

Stormwater Management System Report Addendum 1

**RAW SEAFOODS INC.
PROPOSED COLD STORAGE FACILITY**

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October 22, 2015
Project No. 2064

FIELD
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CONSULTING ENGINEERS

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Section 1

Hydrologic Overview

1.0 Purpose of Addendum

The purpose of this Stormwater Management System Report-Addendum 1 is to present the updated Post-Development Hydrologic Analysis following modifications to the design that have been performed based on the results of soil test pits performed on-site on October 19, 2015. The results of the test pits required us to raise the bottom of the extended detention/infiltration basin located at the front of the property as shown on the attached Post Development Watershed Plan.

1.1 Pre-Development Hydrologic Summary

The Pre-Development Hydrologic Analysis remains unchanged from the original Stormwater Management System Report. A summary of the pre development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.1 below.

Table 1.1 – Pre Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	0.85
10-year storm	3.69
25-year storm	6.23
100-year storm	11.56

1.2 Revised Post-Development Hydrologic Summary

As mentioned above, we have revised the Post-Development Hydrologic Analysis to account for modifications to the proposed design of the extended detention/infiltration basin handling the majority of the impervious surface on-site. Following completion of test pits, we have revised the design to provide two feet of separation between the bottom of the basin and the observed high groundwater in the test pits. In addition, we have also revised the design infiltration rate to that associated with loamy sands (2.41 in/hr) to be more consistent with the soils observed in the test pits. A summary of the post-development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.2 below.

Table 1.2 – Post Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	0.85
10-year storm	2.99
25-year storm	4.76
100-year storm	8.36

A summary of the pre and post-development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.3 below. Results shown as a “negative” represent a decrease in post development condition rates of runoff.

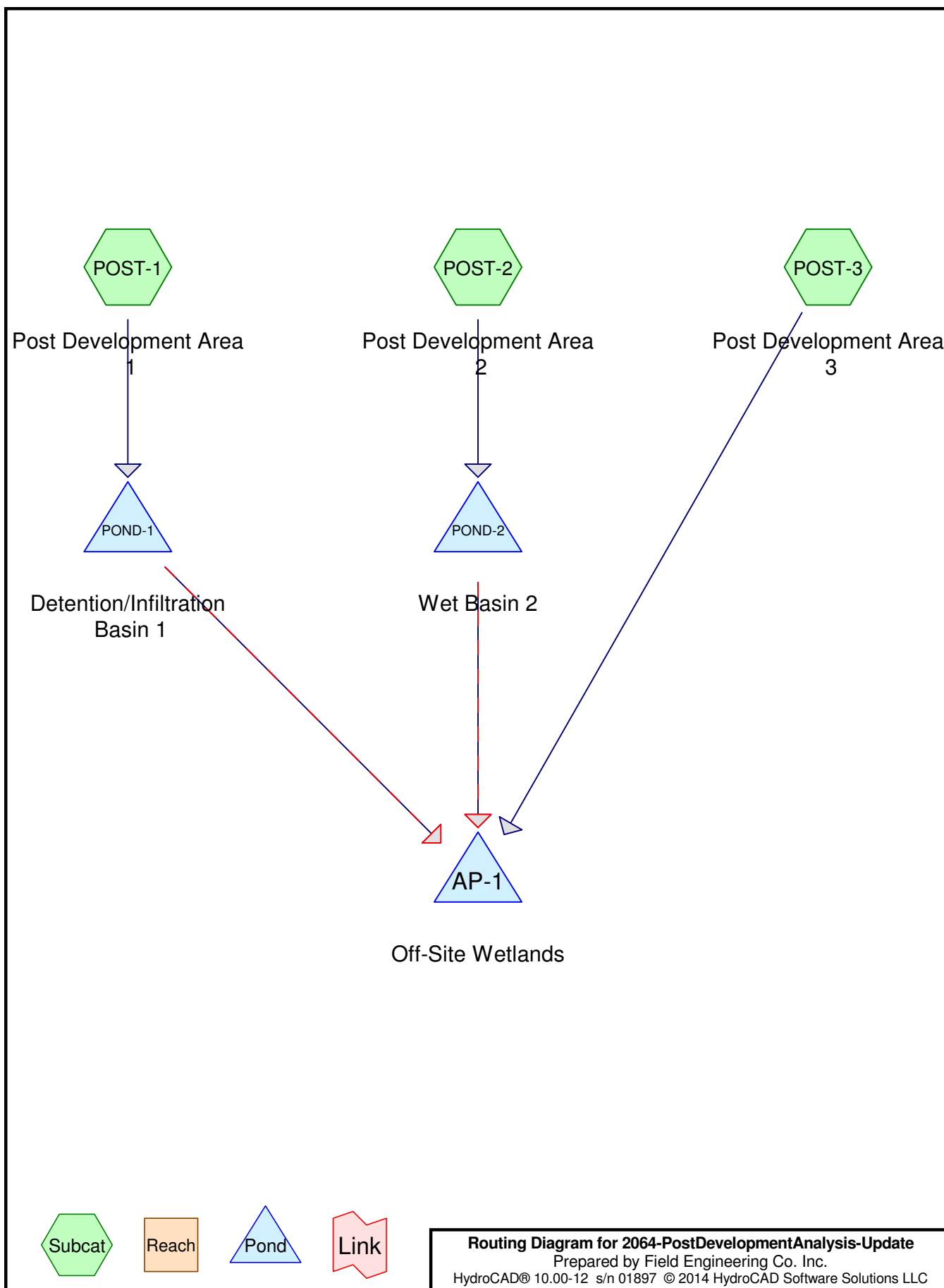
Table 1.3 – Pre-Post Development Hydrologic Results

Storm Event	Analysis Point AP-1 Rate of Flow
2-year storm	-0.0%
10-year storm	-19.0%
25-year storm	-23.6%
100-year storm	-27.7%

The hydrologic analysis indicates that the stormwater management system design for the site meets or reduces peak runoff rates for the 2, 10, 25, and 100 year, 24 hour, Type III storm events from the pre developed levels at the subject analysis point. The analysis shows the proposed development of this project area will not result in an increase in the rates of runoff from the project site.

Section 2

Revised Post Development Hydrologic Analysis



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 2 YR Rainfall=3.50"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=212,995 sf 74.25% Impervious Runoff Depth=2.84"
Flow Length=325' Slope=0.0050 '/' Tc=17.6 min CN=94 Runoff=11.02 cfs 50,331 cf

Subcatchment POST-2: Post Development Runoff Area=40,684 sf 47.95% Impervious Runoff Depth=0.90"
Flow Length=270' Tc=15.7 min CN=68 Runoff=0.64 cfs 3,056 cf

Subcatchment POST-3: Post Runoff Area=205,820 sf 10.77% Impervious Runoff Depth=0.38"
Flow Length=280' Slope=0.0050 '/' Tc=17.0 min CN=56 Runoff=0.82 cfs 6,519 cf

Pond AP-1: Off-Site Wetlands Inflow=0.85 cfs 9,433 cf
Primary=0.85 cfs 9,433 cf

Pond POND-1: Detention/Infiltration Basin Peak Elev=81.87' Storage=18,552 cf Inflow=11.02 cfs 50,331 cf
Discarded=1.59 cfs 50,331 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=1.59 cfs 50,331 cf

Pond POND-2: Wet Basin 2 Peak Elev=79.50' Storage=1,803 cf Inflow=0.64 cfs 3,056 cf
Primary=0.04 cfs 2,914 cf Secondary=0.00 cfs 0 cf Outflow=0.04 cfs 2,914 cf

Total Runoff Area = 459,499 sf Runoff Volume = 59,906 cf Average Runoff Depth = 1.56"
56.51% Pervious = 259,679 sf 43.49% Impervious = 199,820 sf

2064-PostDevelopmentAnalysis-Update

Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment POST-1: Post Development Area 1

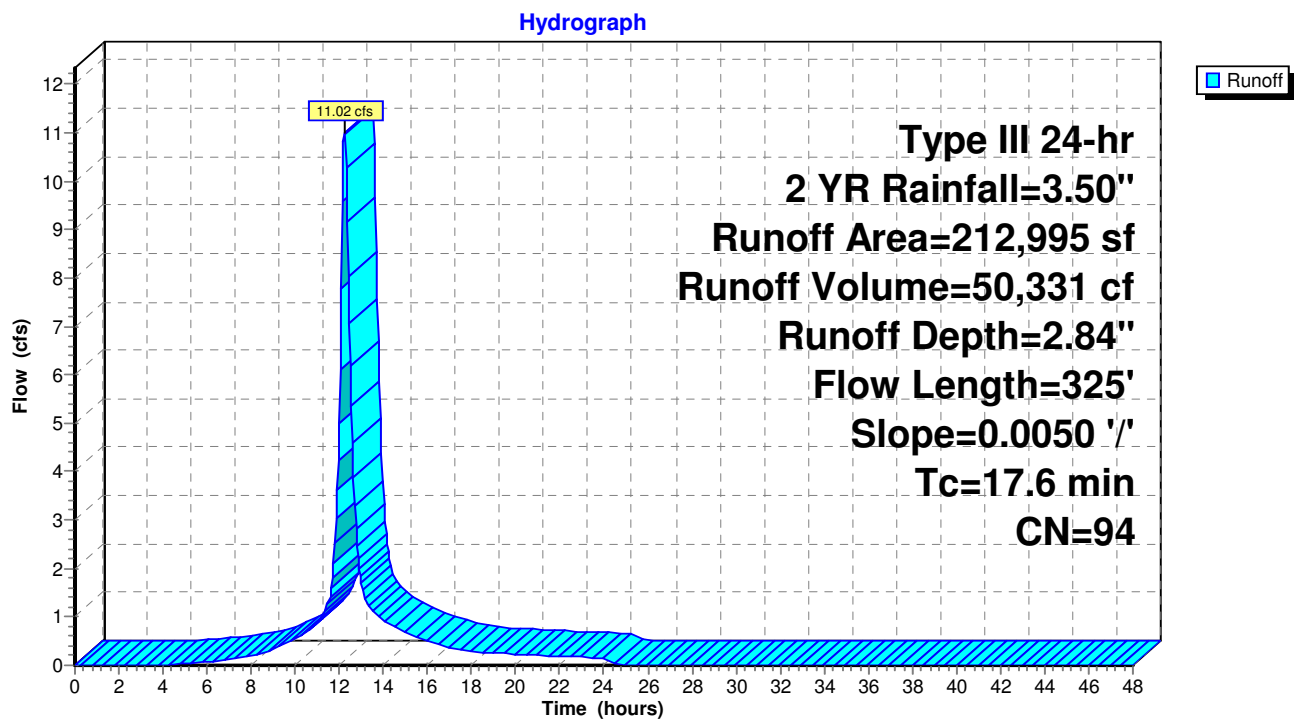
Runoff = 11.02 cfs @ 12.23 hrs, Volume= 50,331 cf, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
19,280	98	Roofs, HSG A
126,684	98	Roofs, HSG B
5,222	98	Paved parking, HSG B
6,964	98	Paved parking, HSG D
18,833	61	>75% Grass cover, Good, HSG B
7,124	80	>75% Grass cover, Good, HSG D
* 23,414	98	Water Surface, 0% imp, HSG B (Basin Bottom)
* 5,474	98	Water Surface, 0% imp, HSG D (Basin Bottom)
212,995	94	Weighted Average
54,845		25.75% Pervious Area
158,150		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
4.0	275	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.6	325	Total			

Subcatchment POST-1: Post Development Area 1



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment POST-2: Post Development Area 2

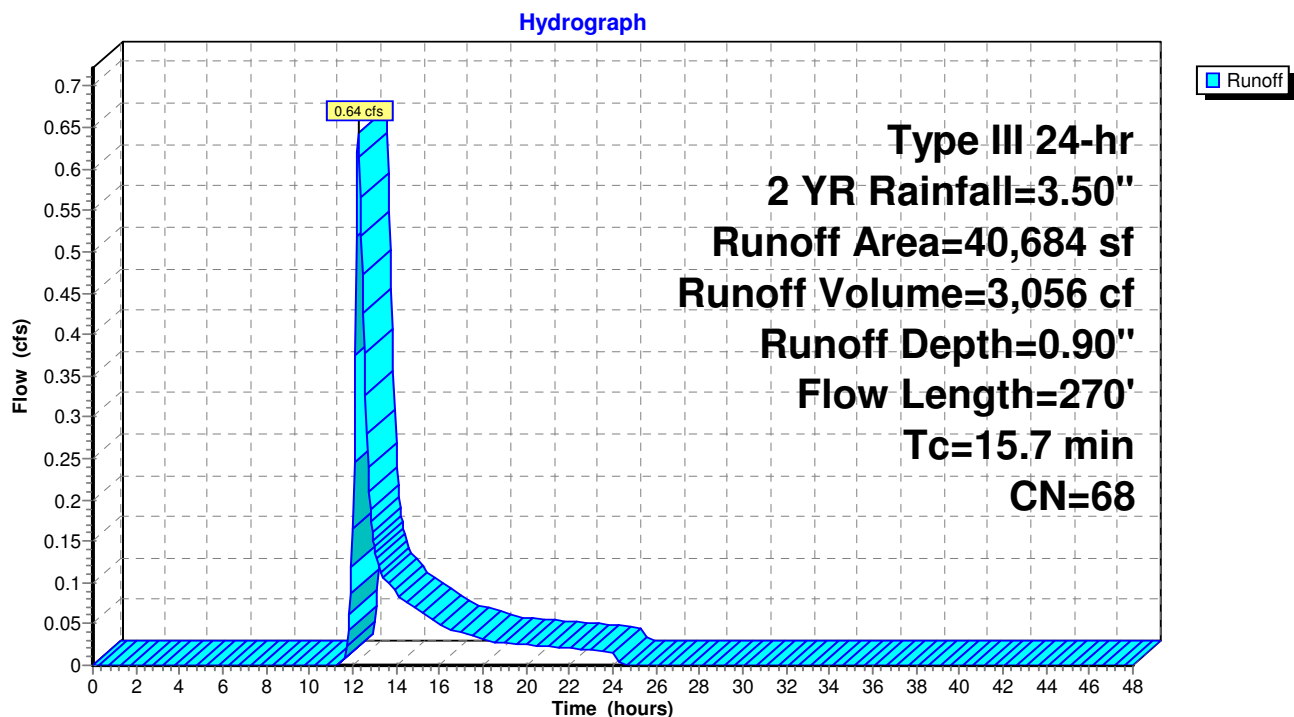
Runoff = 0.64 cfs @ 12.25 hrs, Volume= 3,056 cf, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
10,044	98	Paved parking, HSG A
9,464	98	Paved parking, HSG B
20,139	39	>75% Grass cover, Good, HSG A
1,037	61	>75% Grass cover, Good, HSG B
40,684	68	Weighted Average
21,176		52.05% Pervious Area
19,508		47.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.50"
1.5	100	0.0050	1.14		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.3	40	0.0100	2.03		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.3	80	0.0100	4.54	3.56	Pipe Channel, D-E 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.7	270	Total			

Subcatchment POST-2: Post Development Area 2



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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment POST-3: Post Development Area 3

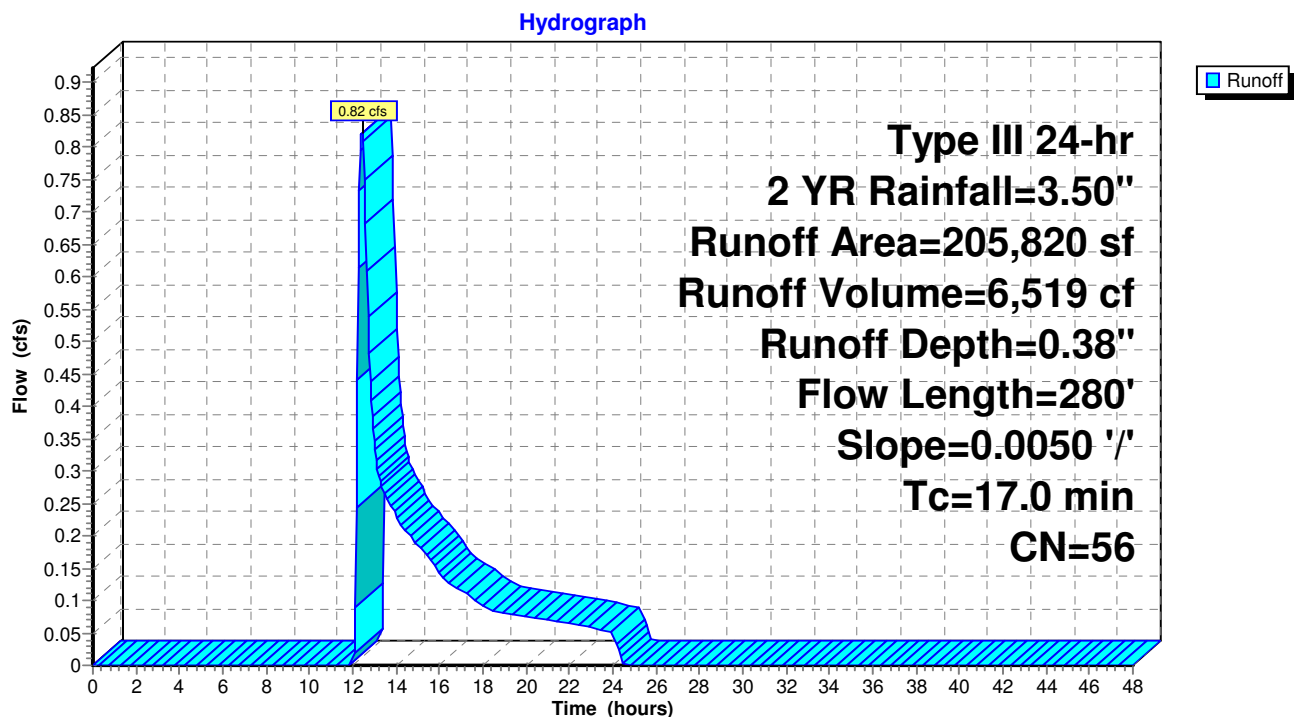
Runoff = 0.82 cfs @ 12.43 hrs, Volume= 6,519 cf, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
56,448	30	Woods, Good, HSG A
49,002	55	Woods, Good, HSG B
11,545	77	Woods, Good, HSG D
20,666	39	>75% Grass cover, Good, HSG A
29,676	61	>75% Grass cover, Good, HSG B
1,640	76	Gravel roads, HSG A
14,681	85	Gravel roads, HSG B
11,877	98	Paved parking, HSG A
8,785	98	Paved parking, HSG B
1,500	98	Paved parking, HSG D
205,820	56	Weighted Average
183,658		89.23% Pervious Area
22,162		10.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
3.4	230	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.0	280	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Pond AP-1: Off-Site Wetlands

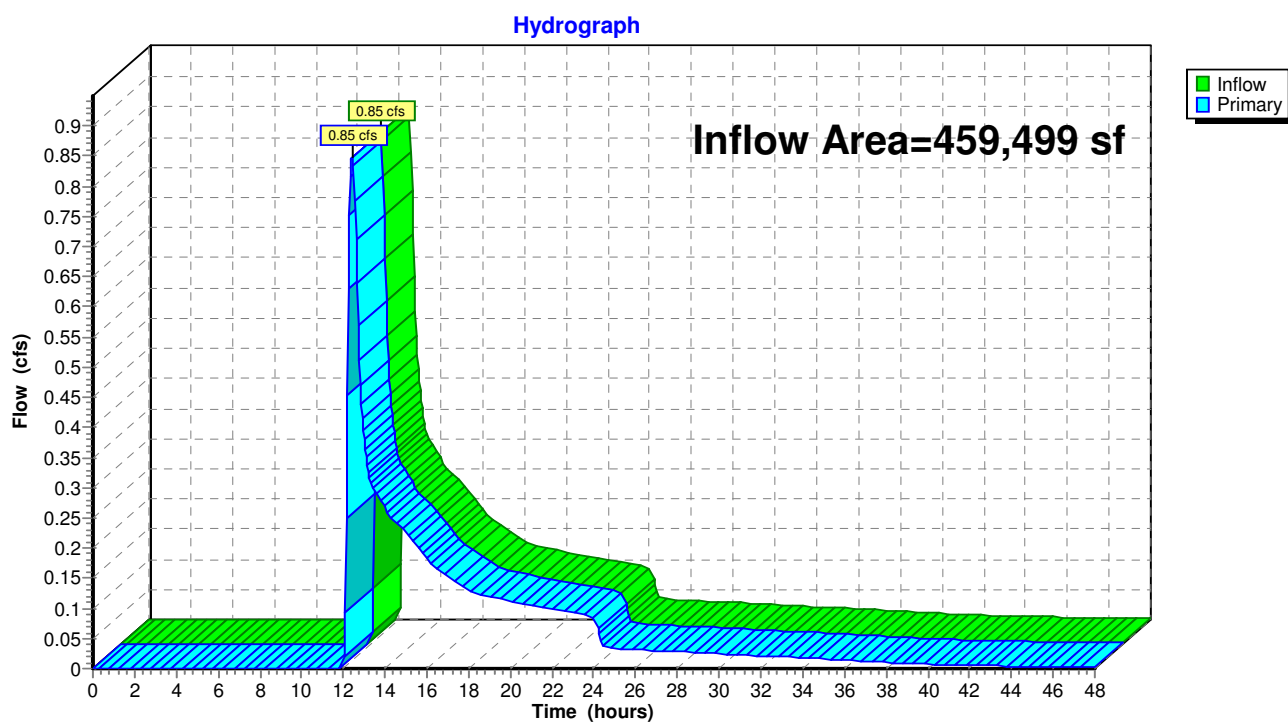
Analysis Point 1 is taken at the boundary of the wetlands surrounding the property which contribute flow to the cross culverts under Samuel Barnet Boulevard.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 459,499 sf, 43.49% Impervious, Inflow Depth > 0.25" for 2 YR event
Inflow = 0.85 cfs @ 12.43 hrs, Volume= 9,433 cf
Primary = 0.85 cfs @ 12.43 hrs, Volume= 9,433 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Pond AP-1: Off-Site Wetlands



Summary for Pond POND-1: Detention/Infiltration Basin 1

Inflow Area = 212,995 sf, 74.25% Impervious, Inflow Depth = 2.84" for 2 YR event
 Inflow = 11.02 cfs @ 12.23 hrs, Volume= 50,331 cf
 Outflow = 1.59 cfs @ 13.05 hrs, Volume= 50,331 cf, Atten= 86%, Lag= 49.2 min
 Discarded = 1.59 cfs @ 13.05 hrs, Volume= 50,331 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 81.87' @ 13.05 hrs Surf.Area= 28,581 sf Storage= 18,552 cf

Plug-Flow detention time= 91.8 min calculated for 50,279 cf (100% of inflow)
 Center-of-Mass det. time= 91.8 min (886.7 - 795.0)

Volume	Invert	Avail.Storage	Storage Description
#1	81.20'	85,136 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.20	27,043	0	0
82.00	28,888	22,372	22,372
83.00	31,245	30,067	52,439
84.00	34,150	32,698	85,136

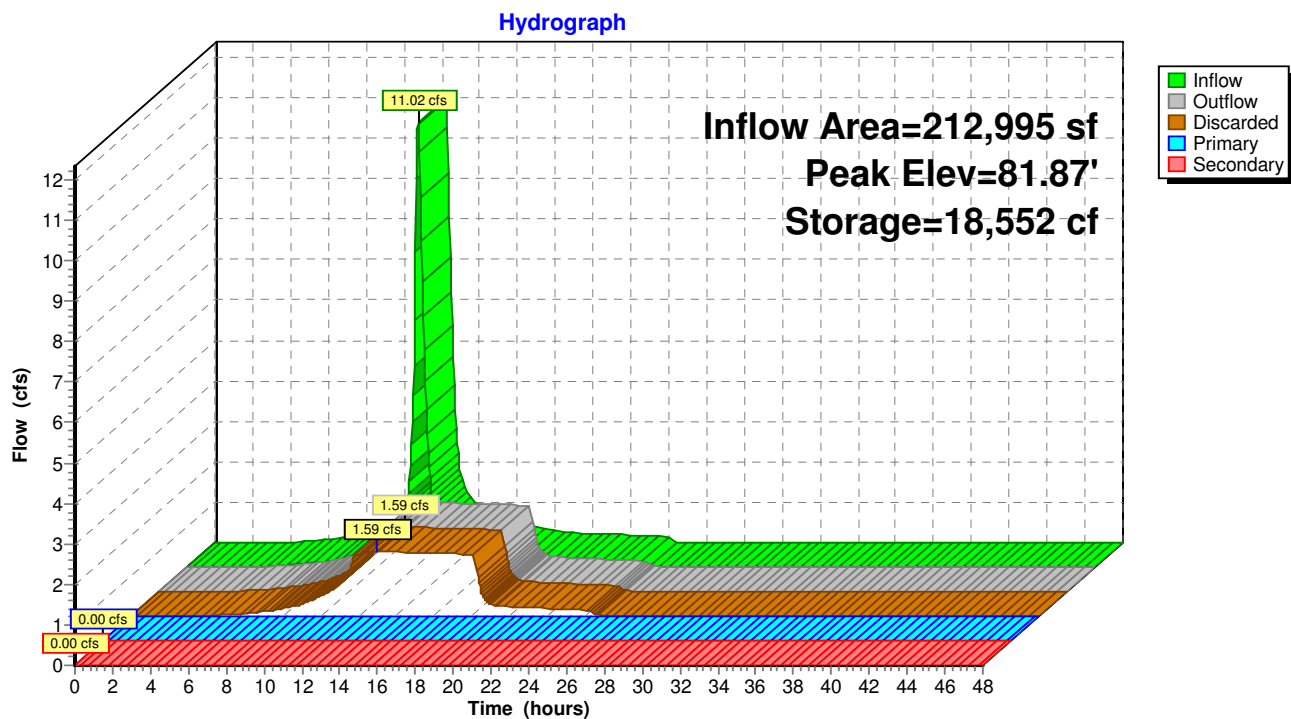
Device	Routing	Invert	Outlet Devices
#1	Primary	81.20'	12.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 81.20' / 80.65' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	81.95'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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
#5	Discarded	81.20'	2.410 in/hr Exfiltration over Surface area Phase-In= 0.05'

Discarded OutFlow Max=1.59 cfs @ 13.05 hrs HW=81.87' (Free Discharge)
 ↑ **5=Exfiltration** (Exfiltration Controls 1.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=81.20' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Controls 0.00 cfs)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=81.20' TW=0.00' (Dynamic Tailwater)
 ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-1: Detention/Infiltration Basin 1



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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Pond POND-2: Wet Basin 2

Inflow Area = 40,684 sf, 47.95% Impervious, Inflow Depth = 0.90" for 2 YR event
 Inflow = 0.64 cfs @ 12.25 hrs, Volume= 3,056 cf
 Outflow = 0.04 cfs @ 17.06 hrs, Volume= 2,914 cf, Atten= 94%, Lag= 289.0 min
 Primary = 0.04 cfs @ 17.06 hrs, Volume= 2,914 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 79.50' @ 17.06 hrs Surf.Area= 3,835 sf Storage= 1,803 cf

Plug-Flow detention time= 600.2 min calculated for 2,911 cf (95% of inflow)
 Center-of-Mass det. time= 576.7 min (1,461.8 - 885.0)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	28,790 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	3,428	0	0
80.00	4,248	3,838	3,838
81.00	5,125	4,687	8,525
82.00	6,058	5,592	14,116
83.00	7,371	6,715	20,831
84.00	8,548	7,960	28,790

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.70' S= 0.0060 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	79.00'	1.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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

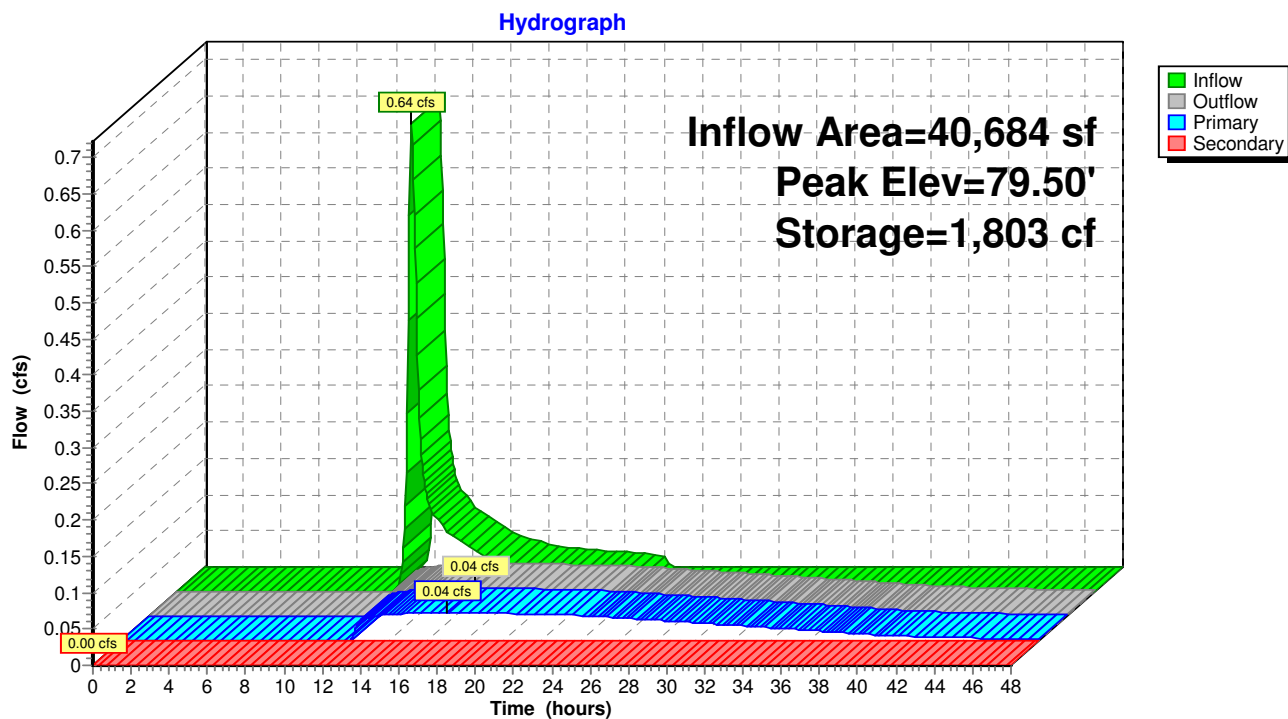
Primary OutFlow Max=0.04 cfs @ 17.06 hrs HW=79.50' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.04 cfs of 0.79 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 3.17 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' TW=0.00' (Dynamic Tailwater)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-2: Wet Basin 2



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Type III 24-hr 10 YR Rainfall=4.80"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=212,995 sf 74.25% Impervious Runoff Depth=4.11"
Flow Length=325' Slope=0.0050 '/' Tc=17.6 min CN=94 Runoff=15.66 cfs 72,964 cf

Subcatchment POST-2: Post Development Runoff Area=40,684 sf 47.95% Impervious Runoff Depth=1.74"
Flow Length=270' Tc=15.7 min CN=68 Runoff=1.35 cfs 5,894 cf

Subcatchment POST-3: Post Runoff Area=205,820 sf 10.77% Impervious Runoff Depth=0.94"
Flow Length=280' Slope=0.0050 '/' Tc=17.0 min CN=56 Runoff=2.95 cfs 16,127 cf

Pond AP-1: Off-Site Wetlands Inflow=2.99 cfs 22,529 cf
Primary=2.99 cfs 22,529 cf

Pond POND-1: Detention/Infiltration Basin Peak Elev=82.25' Storage=29,698 cf Inflow=15.66 cfs 72,964 cf
Discarded=1.64 cfs 72,011 cf Primary=0.10 cfs 953 cf Secondary=0.00 cfs 0 cf Outflow=1.74 cfs 72,964 cf

Pond POND-2: Wet Basin 2 Peak Elev=80.01' Storage=3,898 cf Inflow=1.35 cfs 5,894 cf
Primary=0.06 cfs 5,449 cf Secondary=0.00 cfs 0 cf Outflow=0.06 cfs 5,449 cf

Total Runoff Area = 459,499 sf Runoff Volume = 94,986 cf Average Runoff Depth = 2.48"
56.51% Pervious = 259,679 sf 43.49% Impervious = 199,820 sf

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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment POST-1: Post Development Area 1

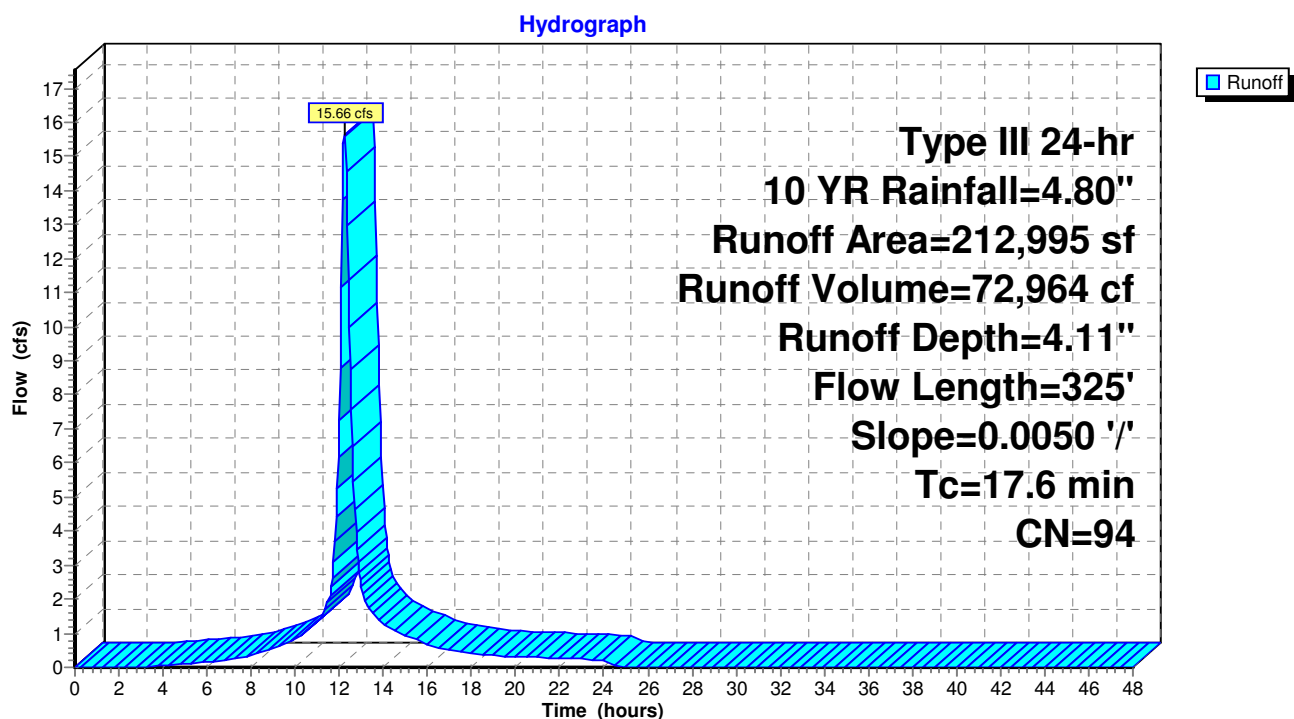
Runoff = 15.66 cfs @ 12.23 hrs, Volume= 72,964 cf, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
19,280	98	Roofs, HSG A
126,684	98	Roofs, HSG B
5,222	98	Paved parking, HSG B
6,964	98	Paved parking, HSG D
18,833	61	>75% Grass cover, Good, HSG B
7,124	80	>75% Grass cover, Good, HSG D
* 23,414	98	Water Surface, 0% imp, HSG B (Basin Bottom)
* 5,474	98	Water Surface, 0% imp, HSG D (Basin Bottom)
212,995	94	Weighted Average
54,845		25.75% Pervious Area
158,150		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
4.0	275	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.6	325	Total			

Subcatchment POST-1: Post Development Area 1



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment POST-2: Post Development Area 2

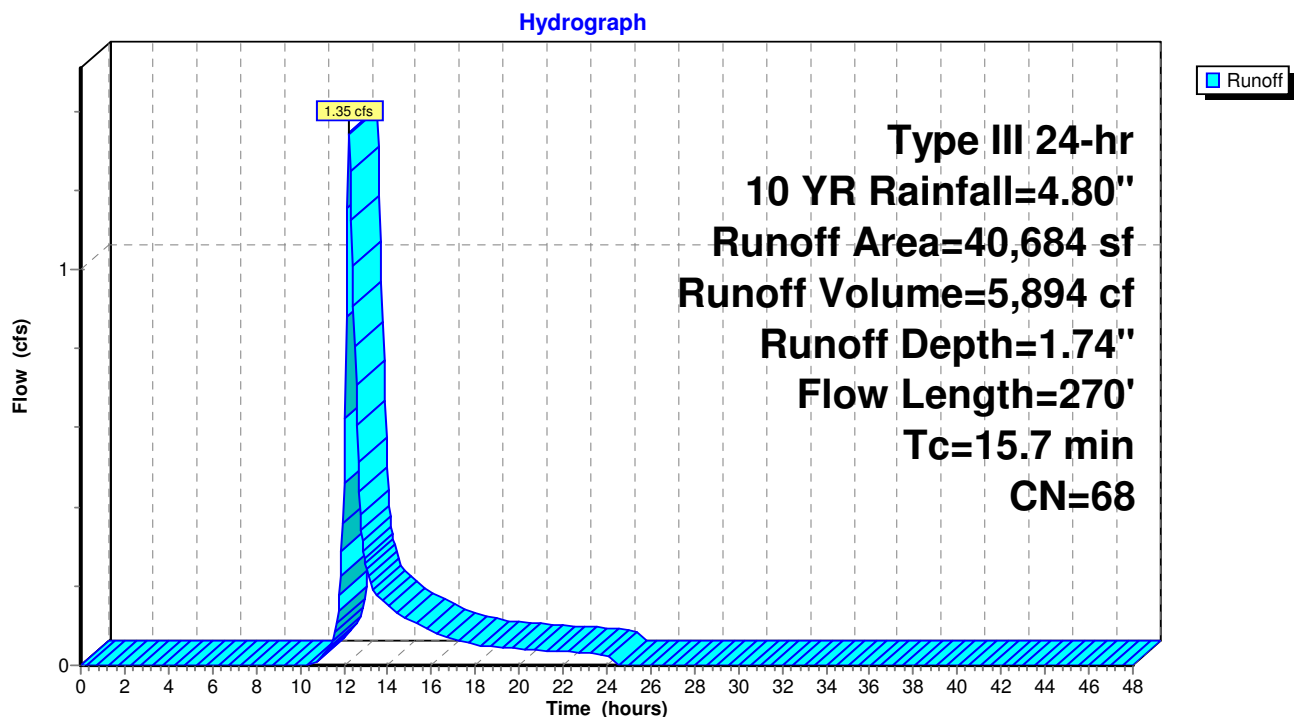
Runoff = 1.35 cfs @ 12.23 hrs, Volume= 5,894 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
10,044	98	Paved parking, HSG A
9,464	98	Paved parking, HSG B
20,139	39	>75% Grass cover, Good, HSG A
1,037	61	>75% Grass cover, Good, HSG B
40,684	68	Weighted Average
21,176		52.05% Pervious Area
19,508		47.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.50"
1.5	100	0.0050	1.14		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.3	40	0.0100	2.03		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.3	80	0.0100	4.54	3.56	Pipe Channel, D-E 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.7	270	Total			

Subcatchment POST-2: Post Development Area 2



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment POST-3: Post Development Area 3

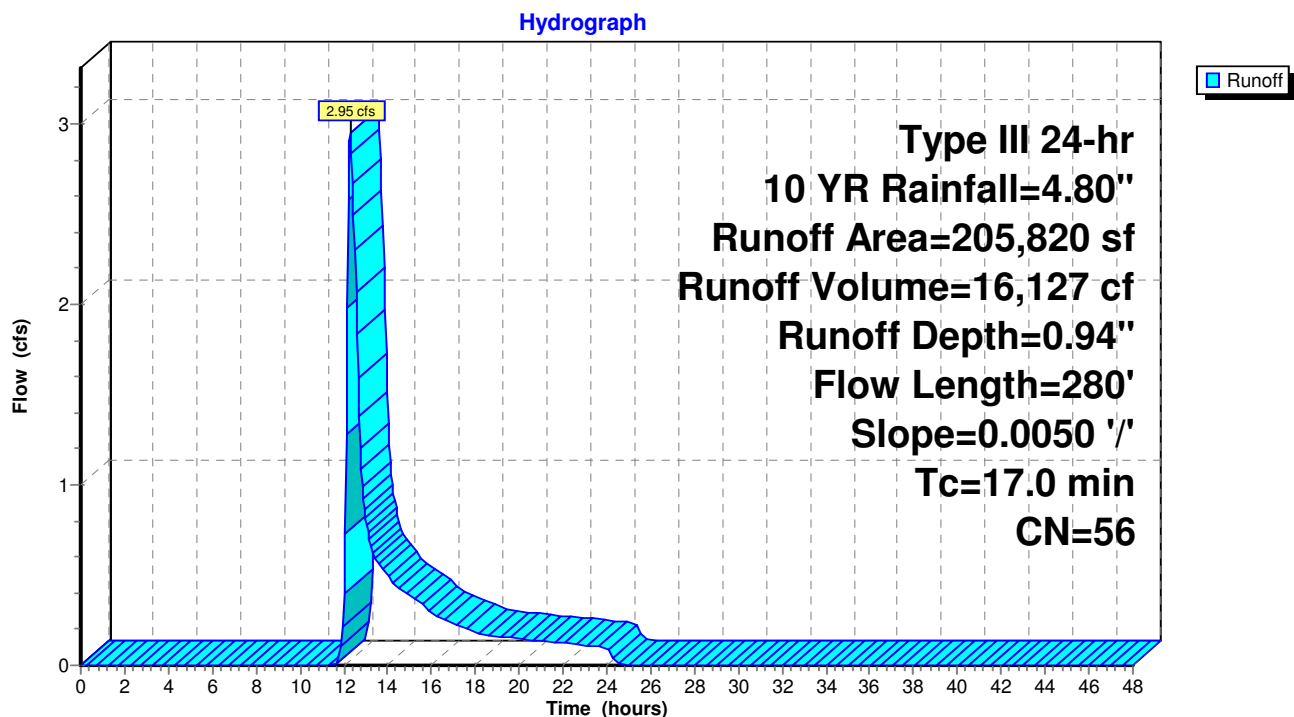
Runoff = 2.95 cfs @ 12.29 hrs, Volume= 16,127 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
56,448	30	Woods, Good, HSG A
49,002	55	Woods, Good, HSG B
11,545	77	Woods, Good, HSG D
20,666	39	>75% Grass cover, Good, HSG A
29,676	61	>75% Grass cover, Good, HSG B
1,640	76	Gravel roads, HSG A
14,681	85	Gravel roads, HSG B
11,877	98	Paved parking, HSG A
8,785	98	Paved parking, HSG B
1,500	98	Paved parking, HSG D
205,820	56	Weighted Average
183,658		89.23% Pervious Area
22,162		10.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
3.4	230	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.0	280	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Pond AP-1: Off-Site Wetlands

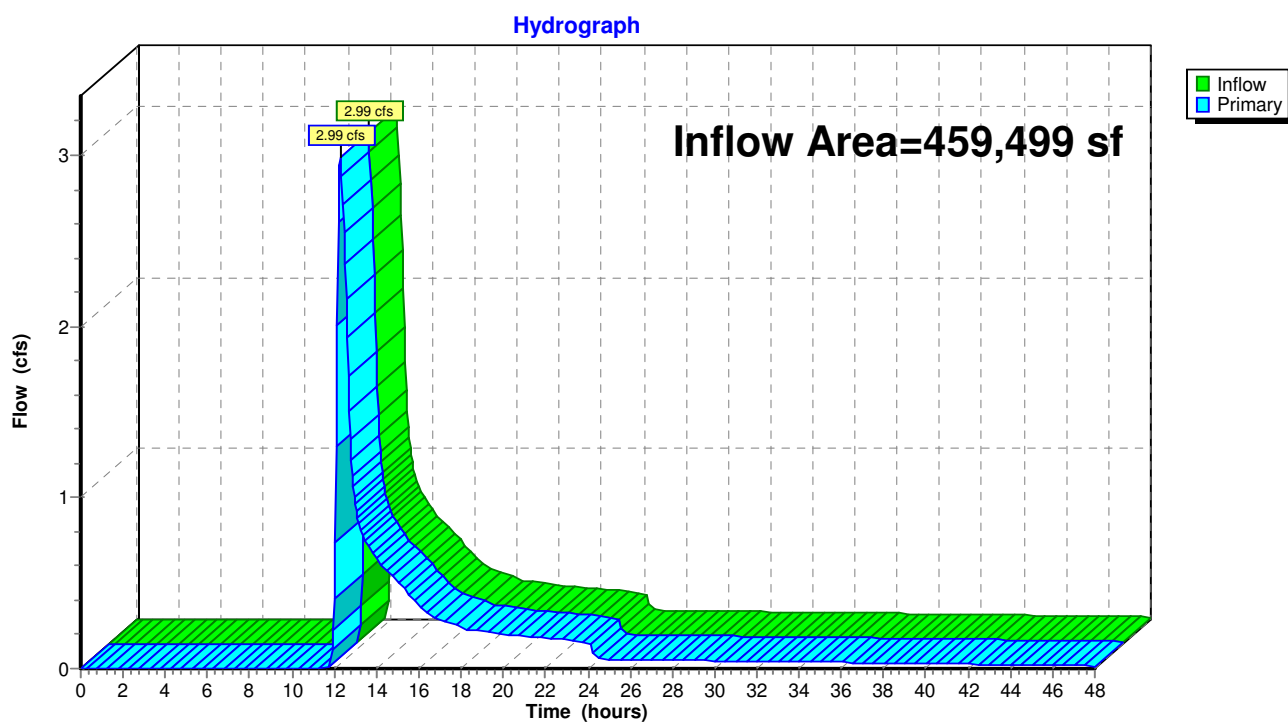
Analysis Point 1 is taken at the boundary of the wetlands surrounding the property which contribute flow to the cross culverts under Samuel Barnet Boulevard.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 459,499 sf, 43.49% Impervious, Inflow Depth > 0.59" for 10 YR event
Inflow = 2.99 cfs @ 12.29 hrs, Volume= 22,529 cf
Primary = 2.99 cfs @ 12.29 hrs, Volume= 22,529 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Pond AP-1: Off-Site Wetlands



Summary for Pond POND-1: Detention/Infiltration Basin 1

Inflow Area = 212,995 sf, 74.25% Impervious, Inflow Depth = 4.11" for 10 YR event
 Inflow = 15.66 cfs @ 12.23 hrs, Volume= 72,964 cf
 Outflow = 1.74 cfs @ 13.30 hrs, Volume= 72,964 cf, Atten= 89%, Lag= 63.8 min
 Discarded = 1.64 cfs @ 13.30 hrs, Volume= 72,011 cf
 Primary = 0.10 cfs @ 13.30 hrs, Volume= 953 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 82.25' @ 13.30 hrs Surf.Area= 29,480 sf Storage= 29,698 cf

Plug-Flow detention time= 146.5 min calculated for 72,888 cf (100% of inflow)
 Center-of-Mass det. time= 146.4 min (931.8 - 785.4)

Volume	Invert	Avail.Storage	Storage Description
#1	81.20'	85,136 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.20	27,043	0	0
82.00	28,888	22,372	22,372
83.00	31,245	30,067	52,439
84.00	34,150	32,698	85,136

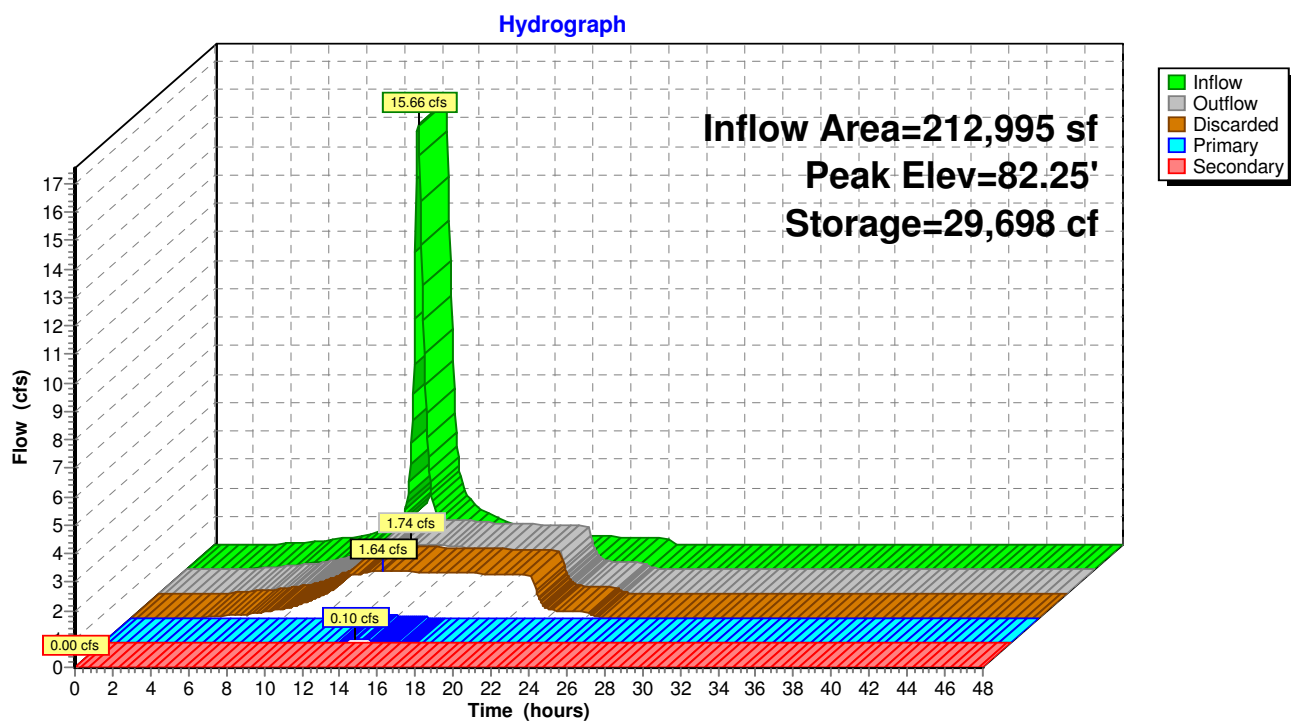
Device	Routing	Invert	Outlet Devices
#1	Primary	81.20'	12.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 81.20' / 80.65' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	81.95'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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
#5	Discarded	81.20'	2.410 in/hr Exfiltration over Surface area Phase-In= 0.05'

Discarded OutFlow Max=1.64 cfs @ 13.30 hrs HW=82.25' (Free Discharge)
 ↑ **5=Exfiltration** (Exfiltration Controls 1.64 cfs)

Primary OutFlow Max=0.10 cfs @ 13.30 hrs HW=82.25' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.10 cfs of 2.81 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.10 cfs @ 2.02 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=81.20' TW=0.00' (Dynamic Tailwater)
 ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-1: Detention/Infiltration Basin 1



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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Pond POND-2: Wet Basin 2

Inflow Area = 40,684 sf, 47.95% Impervious, Inflow Depth = 1.74" for 10 YR event
 Inflow = 1.35 cfs @ 12.23 hrs, Volume= 5,894 cf
 Outflow = 0.06 cfs @ 17.62 hrs, Volume= 5,449 cf, Atten= 96%, Lag= 323.6 min
 Primary = 0.06 cfs @ 17.62 hrs, Volume= 5,449 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 80.01' @ 17.62 hrs Surf.Area= 4,260 sf Storage= 3,898 cf

Plug-Flow detention time= 792.6 min calculated for 5,449 cf (92% of inflow)

Center-of-Mass det. time= 754.0 min (1,618.2 - 864.2)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	28,790 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	3,428	0	0
80.00	4,248	3,838	3,838
81.00	5,125	4,687	8,525
82.00	6,058	5,592	14,116
83.00	7,371	6,715	20,831
84.00	8,548	7,960	28,790

Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.70' S= 0.0060 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	79.00'	1.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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

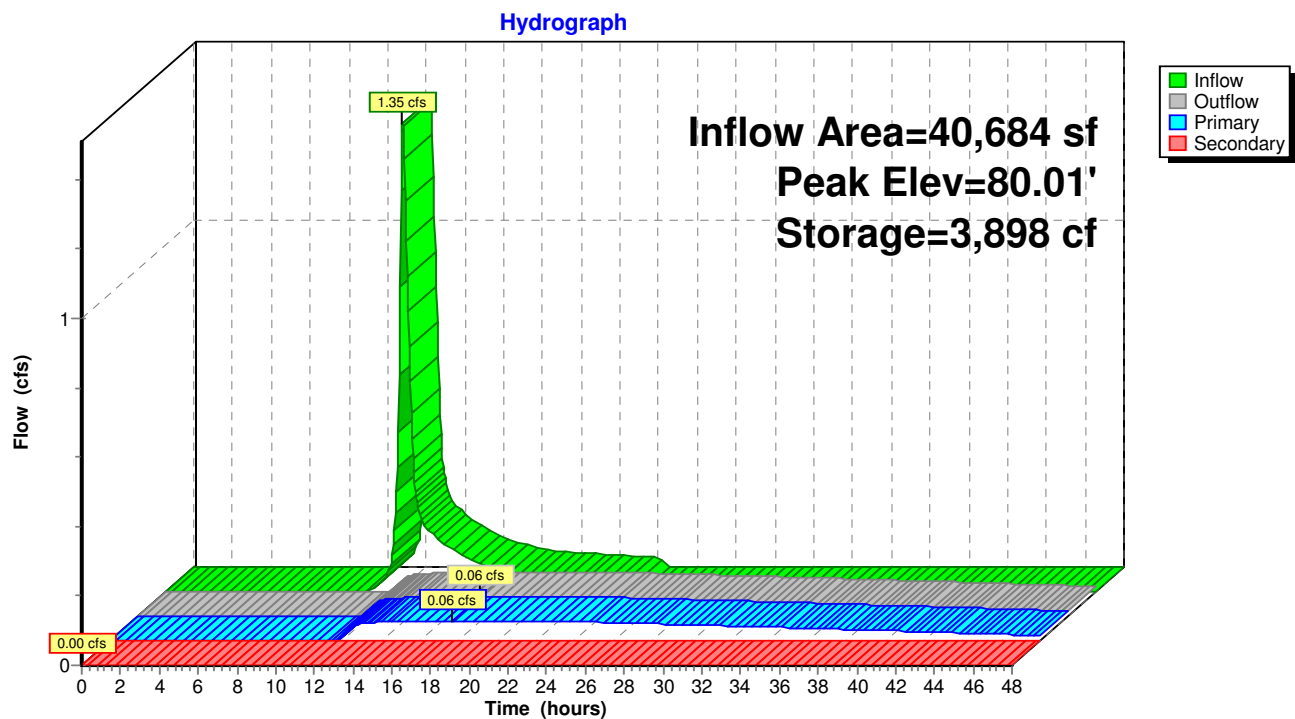
Primary OutFlow Max=0.06 cfs @ 17.62 hrs HW=80.01' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.06 cfs of 2.47 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 4.70 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' TW=0.00' (Dynamic Tailwater)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-2: Wet Basin 2



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Type III 24-hr 25 YR Rainfall=5.60"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=212,995 sf 74.25% Impervious Runoff Depth=4.90"
Flow Length=325' Slope=0.0050 '/' Tc=17.6 min CN=94 Runoff=18.50 cfs 86,986 cf

Subcatchment POST-2: Post Development Runoff Area=40,684 sf 47.95% Impervious Runoff Depth=2.32"
Flow Length=270' Tc=15.7 min CN=68 Runoff=1.83 cfs 7,858 cf

Subcatchment POST-3: Post Runoff Area=205,820 sf 10.77% Impervious Runoff Depth=1.37"
Flow Length=280' Slope=0.0050 '/' Tc=17.0 min CN=56 Runoff=4.72 cfs 23,420 cf

Pond AP-1: Off-Site Wetlands Inflow=4.76 cfs 33,738 cf
Primary=4.76 cfs 33,738 cf

Pond POND-1: Detention/Infiltration Basin Peak Elev=82.48' Storage=36,508 cf Inflow=18.50 cfs 86,986 cf
Discarded=1.67 cfs 83,536 cf Primary=0.44 cfs 3,450 cf Secondary=0.00 cfs 0 cf Outflow=2.12 cfs 86,986 cf

Pond POND-2: Wet Basin 2 Peak Elev=80.36' Storage=5,426 cf Inflow=1.83 cfs 7,858 cf
Primary=0.07 cfs 6,868 cf Secondary=0.00 cfs 0 cf Outflow=0.07 cfs 6,868 cf

Total Runoff Area = 459,499 sf Runoff Volume = 118,263 cf Average Runoff Depth = 3.09"
56.51% Pervious = 259,679 sf 43.49% Impervious = 199,820 sf

2064-PostDevelopmentAnalysis-Update

Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment POST-1: Post Development Area 1

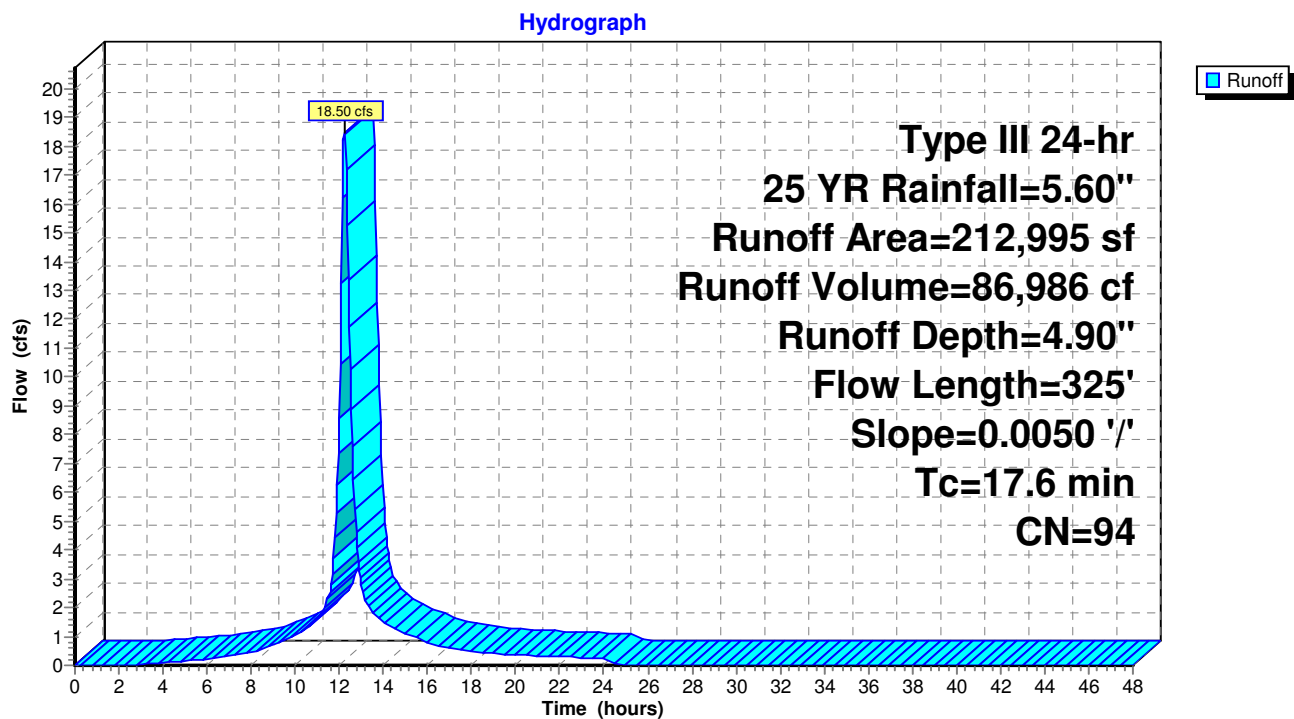
Runoff = 18.50 cfs @ 12.23 hrs, Volume= 86,986 cf, Depth= 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
19,280	98	Roofs, HSG A
126,684	98	Roofs, HSG B
5,222	98	Paved parking, HSG B
6,964	98	Paved parking, HSG D
18,833	61	>75% Grass cover, Good, HSG B
7,124	80	>75% Grass cover, Good, HSG D
* 23,414	98	Water Surface, 0% imp, HSG B (Basin Bottom)
* 5,474	98	Water Surface, 0% imp, HSG D (Basin Bottom)
212,995	94	Weighted Average
54,845		25.75% Pervious Area
158,150		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
4.0	275	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.6	325	Total			

Subcatchment POST-1: Post Development Area 1



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment POST-2: Post Development Area 2

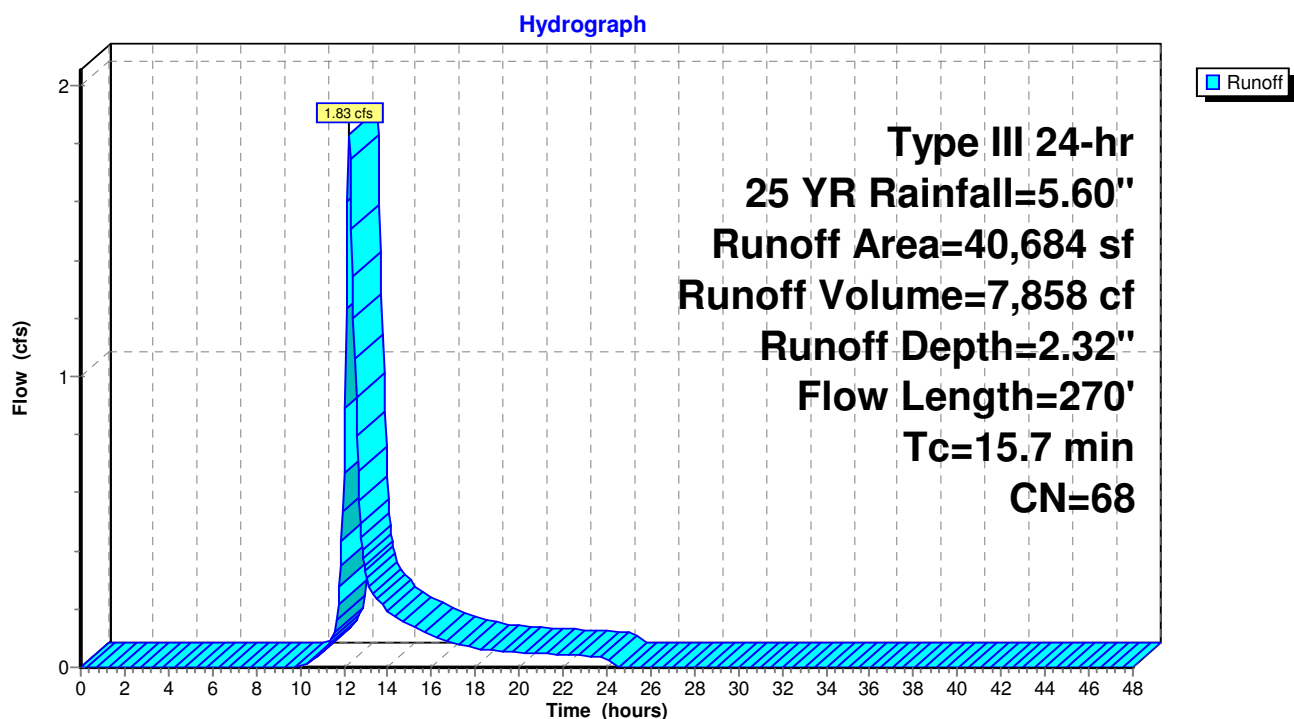
Runoff = 1.83 cfs @ 12.23 hrs, Volume= 7,858 cf, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
10,044	98	Paved parking, HSG A
9,464	98	Paved parking, HSG B
20,139	39	>75% Grass cover, Good, HSG A
1,037	61	>75% Grass cover, Good, HSG B
40,684	68	Weighted Average
21,176		52.05% Pervious Area
19,508		47.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.50"
1.5	100	0.0050	1.14		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.3	40	0.0100	2.03		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.3	80	0.0100	4.54	3.56	Pipe Channel, D-E 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.7	270	Total			

Subcatchment POST-2: Post Development Area 2



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment POST-3: Post Development Area 3

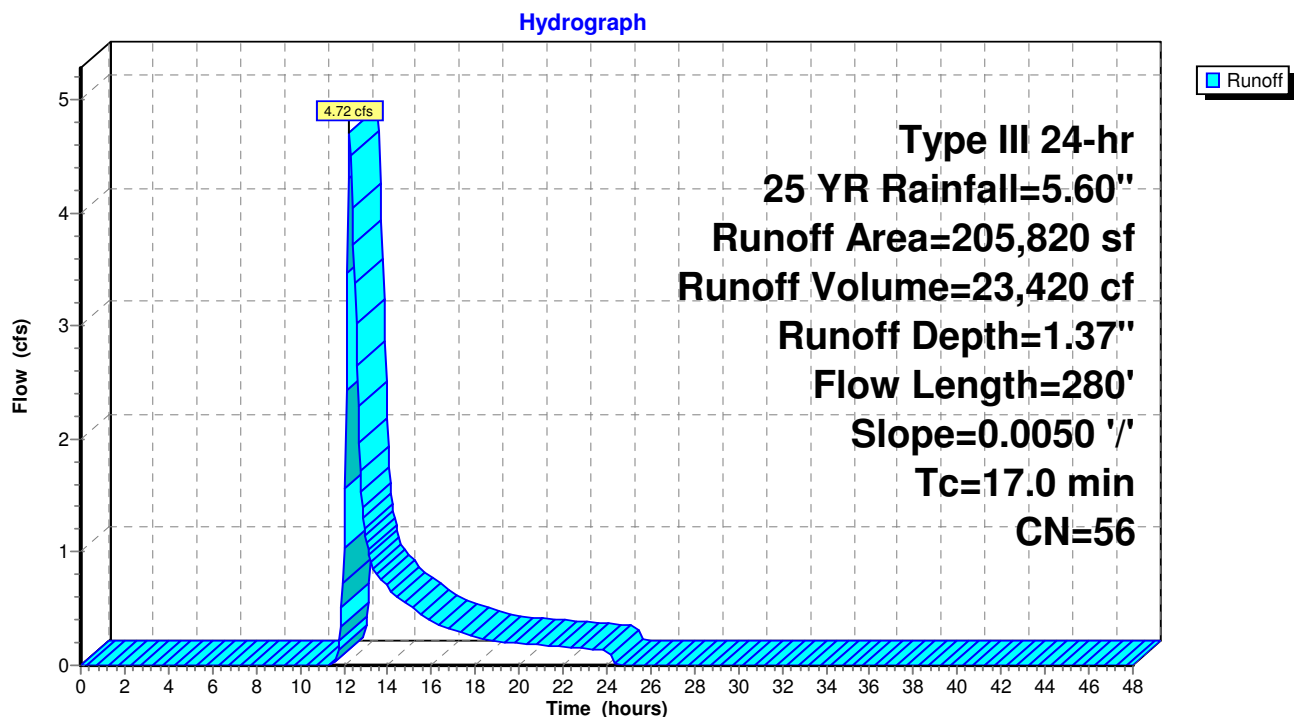
Runoff = 4.72 cfs @ 12.27 hrs, Volume= 23,420 cf, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
56,448	30	Woods, Good, HSG A
49,002	55	Woods, Good, HSG B
11,545	77	Woods, Good, HSG D
20,666	39	>75% Grass cover, Good, HSG A
29,676	61	>75% Grass cover, Good, HSG B
1,640	76	Gravel roads, HSG A
14,681	85	Gravel roads, HSG B
11,877	98	Paved parking, HSG A
8,785	98	Paved parking, HSG B
1,500	98	Paved parking, HSG D
205,820	56	Weighted Average
183,658		89.23% Pervious Area
22,162		10.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
3.4	230	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.0	280	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Pond AP-1: Off-Site Wetlands

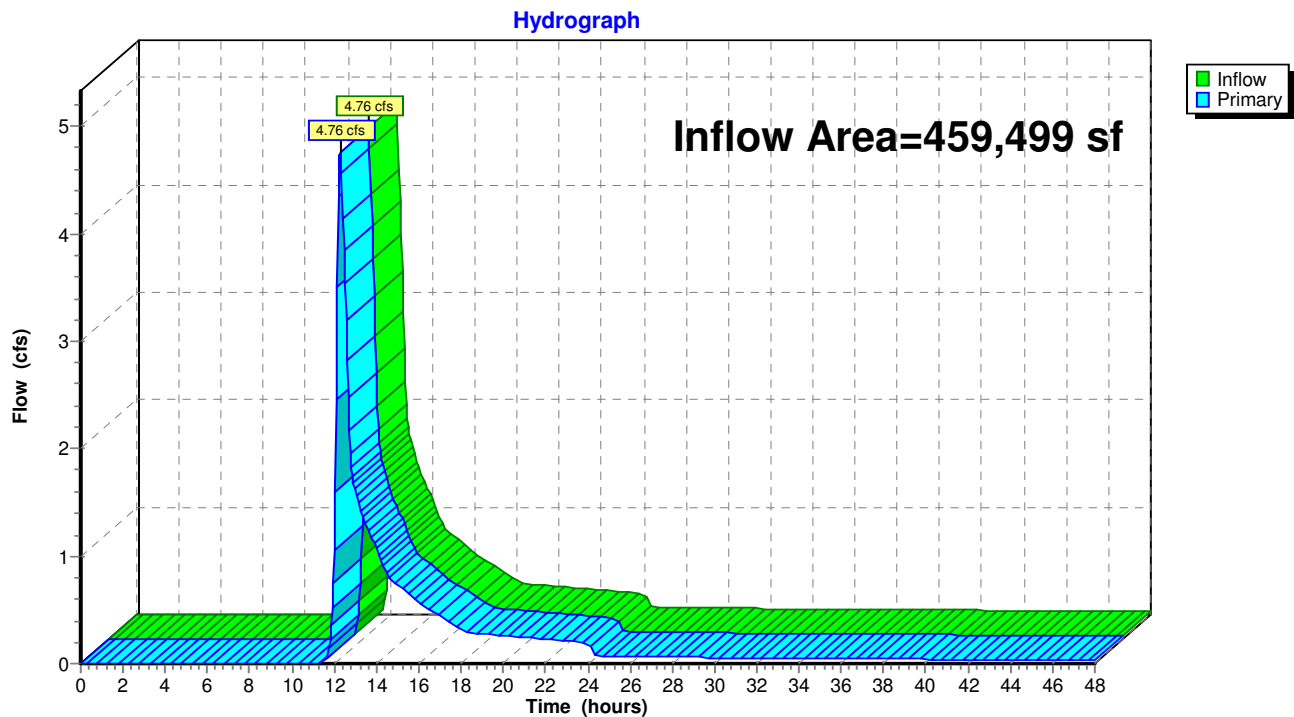
Analysis Point 1 is taken at the boundary of the wetlands surrounding the property which contribute flow to the cross culverts under Samuel Barnet Boulevard.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 459,499 sf, 43.49% Impervious, Inflow Depth > 0.88" for 25 YR event
Inflow = 4.76 cfs @ 12.27 hrs, Volume= 33,738 cf
Primary = 4.76 cfs @ 12.27 hrs, Volume= 33,738 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Pond AP-1: Off-Site Wetlands



Summary for Pond POND-1: Detention/Infiltration Basin 1

Inflow Area = 212,995 sf, 74.25% Impervious, Inflow Depth = 4.90" for 25 YR event
 Inflow = 18.50 cfs @ 12.23 hrs, Volume= 86,986 cf
 Outflow = 2.12 cfs @ 13.25 hrs, Volume= 86,986 cf, Atten= 89%, Lag= 61.1 min
 Discarded = 1.67 cfs @ 13.25 hrs, Volume= 83,536 cf
 Primary = 0.44 cfs @ 13.25 hrs, Volume= 3,450 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 82.48' @ 13.25 hrs Surf.Area= 30,019 sf Storage= 36,508 cf

Plug-Flow detention time= 172.4 min calculated for 86,895 cf (100% of inflow)
 Center-of-Mass det. time= 172.2 min (953.3 - 781.1)

Volume	Invert	Avail.Storage	Storage Description
#1	81.20'	85,136 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.20	27,043	0	0
82.00	28,888	22,372	22,372
83.00	31,245	30,067	52,439
84.00	34,150	32,698	85,136

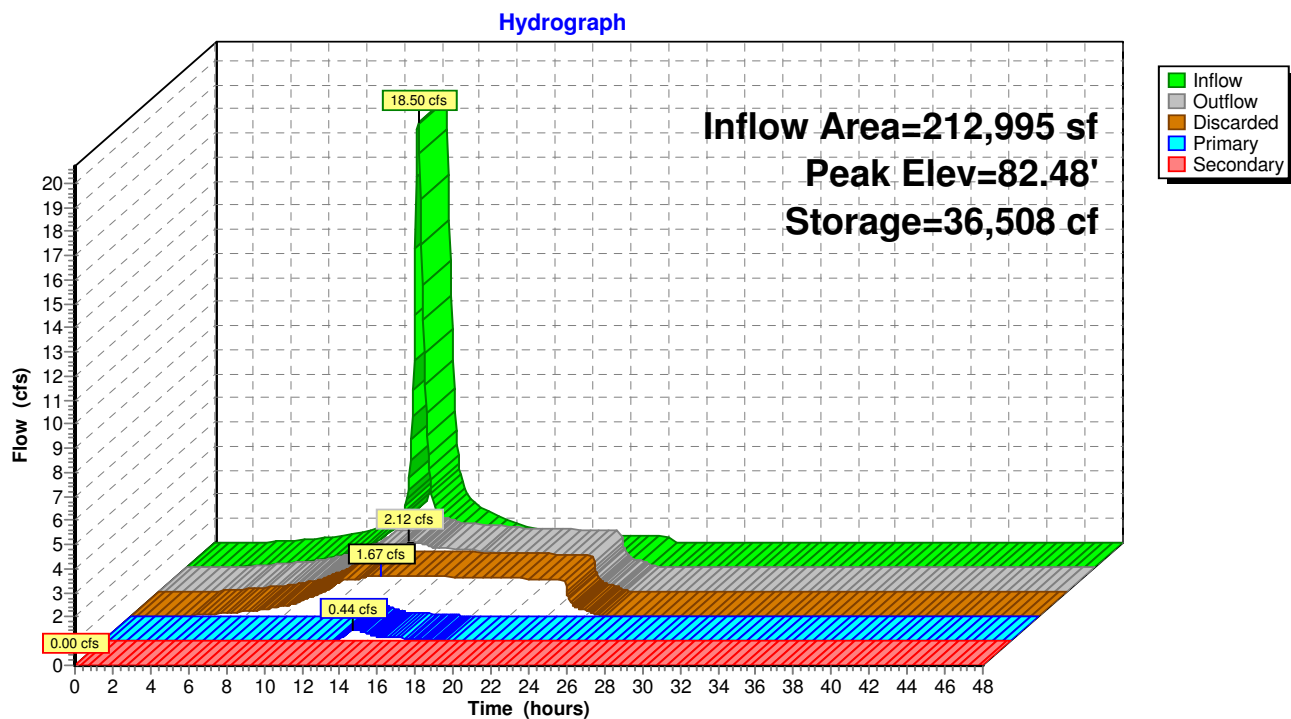
Device	Routing	Invert	Outlet Devices
#1	Primary	81.20'	12.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 81.20' / 80.65' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	81.95'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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
#5	Discarded	81.20'	2.410 in/hr Exfiltration over Surface area Phase-In= 0.05'

Discarded OutFlow Max=1.67 cfs @ 13.25 hrs HW=82.48' (Free Discharge)
 ↑ **5=Exfiltration** (Exfiltration Controls 1.67 cfs)

Primary OutFlow Max=0.44 cfs @ 13.25 hrs HW=82.48' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 0.44 cfs of 3.34 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.15 cfs @ 3.06 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 0.29 cfs @ 0.92 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=81.20' TW=0.00' (Dynamic Tailwater)
 ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-1: Detention/Infiltration Basin 1



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Pond POND-2: Wet Basin 2

Inflow Area = 40,684 sf, 47.95% Impervious, Inflow Depth = 2.32" for 25 YR event
 Inflow = 1.83 cfs @ 12.23 hrs, Volume= 7,858 cf
 Outflow = 0.07 cfs @ 17.91 hrs, Volume= 6,868 cf, Atten= 96%, Lag= 340.9 min
 Primary = 0.07 cfs @ 17.91 hrs, Volume= 6,868 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 80.36' @ 17.91 hrs Surf.Area= 4,564 sf Storage= 5,426 cf

Plug-Flow detention time= 867.8 min calculated for 6,868 cf (87% of inflow)

Center-of-Mass det. time= 809.6 min (1,665.1 - 855.6)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	28,790 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	3,428	0	0
80.00	4,248	3,838	3,838
81.00	5,125	4,687	8,525
82.00	6,058	5,592	14,116
83.00	7,371	6,715	20,831
84.00	8,548	7,960	28,790

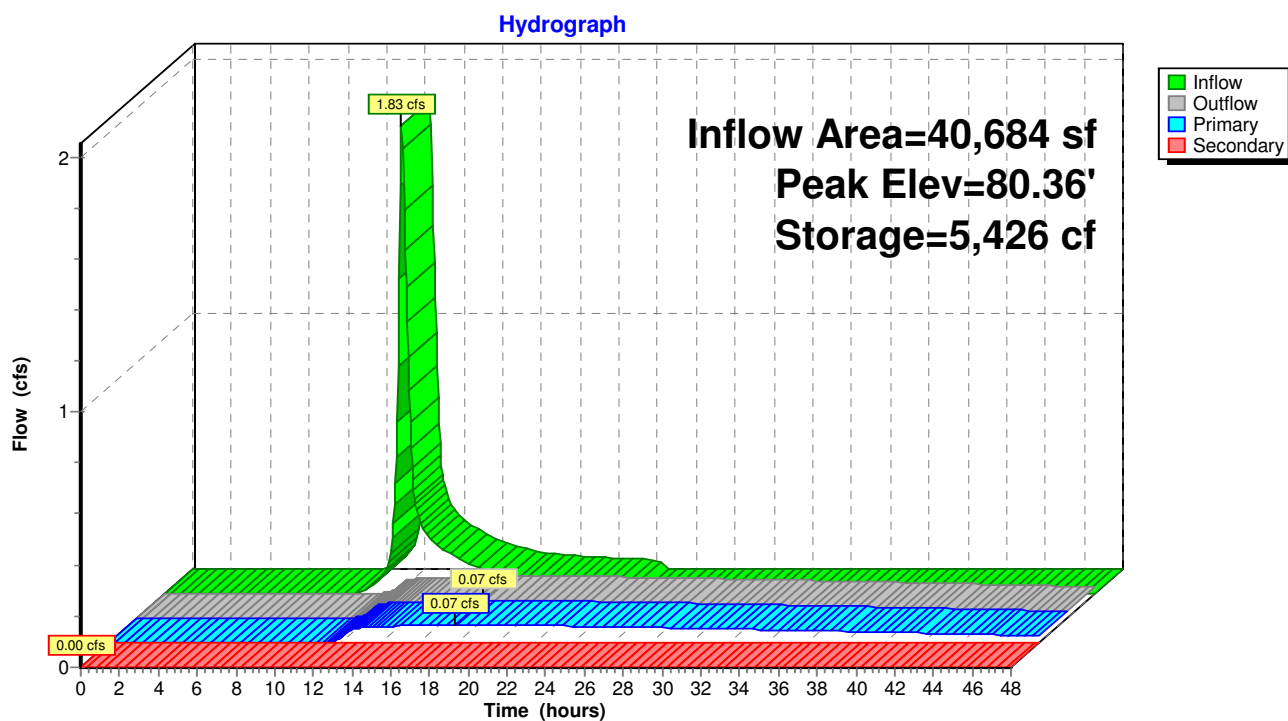
Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.70' S= 0.0060 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	79.00'	1.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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=0.07 cfs @ 17.91 hrs HW=80.36' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.07 cfs of 2.83 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 5.49 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' TW=0.00' (Dynamic Tailwater)↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-2: Wet Basin 2



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Type III 24-hr 100 YR Rainfall=7.00"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post Runoff Area=212,995 sf 74.25% Impervious Runoff Depth=6.29"
Flow Length=325' Slope=0.0050 '/' Tc=17.6 min CN=94 Runoff=23.42 cfs 111,615 cf

Subcatchment POST-2: Post Development Runoff Area=40,684 sf 47.95% Impervious Runoff Depth=3.41"
Flow Length=270' Tc=15.7 min CN=68 Runoff=2.75 cfs 11,562 cf

Subcatchment POST-3: Post Runoff Area=205,820 sf 10.77% Impervious Runoff Depth=2.22"
Flow Length=280' Slope=0.0050 '/' Tc=17.0 min CN=56 Runoff=8.25 cfs 38,045 cf

Pond AP-1: Off-Site Wetlands Inflow=8.36 cfs 64,363 cf
Primary=8.36 cfs 64,363 cf

Pond POND-1: Detention/Infiltration Peak Elev=82.76' Storage=45,006 cf Inflow=23.42 cfs 111,615 cf
Discarded=1.71 cfs 94,320 cf Primary=2.97 cfs 17,294 cf Secondary=0.00 cfs 0 cf Outflow=4.68 cfs 111,615 cf

Pond POND-2: Wet Basin 2 Peak Elev=80.98' Storage=8,406 cf Inflow=2.75 cfs 11,562 cf
Primary=0.08 cfs 9,024 cf Secondary=0.00 cfs 0 cf Outflow=0.08 cfs 9,024 cf

Total Runoff Area = 459,499 sf Runoff Volume = 161,221 cf Average Runoff Depth = 4.21"
56.51% Pervious = 259,679 sf 43.49% Impervious = 199,820 sf

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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment POST-1: Post Development Area 1

Runoff = 23.42 cfs @ 12.23 hrs, Volume= 111,615 cf, Depth= 6.29"

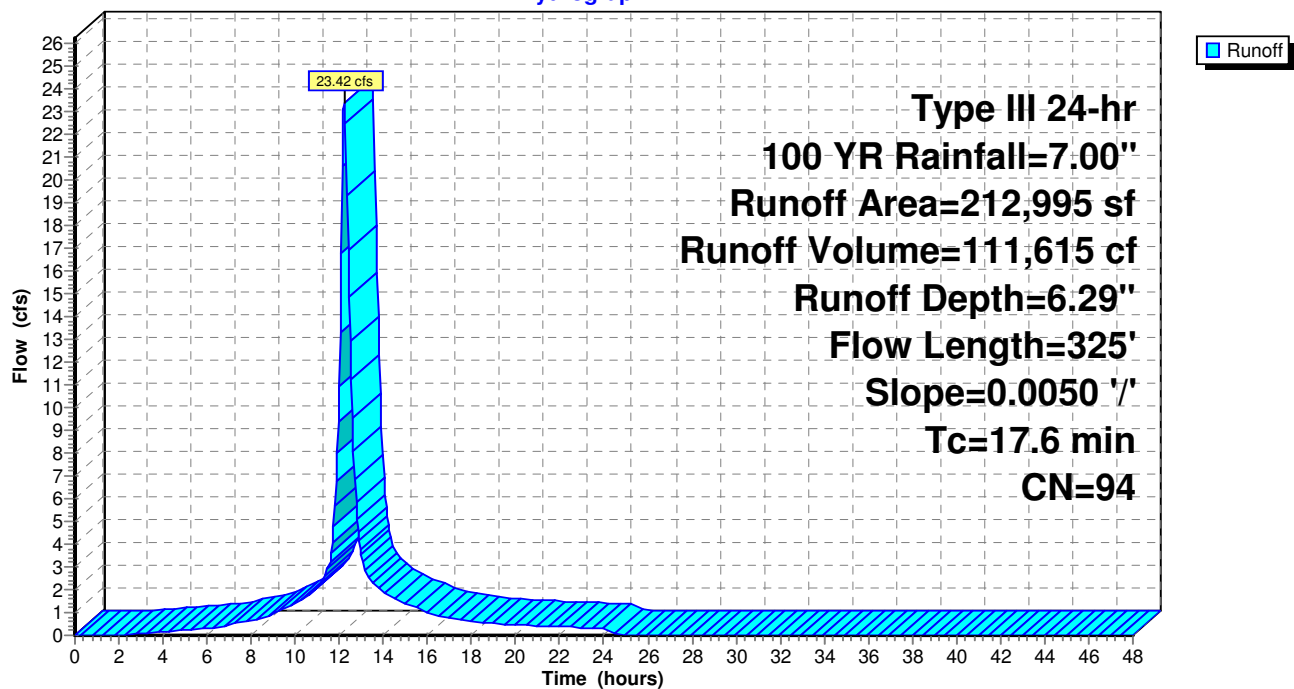
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
19,280	98	Roofs, HSG A
126,684	98	Roofs, HSG B
5,222	98	Paved parking, HSG B
6,964	98	Paved parking, HSG D
18,833	61	>75% Grass cover, Good, HSG B
7,124	80	>75% Grass cover, Good, HSG D
* 23,414	98	Water Surface, 0% imp, HSG B (Basin Bottom)
* 5,474	98	Water Surface, 0% imp, HSG D (Basin Bottom)
212,995	94	Weighted Average
54,845		25.75% Pervious Area
158,150		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
4.0	275	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.6	325	Total			

Subcatchment POST-1: Post Development Area 1

Hydrograph



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment POST-2: Post Development Area 2

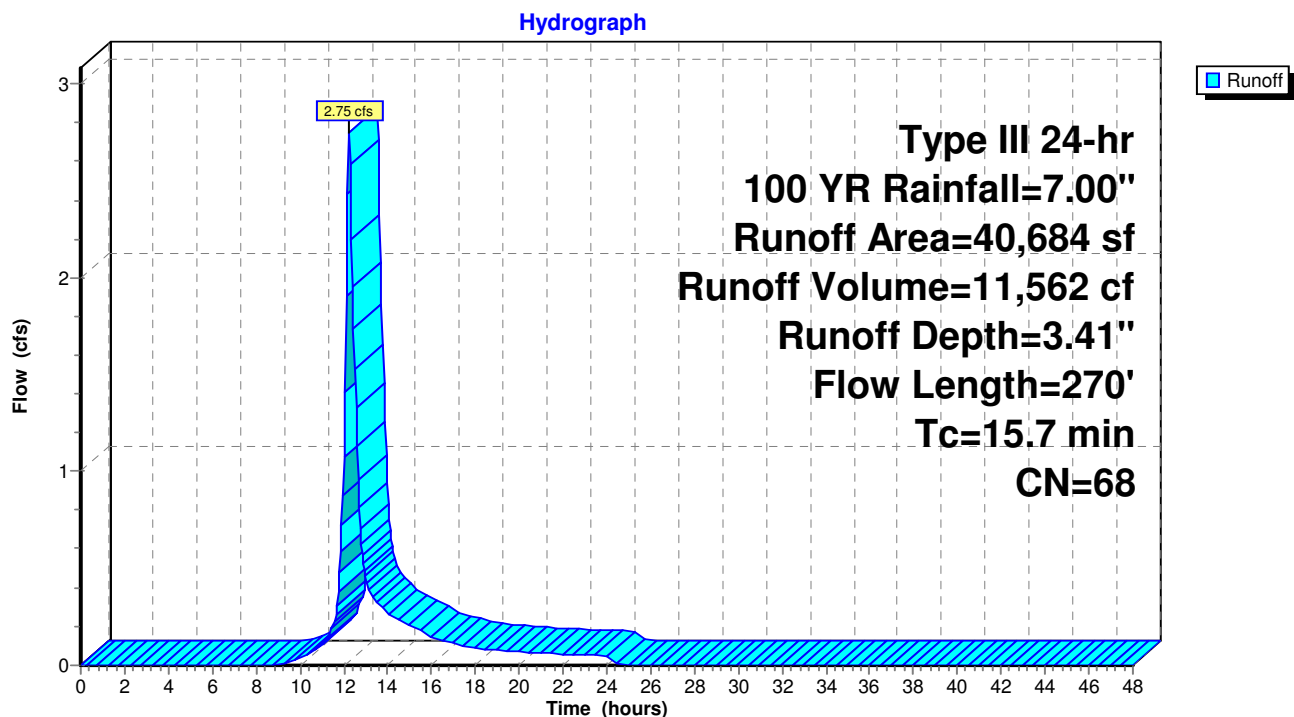
Runoff = 2.75 cfs @ 12.22 hrs, Volume= 11,562 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
10,044	98	Paved parking, HSG A
9,464	98	Paved parking, HSG B
20,139	39	>75% Grass cover, Good, HSG A
1,037	61	>75% Grass cover, Good, HSG B
40,684	68	Weighted Average
21,176		52.05% Pervious Area
19,508		47.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B Grass: Dense n= 0.240 P2= 3.50"
1.5	100	0.0050	1.14		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.3	40	0.0100	2.03		Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps
0.3	80	0.0100	4.54	3.56	Pipe Channel, D-E 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
15.7	270	Total			

Subcatchment POST-2: Post Development Area 2



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment POST-3: Post Development Area 3

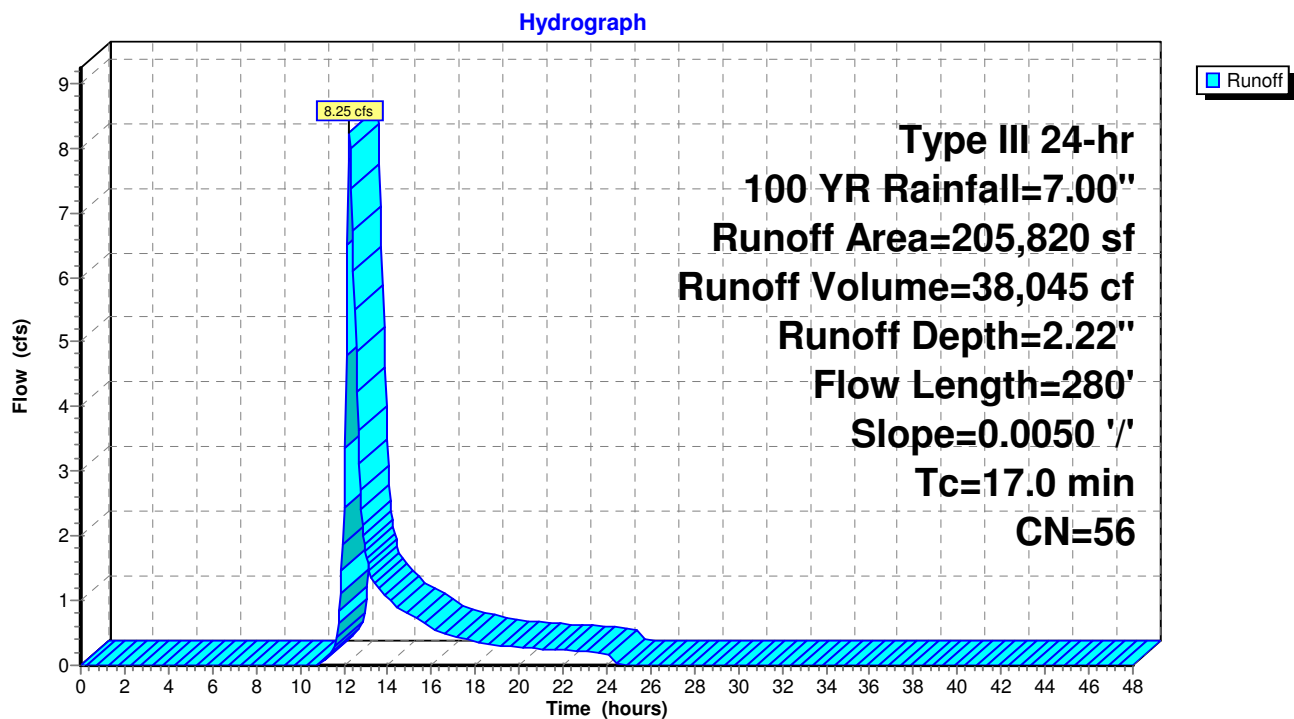
Runoff = 8.25 cfs @ 12.26 hrs, Volume= 38,045 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
56,448	30	Woods, Good, HSG A
49,002	55	Woods, Good, HSG B
11,545	77	Woods, Good, HSG D
20,666	39	>75% Grass cover, Good, HSG A
29,676	61	>75% Grass cover, Good, HSG B
1,640	76	Gravel roads, HSG A
14,681	85	Gravel roads, HSG B
11,877	98	Paved parking, HSG A
8,785	98	Paved parking, HSG B
1,500	98	Paved parking, HSG D
205,820	56	Weighted Average
183,658		89.23% Pervious Area
22,162		10.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	50	0.0050	0.06		Sheet Flow, A-B
					Grass: Dense n= 0.240 P2= 3.50"
3.4	230	0.0050	1.14		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
17.0	280	Total			

Subcatchment POST-3: Post Development Area 3



Summary for Pond AP-1: Off-Site Wetlands

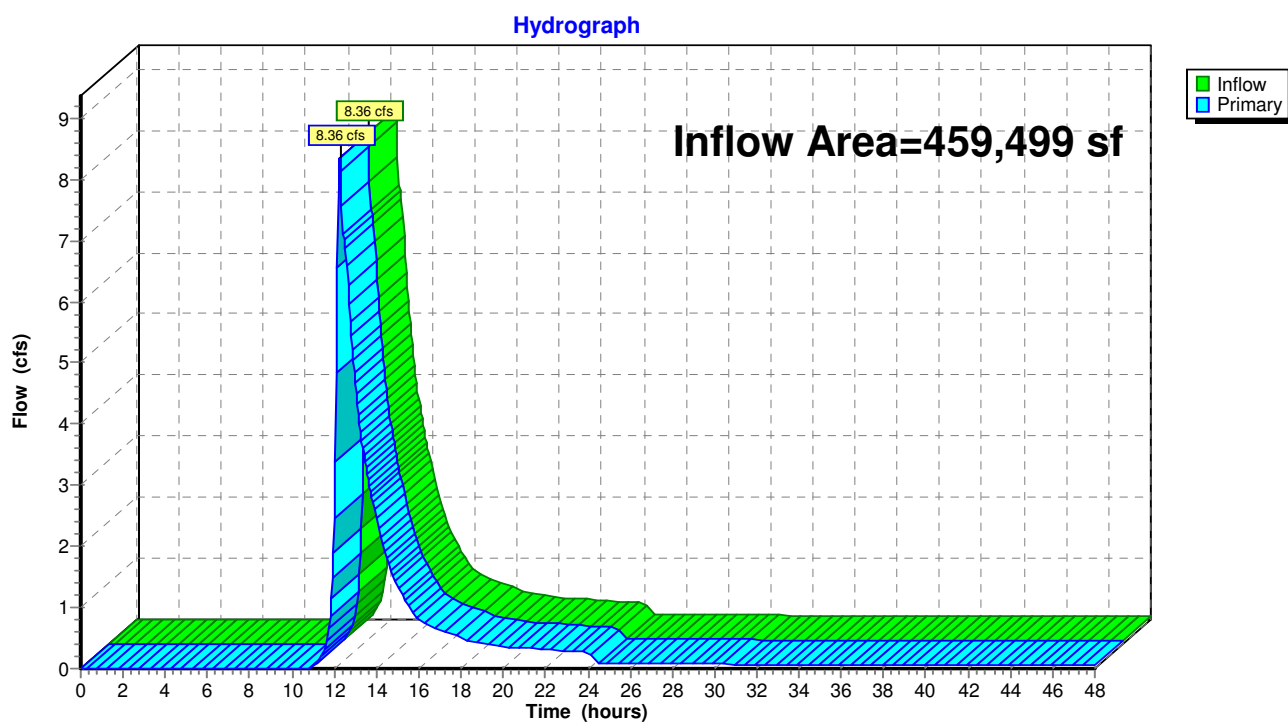
Analysis Point 1 is taken at the boundary of the wetlands surrounding the property which contribute flow to the cross culverts under Samuel Barnet Boulevard.

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 459,499 sf, 43.49% Impervious, Inflow Depth > 1.68" for 100 YR event
 Inflow = 8.36 cfs @ 12.26 hrs, Volume= 64,363 cf
 Primary = 8.36 cfs @ 12.26 hrs, Volume= 64,363 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Pond AP-1: Off-Site Wetlands



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Pond POND-1: Detention/Infiltration Basin 1

Inflow Area = 212,995 sf, 74.25% Impervious, Inflow Depth = 6.29" for 100 YR event
 Inflow = 23.42 cfs @ 12.23 hrs, Volume= 111,615 cf
 Outflow = 4.68 cfs @ 12.84 hrs, Volume= 111,615 cf, Atten= 80%, Lag= 36.5 min
 Discarded = 1.71 cfs @ 12.84 hrs, Volume= 94,320 cf
 Primary = 2.97 cfs @ 12.84 hrs, Volume= 17,294 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 82.76' @ 12.84 hrs Surf.Area= 30,679 sf Storage= 45,006 cf

Plug-Flow detention time= 166.2 min calculated for 111,498 cf (100% of inflow)
 Center-of-Mass det. time= 166.1 min (941.4 - 775.3)

Volume	Invert	Avail.Storage	Storage Description
#1	81.20'	85,136 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
81.20	27,043	0	0
82.00	28,888	22,372	22,372
83.00	31,245	30,067	52,439
84.00	34,150	32,698	85,136

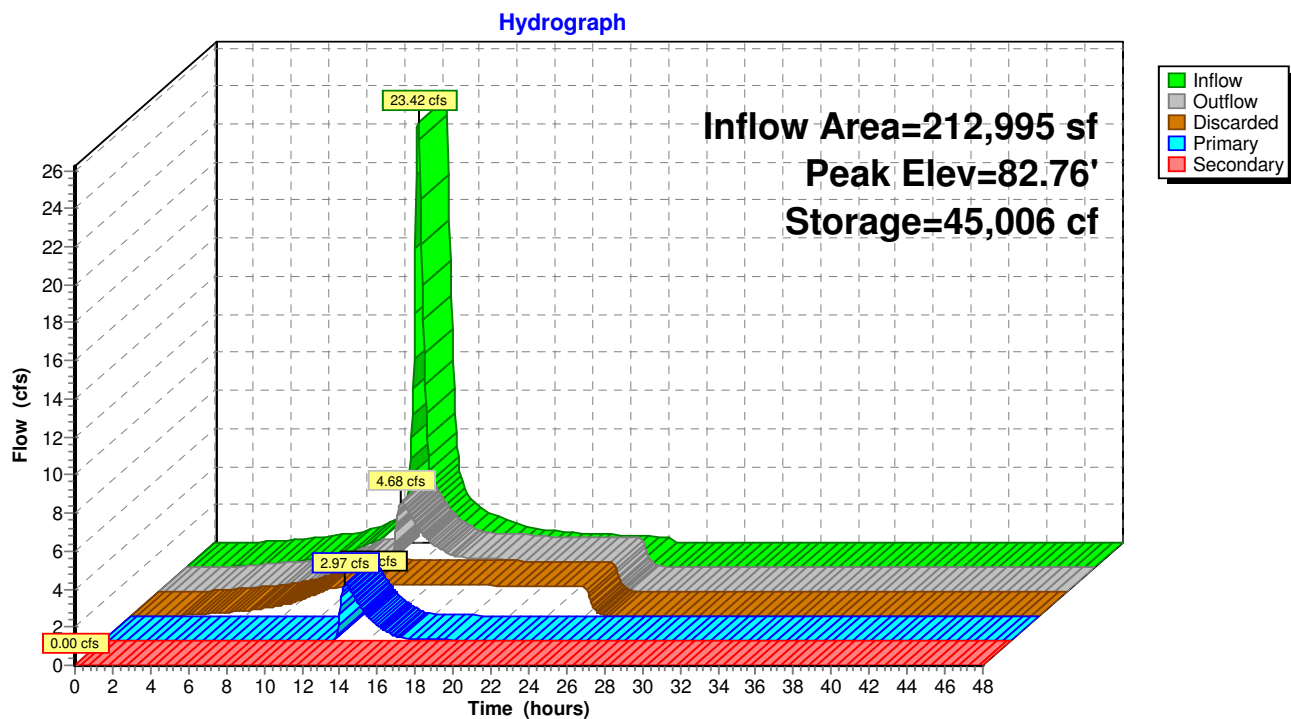
Device	Routing	Invert	Outlet Devices
#1	Primary	81.20'	12.0" Round Culvert L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 81.20' / 80.65' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	81.95'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.40'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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
#5	Discarded	81.20'	2.410 in/hr Exfiltration over Surface area Phase-In= 0.05'

Discarded OutFlow Max=1.71 cfs @ 12.84 hrs HW=82.76' (Free Discharge)
 ↑ **5=Exfiltration** (Exfiltration Controls 1.71 cfs)

Primary OutFlow Max=2.97 cfs @ 12.84 hrs HW=82.76' TW=0.00' (Dynamic Tailwater)
 ↑ **1=Culvert** (Passes 2.97 cfs of 3.70 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.20 cfs @ 3.98 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 2.77 cfs @ 1.96 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=81.20' TW=0.00' (Dynamic Tailwater)
 ↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-1: Detention/Infiltration Basin 1



2064-PostDevelopmentAnalysis-Update

Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Pond POND-2: Wet Basin 2

Inflow Area = 40,684 sf, 47.95% Impervious, Inflow Depth = 3.41" for 100 YR event
 Inflow = 2.75 cfs @ 12.22 hrs, Volume= 11,562 cf
 Outflow = 0.08 cfs @ 18.46 hrs, Volume= 9,024 cf, Atten= 97%, Lag= 374.6 min
 Primary = 0.08 cfs @ 18.46 hrs, Volume= 9,024 cf
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 80.98' @ 18.46 hrs Surf.Area= 5,105 sf Storage= 8,406 cf

Plug-Flow detention time= 944.2 min calculated for 9,014 cf (78% of inflow)

Center-of-Mass det. time= 862.0 min (1,706.3 - 844.3)

Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	28,790 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
79.00	3,428	0	0
80.00	4,248	3,838	3,838
81.00	5,125	4,687	8,525
82.00	6,058	5,592	14,116
83.00	7,371	6,715	20,831
84.00	8,548	7,960	28,790

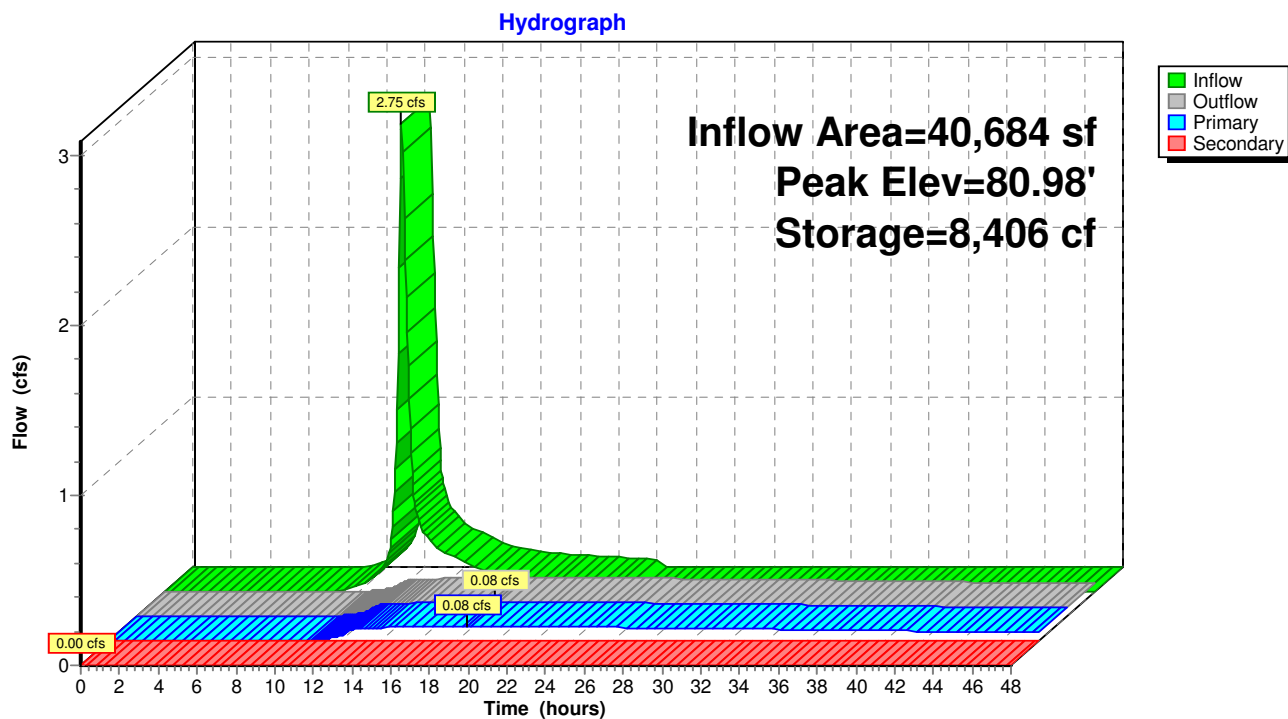
Device	Routing	Invert	Outlet Devices
#1	Primary	79.00'	12.0" Round Culvert L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 79.00' / 77.70' S= 0.0060 ' S= 0.0060 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	79.00'	1.5" Vert. Orifice/Grate C= 0.600
#3	Device 1	82.00'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Secondary	83.00'	15.0' 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=0.08 cfs @ 18.46 hrs HW=80.98' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.08 cfs of 3.31 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.08 cfs @ 6.66 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=79.00' TW=0.00' (Dynamic Tailwater)↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond POND-2: Wet Basin 2



Section 3

Supplemental Data

FIELD ENGINEERING, INC.

MATTAPOISETT, MA

WATER QUALITY VOLUME CALCULATIONS

Client:	RAW SEAFOODS	Job No.	2064
Project:	PROPOSED COLD STORAGE FACILITY	Date:	10/8/2015 Rev 10/21/15
Location:	SAMUEL BARNET BOULEVARD	Design by:	R. RICCIO

REQUIRED WATER QUALITY VOLUME-POST-1

UNIT VOLUME (in.) =	0.50
IMPERVIOUS AREA (s.f.) =	160,690
WATER QUALITY VOLUME (cu.ft.) =	6,695

AVAILABLE VOLUME CALCULATION (POND-1)

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
81.2	27,043.0	0.0	0.0	0.000
83.0	31,245.0	52,459.2	52,459.2	1.204

WATER QUALITY VOLUME PROVIDED =	52,459.2	1.204	
WATER QUALITY VOLUME REQUIRED =	6,695.4	0.154	OK

FIELD ENGINEERING, INC.

MATTAPOISETT, MA

RECHARGE VOLUME CALCULATIONS

Client:	RAW SEAFOODS	Job No.	2064
Project:	PROPOSED COLD STORAGE FACILITY	Date:	10/8/2015 Rev 10/21/15
Location:	SAMUEL BARNET BOULEVARD	Design by:	R. RICCIO

RECHARGE VOLUME CALCULATIONS

HYDROLOGIC SOIL GROUP	A
UNIT VOLUME (in.) =	0.60
IMPERVIOUS AREA (s.f.) =	41,201
RECHARGE VOLUME (cu.ft.) =	2,060

HYDROLOGIC SOIL GROUP	B
UNIT VOLUME (in.) =	0.35
IMPERVIOUS AREA (s.f.) =	149,855
RECHARGE VOLUME (cu.ft.) =	4,371

AVAILABLE VOLUME CALCULATION (POND-1)

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
81.2	27,043.0	0.0	0.0	0.000
81.95	28,772.0	20,930.6	20,930.6	0.481

RECHARGE VOLUME PROVIDED	20,930.6	0.481	
RECHARGE VOLUME REQUIRED	6,430.8	0.148	
ADJUSTED RECHARGE VOLUME REQUIRED*	7,646.0	0.176	OK

ADJUSTED RECHARGE VOLUME REQUIRED CALCULATED BASED ON RATIO OF
TOTAL IMPERVIOUS AREA TO IMPERVIOUS AREA DRAINING TO RECHARGE
FACILITY (BASIN 1) PER VOL 3, CH 1 OF MA STORMWATER HANDBOOK

DRAWDOWN TIME CALCULATION

DRAWDOWN TIME=(REQ.RECH. VOL.)/(DES. INFILTRATION RATE "K"*BOTTOM AREA)

RECHARGE VOLUME PROVIDED (CF)=	20,930.6	
DESIGN INFILTRATION RATE (IN/HR)=	2.4	
BOTTOM AREA(SF)=	27,043.0	
DRAWDOWN TIME (HRS)=	3.9	OK

FIELD ENGINEERING, INC.

TAUNTON, MA

SEDIMENT FOREBAY SIZING CALCULATION

Client:	RAW SEAFOODS	Job No.	2064
Project:	PROPOSED COLD STORAGE FACILITY	Date:	10/8/2015 Rev 10/21/15
Location:	SAMUEL BARNET BOULEVARD	Design by:	R. RICCIO

REQUIRED SEDIMENT FOREBAY SIZING-DETENTION BASIN 1

TOTAL CONTRIBUTING AREA (acre) = 4.94

MINIMUM FOREBAY SIZE (in. per acre) = 0.10

FOREBAY REQUIRED CAPACITY (cu. ft.) = 1,793

AVAILABLE VOLUME CALCULATION- FOREBAY 1

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
81.2	661.0	0.0	0.0	0.000
83.0	1,265.0	1,733.4	1,733.4	0.040

AVAILABLE VOLUME CALCULATION-FOREBAY 2

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
81.2	439.0	0.0	0.0	0.000
83.0	937.0	1,238.4	1,238.4	0.028

FOREBAY VOLUME PROVIDED	2,971.8	0.068	
FOREBAY VOLUME REQUIRED	1,793.2	0.041	OK

Location Address or Lot No. Samuel Barnet Boulevard, New Bedford, MA (Map 163 Lot 33)

On-site Review

Deep Hole Number: TP#1 Date: 10/19/15 Time: 11:00 am Weather: Sunny, 45°F

Location (Identify on site plan): See site location plan

Land Use: Industrial Slope (%): <1% Surface Stones: Present

Vegetation: Woods

Landform: Terrace

Position on Landscape (sketch on the back): See site location plan

Distances from:

Open Water Body: >100 Feet Drainage way: >100 Feet

Possible Wet Area: 70 Feet Property Line: >10 Feet

Drinking Water Well: >100 Feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-5	O	Organic/ Leaf Litter			Friable
5-8	A	Sandy Loam	10YR 2/2		Friable
8-13	B ₁	Sandy Loam	2.5Y 6/2		
13-22	B ₂	Sandy Loam	10YR 5/6		
22-33	C ₁	Loamy Sand	2.5Y 5/5	@30"	Gravelly, Firm
33-72	C ₂	Loamy Sand	2.5Y 5/4		Med.-Coarse, Gravelly

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciofluvial Deposits Depth to Bedrock: N/E

Depth to Groundwater: Standing Water in the Hole N/E Weeping from Pit Face: N/E

Estimated Seasonal High Ground Water: 30" (Mottles)

Location Address or Lot No. Samuel Barnet Boulevard, New Bedford, MA (Map 163 Lot 33)

On-site Review

Deep Hole Number: TP#2 Date: 10/19/15 Time: 11:45 am Weather: Sunny, 45°F

Location (Identify on site plan): See site location plan

Land Use: Industrial Slope (%): <1% Surface Stones: Present

Vegetation: Woods

Landform: Terrace

Position on Landscape (sketch on the back): See site location plan

Distances from:

Open Water Body: >100 Feet Drainage way: >100 Feet

Possible Wet Area: 90 Feet Property Line: >10 Feet

Drinking Water Well: >100 Feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-5	O	Organic/ Leaf Litter			Friable
5-8	A	Sandy Loam	10YR 2/2		Friable
8-11	B ₁	Sandy Loam	2.5Y 6/2		
11-20	B ₂	Sandy Loam	10YR 5/6		
20-30	C ₁	Loamy Sand	2.5Y 5/5		Gravelly, Firm
30-80	C ₂	Loamy Sand	2.5Y 5/4	@33"	Med-Coarse, Gravelly

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciofluvial Deposits Depth to Bedrock: N/E

Depth to Groundwater: Standing Water in the Hole N/E Weeping from Pit Face: N/E

Estimated Seasonal High Ground Water: 33" (Mottles)

Location Address or Lot No. Samuel Barnet Boulevard, New Bedford, MA (Map 163 Lot 33)

On-site Review

Deep Hole Number: TP#3 Date: 10/19/15 Time: 12:30 pm Weather: Sunny, 45°F

Location (Identify on site plan): See site location plan

Land Use: Industrial Slope (%): <1% Surface Stones: Present

Vegetation: Woods

Landform: Outwash Plain

Position on Landscape (sketch on the back): See site location plan

Distances from:

Open Water Body: >100 Feet Drainage way: 80 Feet

Possible Wet Area: >100 Feet Property Line: >10 Feet

Drinking Water Well: >100 Feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-4	O	Organic/ Leaf Litter			Friable
4-7	A	Sandy Loam	10YR 2/2		Friable
7-18	B	Sandy Loam	10YR 5/6		
18-28	C ₁	Loamy Sand	2.5Y 5/5	@30"	Gravelly, Firm
28-80	C ₂	Loamy Sand	2.5Y 5/4		Med.-Coarse, Gravelly

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Eolian over Glaciofluvial Deposits Depth to Bedrock: N/E

Depth to Groundwater: Standing Water in the Hole 80" Weeping from Pit Face: 78"

Estimated Seasonal High Ground Water: 40" (Mottles)

Location Address or Lot No. Samuel Barnet Boulevard, New Bedford, MA (Map 163 Lot 33)

On-site Review

Deep Hole Number: TP#4 Date: 10/19/15 Time: 1:30 pm Weather: Sunny, 45°F

Location (Identify on site plan): See site location plan

Land Use: Industrial Slope (%): <1% Surface Stones: Present

Vegetation: Woods

Landform: Outwash Plain

Position on Landscape (sketch on the back): See site location plan

Distances from:

Open Water Body: >100 Feet Drainage way: 90 Feet

Possible Wet Area: >100 Feet Property Line: >10 Feet

Drinking Water Well: >100 Feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-2	O	Organic/ Leaf Litter			Friable
2-4	A	Sandy Loam	10YR 2/2		Friable
4-18	B	Sandy Loam	10YR 5/6		
18-34	C ₁	Loamy Sand	2.5Y 5/5		Firm
34-83	C ₂	Loamy Sand	2.5Y 5/4	@37"	Med.

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Eolian over Glaciofluvial Deposits Depth to Bedrock: N/E

Depth to Groundwater: Standing Water in the Hole 64" Weeping from Pit Face: 60"

Estimated Seasonal High Ground Water: 37" (Mottles)

Location Address or Lot No. Samuel Barnet Boulevard, New Bedford, MA (Map 163 Lot 33)

On-site Review

Deep Hole Number: TP#5 Date: 10/19/15 Time: 2:30 pm Weather: Sunny, 45°F

Location (Identify on site plan): See site location plan

Land Use: Industrial Slope (%): <1% Surface Stones: Present

Vegetation: Woods

Landform: Outwash Plain

Position on Landscape (sketch on the back): See site location plan

Distances from:

Open Water Body: >100 Feet Drainage way: >100 Feet

Possible Wet Area: >100 Feet Property Line: >10 Feet

Drinking Water Well: >100 Feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-2	O	Organic/ Leaf Litter			Friable
2-4	A	Sandy Loam	10YR 2/2		Friable
4-24	B	Sandy Loam	10YR 5/6		
24-32	C ₁	Loamy Sand	2.5Y 5/5		Gravelly, Firm
32-86	C ₂	Loamy Sand	2.5Y 5/4	@42"	Med.-Coarse, Gravelly

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Eolian over Glaciofluvial Deposits Depth to Bedrock: N/E

Depth to Groundwater: Standing Water in the Hole 68" Weeping from Pit Face: 62"

Estimated Seasonal High Ground Water: 42" (Mottles)

Appendix A

Revised Post Development Watershed Plan

Drawn By RMS	Designed By JCC/RRR	Checked By RMF
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Issued For

PERMITTING

PROPOSED SITE DEVELOPMENT
RAW SEAFOODS

SAMUEL BARNET BOULEVARD
NEW BEDFORD, MASSACHUSETTS

Drawing Title	
POST DEVELOPMENT WATERSHED PLAN	
Project No. 2064	Sheet 1 OF 1

