September 14, 2021

STORMWATER MANAGEMENT REPORT

BEMS Southampton Solar Farm

Southampton Township, Burlington County, New Jersey

Big Hill & Old Forge Roads

Block 2702: Lots 3, 4, 5, 7 & 8

Prepared for:

BEMS Southampton Solar Farm, LLC

Prepared by:

T. W. Diggan
NJ LICENCE NO. 24GE04447300

Kimley»Horn

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1. EXECUTIVE SUMMARY

This report outlines the results of the Stormwater Management (SWM) analysis for the BEMS Southampton Solar Farm, located in Southampton Township, Burlington County, New Jersey, and the Pinelands Comprehensive Management Plan proposed Due to the proposed disturbance for this project exceeding 1-acre of disturbance, the project is considered a major development, thus requiring stormwater analysis and review.

The total proposed development area accounts for the disturbed area of 37.35 acres (areas inclusive of the proposed improvements to include the solar array, ballasts, inverter pads and transformers, maintenance of existing gravel access drives, and the proposed utility infrastructure for interconnection). Existing and Proposed Condition Drainage Maps are provided as **Exhibit 1** and **Exhibit 2**, respectively.

The proposed development was designed in accordance with Southampton Township's Code of Ordinances Chapter 21 – Waste Disposal/Pollution Control/Stormwater Management, the New Jersey Pineland Comprehensive Management Plan (CMP), as well as New Jersey Administrative Code, Section 7:8. The proposed improvements will not impact the existing drainage network. The existing drainage pattern intent will be maintained in the proposed condition to meet the NJAC and Southampton Township ordinance requirements for quantity control. An analysis was performed on the existing stormwater management infrastructure for the landfill and adjacent properties. The results of the existing stormwater management analysis show that the existing basins are adequately sized for the volume of stormwater being collected in both the existing and proposed condition.

NJAC 7:8, NJ Pinelands CMP section 7:50-6.84(6)(ii)(4)(1), and Chapter 21-8.4(b)(4)(a) of the Southampton Township Code of Ordinances requires the post-developed stormwater runoff hydrographs not exceed the hydrographs of the pre-developed runoff hydrographs for the 2, 10, and 100-year storms at any point in time for the same storm events. The summary of flows is shown in Table 1 below for the 2, 10, and 100-year storm events. The table demonstrates that the post-developed condition will achieve the required flows, thus meeting the stormwater requirements of NJAC, NJ Pinelands CMP, and Chapter 21 of the Southampton Township Code of Ordinances. A detailed summary of flows for each point of investigation (POI) can be found in section 2.3.4 – Water Quantity Control.

Table 1: Summary of Flows Leaving Project Site

Design Year Storm	Total $Q_{Pre\text{-}Dev}$ (ft^3/s)	Total $Q_{Post\text{-}Dev}$ (ft^3/s)	Post ≤ Pre?
2-year	62.53	62.53	Yes
10-year	97.09	97.09	Yes
100-year	167.37	167.37	Yes

2. HYDROLOGY REPORT

2.1 - BACKGROUND

2.1.1 Project Description

The proposed project involves the installation of ballast-mounted solar panels on the existing landfill located on the project site in Southampton, Township. The landfill has been closed with an impervious cap to prevent water from seeping into the Landfill. The total disturbance from the proposed improvements exceeds 1-acre, thus designating the project as a major development, requiring stormwater review. Several existing grass and riprap channels have been installed on the surface of the landfill to collect and convey runoff to the existing on-site stormwater basins.

The proposed solar array will be mounted on concrete ballast blocks, which provide structural stability to the array and avoid sub-surface disturbance of the existing impervious landfill cap. The proposed improvements also include the construction of several concrete electrical equipment pads, which will function as supporting infrastructure to the array itself. The NJ Pinelands CMP states that ballast area is contributary to an increase in impervious surface, however, the square footage of solar panels is not considered impervious area. Since the ballast blocks and equipment pads will be installed within the limits of the existing impervious landfill cap, the construction of the array will not result in an increase in impervious surface within the contributing area to each stormwater basin. Additionally, under New Jersey Law S-921, solar panels are not considered to be an impervious surface. This development will not increase drivable surface, as the proposed work is to perform maintenance on existing gravel access drives.

Currently, all stormwater runoff is conveyed across the landfill cap through a series of grass and riprap channels, pipes of varying materials and sizes, an underground leachate collection system, and then delivered to existing stormwater basins. The proposed improvements will maintain the existing drainage patterns and flows to each of the existing stormwater systems.

The proposed improvements will also rehabilitate the existing access drive surrounding the landfill, as noted on the as-built record drawings prepared by Atkinson & Walton, Inc., titled “Final Site Plan (Waste fill Area)” dated 05/28/1999, to as-built conditions. Standard construction details have been provided within the civil engineering plans developed by Kimley-Horn and Associates, Inc. The width of the existing gravel drives is to be maintained throughout the property.

2.1.2 Objectives

The purpose of the following study is to evaluate the pre- and post-development hydrologic and hydraulic conditions of the proposed development to determine appropriate site design measures or detention requirements for stormwater runoff. The NJDEP requires that post-construction runoff hydrographs for the 2-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-development runoff hydrographs for the same storm events.

This study will also demonstrate that the proposed improvements on site will not result in an increase in impervious area and regulated motor vehicle surface relative to the as-built conditions. Therefore, the water quality standards outlined in NJAC Section 7:8-5.5 and NJ Pinelands CMP

section 7:50-6.84(6)(iii)(4)(1) do not apply. Groundwater recharge standards will be met because the post-developed conditions will maintain 100 percent of the average annual pre-construction groundwater recharge volume across the site.

2.1.3 Stormwater Modeling

To evaluate the impact of the proposed improvements on the stormwater runoff from the site, a procedure based upon the USDA Soil Conservation Service (SCS), TR-20 Method was chosen. The project area was divided into sub-watersheds using requirements set forth in the NJDEP 2004 Storm water Management Regulations (including updated revisions). The SCS methods developed in TR-20 model the drainage area's response to rainfall in the form of an excess rainfall (runoff) hydrograph. A drainage watershed's response is dependent upon the individual parameters which affect runoff. These parameters include:

1. Storm rainfall amount
2. Watershed size and shape
3. Hydrologic soils group
4. Land use and treatment classification
5. Time of concentration

The time of concentrations (Tc) for the analyzed area were based on SCS TR-55 Methodology and Chapter 15 in Part 630 of the National Engineering Handbook (NEH). For the Site Stormwater Management analysis, a HydroCAD v10.10 computer program developed by HydroCAD Software Solutions LLC was used. The program is modeled after the SCS, USDA TR-20 Program. The design storm depth is determined from rainfall maps, based on the return period being modeled. Combined with the rainfall distribution, this specifies the cumulative rainfall depth at all times during the storm. For this study a NOAA Type C 24-hour rainfall distribution was used for the storm durations for the 2-, 10-, and 100-year storm events. Cumulative rainfall depth obtained from the National Oceanic and Atmospheric Administration (NOAA) for the project site are presented in Table 2 and included in Appendix A.

Table 2: Rainfall Amounts for Southampton Township

Design Year Storm	24-Hour Rainfall Accumulation (inches)
2-year	3.37
10-year	5.19
100-year	8.82

2.2 - EXISTING CONDITIONS

2.2.1 Overview

The site is located adjacent to Old Forge Road and Big Hill Road in Southampton Township, Burlington County, New Jersey, and is identified as Block 2702, Lots 3, 4, 5, 7 & 8. The site has an area of approximately 108.53 acres and is currently owned by Burlington Environmental Management Services, Inc. The site is bound by the Leisuretowne community to the north and west, as well as New Jersey State Department of Environmental Protection lands to the south and privately owned land to the south and east.

According to FEMA map 34005C 0289F, effective 12/21/2017, the project area is located in Zone X – areas of minimal flood hazard outside the 0.2-percent-annual-chance flood. Therefore, no flood hazard area permit will need to be obtained.

The site is occupied by an existing closed landfill and its relevant supporting infrastructure. The landfill was properly closed according to documents provided by L. Robert Kimball & Associates dated 11/11/1996 The landfill is capped with an impervious liner to prevent water infiltration from mixing with the waste stored in the landfill. This impervious cap is covered with a soil and grass surface, with both grass and riprap lined channels to facilitate drainage. The remainder of the site consists of undeveloped pervious grass open space, medium-density woodland, and stormwater management basins associated with the landfill.

The project area is located in two existing drainage areas. All cover types are considered in “good” condition, and all runoff curve number/coefficient data was obtained via the NRCS TR-55 manual or directly from the NJAC and NJ Pinelands CMP. The grass surface covering the impervious cap is in good condition, yet has curve number of 98 due to no infiltration. The project area drains to two existing storm conveyance systems which outfall to the existing stormwater management basins. No stormwater management improvements are proposed outside of the two existing drainage areas. The existing drainage conditions can be seen on the *Existing Conditions Drainage Map* found as **Exhibit 1** of this report. The two points of analysis for the present study are considered the riprap channel crossing between parcels 5 and 7 (POI 1) and the upstream concrete headwall on parcel (POI 2).

2.3 - POST-DEVELOPED CONDITIONS

2.3.1 Overview

This report analyzes approximately 37.35 acres of disturbed area within the site. The proposed improvements will maintain the existing drainage pattern to the two points of analysis. The addition of the ballast blocks and equipment pads will not increase the overall impervious coverage area in either drainage area. Both areas will continue to drain to their respective Points of Interest (POIs) via sheet flow, shallow concentrated flow, and channelized flow. No additional runoff will be created. All runoff will continue to be detained in the existing stormwater detention basins.

2.3.2 Stormwater Management Approach

The proposed improvements are designed to remain entirely within the existing limits of the landfill's impervious cap. This will not result in an increase to existing runoff flows, because the total impervious coverage area will remain the same in the existing and proposed conditions. Existing drainage patterns will be unchanged. The function and performance of the existing stormwater infrastructure, including all existing channels, swales, pipes, and ponds, will be unaffected by the proposed improvements, as the existing and proposed stormwater runoff flows will be identical.

2.3.3 Water Quality

Stormwater quality requirements do not apply to this project, as the proposed development does not result in an increase of one-quarter acre or more of regulated motor vehicle surface as noted in NJAC 7:8-5.5(a). The proposed improvements will rehabilitate the existing access drives on site to reflect the as-built conditions documented in the record drawings prepared by Atkinson & Walton, Inc, titled "Final Site Plan (Waste fill Area)" dated 05/28/1999. Therefore, the water quality standards of Section 7:8-5.5 of the NJAC do not apply to the proposed improvements.

2.3.4 Water Quantity Control

To satisfy Chapter 21-8.4(b)(4)(a) of the Southampton Township Code of Ordinances, NJAC 7:8, and NJ Pinelands CMP section 7:50-6.84(6)(ii)(4)(1), it shall be demonstrated through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2-, 10- and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events. To the achieve water quantity requirement, the existing drainage pattern intent is maintained and the impervious surface cover for the site is not increased. The peak discharges for the points/limits of investigation are summarized in Table 3 below. The results of the existing and proposed analysis can be found in **Appendix B** and **C**, respectively.

Table 3: Summary of Flows Leaving Project Site

	DA-1 (POI 1)			DA-2 (POI 2)			Total Site		
Design Year Storm	$Q_{Pre\text{-}Dev}$ (ft^3/s)	$Q_{Post\text{-}Dev}$ (ft^3/s)	Post ≤ Pre?	$Q_{Pre\text{-}Dev}$ (ft^3/s)	$Q_{Post\text{-}Dev}$ (ft^3/s)	Post ≤ Pre?	$Q_{Pre\text{-}Dev}$ (ft^3/s)	$Q_{Post\text{-}Dev}$ (ft^3/s)	Post ≤ Pre?
2-year	21.58	21.58	Yes	40.95	40.95	Yes	62.53	62.53	Yes
10-year	33.49	33.49	Yes	63.60	63.60	Yes	97.09	97.09	Yes
100-year	57.13	57.13	Yes	110.24	110.24	Yes	167.37	167.37	Yes

2.3.5 Groundwater Recharge

As outlined in NJAC 7:8-5.4, groundwater recharge standards shall be met if the engineer can demonstrate using hydraulic and hydrologic analyses that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site, or the increase of stormwater runoff volume from the pre-construction to post-construction for the two-year storm is infiltrated.

The proposed improvements result in a net zero increase in impervious coverage. All ballast blocks and equipment pads to support the proposed array will be placed on top of the existing impervious landfill cap; the existing access drives will be rehabilitated to as-built conditions per the record drawings prepared by Atkinson & Walton, Inc., titled “Final Site Plan (Waste fill Area)” dated 05/28/1999. Thus, the proposed improvements will not reduce annual pre-construction groundwater recharge and groundwater recharge requirements will be met. This is reflected in Appendix D, Groundwater Recharge Spreadsheet.

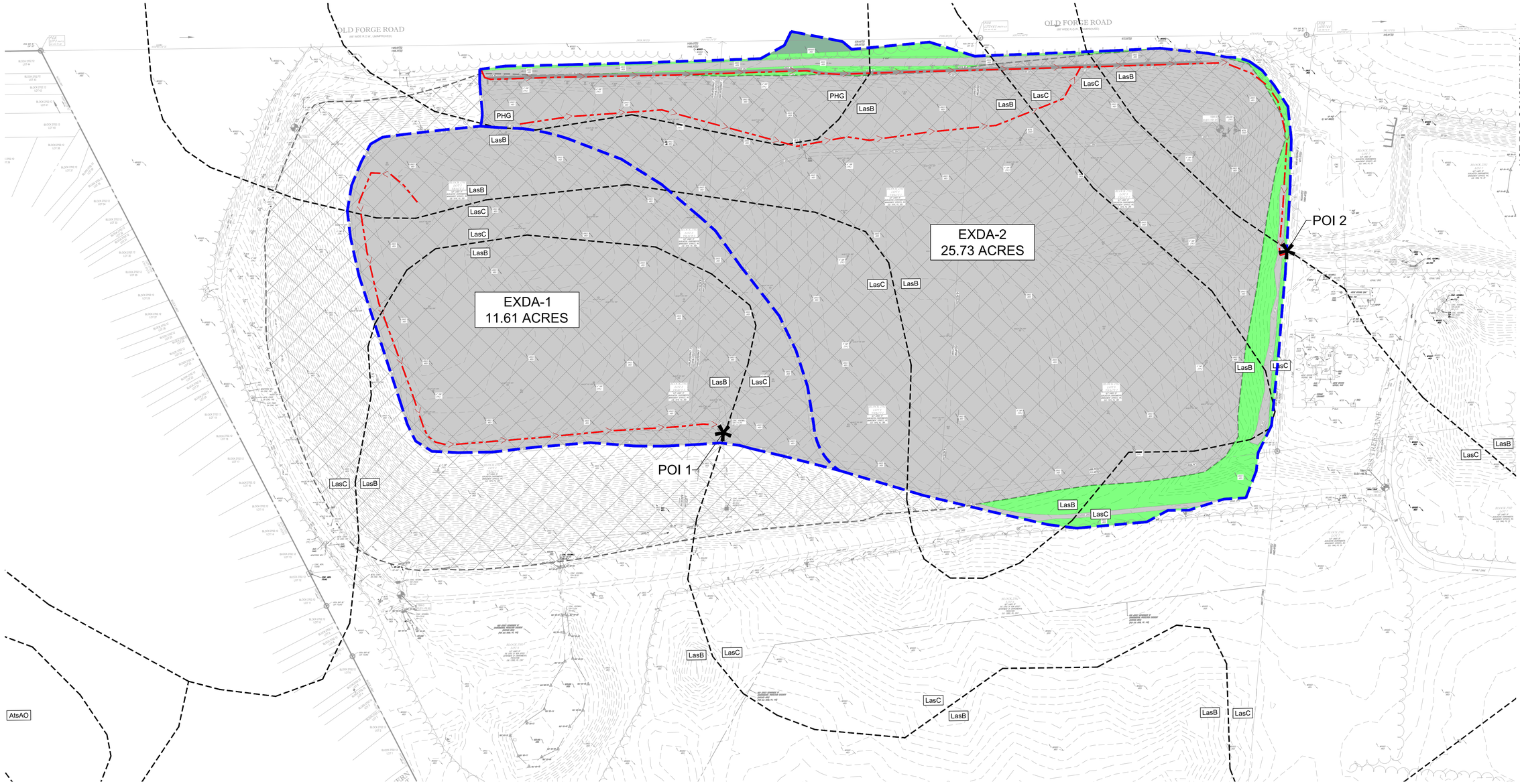
2.3.6 Stormwater Conveyance

All existing stormwater conveyance structures will remain. The peak flows through all appurtenances in the post-development condition will be identical to the pre-development condition and no improvements or modifications are needed.

3. EXHIBITS

EXHIBIT 1 - EXISTING CONDITION DRAINAGE MAP

July 19, 2021 K:\PRN_Energy\112302000 - CEP Renewables LLC - Southampton\6. CAD\Plansheets\Drainage Area Maps\DAM Pre.dwg



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LEGEND

- DRAINAGE AREA
- T_C PATH
- SOIL TYPE BOUNDARY
- POI LOCATION
- IMPERVIOUS AREA
- IMPERVIOUS CAP LIMITS
- PERVIOUS AREA - GRASS
- PERVIOUS AREA - FOREST

TOTAL DRAINAGE AREA = 37.34 AC
EX. IMPERVIOUS AREA = 35.18 AC
EX. PERVIOUS AREA = 2.16 AC
GRASS: 2.05 AC
FOREST: 0.11 AC

DRAINAGE AREA #1 = 11.61 AC
EX. IMPERVIOUS AREA = 11.61 AC
EX. PERVIOUS AREA = 0 AC

DRAINAGE AREA #2 = 25.73 AC
EX. IMPERVIOUS AREA = 23.57 AC
EX. PERVIOUS AREA =2.16 AC
GRASS: 2.05 AC
FOREST: 0.11 AC

SOIL TYPE

MAP SYMBOL	HSG RATING
AtsAO	A/D
BesAs	A/D
LakB	A
LamB	A
LanB	A
LasB	A
LasC	A
PGH	UNRATED

GRAPHIC SCALE IN FEET
0 50 100 200

NOT FOR CONSTRUCTION

FOR REVIEW

No.	REVISIONS	DATE	BY

Kimley»Horn
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902 CARNEGIE CENTER BLVD., SUITE 140, PRINCETON, NJ 08540
PHONE: 609-881-2428
WWW.KIMLEY-HORN.COM
CERTIFICATE OF AUTHORIZATION No. 24GA28039300

T.W. DIGGAN
PROFESSIONAL ENGINEER
NOT ADMITTED LICENSED IN NEW JERSEY

KHA PROJECT 112302000
DATE 07/14/2021
SCALE AS SHOWN
DESIGNED BY MJG
DRAWN BY MJG
CHECKED BY TWD

EXISTING CONDITION DRAINAGE MAP

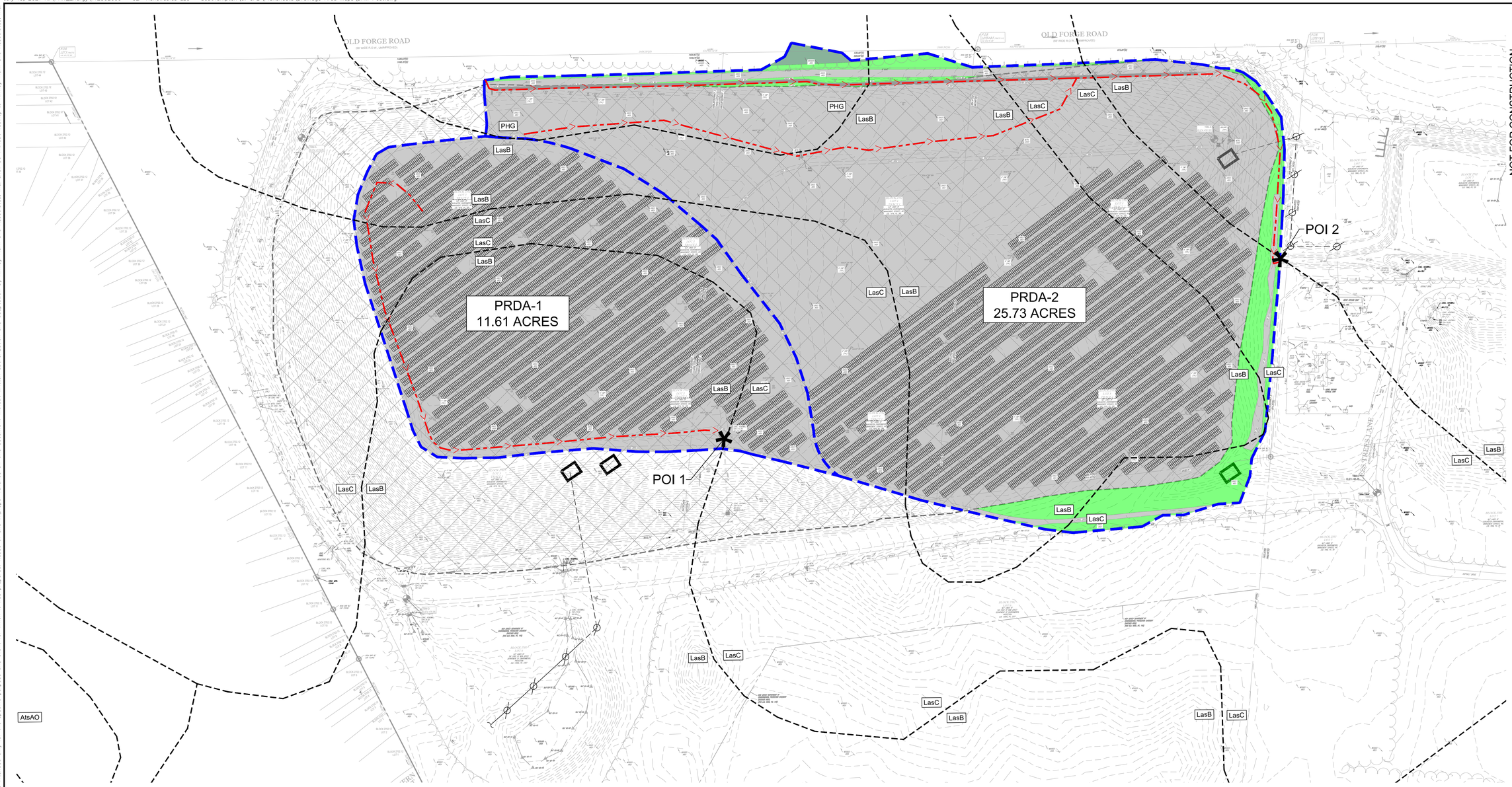
811 Know what's below. Call before you dig.
PRIOR TO CONSTRUCTION, CONTRACTOR SHALL CALL
NEW JERSEY ONE CALL CENTER
STATE OF NEW JERSEY
DIAL 811 OR 1-800-272-1000
FOR LOCATION OF UNDERGROUND UTILITIES

SOUTHAMPTON SOLAR
BLOCK 2702, LOTS 3, 4, 5, 7, & 8
SOUTHAMPTON, NJ
PREPARED FOR
BEMS SOUTHAMPTON SOLAR FARM, LLC
NEW JERSEY
BURLINGTON COUNTY

SHEET NUMBER
EX-1

EXHIBIT 2 – PROPOSED CONDITION DRAINAGE MAP

July 19, 2021 K:\PRN_Energy\112302000 – CEP Renewables LLC – Southampton\6. CAD\Plansheets\Drainage Area Maps\DAM Post.dwg



LEGEND

- DRAINAGE AREA
- T_C PATH
- SOIL TYPE BOUNDARY
- POI LOCATION
- IMPERVIOUS AREA
- IMPERVIOUS CAP LIMITS
- PERVIOUS AREA - GRASS
- PERVIOUS AREA - FOREST

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DRAINAGE AREA #2 = 25.73 AC
EX. IMPERVIOUS AREA = 23.57 AC
EX. PERVIOUS AREA =2.16 AC
GRASS: 2.05 AC
FOREST: 0.11 AC

SOIL TYPE

MAP SYMBOL	HSG RATING
AtsAO	A/D
BesAs	A/D
LakB	A
LamB	A
LanB	A
LasB	A
LasC	A
PGH	UNRATED

NORTH

GRAPHIC SCALE IN FEET
0 50 100 200

NOT FOR CONSTRUCTION

FOR REVIEW

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PHONE: 609-881-2428
WWW.KIMLEY-HORN.COM
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NOT ADMITTED LICENSE IN NEW JERSEY

KHA PROJECT 112302000
DATE 07/14/2021
SCALE AS SHOWN
DESIGNED BY MJG
DRAWN BY MJG
CHECKED BY TWD

PROPOSED CONDITION DRAINAGE MAP

811 Know what's below. Call before you dig.
PRIOR TO CONSTRUCTION, CONTRACTOR SHALL CALL
NEW JERSEY ONE CALL CENTER
STATE OF NEW JERSEY
DIAL 811 OR 1-800-272-1000
FOR LOCATION OF UNDERGROUND UTILITIES

SOUTHAMPTON SOLAR
BLOCK 2702, LOTS 3, 4, 5, 7, & 8
SOUTHAMPTON, NJ
PREPARED FOR
BEMS SOUTHAMPTON SOLAR FARM, LLC
BURLINGTON COUNTY NEW JERSEY

SHEET NUMBER
EX-2

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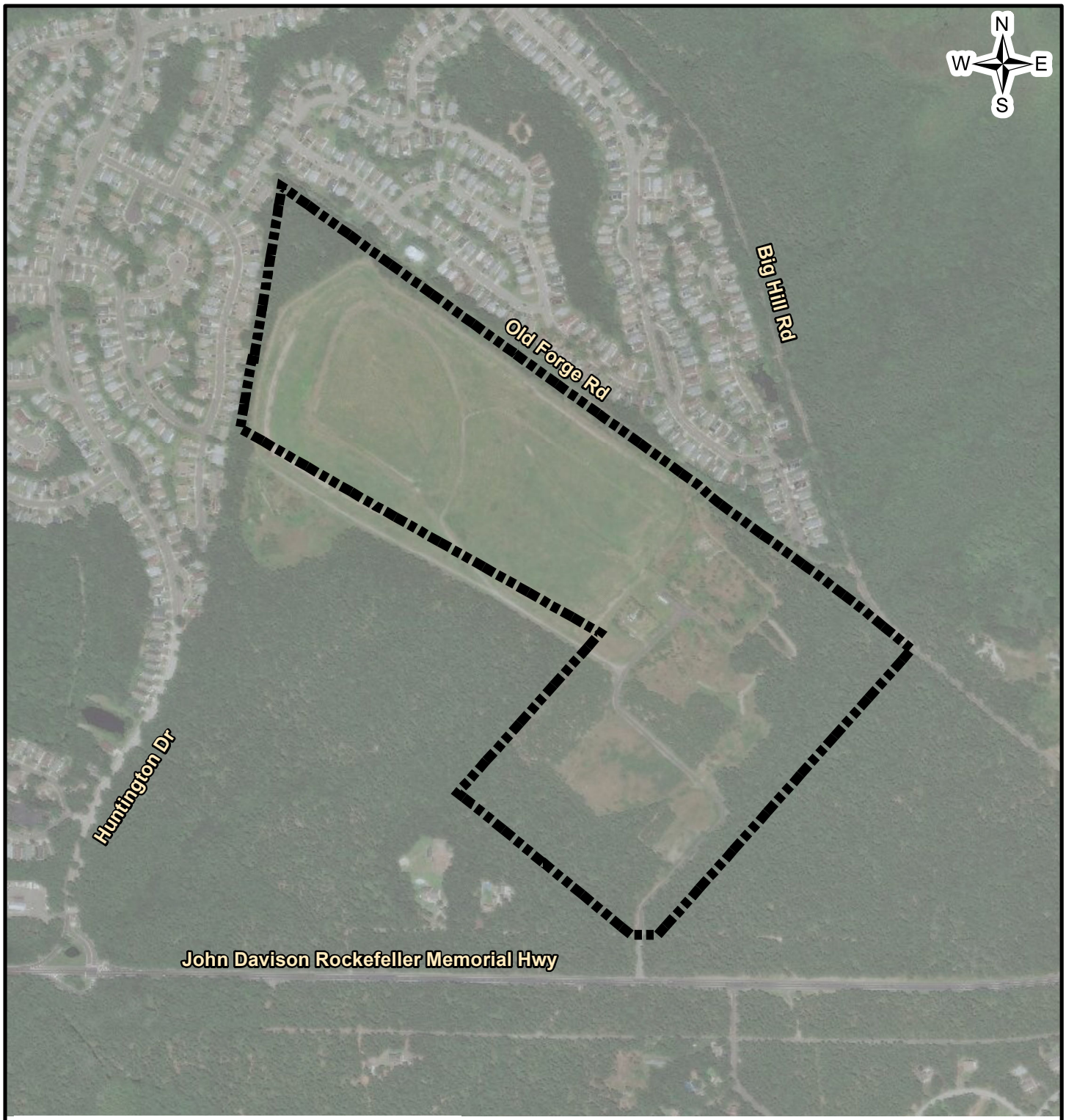
4. APPENDICES

APPENDIX 1 – AERIAL MAP



Legend

Approximate Site Boundary (5 Parcels)

Notes:
1. Basemap is provided through Kimley-Horn's ArcMap Software licensing and ArcGIS online, AeroGRID, CNES/Airbus DS, ESRI, Earthstar Geographics, GeoEye, IGN, USDA, USGS, and the GIS User Community.
2. Site Boundary is comprised of 5 parcels and is based on parcel data provided by the Burlington County GIS Dept all features shown are approximate.

700 0 700
Feet

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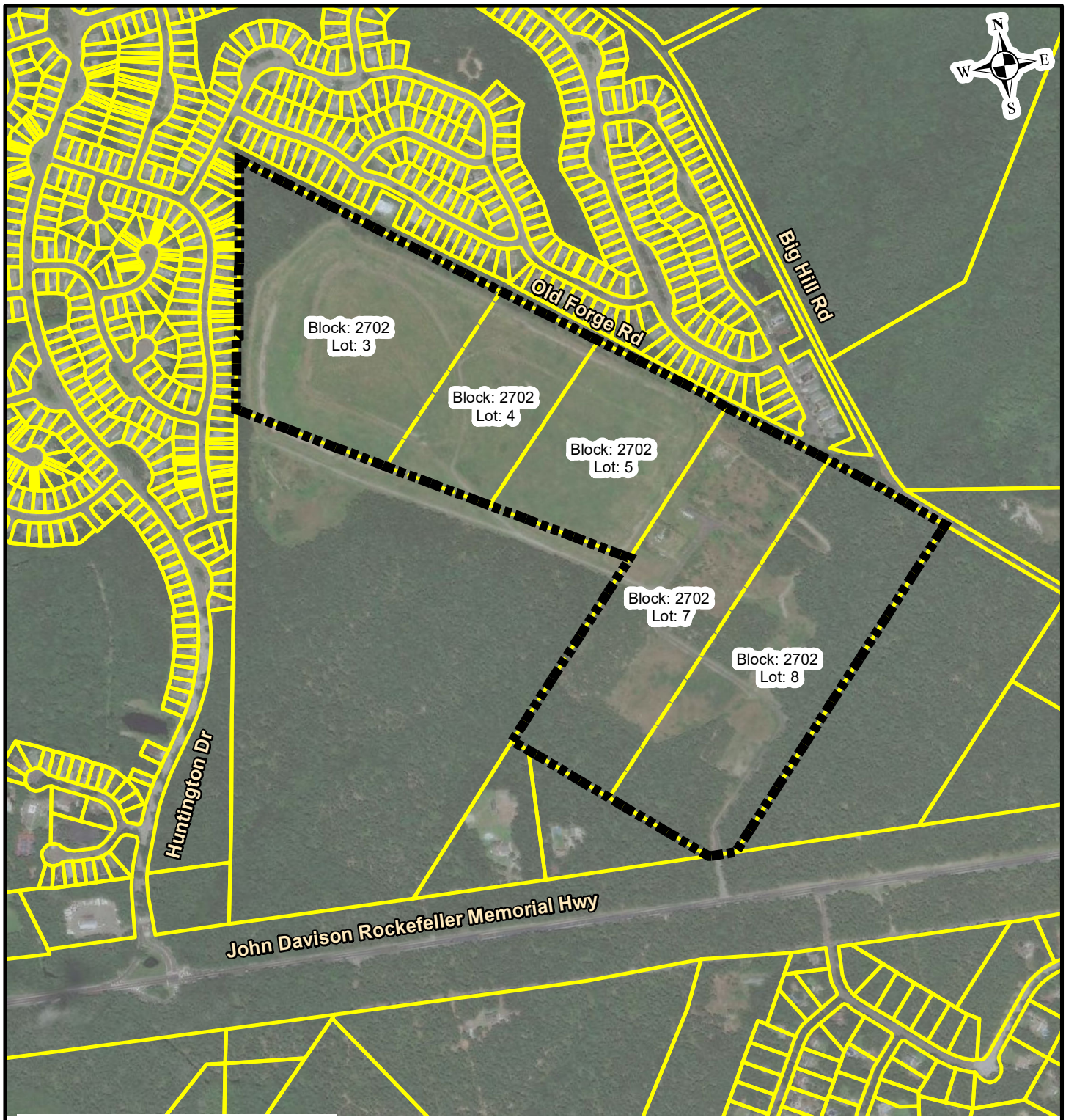
Project	Figure Title	Project No.	Figure
CEP SOUTHAMPTON BURLINGTON COUNTY NEW JERSEY	AERIAL MAP	112302000	1
		Date: APRIL 2021	
		Scale: 1" = 700'	
		Drawn By: JRI	

APPENDIX 2 – PARCEL MAP



Legend

- Approximate Site Boundary (5 Parcels)
- Interior Parcel Boundary
- Parcel Boundary

Notes:
1. Parcel data provided in GIS format by the Burlington County GIS Dept.all features shown are approximate.
2. Basemap is provided through Kimley-Horn's ArcMap Software licensing and ArcGIS online, AeroGRID, CNES/Airbus DS, ESRI, Earthstar Geographics, GeoEye, IGN, USDA, USGS, and the GIS User Community.
3. Site Boundary is comprised of 5 parcels and is based on parcel data provided by the Burlington County GIS Dept, all features shown are approximate.

700 0 700 Feet

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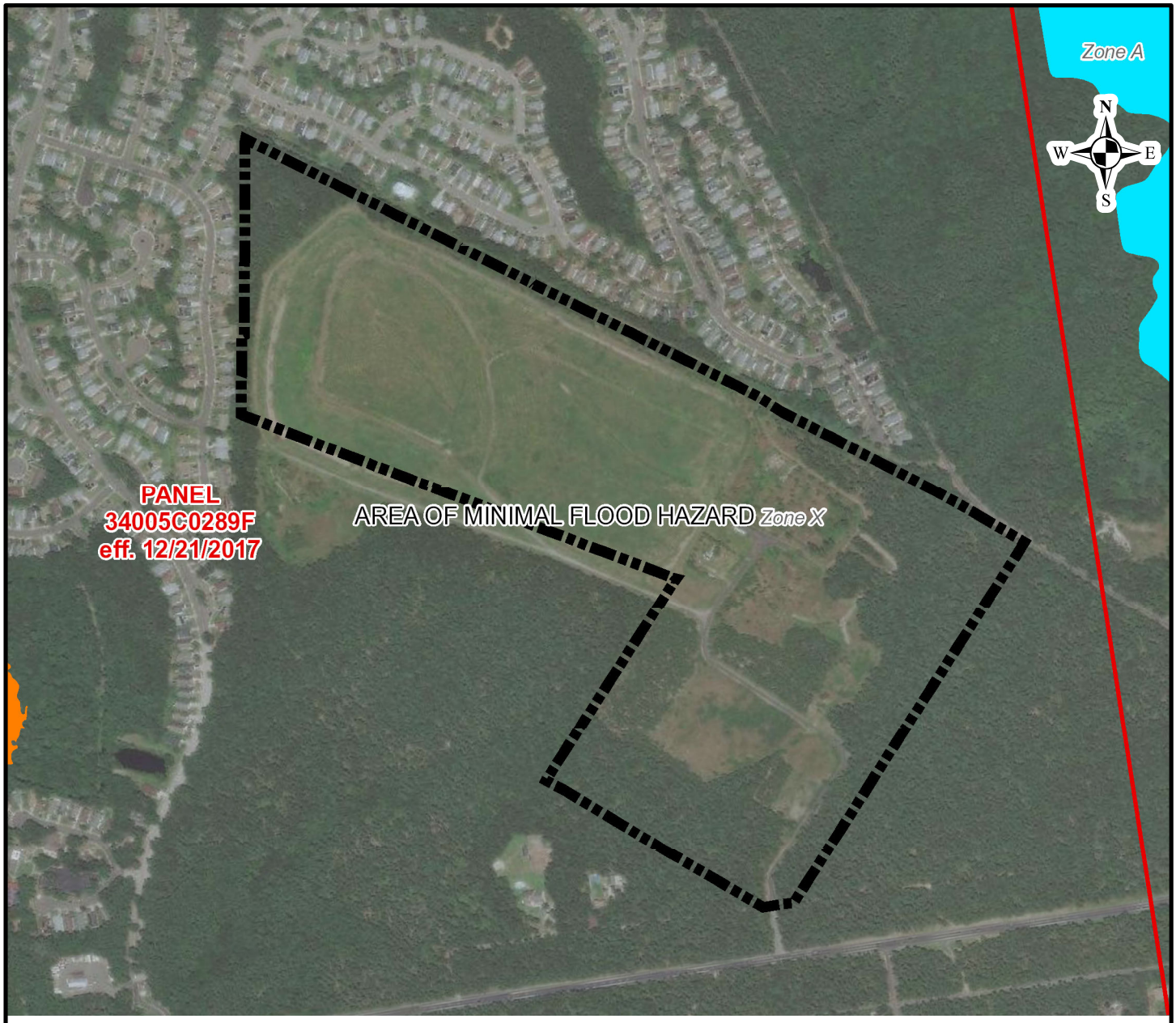
Project	Figure Title	Project No.	Figure
CEP SOUTHAMPTON BURLINGTON COUNTY NEW JERSEY	PARCEL MAP	112302000	2
		Date: APRIL 2021	
		Scale: 1" = 700'	
		Drawn By: JRI	

APPENDIX 3 – FLOOD HAZARD MAP



Legend

- Approximate Site Boundary (5 Parcels)
- FIRM Panels

Flood Hazard Zones

Zone Type

- 1% Annual Chance Flood Hazard
- Regulatory Floodway
- Special Floodway
- Area of Undetermined Flood Hazard
- 0.2% Annual Chance Flood Hazard
- Future Conditions 1% Annual Chance Flood Hazard
- Area with Reduced Risk Due to Levee

Notes:
1. Flood Hazard data provided by FEMA, 2020.
2. Basemap is provided through Kimley-Horn's ArcMap Software licensing and ArcGIS online, AeroGRID, CNES/Airbus DS, ESRI, Earthstar Geographics, GeoEye, IGN, USDA, USGS, and the GIS User Community.
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700 0 700 Feet

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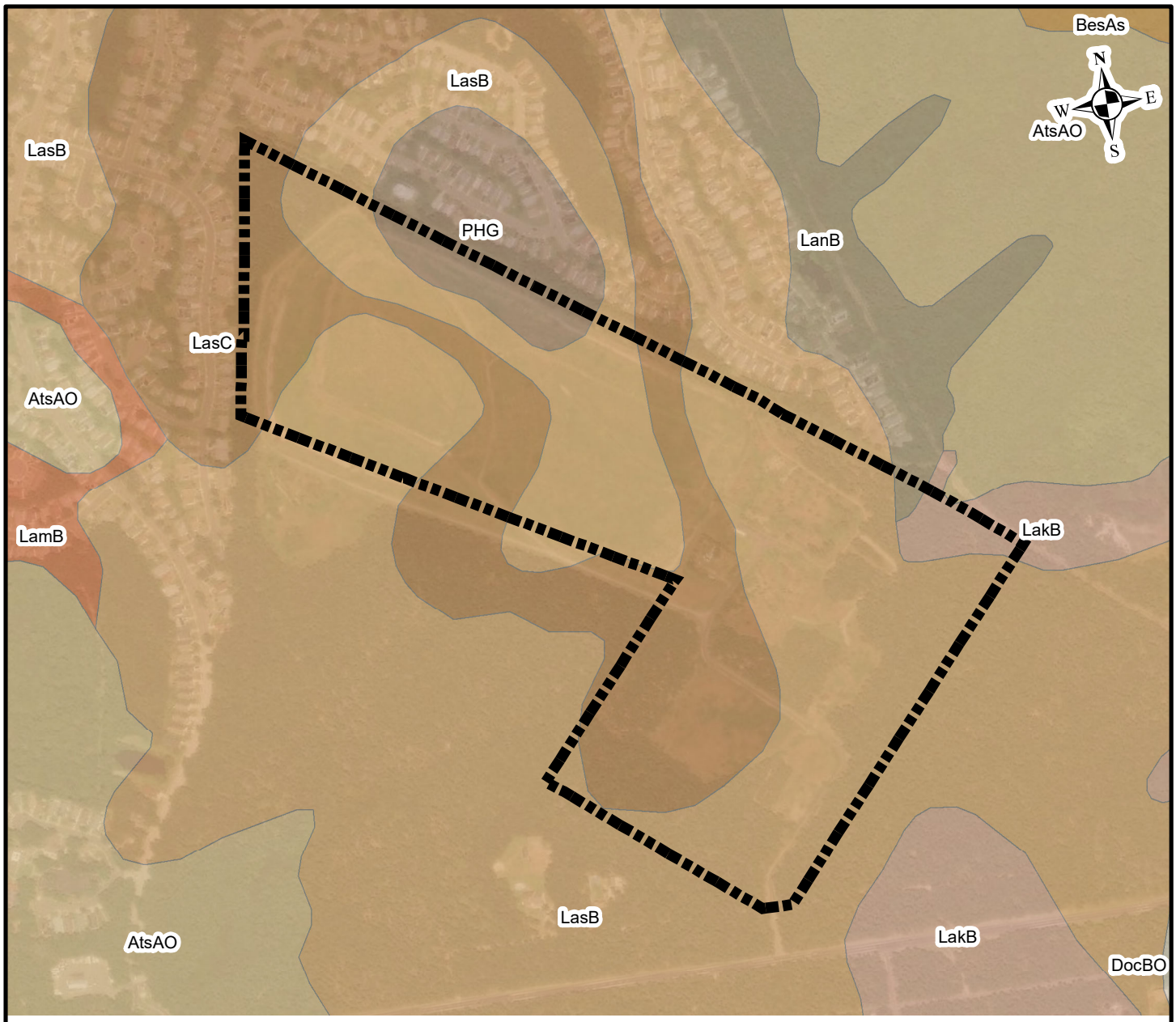
Project	Figure Title	Project No.	Figure
CEP SOUTHAMPTON BURLINGTON COUNTY NEW JERSEY	FEMA FLOOD HAZARD MAP	112302000	3
		Date: APRIL 2021	
		Scale: 1" = 700'	
		Drawn By: JRI	

APPENDIX 4 – NRCS SOILS MAP



Legend

Approximate Site Boundary (5 Parcels)

Map Unit Name

- AtsAO - Atsion Sand
- AtshA - Atsion Sand, Loamy Substratum
- AttA - Atsion Fine Sand
- BesAs - Berryland Mucky Sand
- DocBO - Downer Loamy Sand
- EveB - Evesboro Sand
- FmgAt - Fluvaquents, Sandy
- LakB - Lakehurst Sand
- LamB - Lakehurst Fine Sand
- LanB - Lakehurst-Lakewood Sands
- LasB - Lakewood Sand (0-5% Slope)
- LasC - Lakewood Sand (5-10% Slope)
- LatB - Lakewood Fine Sand
- MunA - Mullica Fine Sandy Loam
- PHG - Pits, Sand, & Gravel
- WATER

Notes:
1. Soil data provided by NRCS
2. Basemap is provided through Kimley-Horn's ArcMap Software licensing and ArcGIS online, AeroGRID, CNES/Airbus DS, ESRI, Earthstar Geographics, GeoEye, IGN, USDA, USGS, and the GIS User Community.
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700 0 700 Feet

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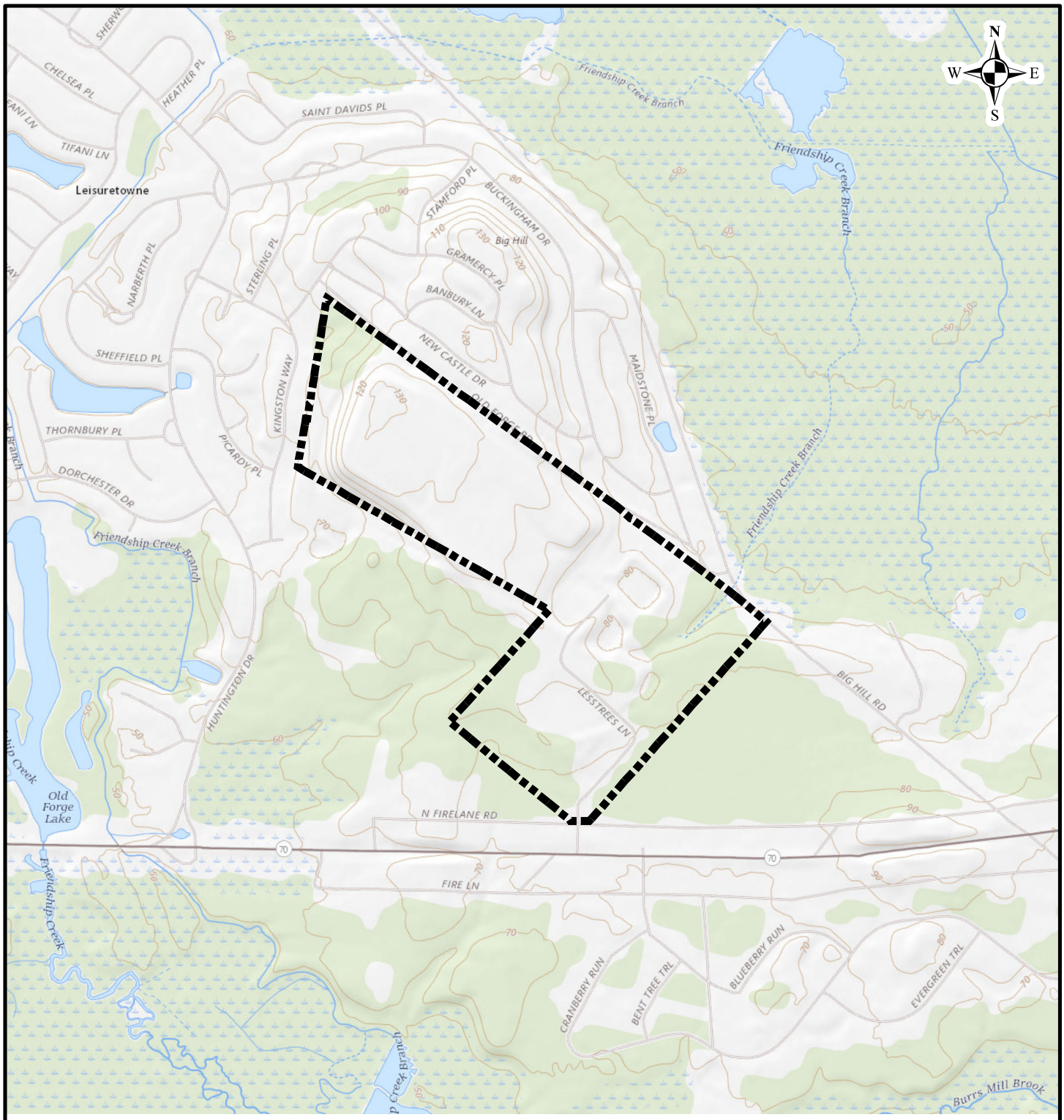
Project	Figure Title	Project No.	Figure
CEP SOUTHAMPTON BURLINGTON COUNTY NEW JERSEY	NRCS SOILS MAP	112302000	4
		Date: APRIL 2021	
		Scale: 1" = 700'	
		Drawn By: JRI	

APPENDIX 5 – USGS TOPOGRAPHIC MAP



Legend

Approximate Site Boundary (5 Parcels)

Notes:
1. Basemap is provided through Kimley-Horn's ArcMap software licensing and ArcGIS online, 3DEP Elevation Program, ESRI, Earthstar Geographics, Geographic Names Information System, National Boundaries Dataset, National Land Cover Database, National Structures Dataset, National Transportation Dataset, USDA, and USGS.
2. Site Boundary is comprised of 1 parcel and is based on parcel data provided by the Burlington County GIS Dept.
All features shown are approximate.

1,000 0 1,000
Feet

Kimley»Horn

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902 Carnegie Center Blvd #140, Princeton, NJ 08540
Phone: 609 681 2428
www.kimley-horn.com

Project
CEP
SOUTHAMPTON
BURLINGTON COUNTY NEW JERSEY

Figure Title
USGS TOPOGRAPHIC MAP

Project No. 112302004	Figure 5
Date APRIL 2021	
Scale 1" = 1,000'	
Drawn By JRI	

APPENDIX 6 – GROUNDWATER RECHARGE SPREADSHEETS

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
BURLINGTON CO., SOUTHAMPTON TWP	45.9	1.44

Project Name:	**BEMS Southampton Solar**
Description:	**Proposed Solar Array POI-1**
Analysis Date:	**10/15/21**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	11.61	Impervious areas	Lakewood	0.0	-
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Total =	11.6			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	11.61	Impervious areas	Lakewood	0.0	-
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Total =	11.6			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	505,732
Post-Development Annual Recharge Deficit=	***0***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	#N/A	(in)	DRWC=	#N/A	(in)
ERWC =	#N/A	(in)	EDRWC=	#N/A	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
BURLINGTON CO., SOUTHAMPTON TWP	45.9	1.44

Project Name:	**BEMS Southampton Solar**
Description:	**Proposed Solar Array POI-2**
Analysis Date:	**06/28/21**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.26	Impervious areas	Gravel Pits	0.0	-
2	21.31	Impervious areas	Lakewood	0.0	-
3	0.11	Woods	Gravel Pits	16.1	6,419
4	0.01	Woods	Lakewood	14.7	534
5	0.3	Open space	Gravel Pits	16.7	18,134
6	1.74	Open space	Lakewood	15.5	98,035
7					
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	25.7			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				1.3	123,123

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.26	Impervious areas	Gravel Pits	0.0	-
2	21.31	Impervious areas	Lakewood	0.0	-
3	0.11	Woods	Gravel Pits	16.1	6,419
4	0.01	Woods	Lakewood	14.7	534
5	0.3	Open space	Gravel Pits	16.7	18,134
6	1.74	Open space	Lakewood	15.5	98,035
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	25.7			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				1.3	123,123

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)
		1,026,709
Post-Development Annual Recharge Deficit=	***0***	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	1.30	(in)	DRWC=	1.30	(in)
ERWC =	0.36	(in)	EDRWC=	0.36	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

APPENDIX 7 – NOAA POINT PRECIPITATION FREQUENCY ESTIMATES

NOAA Atlas 14, Volume 2, Version 3
Location name: Vincentown, New Jersey, USA*
Latitude: 39.8914°, Longitude: -74.6896°
Elevation: 65.02 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.352** (0.319-0.387)	**0.420** (0.381-0.462)	**0.497** (0.450-0.547)	**0.555** (0.502-0.612)	**0.627** (0.564-0.690)	**0.680** (0.608-0.750)	**0.733** (0.653-0.810)	**0.783** (0.692-0.869)	**0.845** (0.739-0.944)	**0.895** (0.775-1.01)
10-min	**0.562** (0.509-0.619)	**0.671** (0.609-0.739)	**0.796** (0.721-0.876)	**0.888** (0.802-0.979)	**1.00** (0.898-1.10)	**1.08** (0.969-1.19)	**1.17** (1.04-1.29)	**1.24** (1.10-1.38)	**1.34** (1.17-1.49)	**1.41** (1.22-1.59)
15-min	**0.702** (0.636-0.773)	**0.844** (0.766-0.929)	**1.01** (0.912-1.11)	**1.12** (1.01-1.24)	**1.27** (1.14-1.39)	**1.37** (1.23-1.51)	**1.47** (1.31-1.63)	**1.57** (1.39-1.74)	**1.68** (1.47-1.88)	**1.77** (1.53-1.99)
30-min	**0.962** (0.873-1.06)	**1.17** (1.06-1.28)	**1.43** (1.30-1.58)	**1.63** (1.47-1.79)	**1.88** (1.69-2.07)	**2.07** (1.85-2.28)	**2.26** (2.01-2.49)	**2.44** (2.15-2.70)	**2.68** (2.34-2.99)	**2.86** (2.48-3.22)
60-min	**1.20** (1.09-1.32)	**1.46** (1.33-1.61)	**1.84** (1.66-2.02)	**2.12** (1.92-2.34)	**2.50** (2.25-2.75)	**2.80** (2.50-3.09)	**3.11** (2.77-3.43)	**3.42** (3.02-3.79)	**3.84** (3.36-4.29)	**4.18** (3.62-4.71)
2-hr	**1.45** (1.31-1.62)	**1.77** (1.60-1.97)	**2.24** (2.01-2.48)	**2.60** (2.33-2.88)	**3.09** (2.76-3.43)	**3.49** (3.10-3.88)	**3.90** (3.44-4.35)	**4.32** (3.79-4.84)	**4.91** (4.24-5.53)	**5.38** (4.60-6.11)
3-hr	**1.59** (1.43-1.77)	**1.94** (1.75-2.16)	**2.45** (2.20-2.73)	**2.86** (2.56-3.19)	**3.42** (3.04-3.81)	**3.89** (3.43-4.33)	**4.38** (3.83-4.89)	**4.88** (4.23-5.47)	**5.59** (4.77-6.31)	**6.18** (5.21-7.01)
6-hr	**1.98** (1.79-2.23)	**2.40** (2.16-2.70)	**3.03** (2.72-3.39)	**3.55** (3.17-3.97)	**4.30** (3.80-4.81)	**4.93** (4.33-5.51)	**5.60** (4.87-6.28)	**6.33** (5.44-7.12)	**7.37** (6.22-8.35)	**8.26** (6.87-9.43)
12-hr	**2.40** (2.17-2.70)	**2.91** (2.62-3.27)	**3.69** (3.30-4.14)	**4.37** (3.90-4.89)	**5.37** (4.75-6.01)	**6.25** (5.48-7.01)	**7.22** (6.24-8.11)	**8.29** (7.05-9.35)	**9.89** (8.22-11.2)	**11.3** (9.20-12.9)
24-hr	**2.77** (2.56-3.02)	**3.37** (3.11-3.66)	**4.35** (4.01-4.72)	**5.19** (4.78-5.63)	**6.46** (5.90-6.98)	**7.57** (6.86-8.16)	**8.82** (7.91-9.49)	**10.2** (9.07-11.0)	**12.3** (10.8-13.3)	**14.2** (12.2-15.3)
2-day	**3.17** (2.94-3.45)	**3.86** (3.57-4.19)	**4.98** (4.60-5.40)	**5.93** (5.46-6.43)	**7.35** (6.72-7.95)	**8.58** (7.79-9.27)	**9.95** (8.95-10.7)	**11.5** (10.2-12.4)	**13.8** (12.1-14.9)	**15.7** (13.6-17.1)
3-day	**3.35** (3.11-3.62)	**4.06** (3.78-4.40)	**5.21** (4.84-5.64)	**6.18** (5.73-6.68)	**7.63** (7.02-8.22)	**8.87** (8.11-9.55)	**10.2** (9.29-11.0)	**11.8** (10.6-12.6)	**14.0** (12.4-15.1)	**16.0** (14.0-17.2)
4-day	**3.52** (3.29-3.80)	**4.26** (3.98-4.60)	**5.45** (5.08-5.88)	**6.44** (5.99-6.94)	**7.91** (7.32-8.49)	**9.16** (8.43-9.83)	**10.5** (9.62-11.3)	**12.0** (10.9-12.9)	**14.3** (12.8-15.3)	**16.2** (14.3-17.4)
7-day	**4.11** (3.85-4.39)	**4.95** (4.64-5.29)	**6.22** (5.83-6.66)	**7.30** (6.81-7.80)	**8.87** (8.24-9.47)	**10.2** (9.44-10.9)	**11.7** (10.7-12.4)	**13.2** (12.1-14.1)	**15.6** (14.0-16.6)	**17.6** (15.6-18.8)
10-day	**4.66** (4.39-4.96)	**5.59** (5.27-5.96)	**6.92** (6.51-7.37)	**8.02** (7.53-8.52)	**9.59** (8.97-10.2)	**10.9** (10.1-11.6)	**12.3** (11.4-13.0)	**13.8** (12.7-14.6)	**15.9** (14.5-16.9)	**17.8** (16.1-19.0)
20-day	**6.31** (5.99-6.65)	**7.50** (7.12-7.92)	**9.04** (8.58-9.53)	**10.3** (9.74-10.8)	**12.0** (11.3-12.6)	**13.4** (12.6-14.1)	**14.8** (13.9-15.5)	**16.2** (15.1-17.1)	**18.2** (16.9-19.3)	**19.8** (18.2-21.0)
30-day	**7.82** (7.45-8.20)	**9.24** (8.81-9.70)	**11.0** (10.4-11.5)	**12.3** (11.7-12.9)	**14.1** (13.4-14.8)	**15.5** (14.7-16.3)	**17.0** (16.0-17.8)	**18.4** (17.3-19.3)	**20.4** (19.0-21.4)	**21.9** (20.3-23.1)
45-day	**9.98** (9.55-10.4)	**11.8** (11.2-12.3)	**13.7** (13.1-14.3)	**15.2** (14.5-15.9)	**17.1** (16.3-17.9)	**18.6** (17.7-19.4)	**20.0** (19.0-20.9)	**21.4** (20.2-22.4)	**23.1** (21.8-24.2)	**24.4** (22.9-25.6)
60-day	**12.0** (11.4-12.5)	**14.0** (13.4-14.7)	**16.2** (15.5-16.9)	**17.8** (17.0-18.5)	**19.8** (18.9-20.7)	**21.3** (20.3-22.2)	**22.7** (21.6-23.7)	**24.0** (22.8-25.1)	**25.7** (24.3-26.9)	**26.9** (25.4-28.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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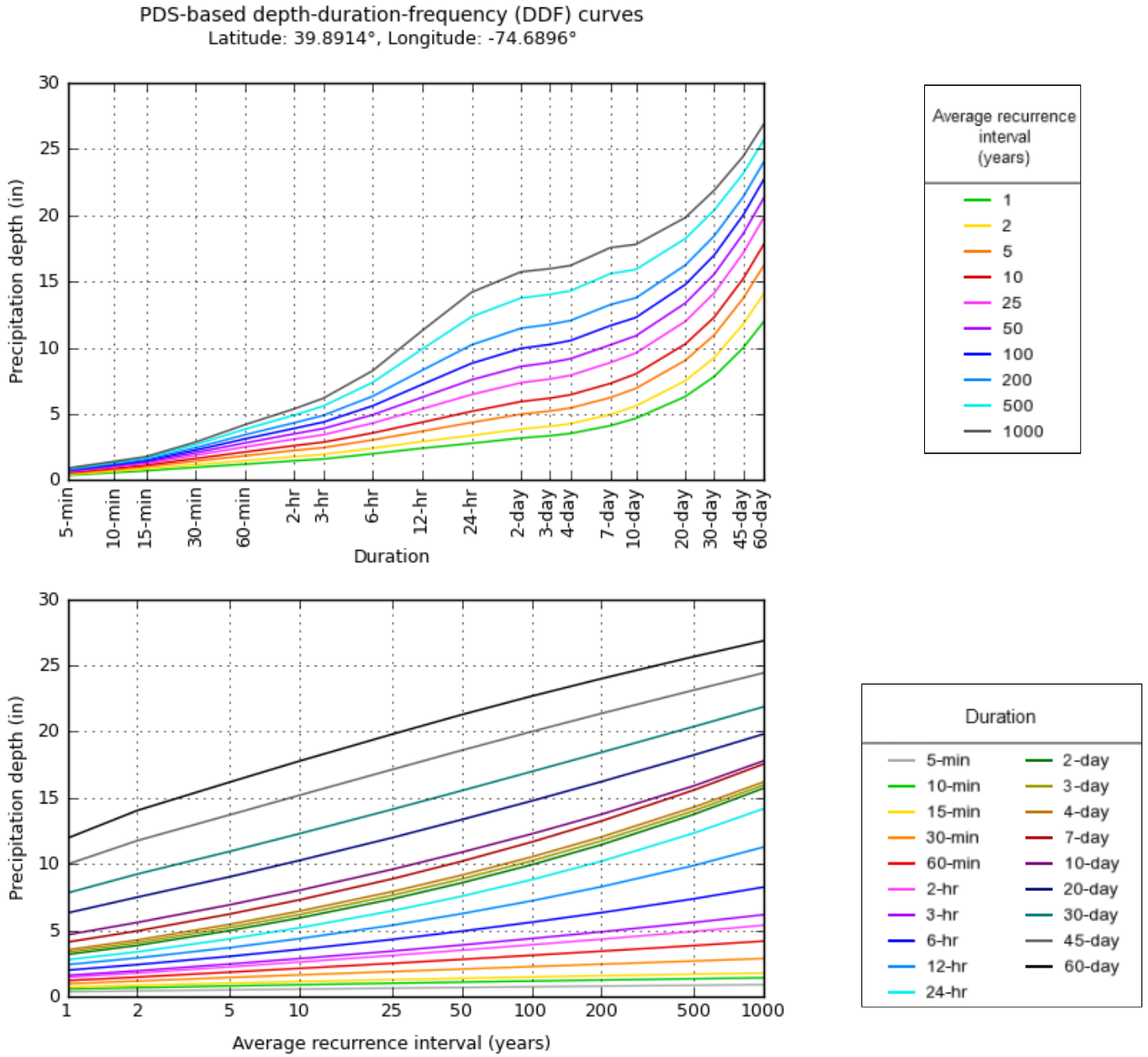
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Thu Apr 15 23:40:46 2021

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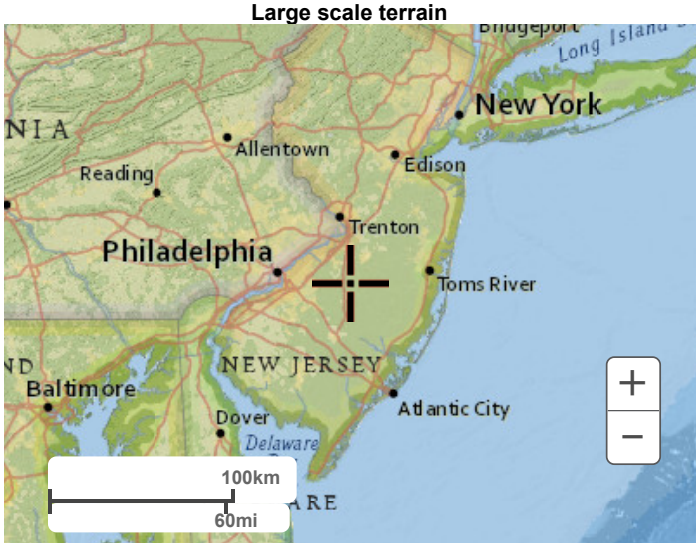
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map

Large scale aerial

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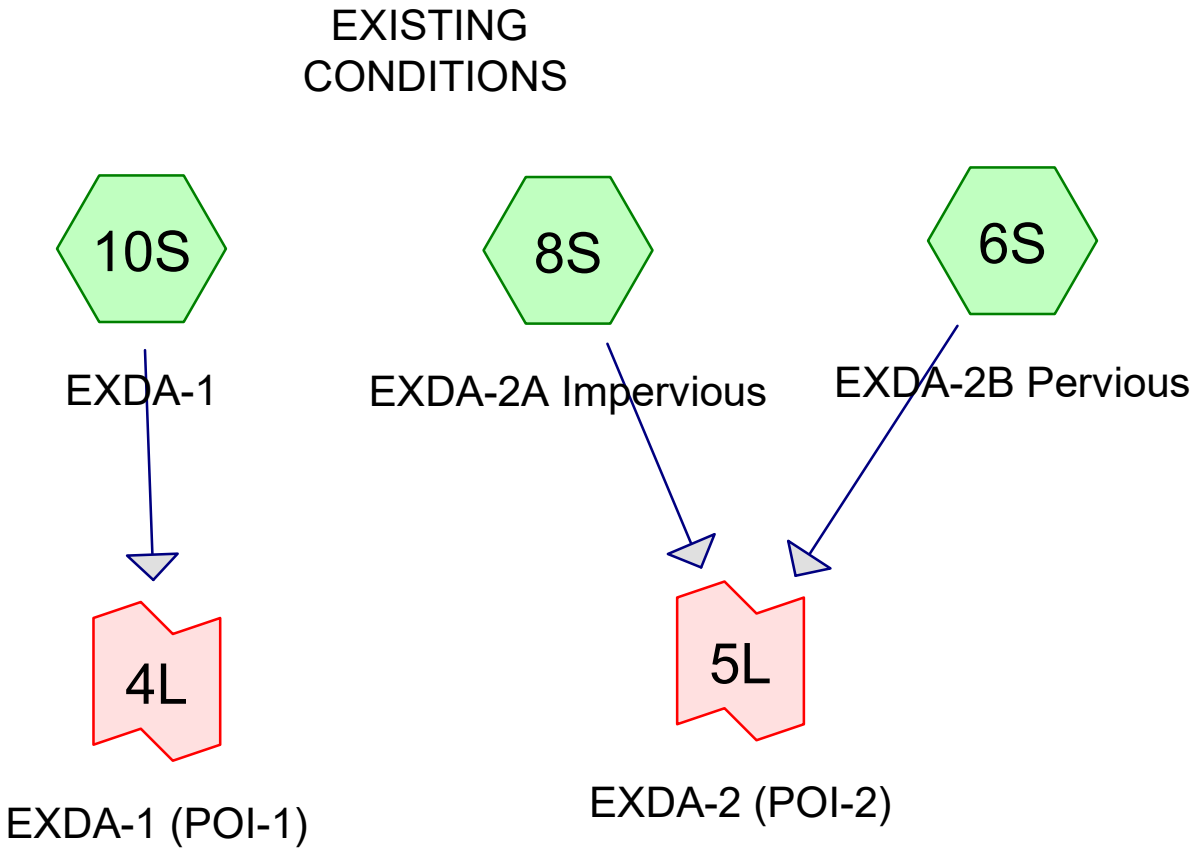
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX 8 – HYDROCAD ANALYSIS – EXISTING CONDITIONS



Subcat Reach Pond Link

Routing Diagram for CEP Southampton - Pre Post_FINAL
Prepared by Kimely-Horn, Printed 7/20/2021
HydroCAD® 10.10-5a s/n 09843 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YR	NOAA 24-hr	C	Default	24.00	1	3.37	2
2	10 YR	NOAA 24-hr	C	Default	24.00	1	5.19	2
3	100 YR	NOAA 24-hr	C	Default	24.00	1	8.82	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
23.573	98	Impervioius Area (landfill cap, access drives, rip-rap areas) (8S)
11.614	98	Landfill with Impervious Cap (10S)
0.799	39	LasB Grass (Good Condition) (6S)
0.006	36	LasB Woods (6S)
0.943	39	LasC Grass (Good Condition) (6S)
0.305	36	PHG Grass (6S)
0.109	39	PHG Woods (6S)
37.348	**95**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
37.348	Other	6S, 8S, 10S
37.348		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.000	0.000	0.000	0.000	23.573	23.573	Impervioius Area (landfill cap, access drives, rip-rap areas)
0.000	0.000	0.000	0.000	11.614	11.614	Landfill with Impervious Cap
0.000	0.000	0.000	0.000	0.799	0.799	LasB Grass (Good Condition)
0.000	0.000	0.000	0.000	0.006	0.006	LasB Woods
0.000	0.000	0.000	0.000	0.943	0.943	LasC Grass (Good Condition)
0.000	0.000	0.000	0.000	0.305	0.305	PHG Grass
0.000	0.000	0.000	0.000	0.109	0.109	PHG Woods
0.000	**0.000**	**0.000**	**0.000**	**37.348**	**37.348**	**TOTAL AREA**

Summary for Subcatchment 6S: EXDA-2B Pervious

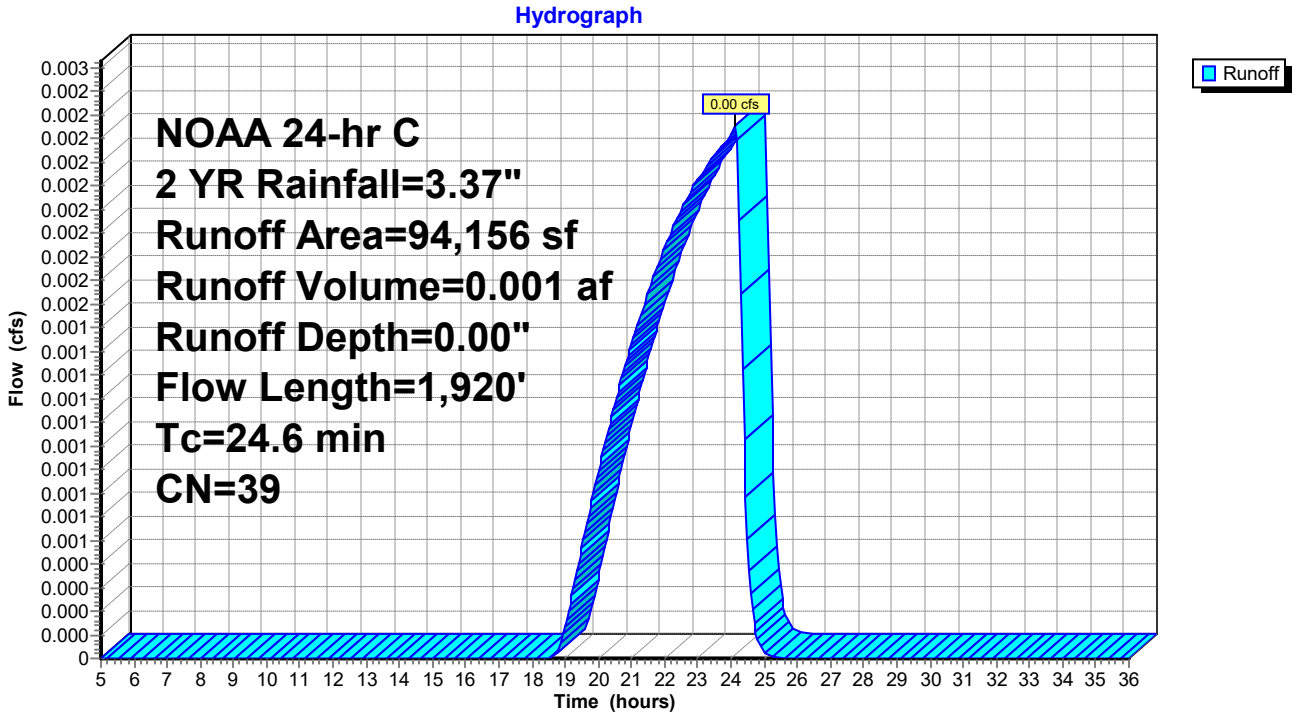
Runoff = 0.00 cfs @ 24.09 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2 YR Rainfall=3.37"

	Area (sf)	CN	Description
*	34,783	39	LasB Grass (Good Condition)
*	280	36	LasB Woods
*	41,065	39	LasC Grass (Good Condition)
*	13,272	36	PHG Grass
*	4,756	39	PHG Woods
	94,156	39	Weighted Average
	94,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	10	0.0250	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
0.2	20	0.0600	1.58		**Sheet Flow, Sheet Flow - Gravel** Smooth surfaces n= 0.011 P2= 3.34"
3.0	20	0.0150	0.11		**Sheet Flow, Sheet Flow - Grass 2** Grass: Short n= 0.150 P2= 3.34"
8.4	635	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 1** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.5	600	0.0310	2.22	3.77	**Channel Flow, Channel Flow - Riprap 2** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
2.7	300	0.0210	1.83	3.10	**Channel Flow, Channel Flow - Riprap 3** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.4	335	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 4** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
24.6	1,920	Total			

Subcatchment 6S: EXDA-2B Pervious



Summary for Subcatchment 8S: EXDA-2A Impervious

[47] Hint: Peak is 519% of capacity of segment #6
[47] Hint: Peak is 752% of capacity of segment #7

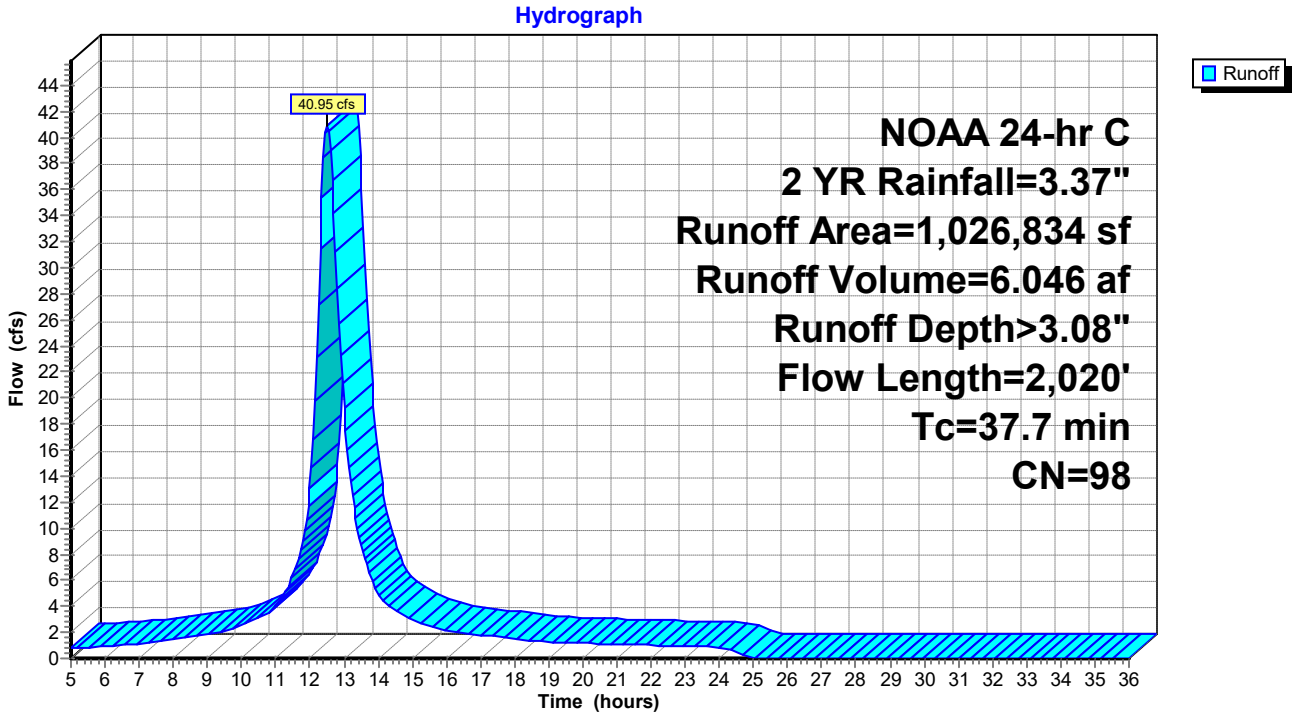
Runoff = 40.95 cfs @ 12.50 hrs, Volume= 6.046 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2 YR Rainfall=3.37"

	Area (sf)	CN	Description
*	1,026,834	98	Impervioius Area (landfill cap, access drives, rip-rap areas)
	1,026,834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0225	0.18		**Sheet Flow, Sheet Flow - Grass (Impervious)** Grass: Short n= 0.150 P2= 3.34"
3.9	200	0.0150	0.86		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1 (Impe** Short Grass Pasture Kv= 7.0 fps
14.3	710	0.0140	0.83		**Shallow Concentrated Flow, Shallow Concentrated - Grass 2 (Impe** Short Grass Pasture Kv= 7.0 fps
1.9	160	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated - Grass 3 (Impe** Short Grass Pasture Kv= 7.0 fps
1.5	75	0.0144	0.84		**Shallow Concentrated Flow, Shallow Concentrated - Grass 4 (Impe** Short Grass Pasture Kv= 7.0 fps
3.0	400	0.0210	2.25	7.89	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
4.0	375	0.0100	1.56	5.45	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
37.7	2,020	Total			

Subcatchment 8S: EXDA-2A Impervious



Summary for Subcatchment 10S: EXDA-1

[47] Hint: Peak is 1385% of capacity of segment #3
[47] Hint: Peak is 980% of capacity of segment #4

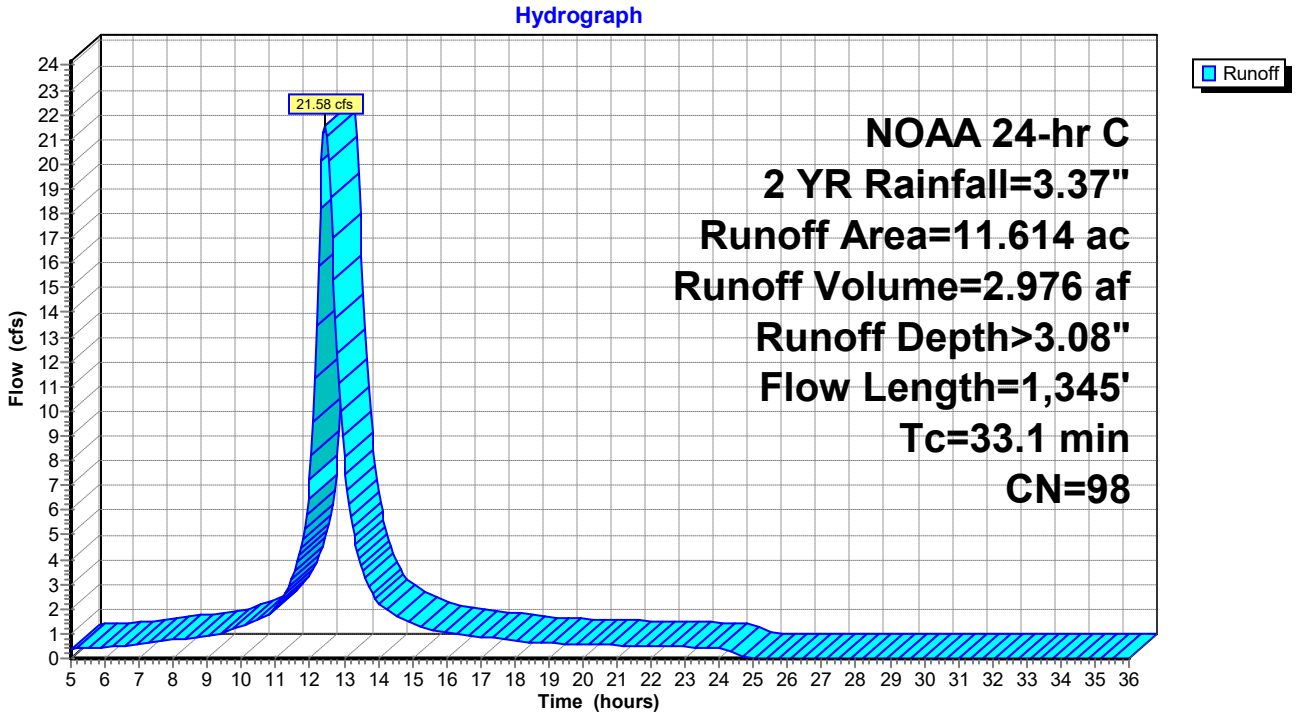
Runoff = 21.58 cfs @ 12.44 hrs, Volume= 2.976 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2 YR Rainfall=3.37"

	Area (ac)	CN	Description
*	11.614	98	Landfill with Impervious Cap
	11.614		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0167	0.16		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
14.5	510	0.0070	0.59		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1** Short Grass Pasture Kv= 7.0 fps
5.5	425	0.0140	1.30	1.56	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
2.8	310	0.0280	1.84	2.20	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
33.1	1,345	Total			

Subcatchment 10S: EXDA-1

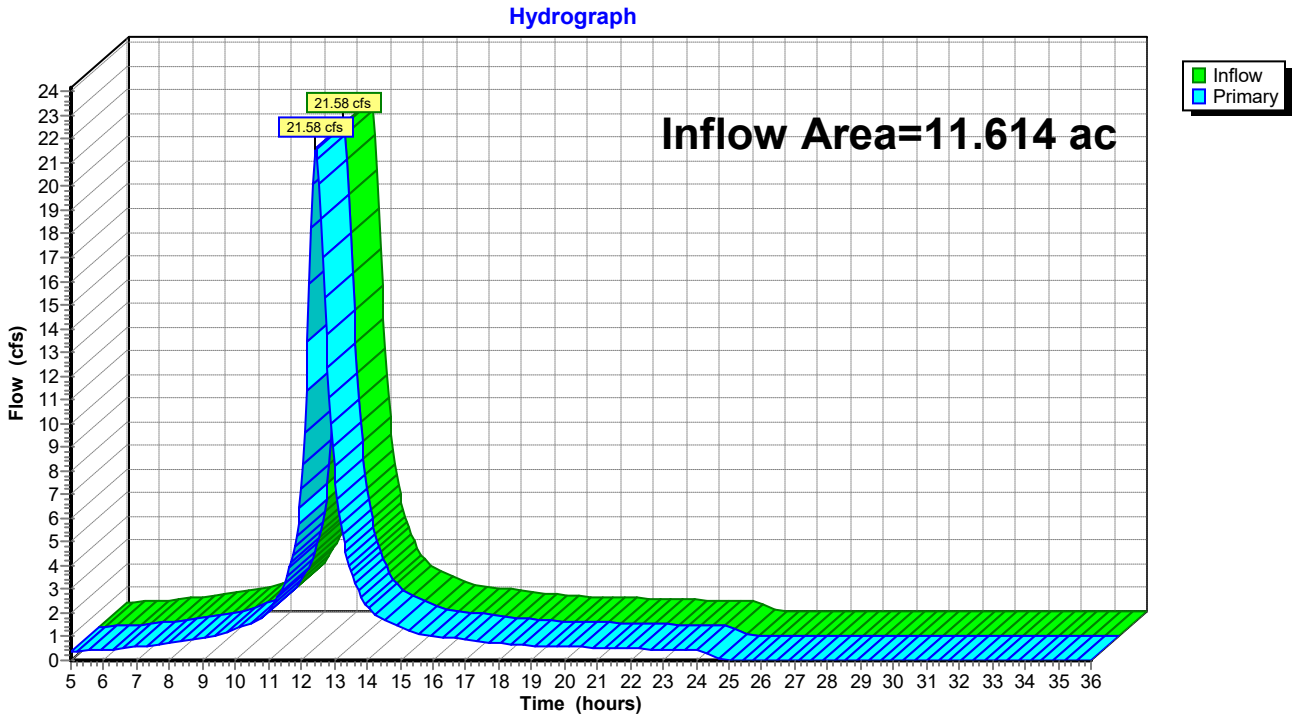


Summary for Link 4L: EXDA-1 (POI-1)

Inflow Area = 11.614 ac,100.00% Impervious, Inflow Depth > 3.08" for 2 YR event
Inflow = 21.58 cfs @ 12.44 hrs, Volume= 2.976 af
Primary = 21.58 cfs @ 12.44 hrs, Volume= 2.976 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 4L: EXDA-1 (POI-1)

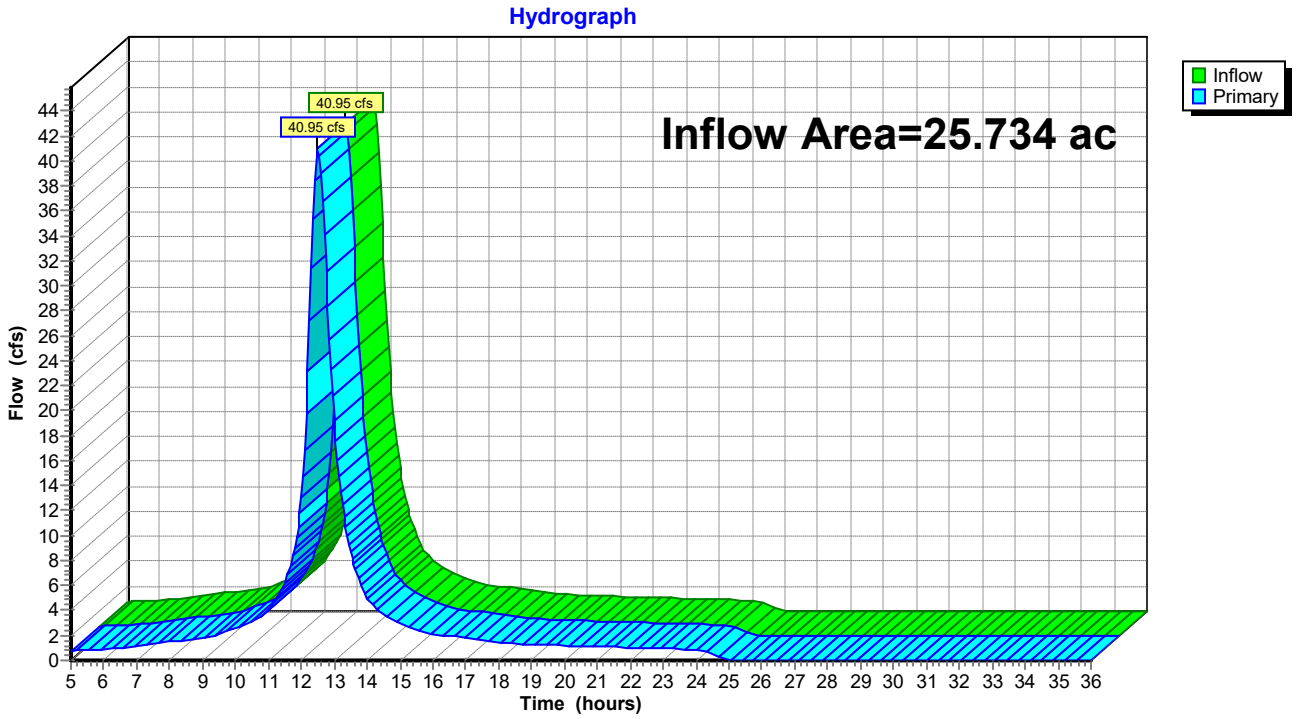


Summary for Link 5L: EXDA-2 (POI-2)

Inflow Area = 25.734 ac, 91.60% Impervious, Inflow Depth > 2.82" for 2 YR event
Inflow = 40.95 cfs @ 12.50 hrs, Volume= 6.046 af
Primary = 40.95 cfs @ 12.50 hrs, Volume= 6.046 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 5L: EXDA-2 (POI-2)



Summary for Subcatchment 6S: EXDA-2B Pervious

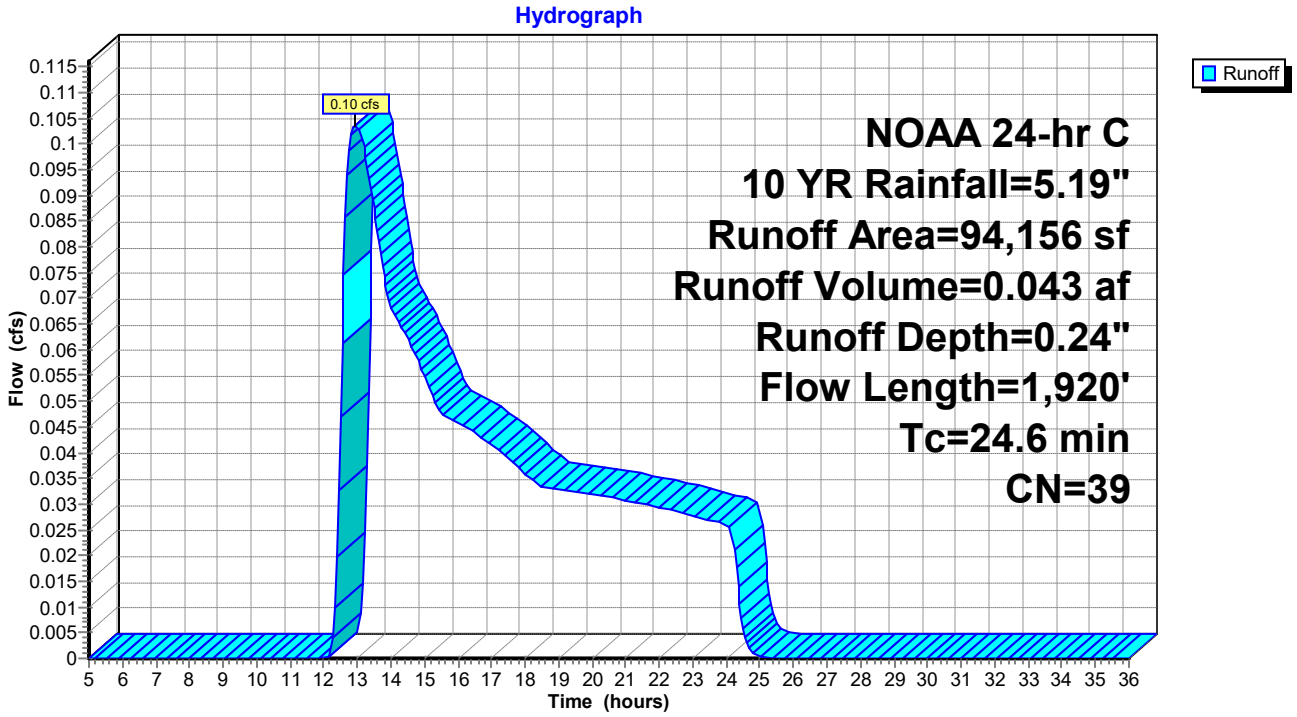
Runoff = 0.10 cfs @ 12.92 hrs, Volume= 0.043 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10 YR Rainfall=5.19"

	Area (sf)	CN	Description
*	34,783	39	LasB Grass (Good Condition)
*	280	36	LasB Woods
*	41,065	39	LasC Grass (Good Condition)
*	13,272	36	PHG Grass
*	4,756	39	PHG Woods
	94,156	39	Weighted Average
	94,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	10	0.0250	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
0.2	20	0.0600	1.58		**Sheet Flow, Sheet Flow - Gravel** Smooth surfaces n= 0.011 P2= 3.34"
3.0	20	0.0150	0.11		**Sheet Flow, Sheet Flow - Grass 2** Grass: Short n= 0.150 P2= 3.34"
8.4	635	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 1** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.5	600	0.0310	2.22	3.77	**Channel Flow, Channel Flow - Riprap 2** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
2.7	300	0.0210	1.83	3.10	**Channel Flow, Channel Flow - Riprap 3** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.4	335	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 4** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
24.6	1,920	Total			

Subcatchment 6S: EXDA-2B Pervious



Summary for Subcatchment 8S: EXDA-2A Impervious

[47] Hint: Peak is 805% of capacity of segment #6
[47] Hint: Peak is 1167% of capacity of segment #7

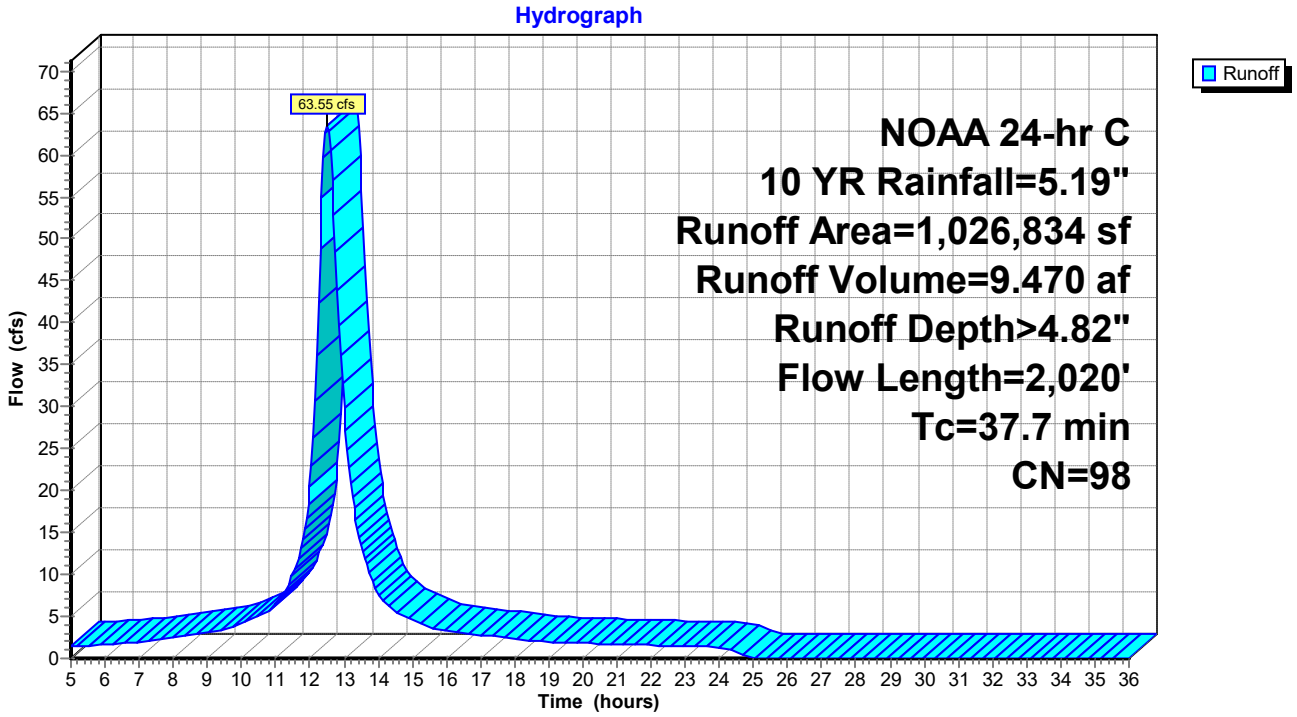
Runoff = 63.55 cfs @ 12.50 hrs, Volume= 9.470 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10 YR Rainfall=5.19"

	Area (sf)	CN	Description
*	1,026,834	98	Impervioius Area (landfill cap, access drives, rip-rap areas)
	1,026,834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0225	0.18		**Sheet Flow, Sheet Flow - Grass (Impervious)** Grass: Short n= 0.150 P2= 3.34"
3.9	200	0.0150	0.86		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1 (Impe** Short Grass Pasture Kv= 7.0 fps
14.3	710	0.0140	0.83		**Shallow Concentrated Flow, Shallow Concentrated - Grass 2 (Impe** Short Grass Pasture Kv= 7.0 fps
1.9	160	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated - Grass 3 (Impe** Short Grass Pasture Kv= 7.0 fps
1.5	75	0.0144	0.84		**Shallow Concentrated Flow, Shallow Concentrated - Grass 4 (Impe** Short Grass Pasture Kv= 7.0 fps
3.0	400	0.0210	2.25	7.89	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
4.0	375	0.0100	1.56	5.45	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
37.7	2,020	Total			

Subcatchment 8S: EXDA-2A Impervious



Summary for Subcatchment 10S: EXDA-1

[47] Hint: Peak is 2150% of capacity of segment #3
[47] Hint: Peak is 1520% of capacity of segment #4

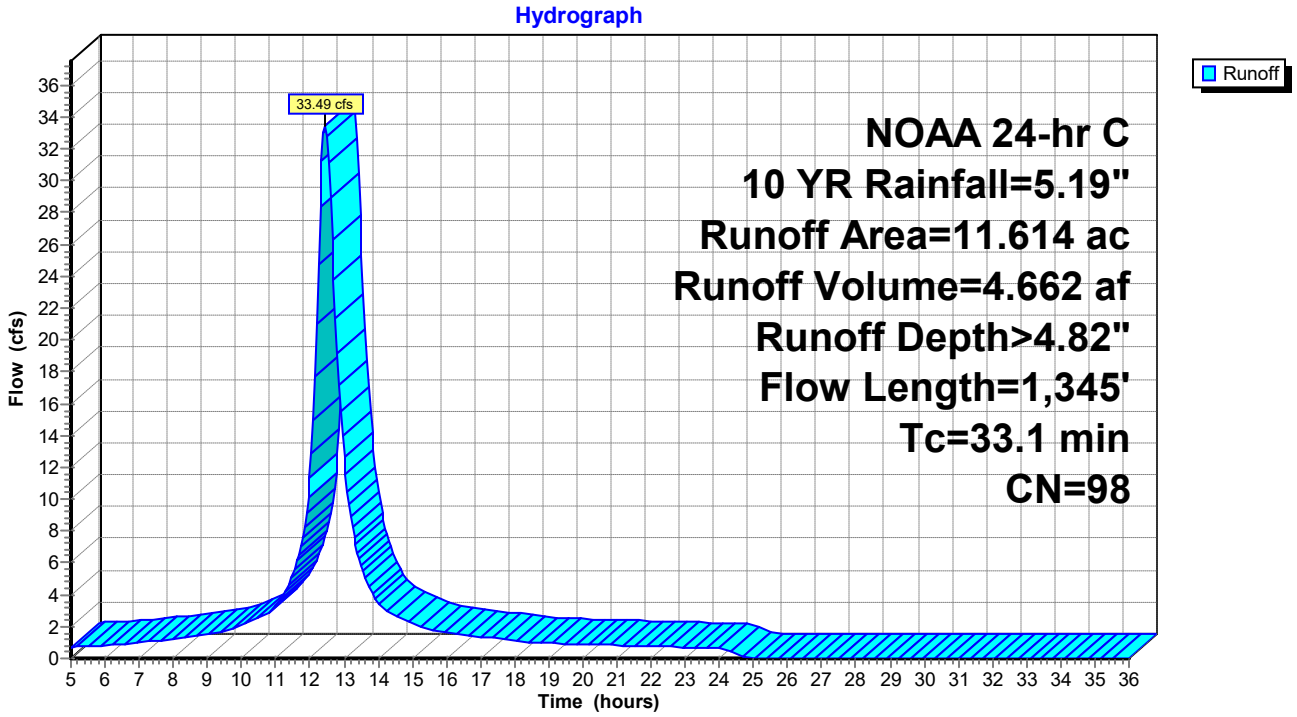
Runoff = 33.49 cfs @ 12.44 hrs, Volume= 4.662 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10 YR Rainfall=5.19"

	Area (ac)	CN	Description
*	11.614	98	Landfill with Impervious Cap
	11.614		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0167	0.16		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
14.5	510	0.0070	0.59		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1** Short Grass Pasture Kv= 7.0 fps
5.5	425	0.0140	1.30	1.56	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
2.8	310	0.0280	1.84	2.20	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
33.1	1,345	Total			

Subcatchment 10S: EXDA-1

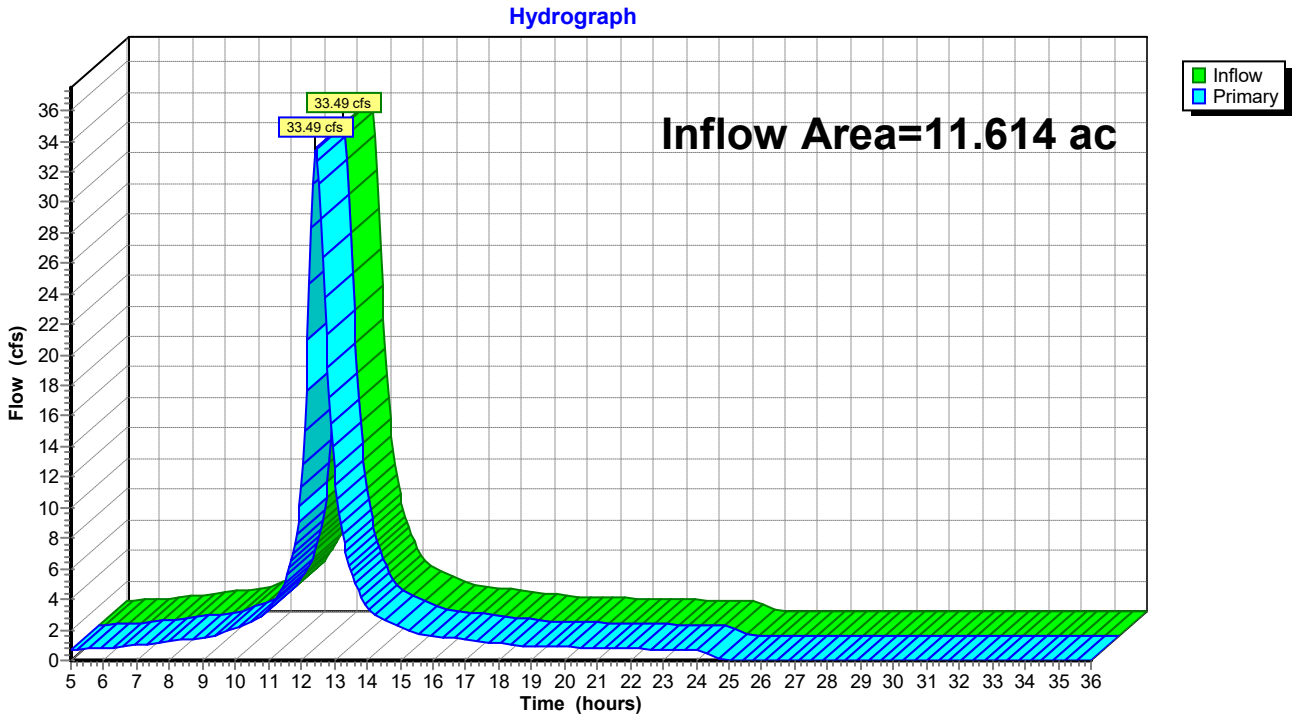


Summary for Link 4L: EXDA-1 (POI-1)

Inflow Area = 11.614 ac,100.00% Impervious, Inflow Depth > 4.82" for 10 YR event
Inflow = 33.49 cfs @ 12.44 hrs, Volume= 4.662 af
Primary = 33.49 cfs @ 12.44 hrs, Volume= 4.662 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 4L: EXDA-1 (POI-1)

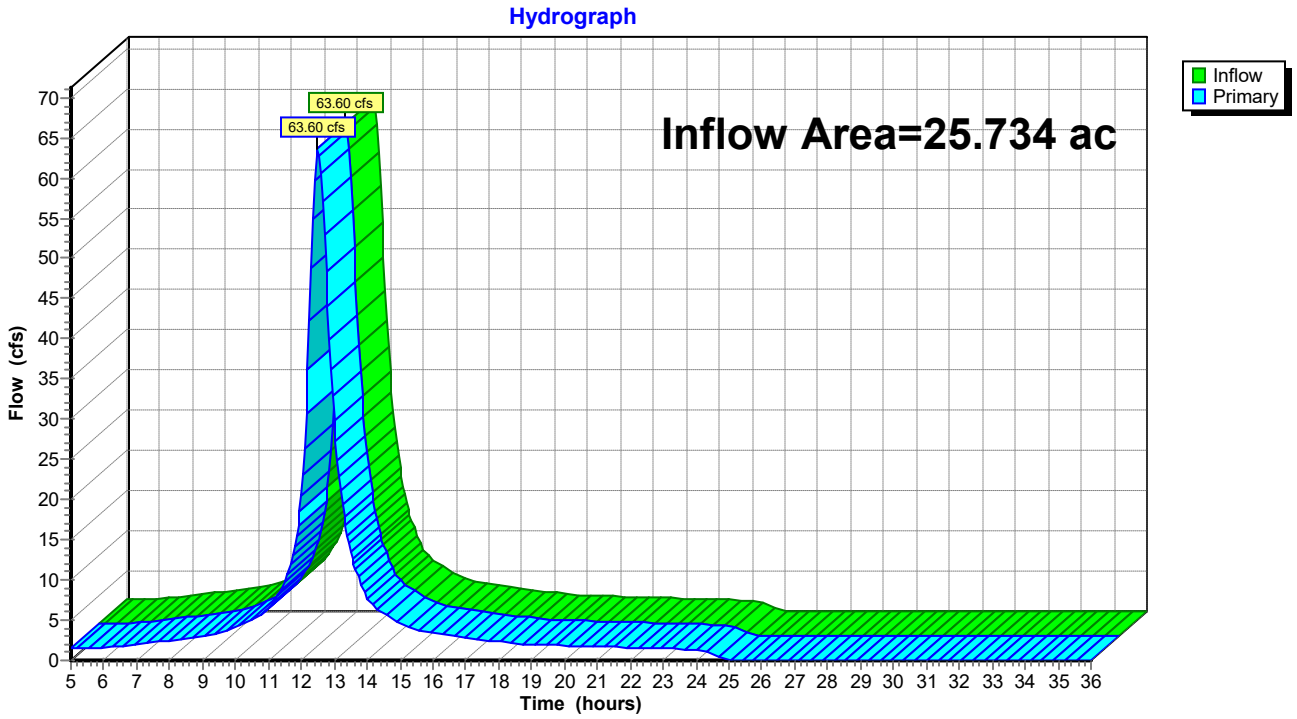


Summary for Link 5L: EXDA-2 (POI-2)

Inflow Area = 25.734 ac, 91.60% Impervious, Inflow Depth > 4.44" for 10 YR event
Inflow = 63.60 cfs @ 12.50 hrs, Volume= 9.513 af
Primary = 63.60 cfs @ 12.50 hrs, Volume= 9.513 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 5L: EXDA-2 (POI-2)



Summary for Subcatchment 6S: EXDA-2B Pervious

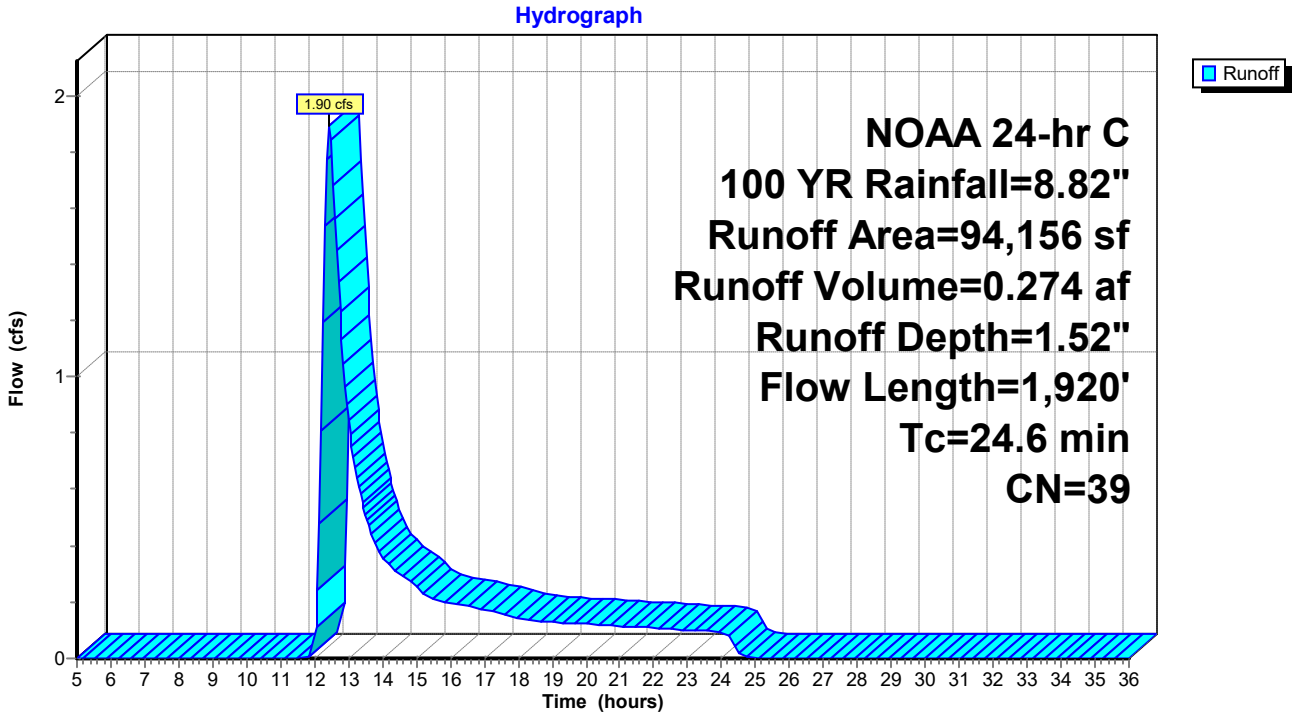
Runoff = 1.90 cfs @ 12.43 hrs, Volume= 0.274 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100 YR Rainfall=8.82"

	Area (sf)	CN	Description
*	34,783	39	LasB Grass (Good Condition)
*	280	36	LasB Woods
*	41,065	39	LasC Grass (Good Condition)
*	13,272	36	PHG Grass
*	4,756	39	PHG Woods
	94,156	39	Weighted Average
	94,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	10	0.0250	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
0.2	20	0.0600	1.58		**Sheet Flow, Sheet Flow - Gravel** Smooth surfaces n= 0.011 P2= 3.34"
3.0	20	0.0150	0.11		**Sheet Flow, Sheet Flow - Grass 2** Grass: Short n= 0.150 P2= 3.34"
8.4	635	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 1** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.5	600	0.0310	2.22	3.77	**Channel Flow, Channel Flow - Riprap 2** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
2.7	300	0.0210	1.83	3.10	**Channel Flow, Channel Flow - Riprap 3** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.4	335	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 4** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
24.6	1,920	Total			

Subcatchment 6S: EXDA-2B Pervious



Summary for Subcatchment 8S: EXDA-2A Impervious

[47] Hint: Peak is 1374% of capacity of segment #6
[47] Hint: Peak is 1991% of capacity of segment #7

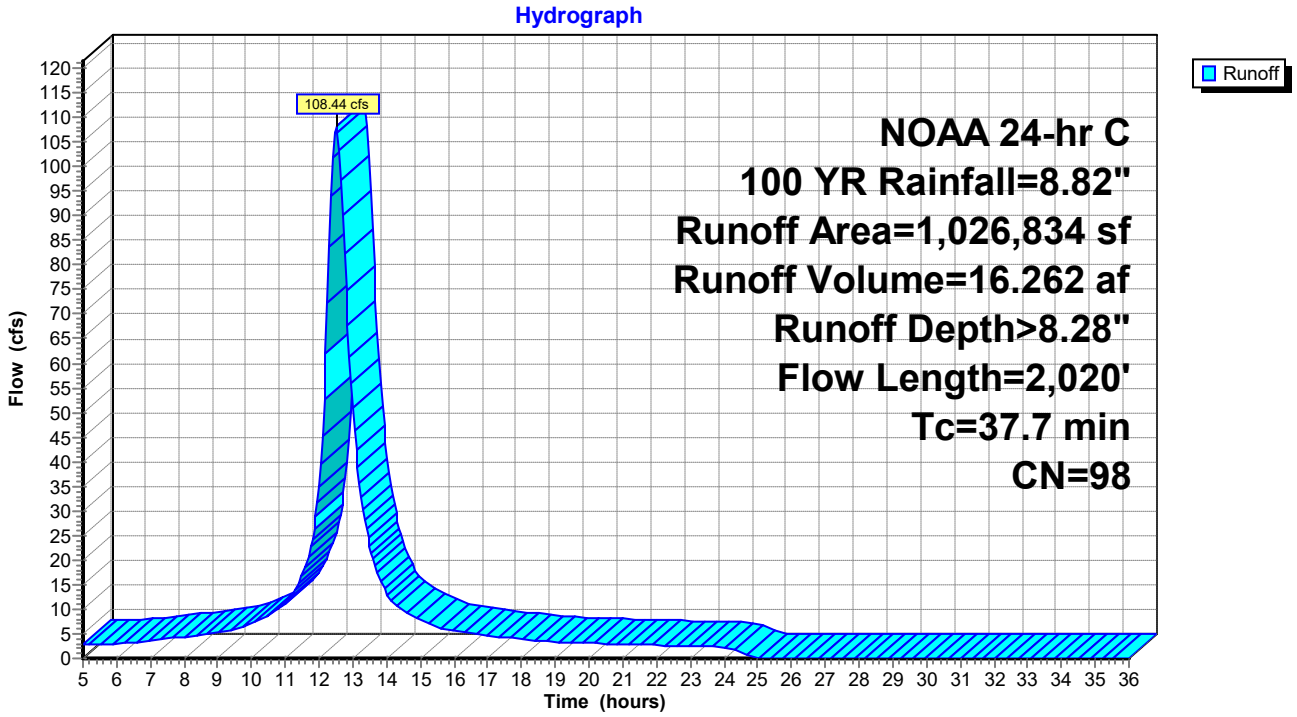
Runoff = 108.44 cfs @ 12.50 hrs, Volume= 16.262 af, Depth> 8.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100 YR Rainfall=8.82"

	Area (sf)	CN	Description
*	1,026,834	98	Impervioius Area (landfill cap, access drives, rip-rap areas)
	1,026,834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0225	0.18		**Sheet Flow, Sheet Flow - Grass (Impervious)** Grass: Short n= 0.150 P2= 3.34"
3.9	200	0.0150	0.86		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1 (Impe** Short Grass Pasture Kv= 7.0 fps
14.3	710	0.0140	0.83		**Shallow Concentrated Flow, Shallow Concentrated - Grass 2 (Impe** Short Grass Pasture Kv= 7.0 fps
1.9	160	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated - Grass 3 (Impe** Short Grass Pasture Kv= 7.0 fps
1.5	75	0.0144	0.84		**Shallow Concentrated Flow, Shallow Concentrated - Grass 4 (Impe** Short Grass Pasture Kv= 7.0 fps
3.0	400	0.0210	2.25	7.89	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
4.0	375	0.0100	1.56	5.45	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
37.7	2,020	Total			

Subcatchment 8S: EXDA-2A Impervious



Summary for Subcatchment 10S: EXDA-1

[47] Hint: Peak is 3667% of capacity of segment #3
[47] Hint: Peak is 2593% of capacity of segment #4

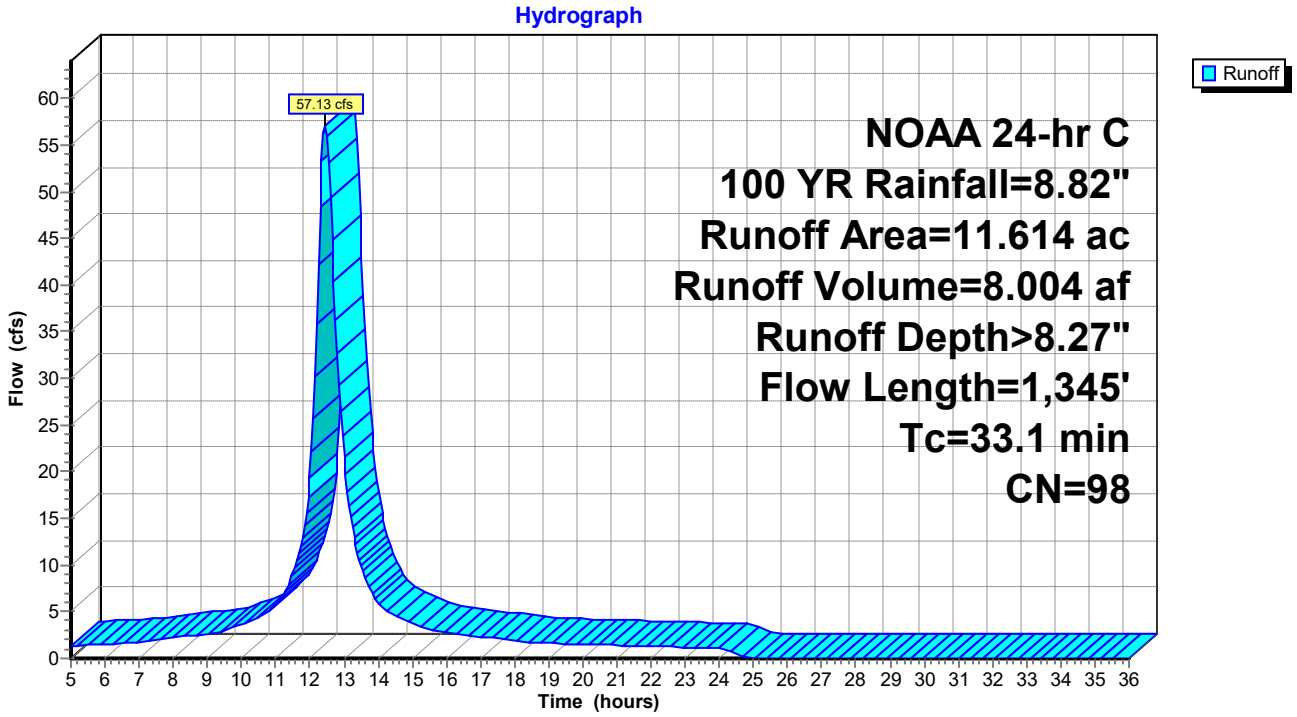
Runoff = 57.13 cfs @ 12.44 hrs, Volume= 8.004 af, Depth> 8.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100 YR Rainfall=8.82"

	Area (ac)	CN	Description
*	11.614	98	Landfill with Impervious Cap
	11.614		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0167	0.16		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
14.5	510	0.0070	0.59		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1** Short Grass Pasture Kv= 7.0 fps
5.5	425	0.0140	1.30	1.56	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
2.8	310	0.0280	1.84	2.20	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
33.1	1,345	Total			

Subcatchment 10S: EXDA-1

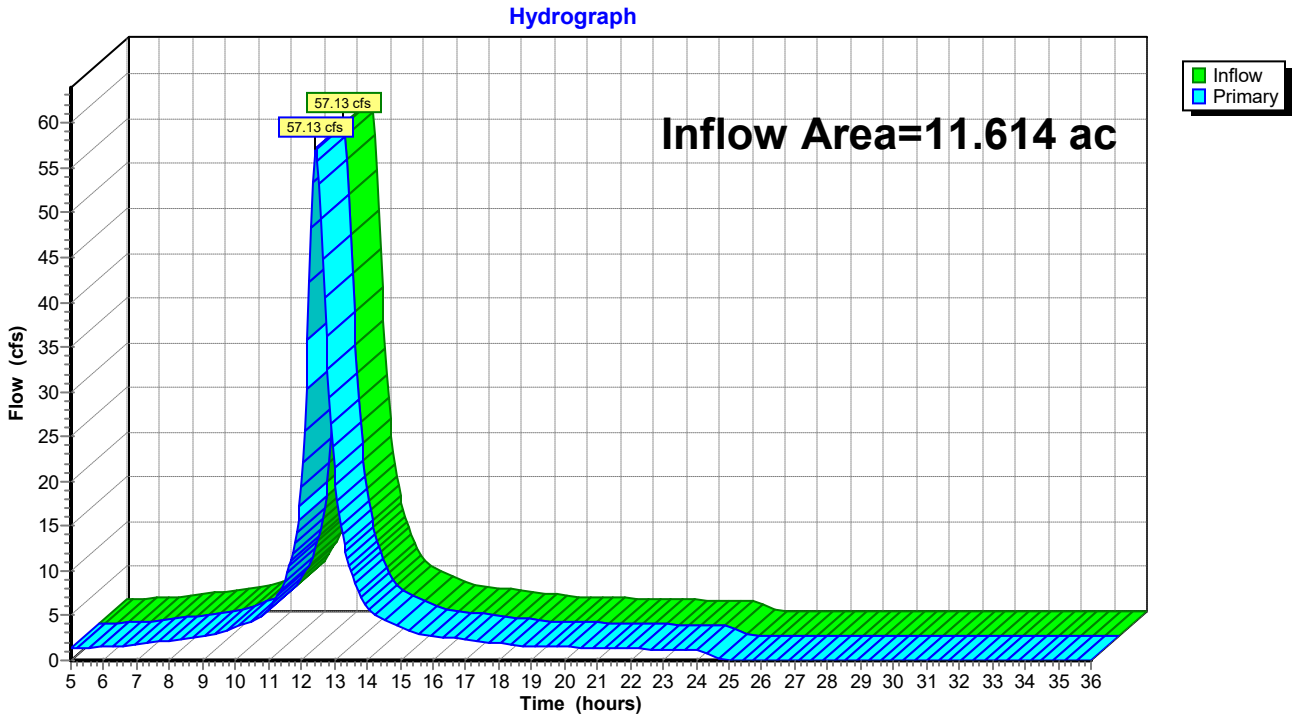


Summary for Link 4L: EXDA-1 (POI-1)

Inflow Area = 11.614 ac,100.00% Impervious, Inflow Depth > 8.27" for 100 YR event
Inflow = 57.13 cfs @ 12.44 hrs, Volume= 8.004 af
Primary = 57.13 cfs @ 12.44 hrs, Volume= 8.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 4L: EXDA-1 (POI-1)

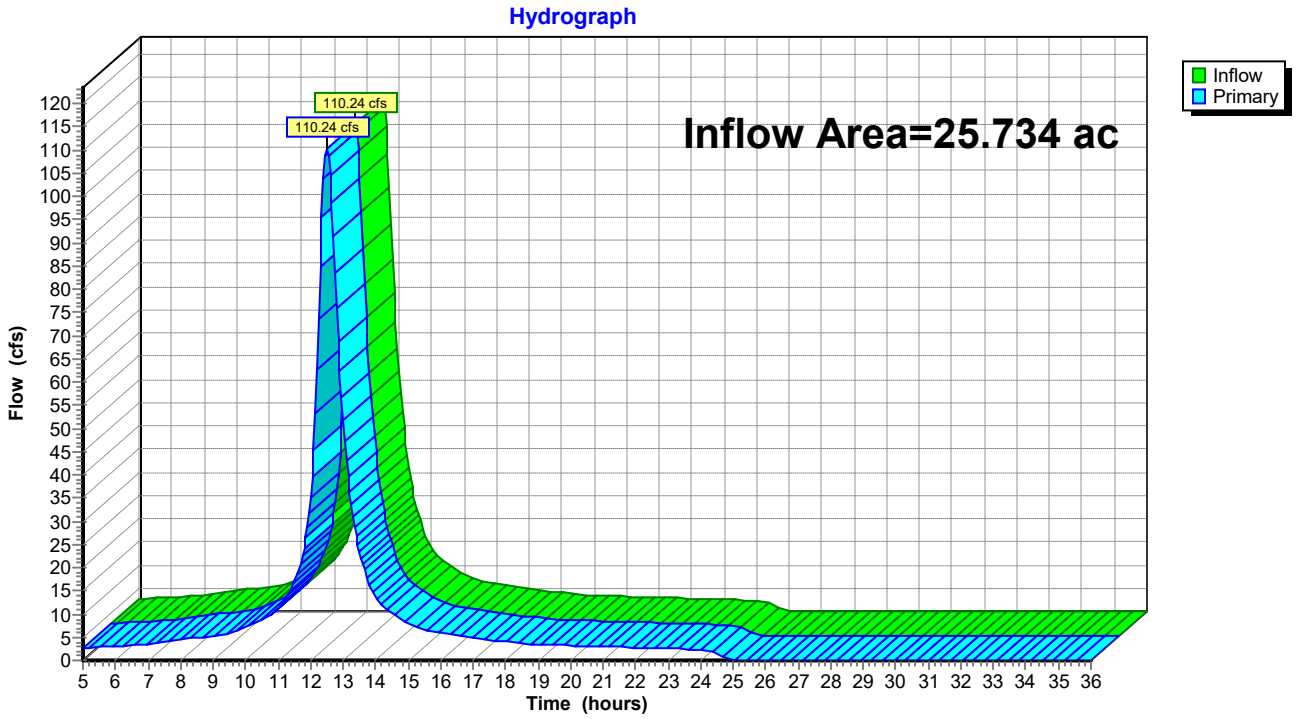


Summary for Link 5L: EXDA-2 (POI-2)

Inflow Area = 25.734 ac, 91.60% Impervious, Inflow Depth > 7.71" for 100 YR event
Inflow = 110.24 cfs @ 12.50 hrs, Volume= 16.535 af
Primary = 110.24 cfs @ 12.50 hrs, Volume= 16.535 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

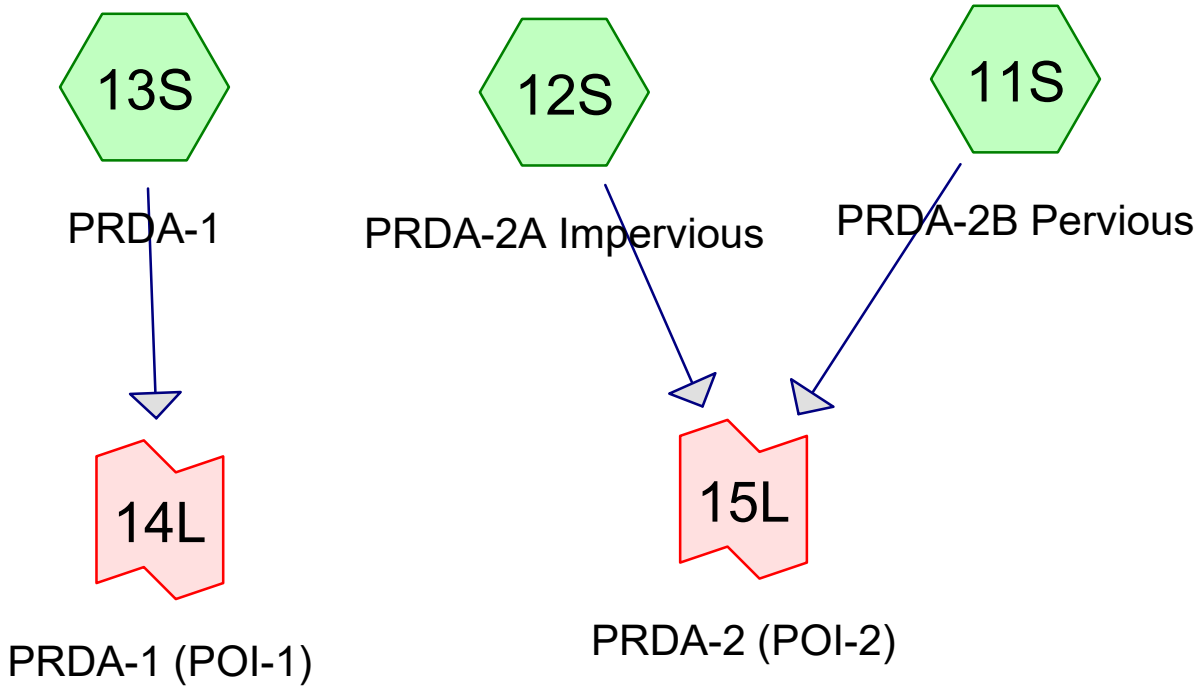
Link 5L: EXDA-2 (POI-2)



APPENDIX 9 – HYDROCAD ANALYSIS – PROPOSED CONDITIONS

DOCS #5286888-V1

PROPOSED
CONDITIONS



Subcat Reach Pond Link

Routing Diagram for CEP Southampton - Pre Post_FINAL
Prepared by Kimely-Horn, Printed 7/20/2021
HydroCAD® 10.10-5a s/n 09843 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 YR	NOAA 24-hr	C	Default	24.00	1	3.37	2
2	10 YR	NOAA 24-hr	C	Default	24.00	1	5.19	2
3	100 YR	NOAA 24-hr	C	Default	24.00	1	8.82	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
23.573	98	Impervioius Area (landfill cap, access drives, rip-rap areas) (12S)
11.614	98	Landfill with Impervious Cap (13S)
0.799	39	LasB Grass (Good Condition) (11S)
0.006	36	LasB Woods (11S)
0.943	39	LasC Grass (Good Condition) (11S)
0.305	36	PHG Grass (11S)
0.109	39	PHG Woods (11S)
37.348	**95**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
37.348	Other	11S, 12S, 13S
37.348		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover
0.000	0.000	0.000	0.000	23.573	23.573	Impervioius Area (landfill cap, access drives, rip-rap areas)
0.000	0.000	0.000	0.000	11.614	11.614	Landfill with Impervious Cap
0.000	0.000	0.000	0.000	0.799	0.799	LasB Grass (Good Condition)
0.000	0.000	0.000	0.000	0.006	0.006	LasB Woods
0.000	0.000	0.000	0.000	0.943	0.943	LasC Grass (Good Condition)
0.000	0.000	0.000	0.000	0.305	0.305	PHG Grass
0.000	0.000	0.000	0.000	0.109	0.109	PHG Woods
0.000	**0.000**	**0.000**	**0.000**	**37.348**	**37.348**	**TOTAL AREA**

Summary for Subcatchment 11S: PRDA-2B Pervious

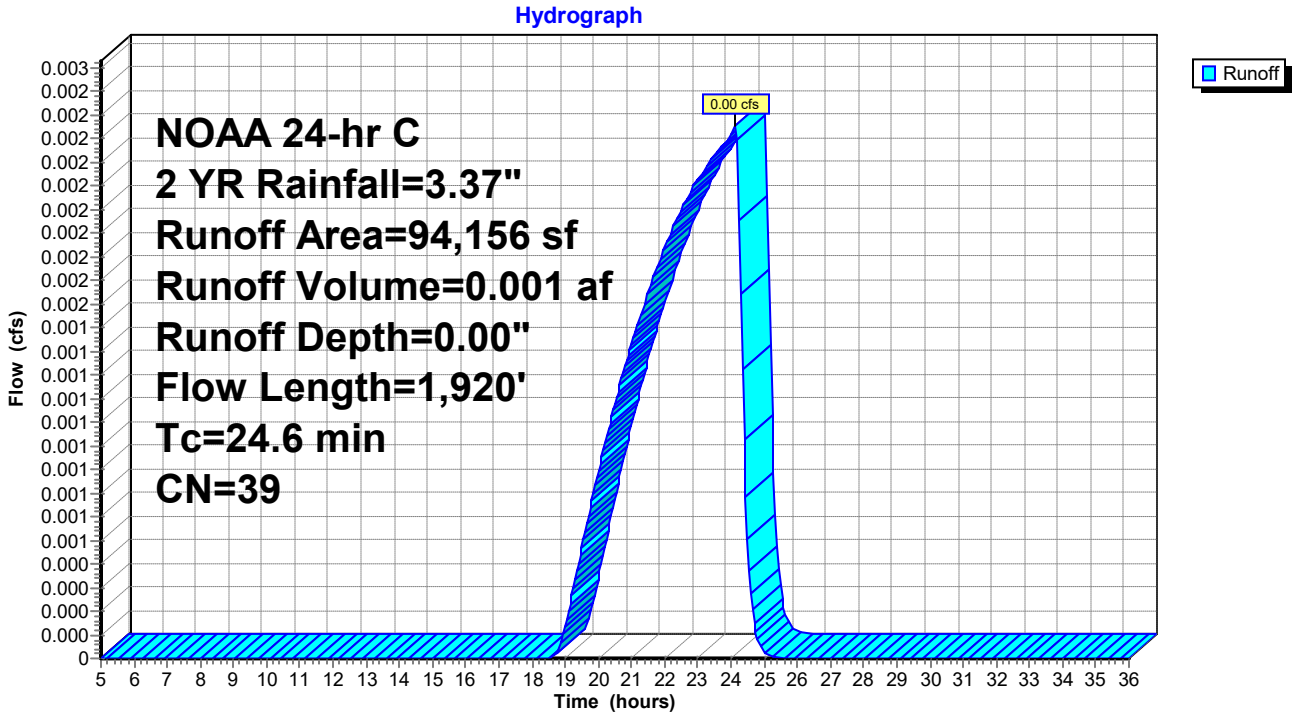
Runoff = 0.00 cfs @ 24.09 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2 YR Rainfall=3.37"

	Area (sf)	CN	Description
*	34,783	39	LasB Grass (Good Condition)
*	280	36	LasB Woods
*	41,065	39	LasC Grass (Good Condition)
*	13,272	36	PHG Grass
*	4,756	39	PHG Woods
	94,156	39	Weighted Average
	94,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	10	0.0250	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
0.2	20	0.0600	1.58		**Sheet Flow, Sheet Flow - Gravel** Smooth surfaces n= 0.011 P2= 3.34"
3.0	20	0.0150	0.11		**Sheet Flow, Sheet Flow - Grass 2** Grass: Short n= 0.150 P2= 3.34"
8.4	635	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 1** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.5	600	0.0310	2.22	3.77	**Channel Flow, Channel Flow - Riprap 2** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
2.7	300	0.0210	1.83	3.10	**Channel Flow, Channel Flow - Riprap 3** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.4	335	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 4** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
24.6	1,920	Total			

Subcatchment 11S: PRDA-2B Pervious



Summary for Subcatchment 12S: PRDA-2A Impervious

[47] Hint: Peak is 519% of capacity of segment #6
[47] Hint: Peak is 752% of capacity of segment #7

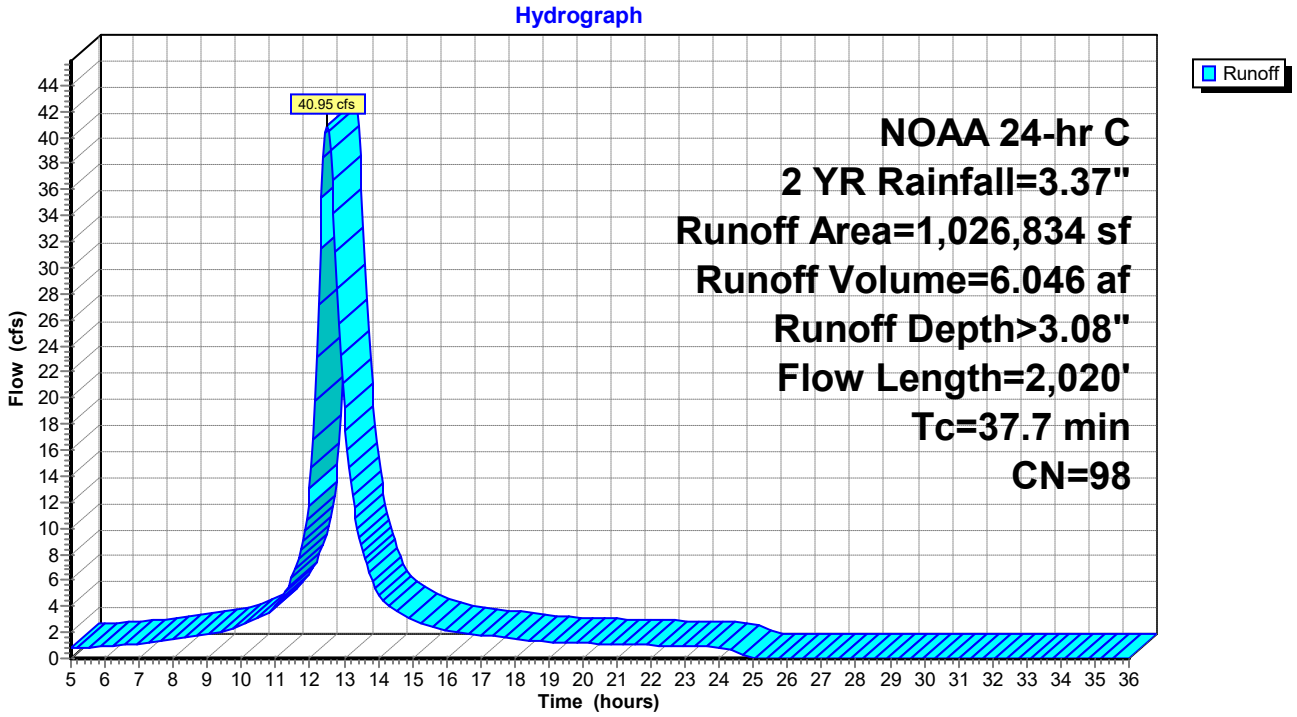
Runoff = 40.95 cfs @ 12.50 hrs, Volume= 6.046 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2 YR Rainfall=3.37"

	Area (sf)	CN	Description
*	1,026,834	98	Impervioius Area (landfill cap, access drives, rip-rap areas)
	1,026,834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0225	0.18		**Sheet Flow, Sheet Flow - Grass (Impervious)** Grass: Short n= 0.150 P2= 3.34"
3.9	200	0.0150	0.86		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1 (Impe** Short Grass Pasture Kv= 7.0 fps
14.3	710	0.0140	0.83		**Shallow Concentrated Flow, Shallow Concentrated - Grass 2 (Impe** Short Grass Pasture Kv= 7.0 fps
1.9	160	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated - Grass 3 (Impe** Short Grass Pasture Kv= 7.0 fps
1.5	75	0.0144	0.84		**Shallow Concentrated Flow, Shallow Concentrated - Grass 4 (Impe** Short Grass Pasture Kv= 7.0 fps
3.0	400	0.0210	2.25	7.89	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
4.0	375	0.0100	1.56	5.45	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
37.7	2,020	Total			

Subcatchment 12S: PRDA-2A Impervious



Summary for Subcatchment 13S: PRDA-1

[47] Hint: Peak is 1385% of capacity of segment #3
[47] Hint: Peak is 980% of capacity of segment #4

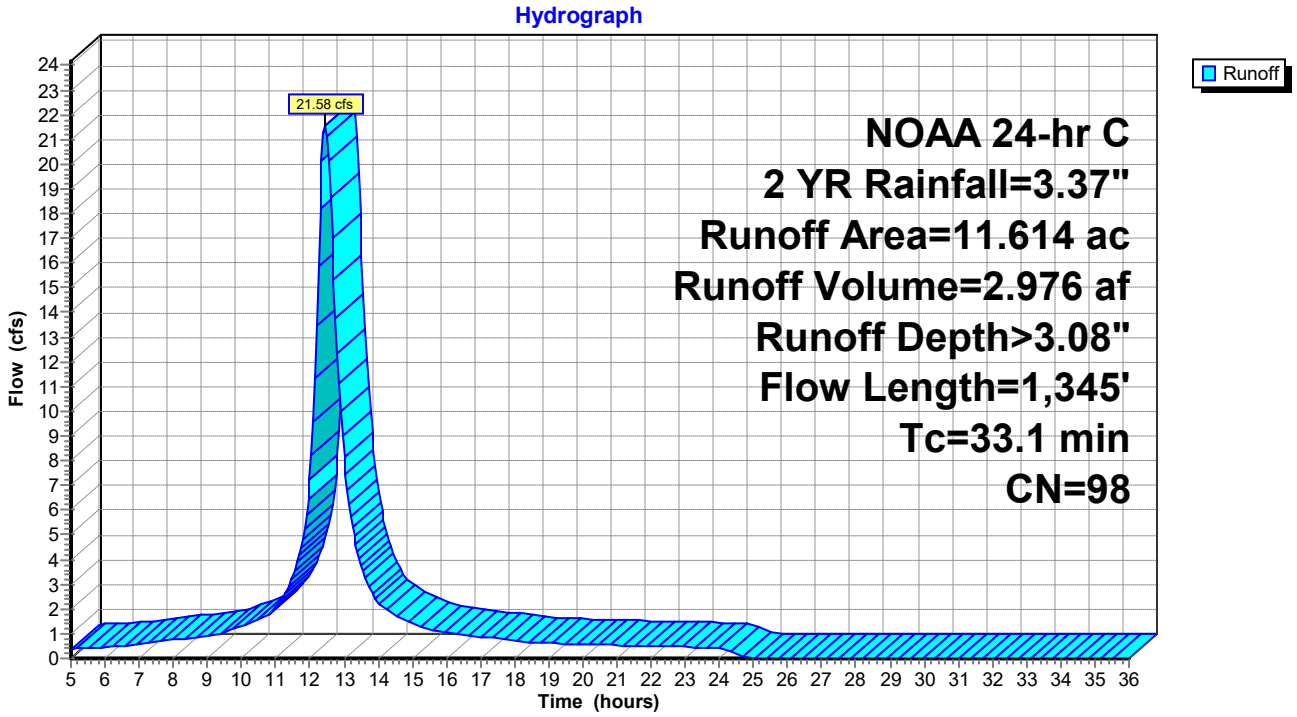
Runoff = 21.58 cfs @ 12.44 hrs, Volume= 2.976 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2 YR Rainfall=3.37"

	Area (ac)	CN	Description
*	11.614	98	Landfill with Impervious Cap
	11.614		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0167	0.16		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
14.5	510	0.0070	0.59		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1** Short Grass Pasture Kv= 7.0 fps
5.5	425	0.0140	1.30	1.56	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
2.8	310	0.0280	1.84	2.20	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
33.1	1,345	Total			

Subcatchment 13S: PRDA-1

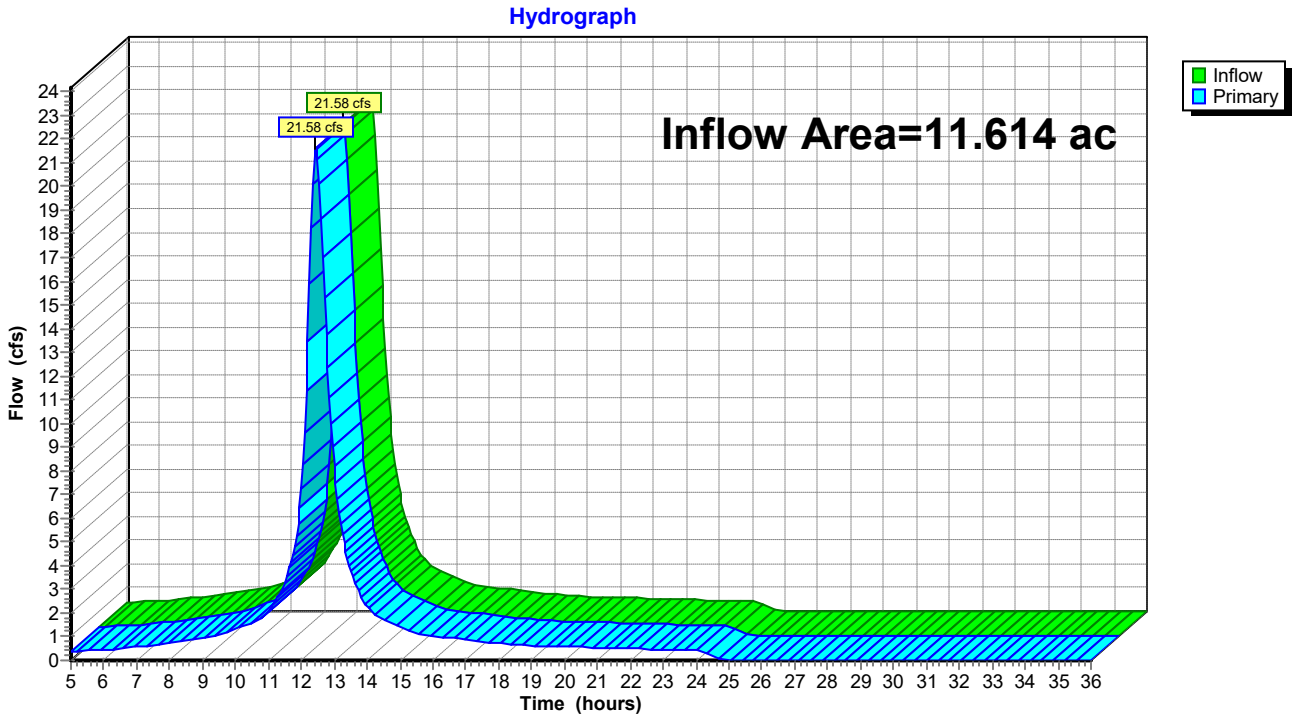


Summary for Link 14L: PRDA-1 (POI-1)

Inflow Area = 11.614 ac,100.00% Impervious, Inflow Depth > 3.08" for 2 YR event
Inflow = 21.58 cfs @ 12.44 hrs, Volume= 2.976 af
Primary = 21.58 cfs @ 12.44 hrs, Volume= 2.976 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 14L: PRDA-1 (POI-1)

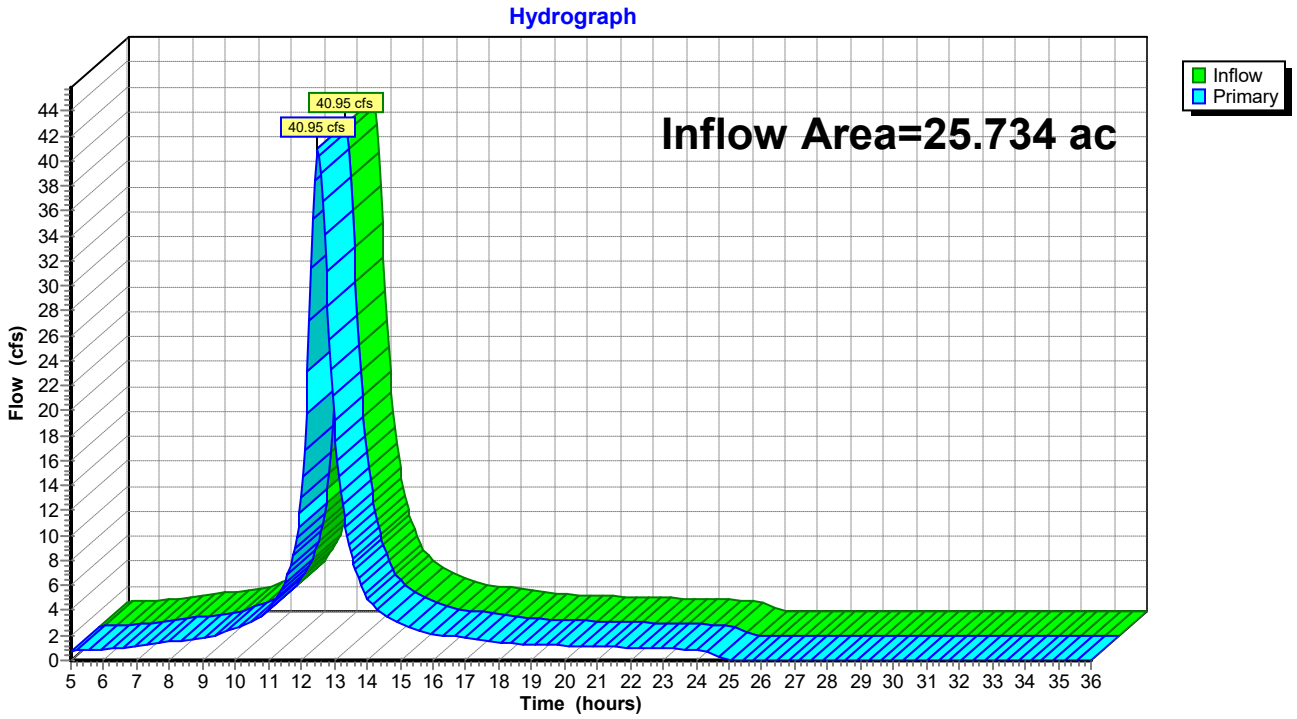


Summary for Link 15L: PRDA-2 (POI-2)

Inflow Area = 25.734 ac, 91.60% Impervious, Inflow Depth > 2.82" for 2 YR event
Inflow = 40.95 cfs @ 12.50 hrs, Volume= 6.046 af
Primary = 40.95 cfs @ 12.50 hrs, Volume= 6.046 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 15L: PRDA-2 (POI-2)



Summary for Subcatchment 11S: PRDA-2B Pervious

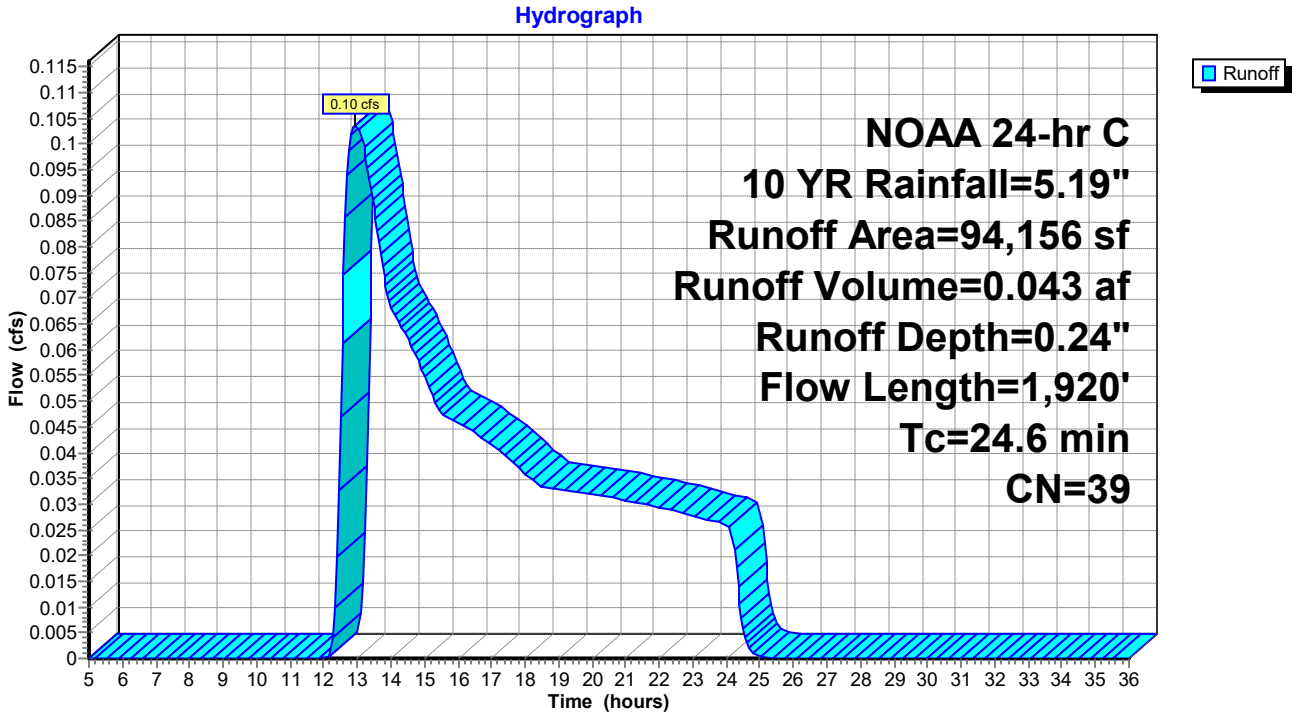
Runoff = 0.10 cfs @ 12.92 hrs, Volume= 0.043 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10 YR Rainfall=5.19"

	Area (sf)	CN	Description
*	34,783	39	LasB Grass (Good Condition)
*	280	36	LasB Woods
*	41,065	39	LasC Grass (Good Condition)
*	13,272	36	PHG Grass
*	4,756	39	PHG Woods
	94,156	39	Weighted Average
	94,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	10	0.0250	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
0.2	20	0.0600	1.58		**Sheet Flow, Sheet Flow - Gravel** Smooth surfaces n= 0.011 P2= 3.34"
3.0	20	0.0150	0.11		**Sheet Flow, Sheet Flow - Grass 2** Grass: Short n= 0.150 P2= 3.34"
8.4	635	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 1** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.5	600	0.0310	2.22	3.77	**Channel Flow, Channel Flow - Riprap 2** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
2.7	300	0.0210	1.83	3.10	**Channel Flow, Channel Flow - Riprap 3** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.4	335	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 4** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
24.6	1,920	Total			

Subcatchment 11S: PRDA-2B Pervious



Summary for Subcatchment 12S: PRDA-2A Impervious

[47] Hint: Peak is 805% of capacity of segment #6
[47] Hint: Peak is 1167% of capacity of segment #7

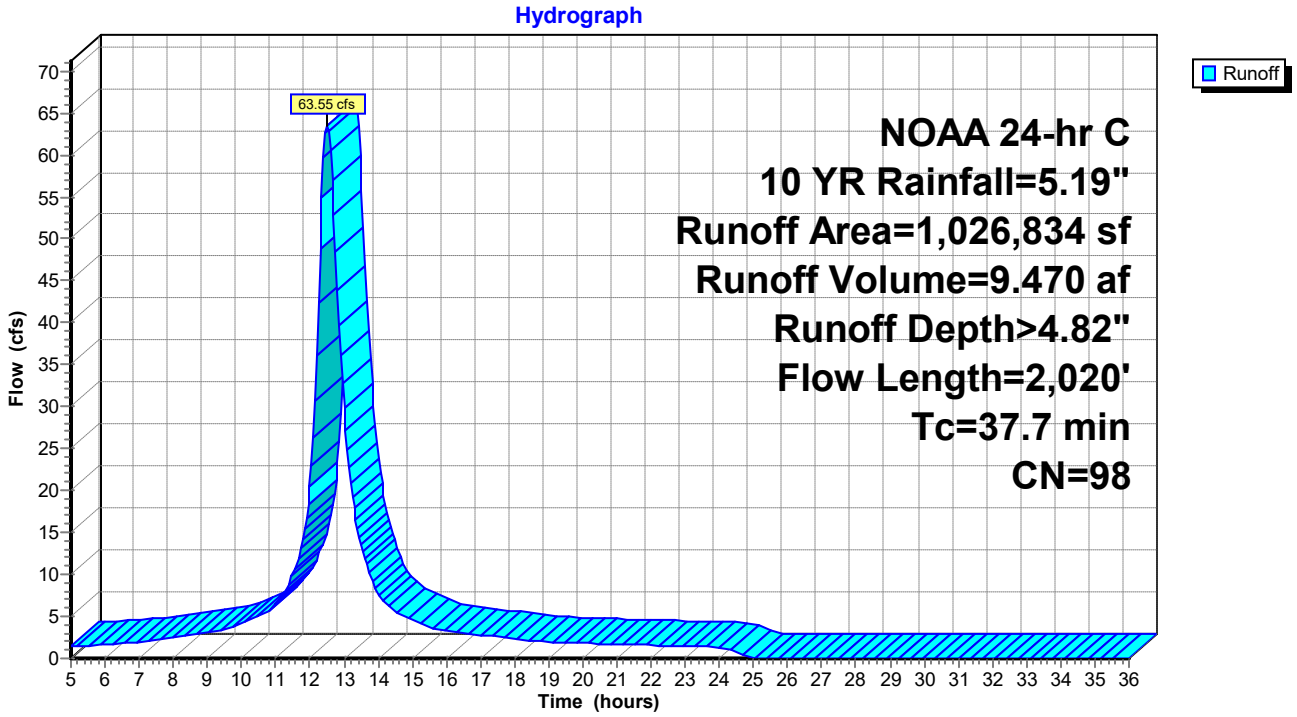
Runoff = 63.55 cfs @ 12.50 hrs, Volume= 9.470 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10 YR Rainfall=5.19"

	Area (sf)	CN	Description
*	1,026,834	98	Impervioius Area (landfill cap, access drives, rip-rap areas)
	1,026,834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0225	0.18		**Sheet Flow, Sheet Flow - Grass (Impervious)** Grass: Short n= 0.150 P2= 3.34"
3.9	200	0.0150	0.86		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1 (Impe** Short Grass Pasture Kv= 7.0 fps
14.3	710	0.0140	0.83		**Shallow Concentrated Flow, Shallow Concentrated - Grass 2 (Impe** Short Grass Pasture Kv= 7.0 fps
1.9	160	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated - Grass 3 (Impe** Short Grass Pasture Kv= 7.0 fps
1.5	75	0.0144	0.84		**Shallow Concentrated Flow, Shallow Concentrated - Grass 4 (Impe** Short Grass Pasture Kv= 7.0 fps
3.0	400	0.0210	2.25	7.89	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
4.0	375	0.0100	1.56	5.45	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
37.7	2,020	Total			

Subcatchment 12S: PRDA-2A Impervious



Summary for Subcatchment 13S: PRDA-1

[47] Hint: Peak is 2150% of capacity of segment #3
[47] Hint: Peak is 1520% of capacity of segment #4

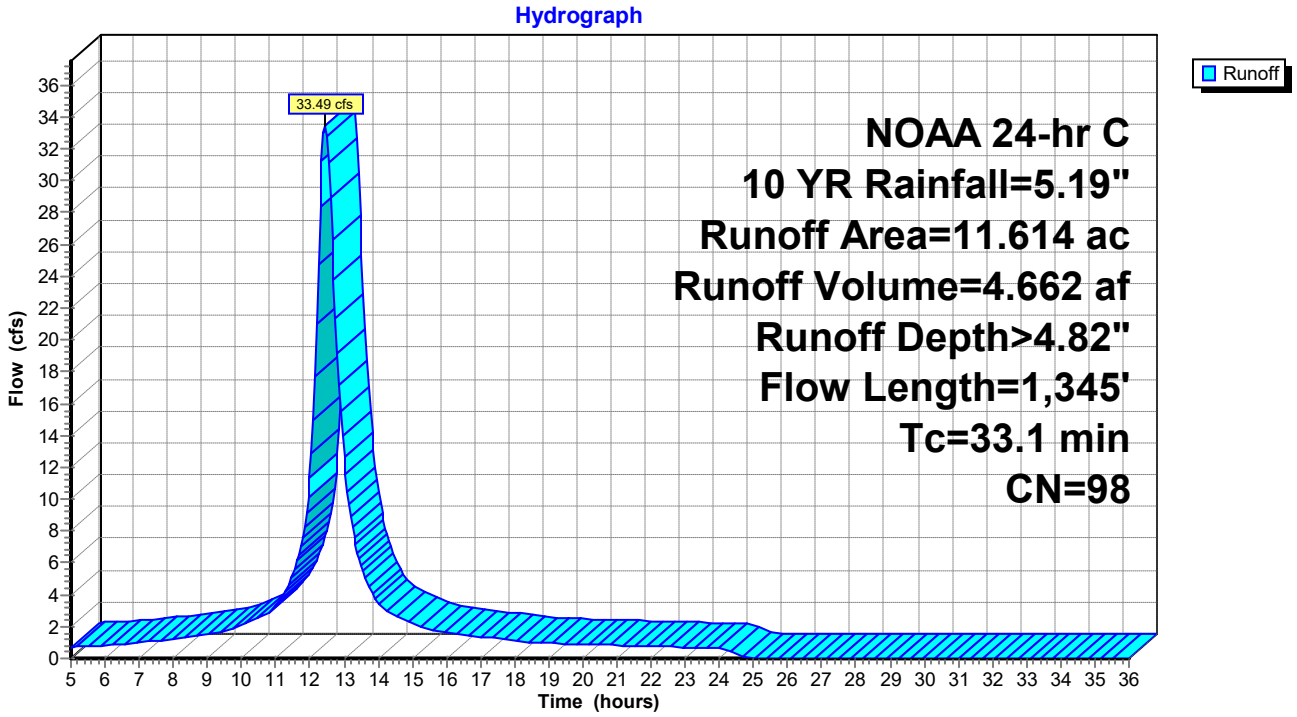
Runoff = 33.49 cfs @ 12.44 hrs, Volume= 4.662 af, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 10 YR Rainfall=5.19"

	Area (ac)	CN	Description
*	11.614	98	Landfill with Impervious Cap
	11.614		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0167	0.16		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
14.5	510	0.0070	0.59		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1** Short Grass Pasture Kv= 7.0 fps
5.5	425	0.0140	1.30	1.56	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
2.8	310	0.0280	1.84	2.20	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
33.1	1,345	Total			

Subcatchment 13S: PRDA-1

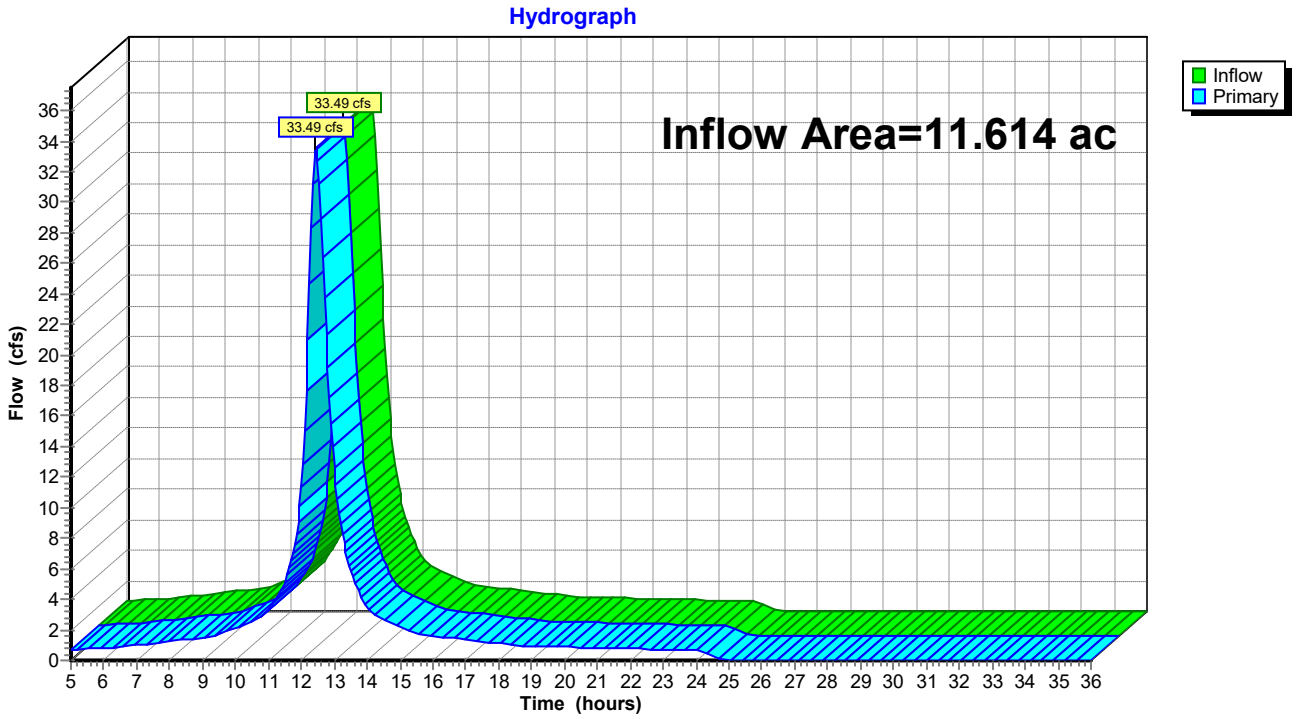


Summary for Link 14L: PRDA-1 (POI-1)

Inflow Area = 11.614 ac,100.00% Impervious, Inflow Depth > 4.82" for 10 YR event
Inflow = 33.49 cfs @ 12.44 hrs, Volume= 4.662 af
Primary = 33.49 cfs @ 12.44 hrs, Volume= 4.662 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 14L: PRDA-1 (POI-1)

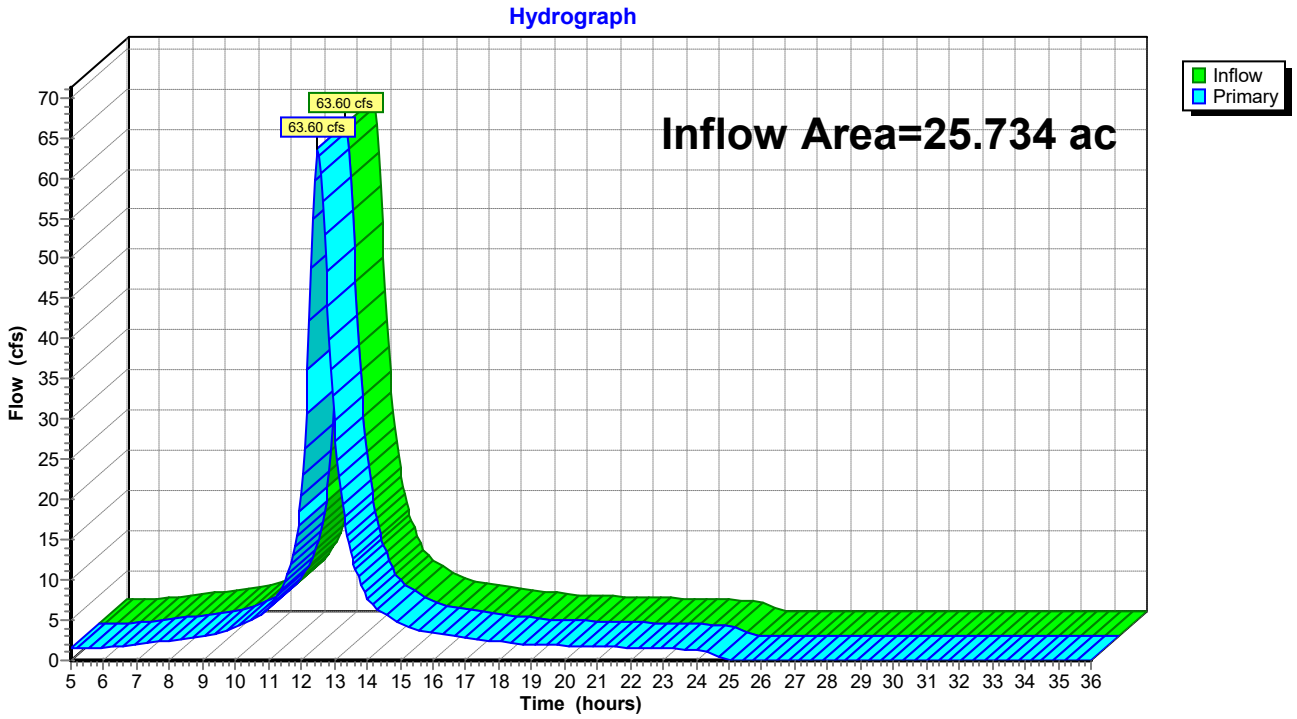


Summary for Link 15L: PRDA-2 (POI-2)

Inflow Area = 25.734 ac, 91.60% Impervious, Inflow Depth > 4.44" for 10 YR event
Inflow = 63.60 cfs @ 12.50 hrs, Volume= 9.513 af
Primary = 63.60 cfs @ 12.50 hrs, Volume= 9.513 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 15L: PRDA-2 (POI-2)



Summary for Subcatchment 11S: PRDA-2B Pervious

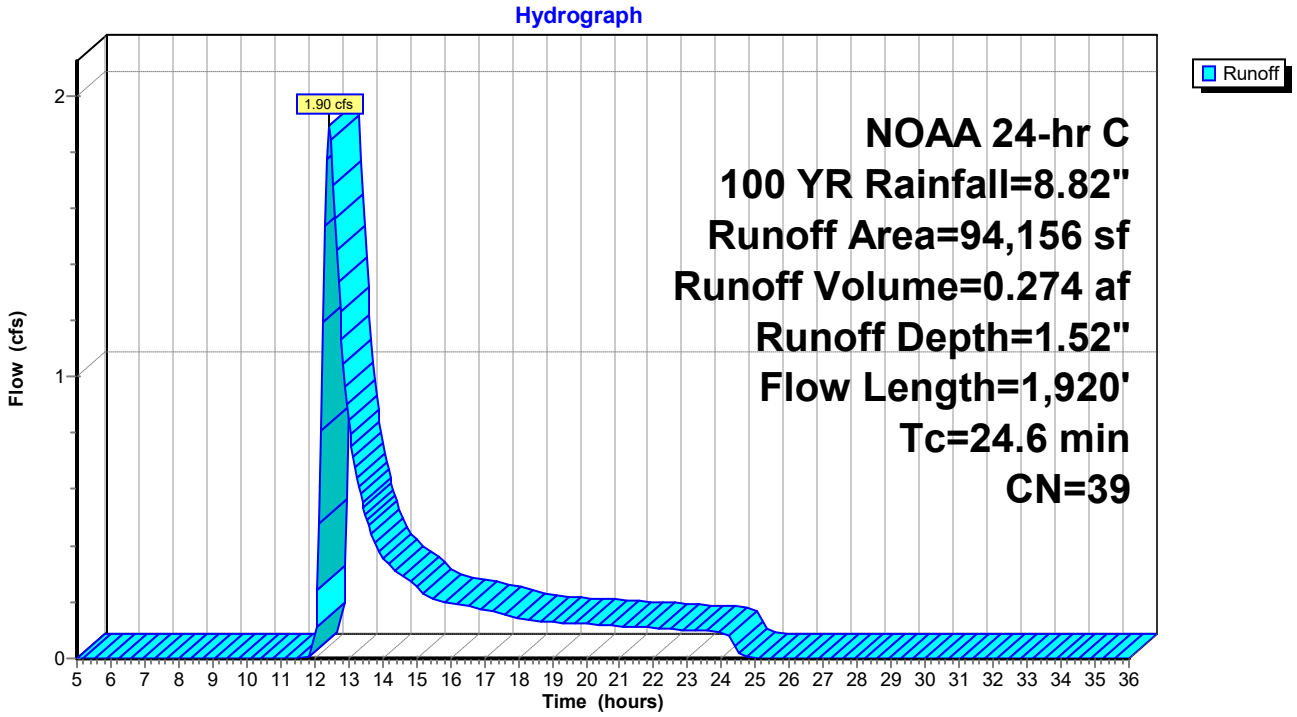
Runoff = 1.90 cfs @ 12.43 hrs, Volume= 0.274 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100 YR Rainfall=8.82"

	Area (sf)	CN	Description
*	34,783	39	LasB Grass (Good Condition)
*	280	36	LasB Woods
*	41,065	39	LasC Grass (Good Condition)
*	13,272	36	PHG Grass
*	4,756	39	PHG Woods
	94,156	39	Weighted Average
	94,156		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	10	0.0250	0.12		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
0.2	20	0.0600	1.58		**Sheet Flow, Sheet Flow - Gravel** Smooth surfaces n= 0.011 P2= 3.34"
3.0	20	0.0150	0.11		**Sheet Flow, Sheet Flow - Grass 2** Grass: Short n= 0.150 P2= 3.34"
8.4	635	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 1** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.5	600	0.0310	2.22	3.77	**Channel Flow, Channel Flow - Riprap 2** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
2.7	300	0.0210	1.83	3.10	**Channel Flow, Channel Flow - Riprap 3** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
4.4	335	0.0100	1.26	2.14	**Channel Flow, Channel Flow - Riprap 4** Area= 1.7 sf Perim= 3.8' r= 0.45' n= 0.069 Riprap, 6-inch
24.6	1,920	Total			

Subcatchment 11S: PRDA-2B Pervious



Summary for Subcatchment 12S: PRDA-2A Impervious

[47] Hint: Peak is 1374% of capacity of segment #6
[47] Hint: Peak is 1991% of capacity of segment #7

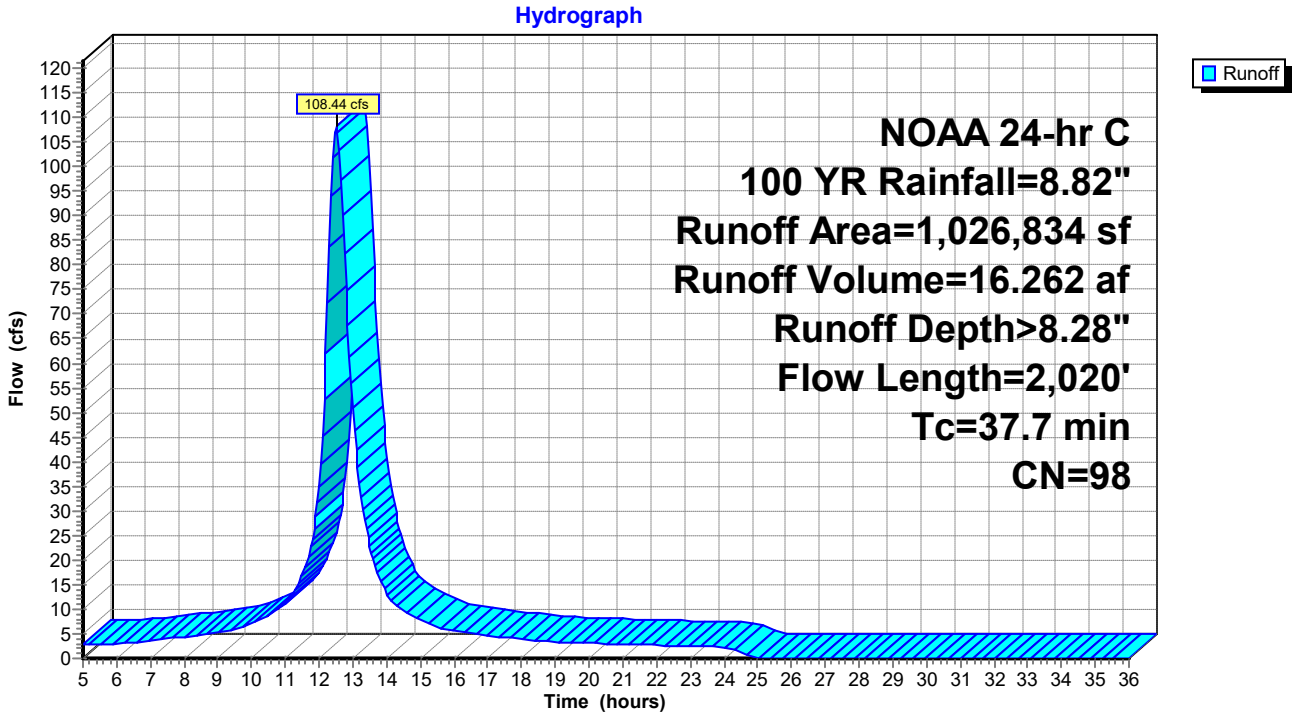
Runoff = 108.44 cfs @ 12.50 hrs, Volume= 16.262 af, Depth> 8.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100 YR Rainfall=8.82"

	Area (sf)	CN	Description
*	1,026,834	98	Impervioius Area (landfill cap, access drives, rip-rap areas)
	1,026,834		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0225	0.18		**Sheet Flow, Sheet Flow - Grass (Impervious)** Grass: Short n= 0.150 P2= 3.34"
3.9	200	0.0150	0.86		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1 (Impe** Short Grass Pasture Kv= 7.0 fps
14.3	710	0.0140	0.83		**Shallow Concentrated Flow, Shallow Concentrated - Grass 2 (Impe** Short Grass Pasture Kv= 7.0 fps
1.9	160	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated - Grass 3 (Impe** Short Grass Pasture Kv= 7.0 fps
1.5	75	0.0144	0.84		**Shallow Concentrated Flow, Shallow Concentrated - Grass 4 (Impe** Short Grass Pasture Kv= 7.0 fps
3.0	400	0.0210	2.25	7.89	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
4.0	375	0.0100	1.56	5.45	**Channel Flow, Channel - Riprap 1** Area= 3.5 sf Perim= 5.7' r= 0.61' n= 0.069 Riprap, 6-inch
37.7	2,020	Total			

Subcatchment 12S: PRDA-2A Impervious



Summary for Subcatchment 13S: PRDA-1

[47] Hint: Peak is 3667% of capacity of segment #3
[47] Hint: Peak is 2593% of capacity of segment #4

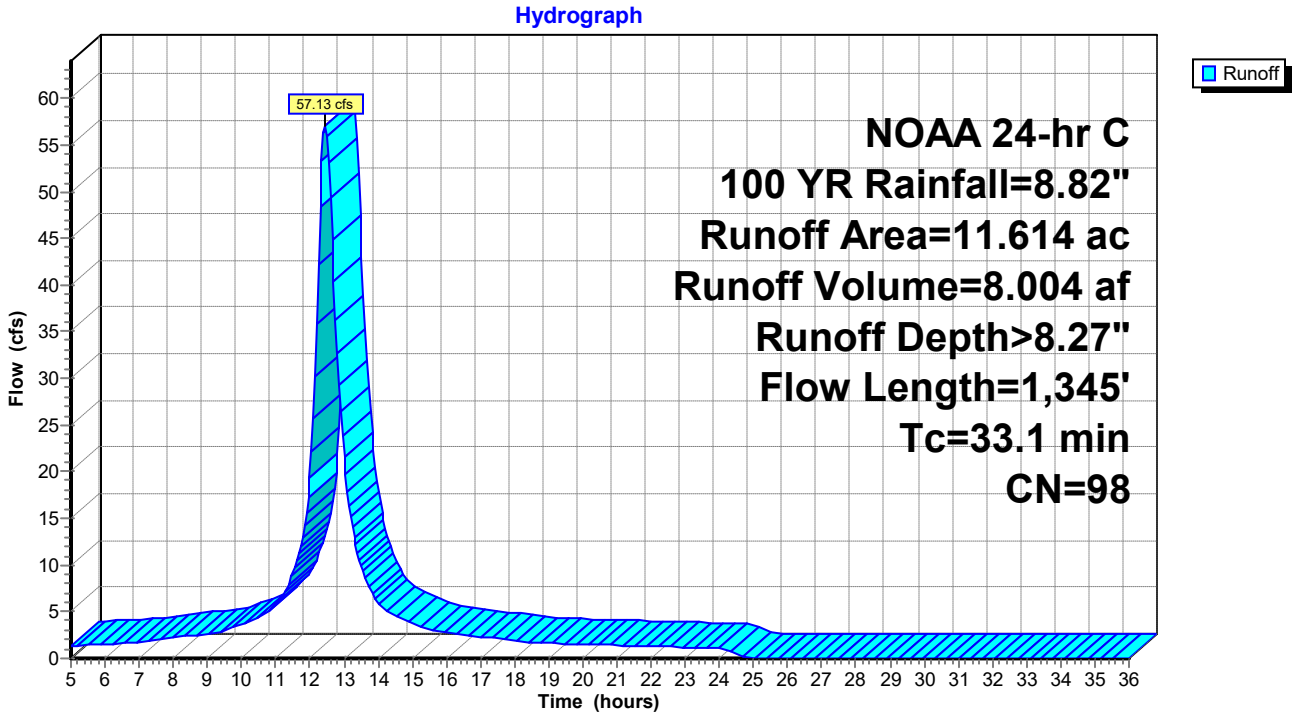
Runoff = 57.13 cfs @ 12.44 hrs, Volume= 8.004 af, Depth> 8.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100 YR Rainfall=8.82"

	Area (ac)	CN	Description
*	11.614	98	Landfill with Impervious Cap
	11.614		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0167	0.16		**Sheet Flow, Sheet Flow - Grass** Grass: Short n= 0.150 P2= 3.34"
14.5	510	0.0070	0.59		**Shallow Concentrated Flow, Shallow Concentrated - Grass 1** Short Grass Pasture Kv= 7.0 fps
5.5	425	0.0140	1.30	1.56	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
2.8	310	0.0280	1.84	2.20	**Channel Flow, Channel Flow - Riprap** Area= 1.2 sf Perim= 3.3' r= 0.36' n= 0.069 Riprap, 6-inch
33.1	1,345	Total			

Subcatchment 13S: PRDA-1

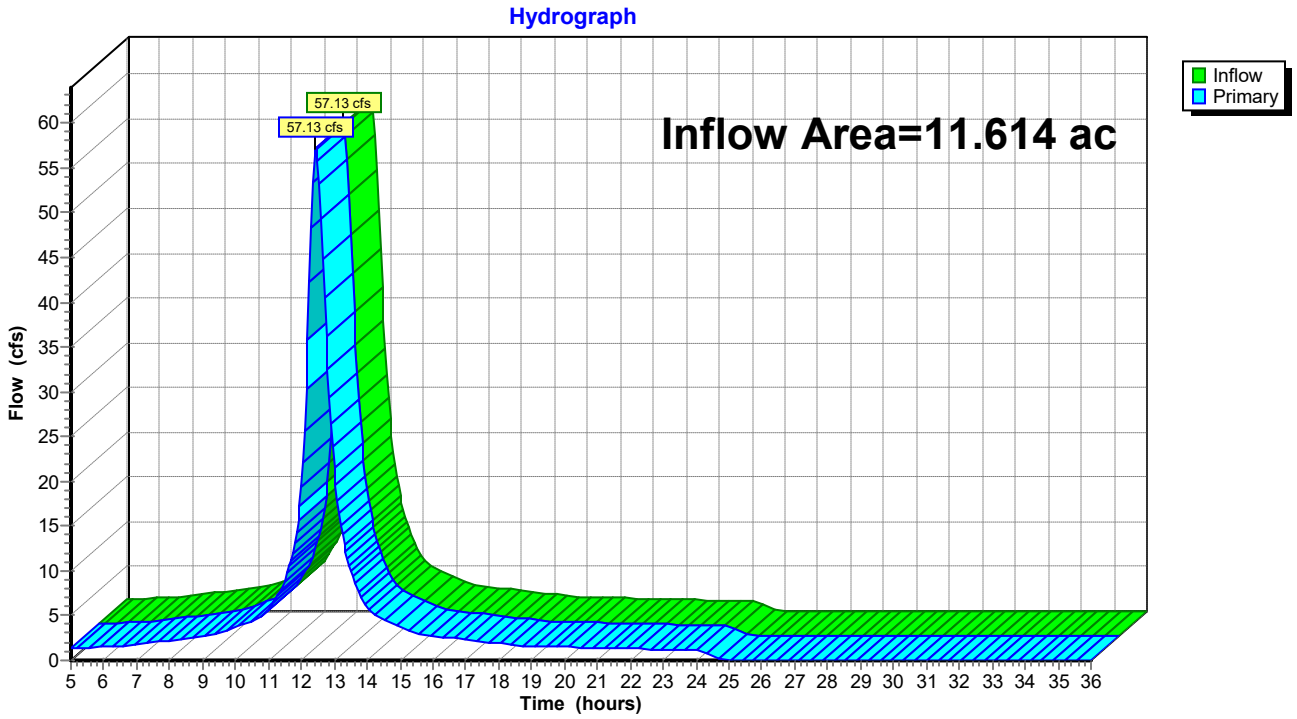


Summary for Link 14L: PRDA-1 (POI-1)

Inflow Area = 11.614 ac,100.00% Impervious, Inflow Depth > 8.27" for 100 YR event
Inflow = 57.13 cfs @ 12.44 hrs, Volume= 8.004 af
Primary = 57.13 cfs @ 12.44 hrs, Volume= 8.004 af, Atten= 0%, Lag= 0.0 min

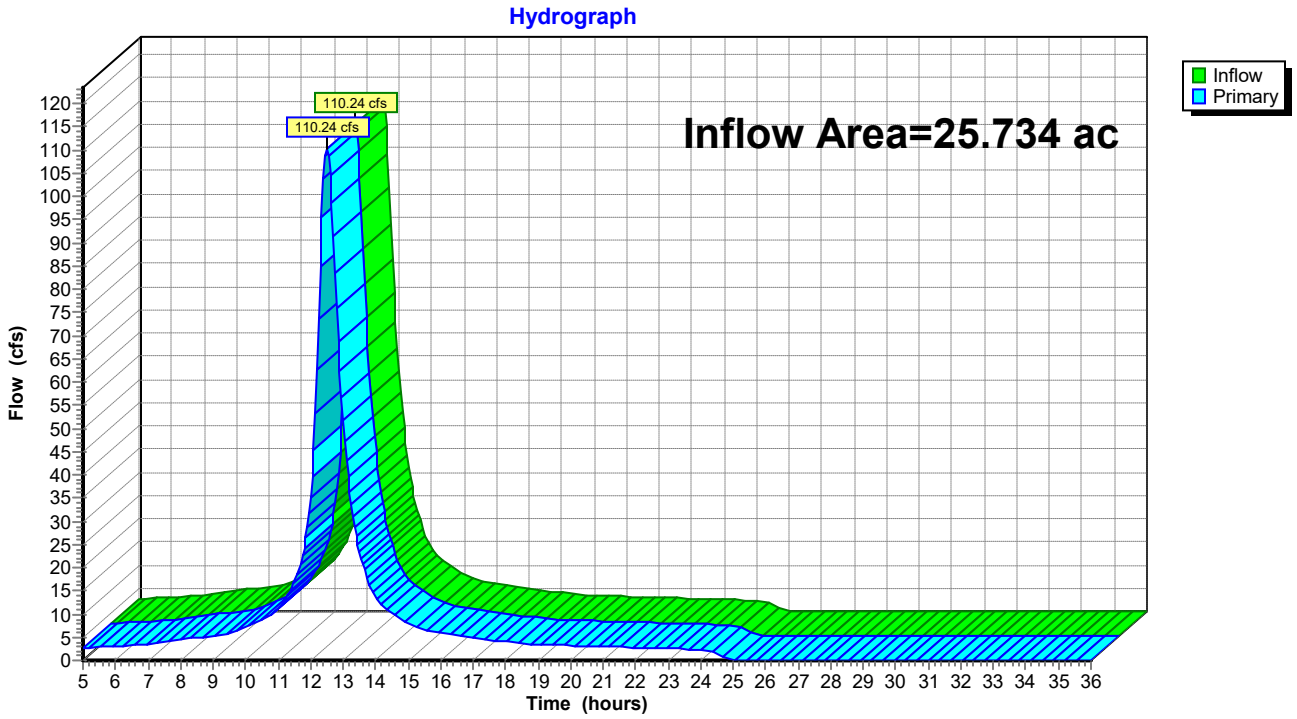
Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 14L: PRDA-1 (POI-1)



Summary for Link 15L: PRDA-2 (POI-2)

Inflow Area = 25.734 ac, 91.60% Impervious, Inflow Depth > 7.71" for 100 YR event
Inflow = 110.24 cfs @ 12.50 hrs, Volume= 16.535 af
Primary = 110.24 cfs @ 12.50 hrs, Volume= 16.535 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-36.00 hrs, dt= 0.05 hrs

Link 15L: PRDA-2 (POI-2)