

STORMWATER IMPACT REPORT

FOR

ACCESS SELF STORAGE FACILITY

BLOCK 502.01 - LOTS 45.01 & 46.01
297 DAVIDSON AVENUE
TOWNSHIP OF FRANKLIN
SOMERSET COUNTY, NEW JERSEY

AUGUST 2021

Revised October 2021

Revised January 2022

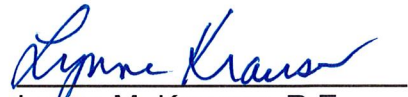
Prepared For:

Applicant:

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Little Ferry, NJ 07643

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I. PROJECT SUMMARY

The applicant proposes to construct a 3-story self-storage facility, 120,750 square feet in total floor area, and associated site improvements on Lots 45.01 and 46.01, Block 502.01 along Davidson Avenue. The 10.997-acre tract previously included an one-story main building, several outbuildings, a large, looped driveway and a smaller driveway. The total impervious coverage from these existing and pre-existing site features is 0.6 acres.

The proposed self-storage facility will result in a total site impervious coverage of 2.08 acres. In order to mitigate the impact of the increase in runoff due to the further development of the site, a small-scale bioretention basin with extended detention storage volume is proposed to collect, treat, store and release, at a reduced rate, stormwater runoff from the developed portion of the site. This stormwater BMP has been designed in accordance with state and local stormwater management regulations for Green Infrastructure.

The majority of the site, approximately 7.5 acres, will remain undeveloped. This area consists of two streams, whose confluence is just downstream from the northerly property line, and their associated flood hazard areas and stream corridors. These areas will be protected from further development by environmental constraints. As required by the Delaware Raritan Canal Commission, a Non-Structural Strategies Point System (NSPS) Spreadsheet has been completed for this project (see Appendix F.) The NSPS spreadsheet shows that the site design incorporates sufficient low impact development strategies to address stormwater management. The design of the structural stormwater BMP and the overall stormwater management plan for this project are discussed in detail below.

II. DISCUSSION OF STORMWATER IMPACT

A. STORMWATER QUANTITY

The proposed development will result in an increase in on-site impervious area of approximately 1.5 acres. As such, measures must be taken to mitigate the impact of the resulting increase in stormwater runoff. In order to adequately design these measures, a hydrologic study of the site has been performed. The hydrologic analysis compares existing and proposed flows from the site, using a total area of analysis which encompasses the tract area up to the Davidson Avenue curb line (10.84 acres.)

In accordance with state and local stormwater regulations, the analysis of the stormwater runoff impact must reflect a reduction in flows after any improvements which increase runoff from the site. As such, the flow analysis includes the computation of “allowable” post development flows. These allowable flows are existing flow values with appropriate reduction factors applied to the undeveloped portion of the site which will be improved. The appropriate reduction factors are as follows: 50% for the 2-year frequency storm, 75% for the 10-year storm, and 80% for the 100-year storm. In the

case of this development, the reduction factors were applied to all existing pervious areas which will be disturbed. The reduction factors have not been applied to existing impervious areas, or those areas which will remain undisturbed.

In order to reduce the impact of stormwater runoff from the site, green infrastructure strategies are proposed as part of the development. The area of disturbance footprint is kept to a minimum by utilizing only the front portion of the site and avoiding environmentally sensitive areas to the greatest extent possible. The proposed conveyance system includes a drainage swale to help reduce the time of concentration and therefore the flow volume. Finally, a small-scale bioretention basin with sufficient storage volume to provide extended detention is proposed to control the quantity and quality of stormwater runoff. A small-scale bioretention basin, which meets the criteria for green infrastructure, has a maximum contributory drainage area of 2.5 acres. The proposed bioretention basin is located in Proposed Drainage Sub-Area #1a, which totals 2.9 acres. Per NJAC 7:8, the definition of “Contributory Drainage Area” (CDA) is “the area from which stormwater runoff drains to a stormwater management measure, not including the area of the stormwater management measure itself.” Since the bioretention basin encompasses an area of 0.4 acres, the resulting CDA is 2.5 acres, thereby meeting the small-scale criteria to be considered green infrastructure per current NJDEP regulations.

The bioretention basin has been designed to reduce the site runoff to below allowable flow values. The site flows were developed using SCS methodology and HydroCAD modelling software. The complete output from the 2, 10 and 100-year HydroCAD models (allowable and proposed conditions) is located in Appendix B. The results of the hydrologic models are summarized in the tables below.

Summary of Site Flows:

ALLOWABLE FLOW (cfs)	Storm Frequency (years)		
	2	10	100
1a: Undeveloped Area to be Disturbed	1.96	4.61	10.43
<i>reduction factor applied</i>	<i>0.5</i>	<i>0.75</i>	<i>0.80</i>
RF: Reduced 1a Flow	0.98	3.45	8.34
1b: Previously Developed Portion of site	2.06	3.10	5.10
1c: Undeveloped Area to Remain	6.30	14.80	33.52
All: Total Allowable flow from site	8.11	19.54	44.05

PROPOSED FLOW	Storm Frequency (years)		
	2	10	100
1a: Proposed Flow to Basin	7.42	11.88	20.66
1P: Bioretention Basin Outflow	0.50	2.89	8.78
Basin Stage	55.06	55.60	56.46*
1b: Proposed Bypass Flow	6.75	15.72	35.49
PR: Total Proposed Flow from site	7.06	17.60	43.62

* The crest elevation of the Emergency Spillway is 56.50; therefore, the required 100-yr storm storage volume is contained within the basin.

As indicated in the tables above, the proposed bioretention basin will provide adequate storage volume to control the rate of runoff from the site to allowable flow levels.

In order to safely convey extraordinary flows from the basin, a 20-foot wide emergency spillway will be provided. The basin embankment is not classified as a dam; therefore, the adequacy of the spillway width was checked using a 100-year storm routing with the outlet structure/pipe blocked. The results of this model can be found in Appendix B and are summarized below:

Bioretention Basin – Emergency Spillway Storm 20'-wide Spillway – Crest @ 56.50	
100 yr Basin Inflow	20.66 cfs
Flow through Emergency Spillway	11.65 cfs
Peak Water Surface Elevation	56.86
Top of Berm Elevation	58.00

Since the peak water surface elevation of the model with flow through the emergency spillway is less than the top of berm elevation, the spillway is adequately sized. The 20-foot spillway is not in a fill area; as such, no spillway stabilization is proposed nor required.

B. STORMWATER QUALITY

In addition to providing quantity control, the proposed bioretention basin will provide water quality treatment for the site runoff. Stormwater runoff from the developed site will be filtered through the planted bed bottom. Per the NJDEP Stormwater BMP Manual, the bioretention basin as designed (24" thick planting bed with site tolerant grasses) will provide 80% TSS removal. The bioretention basin has been designed with an underdrain system since site soils do not provide sufficient recharge under existing conditions (see Section C for more information on soils testing results.) In order to design the BMP to provide adequate treatment, the water quality design storm was

routed through the basin to determine the invert of the lowest quantity control outlet, consistent with best management practices. This model is located in Appendix C and is summarized in the table below:

Bioretention Basin – WQ Storm	
Water Quality Inflow	5.46 cfs
Water Quality Outflow	0.21*
WQ Water Surface Elev.	53.92
Depth of Peak Storage	11 inches

** This outflow value for the WQ storm represents the flow conveyed by the underdrain system after filtration through the bioretention basin soil bed.*

The lowest outlet, a 4" orifice, is set just above the peak water surface elevation, at 53.95. Therefore, the entire water quality design storm will be filtered through the soil bed. An analysis of the time to drain the WQ volume indicates that the stored runoff will drain in approximately 15 hours (see calculations in Appendix C.)

C. GROUNDWATER RECHARGE

An investigation of the permeability of the onsite soils has been performed. Four full depth test pits were excavated to assess the soil parameters, including the ability of the soil to infiltrate stormwater. Additional areas on the site were preliminarily assessed in order to attempt to find a favorable location for a potential recharge BMP. As described in the Soils Testing Summary provided in Appendix D of this report, the permeability of existing on-site soils was found to be immeasurable. This negligible permeability indicates that onsite soils do not currently allow for any significant infiltration of stormwater. Therefore, it can be concluded that negligible groundwater recharge is being provided under existing conditions. As such, no structural stormwater management measures to prevent the loss of groundwater recharge are required as part of this proposal.

Since the runoff collected in the proposed stormwater management facility is not intended to provide groundwater recharge, an underdrain system will be constructed in the bottom of the bioretention basin, below the planting bed. This underdrain system will convey the filtered stormwater to the outlet structure to discharge with the runoff stored and released by the detention basin.

III. STORMWATER CONVEYANCE SYSTEM DESIGN

Calculations supporting the design of the proposed stormwater conveyance system are in Appendix E of this report. The inlet flows were computed using the Rational Method and cumulative pipe flows are compared to pipe capacity. A 100-year design storm was

utilized for the entire system as there are critical pipe runs towards the upstream end of the system. Inlet drainage areas are shown on map DA-3.

The design of the stormwater management basin reflects New Jersey's Standards for Soil Erosion and Sediment Control. Calculations supporting the size of the conduit outlet protection (riprap aprons) provided at the detention basin inflow and outlet pipes are also located in Appendix E.

APPENDIX A

MAP FIGURES



PROPERTY STREET ADDRESS: 297 DAVIDSON AVENUE



575 Route 28 Suite 110 Raritan, N.J. 08869 Tele 908-722-1500

Title: LOCATION MAP

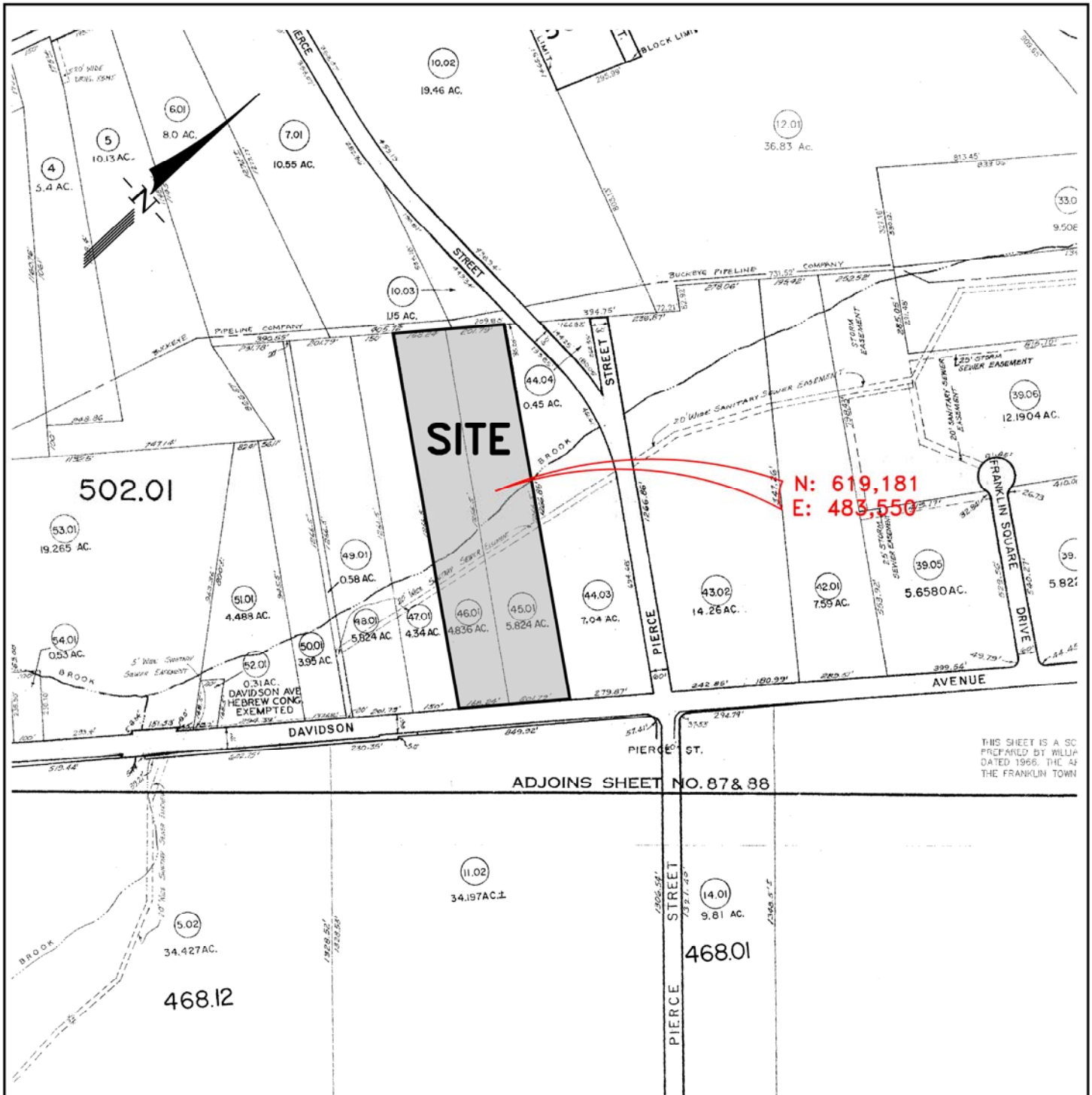
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Date: 08/10/21

Project: ACCESS SELF STORAGE
 BLOCK 502.01, LOT 45.01 & 46.01
 297 DAVIDSON AVENUE
 TOWNSHIP OF FRANKLIN
 SOMERSET COUNTY, NEW JERSEY

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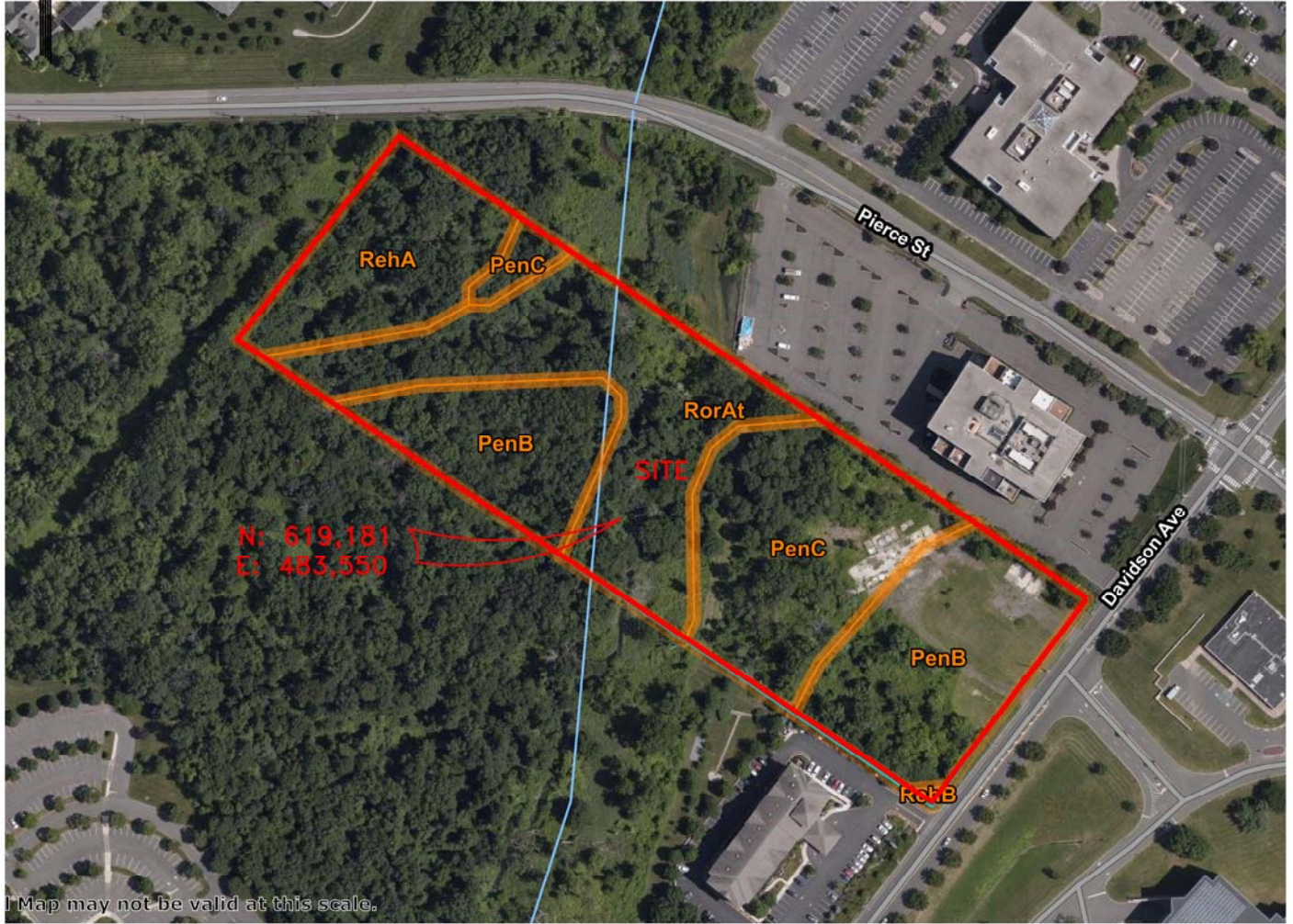


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 THE FRANKLIN TOWNSHIP



626 No. Thompson Street Raritan, N.J. 08869 Tele 908-722-1500

Title: TAX MAP		
Scale: NOT TO SCALE	TRG Job#: 21-010	Date: 08/10/21
Project: ACCESS SELF STORAGE BLOCK 502.01, LOT 45.01 & 46.01 297 DAVIDSON AVENUE TOWNSHIP OF FRANKLIN SOMERSET COUNTY, NEW JERSEY		Sheet No.: 2



- PenB – PENN SILT LOAM
- PenC – PENN SILT LOAM
- RehA – REAVILLE SILT LOAM
- RehB – REAVILLE SILT LOAM
- RorAt – ROLAND SILT LOAM



575 Route 28 Suite 110 Raritan, N.J. 08869 Tele 908-722-1500

Title: **SOILS MAP (USDA WEB SOIL SURVEY)**

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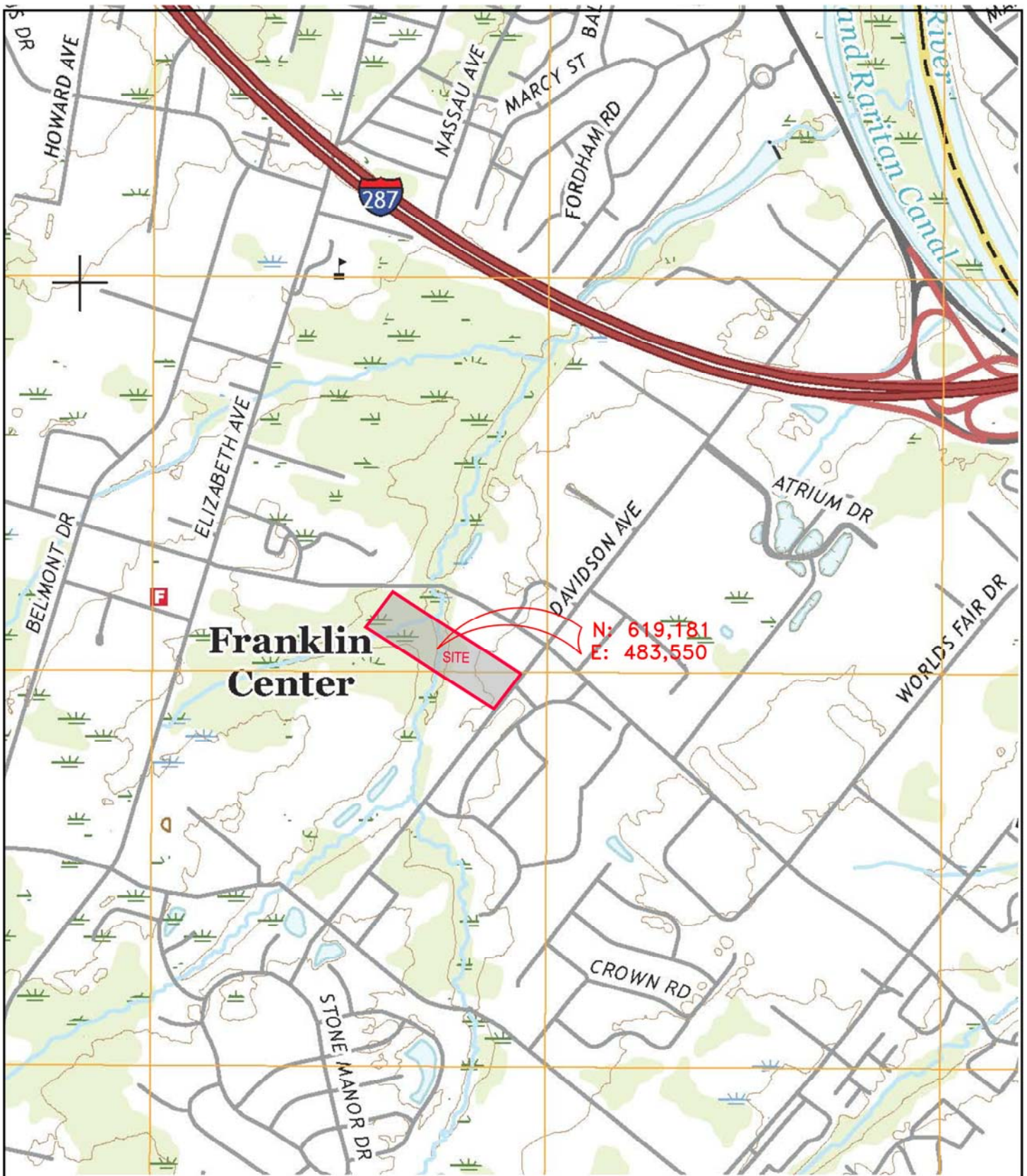
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Date: 08/10/21

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Title: **U.S.G.S TOPO MAP – BOUND BROOK QUAD**

Scale: NOT TO SCALE TRG Job #: 21-010

Date: 08/10/21

Project: **ACCESS SELF STORAGE**
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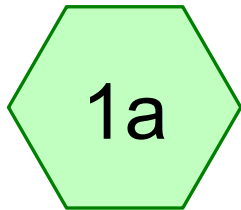
APPENDIX B

STORMWATER RUNOFF CALCULATIONS

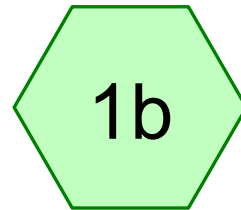
- **Allowable Conditions HydroCAD models**
2, 10 and 100-year storms
- **Proposed Condition HydroCAD model**
2, 10 and 100-year
- **Emergency Spillway HydroCAD models**
100-year storm with Outlet Structure blocked

Allowable Conditions
HydroCAD Models
2,10 & 100 yr storms

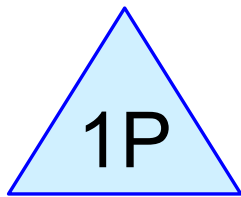
Proposed Conditions
HydroCAD Model
2,10 & 100 yr storms



Prop. Flow to Basin



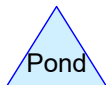
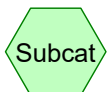
Prop. Site Bypass Flow



BioRetention Basin



Total Proposed Flow



Proposed Flows - 2, 10, 100 yr storms

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	C	Default	24.00	1	3.34	2
2	10-Year	NOAA 24-hr	C	Default	24.00	1	5.01	2
3	100-Year	NOAA 24-hr	C	Default	24.00	1	8.21	2

Proposed Flows - 2, 10, 100 yr storms

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Summary for Subcatchment 1a: Prop. Flow to Basin

Runoff = 7.42 cfs @ 12.16 hrs, Volume= 0.613 af, Depth= 2.53"
 Routed to Pond 1P : BioRetention Basin

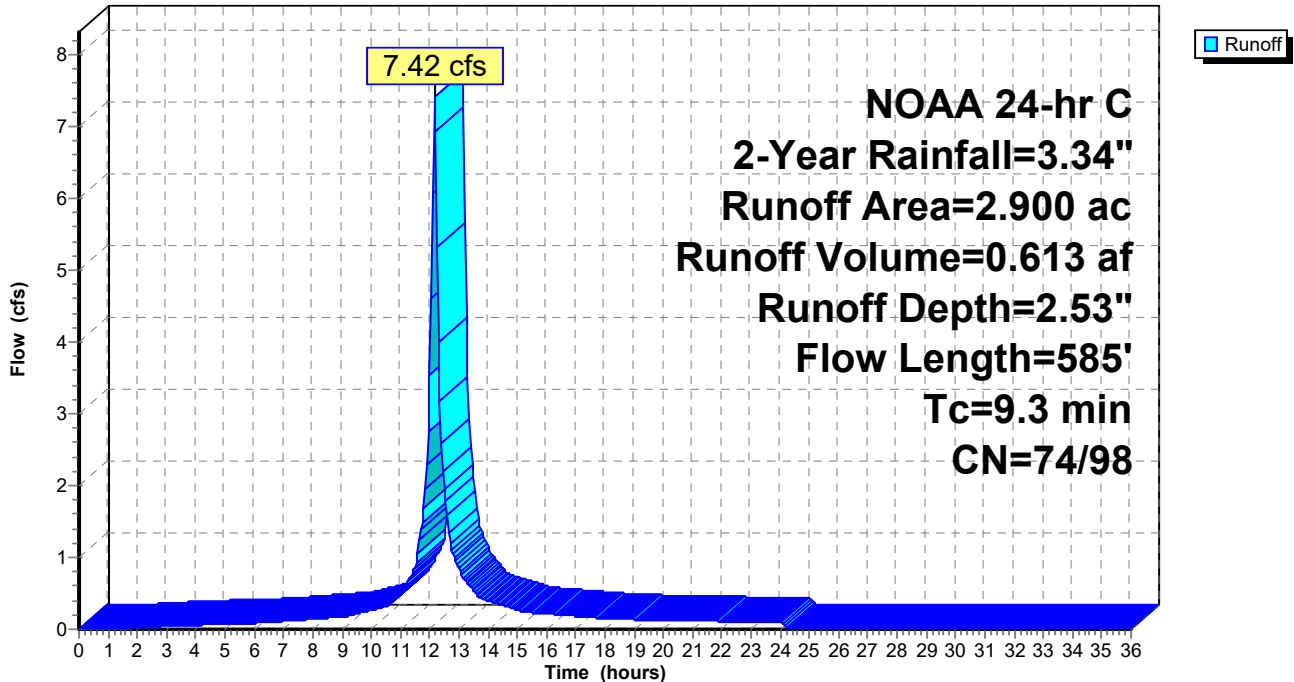
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 2-Year Rainfall=3.34"

Area (ac)	CN	Description
0.840	74	>75% Grass cover, Good, HSG C
* 2.060	98	Roof, Imperv. Prkg & Walks, HSG C
2.900	91	Weighted Average
0.840		28.97% Pervious Area
2.060		71.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	40	0.0280	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.3	20	0.3300	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, Swale Grassed Waterway Kv= 15.0 fps
1.5	465		5.00		Direct Entry, Pipes
9.3	585	Total			

Subcatchment 1a: Prop. Flow to Basin

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 2-Year Rainfall=3.34"

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Summary for Subcatchment 1b: Prop. Site Bypass Flow

Runoff = 6.75 cfs @ 12.26 hrs, Volume= 0.640 af, Depth= 0.97"
 Routed to Link PR : Total Proposed Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 2-Year Rainfall=3.34"

Area (ac)	CN	Description
6.810	70	Woods, Good, HSG C
1.100	74	>75% Grass cover, Good, HSG C
0.020	98	Paved parking, HSG C
7.930	71	Weighted Average
7.910		99.75% Pervious Area
0.020		0.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	30	0.0425	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.7	30	0.3300	0.29		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
5.3	40	0.1000	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.34"
2.0	190	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
2.6	465		3.00		Direct Entry, Channel Flow
15.5	755	Total			

Proposed Flows - 2, 10, 100 yr storms

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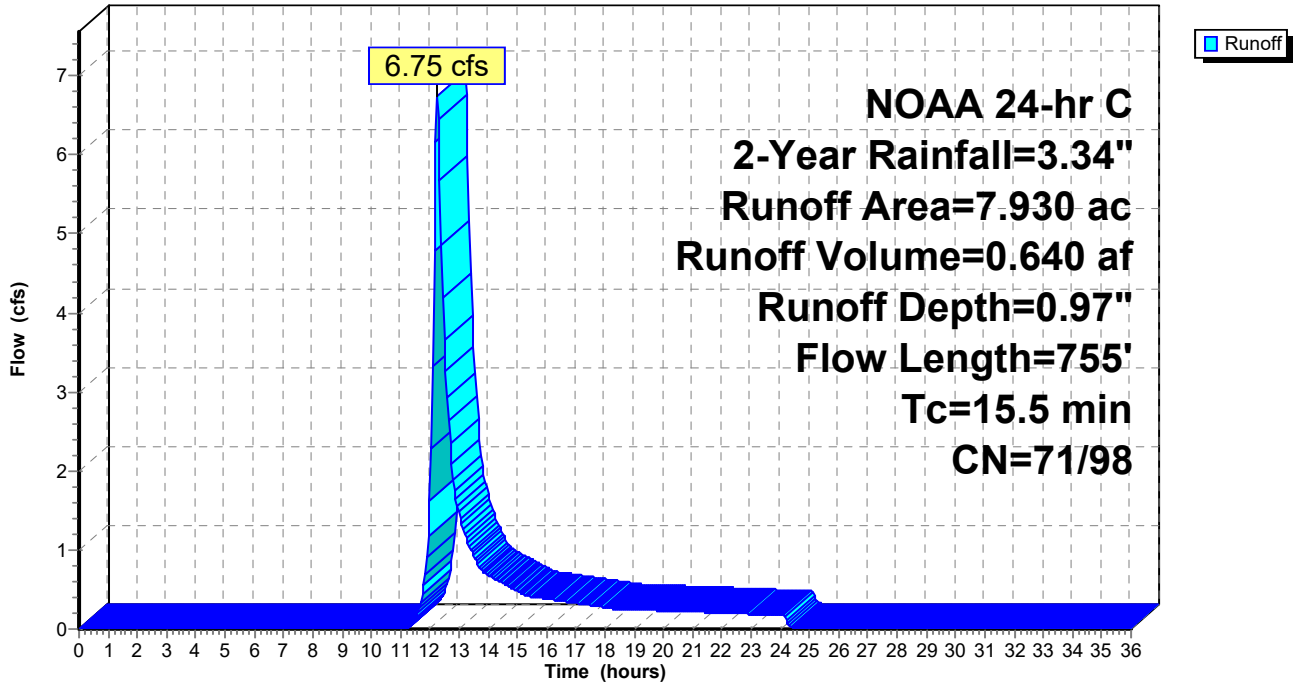
NOAA 24-hr C 2-Year Rainfall=3.34"

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Subcatchment 1b: Prop. Site Bypass Flow

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 2-Year Rainfall=3.34"

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Summary for Pond 1P: BioRetention Basin

Inflow Area = 2.900 ac, 71.03% Impervious, Inflow Depth = 2.53" for 2-Year event
 Inflow = 7.42 cfs @ 12.16 hrs, Volume= 0.613 af
 Outflow = 0.50 cfs @ 13.56 hrs, Volume= 0.446 af, Atten= 93%, Lag= 84.0 min
 Primary = 0.50 cfs @ 13.56 hrs, Volume= 0.446 af

Routed to Link PR : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Peak Elev= 55.06' @ 13.56 hrs Surf.Area= 10,422 sf Storage= 17,926 cf

Plug-Flow detention time= 557.6 min calculated for 0.446 af (73% of inflow)
 Center-of-Mass det. time= 462.6 min (1,236.0 - 773.4)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	54,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
53.00	6,425	0	0
54.00	8,900	7,663	7,663
55.00	10,338	9,619	17,282
56.00	11,698	11,018	28,300
57.00	13,127	12,413	40,712
58.00	14,536	13,832	54,544

Device	Routing	Invert	Outlet Devices
#1	Primary	49.00'	18.0" Round 18" Outlet Pipe L= 90.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 49.00' / 47.20' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	53.95'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	55.00'	1.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	56.50'	20.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.49 cfs @ 13.56 hrs HW=55.06' (Free Discharge)

- 1=18" Outlet Pipe (Passes 0.49 cfs of 19.61 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.41 cfs @ 4.68 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.09 cfs @ 0.81 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Proposed Flows - 2, 10, 100 yr storms

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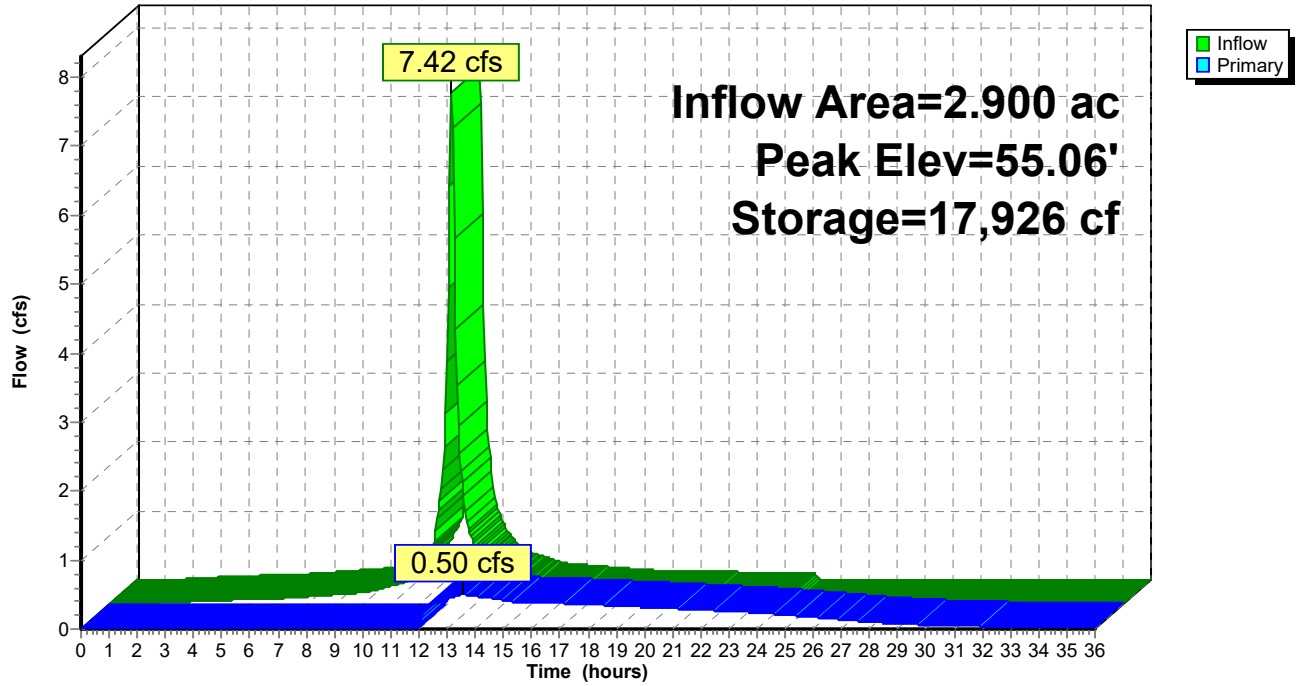
NOAA 24-hr C 2-Year Rainfall=3.34"

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Pond 1P: BioRetention Basin

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 2-Year Rainfall=3.34"

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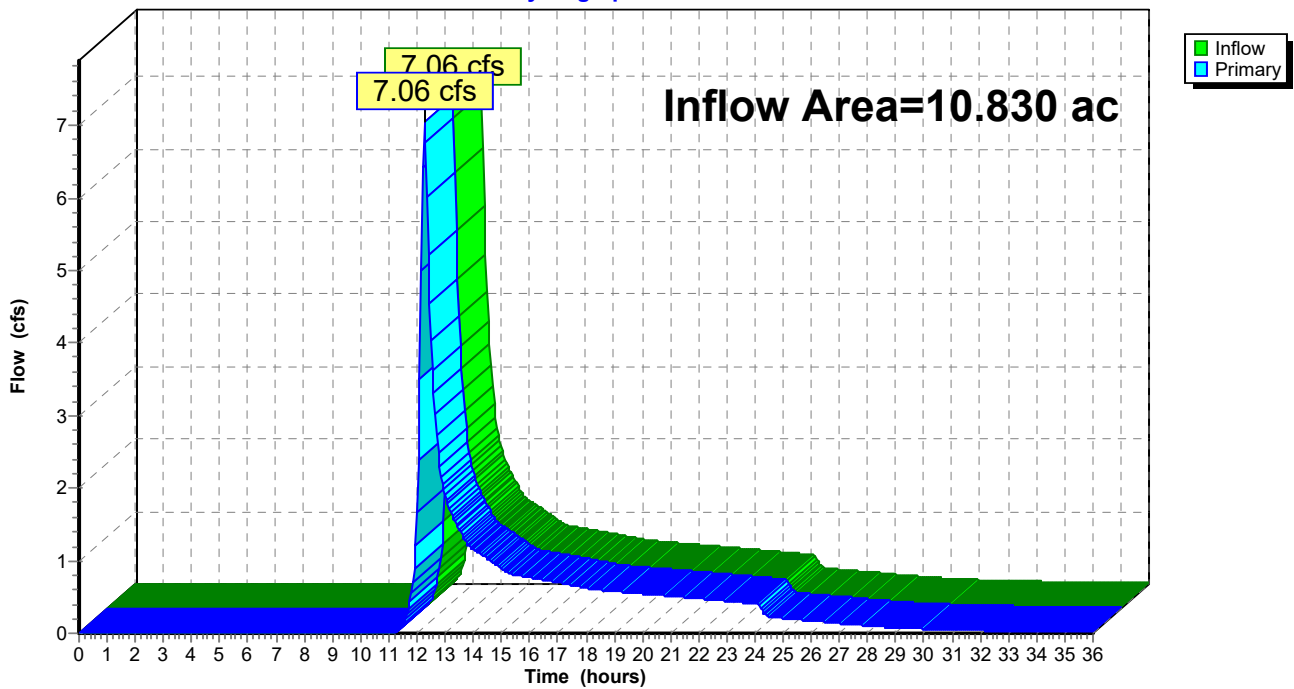
Summary for Link PR: Total Proposed Flow

Inflow Area = 10.830 ac, 19.21% Impervious, Inflow Depth = 1.20" for 2-Year event
Inflow = 7.06 cfs @ 12.26 hrs, Volume= 1.086 af
Primary = 7.06 cfs @ 12.26 hrs, Volume= 1.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link PR: Total Proposed Flow

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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Franklin Storage LLC

NOAA 24-hr C 10-Year Rainfall=5.01"

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Summary for Subcatchment 1a: Prop. Flow to Basin

Runoff = 11.88 cfs @ 12.16 hrs, Volume= 0.985 af, Depth= 4.08"
 Routed to Pond 1P : BioRetention Basin

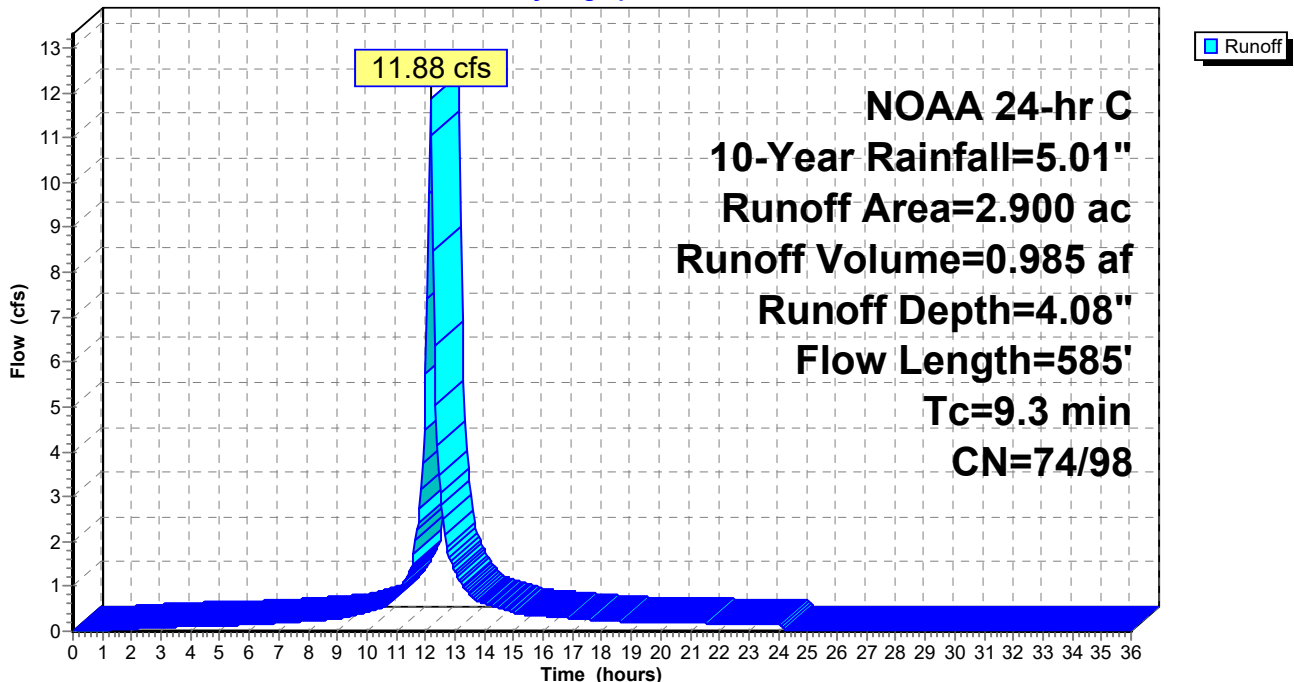
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
0.840	74	>75% Grass cover, Good, HSG C
* 2.060	98	Roof, Imperv. Prkg & Walks, HSG C
2.900	91	Weighted Average
0.840		28.97% Pervious Area
2.060		71.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	40	0.0280	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.3	20	0.3300	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, Swale Grassed Waterway Kv= 15.0 fps
1.5	465		5.00		Direct Entry, Pipes
9.3	585	Total			

Subcatchment 1a: Prop. Flow to Basin

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 10-Year Rainfall=5.01"

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Summary for Subcatchment 1b: Prop. Site Bypass Flow

Runoff = 15.72 cfs @ 12.25 hrs, Volume= 1.408 af, Depth= 2.13"
 Routed to Link PR : Total Proposed Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 10-Year Rainfall=5.01"

Area (ac)	CN	Description
6.810	70	Woods, Good, HSG C
1.100	74	>75% Grass cover, Good, HSG C
0.020	98	Paved parking, HSG C
7.930	71	Weighted Average
7.910		99.75% Pervious Area
0.020		0.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	30	0.0425	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.7	30	0.3300	0.29		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
5.3	40	0.1000	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.34"
2.0	190	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
2.6	465		3.00		Direct Entry, Channel Flow
15.5	755	Total			

Proposed Flows - 2, 10, 100 yr storms

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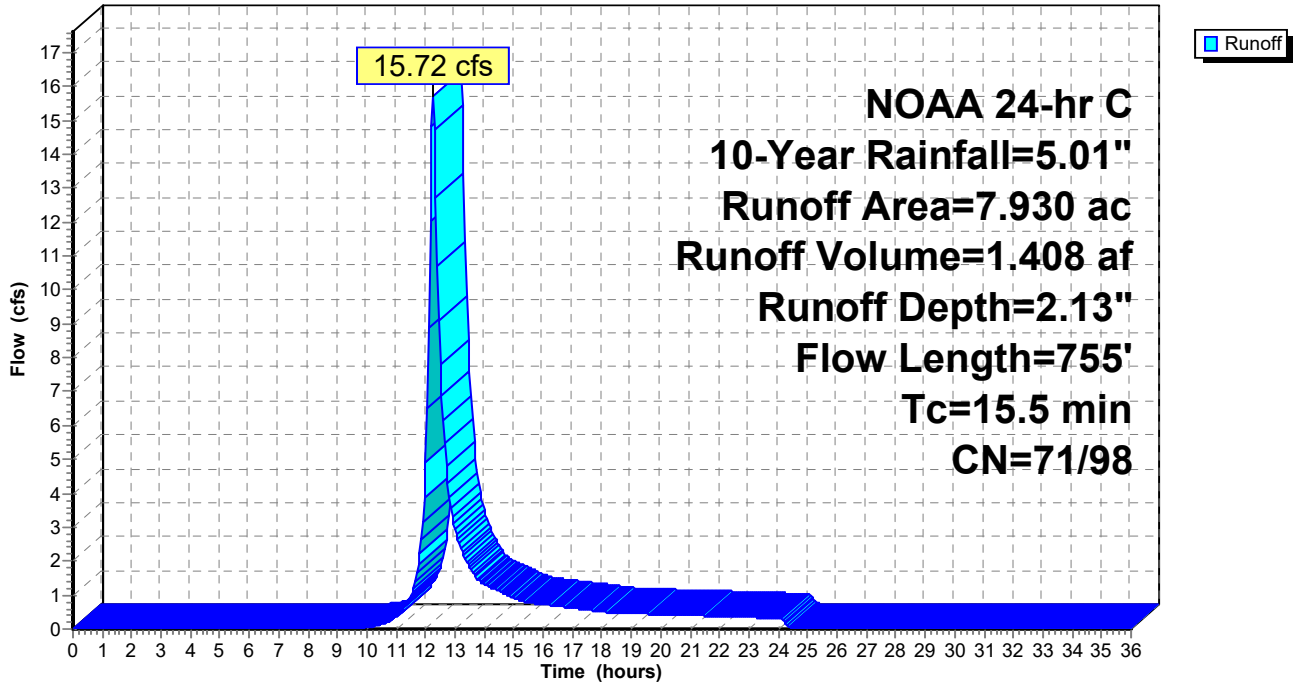
NOAA 24-hr C 10-Year Rainfall=5.01"

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Subcatchment 1b: Prop. Site Bypass Flow

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 10-Year Rainfall=5.01"

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Summary for Pond 1P: BioRetention Basin

Inflow Area = 2.900 ac, 71.03% Impervious, Inflow Depth = 4.08" for 10-Year event
 Inflow = 11.88 cfs @ 12.16 hrs, Volume= 0.985 af
 Outflow = 2.89 cfs @ 12.54 hrs, Volume= 0.819 af, Atten= 76%, Lag= 22.4 min
 Primary = 2.89 cfs @ 12.54 hrs, Volume= 0.819 af

Routed to Link PR : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Peak Elev= 55.60' @ 12.54 hrs Surf.Area= 11,149 sf Storage= 23,692 cf

Plug-Flow detention time= 404.1 min calculated for 0.818 af (83% of inflow)
 Center-of-Mass det. time= 332.0 min (1,099.3 - 767.4)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	54,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
53.00	6,425	0	0
54.00	8,900	7,663	7,663
55.00	10,338	9,619	17,282
56.00	11,698	11,018	28,300
57.00	13,127	12,413	40,712
58.00	14,536	13,832	54,544

Device	Routing	Invert	Outlet Devices
#1	Primary	49.00'	18.0" Round 18" Outlet Pipe L= 90.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 49.00' / 47.20' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	53.95'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	55.00'	1.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	56.50'	20.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.89 cfs @ 12.54 hrs HW=55.60' (Free Discharge)

- 1=18" Outlet Pipe (Passes 2.89 cfs of 20.57 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.51 cfs @ 5.86 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 2.38 cfs @ 2.52 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Proposed Flows - 2, 10, 100 yr storms

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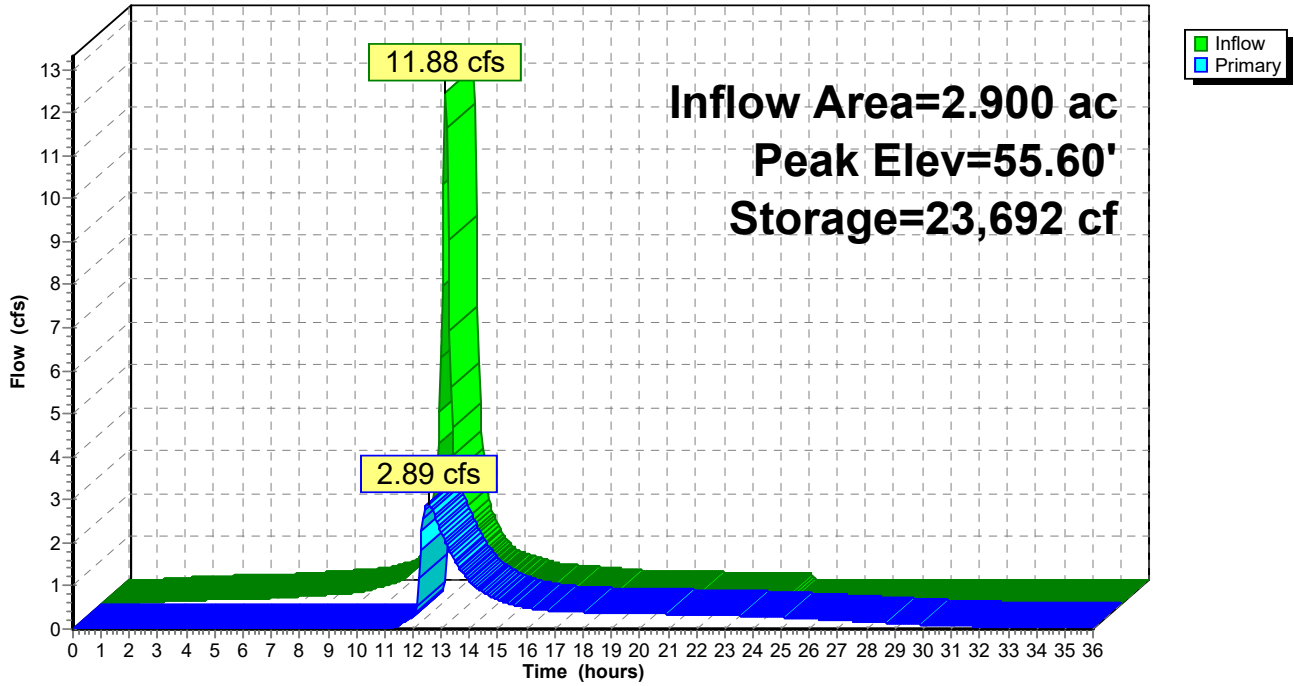
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Pond 1P: BioRetention Basin

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 10-Year Rainfall=5.01"

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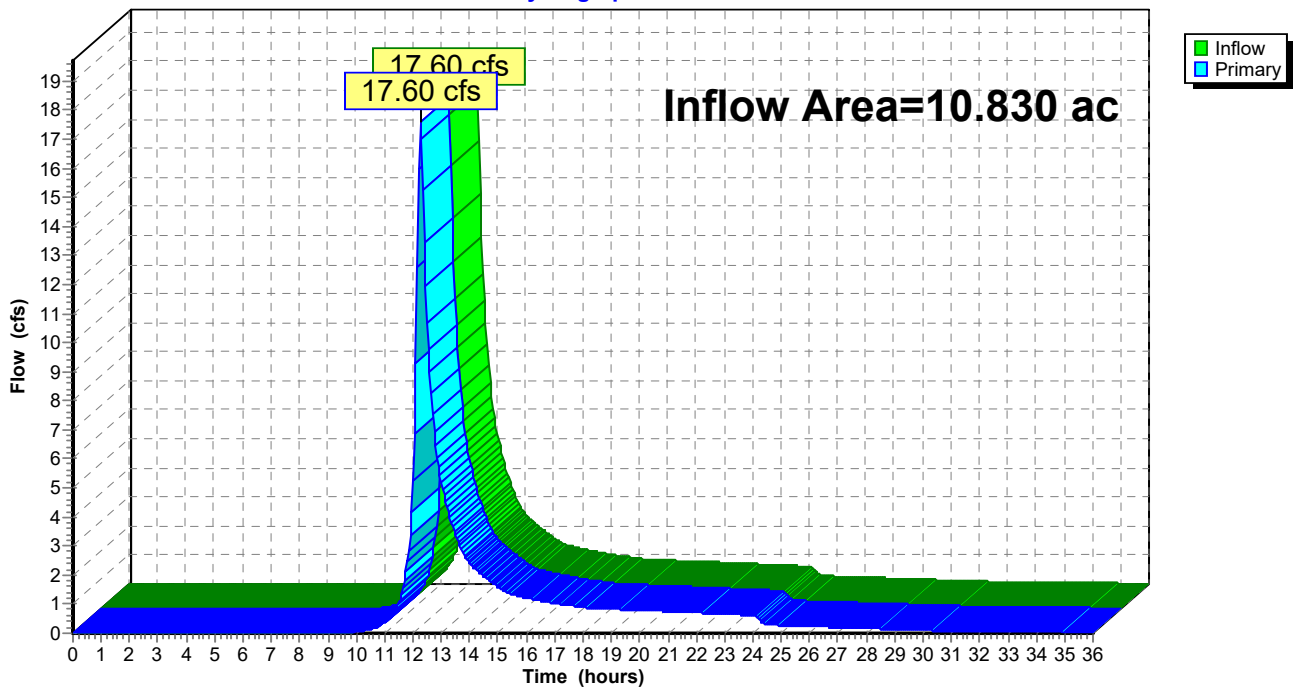
Summary for Link PR: Total Proposed Flow

Inflow Area = 10.830 ac, 19.21% Impervious, Inflow Depth = 2.47" for 10-Year event
Inflow = 17.60 cfs @ 12.26 hrs, Volume= 2.227 af
Primary = 17.60 cfs @ 12.26 hrs, Volume= 2.227 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link PR: Total Proposed Flow

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 100-Year Rainfall=8.21"

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Summary for Subcatchment 1a: Prop. Flow to Basin

Runoff = 20.66 cfs @ 12.16 hrs, Volume= 1.726 af, Depth= 7.14"
 Routed to Pond 1P : BioRetention Basin

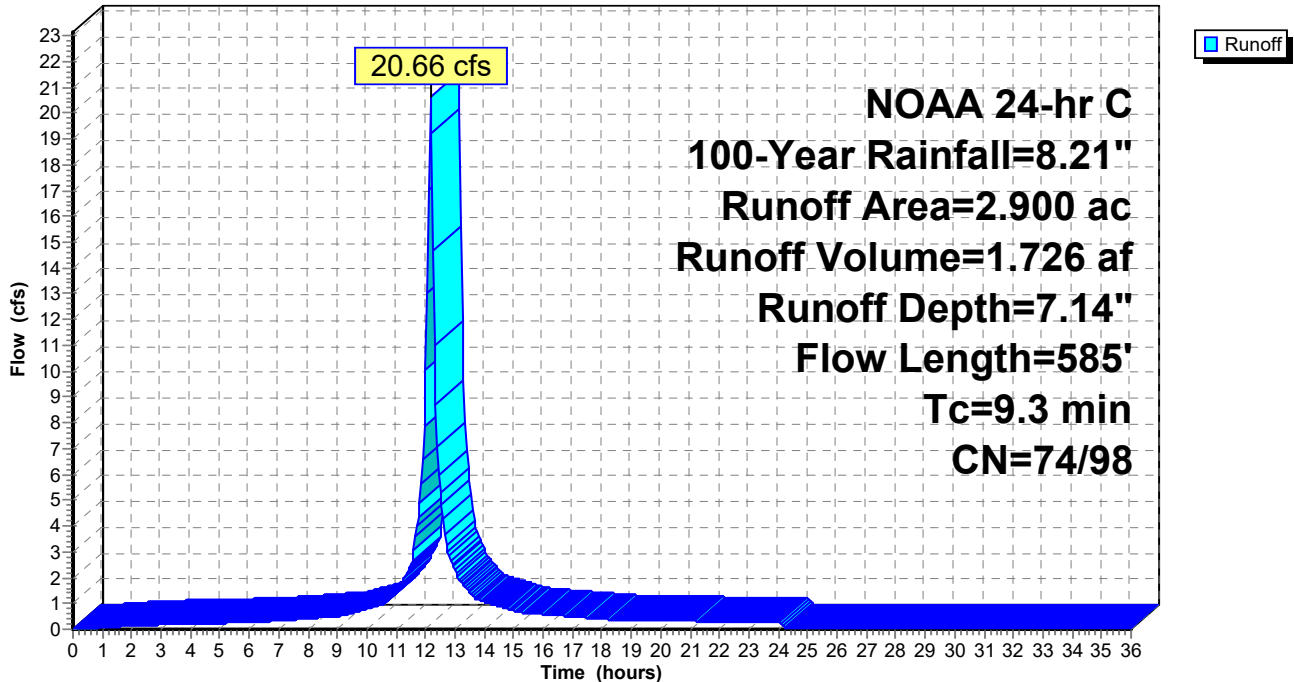
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (ac)	CN	Description
0.840	74	>75% Grass cover, Good, HSG C
* 2.060	98	Roof, Imperv. Prkg & Walks, HSG C
2.900	91	Weighted Average
0.840		28.97% Pervious Area
2.060		71.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	40	0.0280	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.3	20	0.3300	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, Swale Grassed Waterway Kv= 15.0 fps
1.5	465		5.00		Direct Entry, Pipes
9.3	585	Total			

Subcatchment 1a: Prop. Flow to Basin

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 100-Year Rainfall=8.21"

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Summary for Subcatchment 1b: Prop. Site Bypass Flow

Runoff = 35.49 cfs @ 12.24 hrs, Volume= 3.152 af, Depth= 4.77"
 Routed to Link PR : Total Proposed Flow

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (ac)	CN	Description
6.810	70	Woods, Good, HSG C
1.100	74	>75% Grass cover, Good, HSG C
0.020	98	Paved parking, HSG C
7.930	71	Weighted Average
7.910		99.75% Pervious Area
0.020		0.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	30	0.0425	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.7	30	0.3300	0.29		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
5.3	40	0.1000	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.34"
2.0	190	0.1000	1.58		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
2.6	465		3.00		Direct Entry, Channel Flow
15.5	755	Total			

Proposed Flows - 2, 10, 100 yr storms

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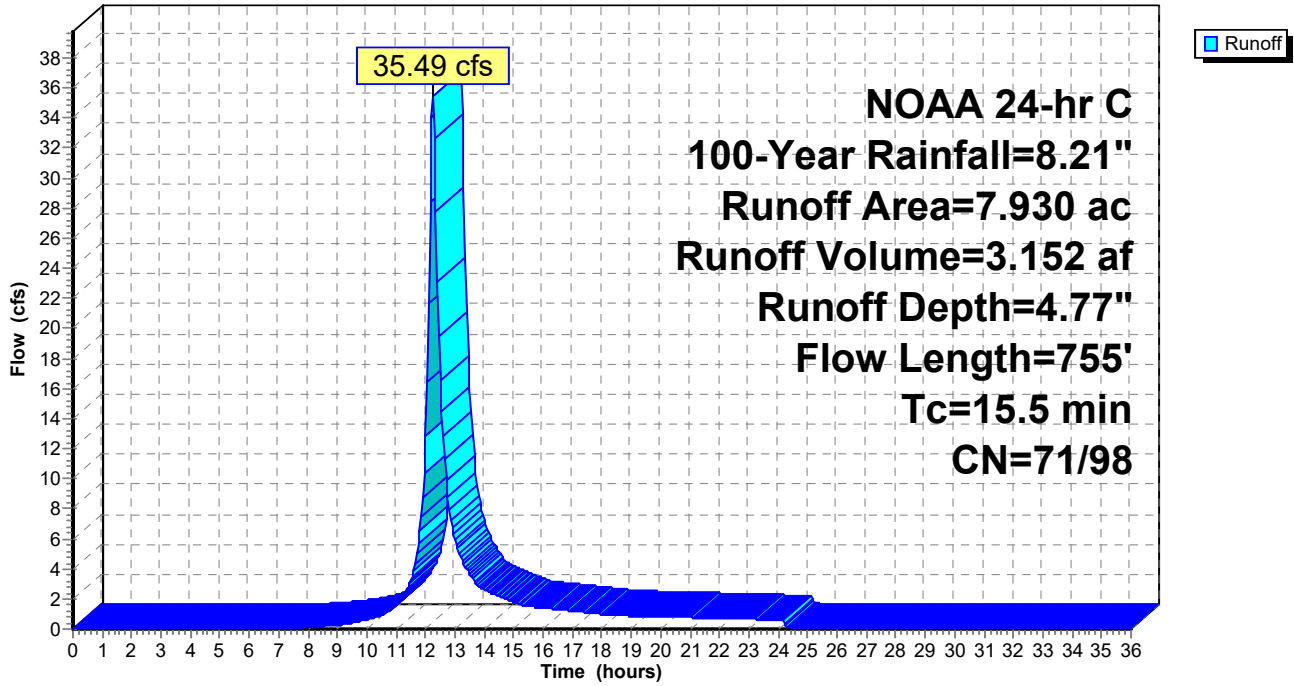
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Subcatchment 1b: Prop. Site Bypass Flow

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 100-Year Rainfall=8.21"

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Summary for Pond 1P: BioRetention Basin

Inflow Area = 2.900 ac, 71.03% Impervious, Inflow Depth = 7.14" for 100-Year event
 Inflow = 20.66 cfs @ 12.16 hrs, Volume= 1.726 af
 Outflow = 8.78 cfs @ 12.35 hrs, Volume= 1.560 af, Atten= 58%, Lag= 11.6 min
 Primary = 8.78 cfs @ 12.35 hrs, Volume= 1.560 af

Routed to Link PR : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Peak Elev= 56.46' @ 12.35 hrs Surf.Area= 12,358 sf Storage= 33,856 cf

Plug-Flow detention time= 283.7 min calculated for 1.559 af (90% of inflow)
 Center-of-Mass det. time= 234.6 min (995.1 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	54,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
53.00	6,425	0	0
54.00	8,900	7,663	7,663
55.00	10,338	9,619	17,282
56.00	11,698	11,018	28,300
57.00	13,127	12,413	40,712
58.00	14,536	13,832	54,544

Device	Routing	Invert	Outlet Devices
#1	Primary	49.00'	18.0" Round 18" Outlet Pipe L= 90.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 49.00' / 47.20' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	53.95'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	55.00'	1.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	56.50'	20.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=8.77 cfs @ 12.35 hrs HW=56.46' (Free Discharge)
 1=18" Outlet Pipe (Passes 8.77 cfs of 22.04 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.64 cfs @ 7.37 fps)
 3=Sharp-Crested Rectangular Weir (Weir Controls 8.13 cfs @ 3.95 fps)
 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Proposed Flows - 2, 10, 100 yr storms

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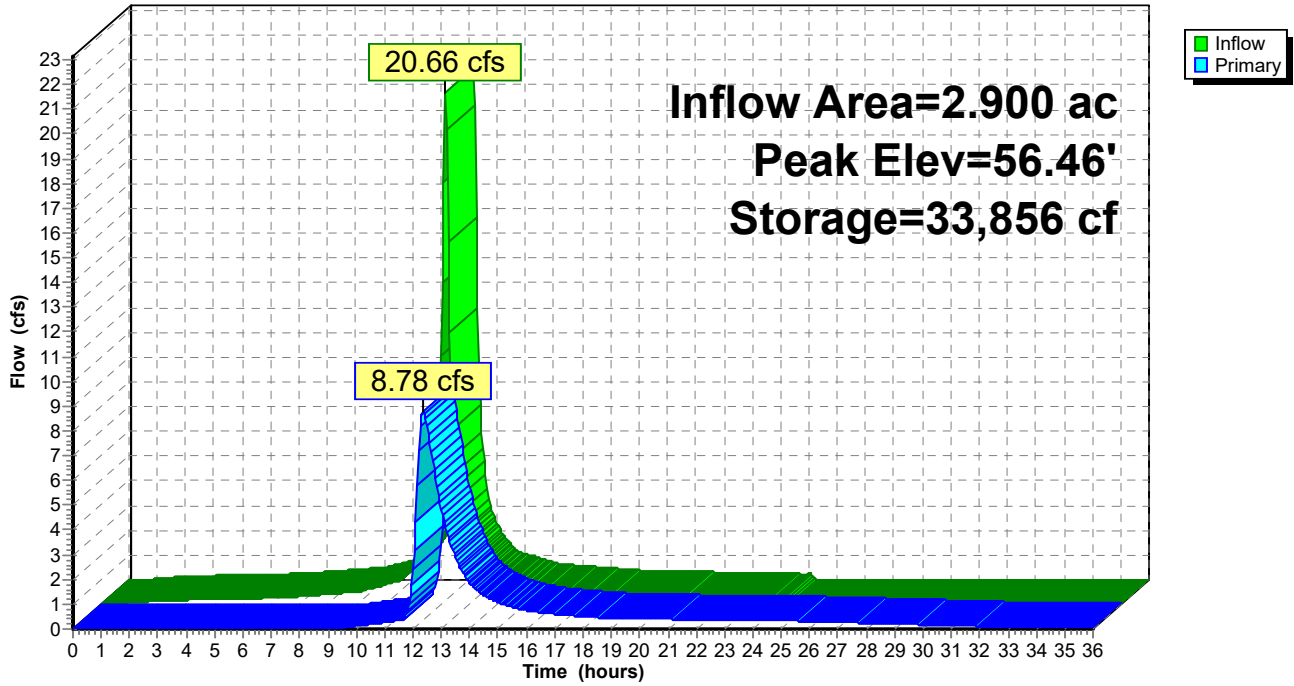
NOAA 24-hr C 100-Year Rainfall=8.21"

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Pond 1P: BioRetention Basin

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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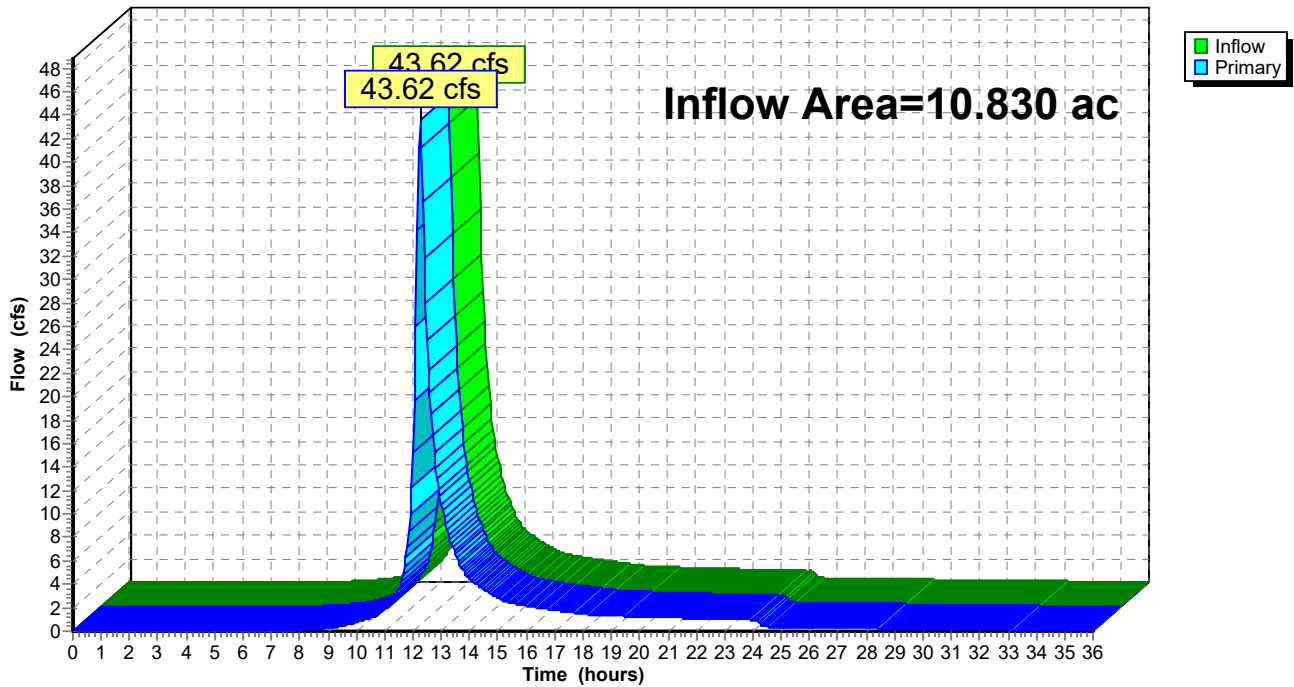
Summary for Link PR: Total Proposed Flow

Inflow Area = 10.830 ac, 19.21% Impervious, Inflow Depth = 5.22" for 100-Year event
Inflow = 43.62 cfs @ 12.25 hrs, Volume= 4.712 af
Primary = 43.62 cfs @ 12.25 hrs, Volume= 4.712 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link PR: Total Proposed Flow

Hydrograph



Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 2-Year Rainfall=3.34"

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Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1a: Prop. Flow to Basin Runoff Area=2.900 ac 71.03% Impervious Runoff Depth=2.53"
Flow Length=585' Tc=9.3 min CN=74/98 Runoff=7.42 cfs 0.613 af

Subcatchment 1b: Prop. Site Bypass Flow Runoff Area=7.930 ac 0.25% Impervious Runoff Depth=0.97"
Flow Length=755' Tc=15.5 min CN=71/98 Runoff=6.75 cfs 0.640 af

Pond 1P: BioRetention Basin Peak Elev=55.06' Storage=17,926 cf Inflow=7.42 cfs 0.613 af
Outflow=0.50 cfs 0.446 af

Link PR: Total Proposed Flow Inflow=7.06 cfs 1.086 af
Primary=7.06 cfs 1.086 af

Total Runoff Area = 10.830 ac Runoff Volume = 1.253 af Average Runoff Depth = 1.39"
80.79% Pervious = 8.750 ac 19.21% Impervious = 2.080 ac

Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 10-Year Rainfall=5.01"

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Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1a: Prop. Flow to Basin Runoff Area=2.900 ac 71.03% Impervious Runoff Depth=4.08"
Flow Length=585' Tc=9.3 min CN=74/98 Runoff=11.88 cfs 0.985 af

Subcatchment 1b: Prop. Site Bypass Flow Runoff Area=7.930 ac 0.25% Impervious Runoff Depth=2.13"
Flow Length=755' Tc=15.5 min CN=71/98 Runoff=15.72 cfs 1.408 af

Pond 1P: BioRetention Basin Peak Elev=55.60' Storage=23,692 cf Inflow=11.88 cfs 0.985 af
Outflow=2.89 cfs 0.819 af

Link PR: Total Proposed Flow Inflow=17.60 cfs 2.227 af
Primary=17.60 cfs 2.227 af

Total Runoff Area = 10.830 ac Runoff Volume = 2.394 af Average Runoff Depth = 2.65"
80.79% Pervious = 8.750 ac 19.21% Impervious = 2.080 ac

Proposed Flows - 2, 10, 100 yr storms

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NOAA 24-hr C 100-Year Rainfall=8.21"

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Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1a: Prop. Flow to Basin Runoff Area=2.900 ac 71.03% Impervious Runoff Depth=7.14"
Flow Length=585' Tc=9.3 min CN=74/98 Runoff=20.66 cfs 1.726 af

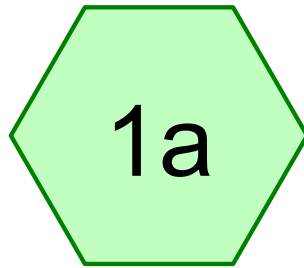
Subcatchment 1b: Prop. Site Bypass Flow Runoff Area=7.930 ac 0.25% Impervious Runoff Depth=4.77"
Flow Length=755' Tc=15.5 min CN=71/98 Runoff=35.49 cfs 3.152 af

Pond 1P: BioRetention Basin Peak Elev=56.46' Storage=33,856 cf Inflow=20.66 cfs 1.726 af
Outflow=8.78 cfs 1.560 af

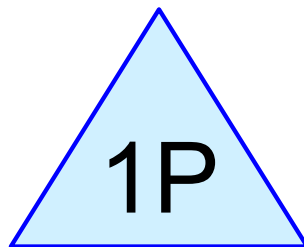
Link PR: Total Proposed Flow Inflow=43.62 cfs 4.712 af
Primary=43.62 cfs 4.712 af

Total Runoff Area = 10.830 ac Runoff Volume = 4.878 af Average Runoff Depth = 5.41"
80.79% Pervious = 8.750 ac 19.21% Impervious = 2.080 ac

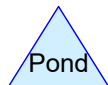
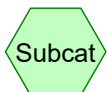
Emergency Spillway
HydroCAD Model
100 yr storm + OS blocked



Prop. Flow to Basin



BioRetention Basin



Emergency Spillway Design

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NOAA 24-hr C 100-Year Rainfall=8.21"

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Summary for Subcatchment 1a: Prop. Flow to Basin

Runoff = 20.66 cfs @ 12.16 hrs, Volume= 1.726 af, Depth= 7.14"
 Routed to Pond 1P : BioRetention Basin

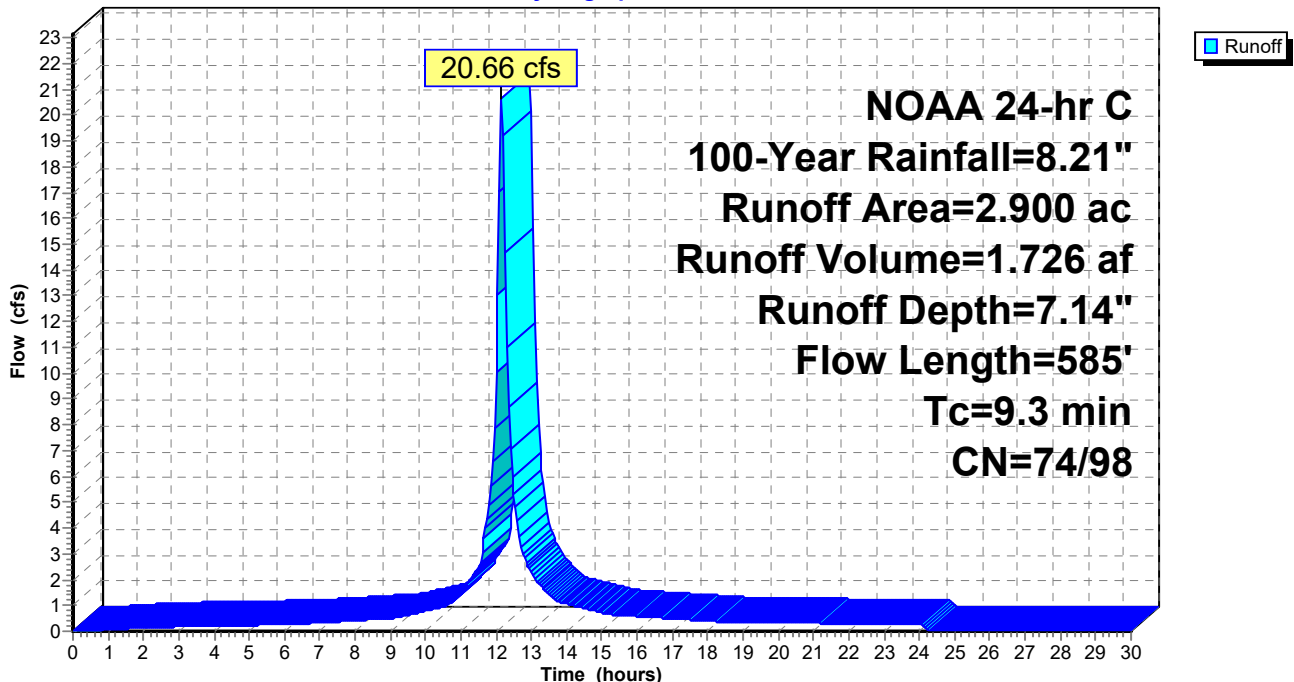
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 NOAA 24-hr C 100-Year Rainfall=8.21"

Area (ac)	CN	Description
0.840	74	>75% Grass cover, Good, HSG C
* 2.060	98	Roof, Imperv. Prkg & Walks, HSG C
2.900	91	Weighted Average
0.840		28.97% Pervious Area
2.060		71.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	40	0.0280	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.3	20	0.3300	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, Swale Grassed Waterway Kv= 15.0 fps
1.5	465		5.00		Direct Entry, Pipes
9.3	585	Total			

Subcatchment 1a: Prop. Flow to Basin

Hydrograph



Emergency Spillway Design

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NOAA 24-hr C 100-Year Rainfall=8.21"

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Summary for Pond 1P: BioRetention Basin

Inflow Area = 2.900 ac, 71.03% Impervious, Inflow Depth = 7.14" for 100-Year event
 Inflow = 20.66 cfs @ 12.16 hrs, Volume= 1.726 af
 Outflow = 11.65 cfs @ 12.30 hrs, Volume= 0.938 af, Atten= 44%, Lag= 8.6 min
 Primary = 11.65 cfs @ 12.30 hrs, Volume= 0.938 af
 Routed to nonexistent node PR

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Peak Elev= 56.86' @ 12.30 hrs Surf.Area= 12,931 sf Storage= 38,928 cf

Plug-Flow detention time= 257.8 min calculated for 0.938 af (54% of inflow)
 Center-of-Mass det. time= 132.5 min (893.0 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	54,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
53.00	6,425	0	0
54.00	8,900	7,663	7,663
55.00	10,338	9,619	17,282
56.00	11,698	11,018	28,300
57.00	13,127	12,413	40,712
58.00	14,536	13,832	54,544

Device	Routing	Invert	Outlet Devices
#1	Primary	56.50'	20.0' long + 3.0 ' SideZ x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=11.56 cfs @ 12.30 hrs HW=56.86' (Free Discharge)
 ↑1=Broad-Crested Rectangular Weir (Weir Controls 11.56 cfs @ 1.52 fps)

Emergency Spillway Design

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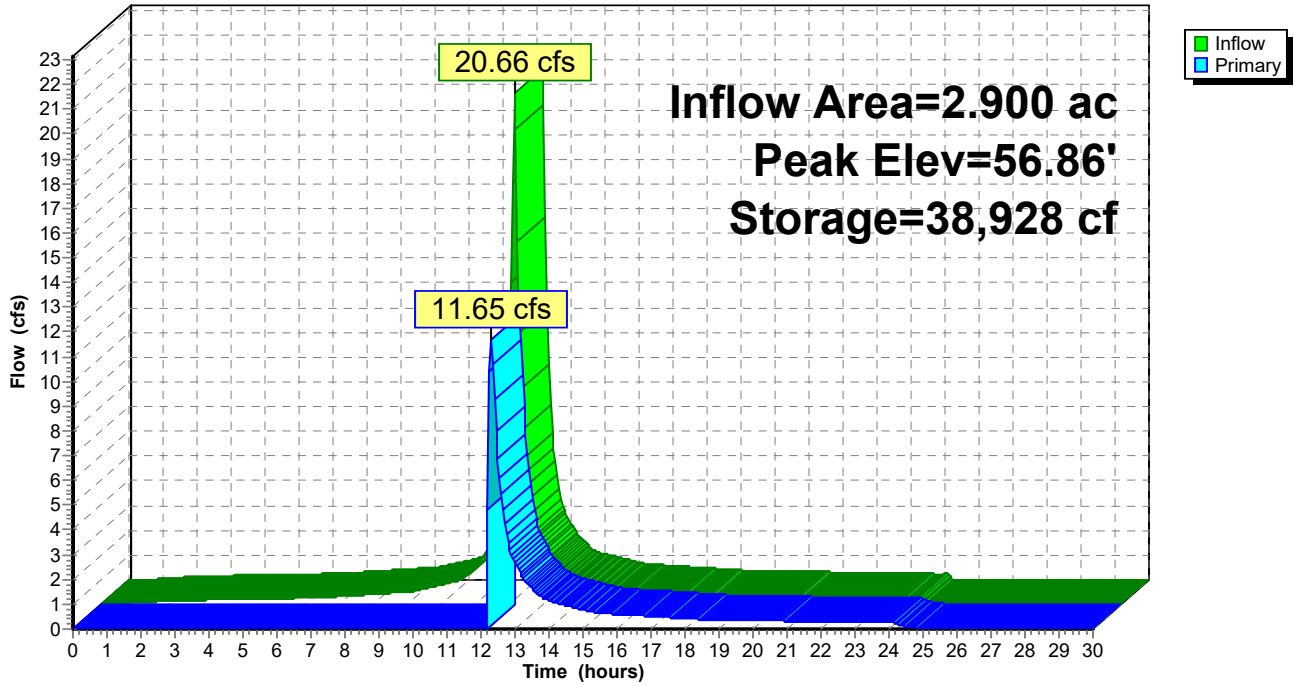
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Pond 1P: BioRetention Basin

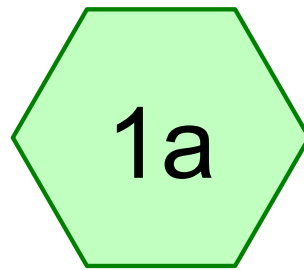
Hydrograph



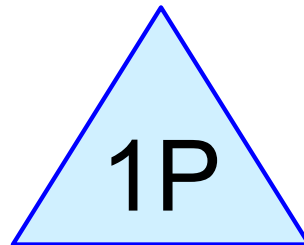
APPENDIX C

WATER QUALITY ANALYSIS

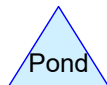
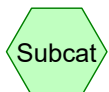
- WQ storm HydroCad model
- Calculation of Drain Time



Prop. Flow to Basin



BioRetention Basin



WQ design storm

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NJ DEP 2-hr WQ storm Rainfall=1.25"

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Page 2

Summary for Subcatchment 1a: Prop. Flow to Basin

Runoff = 5.46 cfs @ 1.14 hrs, Volume= 0.183 af, Depth= 0.76"
Routed to Pond 1P : BioRetention Basin

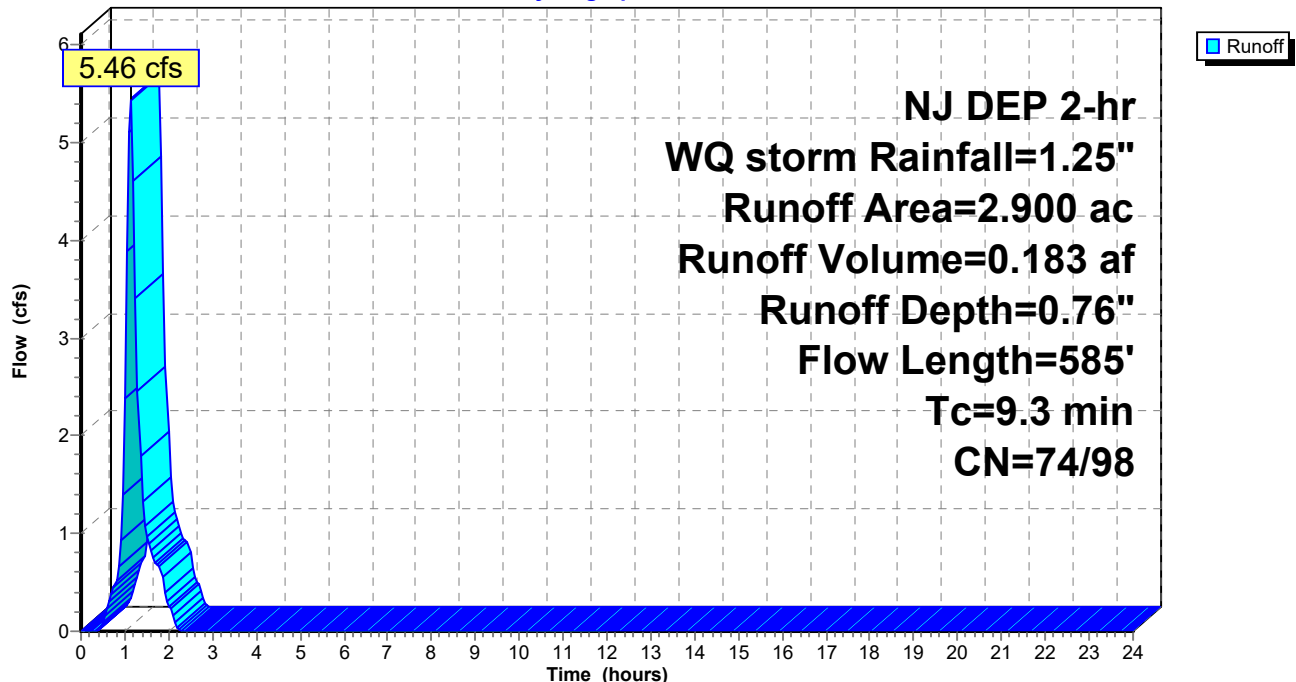
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ storm Rainfall=1.25"

Area (ac)	CN	Description
0.840	74	>75% Grass cover, Good, HSG C
* 2.060	98	Roof, Imperv. Prkg & Walks, HSG C
2.900	91	Weighted Average
0.840		28.97% Pervious Area
2.060		71.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	40	0.0280	0.11		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
1.3	20	0.3300	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.34"
0.5	60	0.0150	1.84		Shallow Concentrated Flow, Swale Grassed Waterway Kv= 15.0 fps
1.5	465		5.00		Direct Entry, Pipes
9.3	585	Total			

Subcatchment 1a: Prop. Flow to Basin

Hydrograph



WQ design storm

Prepared by Microsoft

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Franklin Storage LLC

NJ DEP 2-hr WQ storm Rainfall=1.25"

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Summary for Pond 1P: BioRetention Basin

Inflow Area = 2.900 ac, 71.03% Impervious, Inflow Depth = 0.76" for WQ storm event
Inflow = 5.46 cfs @ 1.14 hrs, Volume= 0.183 af
Outflow = 0.21 cfs @ 2.06 hrs, Volume= 0.183 af, Atten= 96%, Lag= 55.2 min
Primary = 0.21 cfs @ 2.06 hrs, Volume= 0.183 af
Routed to nonexistent node PR

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 53.92' @ 2.06 hrs Surf.Area= 8,699 sf Storage= 6,947 cf

Plug-Flow detention time= 313.7 min calculated for 0.183 af (100% of inflow)
Center-of-Mass det. time= 314.0 min (387.8 - 73.8)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	54,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
53.00	6,425	0	0
54.00	8,900	7,663	7,663
55.00	10,338	9,619	17,282
56.00	11,698	11,018	28,300
57.00	13,127	12,413	40,712
58.00	14,536	13,832	54,544

Device	Routing	Invert	Outlet Devices
#1	Primary	49.00'	18.0" Round 18" Outlet Pipe L= 90.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 49.00' / 47.20' S= 0.0200 1' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	49.90'	4.0" Round 4" Underdrain Pipe L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 49.90' / 49.40' S= 0.0050 1' Cc= 0.900 n= 0.011, Flow Area= 0.09 sf
#3	Device 2	53.00'	1.000 in/hr Exfiltration over Basin Bottom over Surface area Conductivity to Groundwater Elevation = 40.00'
#4	Device 1	53.95'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	55.00'	1.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#6	Primary	56.50'	20.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.21 cfs @ 2.06 hrs HW=53.92' (Free Discharge)

- 1=18" Outlet Pipe (Passes 0.21 cfs of 17.37 cfs potential flow)
- 2=4" Underdrain Pipe (Passes 0.21 cfs of 0.43 cfs potential flow)
- 3=Exfiltration over Basin Bottom (Controls 0.21 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)
- 5=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 6=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

WQ design storm

Prepared by Microsoft

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Franklin Storage LLC

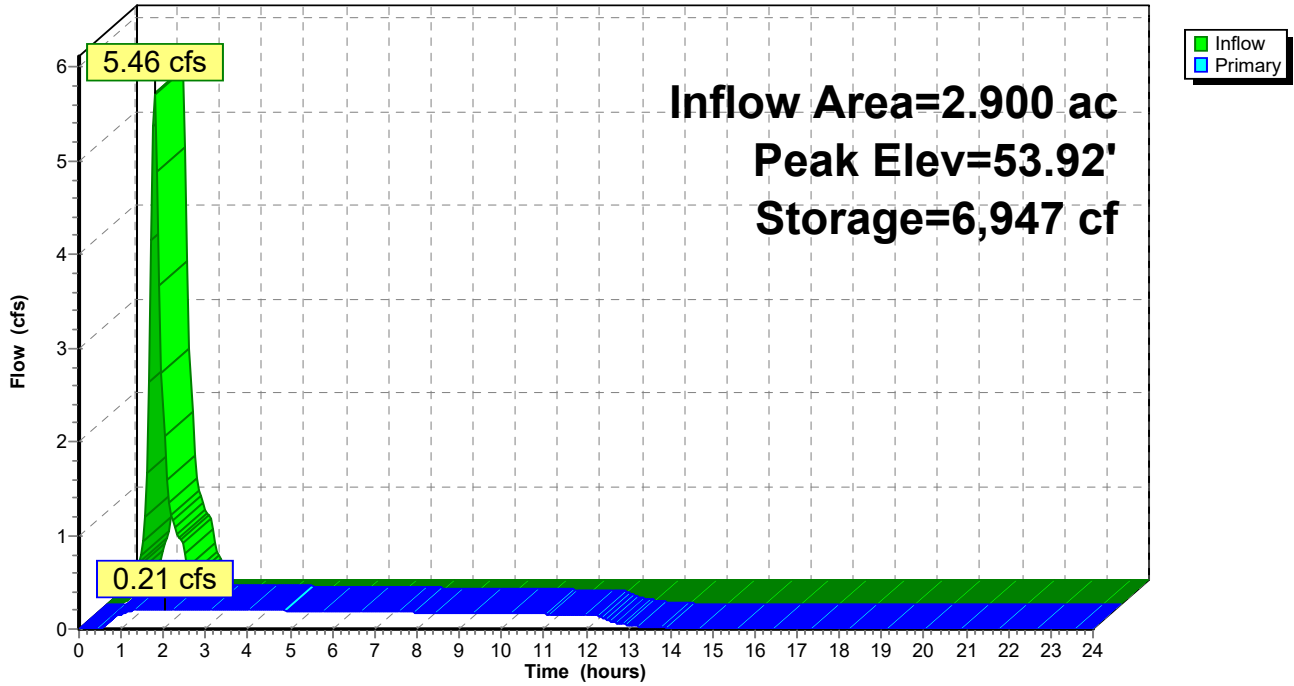
NJ DEP 2-hr WQ storm Rainfall=1.25"

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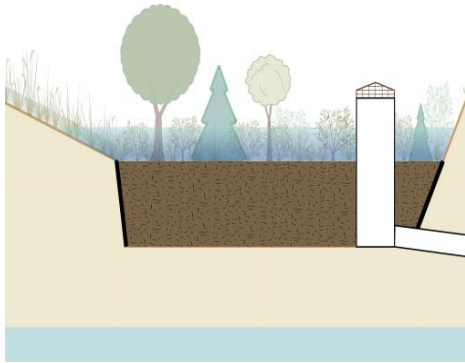
Page 4

Pond 1P: BioRetention Basin

Hydrograph



Bioretention Basin Drain Time



ESTIMATED WQ DRAIN TIME:

Design Data:

WQ Design Runoff Volume	7,970 CF*
Basin Bottom Surface Area	6,425 SF
Design Permeability Rate	1 in/hr**

* From HydroCAD model, WQ design storm Inflow Volume = 0.183 acre-ft

** Use Design Permeability Rate of Soil Bed of 1 inches/hour, for silt loam soil mix

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

$$W.Q. \text{ Drain Time} = \frac{7,970 \text{ cu. ft.}}{6,425 \text{ sq. ft.} \times 1 \frac{\text{inch}}{\text{hr}} \times \frac{1 \text{ ft}}{12 \text{ inches}}}$$

$$W.Q. \text{ Drain Time} = 14.9 \text{ hours}$$

APPENDIX D

SOILS INVESTIGATION RESULTS

SOIL TESTING SUMMARY
for
297 & 305 Davidson Avenue
Block 502.01 - Lot(s) 45.01 & 46.01
Franklin Township, Somerset County

Soils testing was performed at the project site on June 27, 2021. Four full soil profile pits were conducted (Test Areas 1-4) for the purpose of analyzing areas for potential infiltration BMPS; additional areas were preliminarily investigated but rejected for obvious lack of permeability and evidence of high groundwater table. The test pit areas are shown on the location map provided in this appendix.

Soil testing was performed by using a track excavator with hammer to excavate an approximately 5' by 10' area to a maximum depth of 12 feet, where possible. Soil parameters with each pit were logged based on the USDA textural triangle, the Munsell system of classification, among other standard practices for soil log data (see soil log profile data sheets provided in this appendix.) Any seepage within the pit was noted and evaluated. Soil hydraulic conductivity testing was conducted where feasible, in accordance with Chapter 12 of the NJ Stormwater Management BMP Manual. See the descriptions below of each full test pit additional information regarding permeability testing. Any observance of the seasonal high groundwater table is noted in the soil log profile sheets.

Test Pit Area#1

Slight seepage was encountered at 72" depth. A total of 2" of water had accumulated over a 24-hour period, which is not enough water to perform a Pit-Bail Test. Due to the presence of some seepage, no outside water could be introduced into the hole for the option of a permeability calculation. The shale is tightly layered and infilled with a clay loam, indicating poor conditions for positive drainage/recharge in this area, especially when the soils swell when they are wet.

Test Pit Area#2

No Groundwater was encountered during excavation. The pit was prepared for testing, to a width of 5ft, a length of 10ft and a depth of 48"(4ft). Water (375gallons - 12" deep) was introduced into the hole at that time. No drop in water elevation was observed after the required period of 24 hours. Therefore, no passing permeability could be achieved. The tightly layered shale infilled with the clay loam, helped verify this poor draining condition.

Test Pit Area#3

No Groundwater was encountered during excavation. The pit was prepared for testing to a width of 5ft, a length of 10ft and a depth of 56"(4.67ft). Water (375gallons - 12" deep) was introduced into the

hole at that time. There was no drop in water elevation after the required 24-hour period. Therefore, no passing permeability could be achieved. The presence of mottles (indicating perched water) in the test pit along with the tightly layered shale infilled with the clay loam, solidified this evidence of extremely poor draining/recharging condition in this area.

Test Pit Area#4

Slight seepage was encountered at 50". A total of 8 1/2" of water had accumulated over a 24-hour period. That again, is not sufficient water to perform a Pit-Bail Test. Due to the presence of seepage, no outside water could be introduced into the hole for the option of a permeability calculation. The presence of mottles (indicating perched water), combined with the tightly layered shale (infilled with a clay loam), indicate a poor chance for positive drainage/recharge when the soils swell when they are wet.

In Summary, each of these test pits had tightly layered shale along with clay loam which is typical of soils in this area along Davidson Avenue. The geotechnical analysis indicates that the site soils exhibit the properties associated with HSG D soils. The tests conducted confirmed results in this soil type that sufficient permeability is not available.

Historically, site soils with these same D-soil characteristics have been encountered in this area of Franklin Township. We have prepared designs for the adjoining hotel site (to the south) as well as the roadway project which connected Pierce Street at Davidson Avenue to Elizabeth Avenue. Further north we prepared the site plan for the office at the southwest corner of Davidson Avenue and Franklin Square Drive. Each of these sites had soil material similarly described – tightly layered shale with clay.

CLIENT: Murray Davidson

Date: 6.17.21

Project: 297 Davidson

Job No.: 21-010

Soil Log No.: Test Pit Area #1

Ground Surface Elev: 58'+/-

SOIL LOG PROFILE

Depth (in)	Sample	Description
0-8"		Topsoil, fine roots, Clear boundary.
8-48"		5YR 4/4 Reddish Brown clay loam, friable, subang., blocky struc., fine roots to 40", clear boundary.
48-144"		Layered Shale(tight) w/5YR 3/4 Dark Red Brown clay loam in interfaces. Shale becomes more consolidated w/depth
		-Slight Seepage at 72" -2" accum. In 24hrs - No mottles observed -Hard bottom, machine refusal

Excavator: Murray

Field Personnel: WDS

Reviewed by: FMA/LK

CLIENT: Murray Davidson

Date: 6.17.21

Project: 297 Davidson

Job No.: 21-010

Soil Log No.: Test Pit Area #2

Ground Surface Elev: 58'+/-

SOIL LOG PROFILE

Depth (in)	Sample	Description
0-6"		Topsoil, fine roots, Clear boundary.
6-20"		5YR 4/4 Reddish Brown clay loam, friable, subang., blocky struc., fine roots to 40", clear boundary.
20-126"		Layered Shale(tight) w/5YR 3/4 Dark Red Brown clay loam in interfaces. Shale becomes more consolidated w/depth
		-No Groundwater - No mottles observed -Hard bottom, machine refusal

Excavator: Murray

Field Personnel: WDS

Reviewed by: FMA/LK

CLIENT: Murray Davidson

Date: 6.17.21

Project: 297 Davidson

Job No.: 21-010

Soil Log No.: Test Pit Area #3

Ground Surface Elev: 62'+/-

SOIL LOG PROFILE

Depth (in)	Sample	Description
0-4"		Topsoil, fine roots, Clear boundary.
4-26"		Fill material, broken brick, concrete, cinder block & wood
26-56"		Layered Shale(tight) w/5YR 3/4 Dark Red Brown clay loam in interfaces. Common Medium Distinct 5YR 6/2 Pinkish Grey mottles thru-out. Shale becomes more consolidated w/depth
		-No Groundwater -Hard bottom, machine refusal

Excavator: Murray

Field Personnel: WDS

Reviewed by: FMA/LK

CLIENT: Murray Davidson

Date: 6.17.21

Project: 297 Davidson

Job No.: 21-010

Soil Log No.: Test Pit Area #4

Ground Surface Elev: 60'+/-

SOIL LOG PROFILE

Depth (in)	Sample	Description
0-5"		Topsoil, fine roots, Clear boundary.
5-32"		5YR 4/4 Reddish Brown clay loam, friable, medium roots, wavy boundary.
32-55"		Weathered layered Shale w/5YR 3/4 Dark Reddish Brown clay loam in interfaces. Few Fine Faint, 5YR 6/2 Pinkish Grey mottles 40-42". Shale becomes more consolidated w/depth.
		-Slight Seepage at 50" 8 1/2" accum. in 24hrs -Hard bottom, machine refusal

Excavator: Murray

Field Personnel: WDS

Reviewed by: FMA/LK

APPENDIX E

CONVEYANCE SYSTEM CALCULATIONS

- Storm Sewer Pipe Computations
- C.O.P. Sizing
- Anti-Seep Collar Calculation



CALCULATIONS FOR STORM SEWER SYSTEM

PROJECT NAME: Access Self Storage

TRG #: 21-010

STORM FREQ.: 100 years PREPARED BY: LMK

DATE: 2-Aug-21

REV. 01-14-22

INLET from	to	AREA (acres)	C	AxC	TOTAL AxC	Tc (min.)	I (in/hr)	Q (cfs)	PIPE SIZE (in)	SLOPE (%)	CAPACITY (cfs)	FF VEL. (fps)	NOTES	
	1	0.14	0.86	0.12		8	7.2	0.9						
1	2				0.12	8	7.2	0.9	15	1.0	6.5	5.3	100 lf RCP	
	2	0.19	0.86	0.16		8	7.2	1.2						
2	3				0.28	8	7.2	2.0	15	2.0	9.1	7.4	143 lf RCP	
	RD 1	0.47	0.99	0.47		8	7.2	3.4						
RD 1	3				0.47	8	7.2	3.4	12	1.0	4.2	5.4	68 lf PVC	
	3	0.23	0.96	0.22		8	7.2	1.6						
3	FES 1				0.97	8	7.2	7.0	18	1.5	12.9	7.3	35 lf RCP	
	4	0.53	0.62	0.33		8	7.2	2.4						
4	5				0.33	8	7.2	2.4	15	0.5	4.6	3.7	132 lf RCP	
	5	0.10	0.86	0.09		8	7.2	0.6						
5	6				0.41	8	7.2	3.0	18	0.5	7.4	4.2	118 lf RCP	
	6	0.24	0.77	0.18		8	7.2	1.3						
6	7				0.60	8	7.2	4.3	18	0.83	9.6	5.4	128 lf RCP	
	RD 2	0.46	0.99	0.46		8	7.2	3.3						
RD 2	7				0.46	8	7.2	3.3	12	1.0	4.2	5.4	76 lf PVC	
	7	0.15	0.99	0.15		8	7.2	1.1						
7	FES 2				1.20	8	7.2	8.7	18	1.0	10.5	5.9	89 lf RCP	
O.S.	MH 1	(100 yr Storm Outflow from Basin) >>>							8.8	18	2.0	14.8	8.4	90 lf RCP
MH 1	HW 1	(100 yr Storm Outflow from Basin) >>>							8.8	18	2.0	14.8	8.4	120 lf RCP



CALCULATIONS FOR STORM SEWER SYSTEM

PROJECT NAME: Access Self Storage

TRG #: 21-010

STORM FREQ.: 25 years PREPARED BY: LMK

DATE: 9-Aug-21

INLET		AREA (acres)	C	AxC	TOTAL AxC	Tc (min.)	I (in/hr)	Q (cfs)	PIPE SIZE (in)	SLOPE (%)	CAPACITY (cfs)	FF VEL. (fps)	NOTES
from	to												
	1	0.14	0.86	0.12		8	6.2	0.7					
1	2				0.12	8	6.2	0.7	15	1.0	6.5	5.3	100 lf RCP
	2	0.19	0.86	0.16		8	6.2	1.0					
2	3				0.28	8	6.2	1.8	15	2.0	9.1	7.4	143 lf RCP
	RD 1	0.47	0.99	0.47		8	6.2	2.9					
RD 1	3				0.47	8	6.2	2.9	12	1.0	4.2	5.4	68 lf PVC
	3	0.23	0.96	0.22		8	6.2	1.4					
3	FES 1				0.97	8	6.2	6.0	18	1.5	12.9	7.3	35 lf RCP
	4	0.53	0.62	0.33		8	6.2	2.0					
4	5				0.33	8	6.2	2.0	15	0.5	4.6	3.7	132 lf RCP
	5	0.10	0.86	0.09		8	6.2	0.5					
5	6				0.41	8	6.2	2.6	18	0.5	7.4	4.2	118 lf RCP
	6	0.24	0.77	0.18		8	6.2	1.1					
6	7				0.60	8	6.2	3.7	18	0.83	9.6	5.4	128 lf RCP
	RD 2	0.46	0.99	0.46		8	6.2	2.8					
RD 2	7				0.46	8	6.2	2.8	12	1.0	4.2	5.4	76 lf PVC
	7	0.15	0.99	0.15		8	6.2	0.9					
7	FES 2				1.20	8	6.2	7.5	18	1.0	10.5	5.9	89 lf RCP

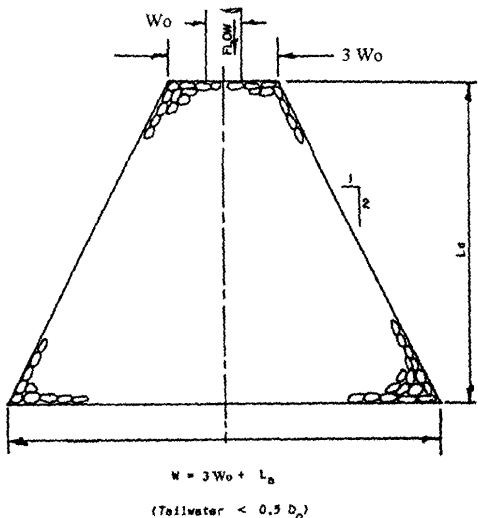
RIPRAP APRON DATA SHEET

PROJECT NAME: ACCESS STORAGE
 STORM FREQUENCIES: 25 Year

TRG #: 21-010
 BY: LMK
 DATE: 08/30/21
 Revised 01/06/21

For Tailwater < 0.5D_o

DISCHARGE STRUCT.	YEAR STORM	Q (cfs)	VELOCITY-max (fps)	PIPE HEIGHT (in)	PIPE WIDTH (in)	TAILWATER (ft)	La (ft)	W (beg) (ft)	W (end) (ft)	d50 * (in)



For tailwater elevation less than the elevation of the center of the pipe,

$$W = 3 W_o + L_a$$

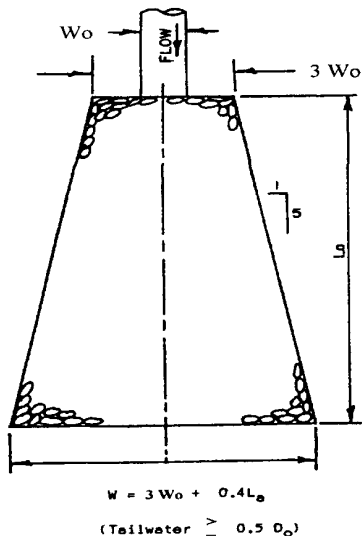
$$L_a = \left(1.8 \frac{q}{D_o^{1/2}}\right) + 7D_o \quad TW < \frac{1}{2} D_o$$

$$d_{50} = \frac{0.02}{TW} q^{1.33} \quad \text{where } q = \frac{Q}{W_o}$$

For areas where Tw cannot be computed, use Tw = 0.2 D_o.

For Tailwater >= 0.5D_o

OUTLET STRUCT.	YEAR STORM	Q (cfs)	VELOCITY-max (fps)	PIPE HEIGHT (in)	PIPE WIDTH (in)	TAILWATER (ft)	La (ft)	W (beg) (ft)	W (end) (ft)	d50 (in)
FES #1*	25	6.00	7.30	18	18	2.06	9.8	4.5	8.4	0.6
FES #2*	25	7.50	5.90	18	18	2.06	12.2	4.5	9.4	0.8
HW #1*	25	5.04	8.40	18	18	1.50	8.2	4.5	7.8	0.6



For tailwater elevation greater than or equal to the elevation of the pipe,

$$W = 3 W_o + 0.4 L_a$$

$$L_a = 3 \frac{q}{D_o^{1/2}} \quad TW > \frac{1}{2} D_o$$

$$d_{50} = \frac{0.02}{TW} q^{1.33} \quad \text{where } q = \frac{Q}{W_o}$$

* Per Standards for Soil Erosion and Sediment Control in New Jersey, COP Design for Discharge into Detention Basins (p. 12-3) shall utilize a flow, Q, for 25 year storm discharge and a tailwater, Tw, equal to the 2-year storm elevation in the basin.

Proposed Flows - 2, 10, 100 yr storms

Prepared by Microsoft

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Franklin Storage LLC
NOAA 24-hr C **25-Year** Rainfall=6.15"

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Page 1

Summary for Pond 1P: BioRetention Basin

Inflow Area = 2.900 ac, 71.03% Impervious, Inflow Depth = 5.16" for 25-Year event
 Inflow = 14.99 cfs @ 12.16 hrs, Volume= 1.247 af
 → **Outflow** = **5.04 cfs @ 12.41 hrs, Volume= 1.080 af, Atten= 66%, Lag= 15.1 min**
 Primary = 5.04 cfs @ 12.41 hrs, Volume= 1.080 af
 Routed to Link PR : Total Proposed Flow

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Peak Elev= 55.93' @ 12.41 hrs Surf.Area= 11,610 sf Storage= 27,541 cf

Plug-Flow detention time= 349.3 min calculated for 1.080 af (87% of inflow)
 Center-of-Mass det. time= 285.2 min (1,049.6 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1	53.00'	54,544 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
53.00	6,425	0	0
54.00	8,900	7,663	7,663
55.00	10,338	9,619	17,282
56.00	11,698	11,018	28,300
57.00	13,127	12,413	40,712
58.00	14,536	13,832	54,544

Device	Routing	Invert	Outlet Devices
#1	Primary	49.00'	18.0" Round 18" Outlet Pipe L= 90.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 49.00' / 47.20' S= 0.0200 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	53.95'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	55.00'	1.7' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Primary	56.50'	20.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=5.03 cfs @ 12.41 hrs HW=55.93' (Free Discharge)

- 1=18" Outlet Pipe (Passes 5.03 cfs of 21.16 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.57 cfs @ 6.49 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 4.46 cfs @ 3.16 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

State Certificate of Authorization
 No. 24GA27969200
 Engineers
 Landscape Architects
 Land Surveyors

Job No.	21-010	Name	Access Storage
Sheet No.	1	Of	1
Calculated by	LMK	Checked by	LMK
Date	08-29-21	Scale	n.t.s.

Rev. 9-30-21
Rev. 01-13-22

ANTI-SEEP COLLAR CALCULATIONS

Per NJAC Title 5, Chapter 21, the following criteria shall be used to determine size and number of anti-seep collars:

- Let V = vertical and horizontal projection of anti-seep collar in feet,
- Let L = length in feet of the zone of saturation, and
- Let n = number of anti-seep collars.

The ratio of (L + 2nV) / L shall be at least 1.15.

Collars shall be spaced at a distance of not more than 25 feet.

For the proposed Infiltration/Extended Detention Basin,

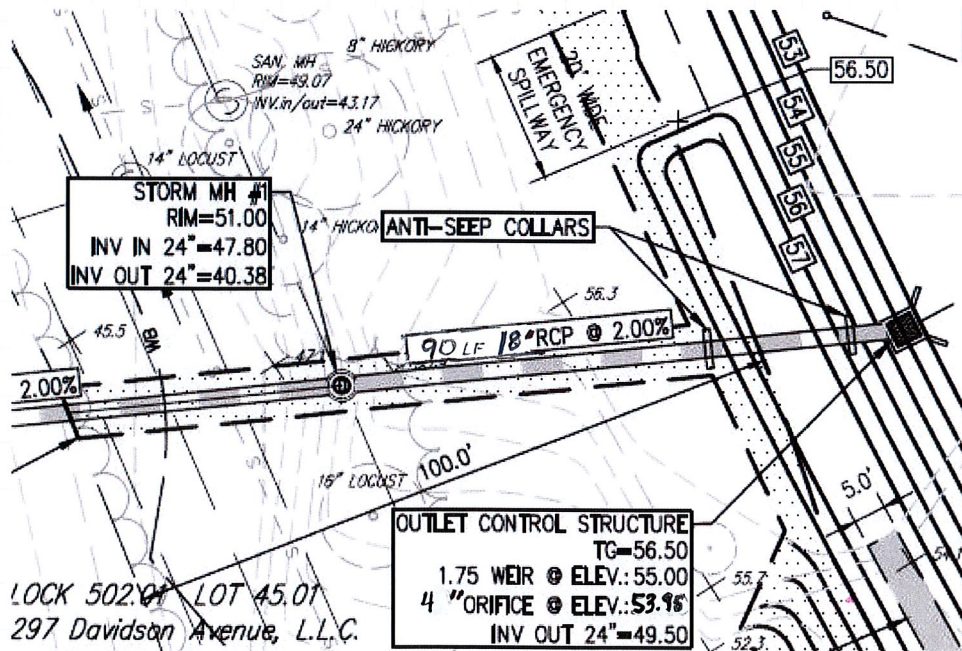
V = 2.0 feet

L = 53 feet

n = 2

$$(L + 2nV) / L = (53 + 2 \cdot 2 \cdot 2.0) / 53 = 61 / 53 = 1.151 > 1.15$$

Therefore, 2 collars with a 2-foot projection in each direction are adequate.



APPENDIX F

NONSTRUCTURAL STRATEGIES

- Nonstructural Strategies Point System (NSPS)
Spreadsheet

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project: Access Self Storage Facility

Date: August 23, 2021

User: The Reynolds Group, Inc.

Notes: Site Plan on Davidson Avenue
Franklin Twp, Somerset County, NJ

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 10.8 **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:	100.0%						100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover	Points
		HSG A	HSG B	HSG C	HSG D	Subtotals	
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space			1.2		1.2	26
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous			9.0		9.0	269
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious					0.0	0
14	Unconnected Impervious with Small D/S Pervious			0.6		0.6	4
15	Unconnected Impervious with Large D/S Pervious					0.0	0
HSG Subtotals (Acres):		0.0	0.0	10.8	0.0		Total Area: 10.8
HSG Subtotals (%):		0.0%	0.0%	100.0%	0.0%		Total % Area: 100.0%
							Points Subtotal: 298
							Total Existing Site Points: 298

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG				Use/Cover	Points
		HSG A	HSG B	HSG C	HSG D	Subtotals	
1	Wetlands and Undisturbed Stream Buffers					0.0	0
2	Lawn and Open Space			1.9		1.9	41
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous			6.8		6.8	203
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious			2.1		2.1	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
HSG Subtotals (Acres):		0.0	0.0	10.8	0.0		Total Area: 10.8
HSG Subtotals (%):		0.0%	0.0%	100.0%	0.0%		Total % Area: 100.0%
							Points Subtotal: 244

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	19%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	19%	% of Site
Effective Site Impervious Coverage =	19%	% of Site

Specify Source of Maximum Allowable Impervious Coverage: Table (None or Table)

Allowable Site Impervious Cover from Maximum Impervious Cover Table: 85%
 Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal: 36

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =	32%	% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =	100%	% of Site

Points Subtotal: 31

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	640	Feet
Length of Vegetated Runoff Conveyance System =	170	Feet
% of Total Runoff Conveyance System That is Vegetated =	27%	

Points Subtotal: 24

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =		% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =		Acres
Maximum Proposed Cluster Lot Size (Note: 1/4 Acre or Less) =		Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =		% of Clustered Site Portion

Points Subtotal: 0

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:
Percent of Proposed Lawn Areas to be Graded with Such Equipment:

Yes	(Yes or No)
25%	% of Lawn Areas

Points Subtotal: **6**

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):

No	(Yes or No)
No	(Yes or No)
No	(Yes or No)

Points Subtotal: **0**

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 341

Ratio of Proposed to Existing Site Points: 114%

Required Site Points Ratio: 80%

Nonstructural Point System Results:

Proposed Nonstructural Measures are Adequate

revisions		
no.	date	description
1	10/12/21	PER SCD & TWP COMMENTS/NUDEP PERMIT PLAN
2	01/17/22	PER DEP, COUNTY & DRCC COMMENTS

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

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State of New Jersey
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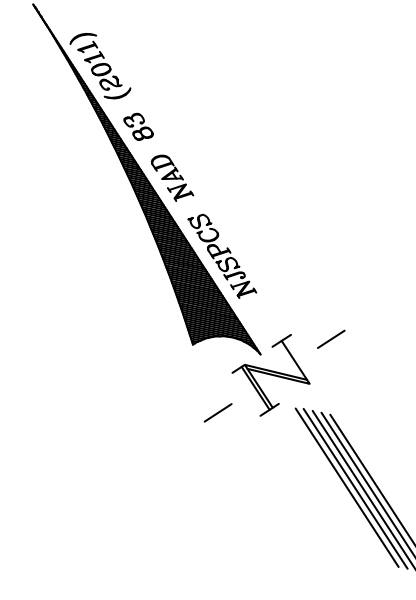
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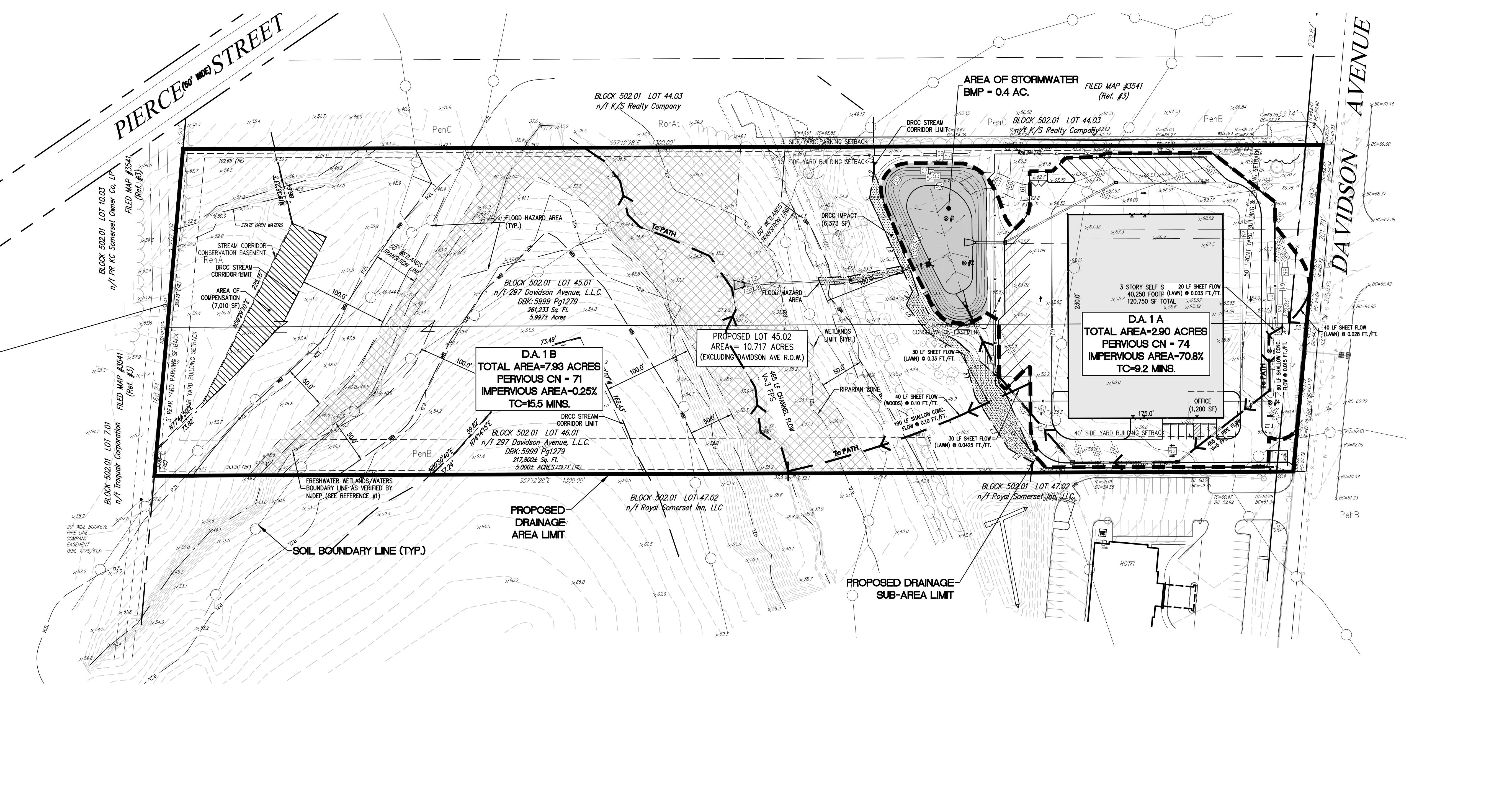
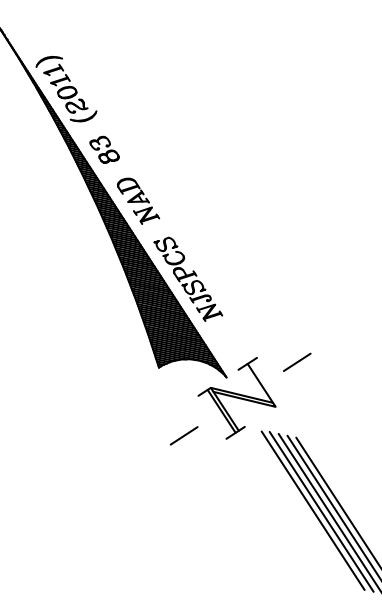
project
ACCESS SELF STORAGE
 BLOCK 502.01, LOTS 45.01 & 46.01
 297 & 305 DAVIDSON AVENUE
 TOWNSHIP OF FRANKLIN
 SOMERSET COUNTY, NEW JERSEY

drawing title
**EXISTING CONDITIONS
 DRAINAGE AREA MAP**

job number 21-010	drawing number DA-1
scale 1"=60'	
checked by FMA	
drawn by GH	
date 07/30/2021	sheet 1 of 3



revisions		
no.	date	description
1	10/12/21	PER SCD & TWP COMMENTS/NUDEP PERMIT PLAN
2	01/17/22	PER DEP, COUNTY & DRCC COMMENTS



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



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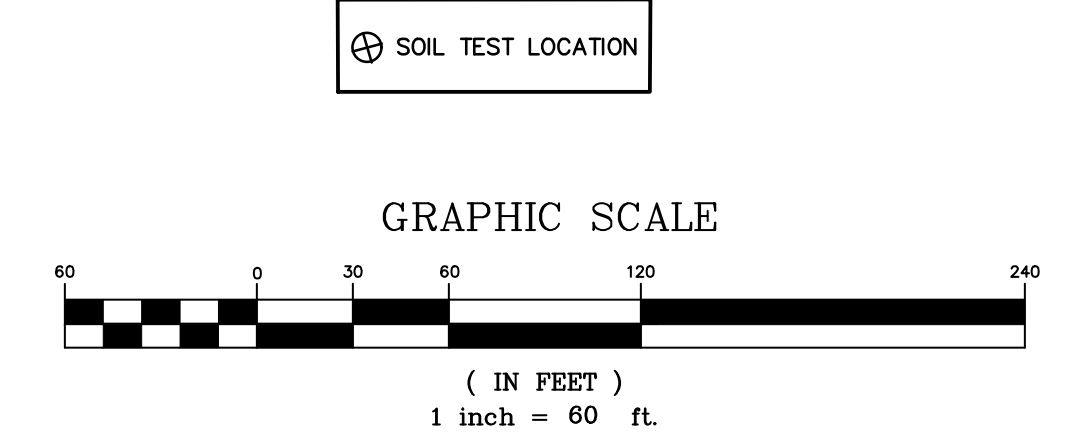
project
ACCESS SELF STORAGE
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 297 & 305 DAVIDSON AVENUE
 TOWNSHIP OF FRANKLIN
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drawing title
**PROPOSED CONDITIONS
 DRAINAGE MAP**

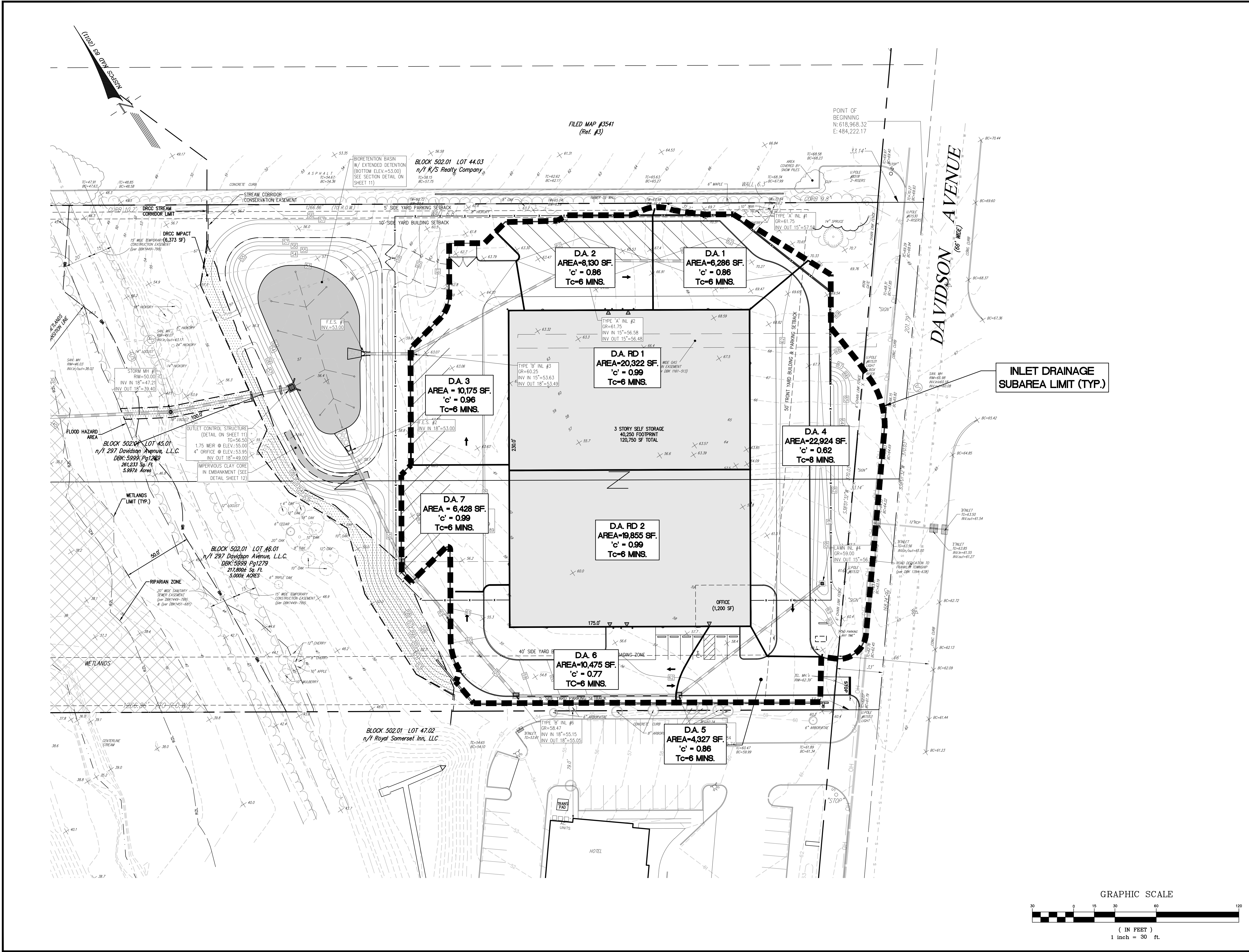
job number	21-010	drawing number	DA-2
scale	1"=60'		
checked by	FMA		
drawn by	GH		
date	07/30/2021	sheet 2 of 3	

CONTRIBUTARY DRAINAGE AREA
 FOR BIORETENTION BASIN = 2.5 ACRES*

* PER NJAC 7:8-12, CONTRIBUTARY DRAINAGE AREA OF
 STORMWATER BMP EQUALS TOTAL DRAINAGE AREA, NOT
 INCLUDING AREA OF THE STORMWATER MANAGEMENT
 MEASURE ITSELF.



SOIL TEST LOCATION



revisions

no.	date	description
1	10/12/21	PER SCD & TWP COMMENTS/NUDEP PERMIT PLAN
2	01/17/22	PER DEP. COUNTY & DRCC COMMENTS

LEGEND

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

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project

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drawing title

PROPOSED INLET AREA DRAINAGE MAP

job number	21-010	drawing number	DA-3
scale	1"=30'		
checked by	FMA		
drawn by	GH		
date	07/30/2021	sheet 3 of 3	

