

MidAtlantic Engineering Partners

September 26, 2019

Project #EEQ-191

Revised: December 5, 2019

Stormwater Management Narrative

Harrison Yards

Block 133; Lot 1.03 & 1.05

Town of Harrison, Hudson County, New Jersey

Introduction

The proposed project is the second phase of Harrison Yards which consists of the construction of two mixed-use buildings comprising of a total of 898 units, associated parking and stormwater management measures. Building 1 consists of 26 stories containing residential apartments, hotel rooms, retail/commercial space, a covered driveway and automated parking. Building 2 consists of 17 stories containing residential apartments, retail/commercial space, a Sports Hub and automated parking. The site was previously fully developed with several masonry industrial buildings and parking with 100% impervious coverage, with the improvements having been recently demolished. The site is located along Frank E. Rodgers Boulevard across from Angelo Cifelli Drive, which intersects the center of the property. The site contains a total of +/- 424,000 SF (9.73 acres).

Stormwater Management Summary

The NJDEP rules regarding stormwater management, N.J.A.C. 7:8-5.2(a), states that stormwater management measures for a major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards. N.J.A.C. 7:8-1.2 defines a major development as any development that disturbs one or more acres of land or increases impervious surface by one-quarter acre or more. The project area contains 9.73 acres, all of which is pre-existing impervious/disturbed area. The proposed improvements consist of a total of 8.08 acres of impervious area, a decrease of +/-1.65 acres. The proposed disturbance for the site is 9.73 acres, however, since the pre-existing site is fully developed and disturbed, there will be no new disturbance. Since the proposed improvements do not create any new disturbance and decrease the total impervious area for the site, the NJDEP standards for groundwater recharge, stormwater quantity and stormwater quality do not apply.

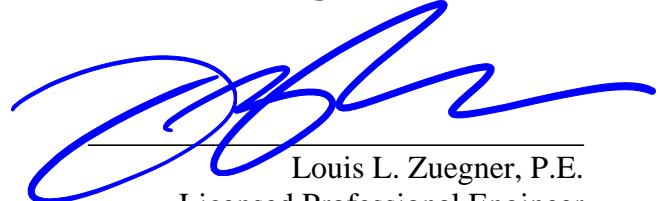
The majority of runoff from the existing site is conveyed to Frank E. Rodgers Boulevard where it is collected by existing catch basins located in the street that connect to an existing combined storm/sanitary sewer system. The proposed improvements will maintain the same general drainage patterns that previously existed. Runoff from the proposed parking areas will be conveyed to a proposed on-site piped stormwater conveyance system consisting of 15, 18, 24, 30 and 36" reinforced concrete pipes designed to accommodate flows for the 10-year storm event. The proposed system connects to the recently installed separate drainage system located in Angelo Cifelli Drive. Roof runoff is directed to downspouts which connect to the proposed stormwater collection system. Pipe calculations are provided in Appendix B. The table below provides a summary of the pre and post-development peak runoff rates for the project area:

Storm Event (Years)	Pre-Dev Runoff (cfs)	Post-Dev Runoff (cfs)
2	27.45	25.52
10	41.93	40.18
100	69.68	68.24

Conclusion

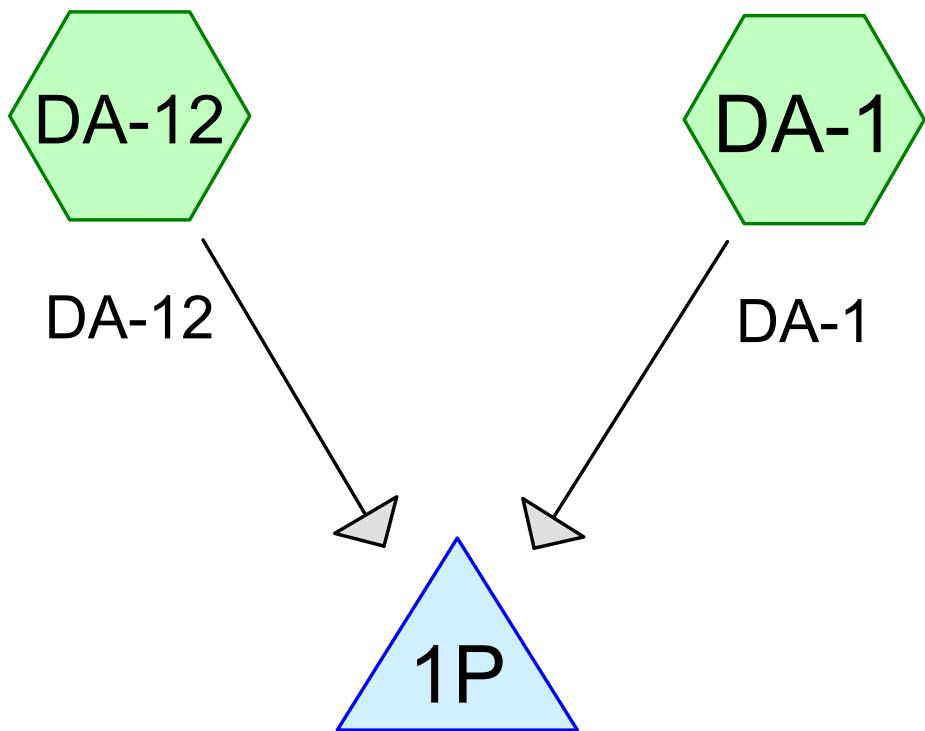
The proposed improvements will maintain the existing drainage patterns in the post-developed condition. Runoff rates are not increased, as the pre-existing site is 100% impervious. The erosion control methods used will ensure the proposed project will not have a negative impact to the surrounding area or downstream drainage system. The post developed site conditions will provide for soil stability and proper management of stormwater runoff. By decreasing the total impervious area on the site and not creating any new disturbance, the NJDEP standards for groundwater recharge, stormwater quantity and stormwater quality do not apply.

MidAtlantic Engineering Partners

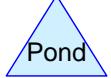
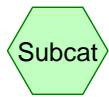


Louis L. Zuegner, P.E.
Licensed Professional Engineer
NJ License No. G.E.04226500

Appendix A – Pre and Post-Development Runoff Calculations



Total



Routing Diagram for Pre Dev Analysis

Prepared by {enter your company name here}, Printed 8/7/2019
HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2 year Rainfall=3.31"

Printed 8/7/2019

Summary for Subcatchment DA-1: DA-1

Runoff = 2.23 cfs @ 12.13 hrs, Volume= 0.203 af, Depth= 3.08"

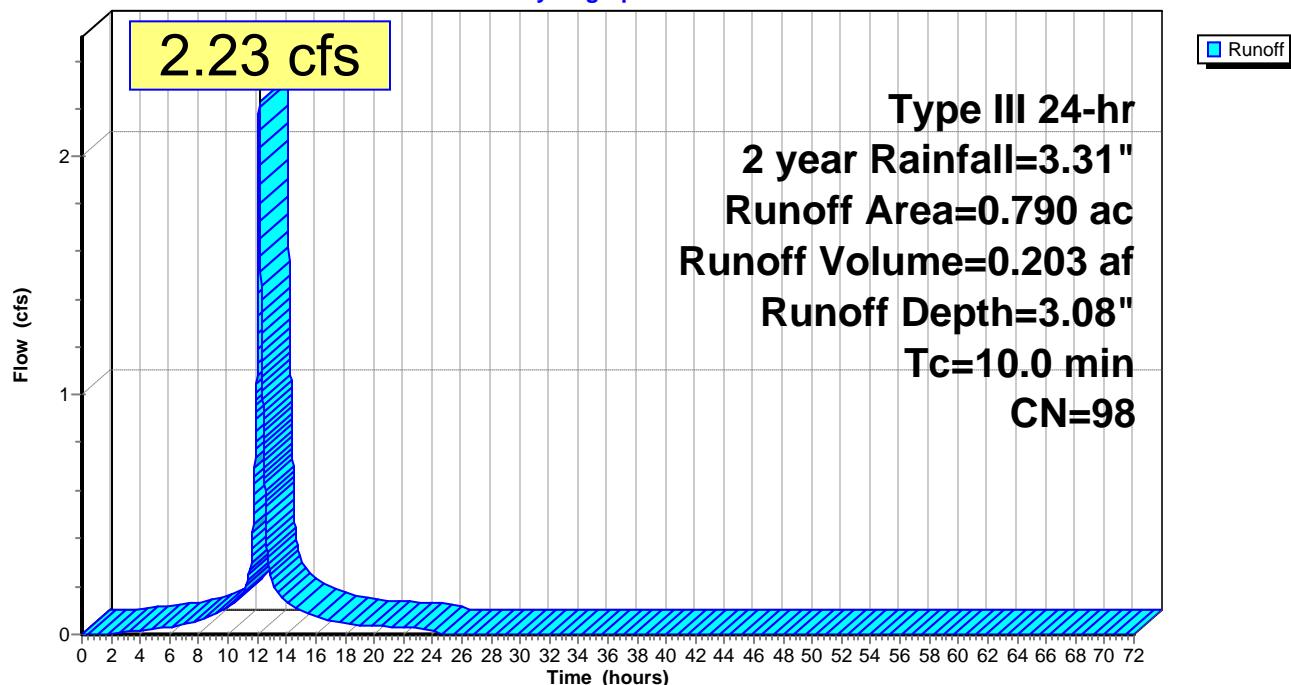
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.31"

Area (ac)	CN	Description
0.790	98	>75% Grass cover, Good, HSG D
0.790		100.00% Impervious Area

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

Subcatchment DA-1: DA-1

Hydrograph



Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2 year Rainfall=3.31"

Printed 8/7/2019

Summary for Subcatchment DA-12: DA-12

Runoff = 25.22 cfs @ 12.13 hrs, Volume= 2.292 af, Depth= 3.08"

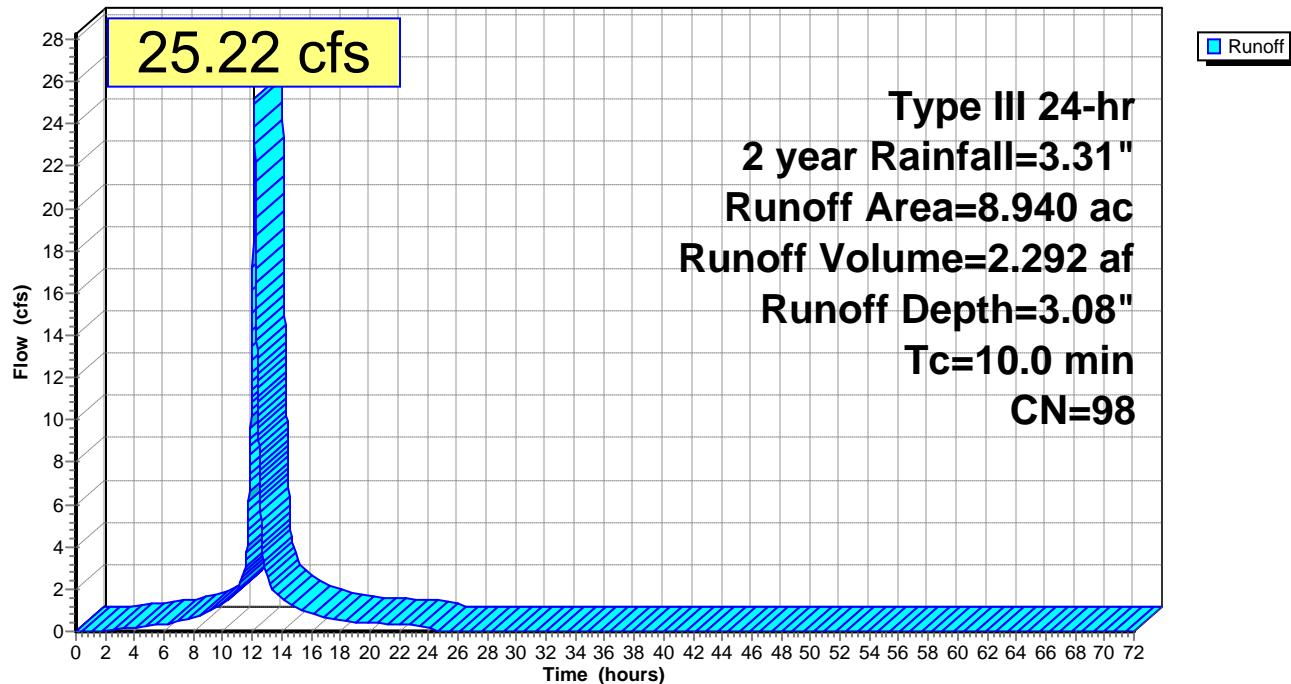
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.31"

Area (ac)	CN	Description
8.940	98	Paved parking, HSG D
8.940		100.00% Impervious Area

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

Subcatchment DA-12: DA-12

Hydrograph



Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2 year Rainfall=3.31"

Printed 8/7/2019

Summary for Pond 1P: Total

Inflow Area = 9.730 ac, 100.00% Impervious, Inflow Depth = 3.08" for 2 year event

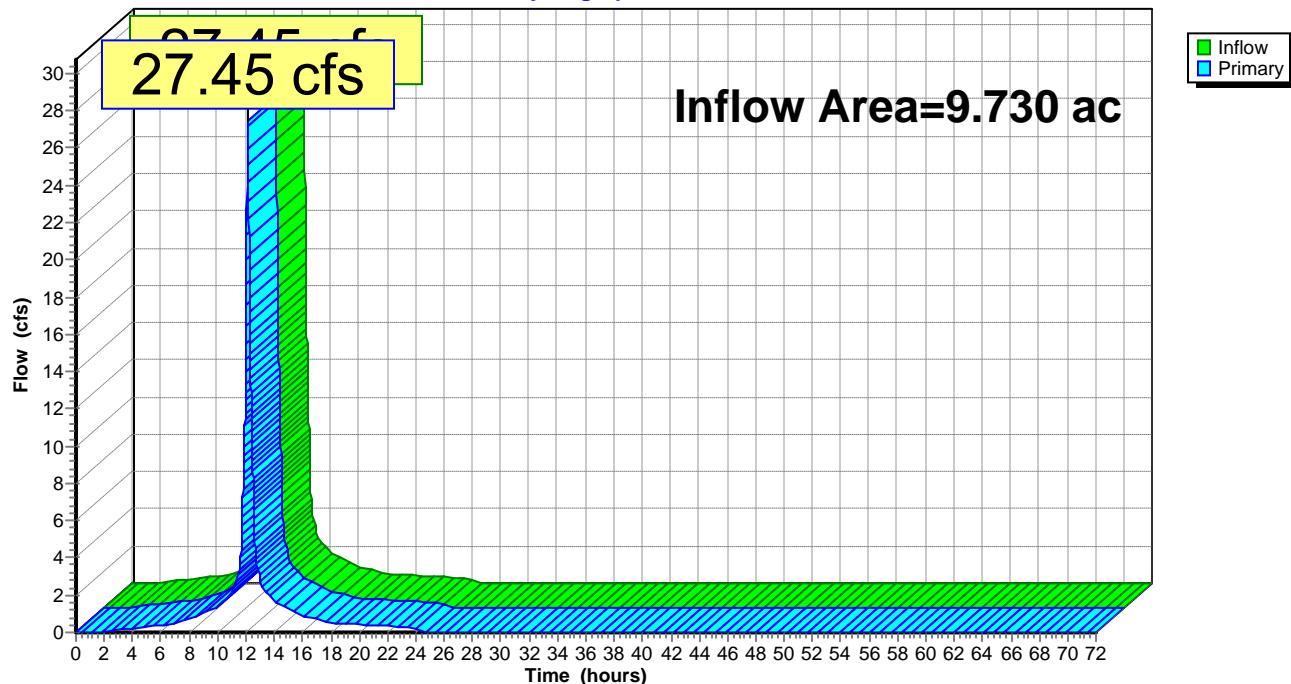
Inflow = 27.45 cfs @ 12.13 hrs, Volume= 2.495 af

Primary = 27.45 cfs @ 12.13 hrs, Volume= 2.495 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Total

Hydrograph



Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 10 year Rainfall=5.02"

Printed 8/7/2019

Summary for Subcatchment DA-1: DA-1

Runoff = 3.40 cfs @ 12.13 hrs, Volume= 0.315 af, Depth= 4.78"

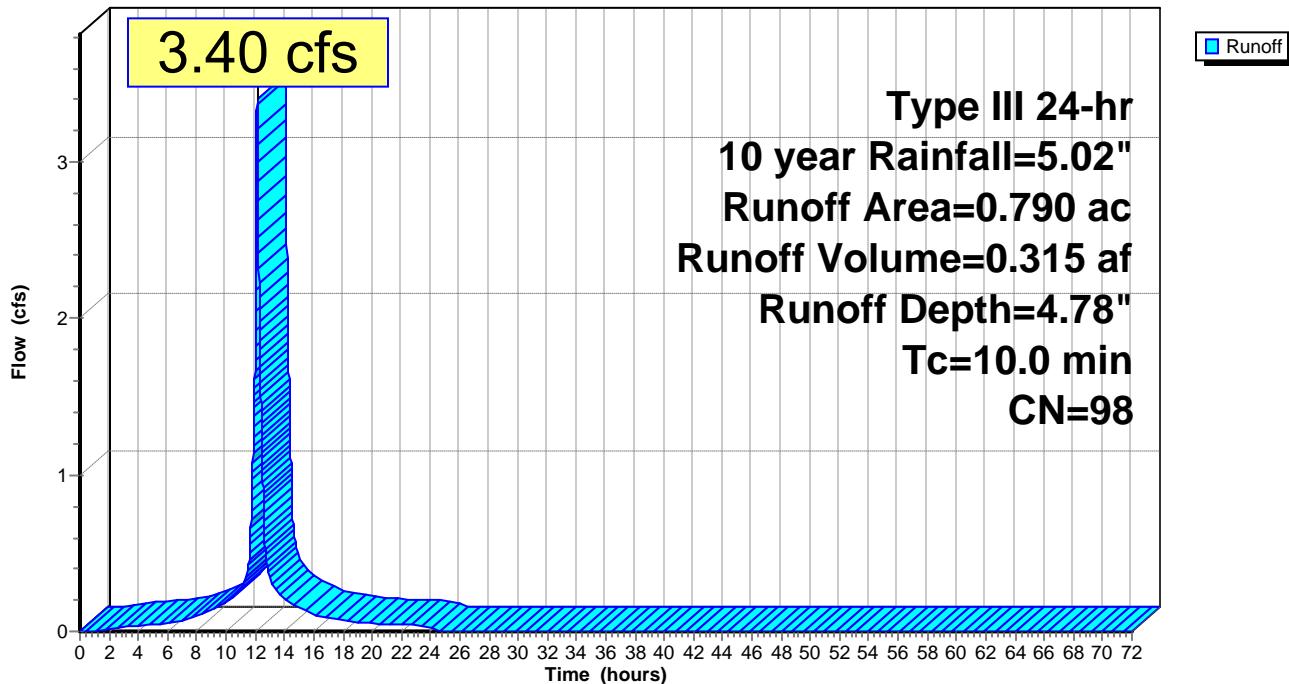
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.02"

Area (ac)	CN	Description
0.790	98	>75% Grass cover, Good, HSG D
0.790		100.00% Impervious Area

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

Subcatchment DA-1: DA-1

Hydrograph



Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 10 year Rainfall=5.02"

Printed 8/7/2019

Summary for Subcatchment DA-12: DA-12

Runoff = 38.53 cfs @ 12.13 hrs, Volume= 3.563 af, Depth= 4.78"

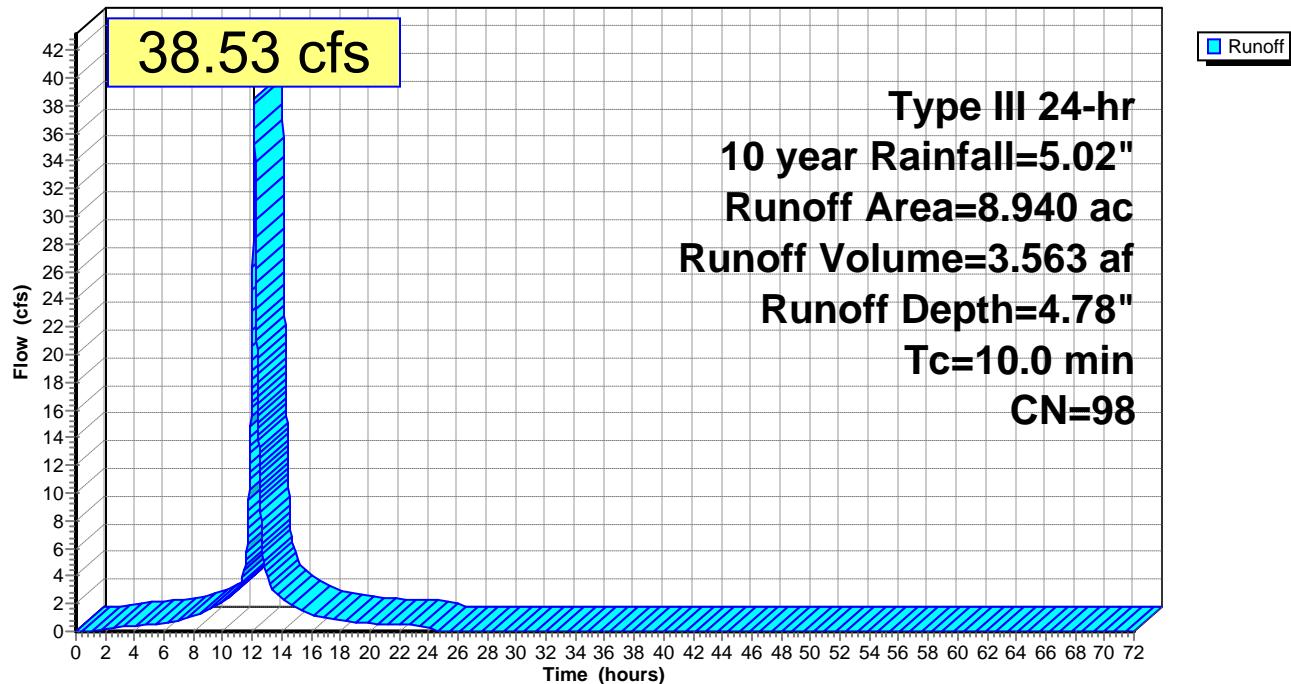
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.02"

Area (ac)	CN	Description
8.940	98	Paved parking, HSG D
8.940		100.00% Impervious Area

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

Subcatchment DA-12: DA-12

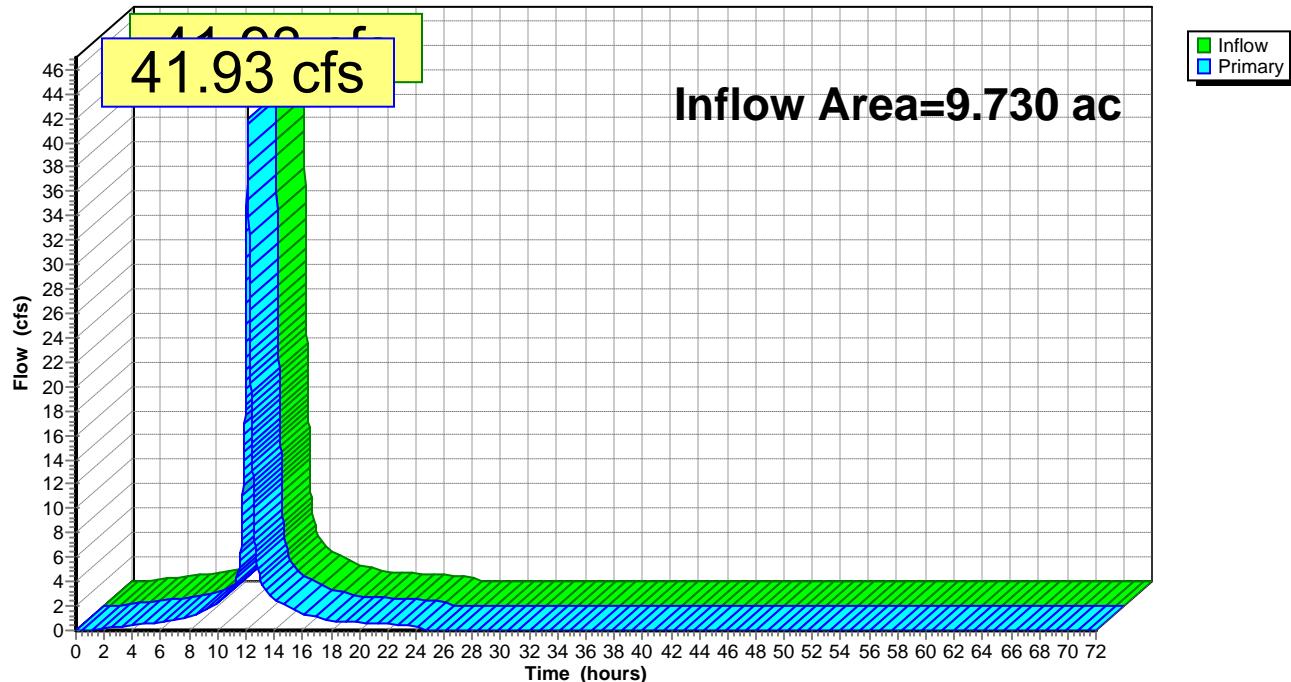
Hydrograph



Summary for Pond 1P: Total

Inflow Area = 9.730 ac, 100.00% Impervious, Inflow Depth = 4.78" for 10 year event
Inflow = 41.93 cfs @ 12.13 hrs, Volume= 3.878 af
Primary = 41.93 cfs @ 12.13 hrs, Volume= 3.878 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Total**Hydrograph**

Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 100 year Rainfall=8.31"

Printed 8/7/2019

Summary for Subcatchment DA-1: DA-1

Runoff = 5.66 cfs @ 12.13 hrs, Volume= 0.531 af, Depth= 8.07"

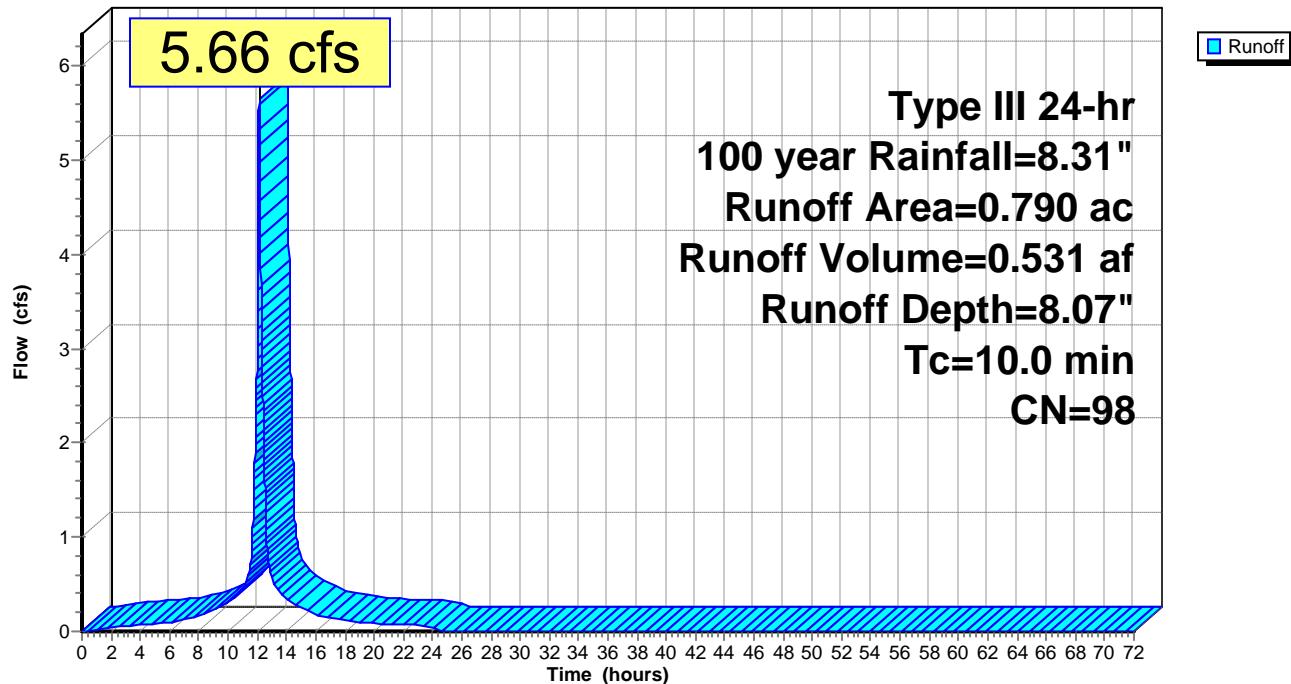
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.31"

Area (ac)	CN	Description
0.790	98	>75% Grass cover, Good, HSG D
0.790		100.00% Impervious Area

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

Subcatchment DA-1: DA-1

Hydrograph



Pre Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 100 year Rainfall=8.31"

Printed 8/7/2019

Summary for Subcatchment DA-12: DA-12

Runoff = 64.02 cfs @ 12.13 hrs, Volume= 6.012 af, Depth= 8.07"

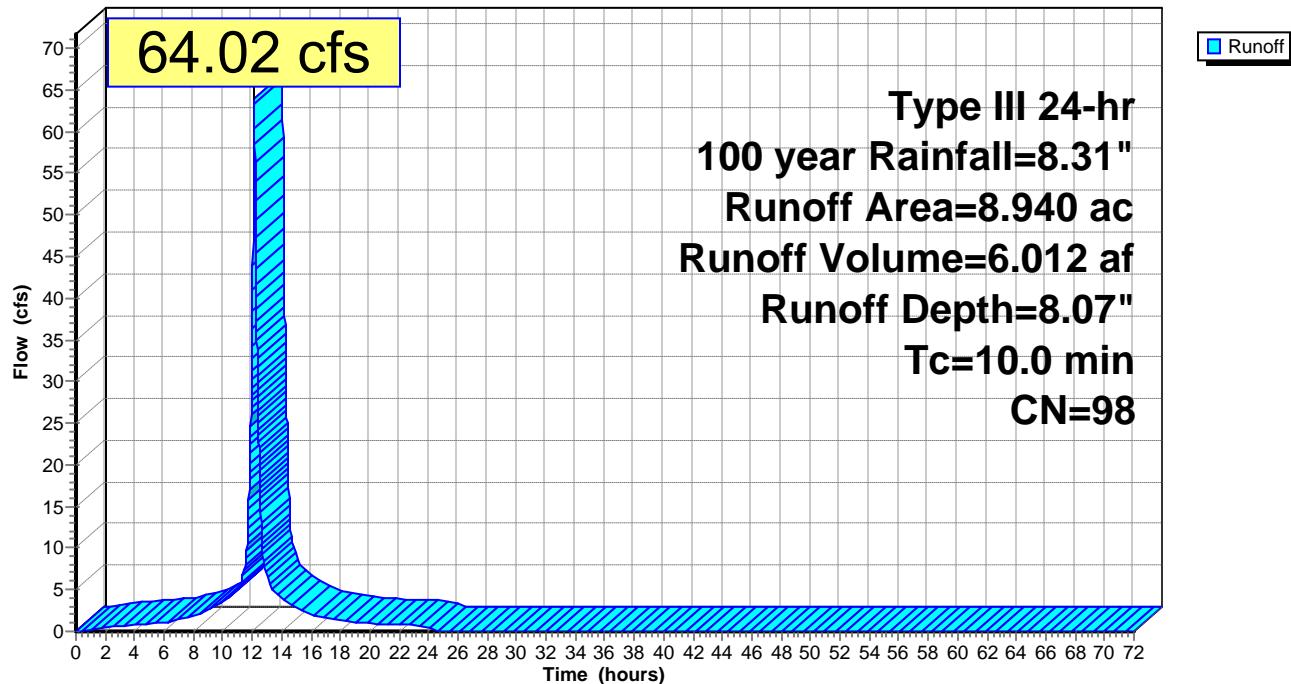
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.31"

Area (ac)	CN	Description
8.940	98	Paved parking, HSG D
8.940		100.00% Impervious Area

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

Subcatchment DA-12: DA-12

Hydrograph



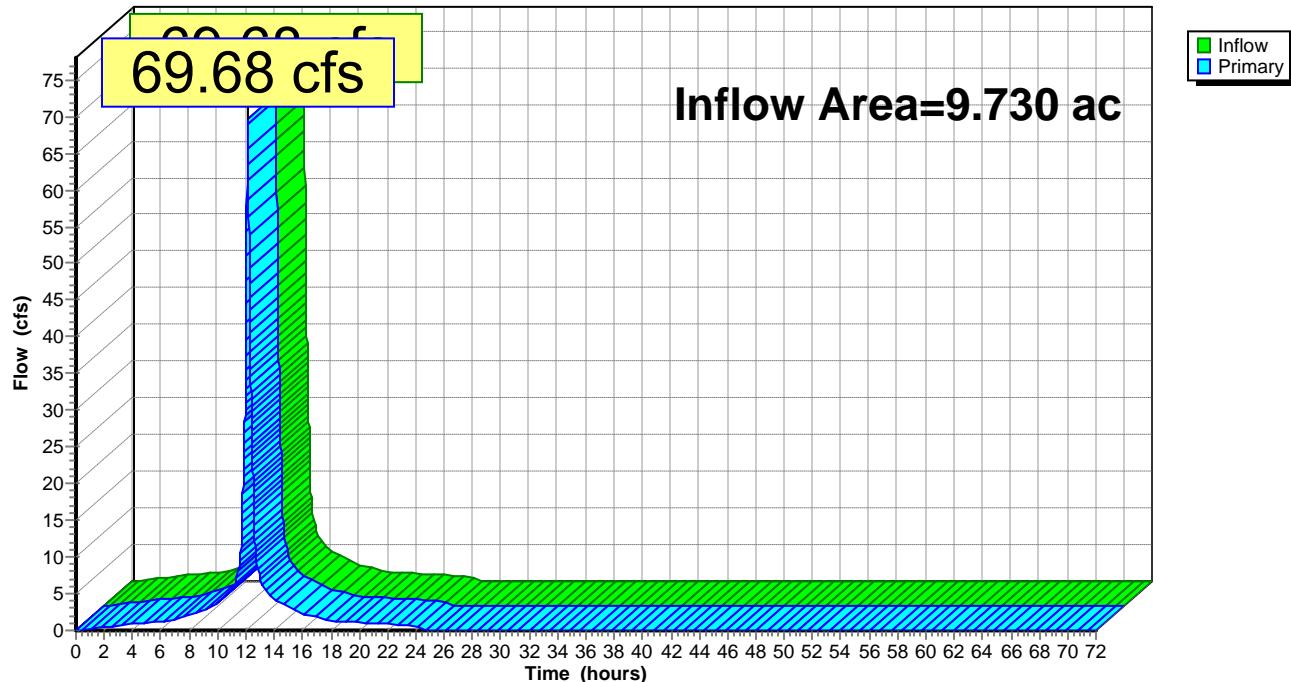
Summary for Pond 1P: Total

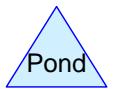
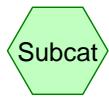
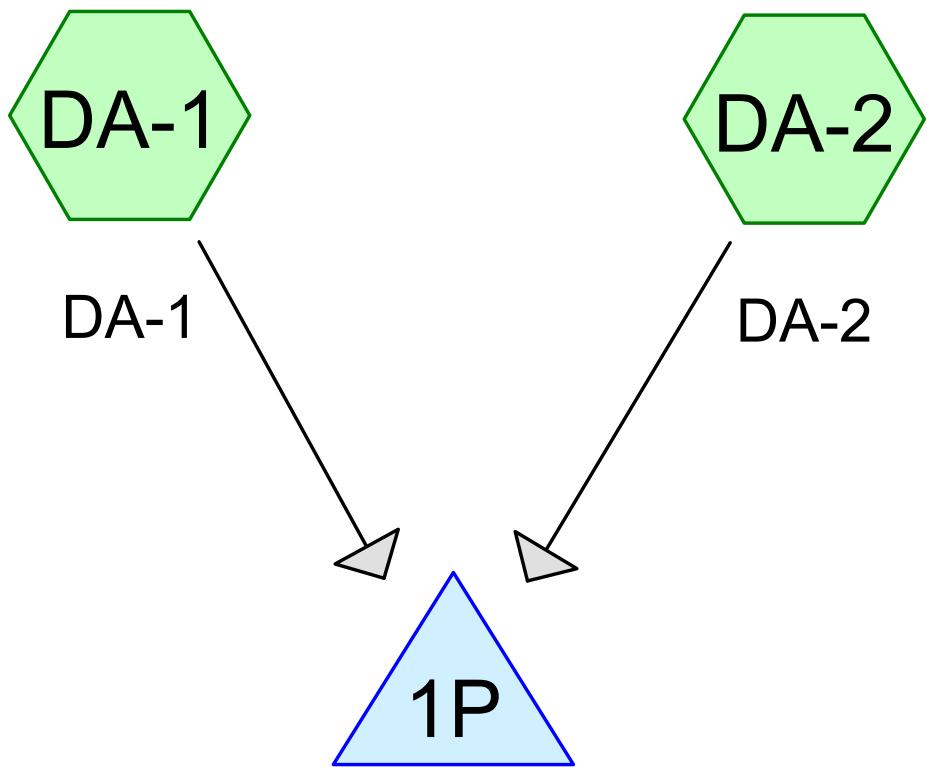
Inflow Area = 9.730 ac, 100.00% Impervious, Inflow Depth = 8.07" for 100 year event

Inflow = 69.68 cfs @ 12.13 hrs, Volume= 6.543 af

Primary = 69.68 cfs @ 12.13 hrs, Volume= 6.543 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Total**Hydrograph**



Routing Diagram for Post Dev Analysis

Prepared by {enter your company name here}, Printed 9/12/2019
HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Post Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 2 year Rainfall=3.31"

Printed 9/12/2019

Page 2

Summary for Subcatchment DA-1: DA-1

Runoff = 24.26 cfs @ 12.13 hrs, Volume= 2.117 af, Depth= 2.86"

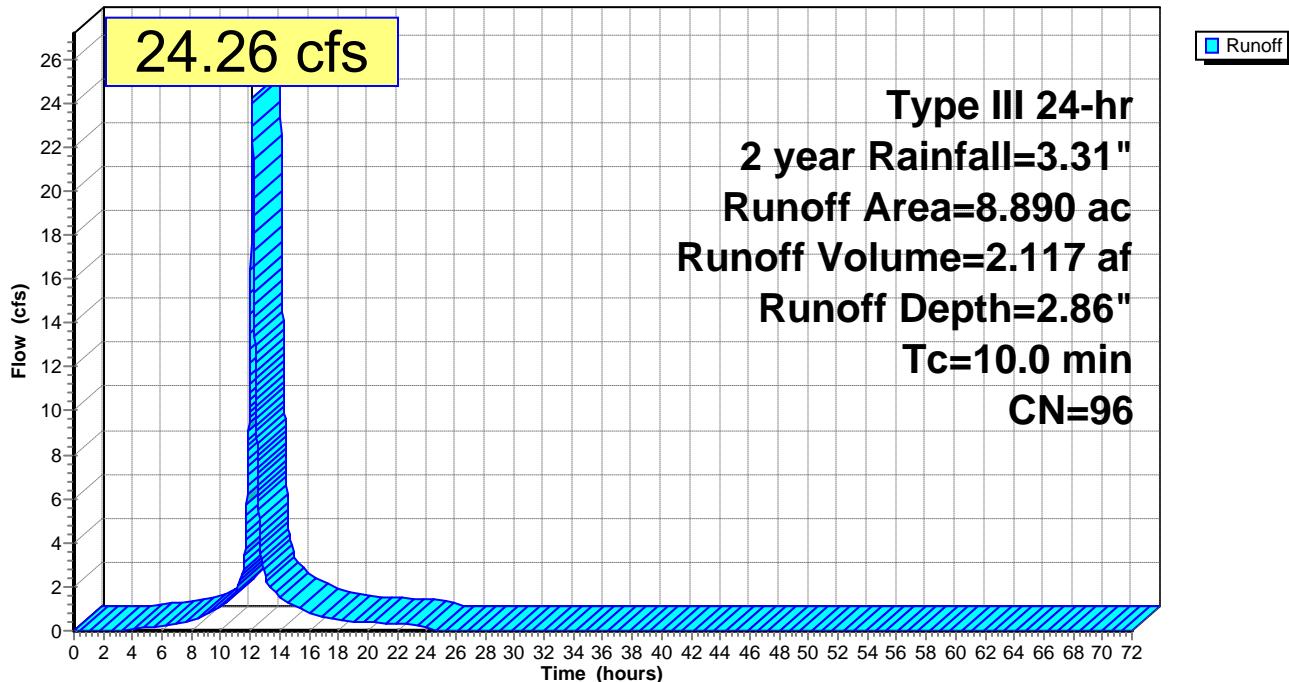
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.31"

Area (ac)	CN	Description
8.080	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
8.890	96	Weighted Average
0.810		9.11% Pervious Area
8.080		90.89% Impervious Area

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

Subcatchment DA-1: DA-1

Hydrograph



Summary for Subcatchment DA-2: DA-2

Runoff = 1.27 cfs @ 12.14 hrs, Volume= 0.104 af, Depth= 1.49"

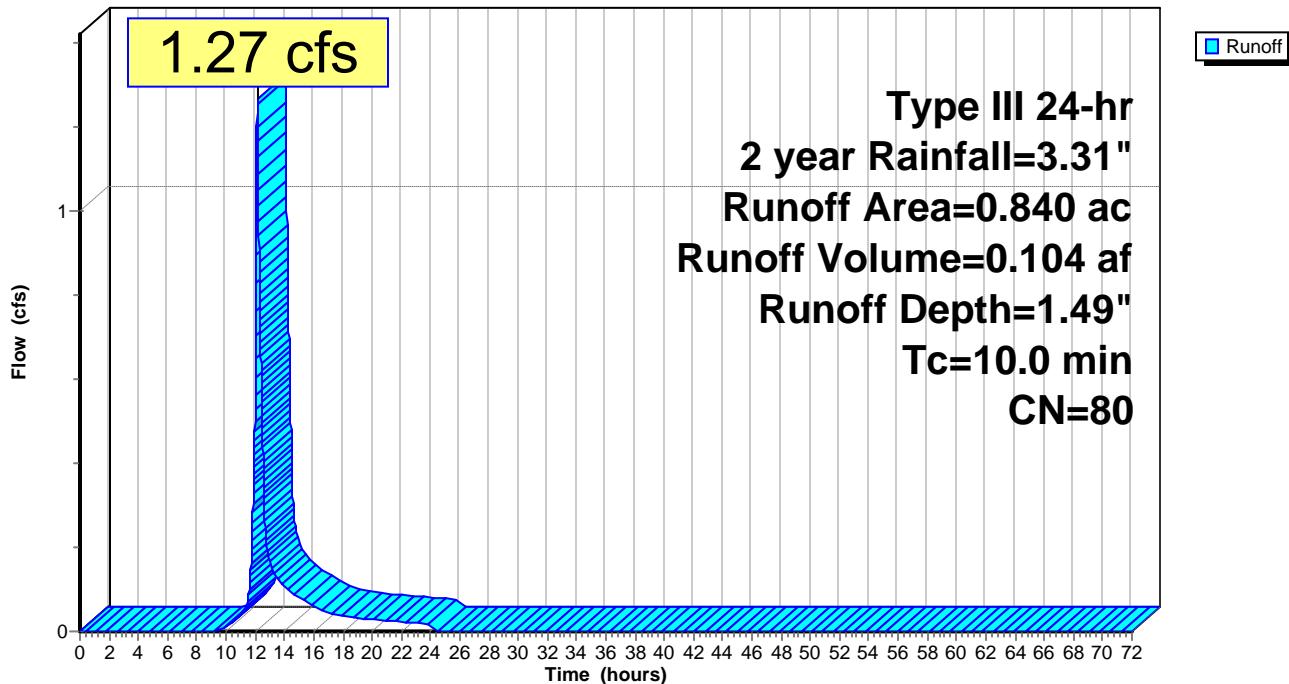
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.31"

Area (ac)	CN	Description
0.840	80	>75% Grass cover, Good, HSG D
0.840		100.00% Pervious Area

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

Subcatchment DA-2: DA-2

Hydrograph



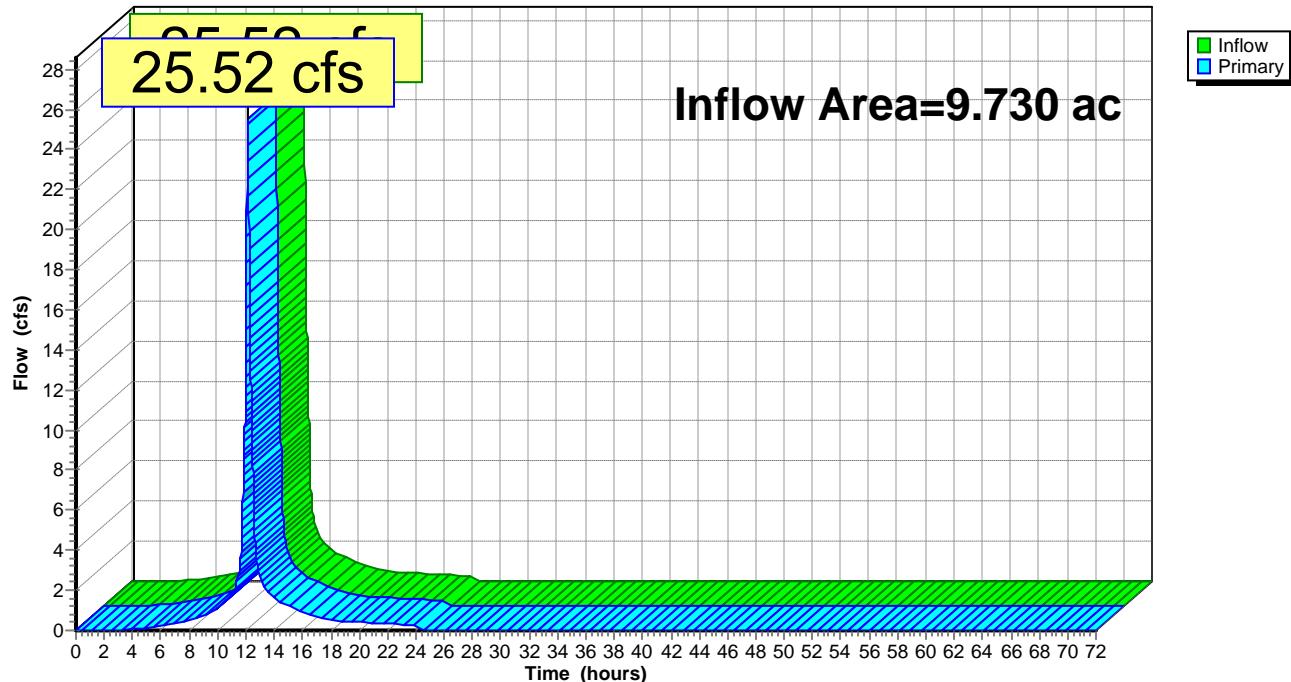
Summary for Pond 1P: Total

Inflow Area = 9.730 ac, 83.04% Impervious, Inflow Depth = 2.74" for 2 year event

Inflow = 25.52 cfs @ 12.14 hrs, Volume= 2.221 af

Primary = 25.52 cfs @ 12.14 hrs, Volume= 2.221 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Total**Hydrograph**

Summary for Subcatchment DA-1: DA-1

Runoff = 37.69 cfs @ 12.13 hrs, Volume= 3.373 af, Depth= 4.55"

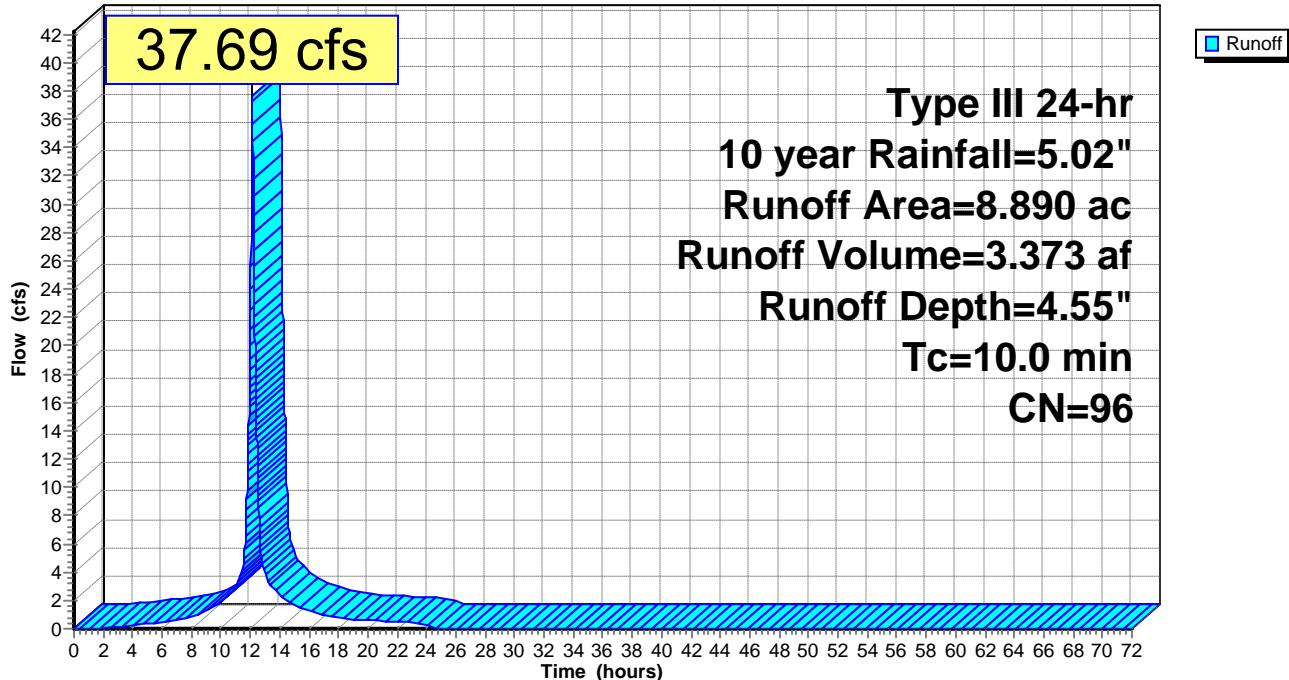
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.02"

Area (ac)	CN	Description
8.080	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
8.890	96	Weighted Average
0.810		9.11% Pervious Area
8.080		90.89% Impervious Area

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

Subcatchment DA-1: DA-1

Hydrograph



Summary for Subcatchment DA-2: DA-2

Runoff = 2.50 cfs @ 12.14 hrs, Volume= 0.204 af, Depth= 2.91"

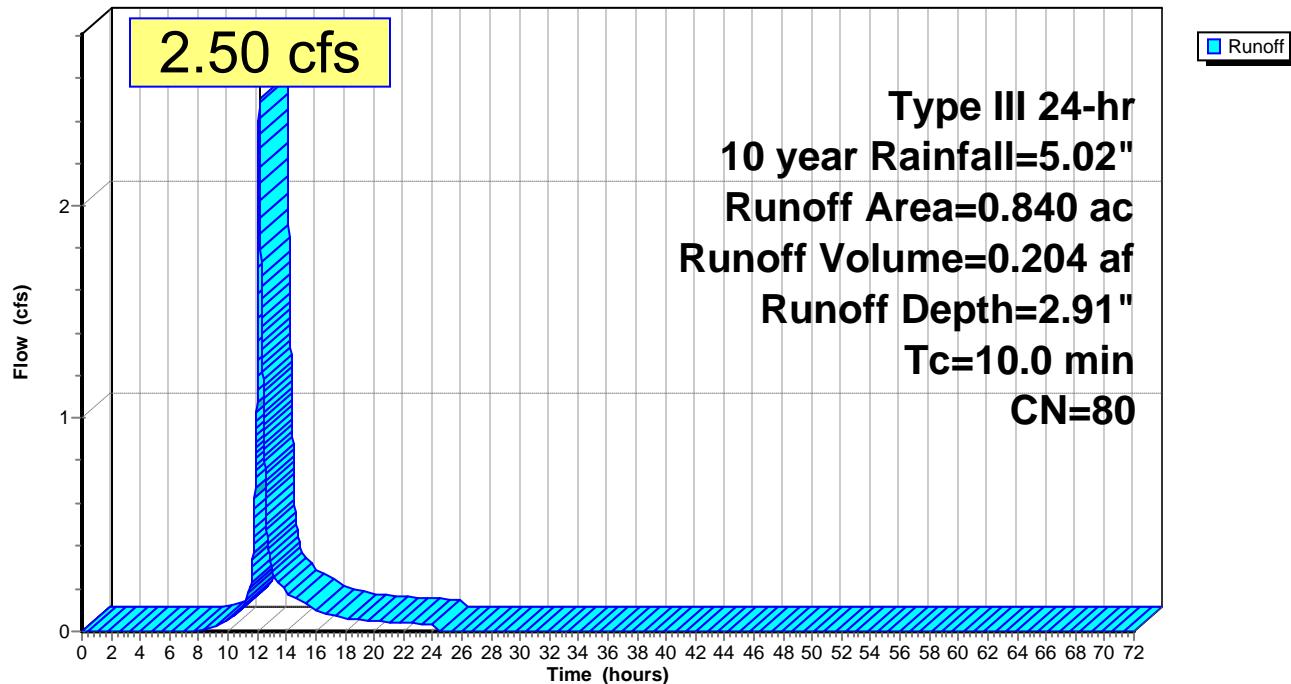
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=5.02"

Area (ac)	CN	Description
0.840	80	>75% Grass cover, Good, HSG D
0.840		100.00% Pervious Area

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

Subcatchment DA-2: DA-2

Hydrograph



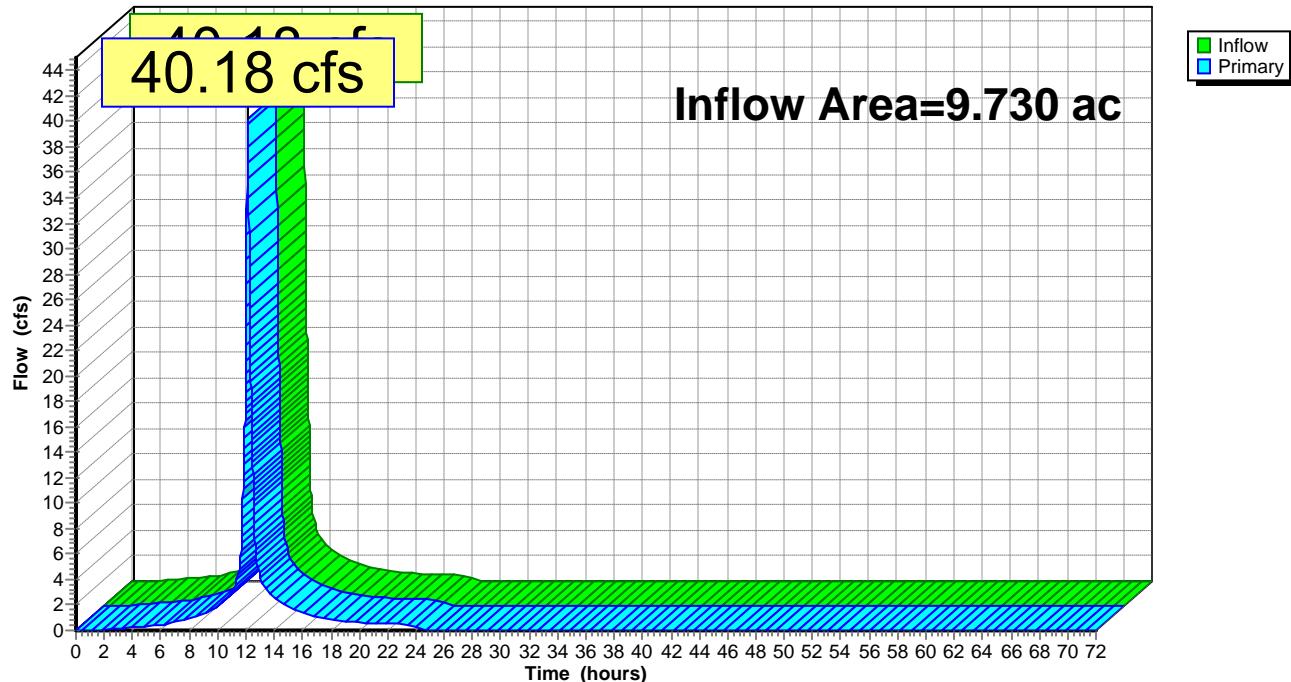
Summary for Pond 1P: Total

Inflow Area = 9.730 ac, 83.04% Impervious, Inflow Depth = 4.41" for 10 year event

Inflow = 40.18 cfs @ 12.13 hrs, Volume= 3.576 af

Primary = 40.18 cfs @ 12.13 hrs, Volume= 3.576 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Total**Hydrograph**

Post Dev Analysis

Prepared by {enter your company name here}

HydroCAD® 10.00-20 s/n 07360 © 2017 HydroCAD Software Solutions LLC

Type III 24-hr 100 year Rainfall=8.31"

Printed 9/12/2019

Page 14

Summary for Subcatchment DA-1: DA-1

Runoff = 63.24 cfs @ 12.13 hrs, Volume= 5.801 af, Depth= 7.83"

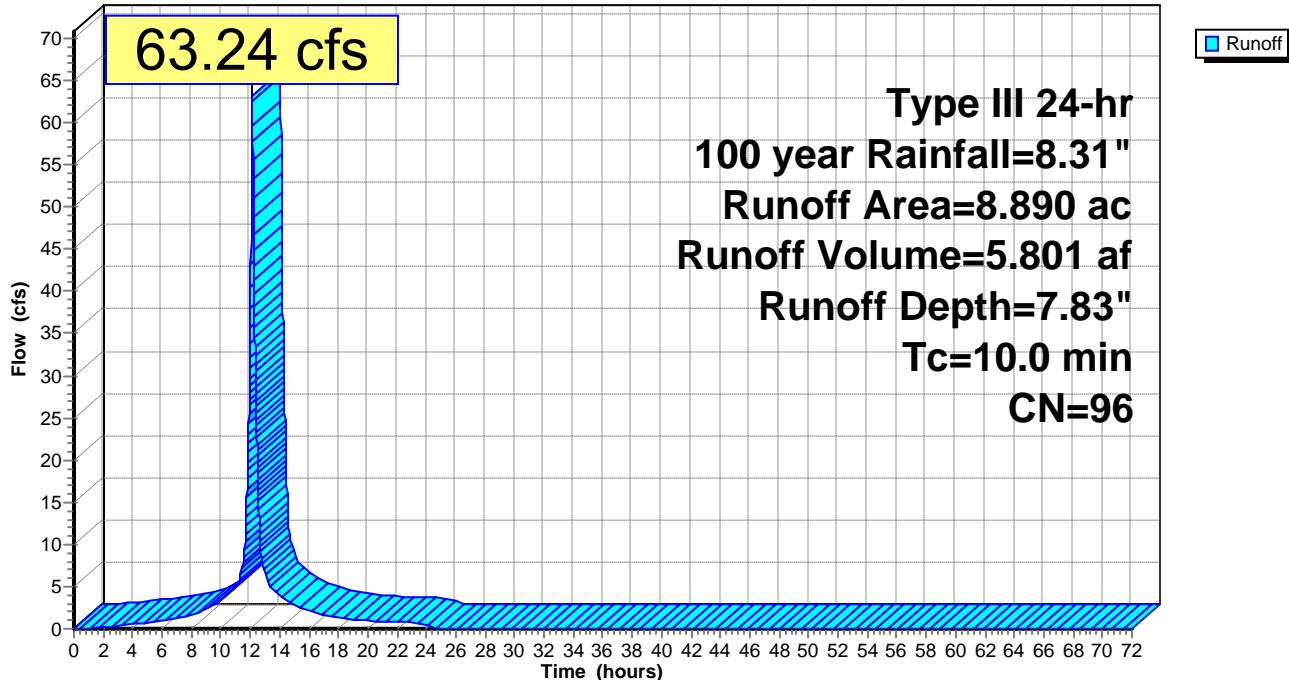
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.31"

Area (ac)	CN	Description
8.080	98	Paved parking, HSG D
0.810	80	>75% Grass cover, Good, HSG D
8.890	96	Weighted Average
0.810		9.11% Pervious Area
8.080		90.89% Impervious Area

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

Subcatchment DA-1: DA-1

Hydrograph



Summary for Subcatchment DA-2: DA-2

Runoff = 5.01 cfs @ 12.14 hrs, Volume= 0.414 af, Depth= 5.92"

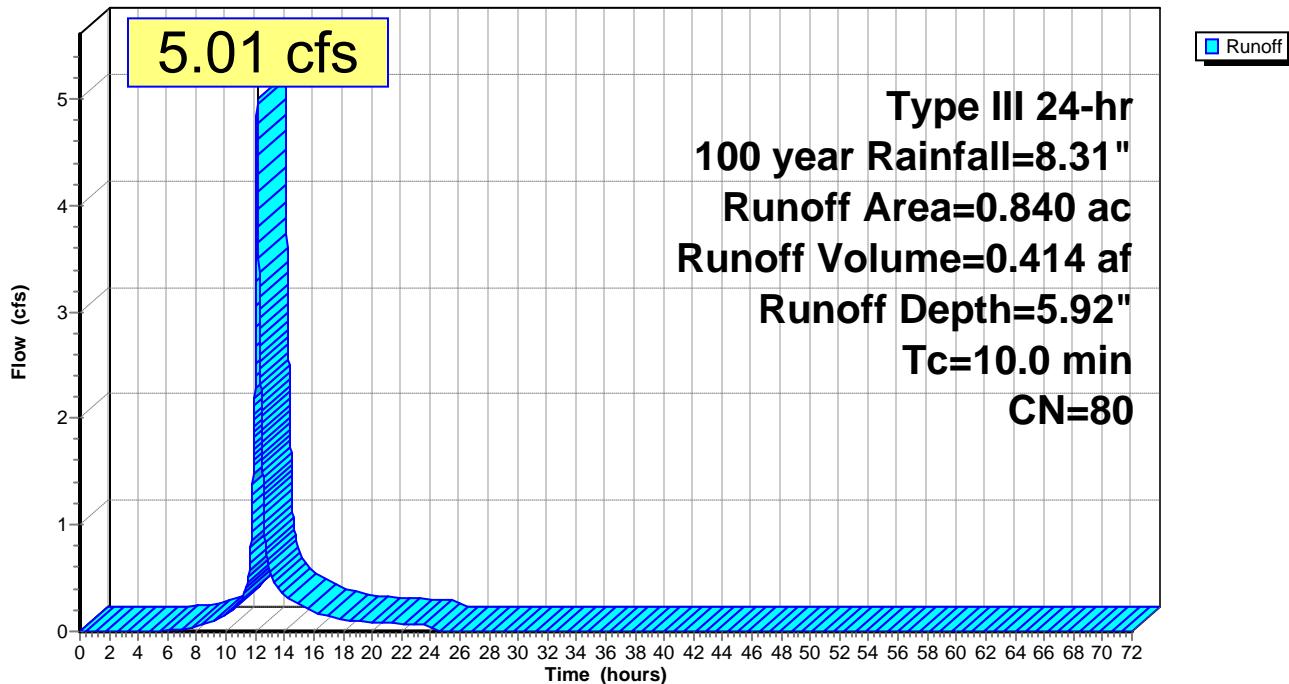
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.31"

Area (ac)	CN	Description
0.840	80	>75% Grass cover, Good, HSG D
0.840		100.00% Pervious Area

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

Subcatchment DA-2: DA-2

Hydrograph



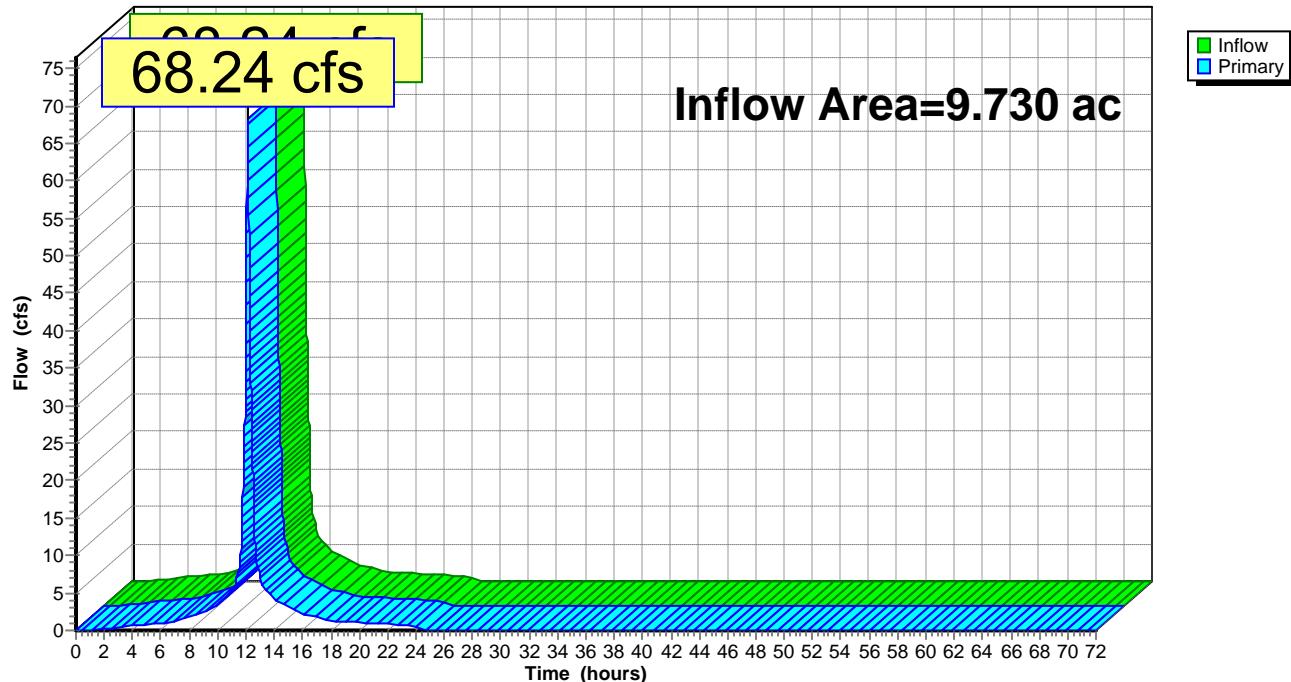
Summary for Pond 1P: Total

Inflow Area = 9.730 ac, 83.04% Impervious, Inflow Depth = 7.66" for 100 year event

Inflow = 68.24 cfs @ 12.13 hrs, Volume= 6.215 af

Primary = 68.24 cfs @ 12.13 hrs, Volume= 6.215 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Total**Hydrograph**

Appendix B – Pipe Calculations

Line No.	Inlet ID	DnStm Ln No	Drng Area	Total Area	Runoff Coeff	i Sys	Line Size	Line Length	Invert Up	Invert Dn	Line Slope	Flow Rate	Capac Full	Vel Ave	Vel Up	Vel Dn	Cover Up	Cover Dn	n-val Pipe	Tc		
																					(min)	
1	CB-20 'B'	Outfall	0.18	1.36	0.87	5.52	24	84.663	7.83	7.61	0.26	6.53	12.49	4.26	3.80	4.73	1.86	n/a	0.012	14.3		
2	CB-21 'B'	1	0.22	1.18	0.87	5.67	24	93.836	8.06	7.83	0.25	5.82	12.13	3.22	3.44	3.00	1.15	1.86	0.012	13.5		
3	CB-22 'B'	2	0.09	0.96	0.87	5.82	18	134.236	8.40	8.06	0.25	4.86	5.73	3.43	3.53	3.33	0.95	1.65	0.012	12.7		
4	CB-23 'B'	3	0.08	0.87	0.87	5.94	18	96.031	8.64	8.40	0.25	4.49	5.69	3.04	3.16	2.92	1.36	0.95	0.012	12.1		
5	CB-24 'E'	4	0.29	0.44	0.87	6.06	15	69.000	8.81	8.64	0.25	2.32	3.47	1.89	1.89	1.89	1.40	1.61	0.012	11.5		
6	CB-25 'B'	5	0.15	0.15	0.87	6.39	15	59.698	8.96	8.81	0.25	0.83	3.51	0.69	0.70	0.68	1.72	1.40	0.012	10.0		
7	CB-33 'Y'	Outfall	0.19	0.38	0.87	5.71	15	19.117	8.46	8.37	0.47	1.89	4.80	3.65	3.66	3.63	2.29	n/a	0.012	13.2		
8	CB-32 'B'	7	0.02	0.19	0.87	5.80	15	23.559	8.58	8.46	0.51	0.96	4.99	2.43	2.99	1.86	2.85	2.29	0.012	12.8		
9	CB-31 'B'	8	0.04	0.17	0.87	5.93	15	30.062	8.73	8.58	0.50	0.88	4.94	2.83	2.92	2.74	1.96	2.85	0.012	12.1		
10	CB-30 'B'	9	0.13	0.13	0.87	6.39	15	74.303	9.10	8.73	0.50	0.72	4.94	2.59	2.77	2.41	1.83	1.96	0.012	10.0		
11	CB-26 'B'	4	0.35	0.35	0.87	6.39	15	66.658	8.80	8.64	0.24	1.95	3.43	1.59	1.59	1.59	1.29	1.61	0.012	10.0		
12	Existing Inlet 'B'	Outfall	0.00	1.18	0.00	5.18	24	26.049	6.94	6.88	0.23	5.32	11.76	4.10	3.76	4.44	3.99	n/a	0.012	16.4		
13	CB-40 'B'	12	0.37	1.18	0.87	5.34	24	116.252	7.23	6.94	0.25	5.48	12.24	2.95	3.24	2.65	3.26	3.99	0.012	15.4		
14	CB-41 'B'	13	0.19	0.81	0.87	5.42	18	66.205	7.39	7.23	0.24	3.82	5.59	2.57	2.67	2.47	3.01	3.76	0.012	14.9		
15	CB-42 'B'	14	0.33	0.62	0.87	5.51	15	85.323	7.82	7.39	0.50	2.97	4.97	2.63	2.84	2.42	3.60	3.26	0.012	14.3		
16	CB-43 'Y'	15	0.17	0.29	0.87	5.60	10	83.229	8.24	7.82	0.50	1.41	1.69	2.59	2.59	2.59	1.93	4.02	0.012	13.9		
17	CB-44 'Y'	16	0.08	0.12	0.87	5.76	10	65.947	8.57	8.24	0.50	0.60	1.68	1.14	1.18	1.10	1.40	1.93	0.012	12.9		
18	CB-45 'Y'	17	0.04	0.04	0.87	6.39	10	71.861	8.93	8.57	0.50	0.22	1.68	0.65	0.87	0.43	1.04	1.40	0.012	10.0		

Project File: 2019-12-04 PROPOSED STORM.stm

Number of lines: 18

Date: 12/4/2019

NOTES: Intensity = 84.74 / (Inlet time + 12.30) ^ 0.83 -- Return period = 25 Yrs. ; ; ** Critical depth