.41	369.38	1.76	369.91	2.05	370.44	5.50
368.86	1.41	369.39	1.77	369.92	2.06	370.45	5.62
368.87	1.42	369.40	1.77	369.93	2.06	370.46	5.75
368.88	1.43	369.41	1.78	369.94	2.07	370.47	5.89
368.89	1.44	369.42	1.79	369.95	2.07	370.48	6.02
368.90	1.44	369.43	1.79	369.96	2.07	370.49	6.16
368.91	1.45	369.44	1.80	369.97	2.08	370.50	6.29
368.92	1.46	369.45	1.80	369.98	2.08	370.51	6.43
368.93	1.47	369.46	1.81	369.99	2.09	370.52	6.58
368.94	1.47	369.47	1.82	370.00	2.09	370.53	6.72
368.95	1.48	369.48	1.82	370.01	2.10	370.54	6.87
368.96	1.49	369.49	1.83	370.02	2.10	370.55	7.01
368.97	1.50	369.50	1.83	370.03	2.12	370.56	7.16
368.98	1.50	369.51	1.84	370.04	2.15	370.57	7.32
368.99	1.51	369.52	1.84	370.05	2.18	370.58	7.47
369.00	1.52	369.53	1.85	370.06	2.21	370.59	7.62
369.01	1.52	369.54	1.85	370.07	2.25	370.60	7.78
369.02	1.53	369.55	1.86	370.08	2.30	370.61	7.94
369.03	1.54	369.56	1.87	370.09	2.35	370.62	8.10
369.04	1.55	369.57	1.87	370.10	2.40	370.63	8.27
369.05	1.55	369.58	1.88	370.11	2.45	370.64	8.44
369.06	1.56	369.59	1.88	370.12	2.51	370.65	8.62
369.07	1.57	369.60	1.89	370.13	2.57	370.66	8.79
369.08	1.57	369.61	1.89	370.14	2.63	370.67	8.97
369.09	1.58	369.62	1.90	370.15	2.69	370.68	9.15
369.10	1.59	369.63	1.90	370.16	2.76	370.69	9.33
369.11	1.59	369.64	1.91	370.17	2.83		
369.12	1.60	369.65	1.92	370.18	2.90		
369.13	1.61	369.66	1.92	370.19	2.97		
369.14	1.61	369.67	1.93	370.20	3.05		
369.15	1.62	369.68	1.93	370.21	3.12		
369.16	1.63	369.69	1.94	370.22	3.20		

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Stage-Area-Storage for Pond B-1: Underground StormTrap Basin

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
366.52	0	367.05	532	367.58	1,063
366.53	10	367.06	542	367.59	1,073
366.54	20	367.07	552	367.60	1,083
366.55	30	367.08	562	367.61	1,093
366.56	40	367.09	572	367.62	1,103
366.57	50	367.10	582	367.63	1,113
366.58	60	367.11	592	367.64	1,123
366.59	70	367.12	602	367.65	1,133
366.60	80	367.13	612	367.66	1,143
366.61	90	367.14	622	367.67	1,153
366.62	100	367.15	632	367.68	1,163
366.63	110	367.16	642	367.69	1,173
366.64	120	367.17	652	367.70	1,183
366.65	130	367.18	662	367.71	1,193
366.66	140	367.19	672	367.72	1,203
366.67	150	367.20	682	367.73	1,213
366.68	160	367.21	692	367.74	1,223
366.69	170	367.22	702	367.75	1,234
366.70	181	367.23	712	367.76	1,244
366.71	191	367.24	722	367.77	1,254
366.72	201	367.25	732	367.78	1,264
366.73	211	367.26	742	367.79	1,274
366.74	221	367.27	752	367.80	1,284
366.75	231	367.28	762	367.81	1,294
366.76	241	367.29	772	367.82	1,304
366.77	251	367.30	782	367.83	1,314
366.78	261	367.31	792	367.84	1,324
366.79	271	367.32	802	367.85	1,334
366.80	281	367.33	812	367.86	1,344
366.81	291	367.34	822	367.87	1,354
366.82	301	367.35	832	367.88	1,364
366.83	311	367.36	842	367.89	1,374
366.84	321	367.37	852	367.90	1,384
366.85	331	367.38	862	367.91	1,394
366.86	341	367.39	872	367.92	1,404
366.87	351	367.40	883	367.93	1,414
366.88	361	367.41	893	367.94	1,424
366.89	371	367.42	903	367.95	1,434
366.90	381	367.43	913	367.96	1,444
366.91	391	367.44	923	367.97	1,454
366.92	401	367.45	933	367.98	1,464
366.93	411	367.46	943	367.99	1,474
366.94	421	367.47	953	368.00	1,484
366.95	431	367.48	963	368.01	1,494
366.96	441	367.49	973	368.02	1,504
366.97	451	367.50	983	368.03	1,514
366.98	461	367.51	993	368.04	1,524
366.99	471	367.52	1,003	368.05	1,534
367.00	481	367.53	1,013	368.06	1,544
367.01	491	367.54	1,023	368.07	1,554
367.02	501	367.55	1,033	368.08	1,564
367.03	511	367.56	1,043	368.09	1,574
367.04	521	367.57	1,053	368.10	1,585

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Stage-Area-Storage for Pond B-1: Underground StormTrap Basin (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
368.11	1,595	368.64	2,126	369.17	2,658
368.12	1,605	368.65	2,136	369.18	2,668
368.13	1,615	368.66	2,146	369.19	2,678
368.14	1,625	368.67	2,156	369.20	2,688
368.15	1,635	368.68	2,166	369.21	2,698
368.16	1,645	368.69	2,176	369.22	2,708
368.17	1,655	368.70	2,186	369.23	2,718
368.18	1,665	368.71	2,196	369.24	2,728
368.19	1,675	368.72	2,206	369.25	2,738
368.20	1,685	368.73	2,216	369.26	2,748
368.21	1,695	368.74	2,226	369.27	2,758
368.22	1,705	368.75	2,236	369.28	2,768
368.23	1,715	368.76	2,246	369.29	2,778
368.24	1,725	368.77	2,256	369.30	2,788
368.25	1,735	368.78	2,266	369.31	2,798
368.26	1,745	368.79	2,276	369.32	2,808
368.27	1,755	368.80	2,287	369.33	2,818
368.28	1,765	368.81	2,297	369.34	2,828
368.29	1,775	368.82	2,307	369.35	2,838
368.30	1,785	368.83	2,317	369.36	2,848
368.31	1,795	368.84	2,327	369.37	2,858
368.32	1,805	368.85	2,337	369.38	2,868
368.33	1,815	368.86	2,347	369.39	2,878
368.34	1,825	368.87	2,357	369.40	2,888
368.35	1,835	368.88	2,367	369.41	2,898
368.36	1,845	368.89	2,377	369.42	2,908
368.37	1,855	368.90	2,387	369.43	2,918
368.38	1,865	368.91	2,397	369.44	2,928
368.39	1,875	368.92	2,407	369.45	2,938
368.40	1,885	368.93	2,417	369.46	2,948
368.41	1,895	368.94	2,427	369.47	2,958
368.42	1,905	368.95	2,437	369.48	2,968
368.43	1,915	368.96	2,447	369.49	2,978
368.44	1,925	368.97	2,457	369.50	2,989
368.45	1,936	368.98	2,467	369.51	2,999
368.46	1,946	368.99	2,477	369.52	3,009
368.47	1,956	369.00	2,487	369.53	3,019
368.48	1,966	369.01	2,497	369.54	3,029
368.49	1,976	369.02	2,507	369.55	3,039
368.50	1,986	369.03	2,517	369.56	3,049
368.51	1,996	369.04	2,527	369.57	3,059
368.52	2,006	369.05	2,537	369.58	3,069
368.53	2,016	369.06	2,547	369.59	3,079
368.54	2,026	369.07	2,557	369.60	3,089
368.55	2,036	369.08	2,567	369.61	3,099
368.56	2,046	369.09	2,577	369.62	3,109
368.57	2,056	369.10	2,587	369.63	3,119
368.58	2,066	369.11	2,597	369.64	3,129
368.59	2,076	369.12	2,607	369.65	3,139
368.60	2,086	369.13	2,617	369.66	3,149
368.61	2,096	369.14	2,627	369.67	3,159
368.62	2,106	369.15	2,638	369.68	3,169
368.63	2,116	369.16	2,648	369.69	3,179

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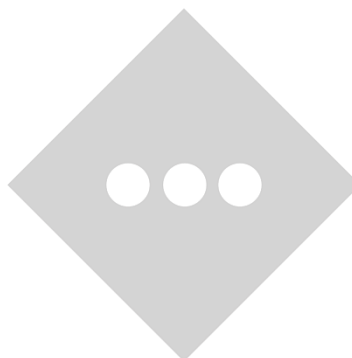
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Stage-Area-Storage for Pond B-1: Underground StormTrap Basin (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
369.70	3,189	370.23	3,510
369.71	3,199	370.24	3,510
369.72	3,209	370.25	3,510
369.73	3,219	370.26	3,510
369.74	3,229	370.27	3,510
369.75	3,239	370.28	3,510
369.76	3,249	370.29	3,510
369.77	3,259	370.30	3,510
369.78	3,269	370.31	3,510
369.79	3,279	370.32	3,510
369.80	3,289	370.33	3,510
369.81	3,299	370.34	3,510
369.82	3,309	370.35	3,510
369.83	3,319	370.36	3,510
369.84	3,329	370.37	3,510
369.85	3,339	370.38	3,510
369.86	3,350	370.39	3,510
369.87	3,360	370.40	3,510
369.88	3,370	370.41	3,510
369.89	3,380	370.42	3,510
369.90	3,390	370.43	3,510
369.91	3,400	370.44	3,510
369.92	3,410	370.45	3,510
369.93	3,420	370.46	3,510
369.94	3,430	370.47	3,510
369.95	3,440	370.48	3,510
369.96	3,450	370.49	3,510
369.97	3,460	370.50	3,510
369.98	3,470	370.51	3,510
369.99	3,480	370.52	3,510
370.00	3,490	370.53	3,510
370.01	3,500	370.54	3,510
370.02	3,510	370.55	3,510
370.03	3,510	370.56	3,510
370.04	3,510	370.57	3,510
370.05	3,510	370.58	3,510
370.06	3,510	370.59	3,510
370.07	3,510	370.60	3,510
370.08	3,510	370.61	3,510
370.09	3,510	370.62	3,510
370.10	3,510	370.63	3,510
370.11	3,510	370.64	3,510
370.12	3,510	370.65	3,510
370.13	3,510	370.66	3,510
370.14	3,510	370.67	3,510
370.15	3,510	370.68	3,510
370.16	3,510	370.69	3,510
370.17	3,510		
370.18	3,510		
370.19	3,510		
370.20	3,510		
370.21	3,510		
370.22	3,510		

APPENDIX D

SUBSURFACE STORMWATER INVESTIGATION RESULTS



**PRELIMINARY
SOIL AND FOUNDATION
ENGINEERING REPORT**

PROPOSED SELF STORAGE FACILITY

**955 Pleasant Valley Way
West Orange Township
Essex County, New Jersey**

FOR

**SOLOMON BUILDERS
141 Ayers Court, Suite 1A
Teaneck, NJ 07666**

March 24, 2020

**UNDERWOOD ENGINEERING COMPANY
U.E. Reference No: 4667-13907-1 (WO 20-2658)**

UNDERWOOD ENGINEERING COMPANY

SOIL & FOUNDATION ENGINEERING

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, PE - President

Phone (856) 933-1818 Fax (856) 933-3121

3/24/2020

Solomon Builders

141 Ayers Court, Suite 1A
Teaneck, NJ 07666

RE: Preliminary Soil and Foundation Engineering Report
Proposed Self Storage Facility
955 Pleasant Valley Way
West Orange Township
Essex County, New Jersey

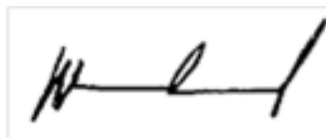
U.E. Reference No: 4667-13907-1 (WO 20-2658)

Sir / Madame:

Underwood Engineering Company has been retained by Solomon Builders to perform a preliminary soil investigation, analysis and to make recommendations for the most suitable foundation system for the above referenced project. Presented herewith is the required information.

We appreciate the opportunity of working with you on this project. If we may be of further assistance, please do not hesitate to contact our office.

Respectfully submitted,
Underwood Engineering Company



William R. Underwood, P.E.
President



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I SITE DESCRIPTION

A. Location

The building site is located at 955 Pleasant Valley Way in West Orange Township, Essex County, New Jersey.

B. Surface Conditions

The proposed building site is an existing commercial property occupied by a one story (United Rent All Facility) masonry building with associated parking lot along the West side and the East side consists of a vacant asphalt lot with several concrete slabs and curbs. An existing masonry retaining wall runs along the lower Northeast section of the site. The rear of the property consists of a steep wooded slope.

The middle section of the property is moderately sloped with existing ground surface elevations ranging from approximate elevations 379.00 to 372.00. The Southwest corner of the proposed building area is significantly sloped with existing ground surface elevations ranging from approximate elevations 395.00 to 373.00. The Northeast corner of the proposed building area is significantly sloped with existing ground surface elevations ranging from approximate elevations 400.00 to 373.00.

C. Site Plans

A site plan (B-1) showing the proposed building location was prepared by Stonefield Engineering & Design, dated 10/18/2019, Entitled “Concept Plan B, Proposed Self-Storage Facility, Block 172.02, Lot 8.01 & 8.03, 955 Pleasant Valley Way, Township of West Orange, Essex County, New Jersey.”

A site plan (B-3) showing the proposed building location, existing conditions, test boring locations and infiltration test locations was prepared by Stonefield Engineering & Design, dated 11/13/2019, Entitled “Concept

Plan B (Survey Overlay), Proposed Self-Storage Facility, Block 172.02, Lot 8.01 & 8.03, 955 Pleasant Valley Way, Township of West Orange, Essex County, New Jersey.”

II PROJECT DESCRIPTION

A. Type of Structure

The project is to consist of the proposed construction of a four (4) story self-storage facility with basement and 1,011 SF office. The overall building measures approximately 331 feet long by 110 feet wide by 55 feet tall in plan area. Floors 2 – 4 are cantilevered at the front of the building to provide covered parking and the rear of the building will be partially cut into the existing slope. The project will also consist of related parking, drive aisles and stormwater management areas.

Framework for the proposed building is anticipated to be structural steel and masonry, concrete slab on grade construction.

Reinforced concrete retaining walls (heights and locations pending design) to be designed by others are also planned for the project.

B. Structural Load Data

Anticipated loading conditions for the proposed structure are as follows:

Column Loads: 23.3 kips.

C. Finished Floor Elevations

Finalized project grading was not available for review as of the published date of this report. All project grading information is to be supplied to Underwood Engineering Company as it is made available so that additions, corrections or modifications to the recommendations contained herein may be made, if necessary.

Based on preliminary data provided the site will require a cut of approximately 11 to 15 feet through the moderately sloped middle portion of

the site and cuts of approximately 25 to 33 feet into the rear slope to achieve the basement finished floor and first floor elevations.

The proposed finished floor elevations are as follows:

Proposed basement finished floor elevation: 361.00

Proposed first floor elevation: 372.00

Note: It is the understanding of this office that based on groundwater and seasonal high groundwater conditions, the basement finished floor elevations will be designed by others to ensure that the basements are not adversely affected by groundwater infiltration.

III FIELD INVESTIGATION & SUBSURFACE CONDITIONS

A. Field Investigation

1) Test Borings

The preliminary field investigation for the building consisted of four (4) test borings advanced to depths of approximately six and one half (6.5), seven (7), twelve and one half (12.5) and twenty-one (21) feet below the existing ground surface elevations with Standard Penetration Resistance per ASTM D-1586 on March 24th, 2020.

The field investigation for the potential stormwater management areas consisted of four (4) continuous test borings advanced to depths of approximately eight and one half (8.5) and twelve (12) feet below the existing ground surface elevations with Standard Penetration Resistance per ASTM D-1586 on March 24th, 2020.

The findings and locations are shown in Appendices A and B to include the Boring Location Plan and Soil Boring logs.

Important Note: Test borings TB-1, TB-2 and TB-3 in the rear of the property were un accessible due to the steep wooded slope. These test borings need to be performed once the site is cleared and

accessible for the drill rig. The completion of the remaining test boring program is required to confirm suitable bearing and to verify consistency of soil conditions as encountered.

The site soils encountered consisted generally of the following profile:

Zone 1

Miscellaneous fills consisting of loose, medium dense and dense fine to coarse sands, little to some silts and little / some / and amounts of stone, asphalt, brick, concrete, etc. were encountered in test borings TB-4, P-2 & P-3 directly below the existing ground surface elevations to depths of approximately two (2), four (4) and eight (8) feet below the existing ground surface elevations. Based on Standard Penetration Test (SPT) data recorded during the drilling operations, test boring P-3 is considered loose to a depth of approximately four (4) feet below the existing ground surface elevations.

Zone 2

Fills consisting of very loose and loose fine to coarse sands and gravels and very loose, loose fine to coarse gravels with some / and amounts of silts were encountered in test borings TB-6 and P-3 directly below the existing ground surface elevations and the Zone 1 materials to depths of approximately twelve (12) and twelve and one half (12.5) feet below the existing ground surface elevations. Test boring P-3 was terminated in the loose Zone 2 fills at a depth of approximately twelve (12) feet below the existing ground surface elevations.

Zone 3

Medium dense and dense fine to coarse sands with little to some amounts of silt and little to some amounts of fine to coarse gravels / rock fragments were encountered in test borings TB-4, TB-5, TB-7, P-1 and P-4 directly below the existing ground surface elevations and the Zone 1

materials to depths of approximately two (2), six (6) and eight (8) feet below the existing ground surface elevations.

Zone 4

Hard Silty Clay was encountered in test boring P-2 directly below the Zone 1 materials. Test boring P-2 was terminated in the hard Zone 4 materials at a depth of approximately twelve (12) feet below the existing ground surface elevations.

Zone 5

Dense weathered siltstone, dense sandstone with some silty clays and dense rock fragments were encountered in test borings TB-4, TB-5, TB-6, TB-7, P-1 and P-4 directly below the Zone 2 and Zone 3 soils to termination depths. Test boring P-1 was terminated in the hard Zone 5 materials at a depth of approximately twelve (12) feet below the existing ground surface elevations. Test borings TB-4, TB-5, TB-6, TB-7 and P-4 were terminated in the hard Zone 5 materials due to auger refusals at depths of approximately twenty-one (21), six and one half (6.5), twelve and one half (12.5), seven (7) and eight and one half (8.5) feet below the existing ground surface elevations.

See attached Soil Boring Logs (Appendix B) for more detailed soil descriptions and profiles.

2) Water Table

The ground water table was encountered in test borings TB-6, P-1, P-2 & P-3 at depths of approximately ten (10) to eleven (11) feet below the existing ground surface elevations as evidenced by direct observation and saturation of the soil samples.

It should be noted that the ground water data presented on the individual boring logs may not be representative of daily or seasonal variations in the ground water level.

3) Field Infiltration Testing

A total of four (4) cased bore hole infiltration tests were performed per ASTM D-6391 on March 24th, 2020 at depths and locations determined by the project Civil Engineer (Stonefield Engineering & Design). The cased bore hole tests were conducted at depths of approximately six (6) feet below the existing ground surface elevations.

The table below illustrates the field infiltration rates at the areas tested.

Test Boring Location	Depth of Test Below Existing Ground Surface Elevation	Soil Classification at Test Location	Infiltration Rate (in./hr.)
P-1	6 ft.	Weathered SILTSTONE	6.25
P-2	6 ft.	Miscellaneous Fill, f/c SAND a. Stone, Asphalt	8.25
P-3	6 ft.	Fill f/c GRAVEL a. f/c. Sand	> 20.0
P-4	6 ft.	f./m. SAND, l. Silt	9.0

IV RECOMMENDATIONS

A. Earthwork

1) Existing Topsoil & Deleterious Conditions

All existing asphalt paving, concrete curbing, any vegetation / topsoil, demolition debris, old foundation elements, abandoned utilities, miscellaneous fills / fills, and all deleterious materials are to be removed from the proposed building and paved areas.

All miscellaneous uncontrolled fill materials and uncontrolled loose fills, as observed in Zone 1 & Zone 2 of the test borings described above are to be removed from the proposed building area to a width of five (5)

feet beyond the building line to stable natural ground. The exact depths of the excavations are to be determined by a representative of the Soil Engineer at the time that the areas are excavated. It is anticipated that the required over-excavations will be in the order of two (2) to twelve (12.5) feet in depth to address the overlying Zone 1 miscellaneous fills and Zone 2 loose fills encountered. Deeper excavations may be required where fill / loose soil is encountered in areas other than those identified during the initial subsurface investigation.

All excavations must be conducted according OSHA Guidelines and temporary shoring must be designed and implemented to prevent loss of lateral support for the surrounding subgrades, slopes, streets etc.

Important Notes:

It is imperative that test pits be performed to identify the limits and extents of miscellaneous fills / fills and to properly address the removal of all loose, uncontrolled fill soils and miscellaneous debris. The completion of the proposed test pit program is also required to confirm suitable bearing, verify consistency of soil conditions as encountered.

It is recommended that test pits also be performed utilizing the type of equipment planned for construction in the area of the proposed basements to ascertain the rip ability of the rock which maybe be encountered during construction. The test pits are important in order to ascertain if the onsite soils can be excavated utilizing standard construction equipment such as dozers and track excavators etc. or if specialized equipment and techniques such as the use of hydraulic rippers on dozers and hydraulic jackhammers mounted to excavators will need to be utilized.

2) Construction Dewatering

Based on the test boring data, groundwater may be encountered during the earthwork activities, excavation of miscellaneous fills, excavation of the basement, utilities etc. Should water be encountered, the dewatering specifications should be of a type capable of maintaining the water table a minimum of two (2) feet below the prevailing excavation bottom during the excavations as well as during backfill operations. As stated above, groundwater and/or perched water levels encountered during construction may vary from those encountered during soil boring operations due to seasonal variations or other climatic conditions. Should water be encountered during earthwork activities, foundation excavations and utility trenches, etc., temporary dewatering may be required i.e. installation of sump pits/pumps.

3) Foundation Waterproofing

Based on preliminary information, the proposed basement of the building would be established at or close to the groundwater elevations. Permanent building drainage systems will need to be designed and provided to limit the amount of water that could become trapped along the foundation walls and under the floor slabs.

It is recommended that a waterproof membrane be applied to the underground walls and a sump and pump system installed. It is also recommended that interior slab drains and exterior perimeter drains be installed to remove any water that accumulates. The drains should be perforated, wrapped in filter fabric, covered in clean stone and connected to a sump / pump system or gravity fed if elevations allow.

4) Proofrolling & Densification

The exposed subgrades for the slab on grades and paved areas are to be proofrolled with a vibrator compactor in the presence of the soil engineer to detect and repair any unsuitable soil conditions and to attain a uniform firm subgrade throughout. Any loose soils encountered may be densified by proofrolling and further compaction by additional passes if necessary. This is extremely important due to areas of loose soils encountered in the soil borings.

Prior to placement of structural fills, building pad area subgrades and paved areas are to be densified utilizing a 20-ton equivalent vibratory compactor. A minimum of six (6) passes over the building subgrade areas is recommended.

It is anticipated that once the site miscellaneous fills are removed, the prevailing subgrade soils will require scarification / aeration to allow the soils to dry to within optimum moisture content ranges so that proper compaction of the soils can be achieved. This will need to be performed only during dry weather conditions. Operation of heavy equipment on the site during wet conditions could result in excessive rutting.

Over excavation / replacement and or stabilization utilizing stone and geogrids of these soils may be required if the soils cannot be properly compacted in a suitable time frame.

5) Structural Fill Placement

Bring existing grade up to the desired elevation with a granular type soil that complies with the following specifications or soils which are reviewed and approved by the soil engineer and compact it to within the specifications listed under **Compaction**, unless approved by the Soils Engineer.

<u>SIEVE SIZE</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
2"	100
3/4"	70-100
#4	30-80
#50	10-35
#200	5-12

Bulk samples of all materials to be used as structural load-bearing fill must be taken and tested prior to the commencement of work and placement of select fill so that moisture/density relationships (compaction) can be determined.

6) On Site Soils

On site granular soils having a maximum particle size of four (4) inches in diameter, as approved by the Soil Engineer, are suitable for use as load-bearing fill but will require strict moisture control due to the presence of fine grain materials (i.e. silt and clays). If the on-site soils are used as structural fill, they must be placed under favorable weather conditions and may require conditioning (i.e. aeration, moisture reducing applications) such that they are dried to within optimum moisture content ranges. This is extremely important to properly compact the soils as specified herein. If inclement weather is a factor, the onsite soils may be unsuitable, and provisions should be taken to import suitable structural materials and / or the use of moisture reducing applications.

On site silts and clays are generally not suitable for use as structural fill due to the difficulty of achieving optimum moisture content ranges for compaction and are not suited for reuse during periods of wet weather without the use of moisture reducing agents.

On site miscellaneous fills consisting of rubble materials are not suitable for use as structural fill.

7) Backfilling & Densification of Load-Bearing Fill

Building subgrades may be brought up to desired elevation with approved structural fill in lifts no greater than twelve (12) inches loose thickness and compacted to 95 % of the material's dry density per ASTM D-1557 as illustrated below. Materials compacted by hand operated equipment shall be placed in lifts no greater than four (4) inches loose thickness.

8) Compaction

All backfill and fill materials should be compacted to the degree noted in the following table in accordance with ASTM D-1557 latest standard.

<u>Building Area</u>	<u>% Maximum Dry Density (ASTM D-1557)</u>
Supporting Foundations	95%
Supporting Floor Slabs	95%
Pavements	95%
Site (Non-Load Bearing)	90%

9) Foundation Compaction

All exposed footing subgrades are to be compacted by two (2) passes with a jumping jack compactor immediately prior to the placement of the footing concrete.

Foundation subgrades founded on intact rock are to be lined with a minimum of 4 inches of crushed stone to provide a uniform, level bearing surface for the concrete footings to bear on.

B. Building Foundation

1) Type

The proposed self-storage building is to be supported by a spread footing foundation system.

2) Elevation

The footings may be placed at any elevation provided the minimum depth criteria is met and the recommendations listed herein are performed.

3) Minimum Depth of Foundation

All footing bottoms are to be founded at least three (3) feet beneath or away from atmospherically exposed final soil subgrade.

4) Allowable Bearing Values

The spread footing foundations may be designed for a maximum allowable bearing capacity of 4,000 Pounds per Square Foot provided that the requirements under Earthwork are adhered to strictly.

5) Settlements

Using the allowable bearing value and following the recommendations under Earthwork will keep total and differential settlements negligible.

C. Lateral Earth Pressures

The following values may be used for calculating lateral earth pressures:

Active Earth Pressure Coefficient, $K_A = 0.32$

At Rest Earth Pressure Coefficient, $K_R = 0.40$

Passive Earth Pressure Coefficient, $K_P = 4.00$

Unit Weight of Soil, $\gamma = 120 \text{ lbs. / ft}^3$

The above values assume, a porous, free draining backfill soil.

D. Seismic Considerations

For Seismic Site Classification, use Site Class C¹.

E. Concrete Floor Slabs

Concrete floor slabs may be placed on grade provided they are underlain by a minimum of four (4) inches of porous material and all soft areas are to be removed and repaired as recommended under Earthwork.

F. Paved Areas

1) Subgrade Preparation

After the procedures as outlined under Proofrolling are completed, the subgrade should be compacted to 95% of the material's Maximum Dry Density (ASTM D-1557). Prior to the installation of the bituminous base course the subgrade is to be proof rolled with a loaded ten-wheel dump truck in the presence of the soils engineer. This is extremely important and will be the primary criteria for subgrade acceptance. Any localized weak areas are to be repaired.

¹ Data obtained from International Building Code

2) Design Criteria

In the design of pavements, a maximum CBR value of ten (10) should be used.

3) Stone Base Course

Pavement areas are to be provided with at least a four (4) inch thick crushed stone or coarse gravel base course.

4) Reinforcing Fabric

A geotechnical reinforcing fabric (Mirafi 500X or equal) should be considered for placement under any heavy traffic areas.

V INSPECTION

It is strongly recommended that all earthwork operations be inspected full time by a qualified representative of the Soil Engineer, especially the proofrolling operations and all footing subgrades immediately prior to placing the footing concrete. Foundation excavation evaluations should be performed to confirm that the design allowable bearing pressure is available. Footing subgrade evaluations should be performed through a combination of visual observation and hand rod probing in conjunction with comparison to the test borings. Concrete placement should be performed immediately after footing subgrade evaluations are made to prevent exposure and potential weakening of foundation subgrades.

VI QUALIFICATIONS

Our recommendations are based on the subsurface conditions as revealed by the test borings, and on the assumptions outlined in the Project Description and Site Description sections of this report.

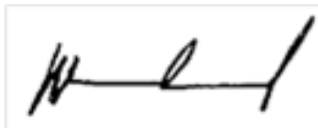
Our recommendations are also based on the assumption that the provisions for strict field inspection will be followed as outlined.

This report does not reflect any variations, which may be encountered during construction.

We should be informed immediately of such conditions so that we may modify our conclusions and recommendations, if necessary.

Underwood Engineering Company will not be responsible for variations in subsurface soils encountered in areas other than those tested.

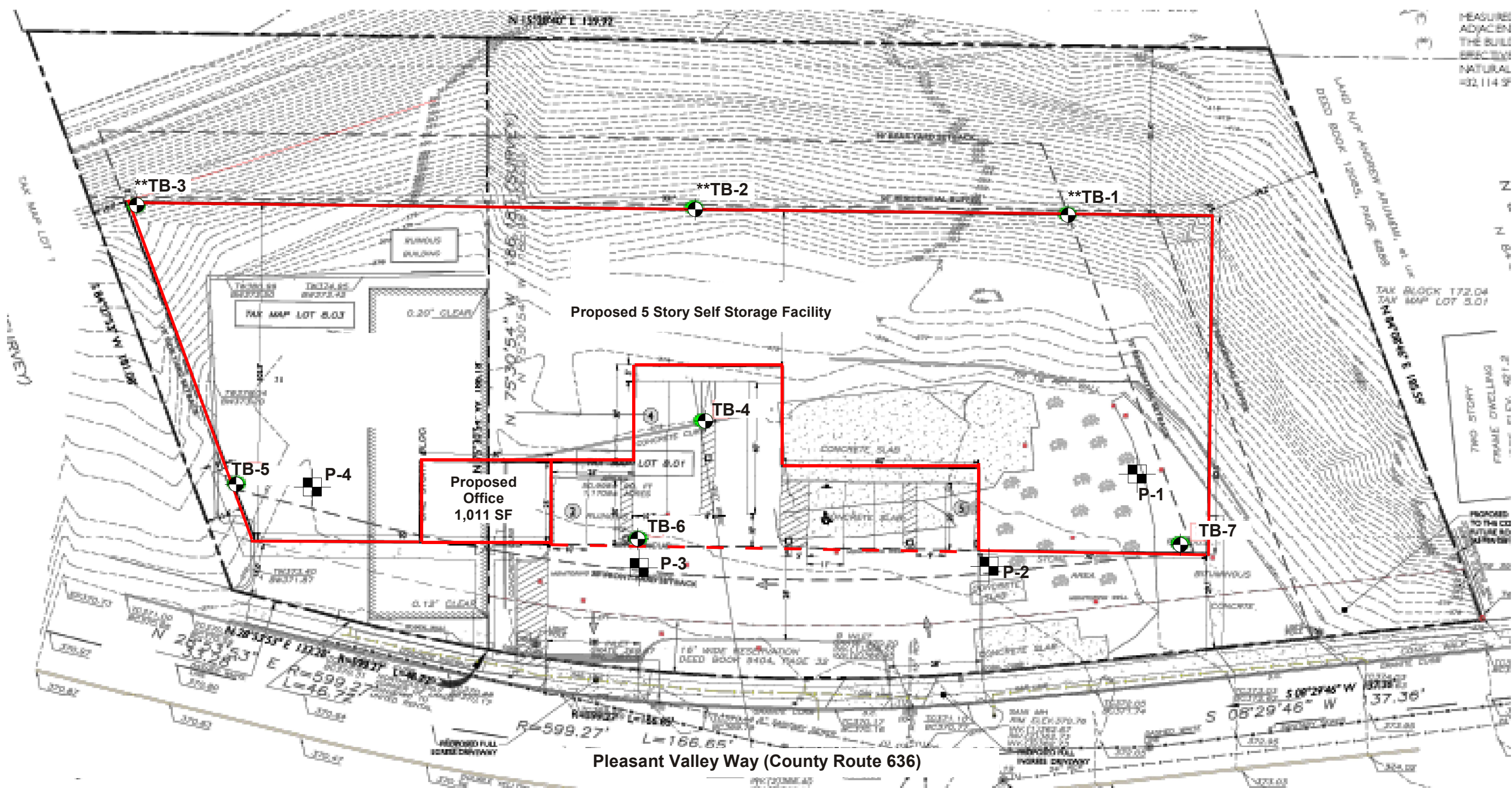
Respectfully submitted,
Underwood Engineering Company



William R. Underwood, P.E.
President



Appendix A
Boring Location Plan



****TB-1, TB-2 & TB-3**
Future Borings to be Performed
Once Site is Clear and Accessible
to Drill Rig

Modified Borehole Percolation Test P- 
Test Boring Location T.B.- 

SOLOMON BUILDERS		Boring Location Plan			Proposed Self Storage Facility 955 Pleasant Valley Way West Orange Essex County, New Jersey
Underwood Engineering Company		Scale: N.T.S.	Date: March 24, 2020	UE Ref. No.: 4667-13907-1	

Appendix B

Boring Logs

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: T.B.-4

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
NE ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 10'
HOLLOW STEM AUGERS	10' TO 21'
2" O.D. SPLIT SPOON	18' TO 20'

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
5		S-1	0'-2'	10-14-24-30	1" Asphalt , Brown Miscellaneous FILL, f/m SAND, s. Silt, s. Stone
		S-2	2'-4'	50/1"	ROCK Fragmnets
		S-3	4'-6'	22-28-31-41	Brown fine to medium SAND, some Silt, some fine to coarse Gravel
		S-4	6'-8'	32-29-40-45	
10		S-5	8'-10'	50/2"	Red / gray WEATHERED SILTSTONE
		S-6	13'-15'	50/2"	
15					Auger Refusal @ 21'
		S-7	18'-20'	50/0"	
		S-8	23'-25'		
25					Auger Refusal @ 21'
30					Auger Refusal @ 21'

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: T.B.-5

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
NE ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 6'
HOLLOW STEM AUGERS	6' TO 6.5'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
5		S-1	0'-2'	15-18-15	3" Asphalt Red f/m SAND, s. Silt, l. f/m Gravel
		S-2	2'-4'	20-35-50/4"	
		S-3	4'-6'	50/2"	Gray ROCK FRAGMENTS
		S-4	6'-8'	50/1"	
		S-5	8'-10'		
10					Auger Refusal @ 6.5'
		S-6	13'-15'		
15					
		S-7	18'-20'		
20					
		S-8	23'-25'		
25					
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: T.B.-6

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
10' ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 10'
HOLLOW STEM AUGERS	10' TO 12.5'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
5		S-1	0'-2'	10-9-5	1" Asphalt Brown FILL, fine to coarse SAND and fine to medium Gravel
		S-2	2'-4'	5-3-3-3	
		S-3	4'-6'	2-2-2-1	
		S-4	6'-8'	2-2-2-2	Brownish gray FILL, fine to medium GRAVEL, some fine to coarse Sand
10		S-5	8'-10'	2-1-1-3	
					Auger Refusal @ 12.5'
		S-6	13'-15'		
15					
		S-7	18'-20'		
20					
		S-8	23'-25'		
25					
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: T.B.-7

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
NE ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 6'
HOLLOW STEM AUGERS	6' TO 7'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
5		S-1	0'-2'	12-9-13-13	Red fine to medium SAND, little Silt
		S-2	2'-4'	14-16-18-15	
		S-3	4'-6'	30-27-28-50/2"	Red fine to medium l. Silt, l. Rock Fragments
		S-4	6'-8'	50/3"	Gray SILTSTONE
10		S-5	8'-10'		Auger Refusal @ 7'
15		S-6	13'-15'		
20		S-7	18'-20'		
25		S-8	23'-25'		
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: P-1

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
11' ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 12'
HOLLOW STEM AUGERS	0' TO 12'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
5		S-1	0'-2'	11-10-14-22	Reddish brown fine to coarse SAND, some fine to coarse Gravel
		S-2	2'-4'	17-23-21-24	
		S-3	4'-6'	28-18-24-48	Gray GRAVEL, little red Silty Sand
		S-4	6'-8'	50/2"	Grayish brown WEATHERED SILTSTONE
10		S-5	8'-10'	12-19-21-19	
		S-6	10'-12'	25-42-40-36	
					T.B.C. @ 12'
15					Infiltration Test Performed @ 6' Infiltration Rate = 6.25 in./hr.
20					
25					
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: P-2

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
11' ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 12'
HOLLOW STEM AUGERS	0' TO 12'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
5		S-1	0'-2'	24-50/4"	Gray / black Miscellaneous FILL, some Asphalt, some Sand
		S-2	2'-4'	50/1"	
		S-3	4'-6'	17-11-21-19	Brownish gray Miscellaneous FILL, fine to coarse SAND and Stone, Asphalt
		S-4	6'-8'	50/2"	
10		S-5	8'-10'	31-41-50/4"	Gray SILTY CLAY
		S-6	10'-12'	12-19-21-42	
					T.B.C. @ 12'
15					Infiltration Test Performed @ 6' Infiltration Rate = 8.25 in./hr.
20					
25					
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

BORING NO.: P-3

GROUNDWATER DATA	
DEPTH	Hours After Completion
11' ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 12'
HOLLOW STEM AUGERS	0' TO 12'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
		S-1	0'-2'	8-7-7	3/4" Asphalt, Brown fine to medium SAND, little Silt, some Stone, Miscellaneous FILL
		S-2	2'-4'	6-4-4-4	Gray / brown Miscellaneous FILL, fine to coarse SAND and Brick, Stone, etc.
5		S-3	4'-6'	4-3-2-2	Gray / brown fine to coarse GRAVEL and fine to coarse Sand
		S-4	6'-8'	3-3-2-2	
		S-5	8'-10'	2-2-1-1	
10		S-6	10'-12'	3-3-4-3	
					T.B.C. @ 12' Infiltration Test Performed @ 6' Infiltration Rate = > 20.0 in./hr.
15					
20					
25					
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

UNDERWOOD ENGINEERING COMPANY

143 Harding Ave. Bellmawr, NJ 08031

William R. Underwood, P.E., President

Phone (856) 933-1818

CLIENT: Solomon Builders

PROJECT: Proposed Self-Storage Facility

LOCATION: 955 Pleasant Valley Way

West Orange Twp., Essex Co., NJ

BORING NO.: P-4

March 24, 2020

Ground Surface Elevation:

Sheet 1 of 1

GROUNDWATER DATA	
DEPTH	Hours After Completion
NE ▼	0.1

A- METHOD OF ADVANCING BORING	DEPTH
CONTINUOUS SPOON SAMPLE	0' TO 8' 10"
HOLLOW STEM AUGERS	0' TO 8.5'
2" O.D. SPLIT SPOON	

DEPTH	A	SAMPLE			SOIL CLASSIFICATION
		NO.	DEPTH	N	FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.
		S-1	0'-2'	8-8-10	3" Asphalt Red fine to coarse SAND, some Silt, some fine to coarse Gravel
		S-2	2'-4'	13-13-14-16	
5		S-3	4'-6'	19-12-17-12	Red fine to medium SAND, little Silt
		S-4	6'-8'	11-11-15-13	
		S-5	8'-10'	16-50/4"	Red SANDSTONE, some Silty Clay
10		S-6	10'-12'		Auger Refusal @ 8.5'
					Infiltration Test Performed @ 6' Infiltration Rate = 9.0 in./hr.
15					
20					
25					
30					

N - STANDARD PENETRATION RESISTANCE PER 12" (140 LB. HAMMER, 30" DROP)

Appendix E
Important Information about Your Geotechnical Engineering Report-ASFE



Underwood Engineering, Inc.
143 Harding Avenue
Bellmawr, NJ 08031
856-933-1818 Phone
856-933-3121 Fax

Material Test Report

Report No: MAT:20-2823-S01

Issue No: 1

Client: Solomon Builders

CC:

Project: Proposed Self Storage
955 Pleasant Valley Way, West Orange, NJ 07052

This report is based on the visual and physical inspection described below. The inspections, laboratory tests and subsequent results are based on a representative sample of the overall project. Inspection by Underwood Engineering, Inc. in no way releases the contractor or sub-contractor of full responsibility of meeting contract documents, plans, specifications, shop drawings and standard in the industry. No other warranty is expressed or implied. No conclusions should be drawn from this report other than those specifically stated.



Submitted By:

Bill Underwood

Date of Issue:

4/1/2020

Sample Details

Sample ID 20-2823-S01
Date Sampled 3/24/2020
Source Test Boring
Specification I-5 plus No. 100 Sieve
Location B5 @ 0-2'

Other Test Results

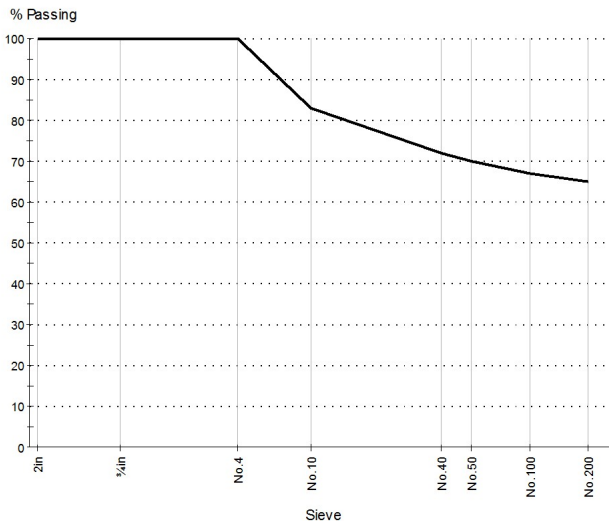
Description	Method	Result	Limits
Water Content (%)	ASTM D 2216	7.6	
Method		B	
Tested By		Cait Brevik	
Date Tested		3/24/2020	

Particle Size Distribution

Method: AASHTO T 27, AASHTO T 11

Date Tested: 3/24/2020

Tested By: Cait Brevik



Sieve Size	% Passing	Limits
2in	100	
3/4in	100	
No.4	100	
No.10	83	
No.40	72	
No.50	70	
No.100	67	
No.200	65	

Comments

Red Silty CLAY, (l) f. Gravel, (tr) c.f. Sand



Underwood Engineering, Inc.
143 Harding Avenue
Bellmawr, NJ 08031
856-933-1818 Phone
856-933-3121 Fax

Material Test Report

Report No: MAT:20-2823-S02

Issue No: 1

Client: Solomon Builders

CC:

Project: Proposed Self Storage
955 Pleasant Valley Way, West Orange, NJ 07052

This report is based on the visual and physical inspection described below. The inspections, laboratory tests and subsequent results are based on a representative sample of the overall project. Inspection by Underwood Engineering, Inc. in no way releases the contractor or sub-contractor of full responsibility of meeting contract documents, plans, specifications, shop drawings and standard in the industry. No other warranty is expressed or implied. No conclusions should be drawn from this report other than those specifically stated.



Submitted By:
Date of Issue:

Bill Underwood
4/1/2020

Sample Details

Sample ID 20-2823-S02
Date Sampled 3/24/2020
Source Test Boring
Specification I-5 plus No. 100 Sieve
Location B4 @ 6'-8'

Other Test Results

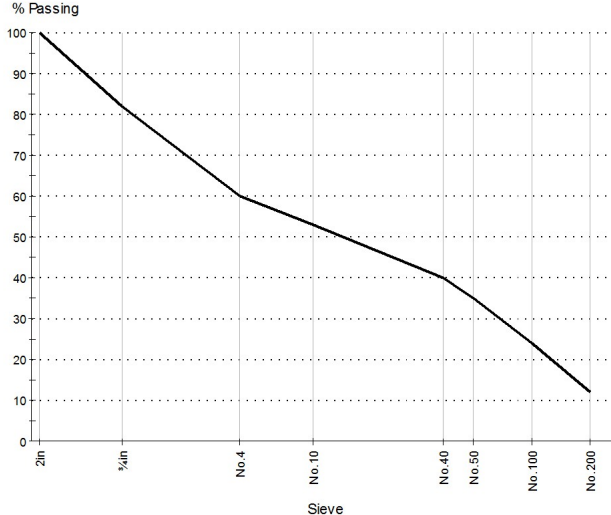
Description	Method	Result	Limits
Water Content (%)	ASTM D 2216	5.5	
Method		B	
Tested By		Cait Brevik	
Date Tested		3/24/2020	

Particle Size Distribution

Method: AASHTO T 27, AASHTO T 11

Date Tested: 3/24/2020

Tested By: Cait Brevik



Sieve Size	% Passing	Limits
2in	100	
3/4in	82	
No. 4	60	
No. 10	53	
No. 40	40	
No. 50	35	
No. 100	24	
No. 200	12	

Comments

Red c.f. SAND, (a) m.f. Gravel, (tr) Silt and Clay



Underwood Engineering, Inc.
143 Harding Avenue
Bellmawr, NJ 08031
856-933-1818 Phone
856-933-3121 Fax

Material Test Report

Report No: MAT:20-2823-S03

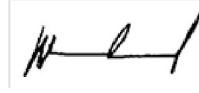
Issue No: 1

Client: Solomon Builders

CC:

Project: Proposed Self Storage
955 Pleasant Valley Way, West Orange, NJ 07052

This report is based on the visual and physical inspection described below. The inspections, laboratory tests and subsequent results are based on a representative sample of the overall project. Inspection by Underwood Engineering, Inc. in no way releases the contractor or sub-contractor of full responsibility of meeting contract documents, plans, specifications, shop drawings and standard in the industry. No other warranty is expressed or implied. No conclusions should be drawn from this report other than those specifically stated.



Submitted By:

Bill Underwood

Date of Issue:

4/1/2020

Sample Details

Sample ID 20-2823-S03
Date Sampled 3/24/2020
Source Test Boring
Specification I-5 plus No. 100 Sieve
Location B6 @ 8'-10'

Other Test Results

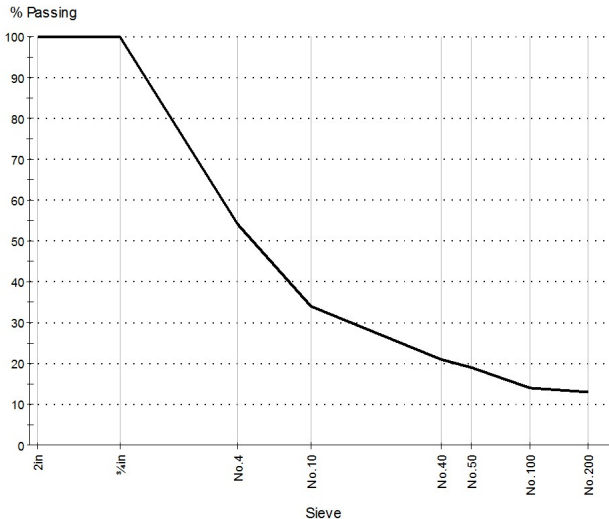
Description	Method	Result	Limits
Water Content (%)	ASTM D 2216	6.8	
Method		B	
Tested By		Cait Brevik	
Date Tested		3/24/2020	

Particle Size Distribution

Method: AASHTO T 27, AASHTO T 11

Date Tested: 3/24/2020

Tested By: Cait Brevik



Sieve Size	% Passing	Limits
2in	100	
3/4in	100	
No. 4	54	
No. 10	34	
No. 40	21	
No. 50	19	
No. 100	14	
No. 200	13	

Comments

Gray f. GRAVEL, (I) c.f. Sand, (I) Silt and Clay

Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Solomon Builders

Project: Proposed Self Storage Facility

Requirement: Hydrometer & Sieve Analysis

Date Performed: 3/24/2020

Location: P1 @ 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) = 91.8 % Coarse fragments = 36.7

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 63.3

Temperature = 62.8 °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 = 158

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	16	10.1	13.7	0.03185
5	14	8.9	14.0	0.02036
15	13	8.2	14.2	0.01184
30	11	7.0	14.5	0.00846
60	10	6.3	14.7	0.00602
250	9	5.7	14.8	0.00296
1440	9	5.7	14.8	0.00123

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 1.4 Wt retained #300 sieve (0.045mm) = 75.8

% Fine plus very fine sand = 1.8

D. SOIL MORPHOLOGY

Structure : Subangular Blocky

Consistence : Friable

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 75.8

%Silt = 10.6

%Clay = 13.6

Soil Texture: Sandy Loam

Soil Permeability Class Rating: K3

Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Solomon Builders

Project: Proposed Self Storage Facility

Requirement: Hydrometer & Sieve Analysis

Date Performed: 3/24/2020

Location: P2 @ 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) = 74.4 % Coarse fragments = 29.8

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 70.2

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 = 142.4

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	15	10.5	13.8	0.03197
5	14	9.8	14.0	0.02036
15	12	8.4	14.3	0.01188
30	12	8.4	14.3	0.00840
60	11	7.7	14.5	0.00598
250	10	7.0	14.7	0.00295
1440	8	5.6	15.0	0.00124

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 9 Wt retained #300 sieve (0.045mm) = 80.8

% Fine plus very fine sand = 11.1

D. SOIL MORPHOLOGY

Structure : Single Grain

Consistence : loose

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 80.8

%Silt = 9

%Clay = 10.2

Soil Texture: Loamy Sand

Soil Permeability Class Rating: K4

Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Solomon Builders

Project: Proposed Self Storage Facility

Requirement: Hydrometer & Sieve Analysis

Date Performed: 3/24/2020

Location: P3 @ 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) = 149.2 % Coarse fragments = 59.7

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 40.3

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 = 248

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	12	4.8	14.3	0.03254
5	10	4.0	14.7	0.02087
15	9	3.6	14.8	0.01209
30	9	3.6	14.8	0.00855
60	8	3.2	15.0	0.00609
250	8	3.2	15.0	0.00298
1440	7	2.8	15.2	0.00125

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 5.4 Wt retained #300 sieve (0.045mm) = 84.8

% Fine plus very fine sand = 6.4

D. SOIL MORPHOLOGY

Structure : Single Grain

Consistence : Loose

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 84.8

%Silt = 6.3

%Clay = 8.9

Soil Texture: Loamy Sand

Soil Permeability Class Rating: K4

Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Solomon Builders

Project: Proposed Self Storage Facility

Requirement: Hydrometer & Sieve Analysis

Date Performed: 3/24/2020

Location: P4 @ 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) = 57.8 % Coarse fragments = 23.1

B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 76.9

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 = 130.1

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	13	10.0	14.2	0.03243
5	13	10.0	14.2	0.02051
15	12	9.2	14.3	0.01188
30	10	7.7	14.7	0.00852
60	10	7.7	14.7	0.00602
250	9	6.9	14.8	0.00296
1440	9	6.9	14.8	0.00123

C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 42.2 Wt retained #300 sieve (0.045mm) = 77.2

% Fine plus very fine sand = 54.7

D. SOIL MORPHOLOGY

Structure : Subangular Blocky

Consistence : Friable

E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 77.2

%Silt = 7

%Clay = 15.8

Soil Texture: Sandy Loam

Soil Permeability Class Rating: K3

Appendix D
General Soil Terms

General Soil Terms

Particle Sizes		Classifications
Boulders	Greater than 2 inches (305mm)	The major soil constituent is the principal noun, i.e. clay, silt, sand, gravel. The second major soil constituent and other minor constituents are reported as follows:
Cobbles	3 inches (76.233) to 12 inches (305mm)	
Gravel-coarse	3/4 inches (19.05mm) to 3 inches (76.2mm)	
Gravel-fine	No. 4- 3/16 inches (4 75mm) to 3/4 inches (19.05mm)	
Sand-coarse	No. 10 (2.00mm) to No. 4 (4 75mm)	Second Major Constituent-Minor Constituents (Percentage by weight)
Sand-medium	No. 40 (0.425mm) to No. 10 (2.00.)	
Sand-fine	No. 200 (0.075mm) to No. 40 (0.425mm)	
Silt	0.005mm to 0.074mm	
Clay	Less than 0.005mm	Trace – 1 to 12% Trace – 1 to 12% Adjective – 12 to 35% Little – 12 to 23 (clayey, silty, etc.) Some – 23 to 33% And – Over 35%

Cohesive Soils

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with other major soil constituent as modifier: i.e. silty clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils: i.e. silty clay, trace of sand, little gravel

Unconfined Compressive Strength (psf)

Consistency	Approximate Range of (N)	
Very Soft	Below 500	0-2
Soft	500-1000	3-4
Medium	1000-2000	5-8
Stiff	2000-4000	9-15
Very Stiff	4000-8000	16-30
Hard	8000-16000	31-50
Very Hard	Over 16000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon Standard Penetration Resistance (N)

Cohesionless Soils

Density Classification	Relative Density	Approximate Range of (N)
Very Loose	0-15	0-4
Loose	16-35	5-10
Medium Compact	36-65	11-30
Compact	66-85	31-50
Very Compact	86-100	Over 50

Relative Density of Cohesionless Soils is based upon the evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

Standard Penetration Test (ASTM D 1586) – A 2.0" outside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).

Appendix C
Mechanical Sieve (Gradation) Analysis Results

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS, AND PROJECTS

#

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely to the client. No one except you should rely on your geotechnical engineering report without first conferring with the GEOTECHNICAL engineer who prepared it. And no one—not even you should apply the report for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING REPORT IS BASES ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences: the general nature of the structure involved, its size, and configuration: the location of the structure on the site: and the other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on geotechnical engineering report that was:

- *not prepared for you,
- *not prepared for your project,
- *not prepared for the specific site explored, or
- *completed before important project changes were made

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- *the function of the proposed structure, as when its changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse
- *elevation, configuration, location, orientation, or weight off the proposed structure,
- *composition of the design team, or
- *project ownership

As general rule, always inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is bases on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL OPINIONS

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A REPORT'S RECOMMENDATIONS ARE NOT FINAL

Do not over rely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

DO NOT REDRAW THE ENGINEER'S LOGS

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

GIVE CONTRACTORS A COMPLETE REPORT AND GUIDANCE

#

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer.

A prebid conference can also be valuable. Be sure contractors have sufficient time to perform additional studies. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

#

READ RESPONSIBILITY PROVISIONS CLOSELY

#

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled “limitations”, many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

GEOENVIRONMENTAL CONCERNS ARE NOT COVERED

The equipment, techniques and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated environmental problems have led to numerous project failures. If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. Do not rely on an environmental report prepared for someone else.

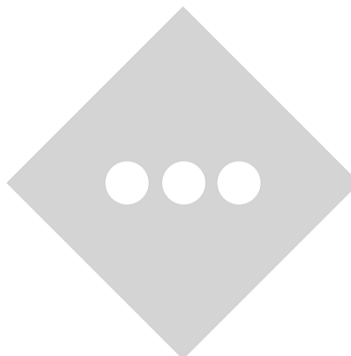
APPENDIX E

DRAINAGE AREA MAPS

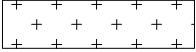
INVENTORY

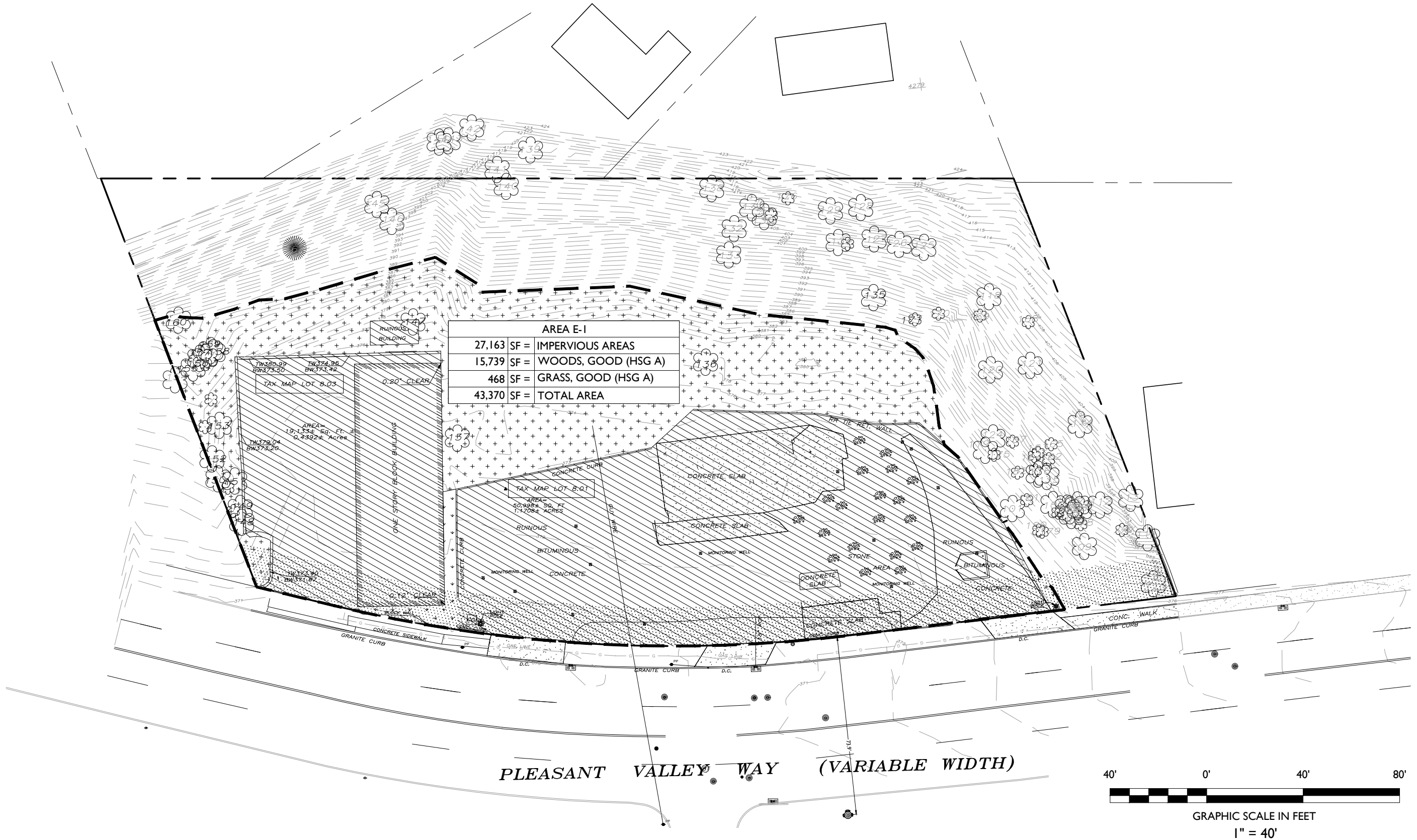
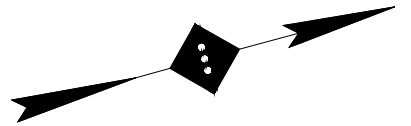
EXISTING DRAINAGE AREA MAP

PROPOSED DRAINAGE AREA MAP



T:\2019\T-19153 Solomon Builders - 955 Pleasant Valley Way, West Orange, NJ\CADD\Exhibits\2021-05-07 Drainage Area Maps.dwg

SYMBOL	DESCRIPTION
	DRAINAGE ANALYSIS AREA
	EXISTING IMPERVIOUS AREA
	EXISTING GRASS AREA
	EXISTING WOODED AREA



T:\32019\T-19153 Solomon Builders - 955 Pleasant Valley Way, West Orange, NJ\CADD\Exhibits\2021-05-07 Drainage Area Maps.dwg

SYMBOL

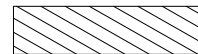
DESCRIPTION

--- DRAINAGE ANALYSIS AREA

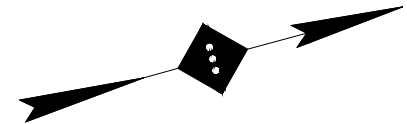
--- PROPOSED DRAINAGE AREA



PROPOSED GRASS AREA



PROPOSED IMPERVIOUS AREA



AREA P-1B	
7,094 SF =	IMPERVIOUS AREAS
2,835 SF =	GRAVEL AREA (HSG A)
9,376 SF =	GRASS, GOOD (HSG A)
19,305 SF =	TOTAL AREA

AREA P-1A	
24,065 SF =	BUILDING AREA
24,065 SF =	TOTAL AREA

PLEASANT VALLEY WAY (VARIABLE WIDTH)

40' 0' 40' 80'

GRAPHIC SCALE IN FEET

1" = 40'

DRAINAGE AREA MAPS

**955 PLEASANT VALLEY WAY, LLC
PROPOSED SELF-STORAGE FACILITY**

BLOCK 272.02, LOTS 8.01 & 8.03
955 PLEASANT VALLEY WAY (C.R. 636)
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NEW JERSEY

CHARLES D. OLIVO, P.E.
NEW JERSEY LICENSE NO. 46119
LICENSED PROFESSIONAL ENGINEER

**NOT APPROVED FOR
CONSTRUCTION**

DRAWN BY: AHM

CHECKED BY: JHK

DATE: 05/07/2021

SCALE: (H) 1" = 40'

PROJECT ID: T-19153

TITLE:

**PROPOSED
DRAINAGE
AREA MAP**

SHEET:

2 OF 2

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Phone 201.340.4468 • Fax 201.340.4472

APPENDIX F

DIVERSION SWALE CALCULATIONS

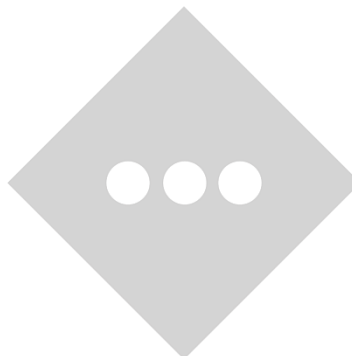
INVENTORY

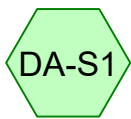
HYDROCAD ROUTING DIAGRAM

HYDROGRAPHS 25-YR

RIPRAP DIVERSION SWALE DESIGN SPREADSHEET

DIVERSION SWALE AREA DRAINAGE MAP

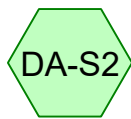




Tributary to Permanent
Diversion Swale



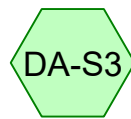
Permanent Diversion
Swale (Left)



Tributary to Permanent
Diversion Swale



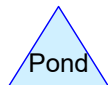
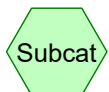
Permanent Diversion
Swale (Back)



Tributary to Permanent
Diversion Swale



Permanent Diversion
Swale (Right)



Routing Diagram for 2021-05-07_West Orange Stormwater Analysis

Prepared by {enter your company name here}, Printed 5/6/2021

HydroCAD® 10.00-26 s/n 10626 © 2020 HydroCAD Software Solutions LLC

2021-05-07_West Orange Stormwater Analysis

NOAA 24-hr D 25-Year Rainfall=6.44"

Prepared by {enter your company name here}

Printed 5/6/2021

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Page 2

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment DA-S1: Tributary toRunoff Area=2,345 sf 0.00% Impervious Runoff Depth=0.13"
Tc=10.0 min CN=30/0 Runoff=0.00 cfs 24 cf**Subcatchment DA-S2: Tributary to**Runoff Area=79,999 sf 24.85% Impervious Runoff Depth=1.76"
Tc=10.0 min CN=34/98 Runoff=2.44 cfs 11,766 cf**Subcatchment DA-S3: Tributary to Permanent**Runoff Area=136 sf 0.00% Impervious Runoff Depth=0.13"
Tc=10.0 min CN=30/0 Runoff=0.00 cfs 1 cf**Reach DS-1: Permanent Diversion Swale**Avg. Flow Depth=0.00' Max Vel=1.10 fps Inflow=0.00 cfs 24 cf
n=0.025 L=106.0' S=0.1611 '/' Capacity=69.25 cfs Outflow=0.00 cfs 24 cf**Reach DS-2: Permanent Diversion**Avg. Flow Depth=0.32' Max Vel=2.85 fps Inflow=2.44 cfs 11,766 cf
n=0.025 L=287.8' S=0.0150 '/' Capacity=21.11 cfs Outflow=2.40 cfs 11,766 cf**Reach DS-3: Permanent Diversion**Avg. Flow Depth=0.16' Max Vel=6.37 fps Inflow=2.40 cfs 11,767 cf
n=0.025 L=62.5' S=0.1611 '/' Capacity=69.25 cfs Outflow=2.40 cfs 11,767 cf**Total Runoff Area = 82,480 sf Runoff Volume = 11,792 cf Average Runoff Depth = 1.72"**
75.90% Pervious = 62,599 sf 24.10% Impervious = 19,881 sf

Summary for Subcatchment DA-S1: Tributary to Permanent Diversion Swale

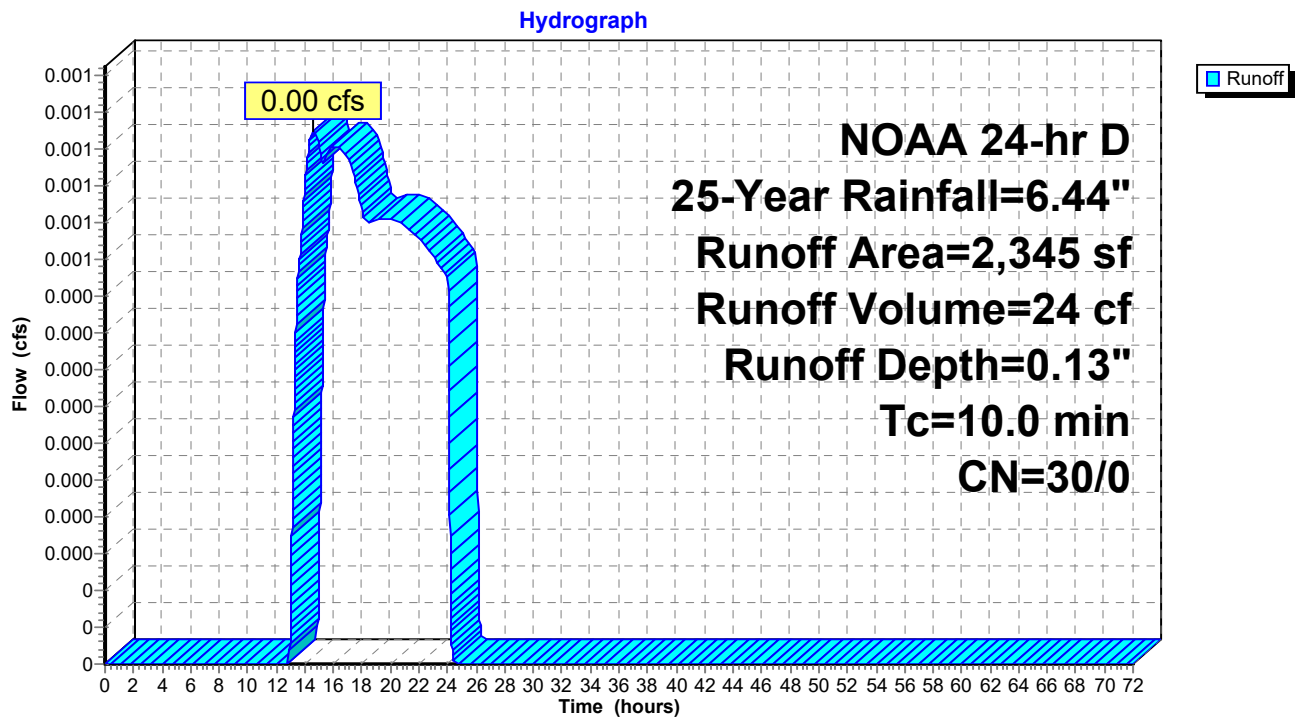
Runoff = 0.00 cfs @ 14.63 hrs, Volume= 24 cf, Depth= 0.13"

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 D 25-Year Rainfall=6.44"

Area (sf)	CN	Description
2,283	30	Woods, Good, HSG A
62	39	>75% Grass cover, Good, HSG A
2,345	30	Weighted Average
2,345	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry, TC < 10 Mins

Subcatchment DA-S1: Tributary to Permanent Diversion Swale



Summary for Subcatchment DA-S2: Tributary to Permanent Diversion Swale

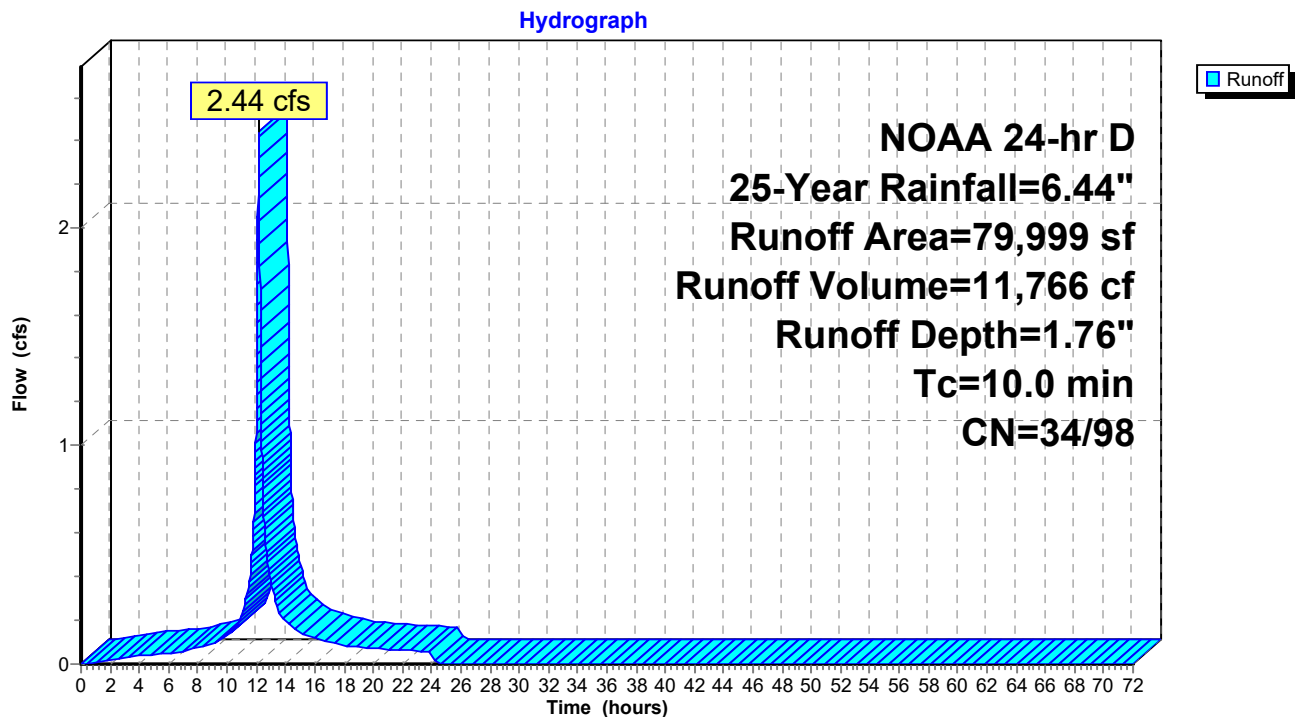
Runoff = 2.44 cfs @ 12.17 hrs, Volume= 11,766 cf, Depth= 1.76"

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 D 25-Year Rainfall=6.44"

	Area (sf)	CN	Description
*	19,881	98	Impervious Areas
	32,925	30	Woods, Good, HSG A
	27,193	39	>75% Grass cover, Good, HSG A
	79,999	50	Weighted Average
	60,118	34	75.15% Pervious Area
	19,881	98	24.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry, TC < 10 Mins

Subcatchment DA-S2: Tributary to Permanent Diversion Swale



Summary for Subcatchment DA-S3: Tributary to Permanent Diversion Swale

Runoff = 0.00 cfs @ 14.63 hrs, Volume= 1 cf, Depth= 0.13"

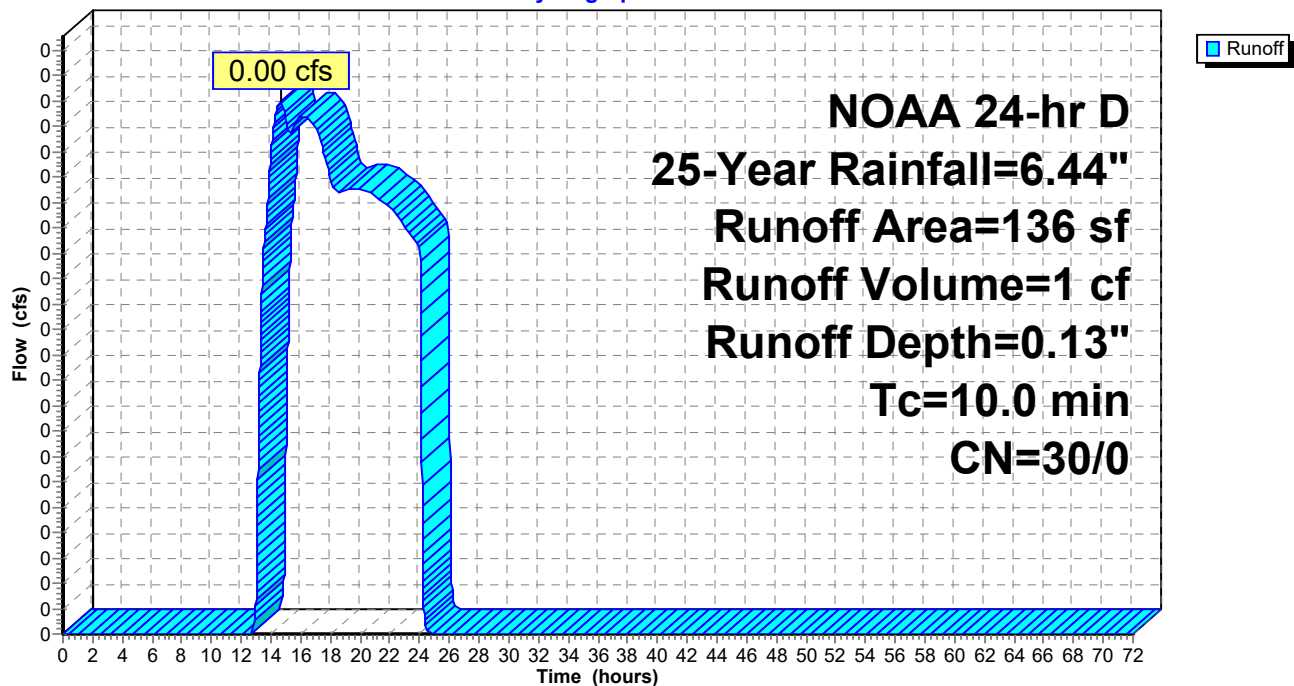
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.44"

Area (sf)	CN	Description
136	30	Woods, Good, HSG A
136	30	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry, TC < 10 Mins

Subcatchment DA-S3: Tributary to Permanent Diversion Swale

Hydrograph



Summary for Reach DS-1: Permanent Diversion Swale (Left)

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 2,345 sf, 0.00% Impervious, Inflow Depth = 0.13" for 25-Year event
 Inflow = 0.00 cfs @ 14.63 hrs, Volume= 24 cf
 Outflow = 0.00 cfs @ 14.67 hrs, Volume= 24 cf, Atten= 0%, Lag= 2.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Max. Velocity= 1.10 fps, Min. Travel Time= 1.6 min

Avg. Velocity = 1.10 fps, Avg. Travel Time= 1.6 min

Peak Storage= 0 cf @ 14.67 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 69.25 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

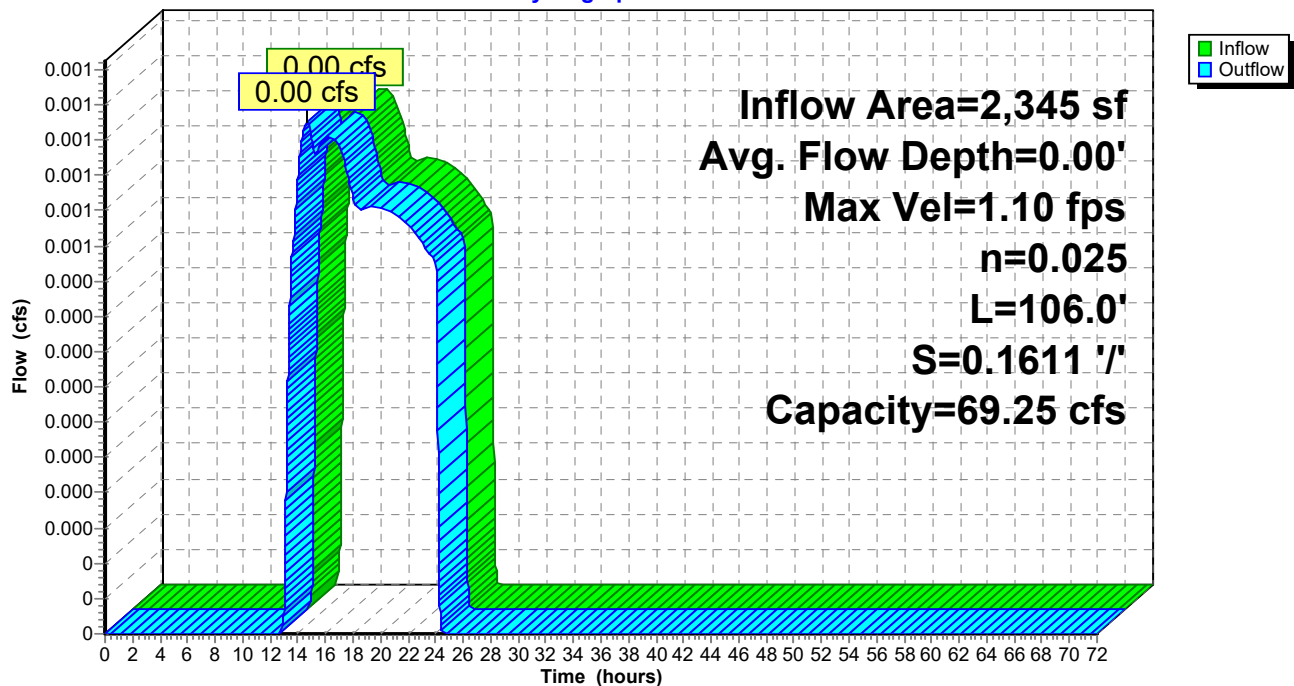
Length= 106.0' Slope= 0.1611 '/'

Inlet Invert= 388.43', Outlet Invert= 371.35'



Reach DS-1: Permanent Diversion Swale (Left)

Hydrograph



Summary for Reach DS-2: Permanent Diversion Swale (Back)

Inflow Area = 79,999 sf, 24.85% Impervious, Inflow Depth = 1.76" for 25-Year event
 Inflow = 2.44 cfs @ 12.17 hrs, Volume= 11,766 cf
 Outflow = 2.40 cfs @ 12.19 hrs, Volume= 11,766 cf, Atten= 2%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Max. Velocity= 2.85 fps, Min. Travel Time= 1.7 min
 Avg. Velocity = 0.90 fps, Avg. Travel Time= 5.3 min

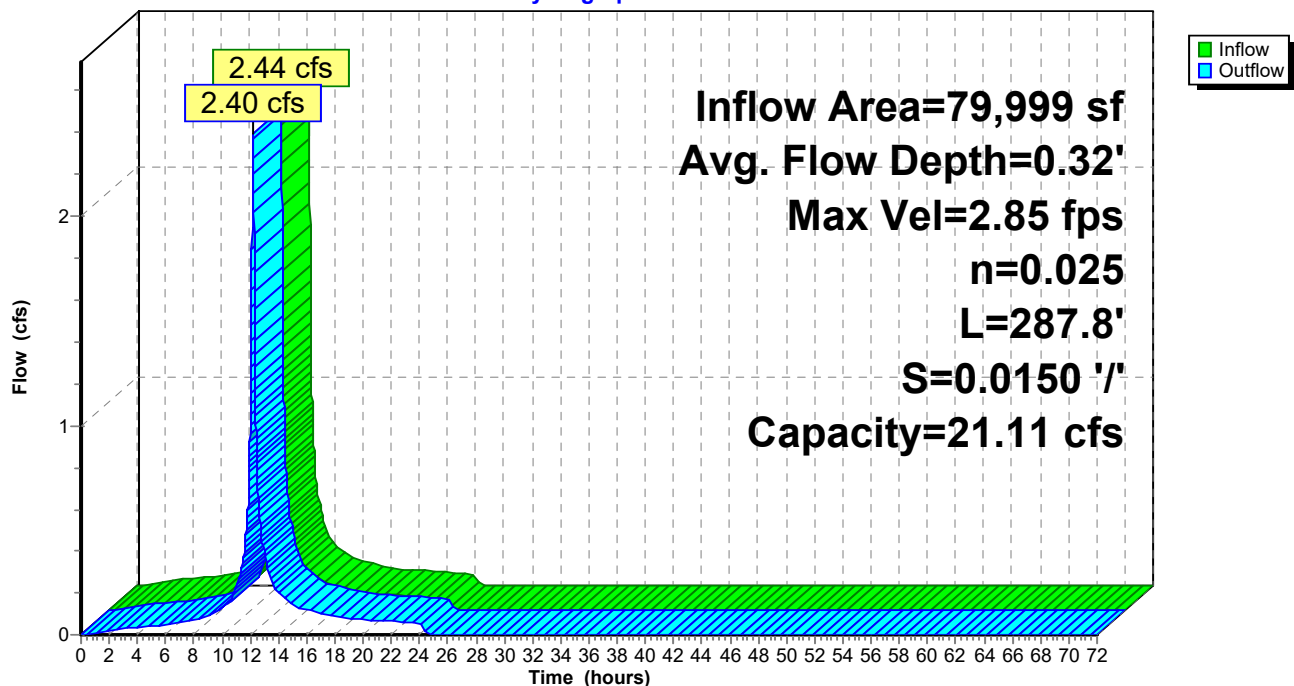
Peak Storage= 242 cf @ 12.19 hrs
 Average Depth at Peak Storage= 0.32'
 Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.11 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding
 Side Slope Z-value= 2.0 '/' Top Width= 6.00'
 Length= 287.8' Slope= 0.0150 '/'
 Inlet Invert= 388.43', Outlet Invert= 384.12'



Reach DS-2: Permanent Diversion Swale (Back)

Hydrograph



Summary for Reach DS-3: Permanent Diversion Swale (Right)

[61] Hint: Exceeded Reach DS-2 outlet invert by 0.16' @ 12.19 hrs

Inflow Area = 80,135 sf, 24.81% Impervious, Inflow Depth = 1.76" for 25-Year event
 Inflow = 2.40 cfs @ 12.19 hrs, Volume= 11,767 cf
 Outflow = 2.40 cfs @ 12.19 hrs, Volume= 11,767 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Max. Velocity= 6.37 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 1.94 fps, Avg. Travel Time= 0.5 min

Peak Storage= 24 cf @ 12.19 hrs

Average Depth at Peak Storage= 0.16'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 69.25 cfs

2.00' x 1.00' deep channel, n= 0.025 Earth, clean & winding

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

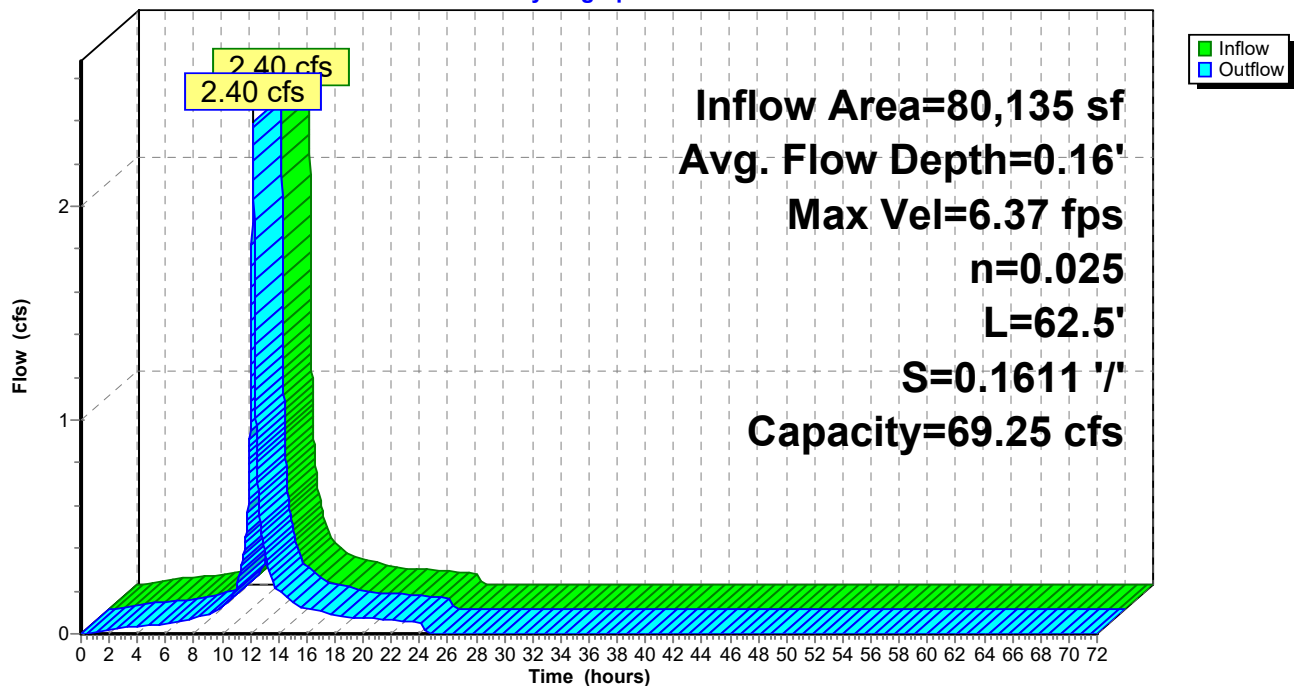
Length= 62.5' Slope= 0.1611 '/'

Inlet Invert= 384.12', Outlet Invert= 374.05'



Reach DS-3: Permanent Diversion Swale (Right)

Hydrograph



RIP-RAP DESIGN CALCULATIONS FOR TRAPEZOIDAL CHANNELS

The following rip rap design calculations are based on the Standards for Soil Erosion and Sediment Control in New Jersey (Jan 2014).

CH. 22 STANDARD FOR RIPRAP:

RIP-RAP SIZING PARAMETERS FOR TRAPEZOIDAL CHANNELS:

Diversion No. (DS)	Bottom Width B (FT)	Channel Depth D (FT)	Channel Side Slopes Z (FT)	Channel Bottom Slope Sb (FT/FT)	Flow Rate - 25-YR Q (CFS)
DS-1	2.0	1.0	2.0	0.161	0
DS-2	2.0	1.0	2.0	0.015	2.4
DS-3	2.0	1.0	2.0	0.161	2.4

RIP-RAP SIZING CALCULATIONS FOR STRAIGHT TRAPEZOIDAL CHANNELS:

Diversion No. (DS)	B / D Ratio	P/R Ratio (Curve 22-2)	Rip-Rap Size D50 (IN)*	Manning's Value (n)
DS-1	2.0	10.5	0.0	0.000
DS-2	2.0	10.5	1.2	0.027
DS-3	2.0	10.5	9.2	0.038

(*) Curve 22-3A Formula (adopted from highway Research Report No. 108)

Rip Rap Size for Straight Locations (D50) =	12" Stone
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Phone 201.340.4468 • Fax 201.340.4472

DRAINAGE AREA MAPS

955 PLEASANT VALLEY WAY, LLC
PROPOSED SELF-STORAGE FACILITY

BLOCK 272.02, LOTS 8.01 & 8.03
955 PLEASANT VALLEY WAY (C.R. 636)
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NEW JERSEY

CHARLES D. OLIVO, P.E.
NEW JERSEY LICENSE No. 46119
LICENSED PROFESSIONAL ENGINEER

NOT APPROVED FOR CONSTRUCTION

DRAWN BY: AHM

CHECKED BY: JHK

DATE: 05/07/2021

SCALE: (H) 1" = 60'

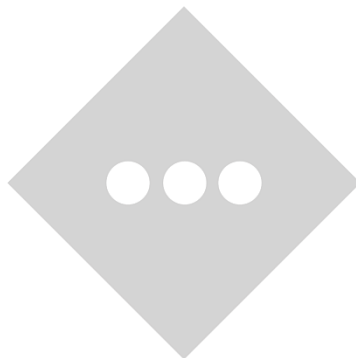
PROJECT ID: T-19153

TITLE:
SWALE DRAINAGE AREA MAP

SHEET:
I OF I

APPENDIX G

LOW IMPACT DEVELOPMENT CHECKLIST



Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Township of West Orange

County: Essex County Date: May 7, 2021

Review board or agency: Township of West Orange Zoning Board of Adjustment

Proposed land development name: Proposed Self-Storage Facility

Lot(s): 172.02 Block(s): 8.01 & 8.03

Project or application number: ZB 19-10

Applicant's name: 955 Pleasant Valley Way, LLC

Applicant's address: 141 Ayers Court, Suite 1A

Township of Teaneck, New Jersey 07666

Telephone: _____ Fax: _____

Email address: _____

Designer's name: Stonefield Engineering & Design, LLC

Designer's address: 92 Park Avenue

Rutherford, New Jersey 07070

Telephone: 201-340-4468 Fax: 201-340-4472

Email address: jkline@stonefieldeng.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

Proposed improvements a two-story self-storage facility with two cellars and a building footprint of 18,585 SF with 785 SF dedicated to office operations. The proposed development includes the construction of associated parking, utilities, landscaping, lighting, and stormwater management facilities. The building is collected via roof leaders and sent to an underground detention basin consisting of twelve (12) StormTrap SingleTrap stormwater detention vaults, each with an internal height of 42". The back of the site is collected via a 6' riprap swale along the back of the building (DS-2) that is sent to another 6' riprap swale along the right side of the building (DS-3). The remainder of the back of the site is collected via a 6' riprap swale along the left side of the building (DS-1). All stormwater conveyed within the riprap swales is collected via catch basins and routed to the catch basins within Pleasant Valley Way (County Route 636) via one 12" solid HDPE pipe and one 15" solid HDPE pipe. The drainage toward the front of the building sheet flows overland to Pleasant Valley Way (County Route 636) where it is collected via existing catch basins and discharged into the County stormwater conveyance system.

Point of Interest P-1 (POI-1) - Tributary Area to Pleasant Valley Way (CR 636) County Conveyance System

The primary discharge point for the project site is to the Essex County stormwater conveyance system along Pleasant Valley Way (CR 636). Due to the steep topography of the site, runoff sheet flows overland directly into the conveyance system with the exception of the proposed roof which is collected via roof leaders and discharges into the County conveyance system.

Sub-Point of Interest P-1A - Tributary Area of Proposed Roof

This sub-node represents the total collective roof drainage from the proposed building. Runoff from this sub-node is collected via roof drains and conveyed via roof leaders to an an underground detention basin consisting of twelve (12) StormTrap SingleTrap stormwater detention vaults, each with an internal height of 42". The basin then discharges into the existing Type 'B' inlet within Pleasant Valley Way (CR 636).

Sub-Point of Interest P-1B - Tributary Area of Direct Drainage to Pleasant Valley Way (CR 636)

This sub-node consists of four areas of drainage. The first three areas consist of discharge that is collected via 6' wide riprap swales and collected via proposed Type 'A' inlets that connect directly into the existing Type 'B' inlets within Pleasant Valley Way (CR 636). The swales are proposed to divert stormwater runoff around the proposed building while minimizing soil erosion. The remaining discharge that does not enter the riprap swales flows directly into Pleasant Valley Way where it is collected by the existing Type 'B' inlets within Pleasant Valley Way (CR 636).

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

Township of West Orange - Code of Ordinances - Chapter 25, Section 29 - Stormwater Control

Do regulations include nonstructural requirements? Yes: X No: _____

If yes, briefly describe: Chapter 25, Section 29.4.e. - To the maximum extent practicable, the standards

shall be met by incorporating nonstructural stormwater management strategies for erosion control,

groundwater recharge, runoff quantity, and runoff quality.

List LID-BMPs prohibited by local regulations: N/A

Pre-design meeting held? Yes: _____ Date: _____ No: _____

Meeting held with: _____

Pre-design site walk held? Yes: _____ Date: _____ No: _____

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: N/A

Required approval: _____

Name: _____

Required approval: _____

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: x No:

If yes, was this inventory a factor in the site's layout and design? Yes: x No:

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: x No: If yes, specify % of site: 38.2%

Native ground cover? Yes: No: x If yes, specify % of site:

Vegetated buffers? Yes: No: x If yes, specify % of site:

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: No: x If yes, specify % of site:

Native ground cover? Yes: No: x If yes, specify % of site:

Vegetated buffers? Yes: No: x If yes, specify % of site:

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: No: x

Reduce runoff pollutant loads through runoff treatment: Yes: No: x

Maintain groundwater recharge by preserving natural areas: Yes: No: x

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

If yes, were these inventories factors in the site's layout and design? Yes: x No:

Restrict permanent site disturbance by land owners? Yes: _____ No: x

If yes, how: _____

If yes, how: Approximately 38% of the site will not have land disturbed to protect existing trees and soils

If yes, how: The disturbance limits were set to limit the amount of steep slopes disturbed with
regards to the amount of steep slopes onsite

D. Specify percentage of cleared areas done so for buildings: 34.3% (24,065 SF)

For driveways and parking: 16.4% (5,863 SF) For roadways: N/A

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

The percentages for C and D have been reduced by implementing cellars into the design to minimize
the building footprint that could have contributed to a larger limit of disturbance and therefore a
greater disturbance of the surrounding natural flora and existing steep slopes.

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: 100.0% HSG B: 0.0% HSG C: 0.0% HSG D: 0.0%

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: 61.8% HSG B: N/A HSG C: N/A HSG D: N/A

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

The entirety of the site is within a greater permeable soil (HSG A) to reduce runoff volume increases
and groundwater recharge rates. The majority of the developed area runoff is collected in an
underground infiltration basin to control runoff volume as recharge is not required for this site.

I. Does the site include Karst topography? Yes: _____ No: x

If yes, discuss measures taken to limit Karst impacts:

N/A

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 27,163 SF (0.62 AC) Proposed: 31,159 SF (0.72 AC)

B. Specify maximum site impervious coverage allowed by regulations: 19,492 SF (0.45 AC)

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity		
Residential access – medium intensity		
Residential access – high intensity with parking		
Residential access – high intensity without parking		
Neighborhood		
Minor collector – low intensity without parking		
Minor collector – with one parking lane		
Minor collector – with two parking lanes		
Minor collector – without parking		
Major collector		

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 9' x 19' Regulations: 9' x 18'

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 12 spaces Regulations: 212 spaces

F. Specify percentage of total site impervious cover created by buildings: 77.2% (24,065 SF)
By driveways and parking: 18.8% (5,863 SF) By roadways: N/A

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

Cellars have been implemented in the design to reduce the building footprint that could have
contributed to a larger limit of disturbance and therefore a greater disturbance of the surrounding
natural flora and existing steep slopes.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 44.4% Buildings: 100.0% Driveways and parking: 100.0% Roads: N/A

I. Specify percentage of total impervious area that will be porous:

Total site: 0.0% Buildings: 0.0% Driveways and parking: 0.0% Roads: 0.0%

J. Specify percentage of total building roof area that will be vegetated: 0.0%

K. Specify percentage of total parking area located beneath buildings: 100.0% (12 of 12 spaces)

L. Specify percentage of total parking located within multi-level parking deck: 0.0%

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 31.1% Vegetated swale: 0.0% Natural channel: 0.0%

Stormwater management facility: 0.0% Other: 68.9%

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

Riprap swales have been provided to preserve the existing densely wooded areas, minimize
disturbance, and minimize soil erosion while reducing peak flows and conveying water to the county
conveyance system within Pleasant Valley Way (CR 636).

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: To minimize disturbance to the surrounding existing slopes, a majority
of the surrounding areas are collected via the riprap swales for collection instead of collecting the
areas within the proposed parking area, therefore decreasing the discharge through impervious.

Increase overland flow roughness: In lieu of utilizing turf grass, 9,376 SF of grass is being proposed,
which has a higher Manning coefficient. A majority of the proposed pavement is going to be asphalt,
which has the highest Manning coefficient of common types of pavement.

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: One (1)

Specify the spacing between the trash receptacles: N/A

Compare trash receptacles proposed with those required by regulations:

Proposed: One (1) Regulations: N/A

B. Pet Waste Stations

Specify the number of pet waste stations provided: N/A

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: N/A Regulations: N/A

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100.0%

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: N/A Regulations: N/A

Litter collection: Proposed: N/A Regulations: N/A

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

Trash racks are proposed on all outlet structures and manholes that discharge to the existing Type 'B'

inlets within Pleasant Valley Way (CR 636) to prevent discharge of large trash and debris.

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	x	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	x	
3.	Maximize the protection of natural drainage features and vegetation.	x	
4.	Minimize the decrease in the pre-construction time of concentration.		x
5.	Minimize land disturbance including clearing and grading.	x	
6.	Minimize soil compaction.	x	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	x	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.		x
9.	Provide preventative source controls.	x	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

Due to the steep slopes on site, the time of concentration could not be decreased as it was already below the minimum allowed by the NJDEP (6.0 minutes). The existing area is also heavily wooded with minimal impervious coverage, so the decrease in the time of concentration was not possible while maintaining the existing steep slopes onsite to the greatest extent possible. It was not possible to provide vegetated open-channel conveyance systems instead of the proposed riprap swales due to the steep slopes needed to tie into the existing grades with minimal impact and preventing possible soil erosion due to the steep slopes onsite. It was determined that riprap swales were more respectful to the preservation of existing conditions onsite while minimizing impacts.

