STORMWATER REPORT

Tarrant Lane
Wakefield, Massachusetts

September 20, 2018
Revised April 8, 2019
Revised July 8, 2019

Applicant
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W&S Project Data
WAKE-0048
SPtarrant_R5.dwg
Existing_R1.hcp
Proposed_R3.hcp
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WILLIAMS & SPARAGES
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TABLE OF CONTENTS

COMMONWEALTH OF MASSACHUSETTS
MATTHEW E MOORE
CIVIL
No. 45885
REGISTERED PROFESSIONAL ENGINEER

7.5.2019

Any unsuitable material encountered during construction of the subsurface infiltration pipe network will be removed and replaced with either on-site parent material or imported granular material. Should refusal/ledge be encountered during construction it shall be removed to a depth of four feet below infiltration system and backfilled with clean blasted rock fragments.

Standard 4

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:
a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

The project will utilize deep-sump catch basins equipped with a hood/trap and oil grit separators to collect and pre-treat stormwater runoff prior to discharging to the subsurface infiltration pipe network.

The project site is not considered a LUHPPL, within a Zone II or Interim Wellhead Protection Area or Critical Area. Given the stormwater management systems lie within an area of rapid infiltration water quality volume is based on a runoff of one inch.

Standard 5

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow melt, and stormwater runoff, the proponent shall use specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

This project is not being considered a LUHPPL.

Standard 6

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2) (a) (1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of public water supply.

Stormwater discharge from this property is not within a Zone II, Interim Wellhead Protection Area of a public water supply or a critical area.

soil testing reveals a texture of loamy sand and sands consistent with an A rating, this analysis assumes a HSG rating of A for all soil groups.

1.4 Stormwater Modeling Methodology

The mathematical model used in this analysis for post development is computed using the stormwater modeling software HydroCAD, v10.00, developed by HydroCAD Software Solutions LLC. HydroCAD is a program used to model the hydrology and hydraulics of stormwater runoff and is based largely on programs and techniques developed by the NRCS, specifically TR-20 and TR-55 and other hydraulic calculation methods.

HydroCAD allows the user, for a given rainfall event, to generate runoff hydrographs for single or multiple watersheds and is used to determine if a given drainage system is adequate under the desired conditions and to predict flooding or other hydraulic impacts such as erosion at specified locations.

Five design storm events are analyzed and the result is summarized in Tables 1 through 4 below.

1.5 Pre-Development Watershed

The pre-development watershed area is separated into five watersheds resulting from the existing topography and for comparison with the post-development condition.

The selected Comparison Edge 1L represents flow tributary towards Route 128. The area tributary to this selected edge of comparison is 61,735 ft^2.

The selected Comparison Edge 2L represents flow tributary towards Hopkins Street. The area tributary to this selected edge of comparison is 78,212 ft^2.

The selected Comparison Edges 3L and 4L represents flow tributary towards the northerly site boundary at the Legacy Park apartment building. The area tributary to this selected edge of comparison is 23,416 ft^2.

The total watershed area within the limit of watershed analysis is 163,363 ft^2.

Using the methods described in the stormwater modeling methodology above, runoff curve numbers and times of concentration are generated for each watershed for the pre-development condition to be used for comparison with the post-development condition described below. A schematic of the mathematical model and the results of the calculations for the 2-year, 10-year, 25-year, 50-year and 100-year Type III, 24-hour storm events are included in this analysis.

1.6 Post-Development Watershed

The post-development watershed is separated into eighteen subcatchments tributary to the selected edge of comparison.

Similar to the pre development watershed Comparison Edge 1L represents flow tributary towards Route 128. The area tributary to this selected edge of comparison is 12,628 ft^2.

The selected Comparison Edge 2L represents flow tributary towards Hopkins Street. The area tributary to this selected edge of comparison is 148,995 ft^2.

The selected Comparison Edges 3L and 4L represents flow tributary towards the northerly site boundary at the Legacy Park apartment building. The area tributary to this selected edge of comparison is 1,740 ft^2.

The total watershed area within the limit of watershed analysis is 163,363 ft^2.

Post-development design provides for the construction of a subsurface infiltration system. This system consists of a corrugated metal perforated pipe system. This system located in the westerly parking field will provide peak rate of runoff mitigation, water quality and groundwater recharge in the volume provided below the basin outlet.

Stormwater runoff from building roof areas will be piped into an underground piping network which discharges into the subsurface infiltration system.

Using the methods described in the stormwater modeling methodology above, runoff curve numbers and times of concentration are generated for each watershed for the pre-development condition to be used for comparison with the post-development condition described below. A schematic of the mathematical model and the results of the calculations for the 2-year, 10-year, 25-year, 50-year and 100-year Type III, 24-hour storm events are included in this analysis.

1.7 Compliance with DEP Stormwater Management Standards

Standard 1

No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

New stormwater runoff requiring treatment will be treated prior to being discharged towards the selected edge of comparison. No stormwater outfalls are proposed.

Standard 2

Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

See Tables 1 through 4 below which demonstrate the post-development peak discharge rates are less than or equal to the pre-development peak discharge rates.

Standard 3

Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The project site is analyzed using Hydrologic Soil Group A. Groundwater recharge is provided by a subsurface infiltration pipe network which lies within an area of loamy sand and sands as determined by on site soil testing performed by a certified soil evaluator from Williams & Sparages, LLC. An exfiltration rate of 2.41 inches per hour is used as found in Table 2-1 of the Hydrology Handbook of Conservation Commissioners, March 2002 using Rawls, Brakensiek and Saxton, 1982.

Any unsuitable material encountered during construction of the surface infiltration pipe network will be removed and replaced with either on-site parent material or imported granular material. Should refusal/ledge be encountered during construction it shall be removed to a depth of four feet below infiltration system and backfilled with clean blasted rock fragments.

Standard 4

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:
a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

The project will utilize deep-sump catch basins equipped with a hood/trap and oil grit separators to collect and pre-treat stormwater runoff prior to discharging to the subsurface infiltration pipe network.

The project site is not considered a LUHPPL, within a Zone II or Interim Wellhead Protection Area or Critical Area. Given the stormwater management systems lie within an area of rapid infiltration water quality volume is based on a runoff of one inch.

Standard 5

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow melt, and stormwater runoff, the proponent shall use specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated there under at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

This project is not being considered a LUHPPL.

Standard 6

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2) (a) (1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of public water supply.

Stormwater discharge from this property is not within a Zone II, Interim Wellhead Protection Area of a public water supply or a critical area.

Standard 7
A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

This project is not considered a redevelopment.

Standard 8
A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

A Stormwater Pollution Prevention Plan (SWPPP) will be submitted prior to land disturbance.

Standard 9
A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Refer to Section 4 Long Term Operation and Maintenance Plan (O&M).

Standard 10
All illicit discharges to the stormwater management system are prohibited.

Illicit Discharge Compliance Statement
No connection between the stormwater and wastewater management systems is proposed. Per requirements of Standard 10 it is herein stated that there are no proposed illicit discharges into the Stormwater Management System to be constructed as shown on the site plan.

1.8 Conclusion

Examining the following Peak Rate of Runoff Runoff and Basin Performance tables, the proposed stormwater management system is effective for mitigating the peak flow rates and volume of runoff from the limit of the watershed analysis for the 2, 10, 25, 50 and 100 year storm events.

Table 1.0: Peak Rate of Runoff | Comparison Location 1L

Description	**2 Year**	**10 Year**	**25 Year**	**50 Year**	**100 Year**
Existing Peak Rate of Runoff (cfs)	0.01	0.15	0.50	0.84	1.03
Proposed Peak Rate of Runoff (cfs)	0.00	0.02	0.07	0.13	0.17
Difference	**-0.01**	**-0.13**	**-0.43**	**-0.71**	**-0.86**

Table 2.0: Peak Rate of Runoff | Comparison Location 2L

Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.18	0.96	1.92	2.56	2.88
Proposed Peak Rate of Runoff (cfs)	0.09	0.87	1.65	2.01	2.15
Difference	**-0.09**	**-0.09**	**-0.27**	**-0.55**	**-0.73**

Table 3.0: Peak Rate of Runoff | Comparison Location 3L

Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.00	0.04	0.15	0.24	0.29
Proposed Peak Rate of Runoff (cfs)	0.00	0.00	0.00	0.00	0.00
Difference	**0.00**	**-0.04**	**-0.15**	**-0.24**	**-0.29**

Table 4.0: Peak Rate of Runoff | Comparison Location 4L

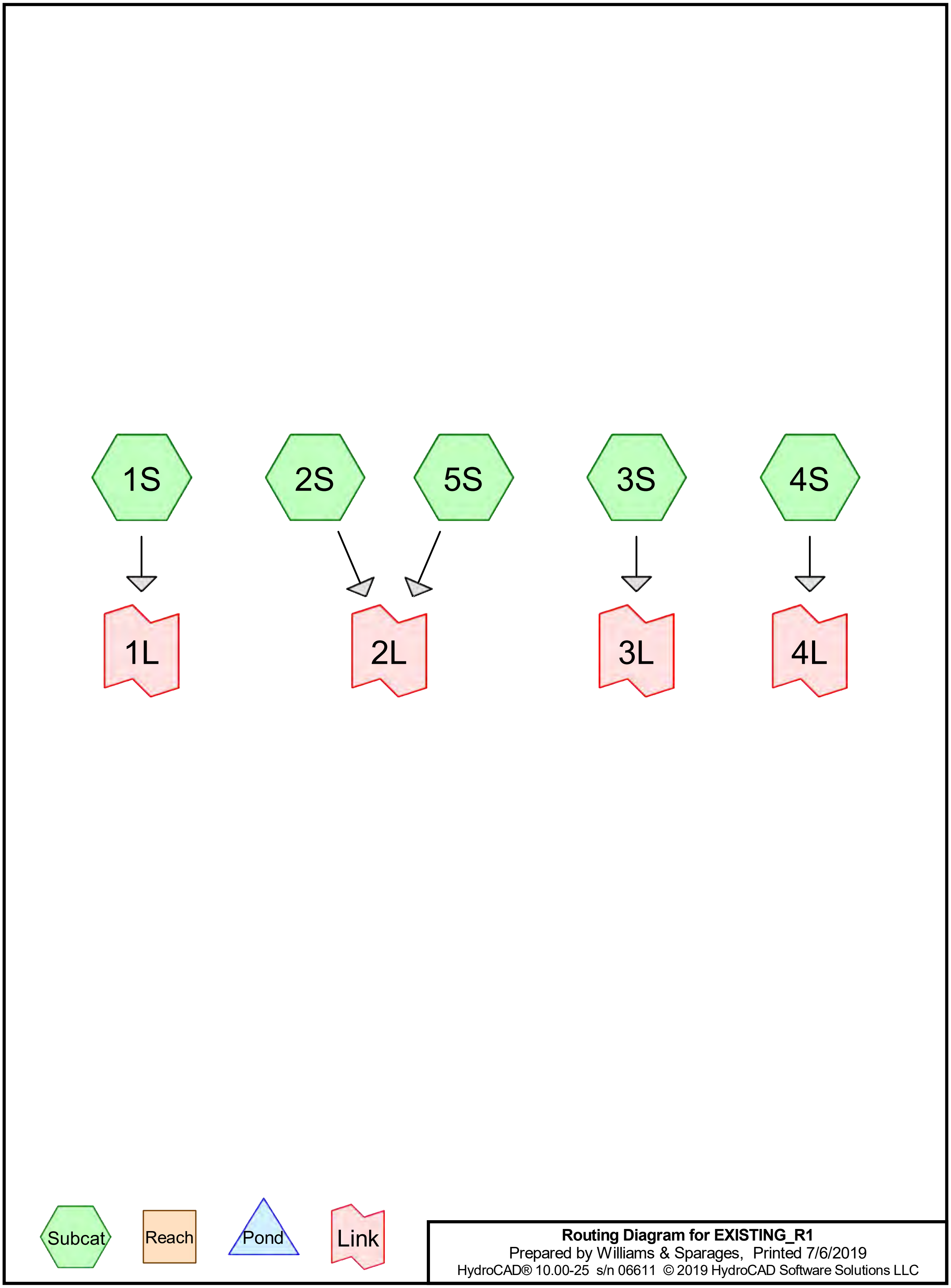
Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.00	0.04	0.13	0.19	0.22
Proposed Peak Rate of Runoff (cfs)	0.00	0.00	0.01	0.01	0.02
Difference	**0.00**	**-0.04**	**-0.12**	**-0.18**	**-0.20**

Table 5.0: Stormwater Management Area 1P | Infiltration Pipe Network Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs)				Peak Water Level (ft)
		Total (cfs)	Exfiltration (cfs)	8″ Outlet (cfs)		
2 year	6.69	0.36	0.36	0.00		184.03
10 year	10.74	1.18	0.36	0.83		185.14
25 year	14.07	1.90	0.36	1.55		186.11
50 year	15.9	2.21	0.36	1.85		186.77
100 year	16.82	2.33	0.36	1.98		187.15

1.9 HydroCAD Data

1.9.1 Existing Condition



Routing Diagram for EXISTING_R1
Prepared by Williams & Sparages, Printed 7/6/2019

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
102,188	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S, 4S, 5S)
18,790	98	Paved parking, HSG A (1S, 2S, 3S, 4S, 5S)
16,020	98	Roofs, HSG A (1S, 2S, 3S, 4S, 5S)
26,365	30	Woods, Good, HSG A (1S, 2S, 4S)
163,363	**50**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
163,363	HSG A	1S, 2S, 3S, 4S, 5S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
163,363		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatch Numbers
102,188	0	0	0	0	102,188	>75% Grass cover, Good	
18,790	0	0	0	0	18,790	Paved parking	
16,020	0	0	0	0	16,020	Roofs	
26,365	0	0	0	0	26,365	Woods, Good	
163,363	**0**	**0**	**0**	**0**	**163,363**	**TOTAL AREA**	

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=61,735 sf 15.97% Impervious Runoff Depth=0.03"
Flow Length=145' Tc=9.0 min CN=45 Runoff=0.01 cfs 172 cf

Subcatchment 2S: Runoff Area=64,762 sf 31.43% Impervious Runoff Depth=0.28"
Flow Length=329' Tc=11.2 min CN=57 Runoff=0.18 cfs 1,496 cf

Subcatchment 3S: Runoff Area=13,913 sf 11.67% Impervious Runoff Depth=0.05"
Flow Length=164' Tc=6.0 min CN=46 Runoff=0.00 cfs 53 cf

Subcatchment 4S: Runoff Area=9,503 sf 19.53% Impervious Runoff Depth=0.07"
Flow Length=100' Tc=8.6 min CN=48 Runoff=0.00 cfs 59 cf

Subcatchment 5S: Runoff Area=13,450 sf 8.30% Impervious Runoff Depth=0.02"
Flow Length=136' Tc=9.6 min CN=44 Runoff=0.00 cfs 26 cf

Link 1L: Inflow=0.01 cfs 172 cf
Primary=0.01 cfs 172 cf

Link 2L: Inflow=0.18 cfs 1,522 cf
Primary=0.18 cfs 1,522 cf

Link 3L: Inflow=0.00 cfs 53 cf
Primary=0.00 cfs 53 cf

Link 4L: Inflow=0.00 cfs 59 cf
Primary=0.00 cfs 59 cf

Total Runoff Area = 163,363 sf Runoff Volume = 1,805 cf Average Runoff Depth = 0.13"
78.69% Pervious = 128,553 sf 21.31% Impervious = 34,810 sf

Summary for Subcatchment 1S:

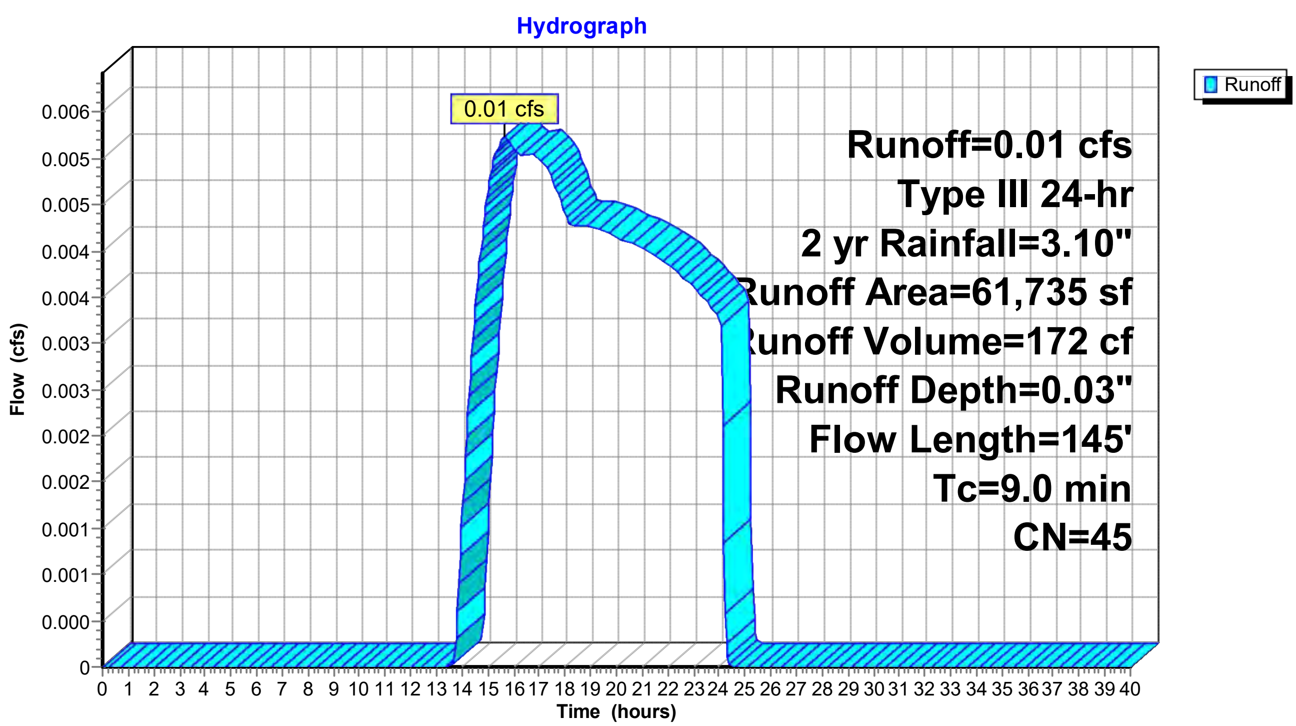
Runoff = 0.01 cfs @ 15.66 hrs, Volume= 172 cf, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
5,437	98	Paved parking, HSG A
4,422	98	Roofs, HSG A
28,821	39	>75% Grass cover, Good, HSG A
23,055	30	Woods, Good, HSG A
61,735	45	Weighted Average
51,876		84.03% Pervious Area
9,859		15.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0180	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	95	0.1160	5.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	145	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

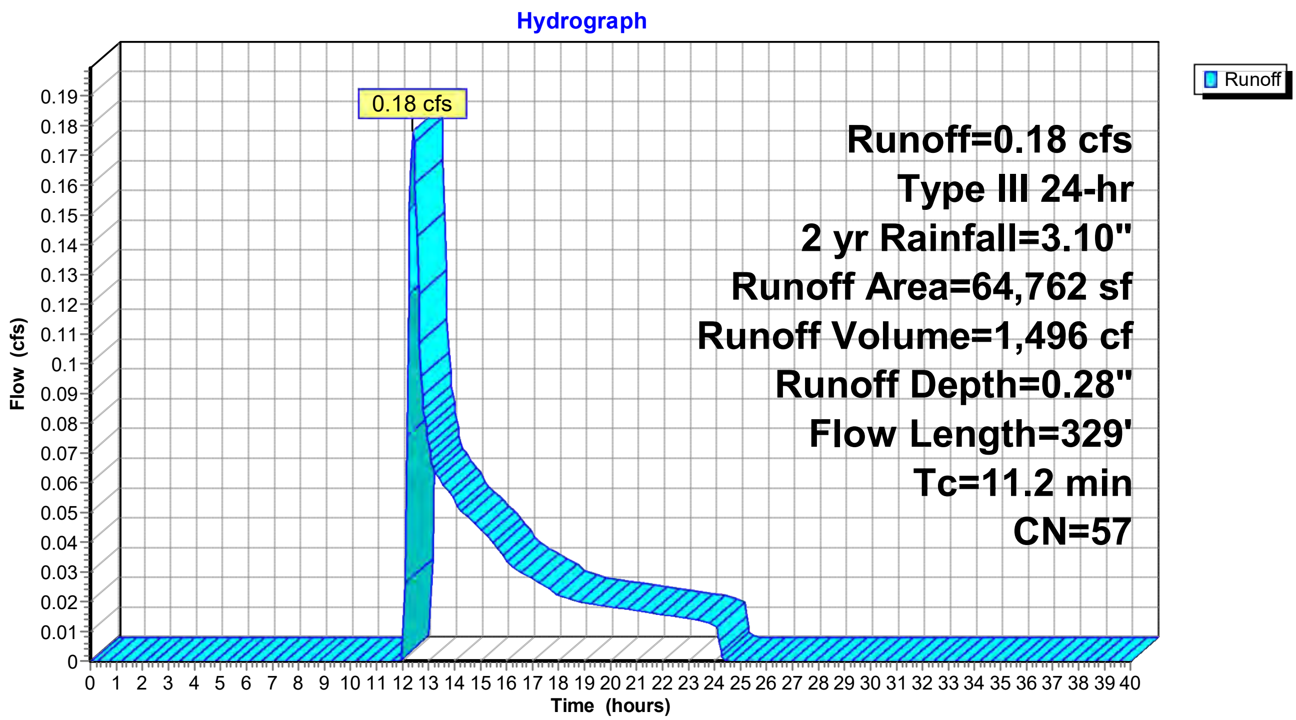
Runoff = 0.18 cfs @ 12.39 hrs, Volume= 1,496 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
12,262	98	Paved parking, HSG A
8,094	98	Roofs, HSG A
43,657	39	>75% Grass cover, Good, HSG A
749	30	Woods, Good, HSG A
64,762	57	Weighted Average
44,406		68.57% Pervious Area
20,356		31.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.0	279	0.0480	4.45		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.2	329	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

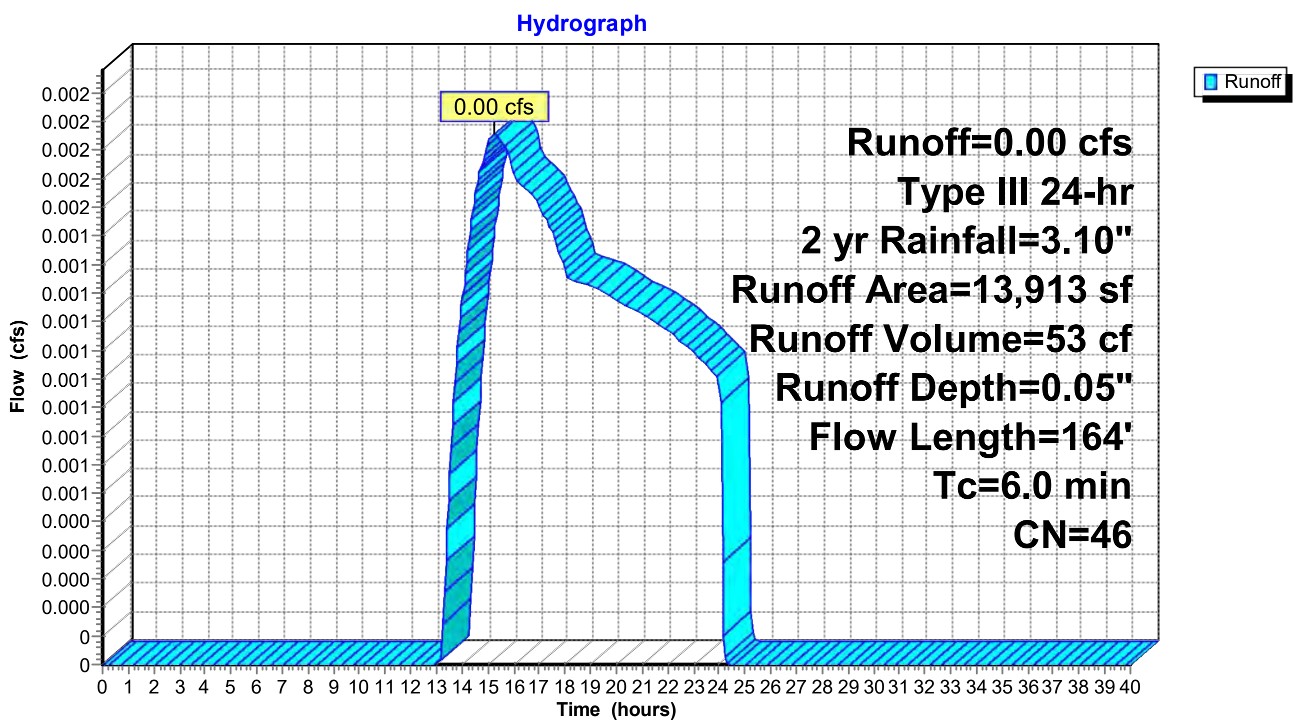
Runoff = 0.00 cfs @ 15.28 hrs, Volume= 53 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
546	98	Paved parking, HSG A
1,077	98	Roofs, HSG A
12,290	39	>75% Grass cover, Good, HSG A
13,913	46	Weighted Average
12,290		88.33% Pervious Area
1,623		11.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.1280	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.4	114	0.0940	4.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	164	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S:



Summary for Subcatchment 4S:

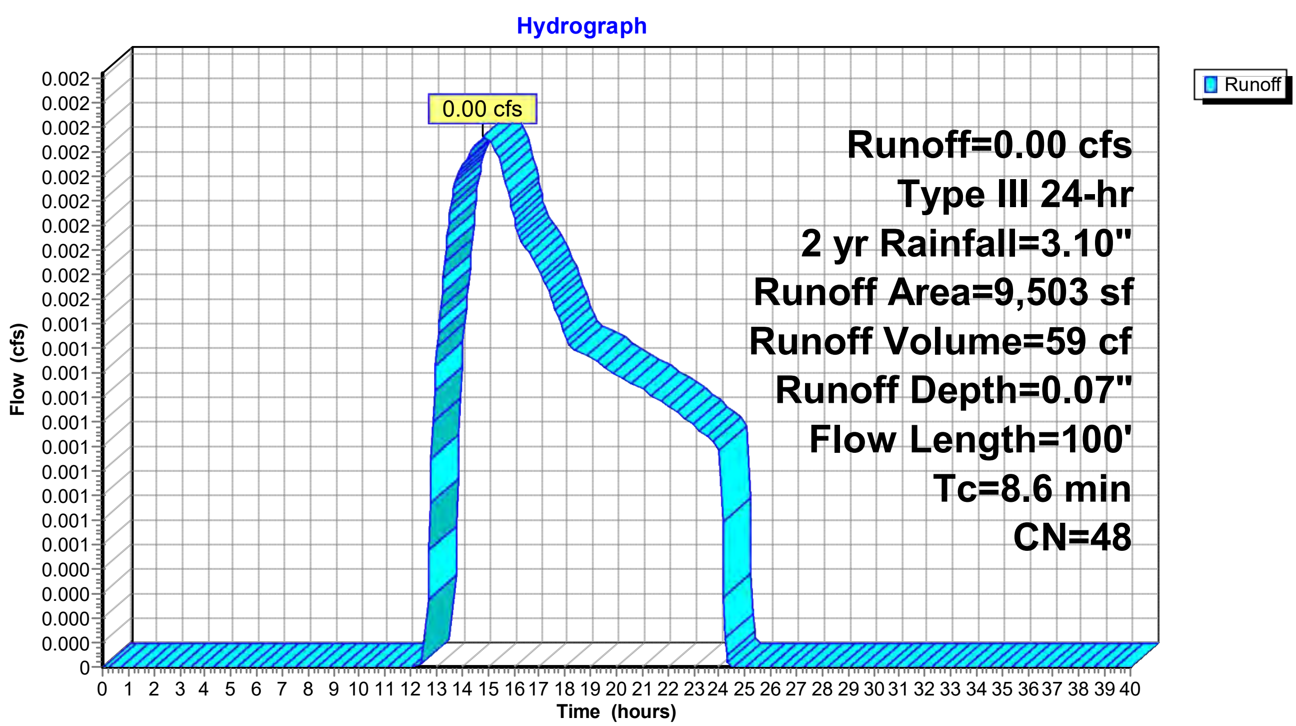
Runoff = 0.00 cfs @ 14.79 hrs, Volume= 59 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
511	98	Paved parking, HSG A
1,345	98	Roofs, HSG A
5,086	39	>75% Grass cover, Good, HSG A
2,561	30	Woods, Good, HSG A
9,503	48	Weighted Average
7,647		80.47% Pervious Area
1,856		19.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	50	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.6	100	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

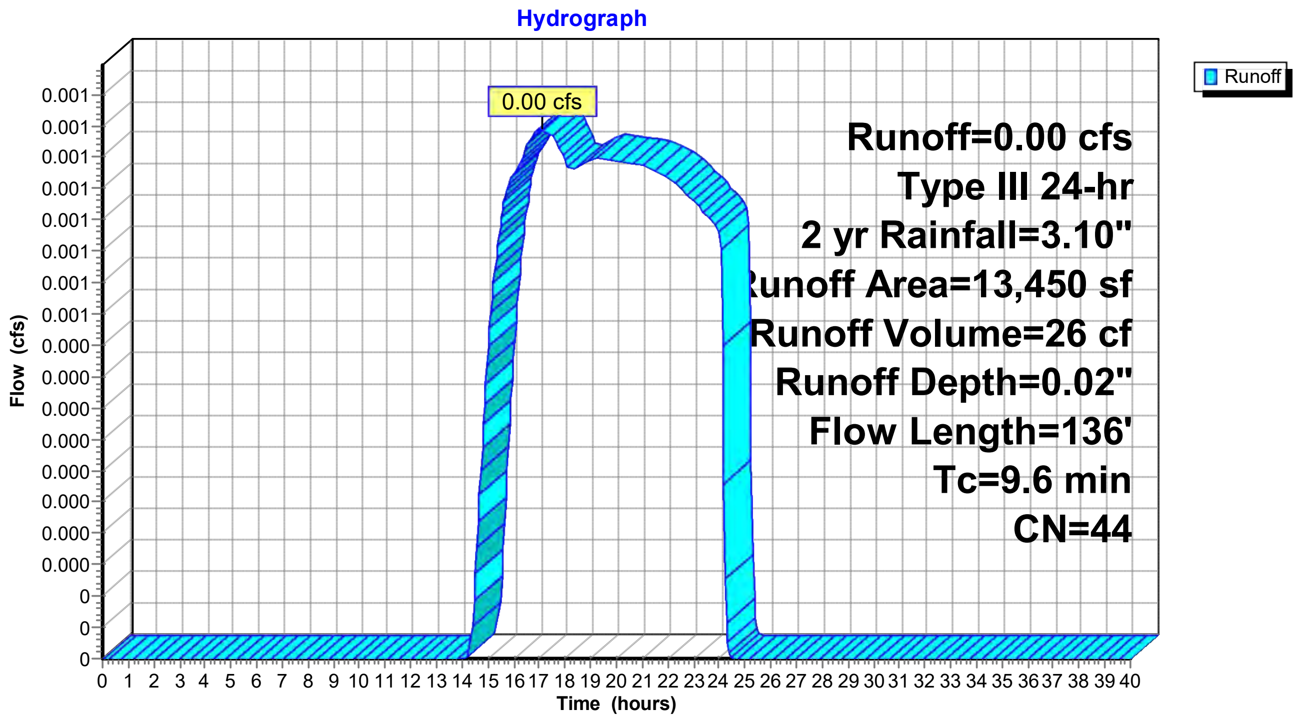
Runoff = 0.00 cfs @ 17.10 hrs, Volume= 26 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
34	98	Paved parking, HSG A
1,082	98	Roofs, HSG A
12,334	39	>75% Grass cover, Good, HSG A
13,450	44	Weighted Average
12,334		91.70% Pervious Area
1,116		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0160	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.5	86	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	136	Total			

Subcatchment 5S:

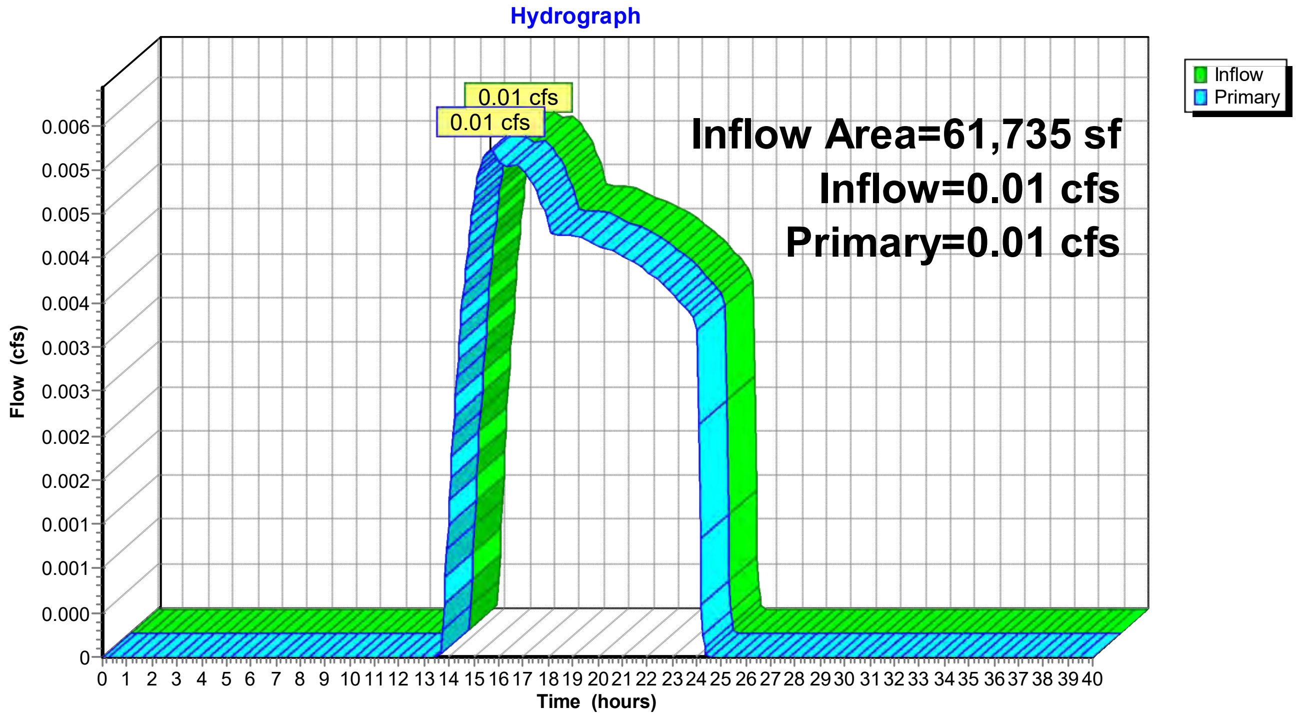


Summary for Link 1L:

Inflow Area = 61,735 sf, 15.97% Impervious, Inflow Depth = 0.03" for 2 yr event
Inflow = 0.01 cfs @ 15.66 hrs, Volume= 172 cf
Primary = 0.01 cfs @ 15.66 hrs, Volume= 172 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L:

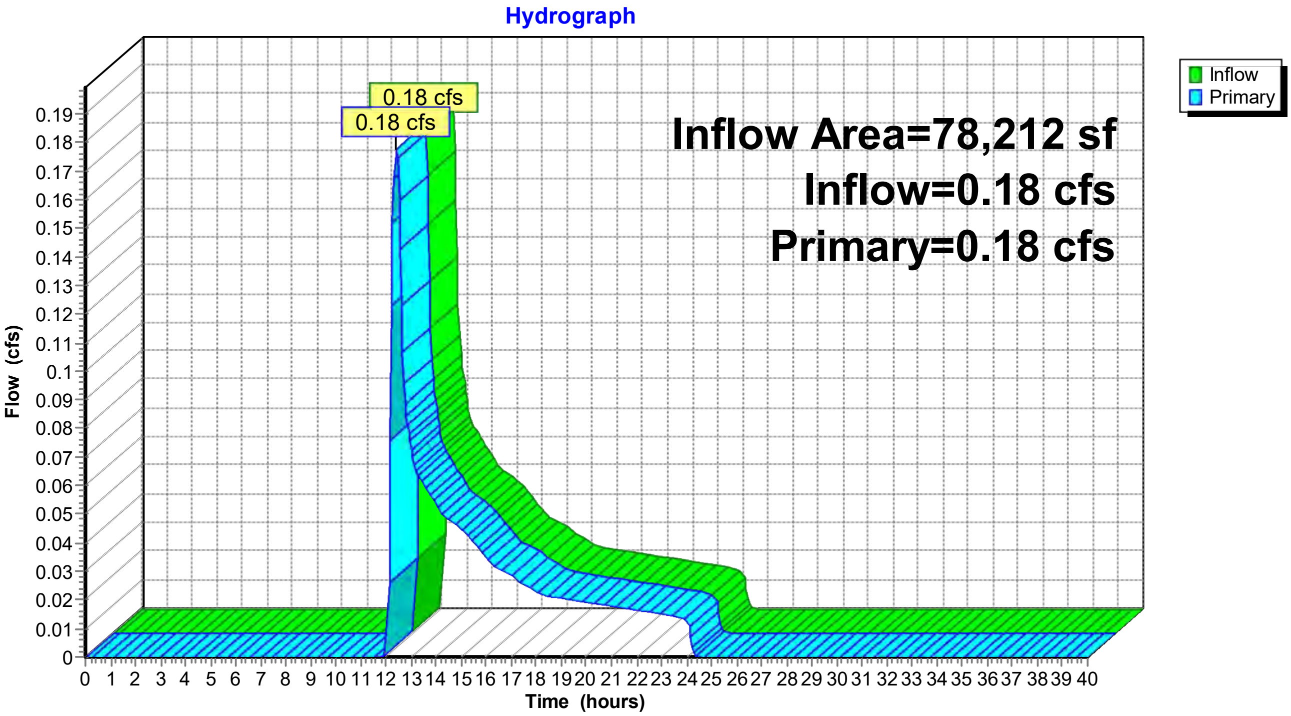


Summary for Link 2L:

Inflow Area = 78,212 sf, 27.45% Impervious, Inflow Depth = 0.23" for 2 yr event
Inflow = 0.18 cfs @ 12.39 hrs, Volume= 1,522 cf
Primary = 0.18 cfs @ 12.39 hrs, Volume= 1,522 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L:

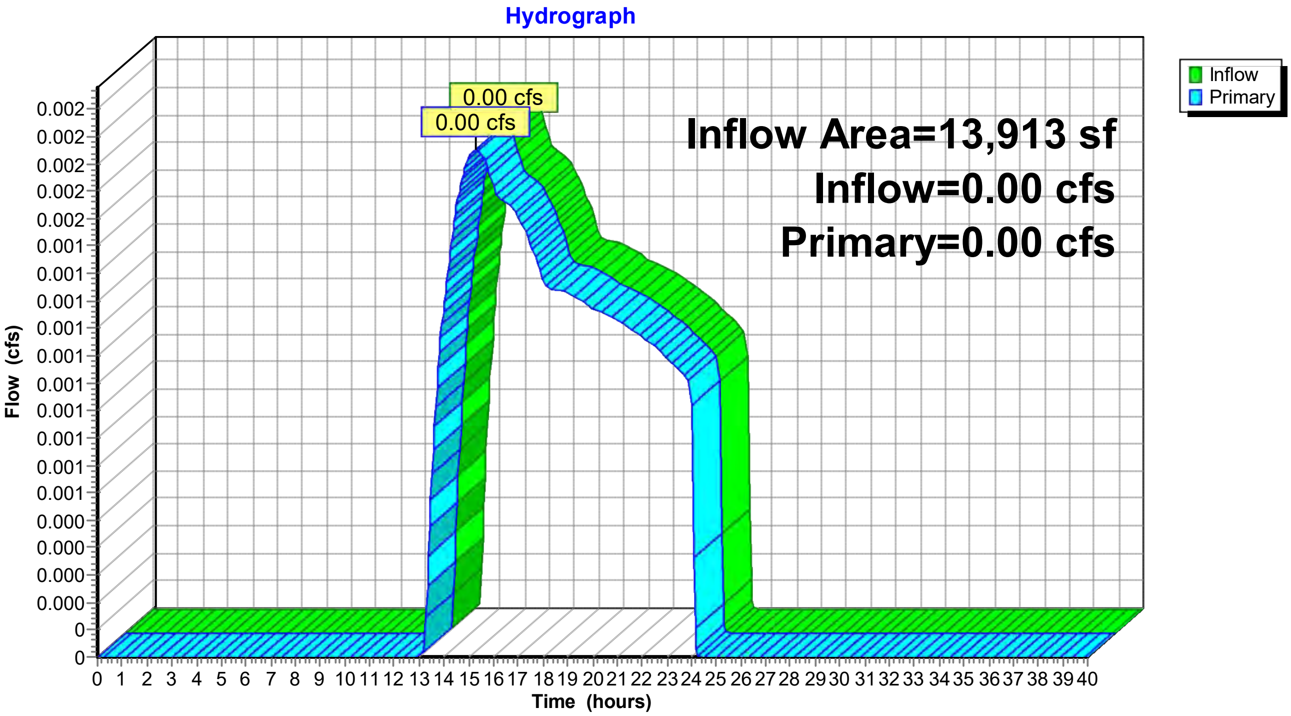


Summary for Link 3L:

Inflow Area = 13,913 sf, 11.67% Impervious, Inflow Depth = 0.05" for 2 yr event
Inflow = 0.00 cfs @ 15.28 hrs, Volume= 53 cf
Primary = 0.00 cfs @ 15.28 hrs, Volume= 53 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L:

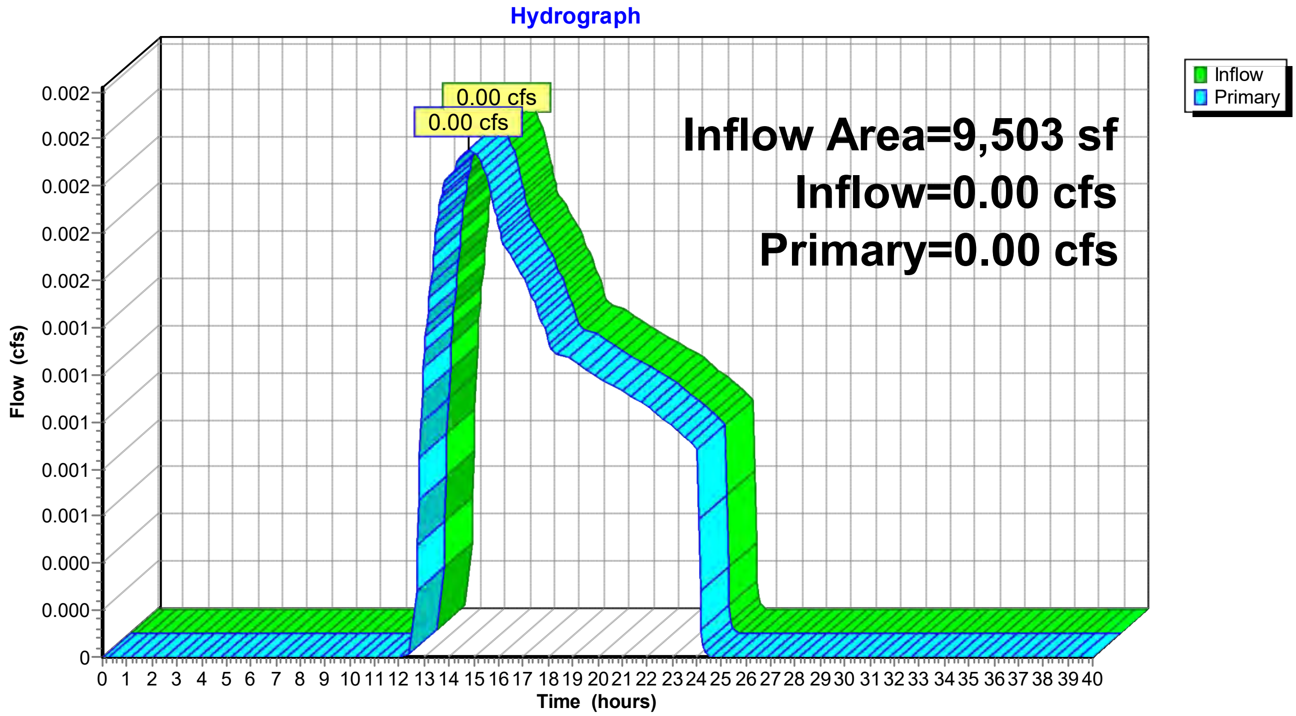


Summary for Link 4L:

Inflow Area =	9,503 sf,	19.53% Impervious,	Inflow Depth = 0.07"	for 2 yr event	
Inflow =	0.00 cfs @	14.79 hrs,	Volume=	59 cf	
Primary =	0.00 cfs @	14.79 hrs,	Volume=	59 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L:



Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=61,735 sf 15.97% Impervious Runoff Depth=0.30"
Flow Length=145' Tc=9.0 min CN=45 Runoff=0.15 cfs 1,522 cf

Subcatchment 2S: Runoff Area=64,762 sf 31.43% Impervious Runoff Depth=0.85"
Flow Length=329' Tc=11.2 min CN=57 Runoff=0.95 cfs 4,584 cf

Subcatchment 3S: Runoff Area=13,913 sf 11.67% Impervious Runoff Depth=0.33"
Flow Length=164' Tc=6.0 min CN=46 Runoff=0.04 cfs 387 cf

Subcatchment 4S: Runoff Area=9,503 sf 19.53% Impervious Runoff Depth=0.41"
Flow Length=100' Tc=8.6 min CN=48 Runoff=0.04 cfs 327 cf

Subcatchment 5S: Runoff Area=13,450 sf 8.30% Impervious Runoff Depth=0.26"
Flow Length=136' Tc=9.6 min CN=44 Runoff=0.02 cfs 292 cf

Link 1L: Inflow=0.15 cfs 1,522 cf
Primary=0.15 cfs 1,522 cf

Link 2L: Inflow=0.96 cfs 4,875 cf
Primary=0.96 cfs 4,875 cf

Link 3L: Inflow=0.04 cfs 387 cf
Primary=0.04 cfs 387 cf

Link 4L: Inflow=0.04 cfs 327 cf
Primary=0.04 cfs 327 cf

Total Runoff Area = 163,363 sf Runoff Volume = 7,112 cf Average Runoff Depth = 0.52"
78.69% Pervious = 128,553 sf 21.31% Impervious = 34,810 sf

Summary for Subcatchment 1S:

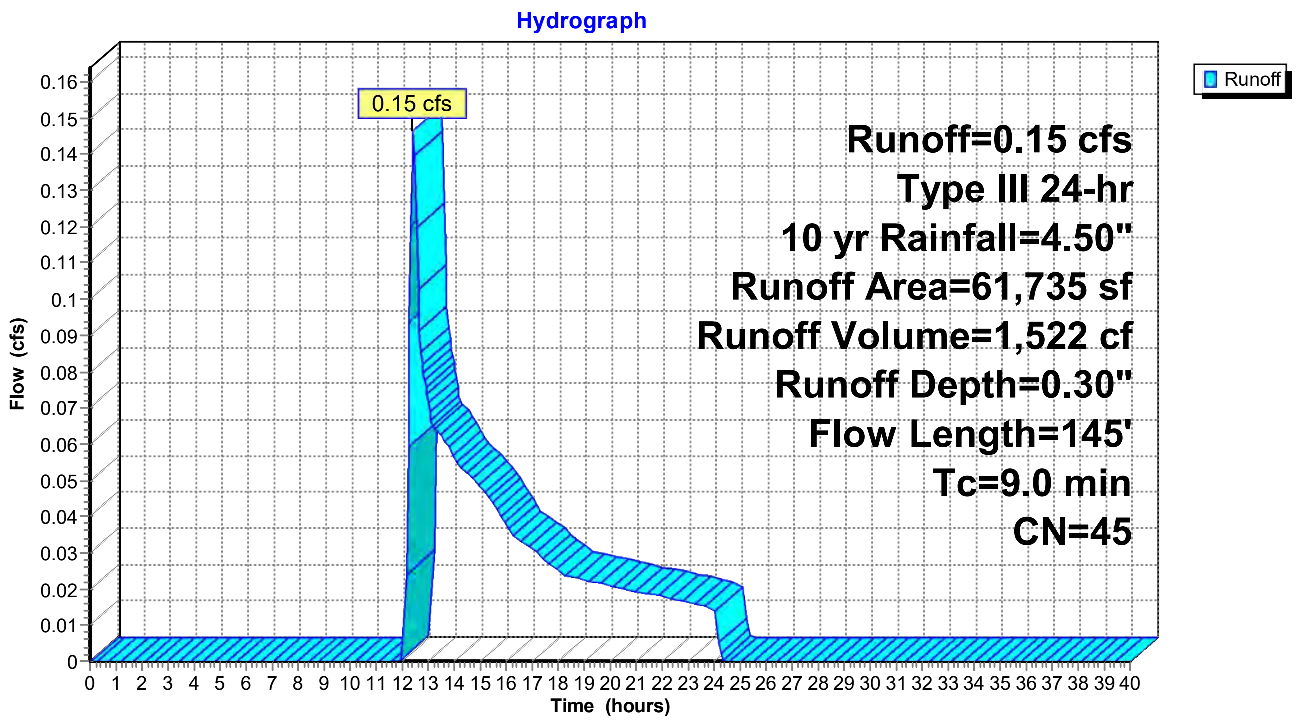
Runoff = 0.15 cfs @ 12.42 hrs, Volume= 1,522 cf, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
5,437	98	Paved parking, HSG A
4,422	98	Roofs, HSG A
28,821	39	>75% Grass cover, Good, HSG A
23,055	30	Woods, Good, HSG A
61,735	45	Weighted Average
51,876		84.03% Pervious Area
9,859		15.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0180	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	95	0.1160	5.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	145	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

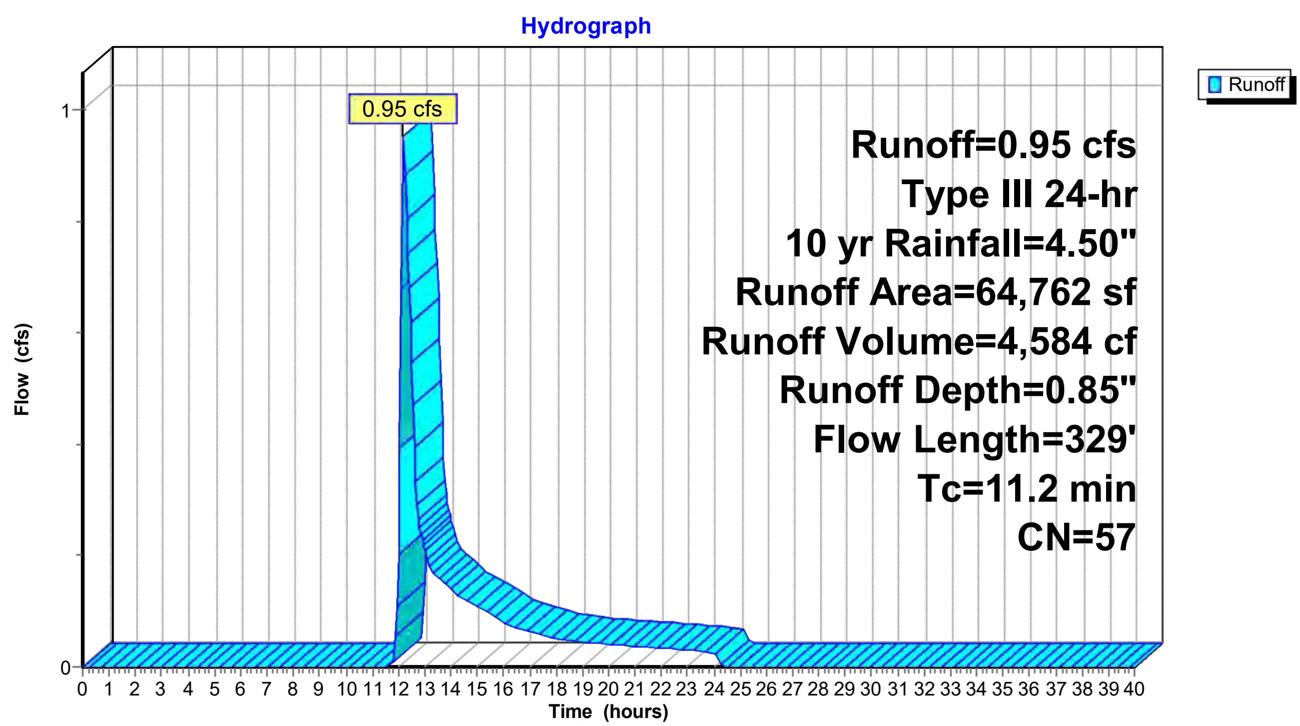
Runoff = 0.95 cfs @ 12.20 hrs, Volume= 4,584 cf, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
12,262	98	Paved parking, HSG A
8,094	98	Roofs, HSG A
43,657	39	>75% Grass cover, Good, HSG A
749	30	Woods, Good, HSG A
64,762	57	Weighted Average
44,406		68.57% Pervious Area
20,356		31.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.0	279	0.0480	4.45		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.2	329	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

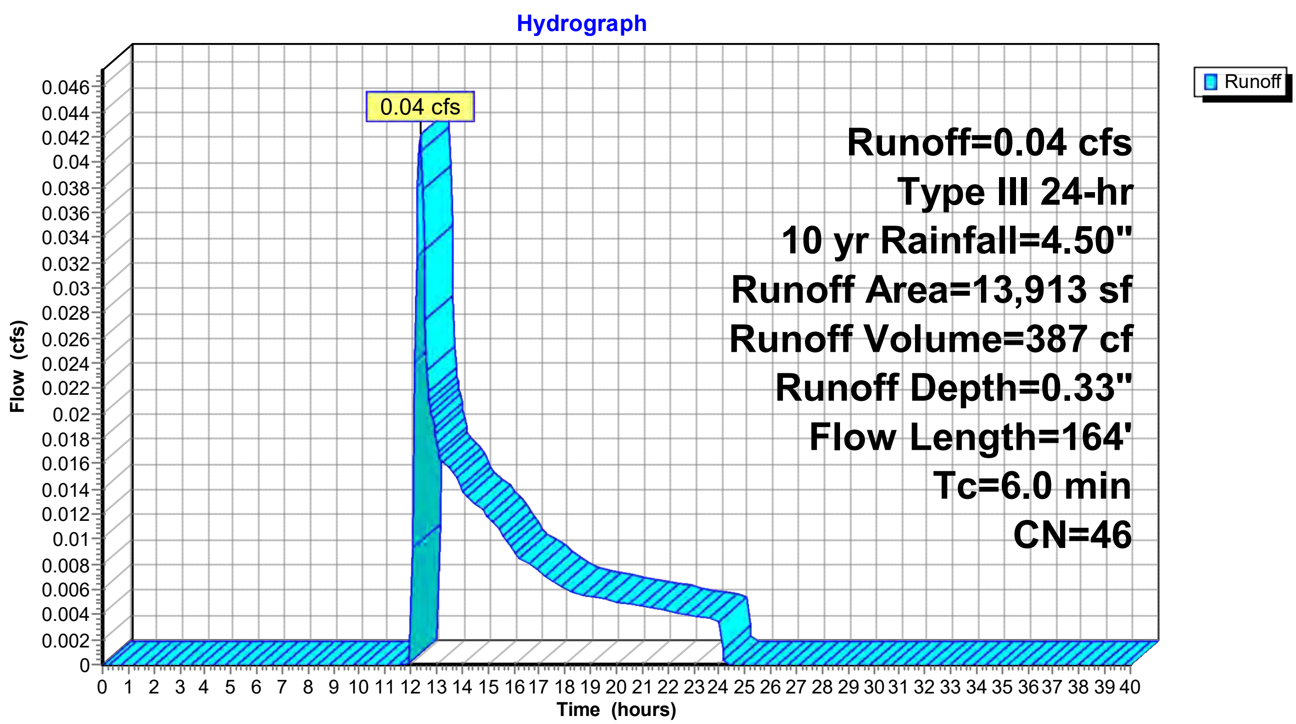
Runoff = 0.04 cfs @ 12.35 hrs, Volume= 387 cf, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
546	98	Paved parking, HSG A
1,077	98	Roofs, HSG A
12,290	39	>75% Grass cover, Good, HSG A
13,913	46	Weighted Average
12,290		88.33% Pervious Area
1,623		11.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.1280	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.4	114	0.0940	4.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	164	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S:



Summary for Subcatchment 4S:

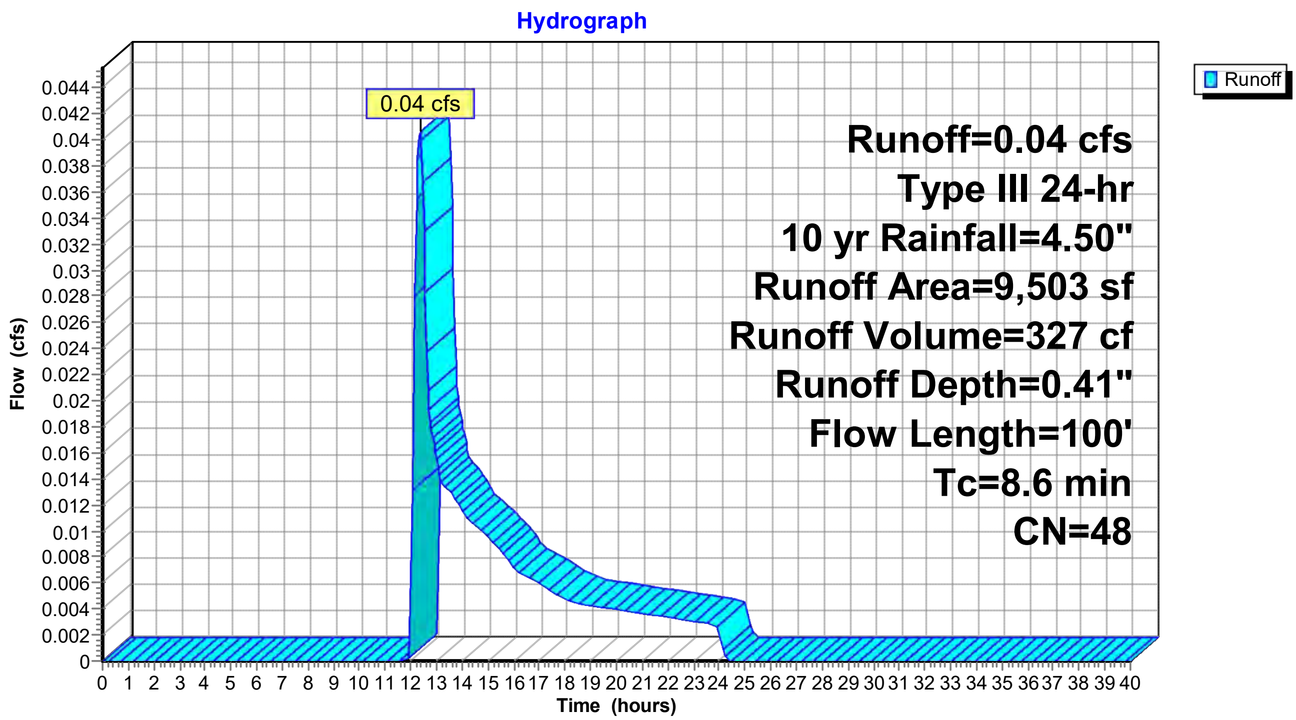
Runoff = 0.04 cfs @ 12.34 hrs, Volume= 327 cf, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
511	98	Paved parking, HSG A
1,345	98	Roofs, HSG A
5,086	39	>75% Grass cover, Good, HSG A
2,561	30	Woods, Good, HSG A
9,503	48	Weighted Average
7,647		80.47% Pervious Area
1,856		19.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	50	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.6	100	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

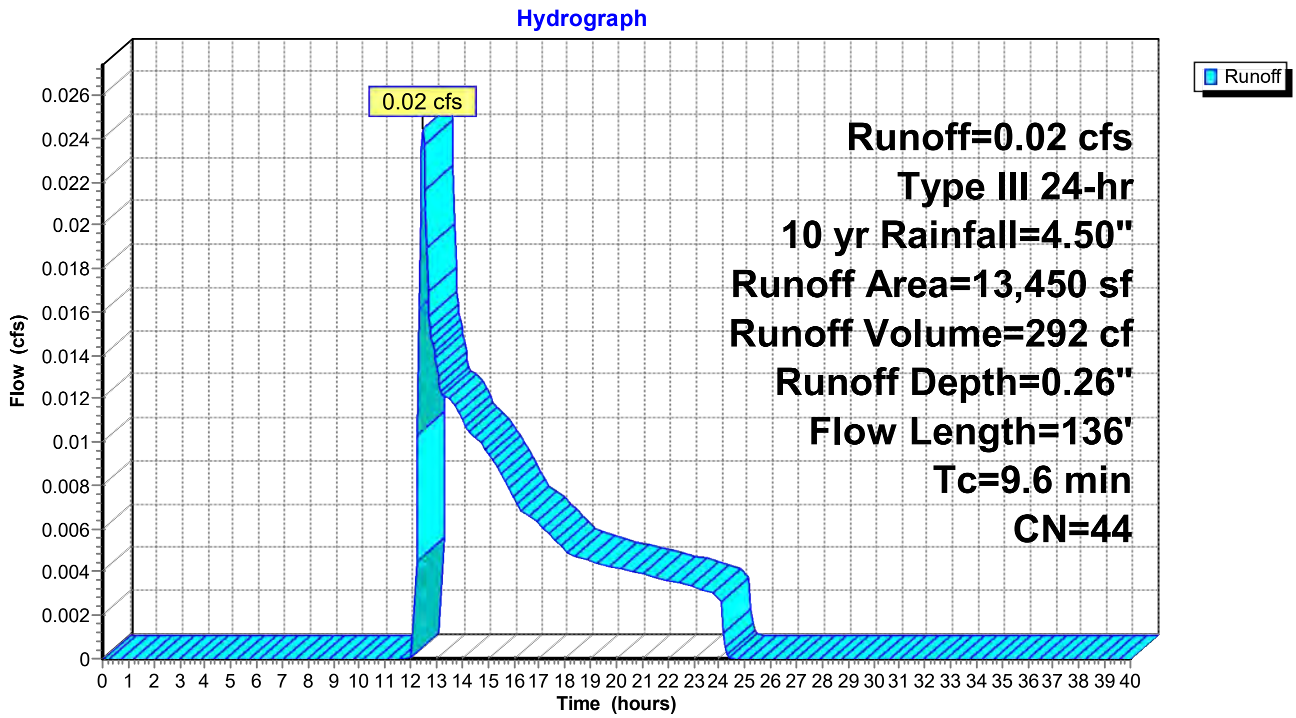
Runoff = 0.02 cfs @ 12.45 hrs, Volume= 292 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
34	98	Paved parking, HSG A
1,082	98	Roofs, HSG A
12,334	39	>75% Grass cover, Good, HSG A
13,450	44	Weighted Average
12,334		91.70% Pervious Area
1,116		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0160	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.5	86	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	136	Total			

Subcatchment 5S:

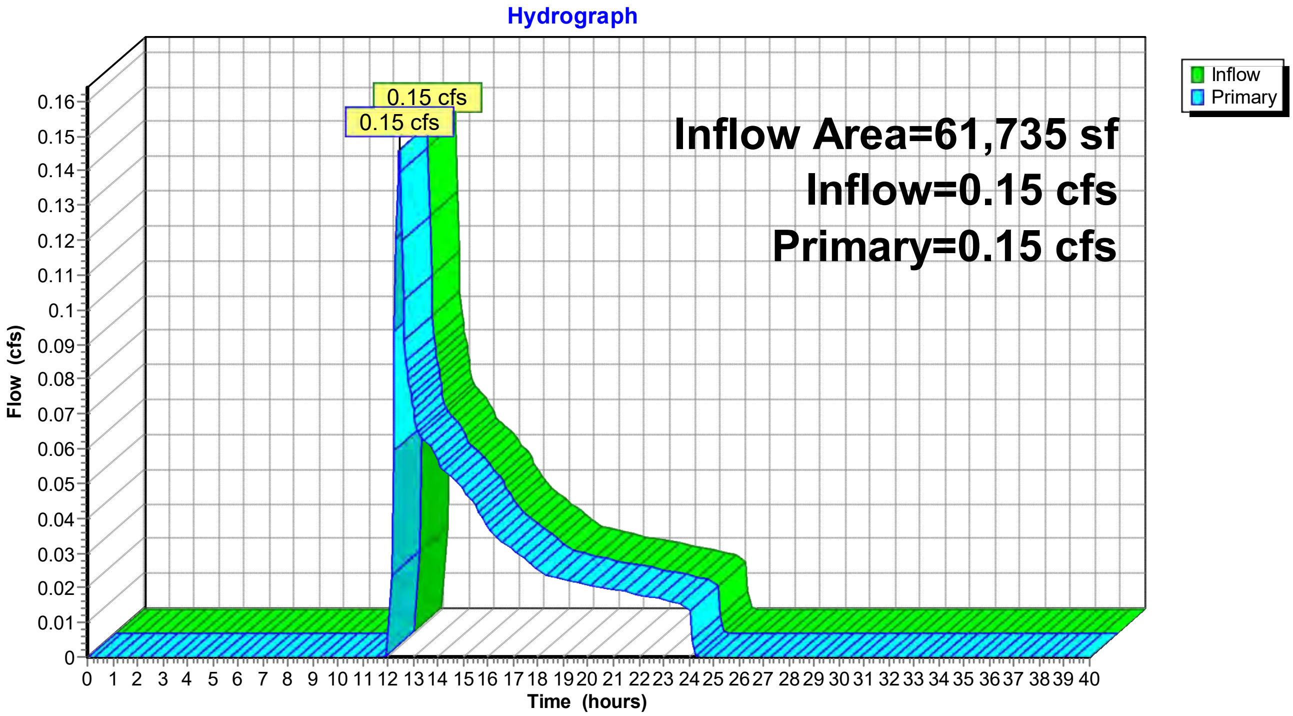


Summary for Link 1L:

Inflow Area = 61,735 sf, 15.97% Impervious, Inflow Depth = 0.30" for 10 yr event
Inflow = 0.15 cfs @ 12.42 hrs, Volume= 1,522 cf
Primary = 0.15 cfs @ 12.42 hrs, Volume= 1,522 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L:

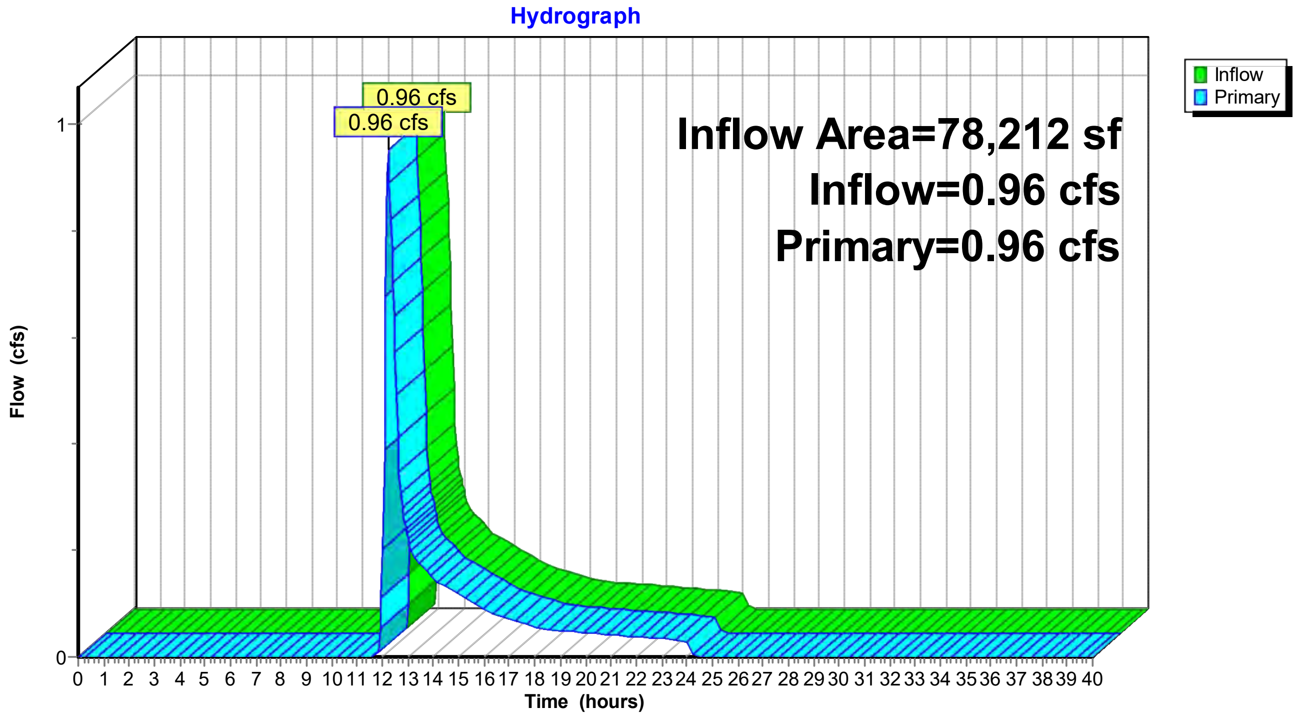


Summary for Link 2L:

Inflow Area =	78,212 sf,	27.45% Impervious,	Inflow Depth = 0.75"	for 10 yr event
Inflow =	0.96 cfs @	12.20 hrs, Volume=	4,875 cf	
Primary =	0.96 cfs @	12.20 hrs, Volume=	4,875 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L:

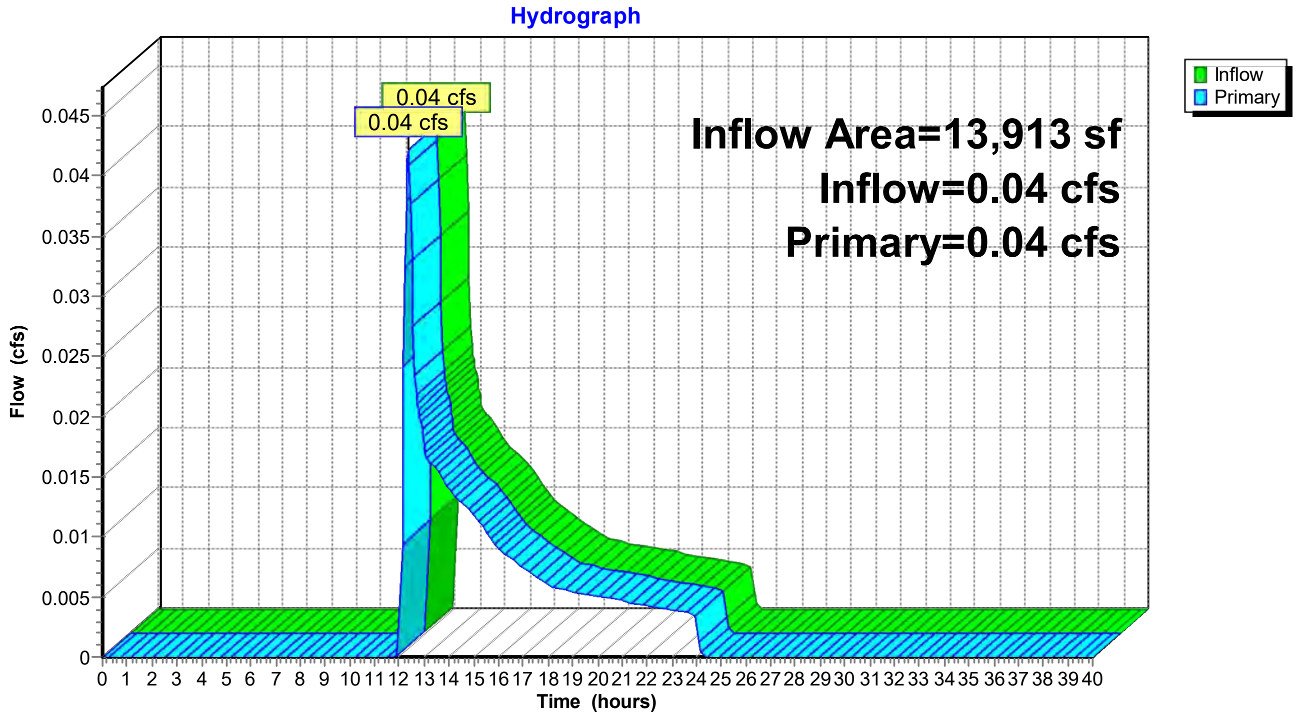


Summary for Link 3L:

Inflow Area = 13,913 sf, 11.67% Impervious, Inflow Depth = 0.33" for 10 yr event
Inflow = 0.04 cfs @ 12.35 hrs, Volume= 387 cf
Primary = 0.04 cfs @ 12.35 hrs, Volume= 387 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L:

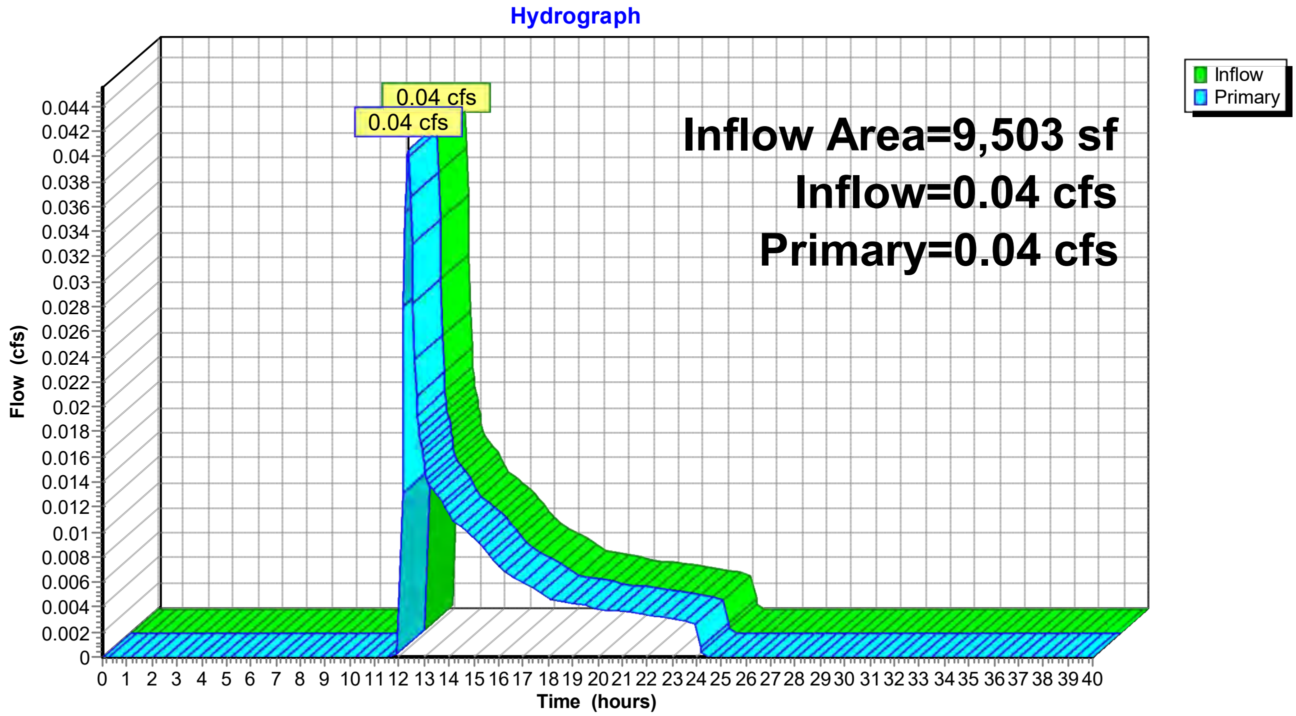


Summary for Link 4L:

Inflow Area =	9,503 sf,	19.53% Impervious,	Inflow Depth = 0.41"	for 10 yr event
Inflow =	0.04 cfs @	12.34 hrs, Volume=	327 cf	
Primary =	0.04 cfs @	12.34 hrs, Volume=	327 cf, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L:



Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=61,735 sf 15.97% Impervious Runoff Depth=0.65"
Flow Length=145' Tc=9.0 min CN=45 Runoff=0.50 cfs 3,331 cf

Subcatchment 2S: Runoff Area=64,762 sf 31.43% Impervious Runoff Depth=1.44"
Flow Length=329' Tc=11.2 min CN=57 Runoff=1.84 cfs 7,764 cf

Subcatchment 3S: Runoff Area=13,913 sf 11.67% Impervious Runoff Depth=0.71"
Flow Length=164' Tc=6.0 min CN=46 Runoff=0.15 cfs 818 cf

Subcatchment 4S: Runoff Area=9,503 sf 19.53% Impervious Runoff Depth=0.83"
Flow Length=100' Tc=8.6 min CN=48 Runoff=0.13 cfs 654 cf

Subcatchment 5S: Runoff Area=13,450 sf 8.30% Impervious Runoff Depth=0.59"
Flow Length=136' Tc=9.6 min CN=44 Runoff=0.09 cfs 663 cf

Link 1L: Inflow=0.50 cfs 3,331 cf
Primary=0.50 cfs 3,331 cf

Link 2L: Inflow=1.92 cfs 8,426 cf
Primary=1.92 cfs 8,426 cf

Link 3L: Inflow=0.15 cfs 818 cf
Primary=0.15 cfs 818 cf

Link 4L: Inflow=0.13 cfs 654 cf
Primary=0.13 cfs 654 cf

Total Runoff Area = 163,363 sf Runoff Volume = 13,230 cf Average Runoff Depth = 0.97"
78.69% Pervious = 128,553 sf 21.31% Impervious = 34,810 sf

Summary for Subcatchment 1S:

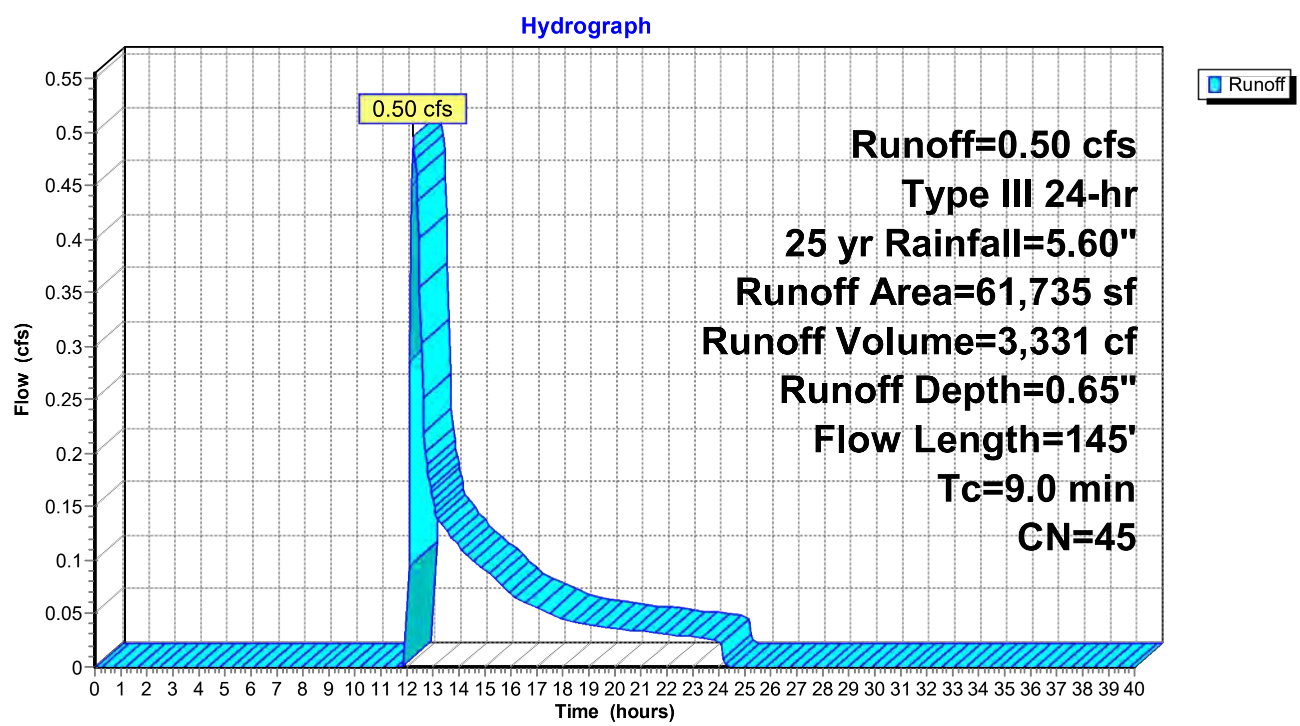
Runoff = 0.50 cfs @ 12.22 hrs, Volume= 3,331 cf, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
5,437	98	Paved parking, HSG A
4,422	98	Roofs, HSG A
28,821	39	>75% Grass cover, Good, HSG A
23,055	30	Woods, Good, HSG A
61,735	45	Weighted Average
51,876		84.03% Pervious Area
9,859		15.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0180	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	95	0.1160	5.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	145	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

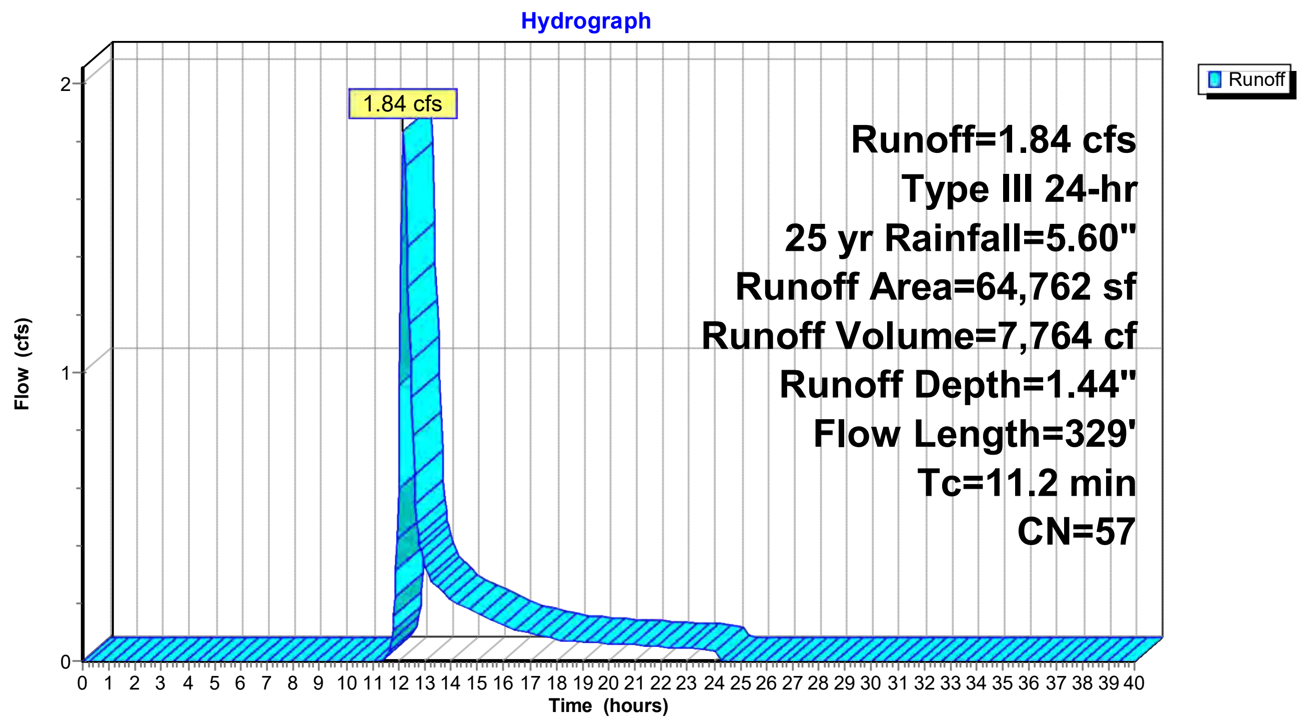
Runoff = 1.84 cfs @ 12.18 hrs, Volume= 7,764 cf, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
12,262	98	Paved parking, HSG A
8,094	98	Roofs, HSG A
43,657	39	>75% Grass cover, Good, HSG A
749	30	Woods, Good, HSG A
64,762	57	Weighted Average
44,406		68.57% Pervious Area
20,356		31.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.0	279	0.0480	4.45		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.2	329	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

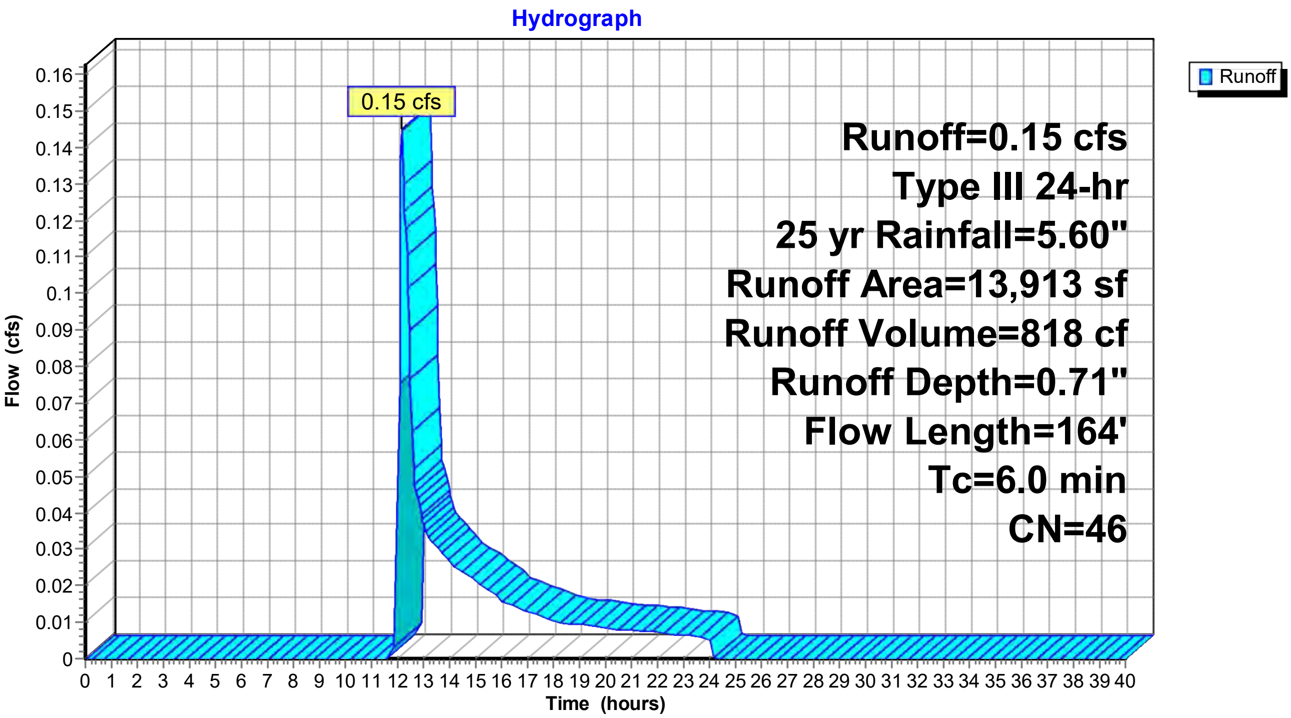
Runoff = 0.15 cfs @ 12.14 hrs, Volume= 818 cf, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
546	98	Paved parking, HSG A
1,077	98	Roofs, HSG A
12,290	39	>75% Grass cover, Good, HSG A
13,913	46	Weighted Average
12,290		88.33% Pervious Area
1,623		11.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.1280	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.4	114	0.0940	4.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	164	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S:



Summary for Subcatchment 4S:

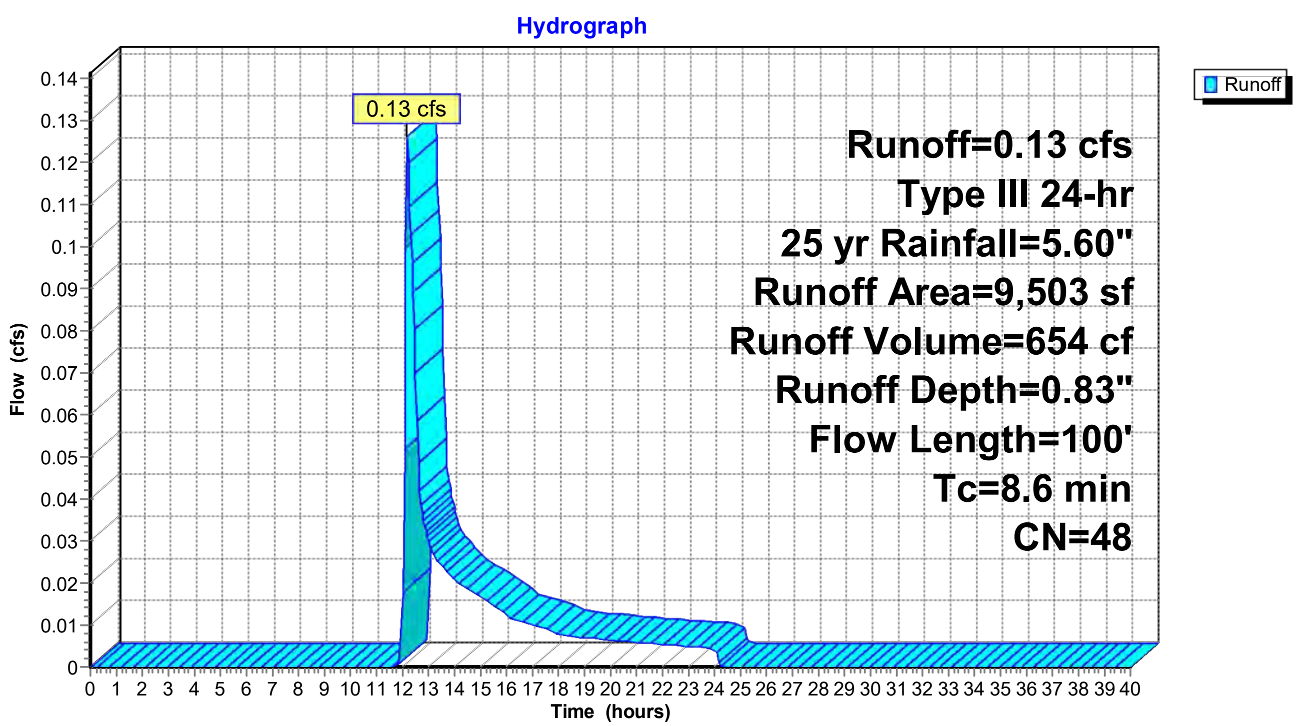
Runoff = 0.13 cfs @ 12.17 hrs, Volume= 654 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
511	98	Paved parking, HSG A
1,345	98	Roofs, HSG A
5,086	39	>75% Grass cover, Good, HSG A
2,561	30	Woods, Good, HSG A
9,503	48	Weighted Average
7,647		80.47% Pervious Area
1,856		19.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	50	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.6	100	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

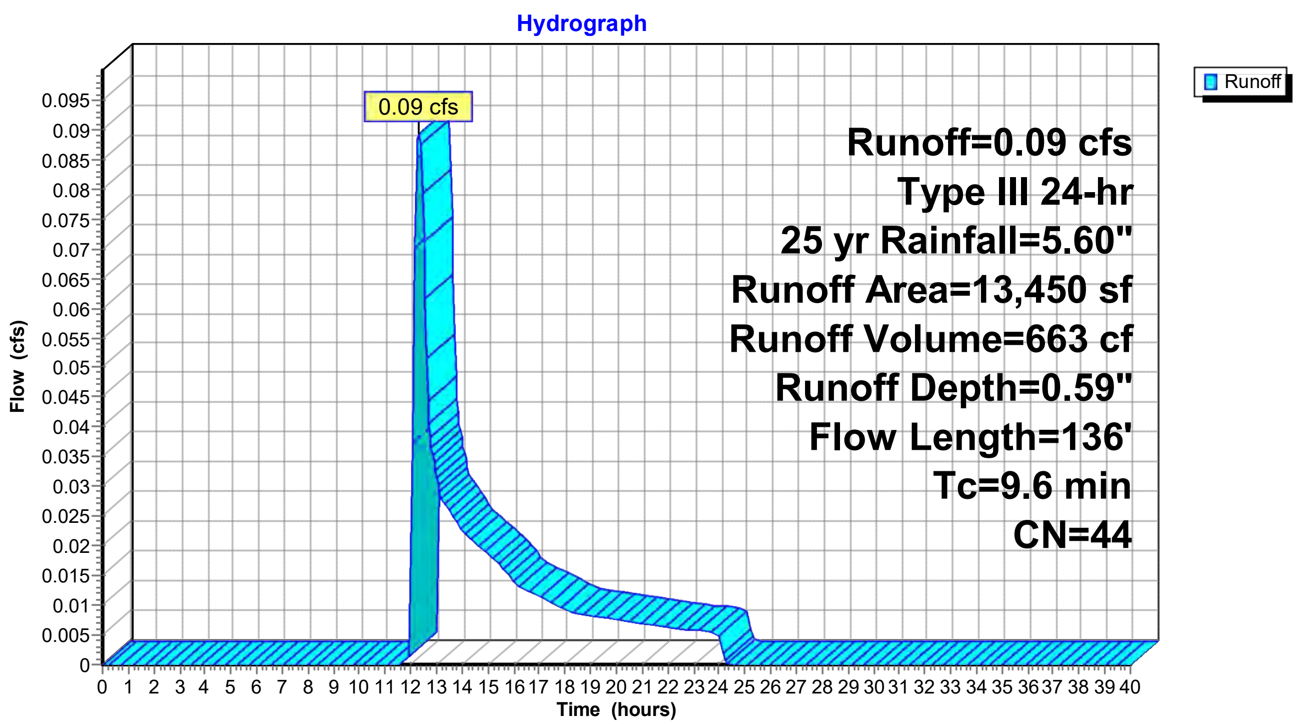
Runoff = 0.09 cfs @ 12.30 hrs, Volume= 663 cf, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=5.60"

Area (sf)	CN	Description
34	98	Paved parking, HSG A
1,082	98	Roofs, HSG A
12,334	39	>75% Grass cover, Good, HSG A
13,450	44	Weighted Average
12,334		91.70% Pervious Area
1,116		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0160	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.5	86	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	136	Total			

Subcatchment 5S:

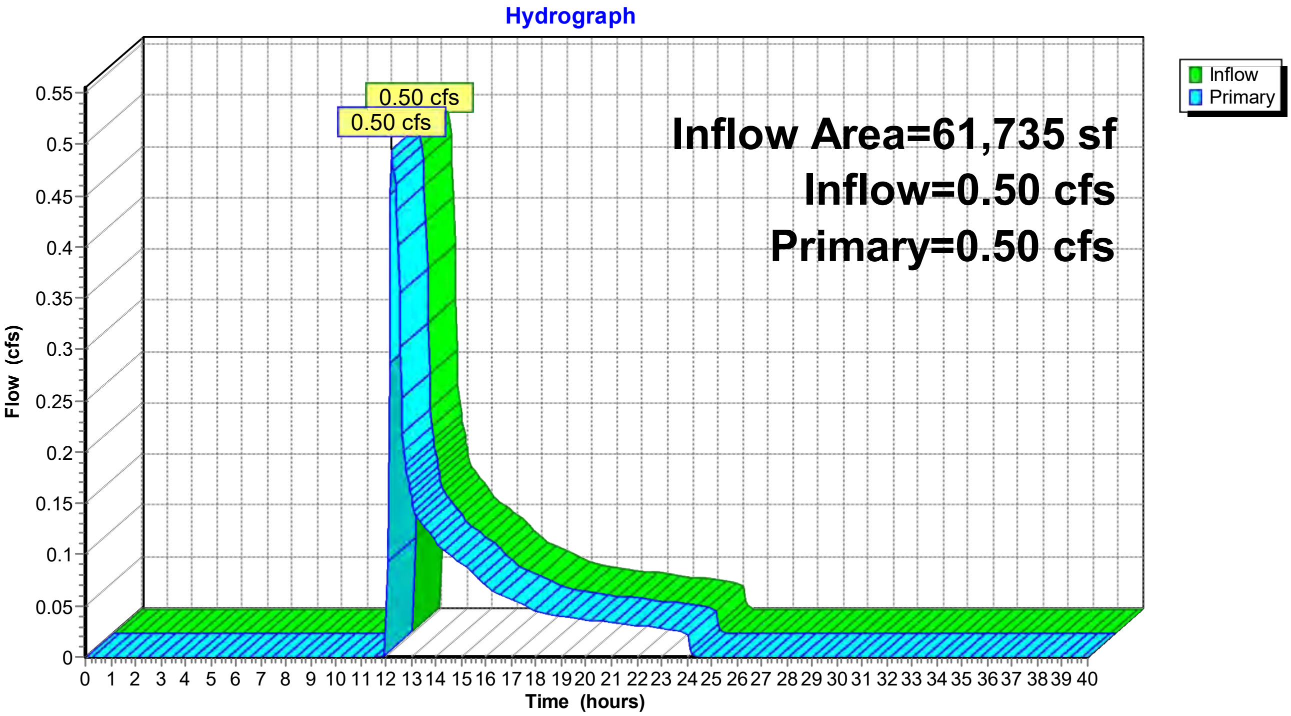


Summary for Link 1L:

Inflow Area =	61,735 sf,	15.97% Impervious,	Inflow Depth = 0.65"	for 25 yr event	
Inflow =	0.50 cfs @	12.22 hrs,	Volume=	3,331 cf	
Primary =	0.50 cfs @	12.22 hrs,	Volume=	3,331 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L:

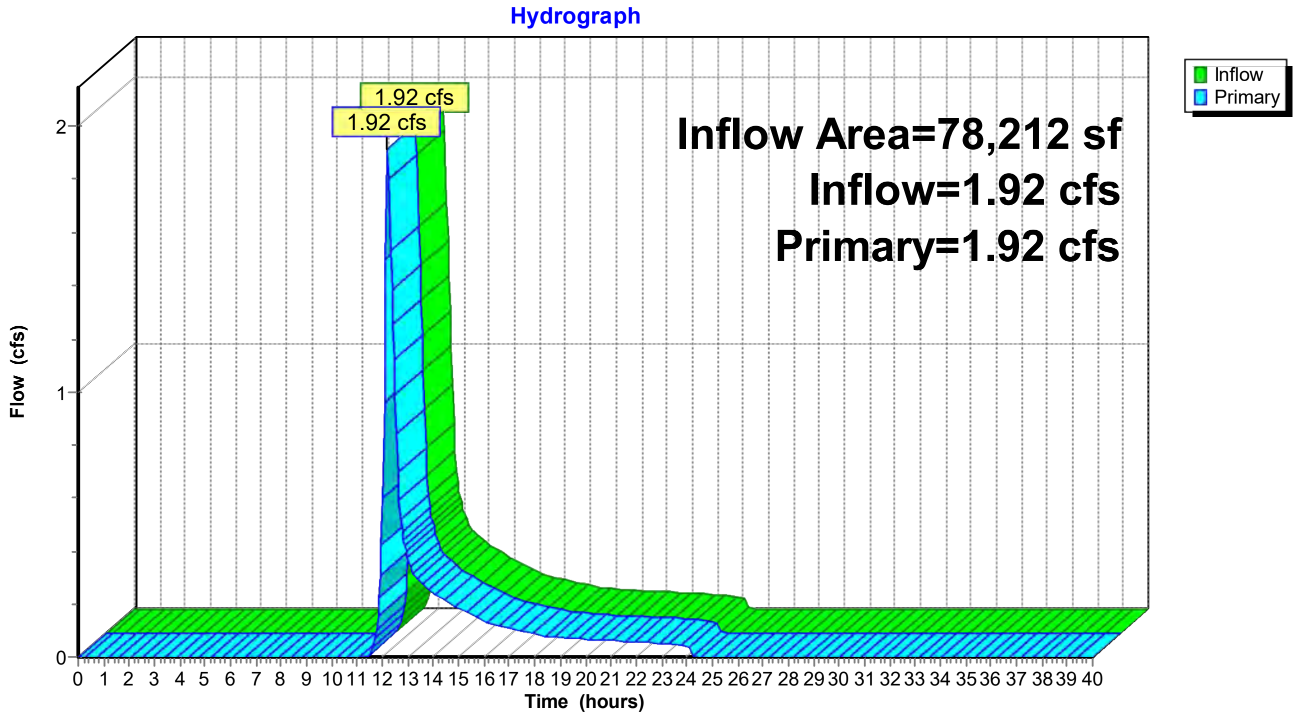


Summary for Link 2L:

Inflow Area =	78,212 sf,	27.45% Impervious,	Inflow Depth = 1.29"	for 25 yr event
Inflow =	1.92 cfs @	12.18 hrs, Volume=	8,426 cf	
Primary =	1.92 cfs @	12.18 hrs, Volume=	8,426 cf,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L:

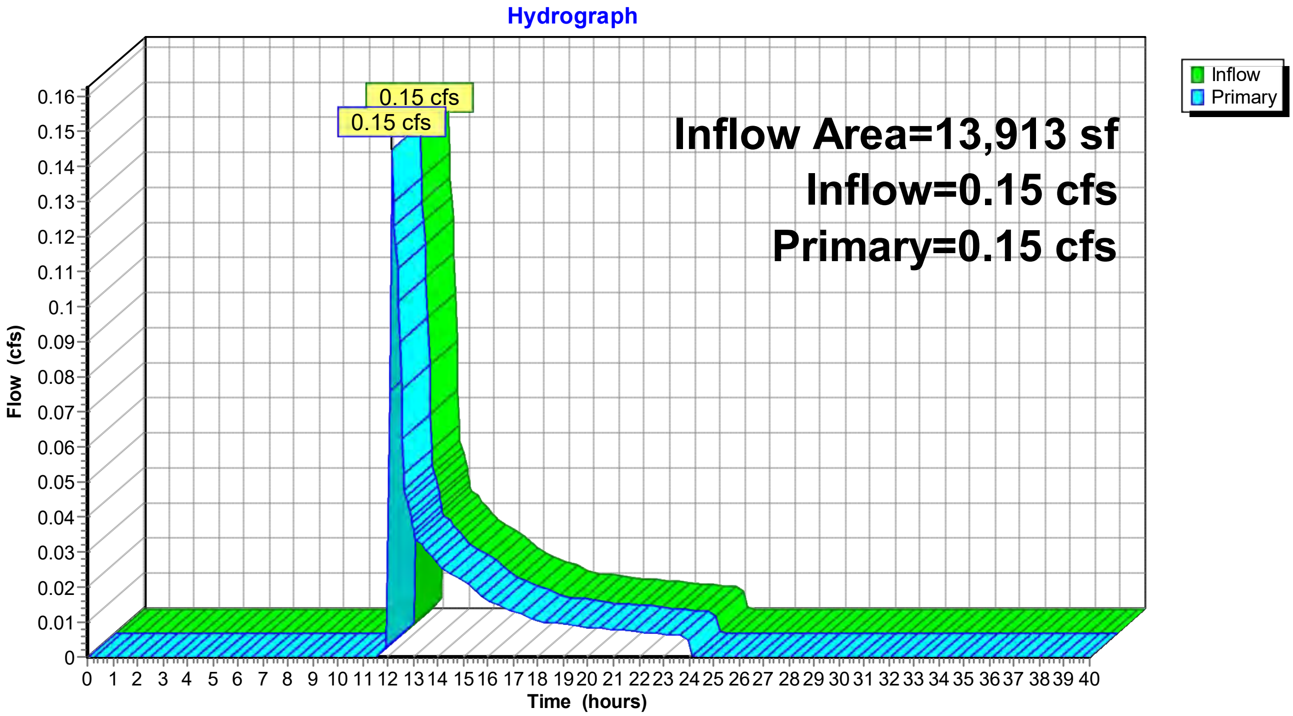


Summary for Link 3L:

Inflow Area = 13,913 sf, 11.67% Impervious, Inflow Depth = 0.71" for 25 yr event
Inflow = 0.15 cfs @ 12.14 hrs, Volume= 818 cf
Primary = 0.15 cfs @ 12.14 hrs, Volume= 818 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L:

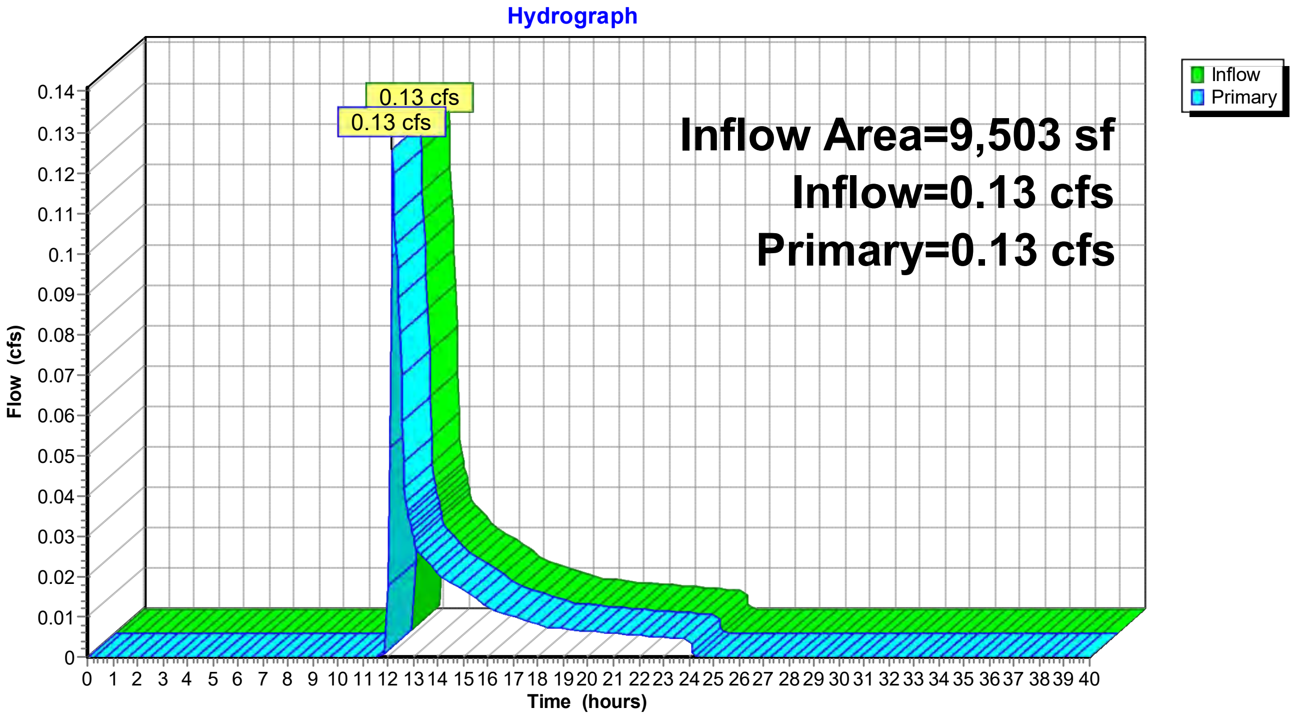


Summary for Link 4L:

Inflow Area = 9,503 sf, 19.53% Impervious, Inflow Depth = 0.83" for 25 yr event
Inflow = 0.13 cfs @ 12.17 hrs, Volume= 654 cf
Primary = 0.13 cfs @ 12.17 hrs, Volume= 654 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L:



Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S:	Runoff Area=61,735 sf 15.97% Impervious Runoff Depth=0.88" Flow Length=145' Tc=9.0 min CN=45 Runoff=0.84 cfs 4,541 cf
Subcatchment 2S:	Runoff Area=64,762 sf 31.43% Impervious Runoff Depth=1.80" Flow Length=329' Tc=11.2 min CN=57 Runoff=2.41 cfs 9,707 cf
Subcatchment 3S:	Runoff Area=13,913 sf 11.67% Impervious Runoff Depth=0.95" Flow Length=164' Tc=6.0 min CN=46 Runoff=0.24 cfs 1,103 cf
Subcatchment 4S:	Runoff Area=9,503 sf 19.53% Impervious Runoff Depth=1.09" Flow Length=100' Tc=8.6 min CN=48 Runoff=0.19 cfs 867 cf
Subcatchment 5S:	Runoff Area=13,450 sf 8.30% Impervious Runoff Depth=0.82" Flow Length=136' Tc=9.6 min CN=44 Runoff=0.15 cfs 914 cf
Link 1L:	Inflow=0.84 cfs 4,541 cf Primary=0.84 cfs 4,541 cf
Link 2L:	Inflow=2.56 cfs 10,621 cf Primary=2.56 cfs 10,621 cf
Link 3L:	Inflow=0.24 cfs 1,103 cf Primary=0.24 cfs 1,103 cf
Link 4L:	Inflow=0.19 cfs 867 cf Primary=0.19 cfs 867 cf

Total Runoff Area = 163,363 sf Runoff Volume = 17,133 cf Average Runoff Depth = 1.26"
78.69% Pervious = 128,553 sf 21.31% Impervious = 34,810 sf

Summary for Subcatchment 1S:

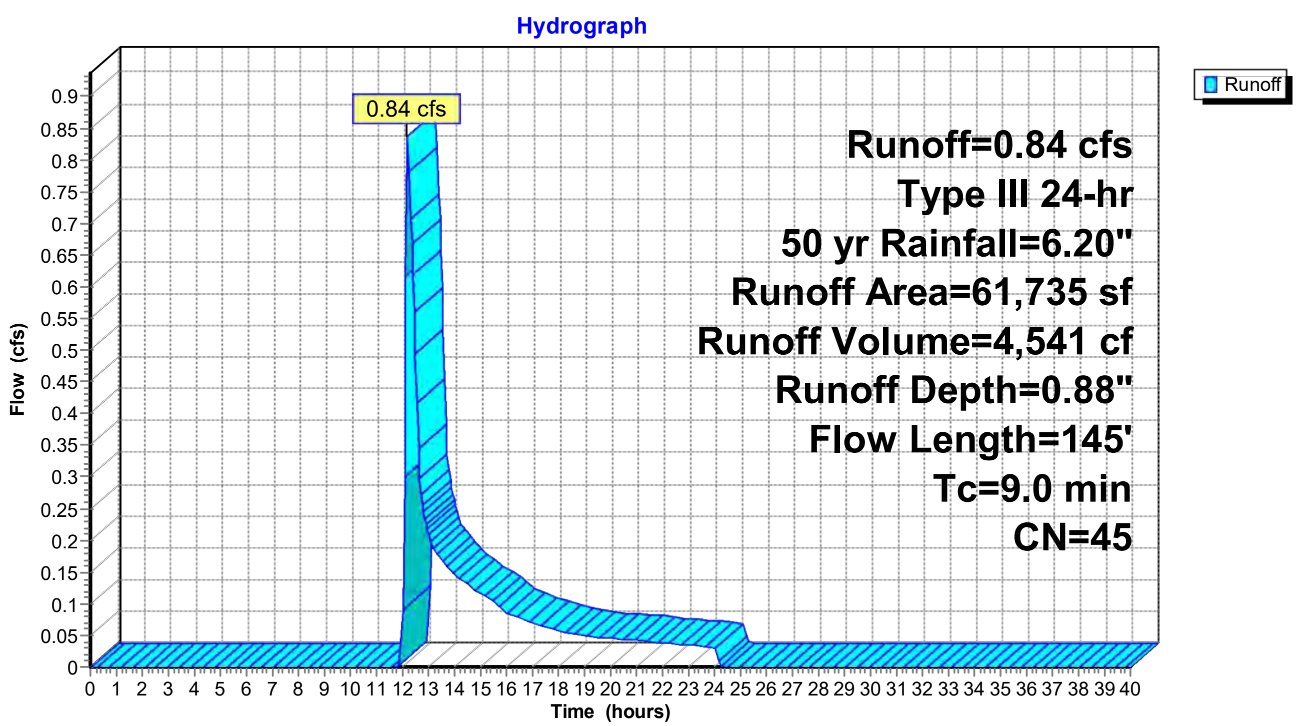
Runoff = 0.84 cfs @ 12.17 hrs, Volume= 4,541 cf, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=6.20"

Area (sf)	CN	Description
5,437	98	Paved parking, HSG A
4,422	98	Roofs, HSG A
28,821	39	>75% Grass cover, Good, HSG A
23,055	30	Woods, Good, HSG A
61,735	45	Weighted Average
51,876		84.03% Pervious Area
9,859		15.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0180	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	95	0.1160	5.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	145	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

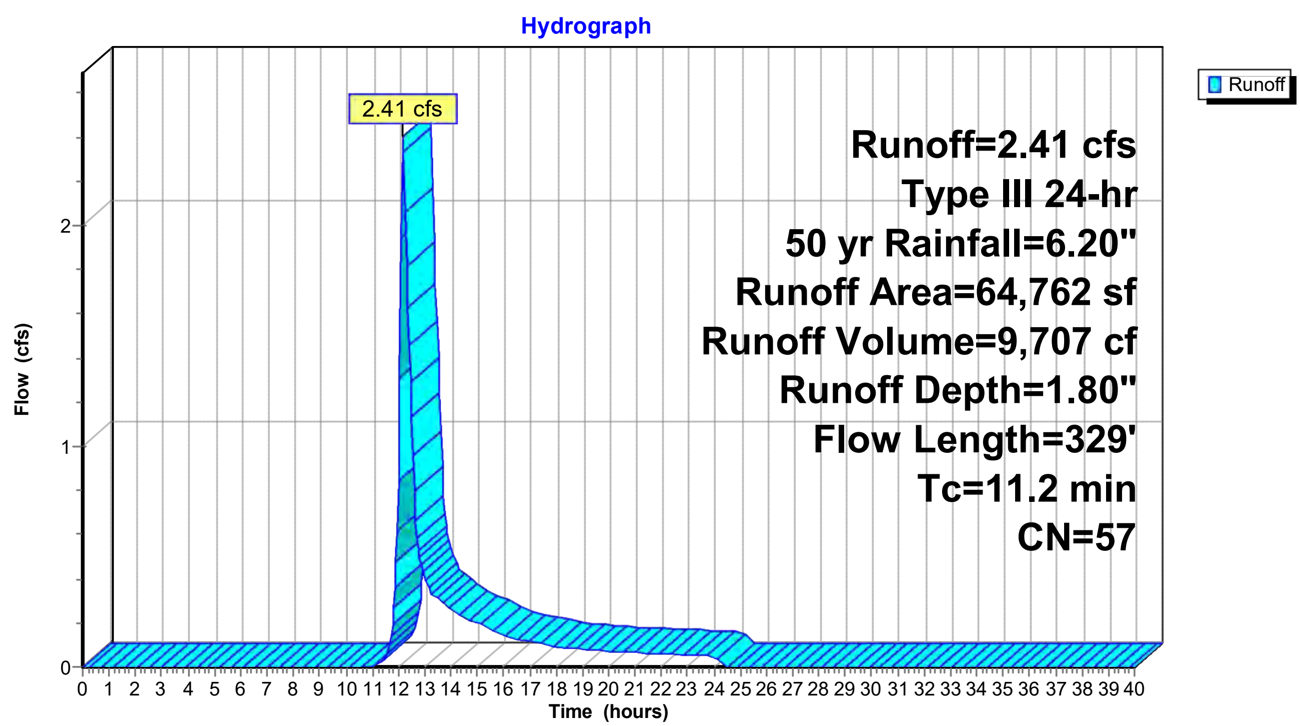
Runoff = 2.41 cfs @ 12.17 hrs, Volume= 9,707 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=6.20"

Area (sf)	CN	Description
12,262	98	Paved parking, HSG A
8,094	98	Roofs, HSG A
43,657	39	>75% Grass cover, Good, HSG A
749	30	Woods, Good, HSG A
64,762	57	Weighted Average
44,406		68.57% Pervious Area
20,356		31.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.0	279	0.0480	4.45		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.2	329	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

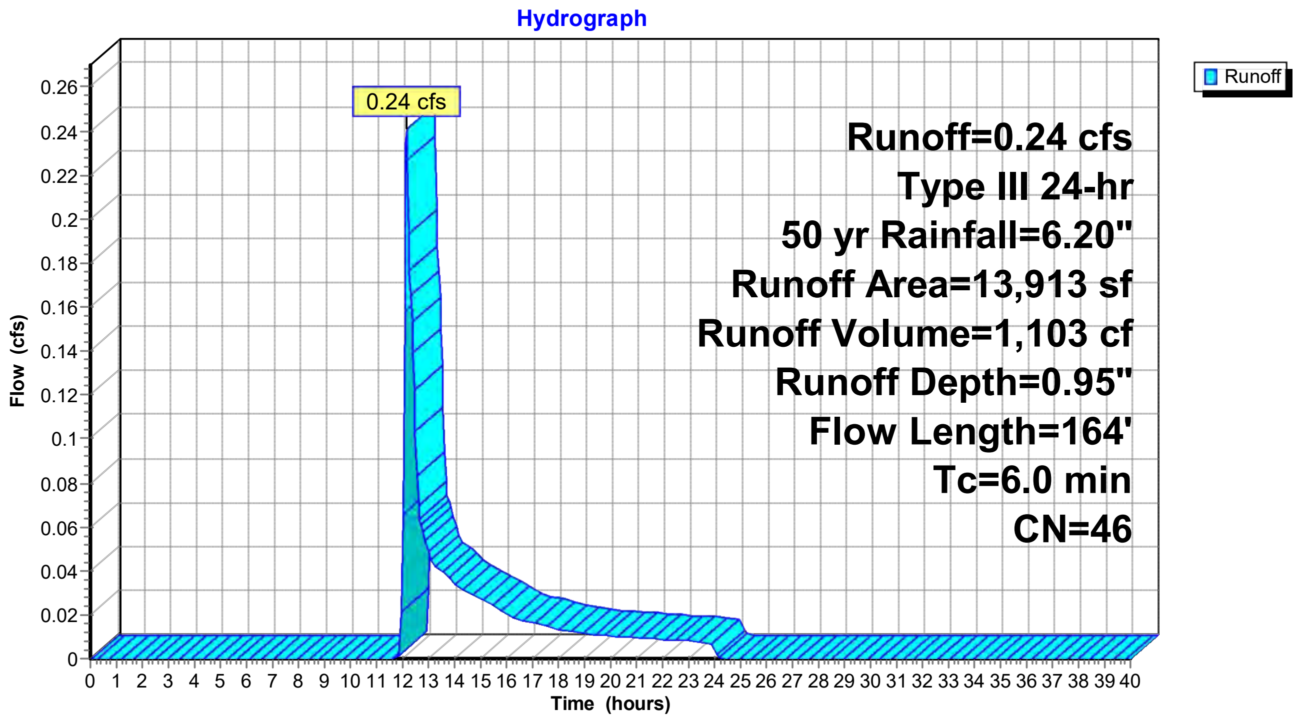
Runoff = 0.24 cfs @ 12.12 hrs, Volume= 1,103 cf, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=6.20"

Area (sf)	CN	Description
546	98	Paved parking, HSG A
1,077	98	Roofs, HSG A
12,290	39	>75% Grass cover, Good, HSG A
13,913	46	Weighted Average
12,290		88.33% Pervious Area
1,623		11.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.1280	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.4	114	0.0940	4.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	164	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S:



Summary for Subcatchment 4S:

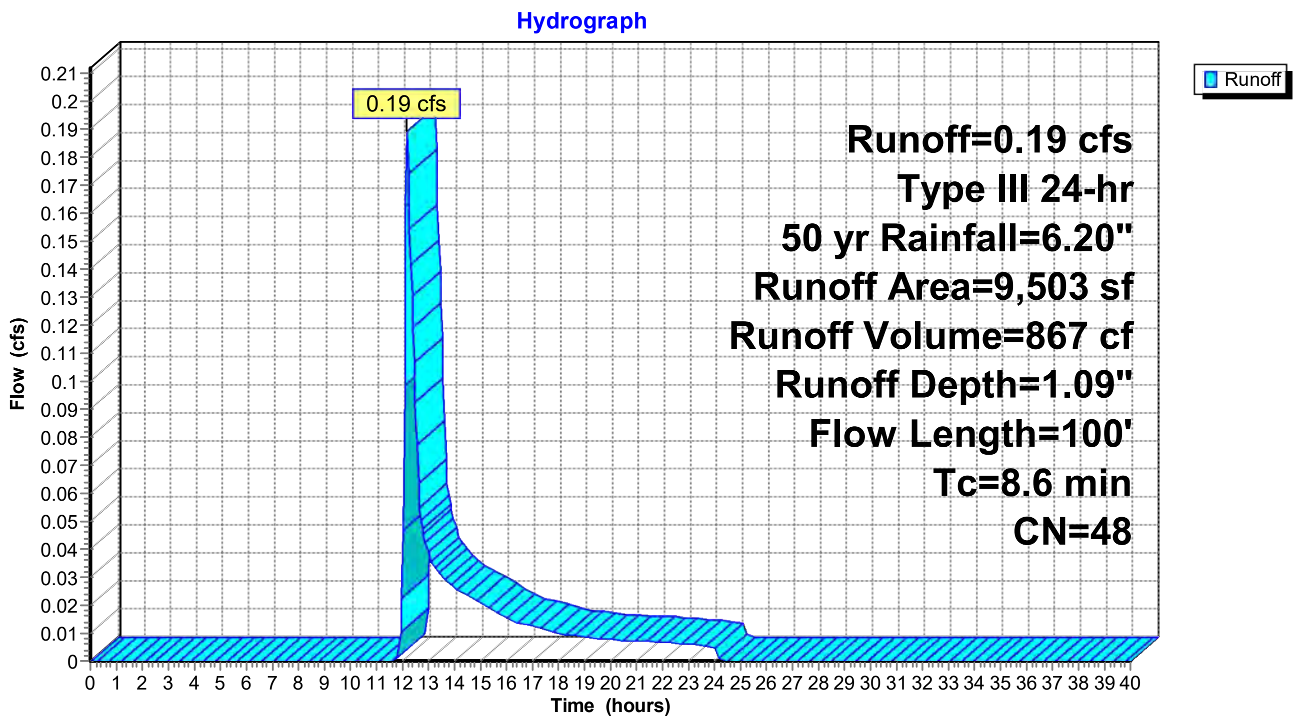
Runoff = 0.19 cfs @ 12.16 hrs, Volume= 867 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=6.20"

Area (sf)	CN	Description
511	98	Paved parking, HSG A
1,345	98	Roofs, HSG A
5,086	39	>75% Grass cover, Good, HSG A
2,561	30	Woods, Good, HSG A
9,503	48	Weighted Average
7,647		80.47% Pervious Area
1,856		19.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	50	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.6	100	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

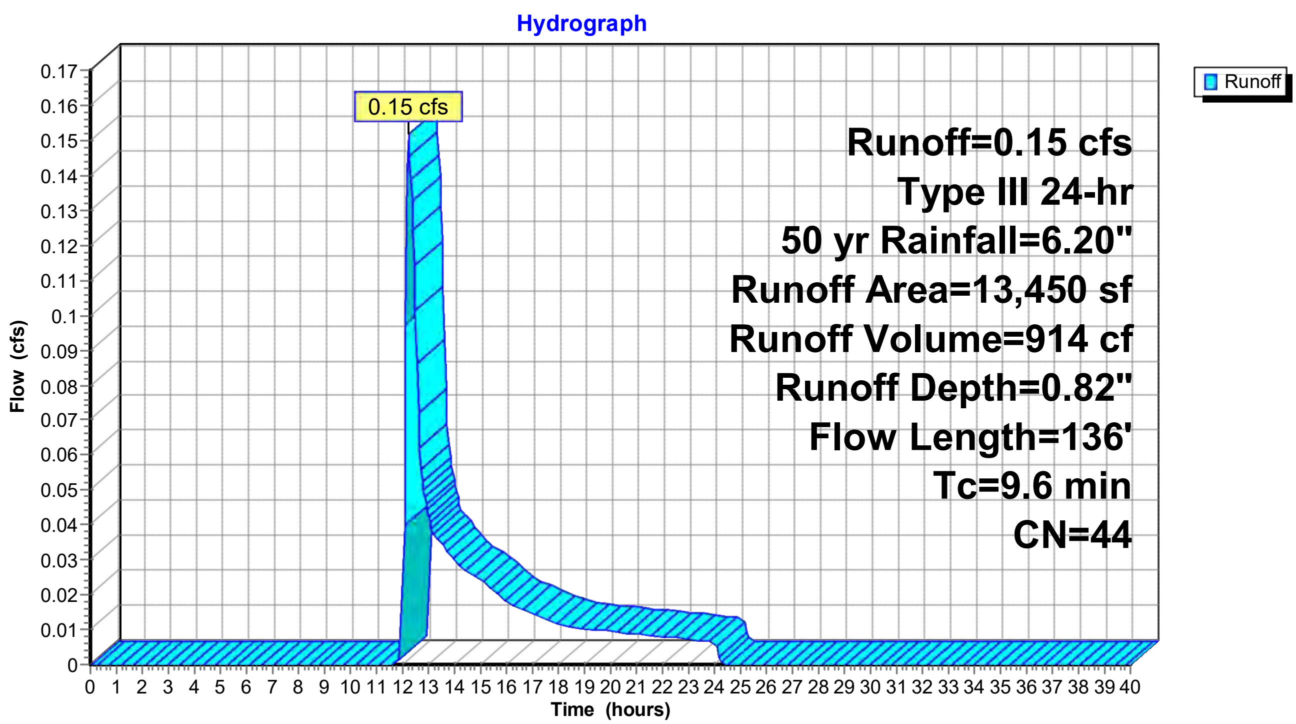
Runoff = 0.15 cfs @ 12.21 hrs, Volume= 914 cf, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 50 yr Rainfall=6.20"

Area (sf)	CN	Description
34	98	Paved parking, HSG A
1,082	98	Roofs, HSG A
12,334	39	>75% Grass cover, Good, HSG A
13,450	44	Weighted Average
12,334		91.70% Pervious Area
1,116		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0160	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.5	86	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	136	Total			

Subcatchment 5S:

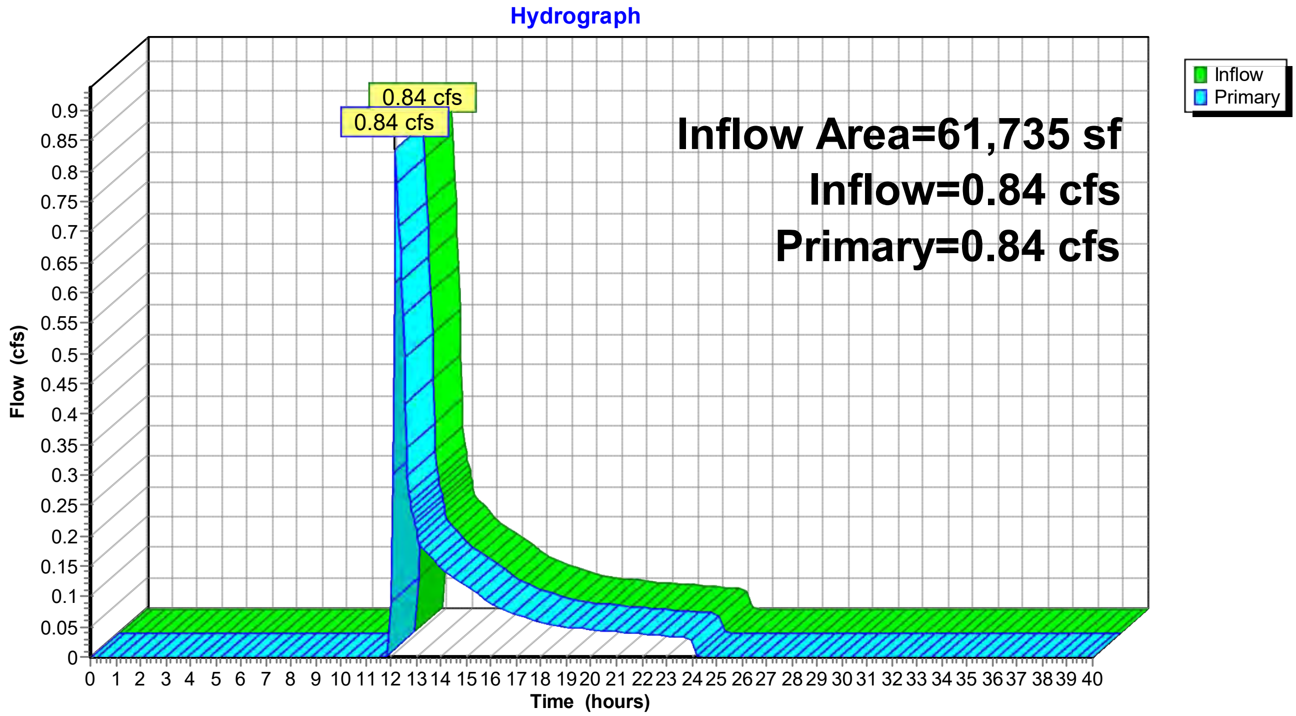


Summary for Link 1L:

Inflow Area = 61,735 sf, 15.97% Impervious, Inflow Depth = 0.88" for 50 yr event
Inflow = 0.84 cfs @ 12.17 hrs, Volume= 4,541 cf
Primary = 0.84 cfs @ 12.17 hrs, Volume= 4,541 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L:

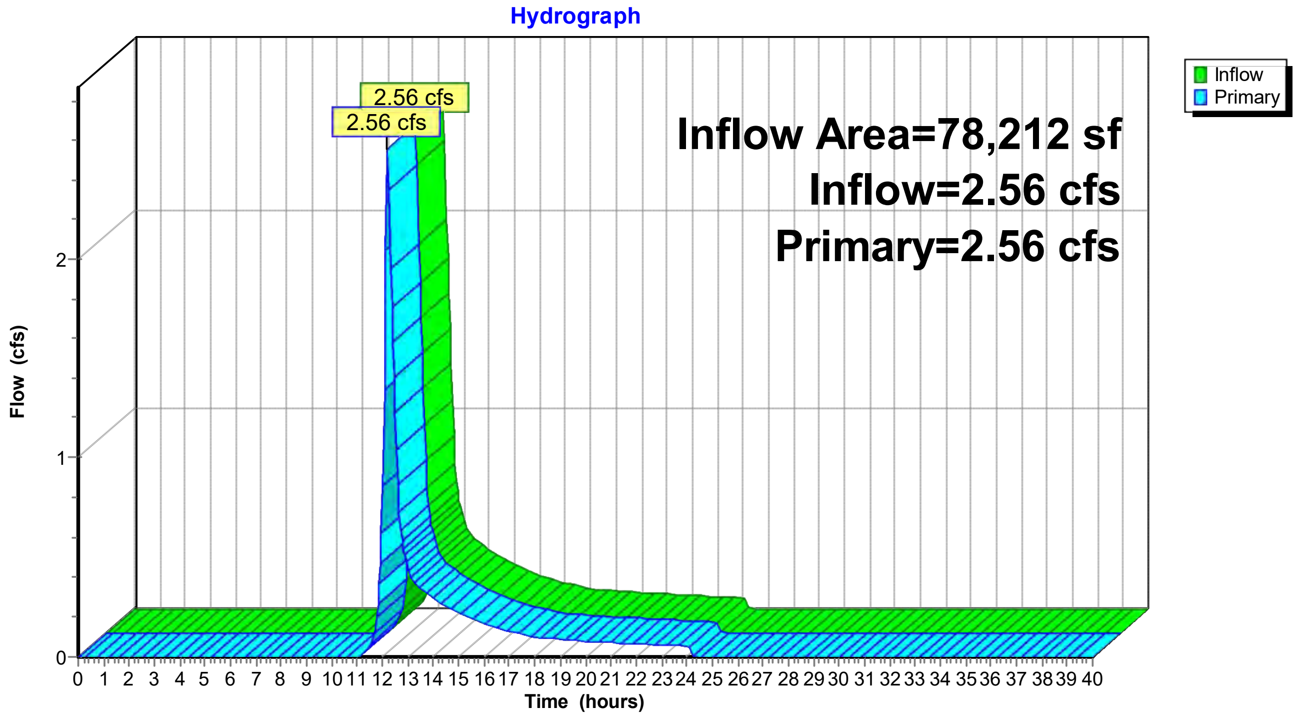


Summary for Link 2L:

Inflow Area = 78,212 sf, 27.45% Impervious, Inflow Depth = 1.63" for 50 yr event
Inflow = 2.56 cfs @ 12.17 hrs, Volume= 10,621 cf
Primary = 2.56 cfs @ 12.17 hrs, Volume= 10,621 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L:

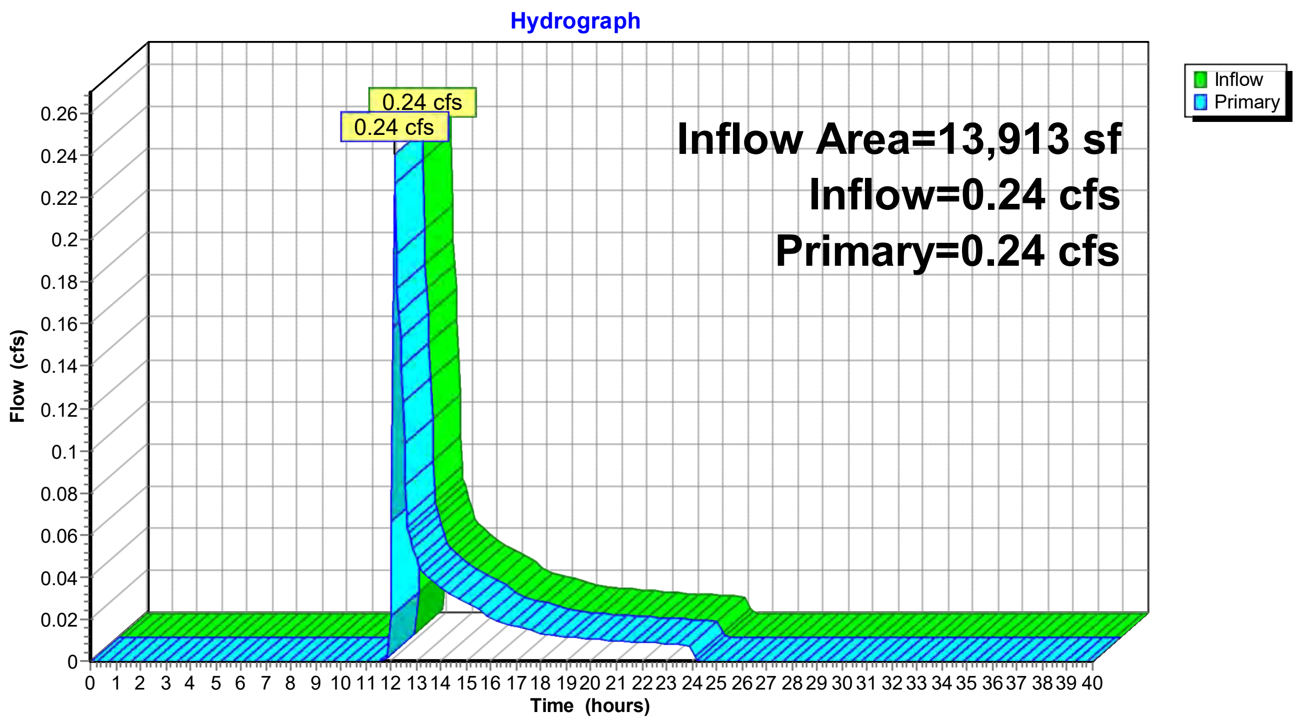


Summary for Link 3L:

Inflow Area = 13,913 sf, 11.67% Impervious, Inflow Depth = 0.95" for 50 yr event
Inflow = 0.24 cfs @ 12.12 hrs, Volume= 1,103 cf
Primary = 0.24 cfs @ 12.12 hrs, Volume= 1,103 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L:

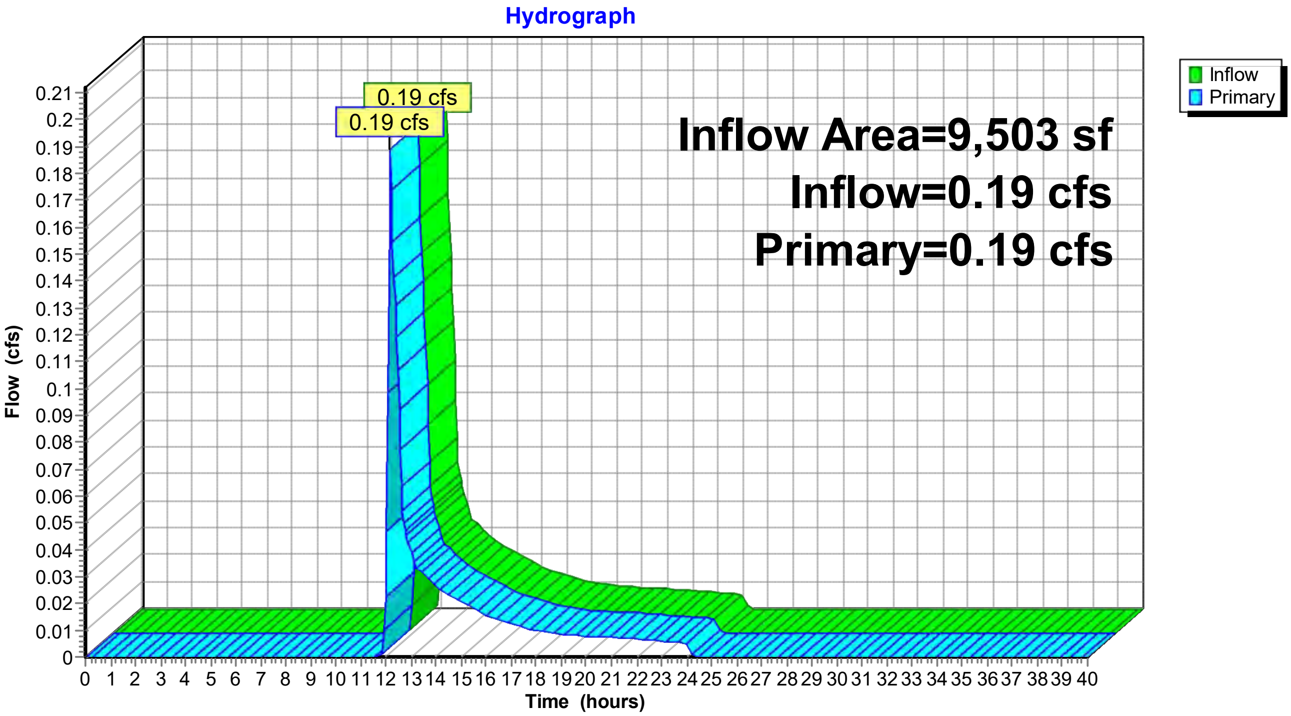


Summary for Link 4L:

Inflow Area =	9,503 sf,	19.53% Impervious,	Inflow Depth = 1.09"	for 50 yr event
Inflow =	0.19 cfs @	12.16 hrs, Volume=	867 cf	
Primary =	0.19 cfs @	12.16 hrs, Volume=	867 cf, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L:



Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S:	Runoff Area=61,735 sf 15.97% Impervious Runoff Depth=1.01" Flow Length=145' Tc=9.0 min CN=45 Runoff=1.03 cfs 5,198 cf
Subcatchment 2S:	Runoff Area=64,762 sf 31.43% Impervious Runoff Depth=1.99" Flow Length=329' Tc=11.2 min CN=57 Runoff=2.69 cfs 10,726 cf
Subcatchment 3S:	Runoff Area=13,913 sf 11.67% Impervious Runoff Depth=1.08" Flow Length=164' Tc=6.0 min CN=46 Runoff=0.29 cfs 1,258 cf
Subcatchment 4S:	Runoff Area=9,503 sf 19.53% Impervious Runoff Depth=1.24" Flow Length=100' Tc=8.6 min CN=48 Runoff=0.22 cfs 980 cf
Subcatchment 5S:	Runoff Area=13,450 sf 8.30% Impervious Runoff Depth=0.94" Flow Length=136' Tc=9.6 min CN=44 Runoff=0.19 cfs 1,051 cf
Link 1L:	Inflow=1.03 cfs 5,198 cf Primary=1.03 cfs 5,198 cf
Link 2L:	Inflow=2.88 cfs 11,776 cf Primary=2.88 cfs 11,776 cf
Link 3L:	Inflow=0.29 cfs 1,258 cf Primary=0.29 cfs 1,258 cf
Link 4L:	Inflow=0.22 cfs 980 cf Primary=0.22 cfs 980 cf

Total Runoff Area = 163,363 sf Runoff Volume = 19,213 cf Average Runoff Depth = 1.41"
78.69% Pervious = 128,553 sf 21.31% Impervious = 34,810 sf

Summary for Subcatchment 1S:

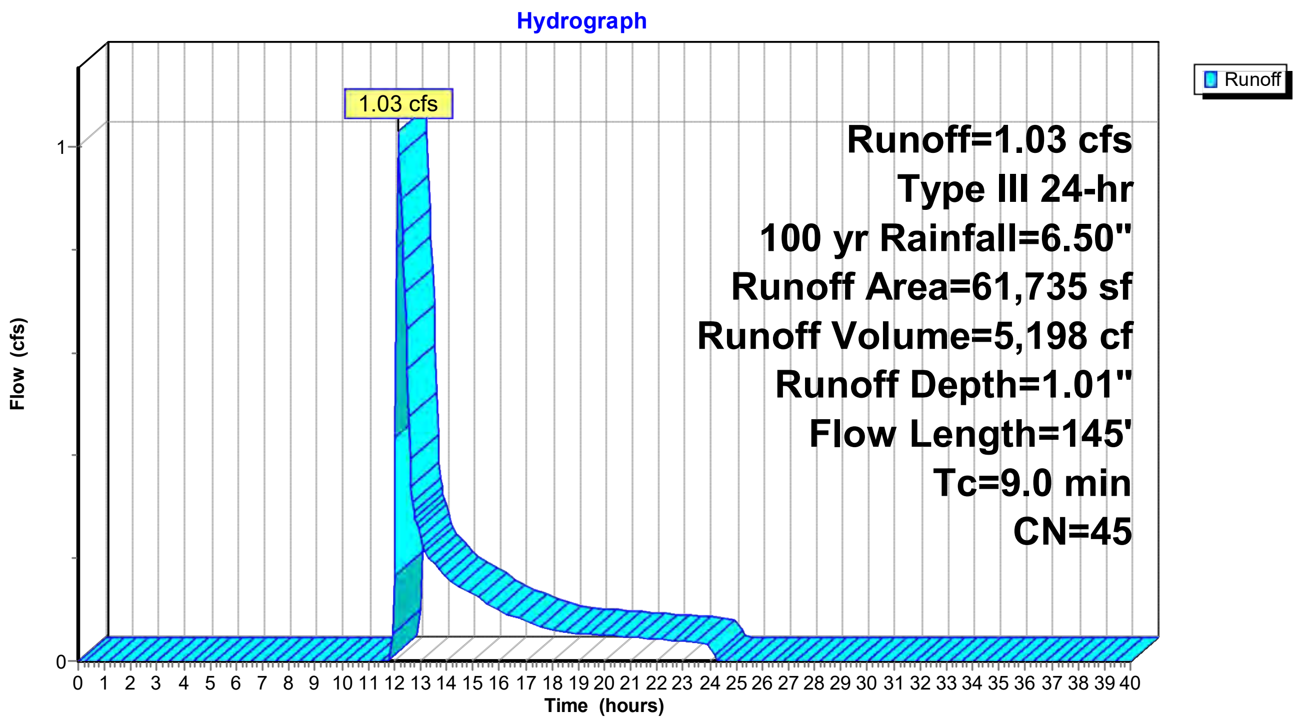
Runoff = 1.03 cfs @ 12.17 hrs, Volume= 5,198 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
5,437	98	Paved parking, HSG A
4,422	98	Roofs, HSG A
28,821	39	>75% Grass cover, Good, HSG A
23,055	30	Woods, Good, HSG A
61,735	45	Weighted Average
51,876		84.03% Pervious Area
9,859		15.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0180	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	95	0.1160	5.48		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	145	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

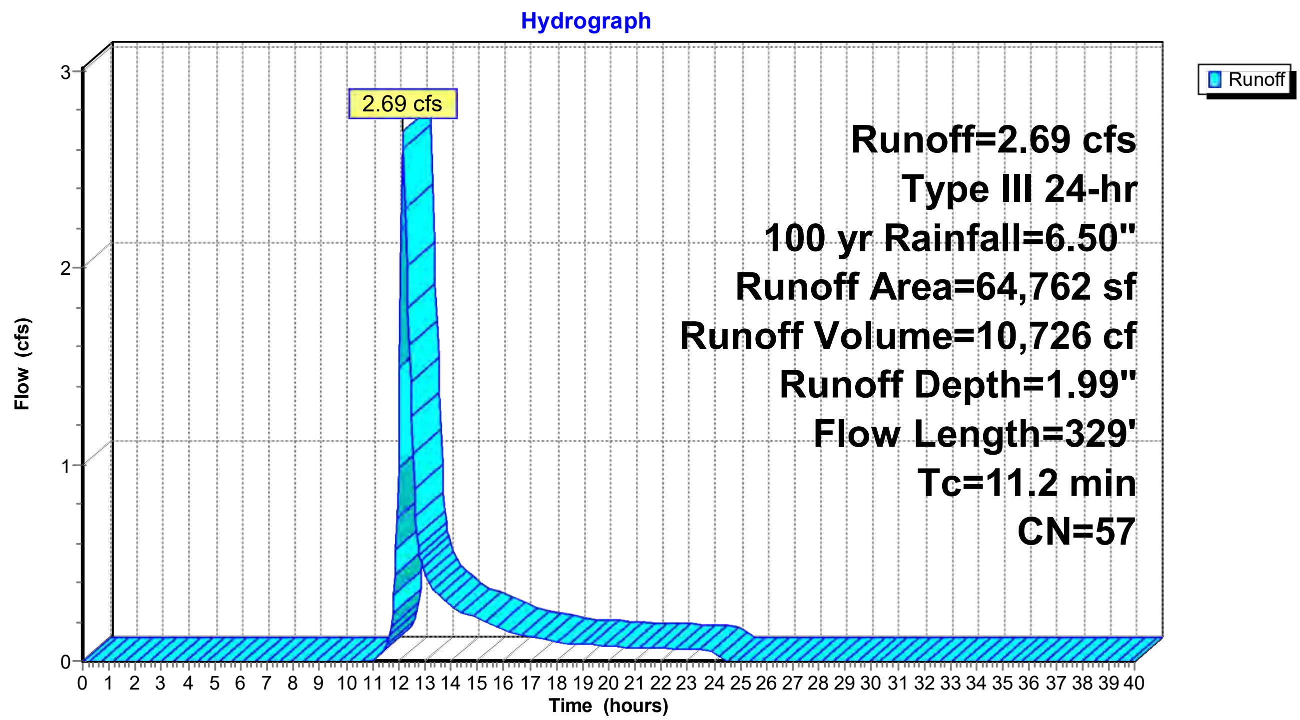
Runoff = 2.69 cfs @ 12.17 hrs, Volume= 10,726 cf, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
12,262	98	Paved parking, HSG A
8,094	98	Roofs, HSG A
43,657	39	>75% Grass cover, Good, HSG A
749	30	Woods, Good, HSG A
64,762	57	Weighted Average
44,406		68.57% Pervious Area
20,356		31.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0120	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
1.0	279	0.0480	4.45		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
11.2	329	Total			

Subcatchment 2S:



Summary for Subcatchment 3S:

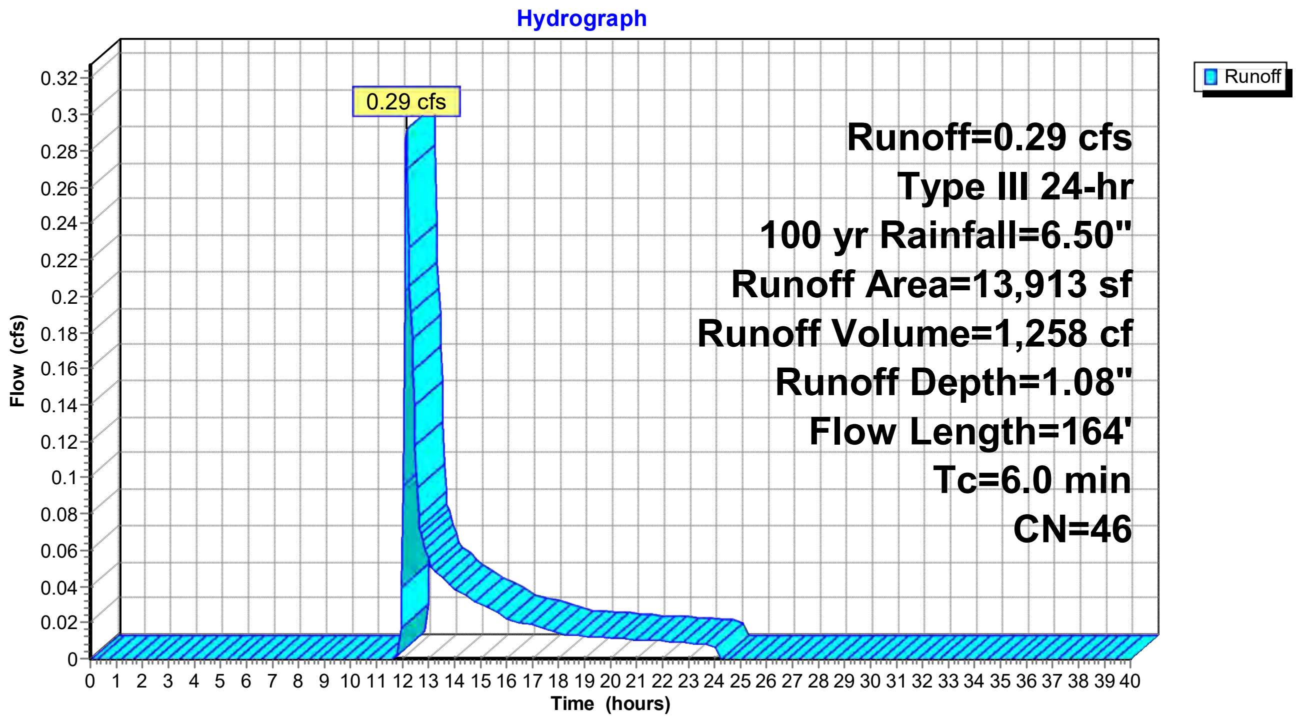
Runoff = 0.29 cfs @ 12.12 hrs, Volume= 1,258 cf, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
546	98	Paved parking, HSG A
1,077	98	Roofs, HSG A
12,290	39	>75% Grass cover, Good, HSG A
13,913	46	Weighted Average
12,290		88.33% Pervious Area
1,623		11.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.1280	0.21		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.4	114	0.0940	4.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
4.4	164	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3S:



Summary for Subcatchment 4S:

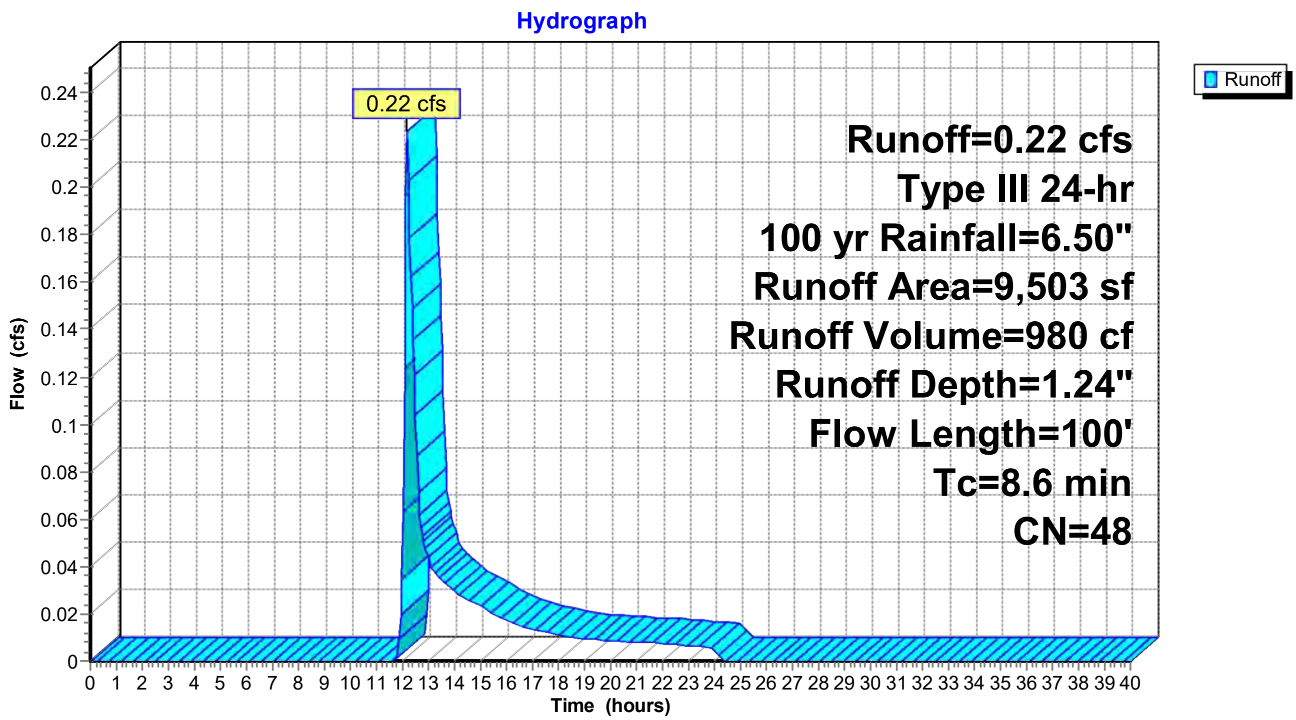
Runoff = 0.22 cfs @ 12.15 hrs, Volume= 980 cf, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
511	98	Paved parking, HSG A
1,345	98	Roofs, HSG A
5,086	39	>75% Grass cover, Good, HSG A
2,561	30	Woods, Good, HSG A
9,503	48	Weighted Average
7,647		80.47% Pervious Area
1,856		19.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.3	50	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.6	100	Total			

Subcatchment 4S:



Summary for Subcatchment 5S:

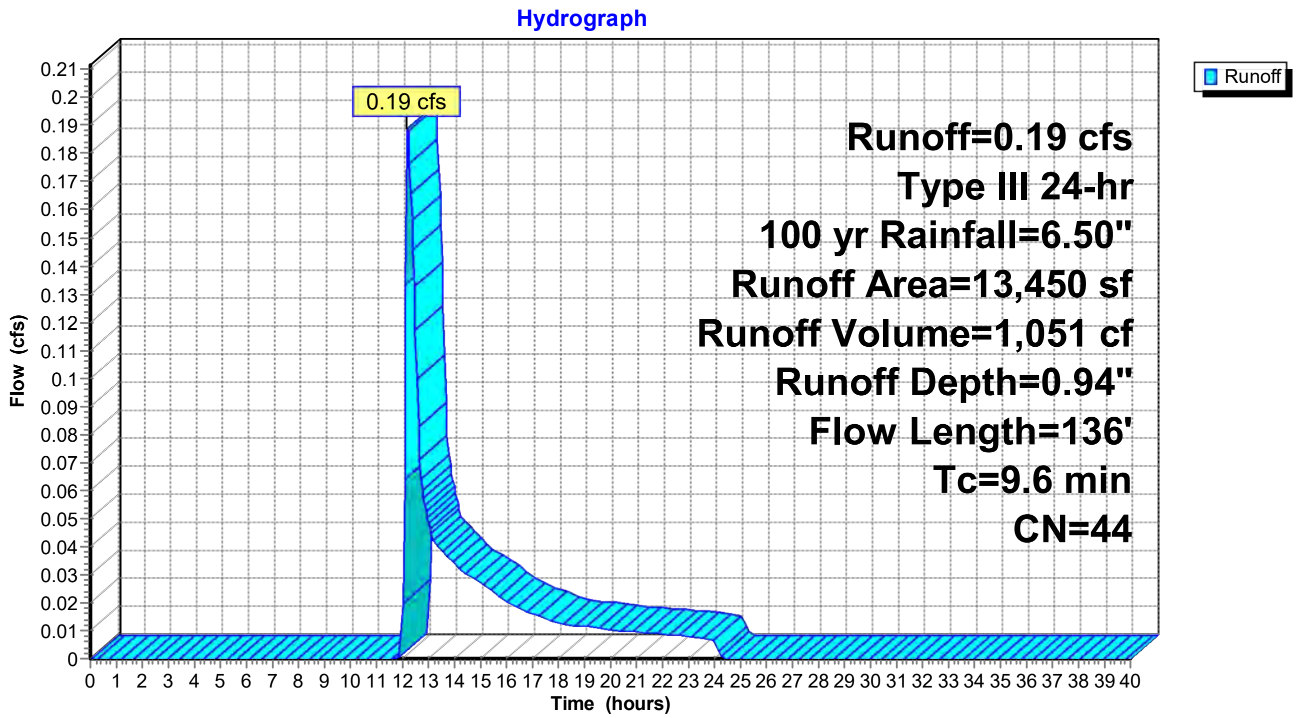
Runoff = 0.19 cfs @ 12.19 hrs, Volume= 1,051 cf, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=6.50"

Area (sf)	CN	Description
34	98	Paved parking, HSG A
1,082	98	Roofs, HSG A
12,334	39	>75% Grass cover, Good, HSG A
13,450	44	Weighted Average
12,334		91.70% Pervious Area
1,116		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0160	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.11"
0.5	86	0.0330	2.92		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.6	136	Total			

Subcatchment 5S:

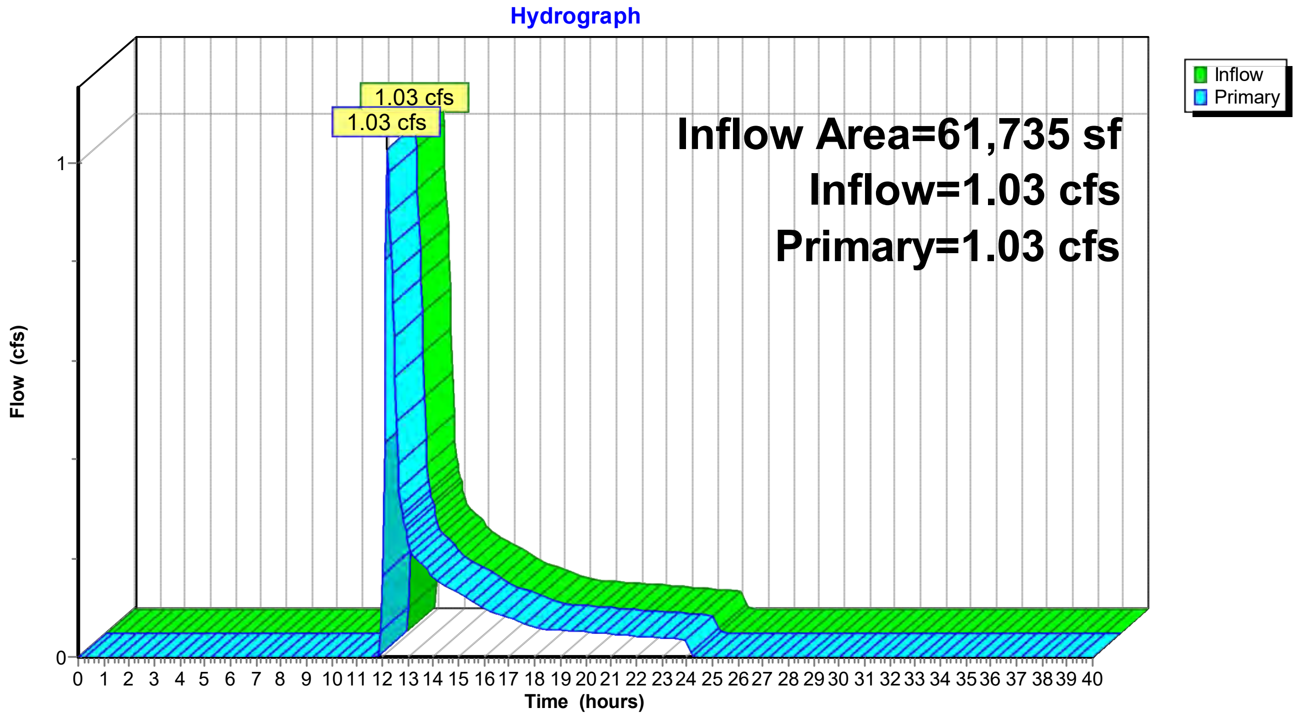


Summary for Link 1L:

Inflow Area = 61,735 sf, 15.97% Impervious, Inflow Depth = 1.01" for 100 yr event
Inflow = 1.03 cfs @ 12.17 hrs, Volume= 5,198 cf
Primary = 1.03 cfs @ 12.17 hrs, Volume= 5,198 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L:

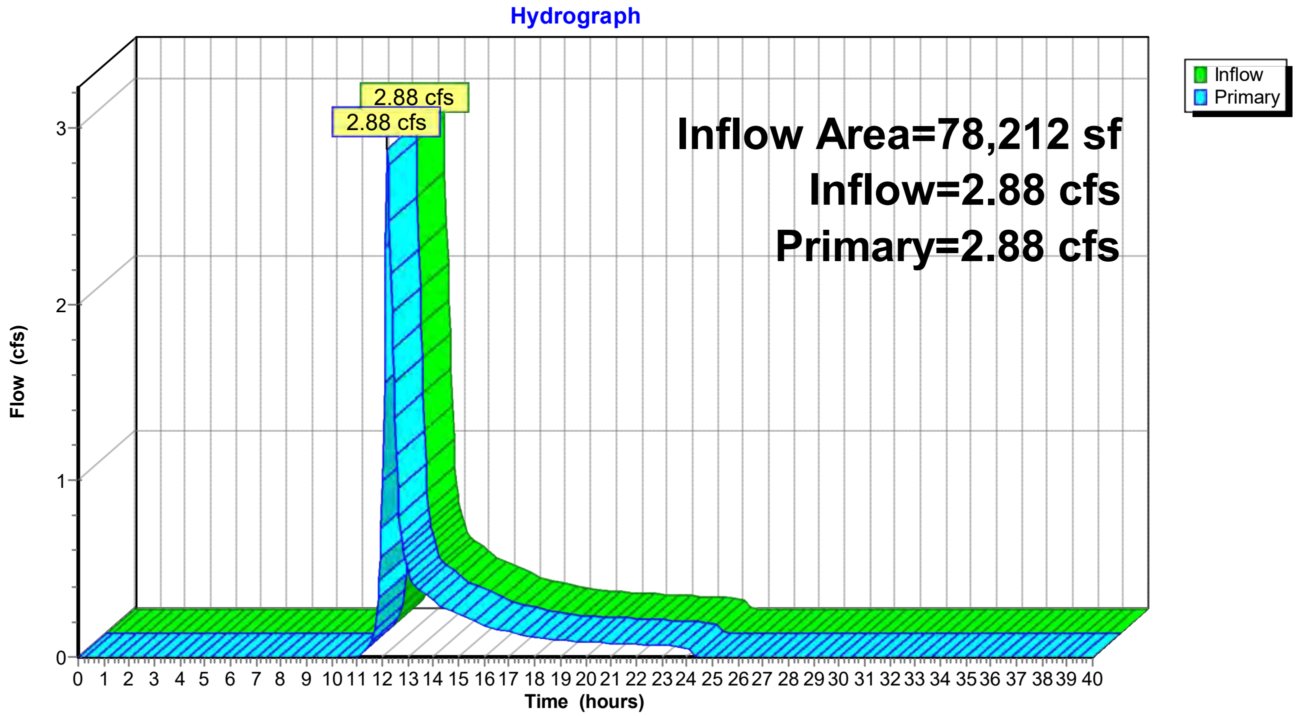


Summary for Link 2L:

Inflow Area = 78,212 sf, 27.45% Impervious, Inflow Depth = 1.81" for 100 yr event
Inflow = 2.88 cfs @ 12.17 hrs, Volume= 11,776 cf
Primary = 2.88 cfs @ 12.17 hrs, Volume= 11,776 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L:

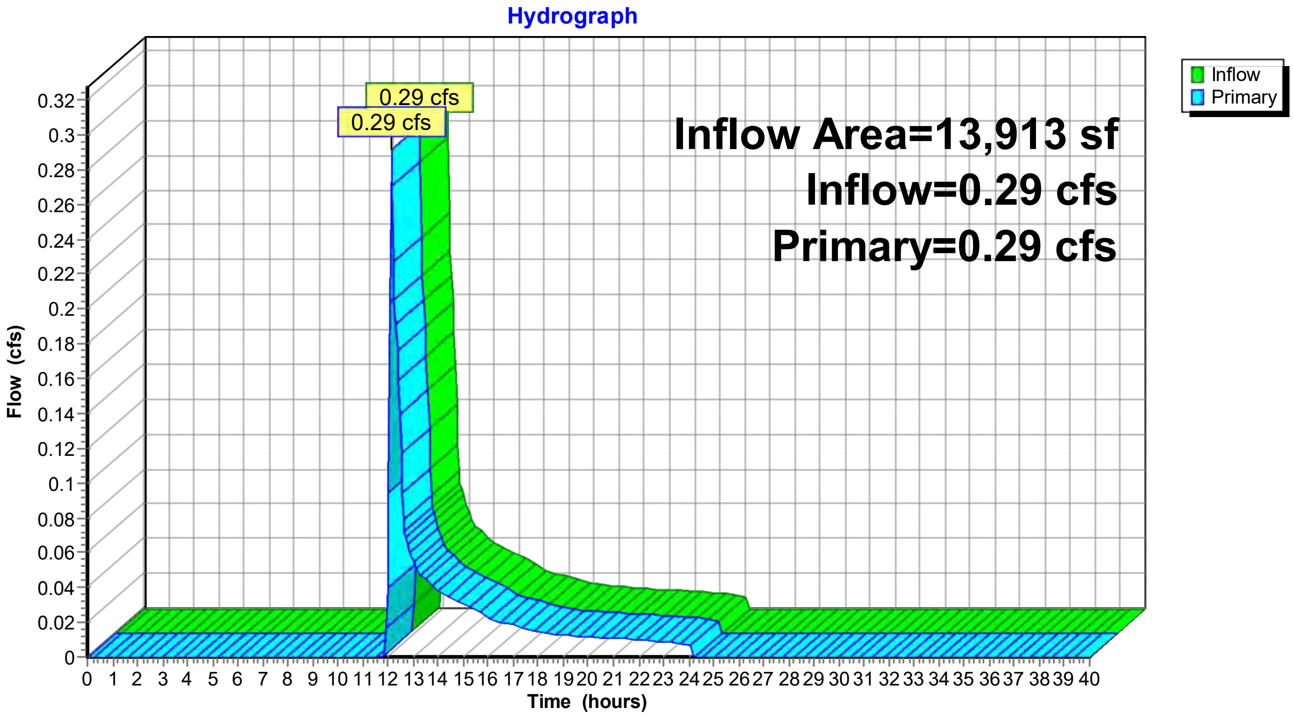


Summary for Link 3L:

Inflow Area = 13,913 sf, 11.67% Impervious, Inflow Depth = 1.08" for 100 yr event
Inflow = 0.29 cfs @ 12.12 hrs, Volume= 1,258 cf
Primary = 0.29 cfs @ 12.12 hrs, Volume= 1,258 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L:

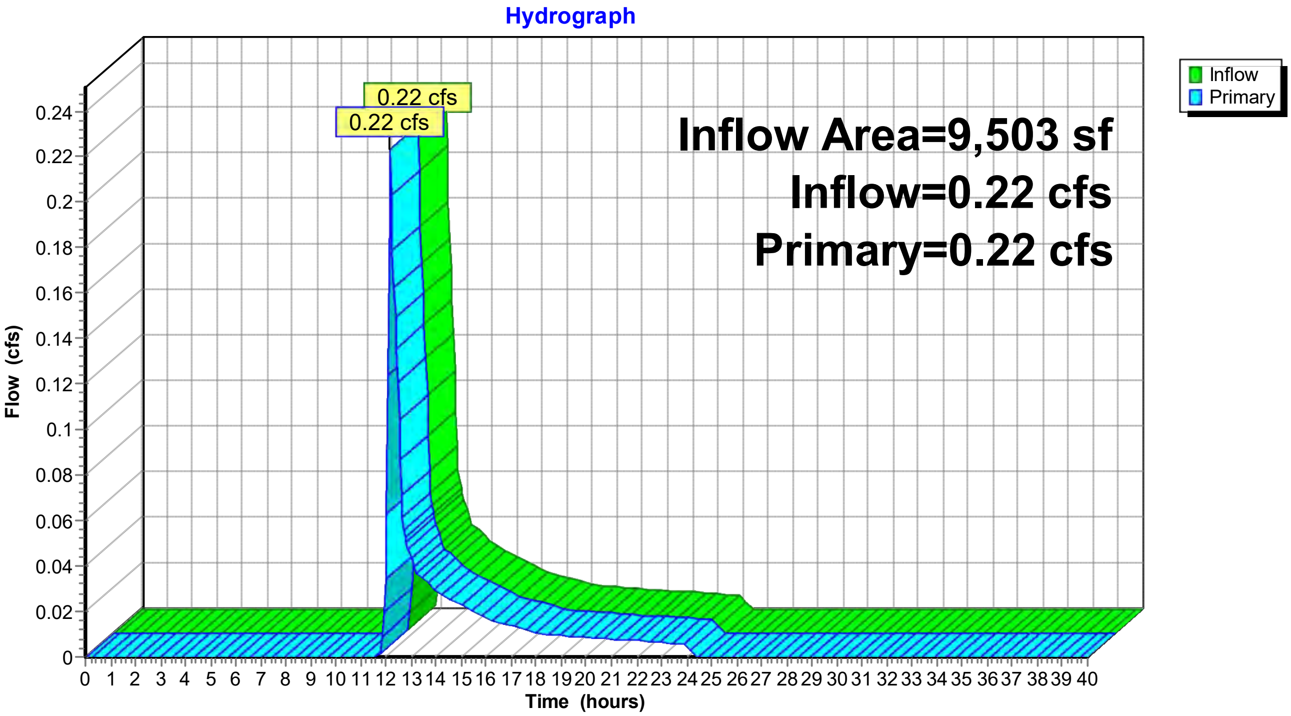


Summary for Link 4L:

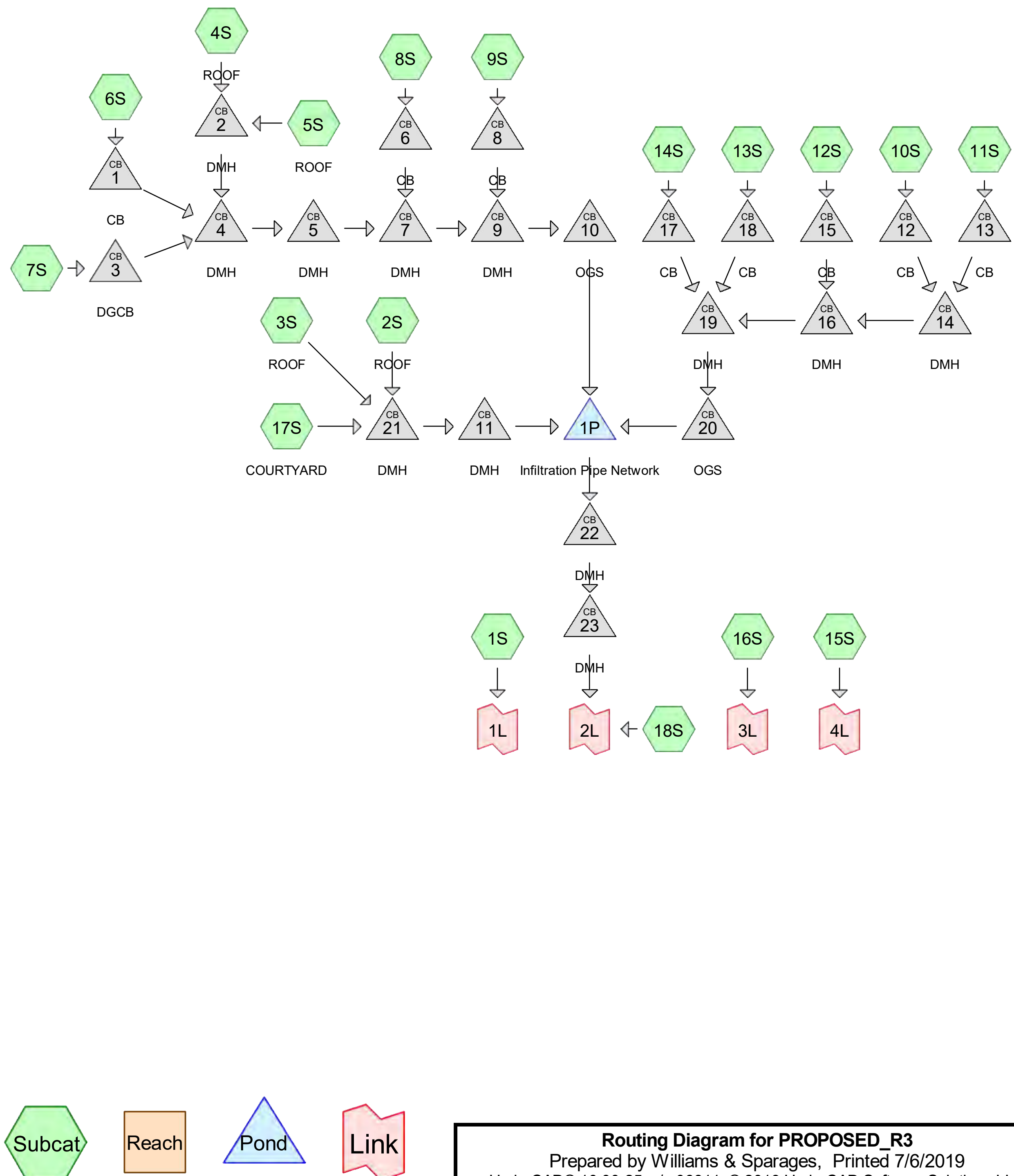
Inflow Area = 9,503 sf, 19.53% Impervious, Inflow Depth = 1.24" for 100 yr event
Inflow = 0.22 cfs @ 12.15 hrs, Volume= 980 cf
Primary = 0.22 cfs @ 12.15 hrs, Volume= 980 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L:



1.9.2 Proposed Condition



Routing Diagram for PROPOSED_R3
Prepared by Williams & Sparages, Printed 7/6/2019
HydroCAD® 10.00-25 s/n 06611 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
46,958	39	>75% Grass cover, Good, HSG A (1S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S)
64,897	98	Paved parking, HSG A (1S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 17S, 18S)
51,424	98	Roofs, HSG A (2S, 3S, 4S, 5S, 6S, 7S, 8S, 10S, 11S, 17S, 18S)
84	98	Wall, HSG A (15S)
163,363	**81**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
163,363	HSG A	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
163,363		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatch Numbers
46,958	0	0	0	0	46,958	>75% Grass cover, Good	
64,897	0	0	0	0	64,897	Paved parking	
51,424	0	0	0	0	51,424	Roofs	
84	0	0	0	0	84	Wall	
163,363	**0**	**0**	**0**	**0**	**163,363**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1	194.50	193.70	79.0	0.0101	0.012	12.0	0.0	0.0
2	1P	184.42	183.92	50.0	0.0100	0.012	8.0	0.0	0.0
3	2	194.50	193.95	14.0	0.0393	0.012	15.0	0.0	0.0
4	3	194.25	194.20	5.0	0.0100	0.012	12.0	0.0	0.0
5	4	193.20	192.72	48.0	0.0100	0.012	18.0	0.0	0.0
6	5	192.72	190.95	177.0	0.0100	0.012	18.0	0.0	0.0
7	6	194.00	193.93	7.0	0.0100	0.012	12.0	0.0	0.0
8	7	190.95	189.86	109.0	0.0100	0.012	18.0	0.0	0.0
9	8	190.47	190.36	11.0	0.0100	0.012	12.0	0.0	0.0
10	9	189.36	189.31	5.0	0.0100	0.012	24.0	0.0	0.0
11	10	185.50	185.50	7.0	0.0000	0.012	24.0	0.0	0.0
12	11	182.73	182.73	6.0	0.0000	0.012	15.0	0.0	0.0
13	12	186.20	185.87	29.0	0.0114	0.012	12.0	0.0	0.0
14	13	186.00	185.87	13.0	0.0100	0.012	12.0	0.0	0.0
15	14	185.87	185.55	32.0	0.0100	0.012	12.0	0.0	0.0
16	15	190.10	190.06	4.0	0.0100	0.012	12.0	0.0	0.0
17	16	185.55	184.39	116.0	0.0100	0.012	12.0	0.0	0.0
18	17	186.00	185.68	32.0	0.0100	0.012	12.0	0.0	0.0
19	18	186.00	185.92	8.0	0.0100	0.012	12.0	0.0	0.0
20	19	184.39	184.25	13.0	0.0108	0.012	12.0	0.0	0.0
21	20	184.00	184.00	11.0	0.0000	0.012	12.0	0.0	0.0
22	21	183.94	182.73	121.0	0.0100	0.012	15.0	0.0	0.0
23	22	183.75	183.37	38.0	0.0100	0.012	10.0	0.0	0.0
24	23	183.37	183.15	22.0	0.0100	0.012	10.0	0.0	0.0

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=12,628 sf 6.92% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=43 Runoff=0.00 cfs 15 cf

Subcatchment 2S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=1.00 cfs 3,544 cf

Subcatchment 3S: ROOF Runoff Area=3,914 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.26 cfs 935 cf

Subcatchment 4S: ROOF Runoff Area=16,016 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=1.08 cfs 3,828 cf

Subcatchment 5S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=1.00 cfs 3,544 cf

Subcatchment 6S: Runoff Area=8,679 sf 65.86% Impervious Runoff Depth=1.20"
Tc=6.0 min CN=78 Runoff=0.27 cfs 868 cf

Subcatchment 7S: Runoff Area=14,296 sf 76.44% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=84 Runoff=0.60 cfs 1,905 cf

Subcatchment 8S: Runoff Area=11,190 sf 74.35% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=83 Runoff=0.45 cfs 1,424 cf

Subcatchment 9S: Runoff Area=10,461 sf 79.30% Impervious Runoff Depth=1.75"
Tc=6.0 min CN=86 Runoff=0.48 cfs 1,524 cf

Subcatchment 10S: Runoff Area=3,298 sf 70.98% Impervious Runoff Depth=1.39"
Tc=6.0 min CN=81 Runoff=0.12 cfs 382 cf

Subcatchment 11S: Runoff Area=3,216 sf 84.86% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=89 Runoff=0.17 cfs 533 cf

Subcatchment 12S: Runoff Area=9,466 sf 84.77% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=89 Runoff=0.49 cfs 1,570 cf

Subcatchment 13S: Runoff Area=4,435 sf 94.45% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=95 Runoff=0.28 cfs 941 cf

Subcatchment 14S: Runoff Area=9,948 sf 80.86% Impervious Runoff Depth=1.83"
Tc=6.0 min CN=87 Runoff=0.48 cfs 1,514 cf

Subcatchment 15S: Runoff Area=1,132 sf 7.42% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=43 Runoff=0.00 cfs 1 cf

Subcatchment 16S: Runoff Area=608 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment 17S: COURTYARD Runoff Area=15,427 sf 22.31% Impervious Runoff Depth=0.15"
Tc=6.0 min CN=52 Runoff=0.01 cfs 193 cf

Subcatchment 18S: Runoff Area=8,989 sf 42.60% Impervious Runoff Depth=0.51"
Tc=6.0 min CN=64 Runoff=0.09 cfs 384 cf

Pond 1: CB Peak Elev=194.75' Inflow=0.27 cfs 868 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0101 '/' Outflow=0.27 cfs 868 cf

Pond 1P: Infiltration Pipe Network Peak Elev=184.03' Storage=10,344 cf Inflow=6.69 cfs 22,706 cf
Discarded=0.36 cfs 22,711 cf Primary=0.00 cfs 0 cf Outflow=0.36 cfs 22,711 cf

Pond 2: DMH Peak Elev=195.21' Inflow=2.08 cfs 7,372 cf
15.0" Round Culvert n=0.012 L=14.0' S=0.0393 '/' Outflow=2.08 cfs 7,372 cf

Pond 3: DGCB Peak Elev=194.71' Inflow=0.60 cfs 1,905 cf
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=0.60 cfs 1,905 cf

Pond 4: DMH Peak Elev=194.07' Inflow=2.95 cfs 10,145 cf
18.0" Round Culvert n=0.012 L=48.0' S=0.0100 '/' Outflow=2.95 cfs 10,145 cf

Pond 5: DMH Peak Elev=193.52' Inflow=2.95 cfs 10,145 cf
18.0" Round Culvert n=0.012 L=177.0' S=0.0100 '/' Outflow=2.95 cfs 10,145 cf

Pond 6: CB Peak Elev=194.38' Inflow=0.45 cfs 1,424 cf
12.0" Round Culvert n=0.012 L=7.0' S=0.0100 '/' Outflow=0.45 cfs 1,424 cf

Pond 7: DMH Peak Elev=191.82' Inflow=3.40 cfs 11,569 cf
18.0" Round Culvert n=0.012 L=109.0' S=0.0100 '/' Outflow=3.40 cfs 11,569 cf

Pond 8: CB Peak Elev=190.85' Inflow=0.48 cfs 1,524 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0100 '/' Outflow=0.48 cfs 1,524 cf

Pond 9: DMH Peak Elev=190.38' Inflow=3.88 cfs 13,094 cf
24.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=3.88 cfs 13,094 cf

Pond 10: OGS Peak Elev=186.57' Inflow=3.88 cfs 13,094 cf
24.0" Round Culvert n=0.012 L=7.0' S=0.0000 '/' Outflow=3.88 cfs 13,094 cf

Pond 11: DMH Peak Elev=184.03' Inflow=1.26 cfs 4,672 cf
15.0" Round Culvert n=0.012 L=6.0' S=0.0000 '/' Outflow=1.26 cfs 4,671 cf

Pond 12: CB Peak Elev=186.39' Inflow=0.12 cfs 382 cf
12.0" Round Culvert n=0.012 L=29.0' S=0.0114 '/' Outflow=0.12 cfs 382 cf

Pond 13: CB Peak Elev=186.26' Inflow=0.17 cfs 533 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0100 '/' Outflow=0.17 cfs 533 cf

Pond 14: DMH Peak Elev=186.19' Inflow=0.29 cfs 916 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.29 cfs 916 cf

Pond 15: CB Peak Elev=190.52' Inflow=0.49 cfs 1,570 cf
12.0" Round Culvert n=0.012 L=4.0' S=0.0100 '/' Outflow=0.49 cfs 1,570 cf

Pond 16: DMH Peak Elev=186.02' Inflow=0.78 cfs 2,486 cf
12.0" Round Culvert n=0.012 L=116.0' S=0.0100 '/' Outflow=0.78 cfs 2,486 cf

Pond 17: CB Peak Elev=186.35' Inflow=0.48 cfs 1,514 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.48 cfs 1,514 cf

Pond 18: CB Peak Elev=186.29' Inflow=0.28 cfs 941 cf
12.0" Round Culvert n=0.012 L=8.0' S=0.0100 '/' Outflow=0.28 cfs 941 cf

Pond 19: DMH Peak Elev=185.14' Inflow=1.54 cfs 4,942 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0108 '/' Outflow=1.54 cfs 4,942 cf

Pond 20: OGS Peak Elev=184.87' Inflow=1.54 cfs 4,942 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0000 '/' Outflow=1.54 cfs 4,942 cf

Pond 21: DMH Peak Elev=184.48' Inflow=1.26 cfs 4,672 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0100 '/' Outflow=1.26 cfs 4,672 cf

Pond 22: DMH Peak Elev=183.75' Inflow=0.00 cfs 0 cf
10.0" Round Culvert n=0.012 L=38.0' S=0.0100 '/' Outflow=0.00 cfs 0 cf

Pond 23: DMH Peak Elev=183.37' Inflow=0.00 cfs 0 cf
10.0" Round Culvert n=0.012 L=22.0' S=0.0100 '/' Outflow=0.00 cfs 0 cf

Link 1L: Inflow=0.00 cfs 15 cf
Primary=0.00 cfs 15 cf

Link 2L: Inflow=0.09 cfs 384 cf
Primary=0.09 cfs 384 cf

Link 3L: Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link 4L: Inflow=0.00 cfs 1 cf
Primary=0.00 cfs 1 cf

Total Runoff Area = 163,363 sf Runoff Volume = 23,109 cf Average Runoff Depth = 1.70"
28.74% Pervious = 46,958 sf 71.26% Impervious = 116,405 sf

Summary for Subcatchment 1S:

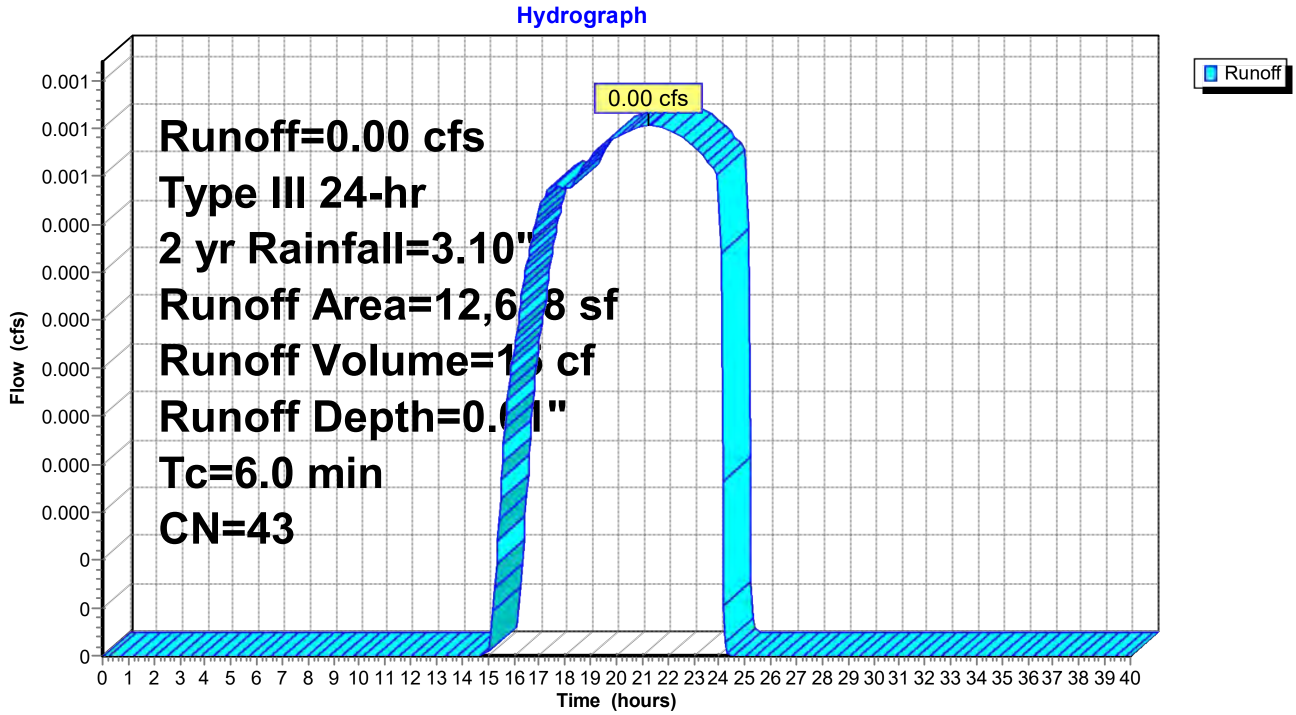
Runoff = 0.00 cfs @ 21.24 hrs, Volume= 15 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
11,754	39	>75% Grass cover, Good, HSG A
874	98	Paved parking, HSG A
12,628	43	Weighted Average
11,754		93.08% Pervious Area
874		6.92% Impervious Area

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

Subcatchment 1S:



Summary for Subcatchment 2S: ROOF

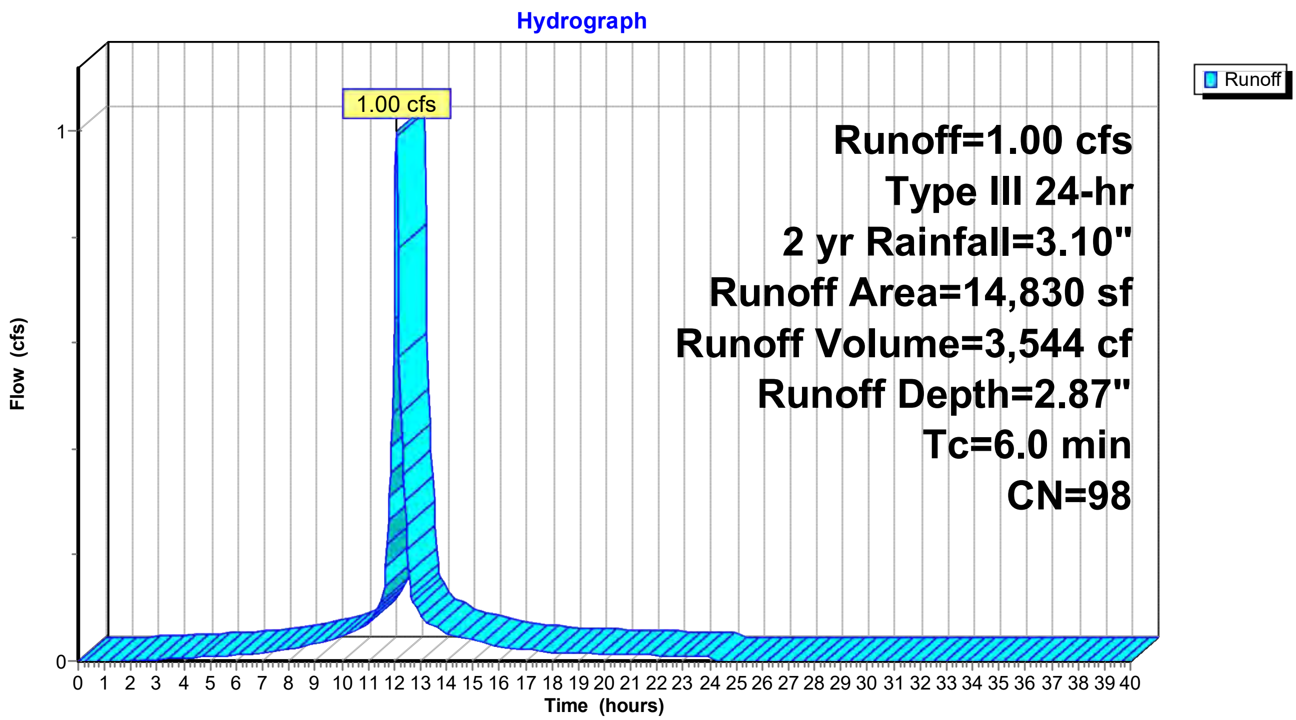
Runoff = 1.00 cfs @ 12.09 hrs, Volume= 3,544 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
14,830	98	Roofs, HSG A
14,830		100.00% Impervious Area

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

Subcatchment 2S: ROOF



Summary for Subcatchment 3S: ROOF

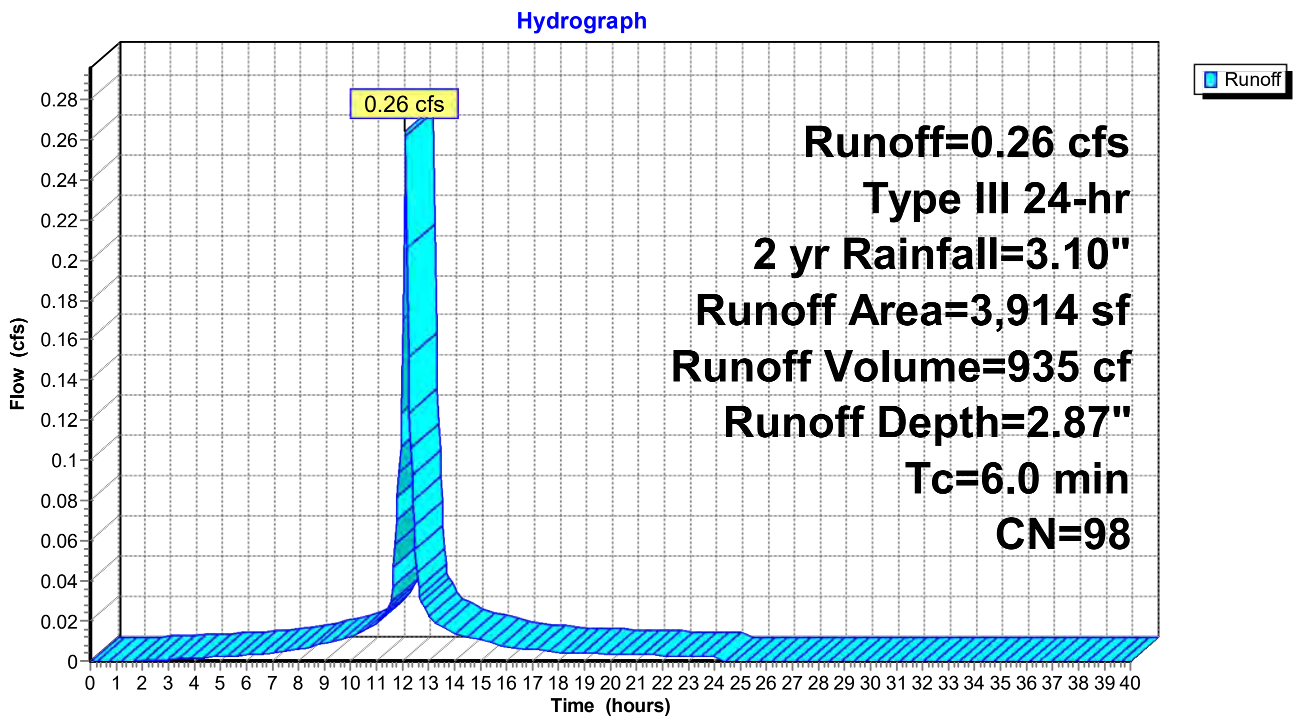
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 935 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
3,914	98	Roofs, HSG A
3,914		100.00% Impervious Area

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

Subcatchment 3S: ROOF



Summary for Subcatchment 4S: ROOF

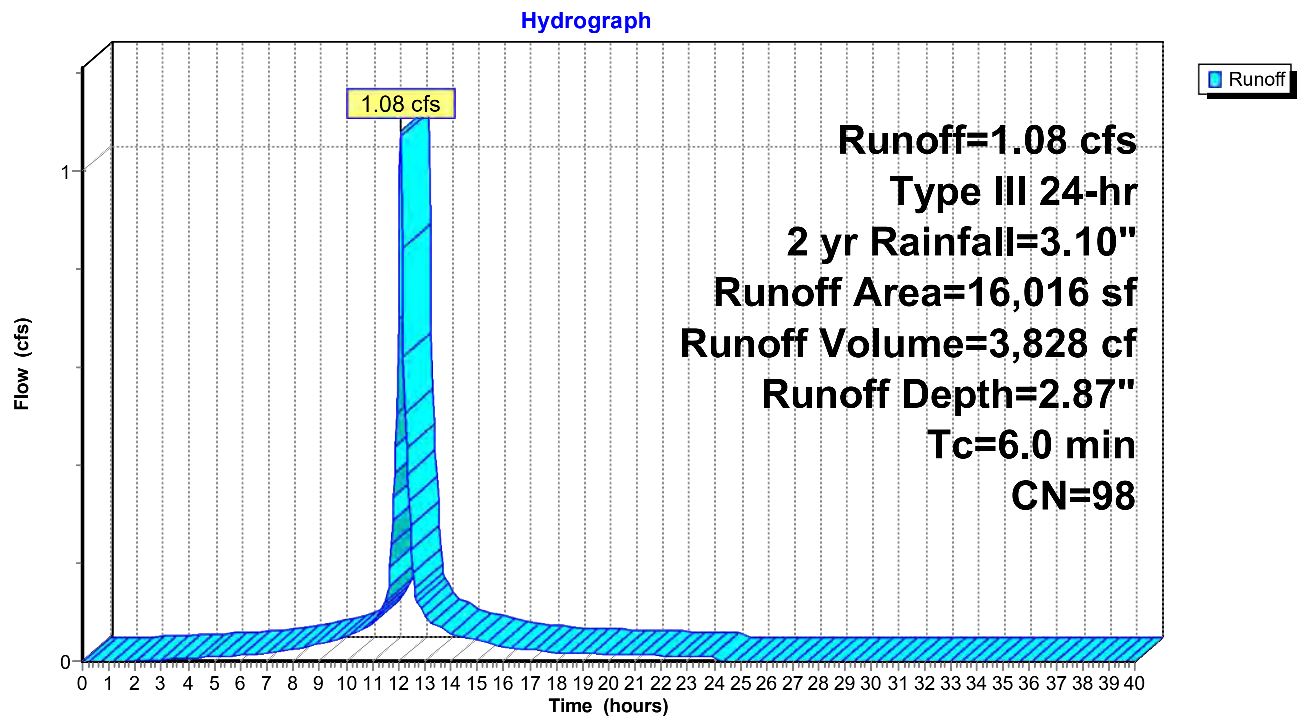
Runoff = 1.08 cfs @ 12.09 hrs, Volume= 3,828 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
16,016	98	Roofs, HSG A
16,016		100.00% Impervious Area

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

Subcatchment 4S: ROOF



Summary for Subcatchment 5S: ROOF

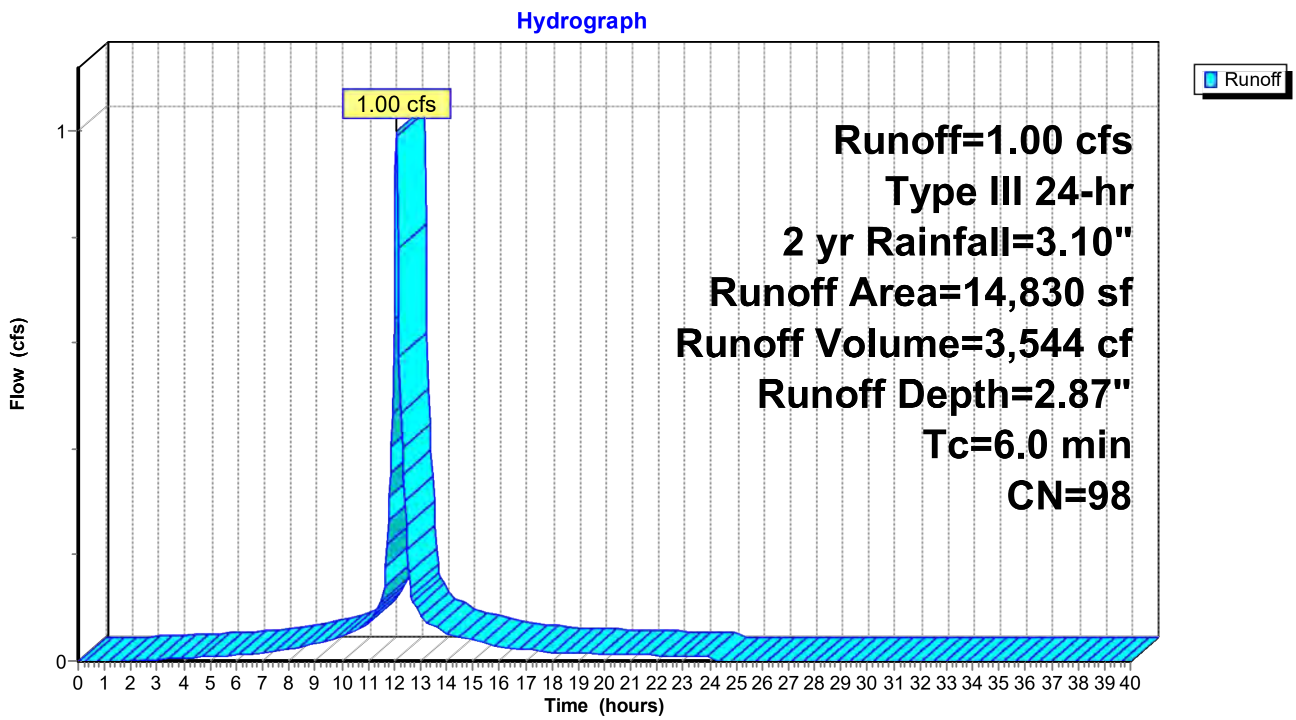
Runoff = 1.00 cfs @ 12.09 hrs, Volume= 3,544 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
14,830	98	Roofs, HSG A
14,830		100.00% Impervious Area

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

Subcatchment 5S: ROOF



Summary for Subcatchment 6S:

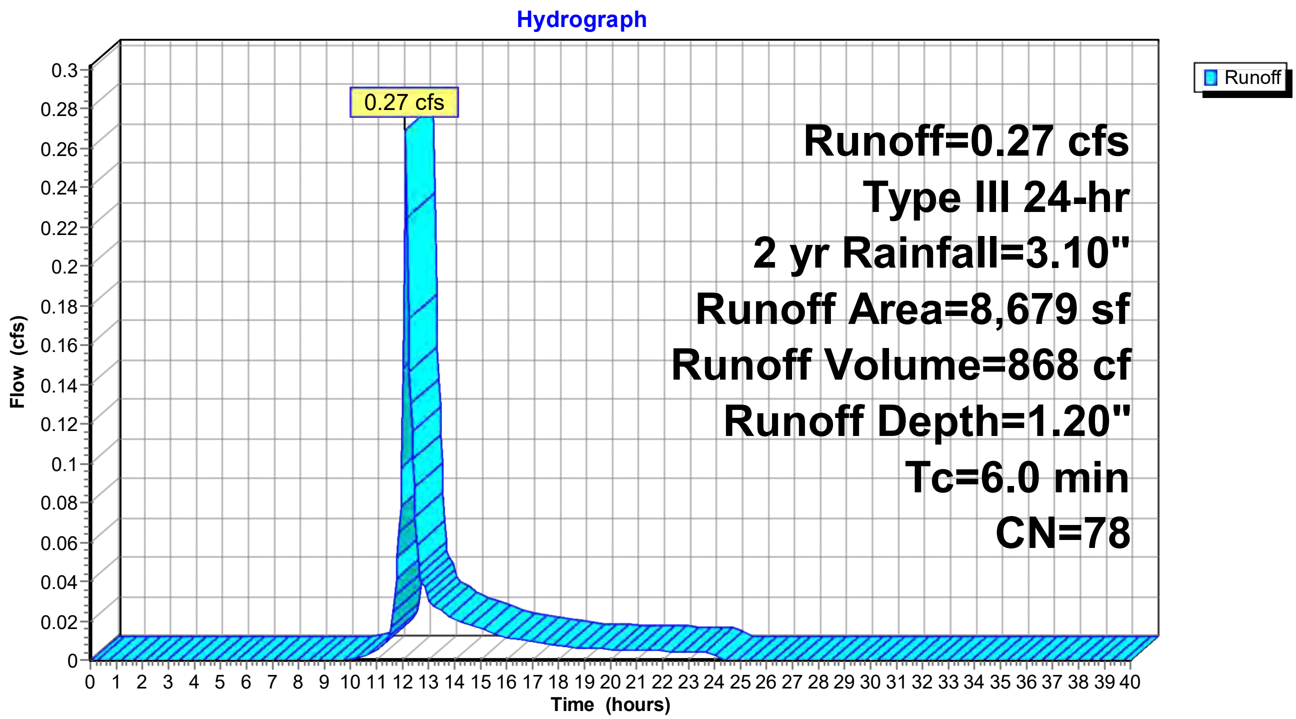
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 868 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
2,963	39	>75% Grass cover, Good, HSG A
5,613	98	Paved parking, HSG A
103	98	Roofs, HSG A
8,679	78	Weighted Average
2,963		34.14% Pervious Area
5,716		65.86% Impervious Area

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

Subcatchment 6S:



Summary for Subcatchment 7S:

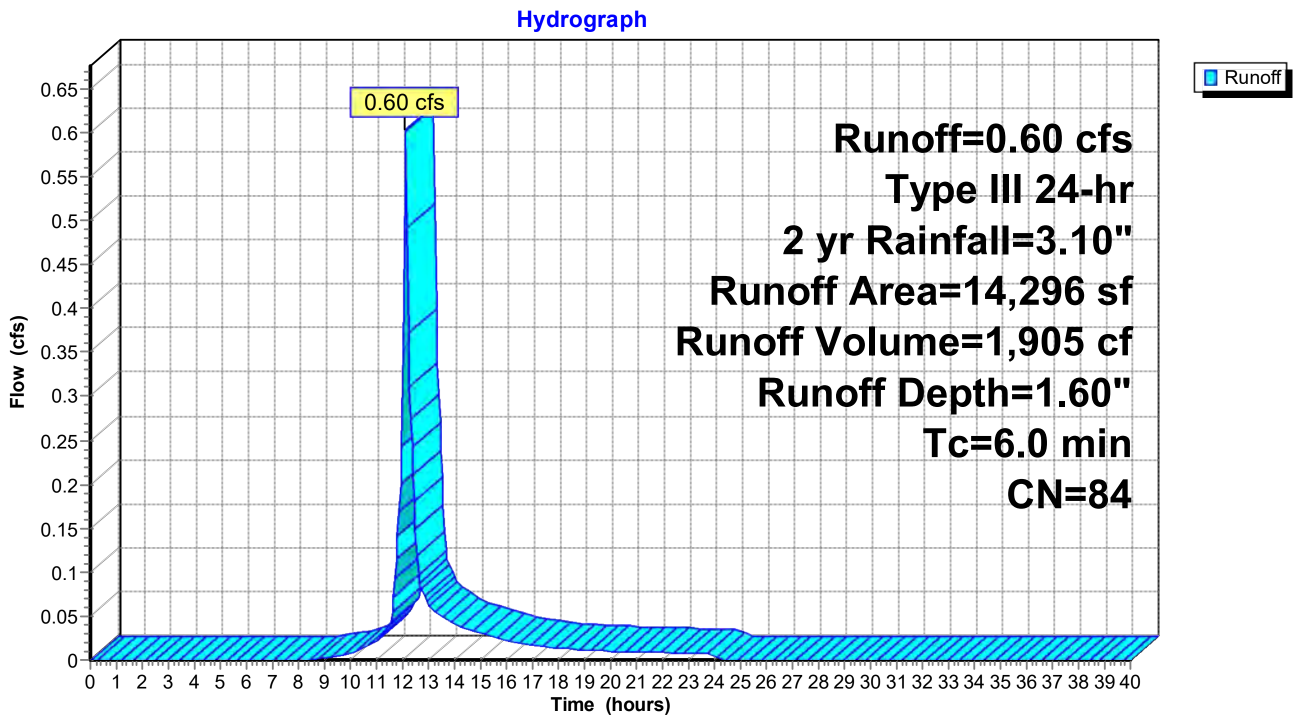
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 1,905 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
3,368	39	>75% Grass cover, Good, HSG A
10,848	98	Paved parking, HSG A
80	98	Roofs, HSG A
14,296	84	Weighted Average
3,368		23.56% Pervious Area
10,928		76.44% Impervious Area

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

Subcatchment 7S:



Summary for Subcatchment 8S:

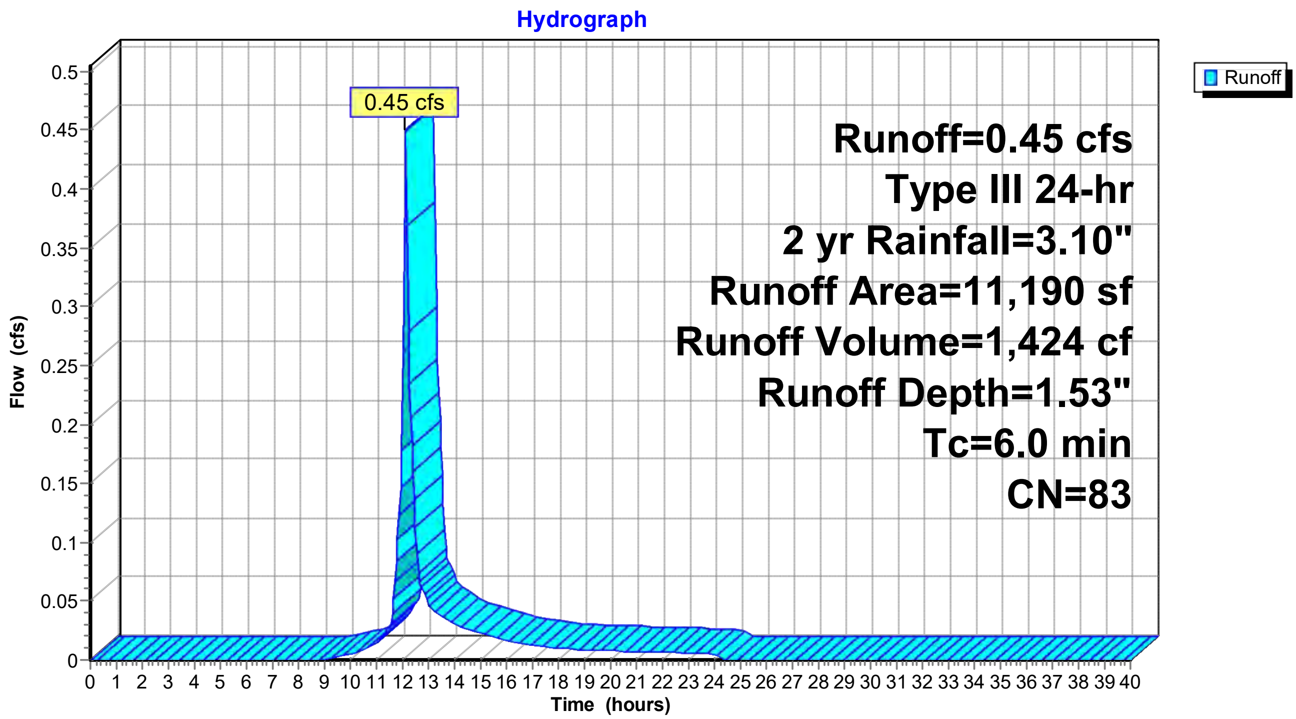
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 1,424 cf, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
2,870	39	>75% Grass cover, Good, HSG A
8,269	98	Paved parking, HSG A
51	98	Roofs, HSG A
11,190	83	Weighted Average
2,870		25.65% Pervious Area
8,320		74.35% Impervious Area

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

Subcatchment 8S:



Summary for Subcatchment 9S:

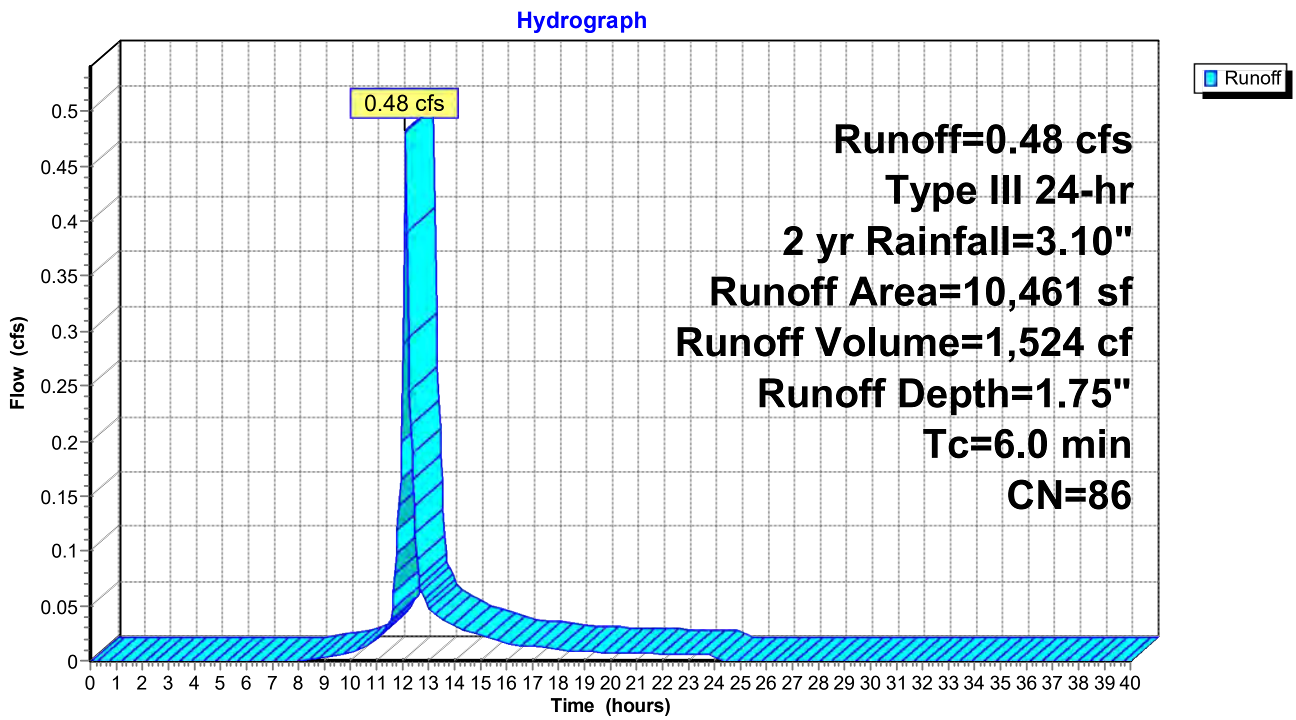
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,524 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
2,165	39	>75% Grass cover, Good, HSG A
8,296	98	Paved parking, HSG A
10,461	86	Weighted Average
2,165		20.70% Pervious Area
8,296		79.30% Impervious Area

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

Subcatchment 9S:



Summary for Subcatchment 10S:

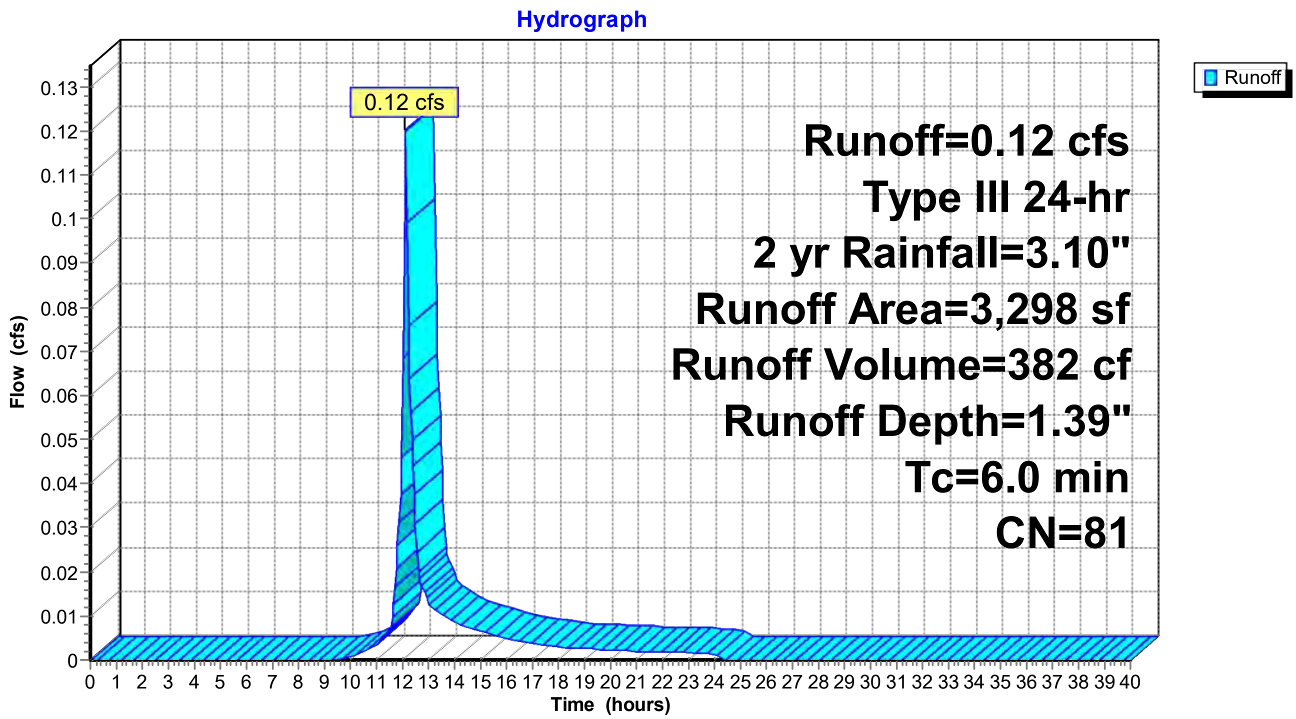
Runoff = 0.12 cfs @ 12.10 hrs, Volume= 382 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
957	39	>75% Grass cover, Good, HSG A
2,207	98	Paved parking, HSG A
134	98	Roofs, HSG A
3,298	81	Weighted Average
957		29.02% Pervious Area
2,341		70.98% Impervious Area

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

Subcatchment 10S:



Summary for Subcatchment 11S:

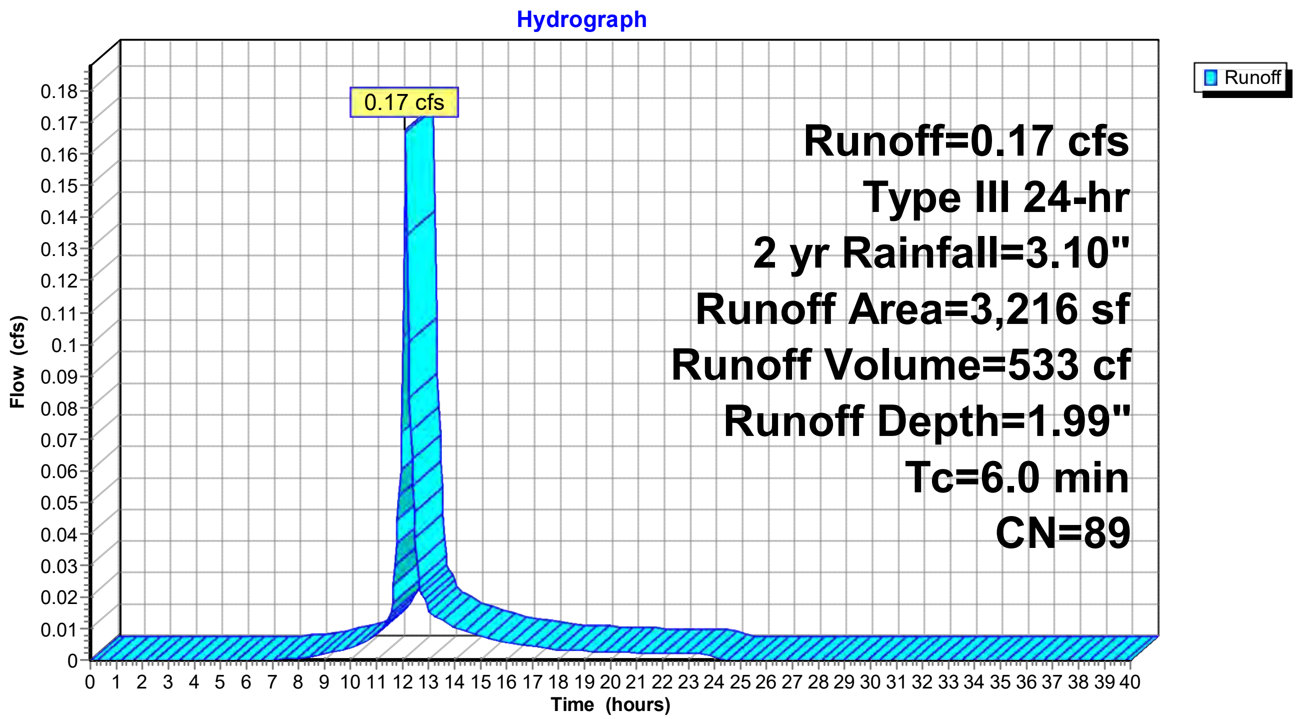
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 533 cf, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
487	39	>75% Grass cover, Good, HSG A
2,668	98	Paved parking, HSG A
61	98	Roofs, HSG A
3,216	89	Weighted Average
487		15.14% Pervious Area
2,729		84.86% Impervious Area

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

Subcatchment 11S:



Summary for Subcatchment 12S:

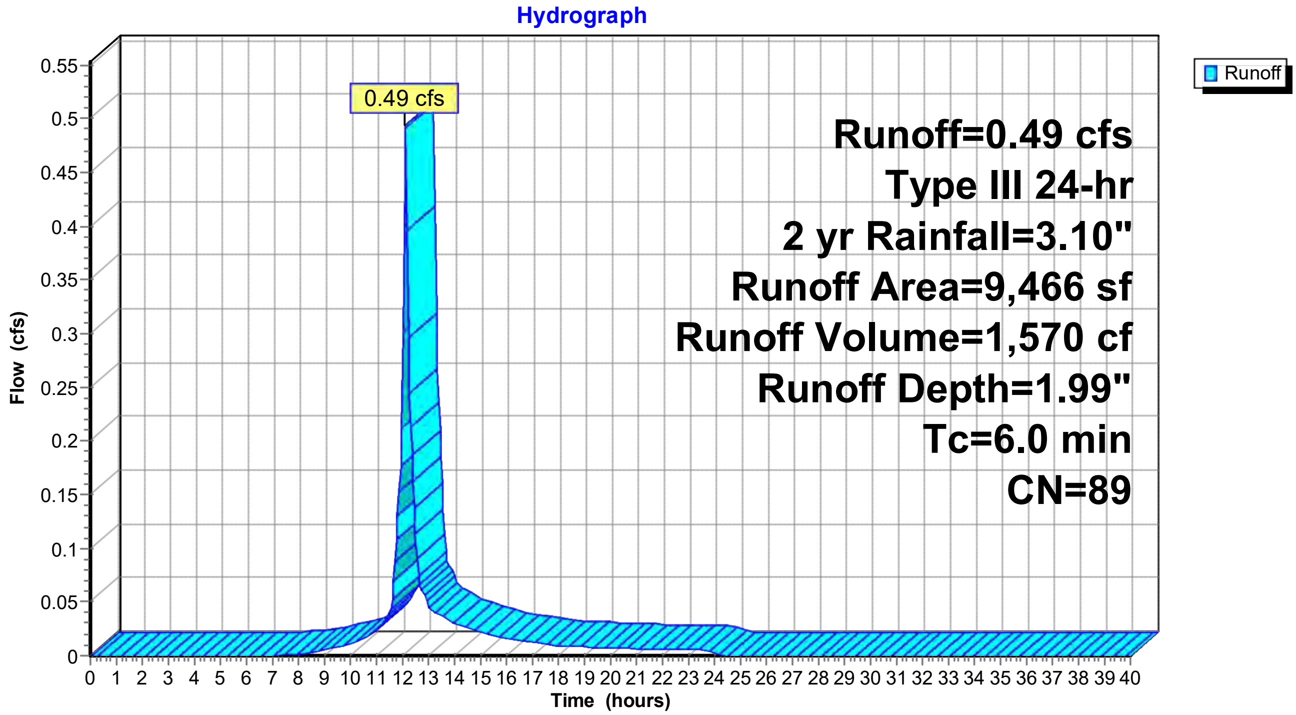
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,570 cf, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
1,442	39	>75% Grass cover, Good, HSG A
8,024	98	Paved parking, HSG A
9,466	89	Weighted Average
1,442		15.23% Pervious Area
8,024		84.77% Impervious Area

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

Subcatchment 12S:



Summary for Subcatchment 13S:

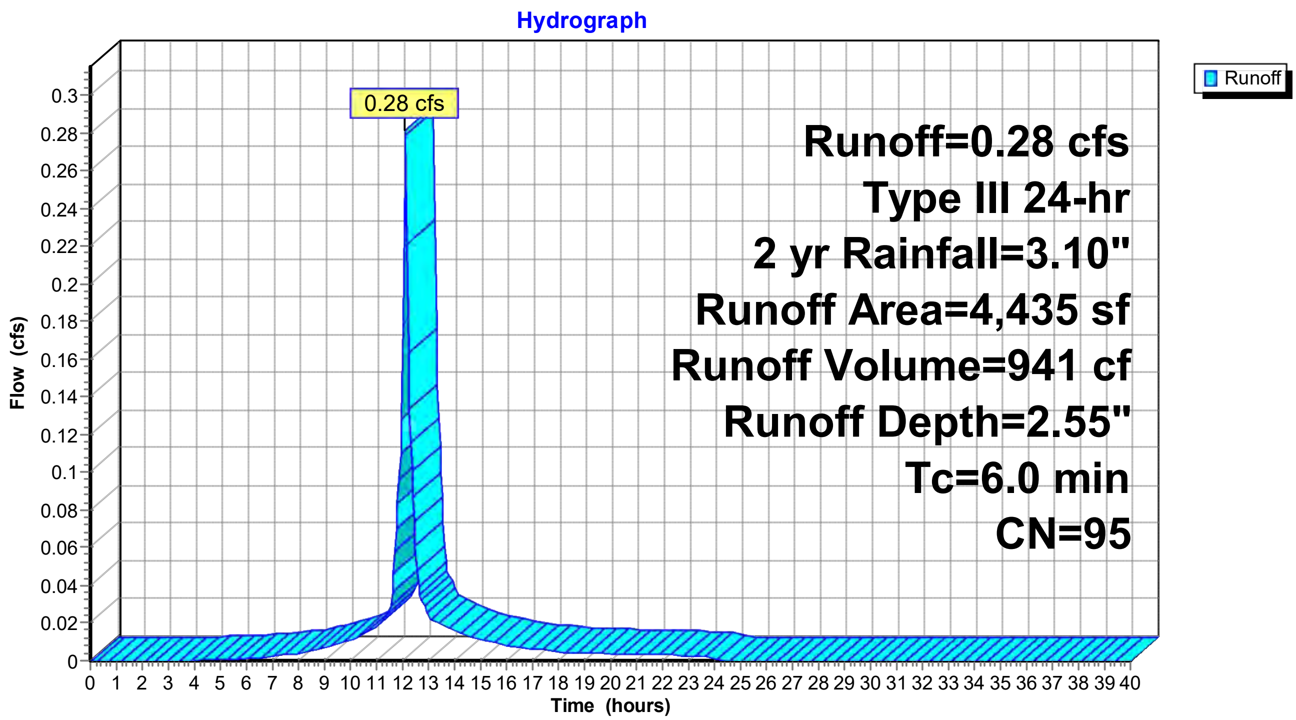
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 941 cf, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
246	39	>75% Grass cover, Good, HSG A
4,189	98	Paved parking, HSG A
4,435	95	Weighted Average
246		5.55% Pervious Area
4,189		94.45% Impervious Area

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

Subcatchment 13S:



Summary for Subcatchment 14S:

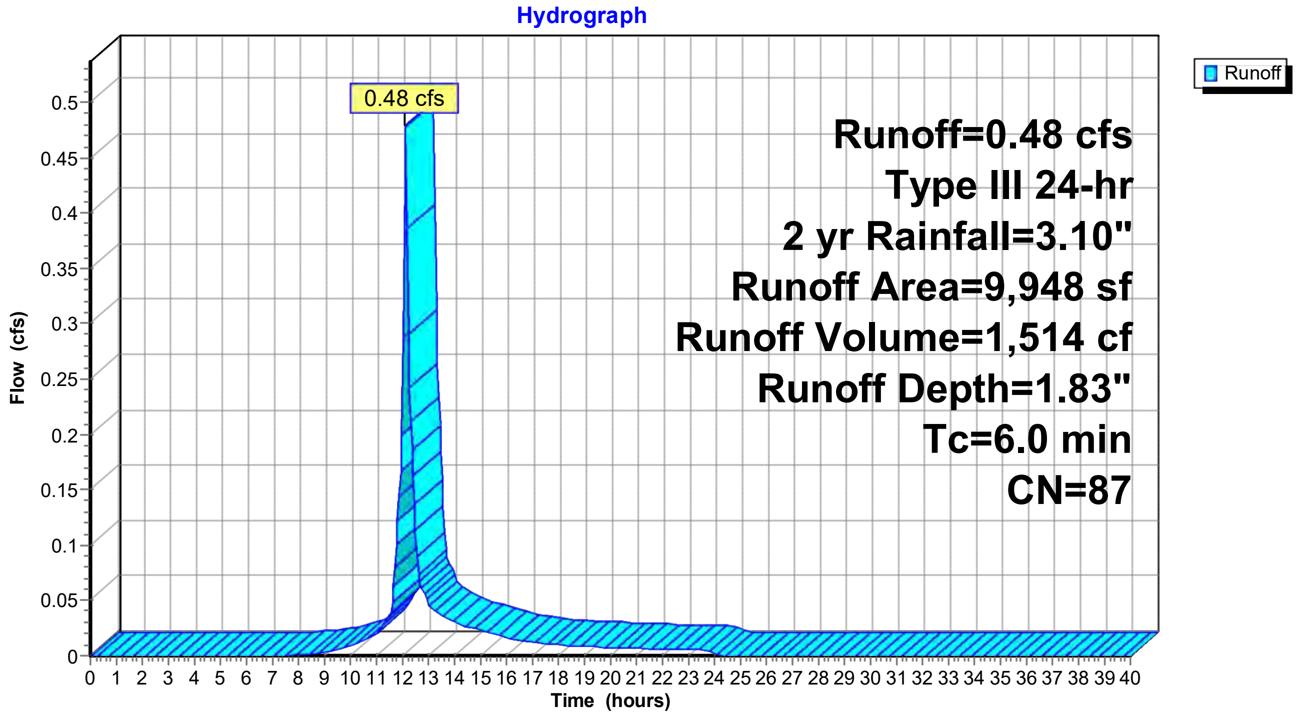
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,514 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
1,904	39	>75% Grass cover, Good, HSG A
8,044	98	Paved parking, HSG A
9,948	87	Weighted Average
1,904		19.14% Pervious Area
8,044		80.86% Impervious Area

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

Subcatchment 14S:



Summary for Subcatchment 15S:

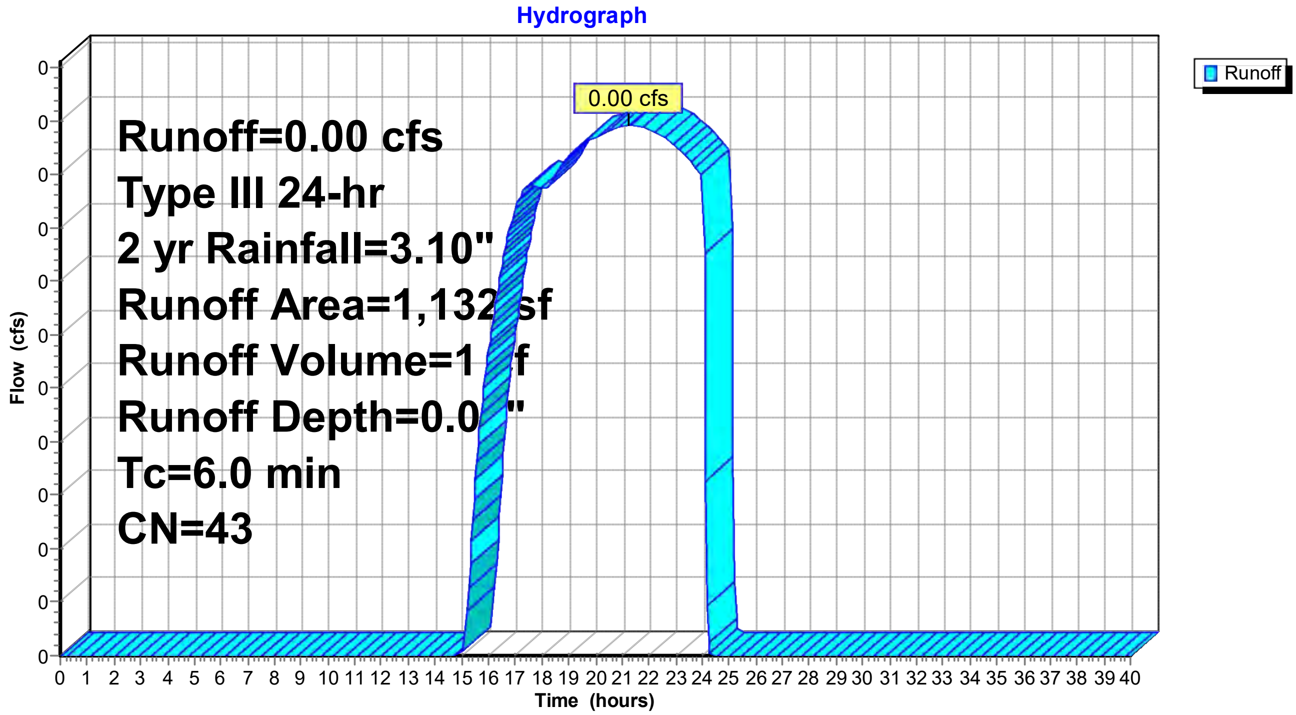
Runoff = 0.00 cfs @ 21.24 hrs, Volume= 1 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

	Area (sf)	CN	Description
	1,048	39	>75% Grass cover, Good, HSG A
*	84	98	Wall, HSG A
	1,132	43	Weighted Average
	1,048		92.58% Pervious Area
	84		7.42% Impervious Area

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

Subcatchment 15S:



Summary for Subcatchment 16S:

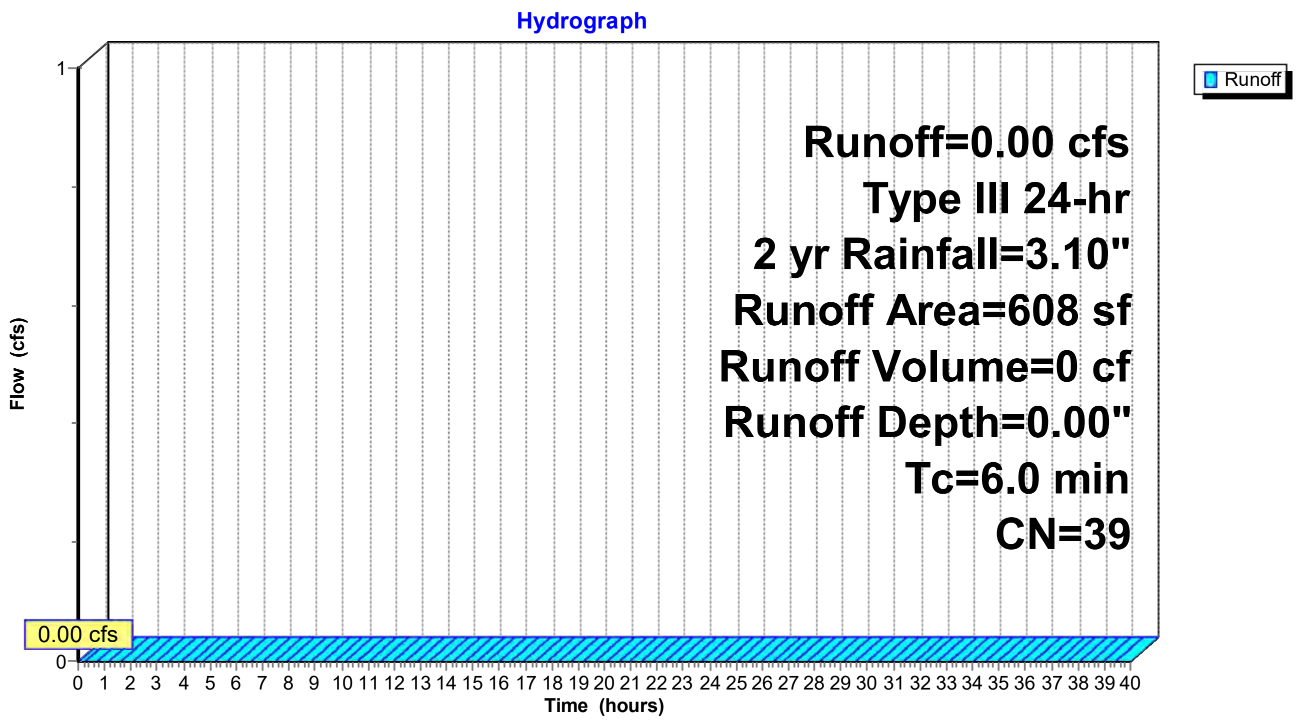
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
608	39	>75% Grass cover, Good, HSG A
608		100.00% Pervious Area

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

Subcatchment 16S:



Summary for Subcatchment 17S: COURTYARD

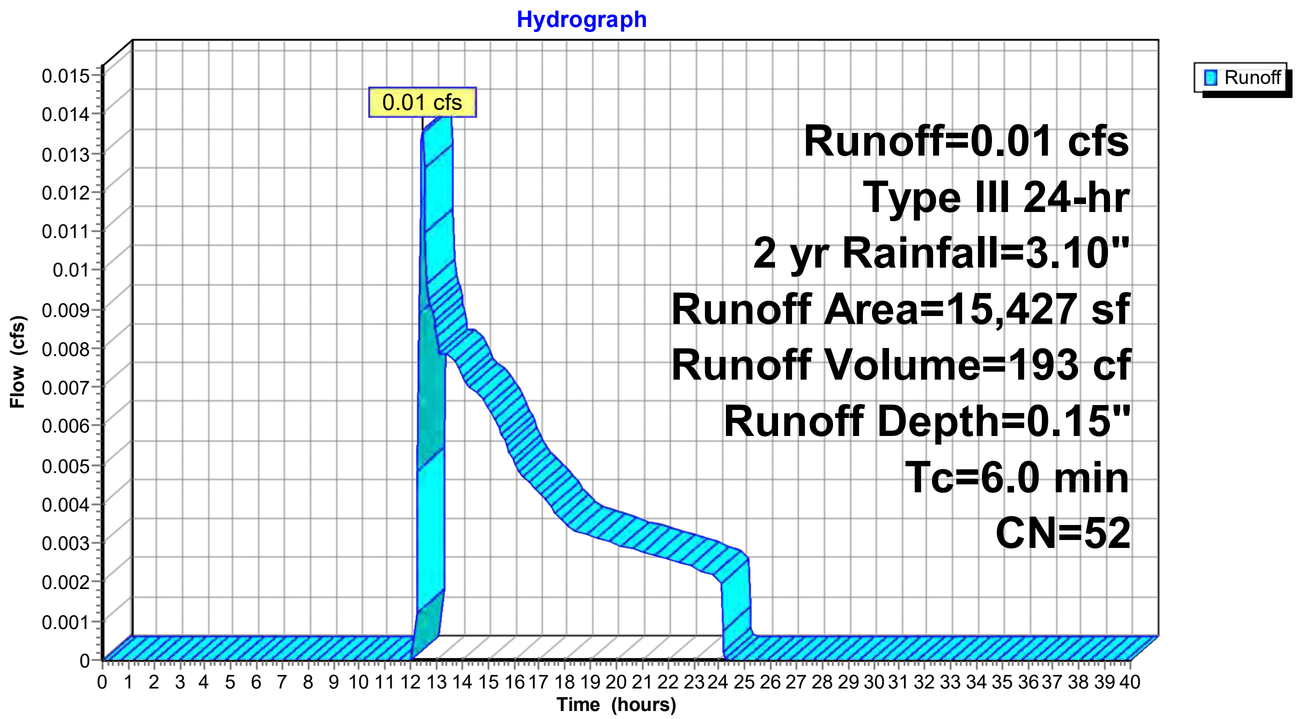
Runoff = 0.01 cfs @ 12.43 hrs, Volume= 193 cf, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
11,986	39	>75% Grass cover, Good, HSG A
2,757	98	Paved parking, HSG A
684	98	Roofs, HSG A
15,427	52	Weighted Average
11,986		77.69% Pervious Area
3,441		22.31% Impervious Area

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

Subcatchment 17S: COURTYARD



Summary for Subcatchment 18S:

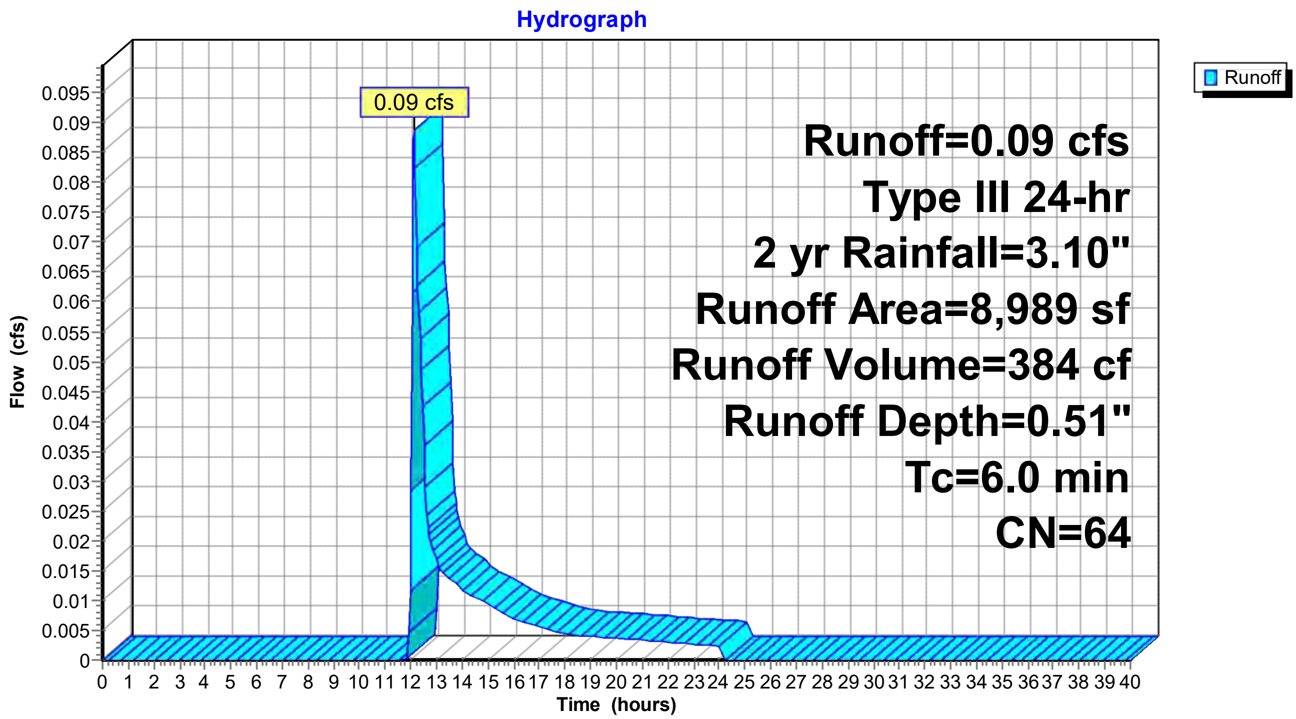
Runoff = 0.09 cfs @ 12.12 hrs, Volume= 384 cf, Depth= 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.10"

Area (sf)	CN	Description
5,160	39	>75% Grass cover, Good, HSG A
3,108	98	Paved parking, HSG A
721	98	Roofs, HSG A
8,989	64	Weighted Average
5,160		57.40% Pervious Area
3,829		42.60% Impervious Area

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

Subcatchment 18S:



Summary for Pond 1: CB

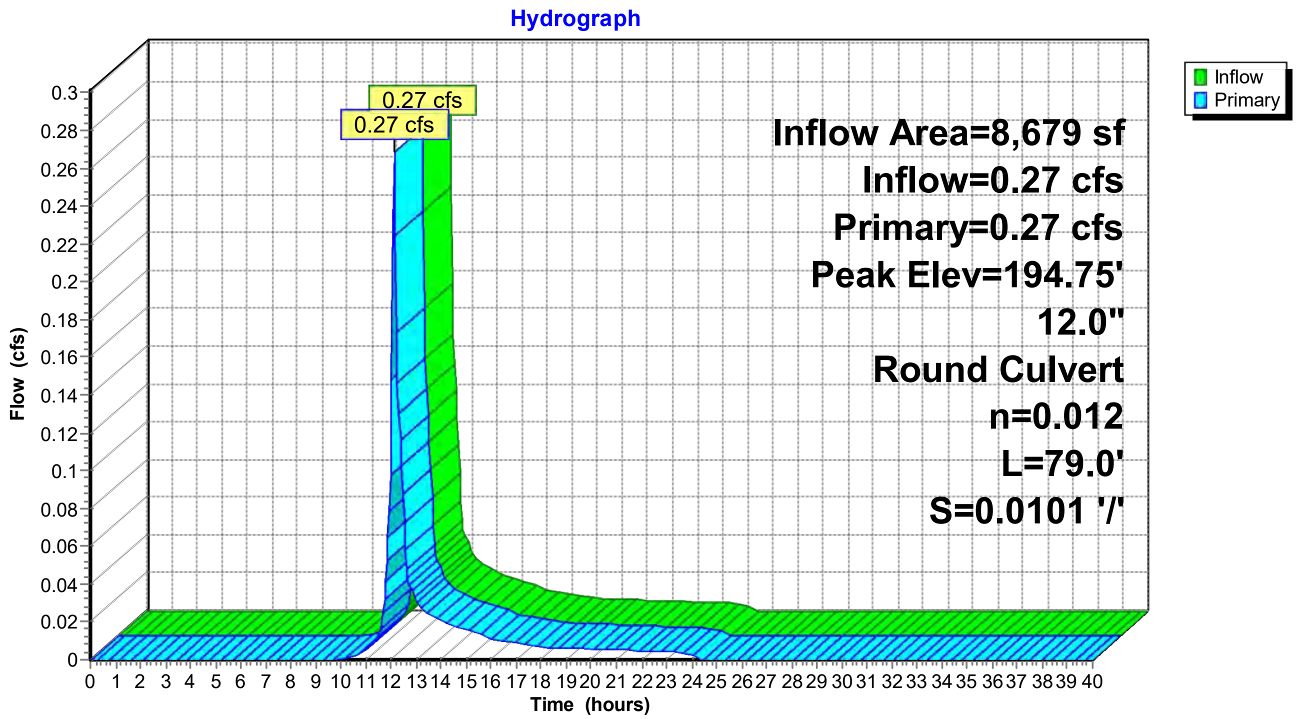
Inflow Area =	8,679 sf, 65.86% Impervious,	Inflow Depth = 1.20"	for 2 yr event
Inflow =	0.27 cfs @ 12.10 hrs, Volume=	868 cf	
Outflow =	0.27 cfs @ 12.10 hrs, Volume=	868 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.27 cfs @ 12.10 hrs, Volume=	868 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 194.75' @ 12.10 hrs
Flood Elev= 198.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	194.50'	**12.0" Round Culvert** L= 79.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 194.50' / 193.70' S= 0.0101 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 12.10 hrs HW=194.75' TW=194.06' (Dynamic Tailwater)
└─1=Culvert (Outlet Controls 0.25 cfs @ 2.45 fps)

Pond 1: CB



Summary for Pond 1P: Infiltration Pipe Network

Inflow Area = 140,006 sf, 79.72% Impervious, Inflow Depth = 1.95" for 2 yr event
Inflow = 6.69 cfs @ 12.09 hrs, Volume= 22,706 cf
Outflow = 0.36 cfs @ 11.40 hrs, Volume= 22,711 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.36 cfs @ 11.40 hrs, Volume= 22,711 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 184.03' @ 14.49 hrs Surf.Area= 6,395 sf Storage= 10,344 cf

Plug-Flow detention time= 258.7 min calculated for 22,682 cf (100% of inflow)
Center-of-Mass det. time= 258.7 min (1,048.8 - 790.0)

Volume	Invert	Avail.Storage	Storage Description
#1B	181.50'	8,961 cf	**65.25'W x 98.00'L x 6.50'H Field B**
			41,564 cf Overall - 19,161 cf Embedded = 22,403 cf x 40.0% Voids
#2B	182.00'	19,161 cf	**CMP Round 66** x 8 Inside #1
			Effective Size= 66.0"W x 66.0"H => 23.76 sf x 20.00'L = 475.2 cf
			Overall Size= 66.0"W x 66.0"H x 20.00'L
			Row Length Adjustment= +65.00' x 23.76 sf x 8 rows
			63.25' Header x 23.76 sf x 2 = 3,005.4 cf Inside
		28,122 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	181.50'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	184.42'	**8.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 184.42' / 183.92' S= 0.0100 '/' Cc= 0.900
			n= 0.012, Flow Area= 0.35 sf

Discarded OutFlow Max=0.36 cfs @ 11.40 hrs HW=181.57' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=181.50' TW=183.75' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond 1P: Infiltration Pipe Network - Chamber Wizard Field B

Chamber Model = CMP Round 66 (Round Corrugated Metal Pipe)
Effective Size= 66.0"W x 66.0"H => 23.76 sf x 20.00'L = 475.2 cf
Overall Size= 66.0"W x 66.0"H x 20.00'L
Row Length Adjustment= +65.00' x 23.76 sf x 8 rows

66.0" Wide + 33.0" Spacing = 99.0" C-C Row Spacing

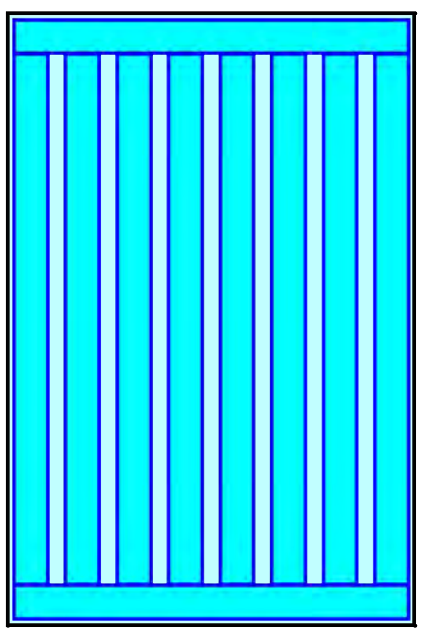
1 Chambers/Row x 20.00' Long +65.00' Row Adjustment +5.50' Header x 2 = 96.00' Row Length +12.0" End Stone x 2 = 98.00' Base Length
8 Rows x 66.0" Wide + 33.0" Spacing x 7 + 12.0" Side Stone x 2 = 65.25' Base Width
6.0" Base + 66.0" Chamber Height + 6.0" Cover = 6.50' Field Height

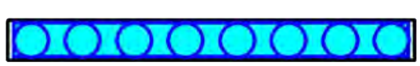
8 Chambers x 475.2 cf +65.00' Row Adjustment x 23.76 sf x 8 Rows + 63.25' Header x 23.76 sf x 2 = 19,161.1 cf Chamber Storage

41,564.3 cf Field - 19,161.1 cf Chambers = 22,403.2 cf Stone x 40.0% Voids = 8,961.3 cf Stone Storage

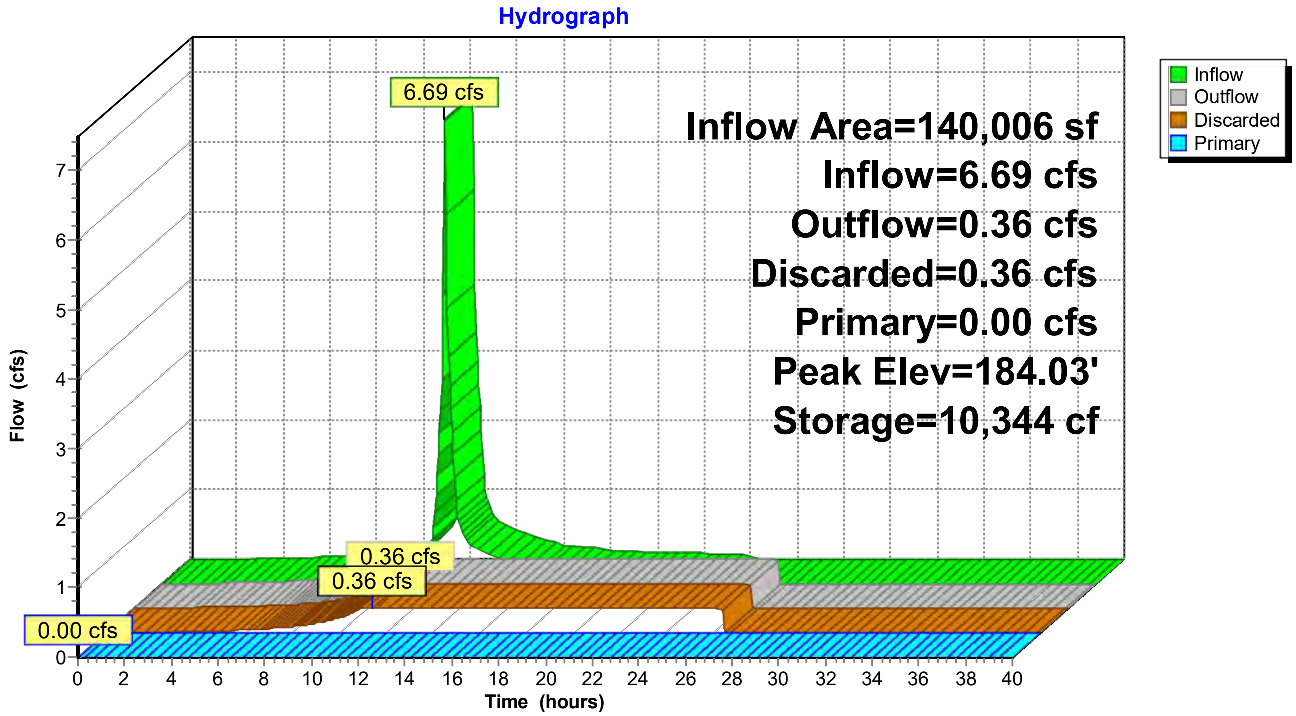
Chamber Storage + Stone Storage = 28,122.3 cf = 0.646 af
Overall Storage Efficiency = 67.7%
Overall System Size = 98.00' x 65.25' x 6.50'

8 Chambers
1,539.4 cy Field
829.7 cy Stone





Pond 1P: Infiltration Pipe Network



Summary for Pond 2: DMH

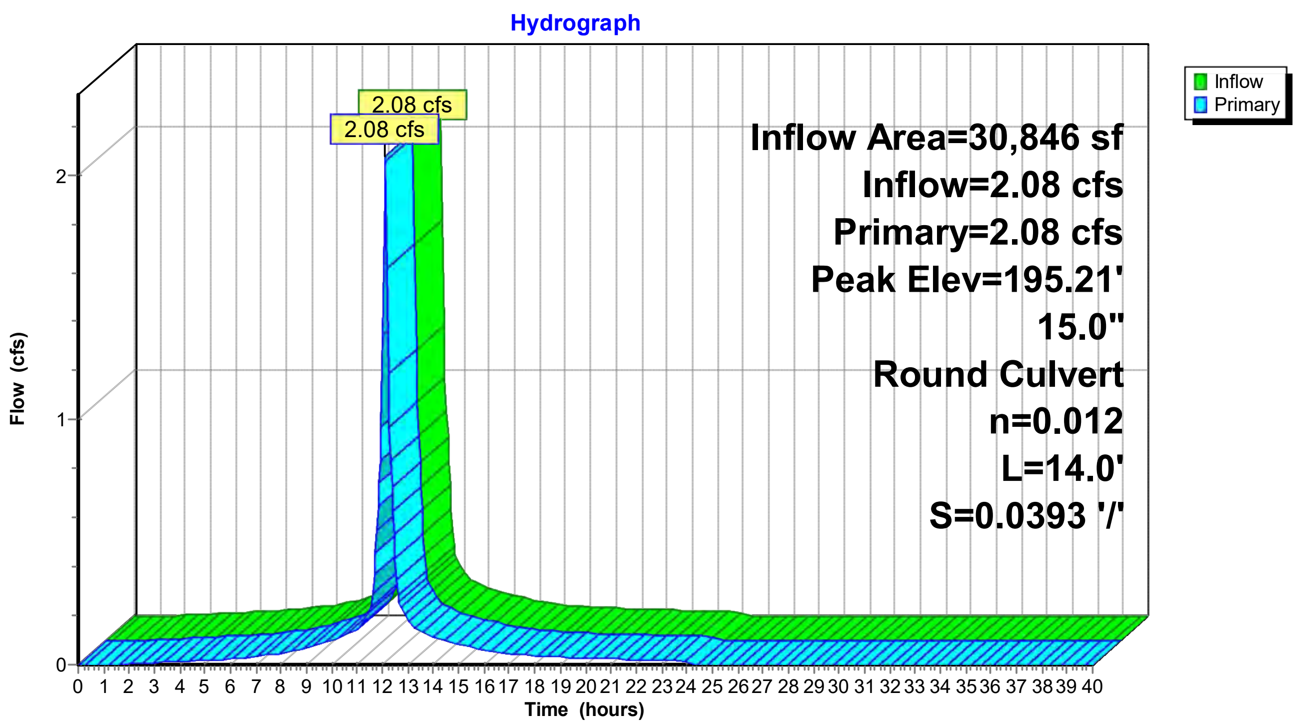
Inflow Area = 30,846 sf,100.00% Impervious, Inflow Depth = 2.87" for 2 yr event
Inflow = 2.08 cfs @ 12.09 hrs, Volume= 7,372 cf
Outflow = 2.08 cfs @ 12.09 hrs, Volume= 7,372 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.08 cfs @ 12.09 hrs, Volume= 7,372 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 195.21' @ 12.09 hrs
Flood Elev= 198.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	194.50'	**15.0" Round Culvert** L= 14.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 194.50' / 193.95' S= 0.0393 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=2.02 cfs @ 12.09 hrs HW=195.20' TW=194.05' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.02 cfs @ 2.85 fps)

Pond 2: DMH



Summary for Pond 3: DGCB

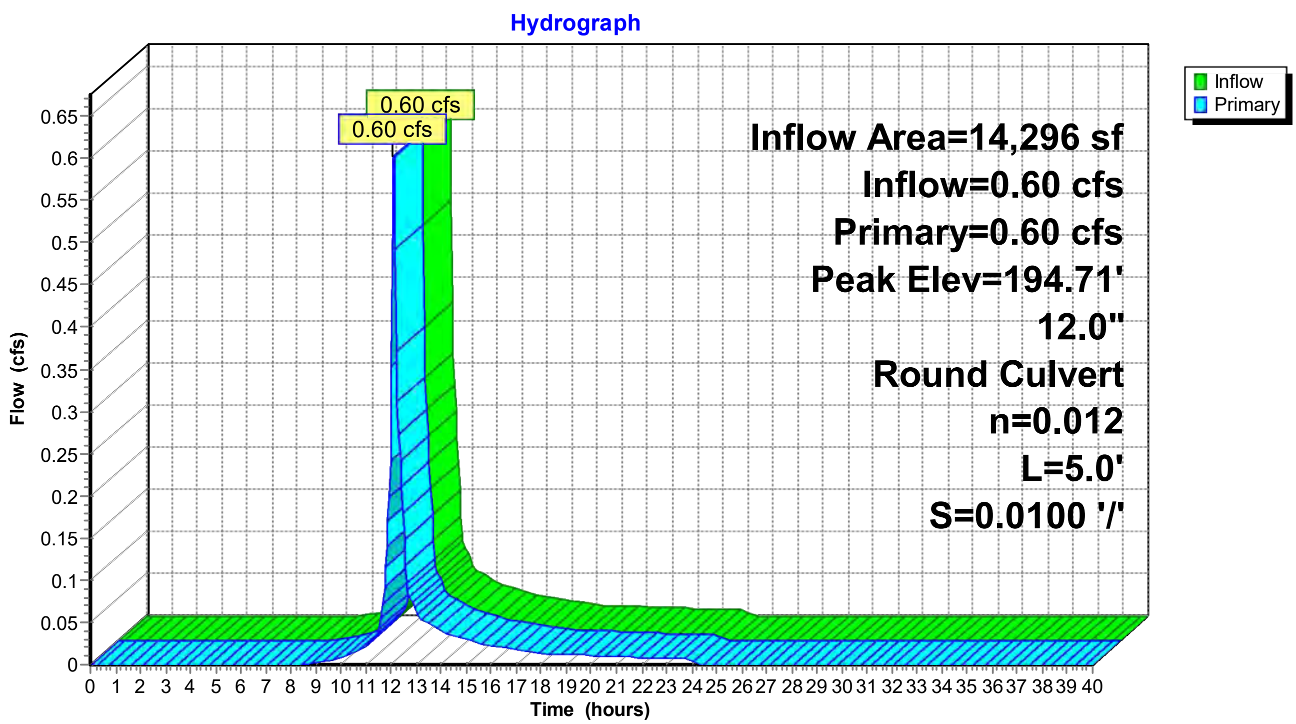
Inflow Area = 14,296 sf, 76.44% Impervious, Inflow Depth = 1.60" for 2 yr event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 1,905 cf
Outflow = 0.60 cfs @ 12.09 hrs, Volume= 1,905 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.09 hrs, Volume= 1,905 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 194.71' @ 12.09 hrs
Flood Elev= 198.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	194.25'	**12.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 194.25' / 194.20' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.59 cfs @ 12.09 hrs HW=194.71' TW=194.06' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.59 cfs @ 2.50 fps)

Pond 3: DGCB



Summary for Pond 4: DMH

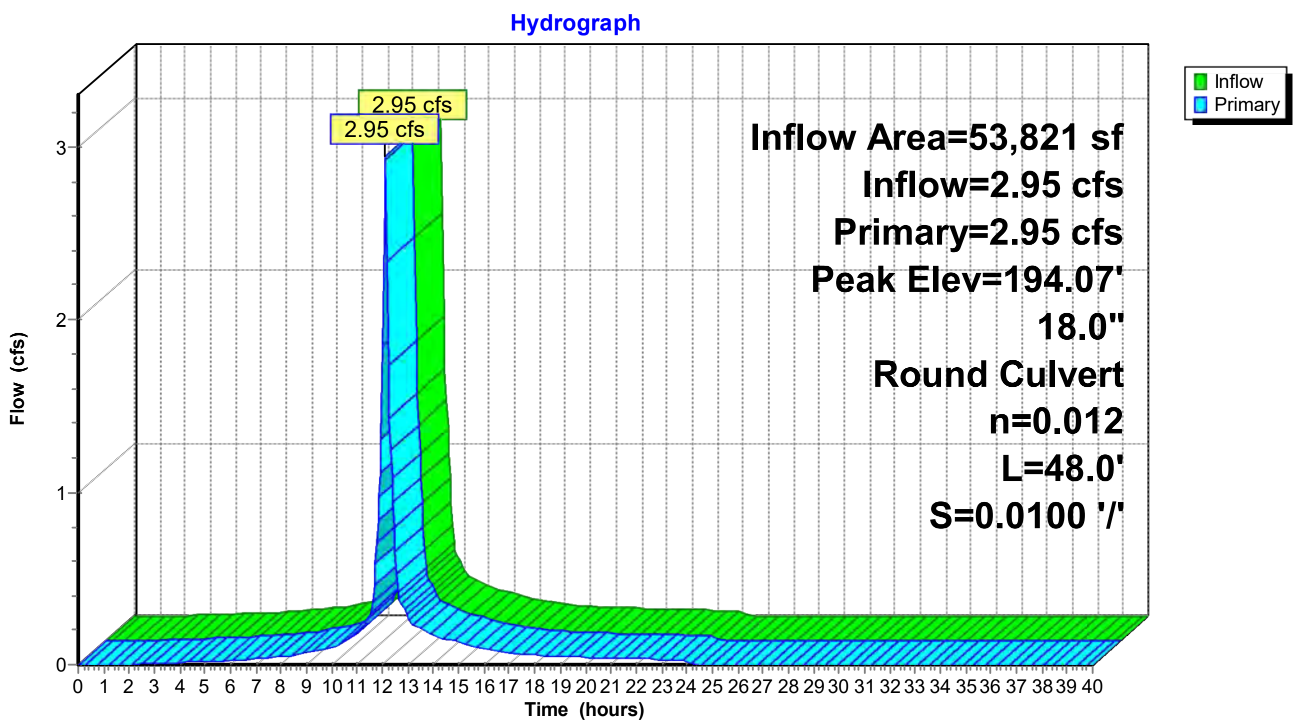
Inflow Area =	53,821 sf,	88.24% Impervious,	Inflow Depth = 2.26"	for 2 yr event
Inflow =	2.95 cfs @	12.09 hrs, Volume=	10,145 cf	
Outflow =	2.95 cfs @	12.09 hrs, Volume=	10,145 cf, Atten= 0%, Lag= 0.0 min	
Primary =	2.95 cfs @	12.09 hrs, Volume=	10,145 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 194.07' @ 12.10 hrs
Flood Elev= 198.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	193.20'	**18.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 193.20' / 192.72' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.73 cfs @ 12.09 hrs HW=194.05' TW=193.51' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.73 cfs @ 3.82 fps)

Pond 4: DMH



Summary for Pond 5: DMH

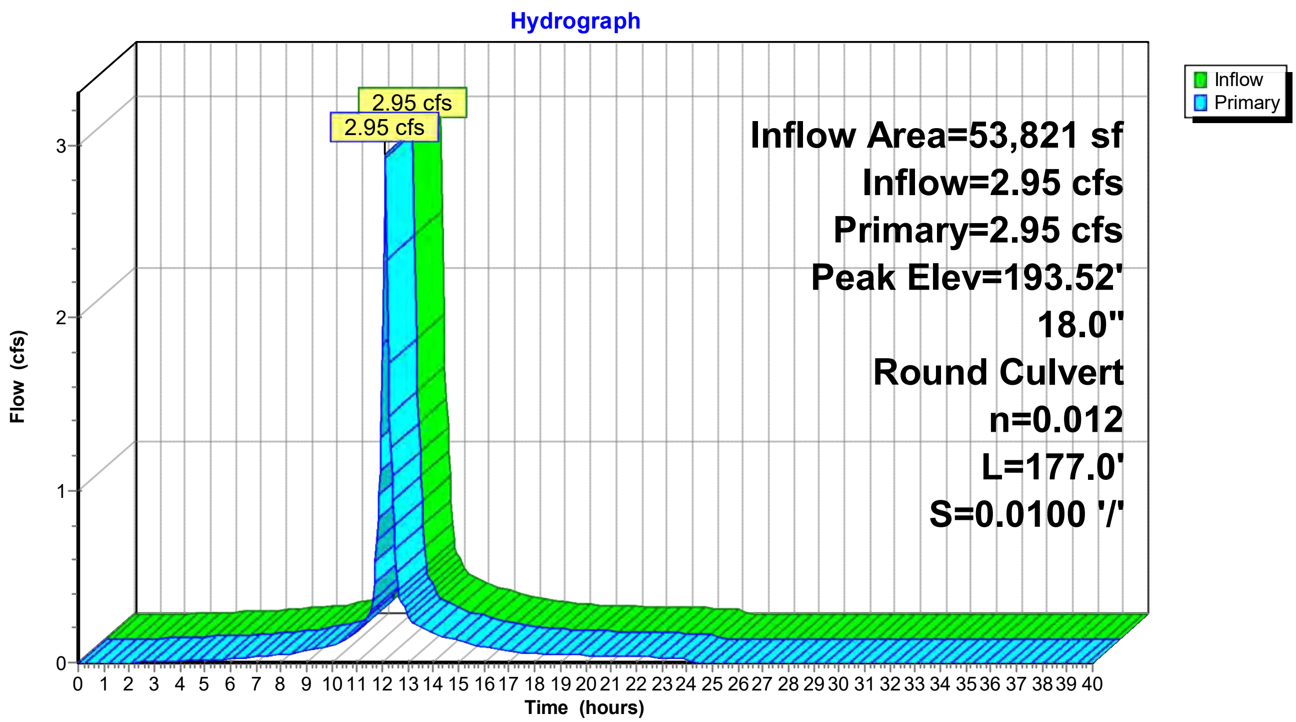
Inflow Area = 53,821 sf, 88.24% Impervious, Inflow Depth = 2.26" for 2 yr event
Inflow = 2.95 cfs @ 12.09 hrs, Volume= 10,145 cf
Outflow = 2.95 cfs @ 12.09 hrs, Volume= 10,145 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.95 cfs @ 12.09 hrs, Volume= 10,145 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 193.52' @ 12.09 hrs
Flood Elev= 198.92'

Device	Routing	Invert	Outlet Devices
#1	Primary	192.72'	**18.0" Round Culvert** L= 177.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 192.72' / 190.95' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=2.88 cfs @ 12.09 hrs HW=193.51' TW=191.81' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.88 cfs @ 3.03 fps)

Pond 5: DMH



Summary for Pond 6: CB

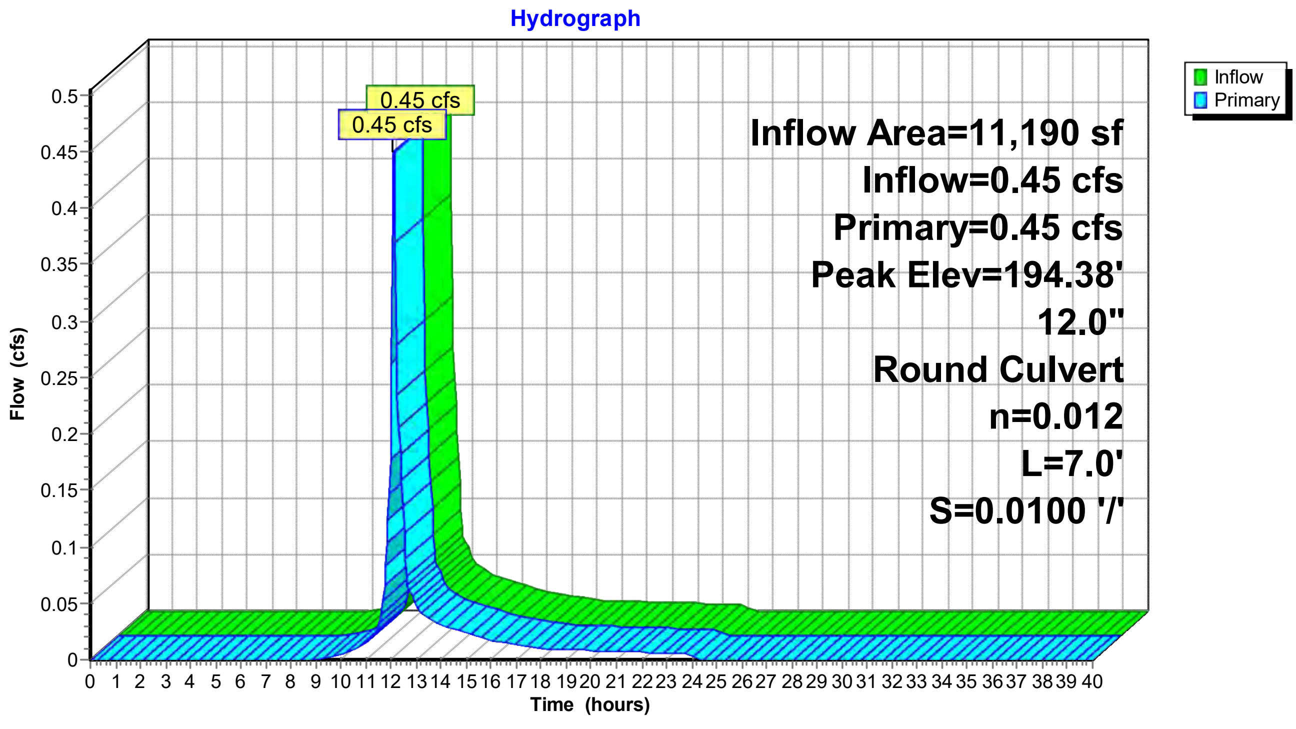
Inflow Area = 11,190 sf, 74.35% Impervious, Inflow Depth = 1.53" for 2 yr event
Inflow = 0.45 cfs @ 12.09 hrs, Volume= 1,424 cf
Outflow = 0.45 cfs @ 12.09 hrs, Volume= 1,424 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.45 cfs @ 12.09 hrs, Volume= 1,424 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 194.38' @ 12.09 hrs
Flood Elev= 198.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	194.00'	**12.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 194.00' / 193.93' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.44 cfs @ 12.09 hrs HW=194.38' TW=191.82' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.44 cfs @ 2.41 fps)

Pond 6: CB



Summary for Pond 7: DMH

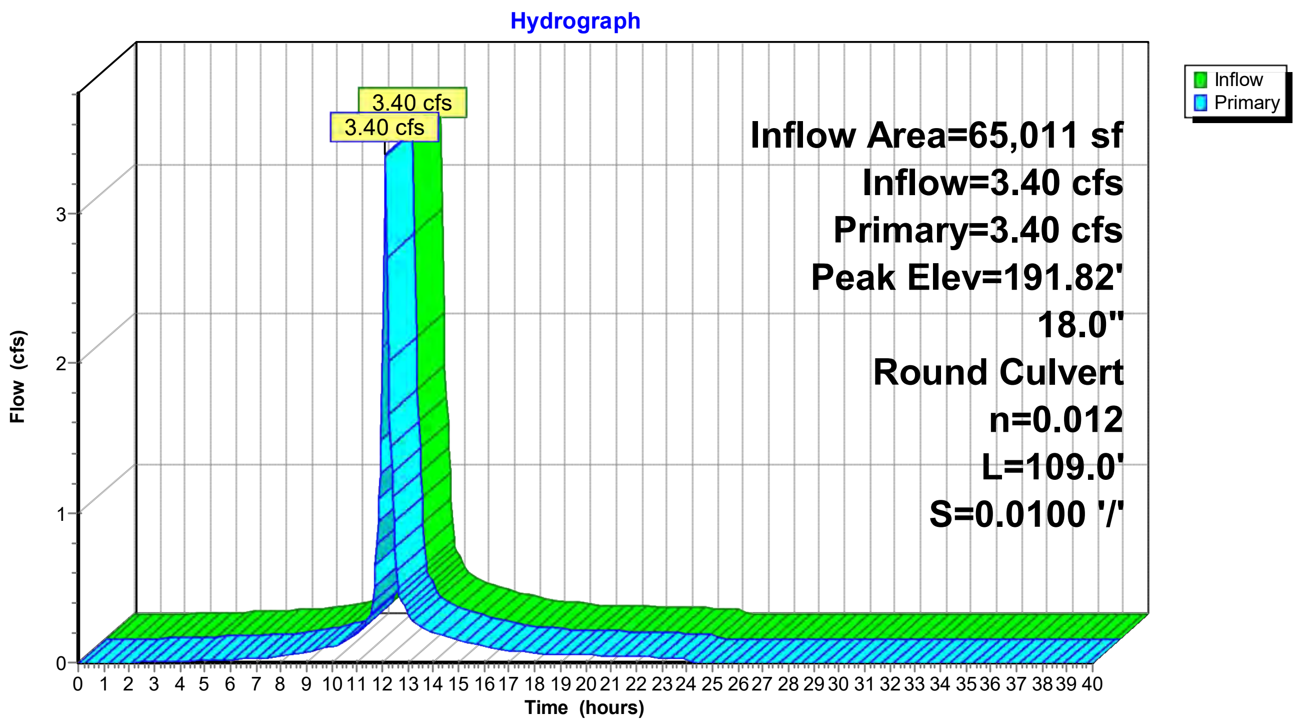
Inflow Area = 65,011 sf, 85.85% Impervious, Inflow Depth = 2.14" for 2 yr event
Inflow = 3.40 cfs @ 12.09 hrs, Volume= 11,569 cf
Outflow = 3.40 cfs @ 12.09 hrs, Volume= 11,569 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.40 cfs @ 12.09 hrs, Volume= 11,569 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 191.82' @ 12.09 hrs
Flood Elev= 198.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.95'	**18.0" Round Culvert** L= 109.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 190.95' / 189.86' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.32 cfs @ 12.09 hrs HW=191.81' TW=190.36' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 3.32 cfs @ 3.16 fps)

Pond 7: DMH



Summary for Pond 8: CB

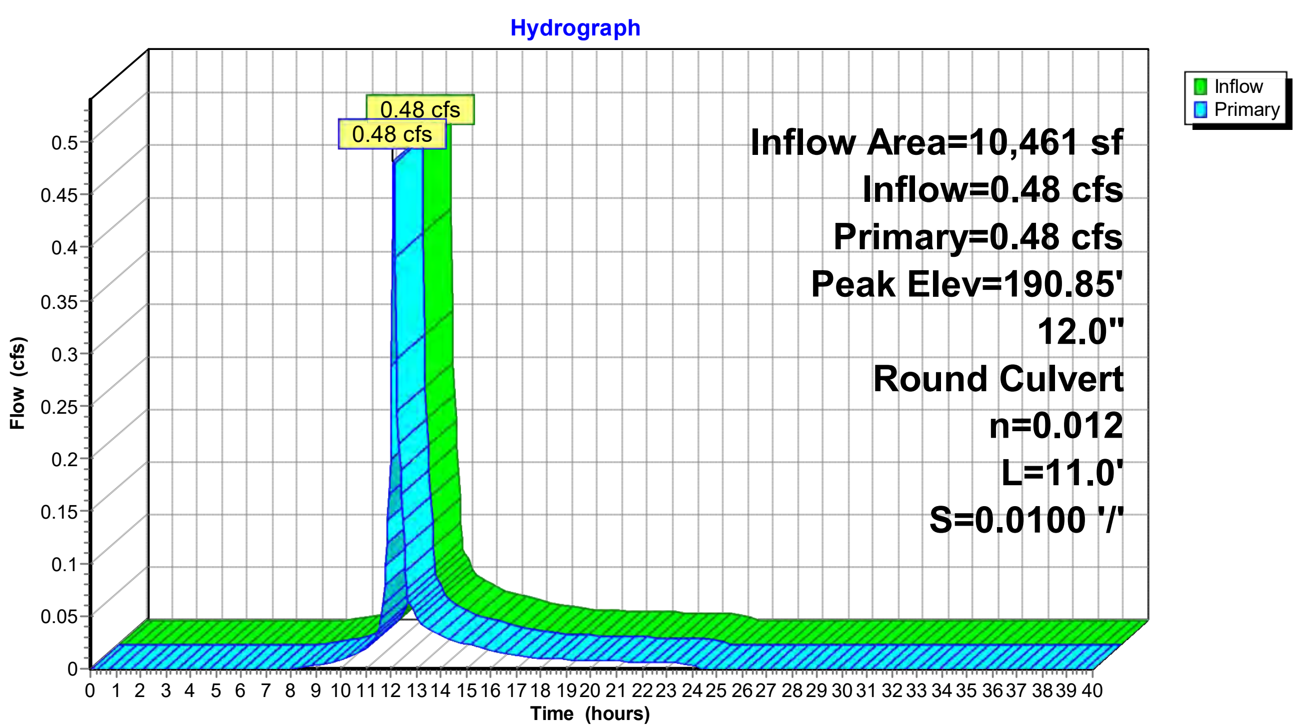
Inflow Area =	10,461 sf, 79.30% Impervious,	Inflow Depth = 1.75"	for 2 yr event	
Inflow =	0.48 cfs @	12.09 hrs, Volume=	1,524 cf	
Outflow =	0.48 cfs @	12.09 hrs, Volume=	1,524 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.48 cfs @	12.09 hrs, Volume=	1,524 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 190.85' @ 12.09 hrs
Flood Elev= 193.27'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.47'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 190.47' / 190.36' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.09 hrs HW=190.85' TW=190.37' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.47 cfs @ 2.56 fps)

Pond 8: CB



Summary for Pond 9: DMH

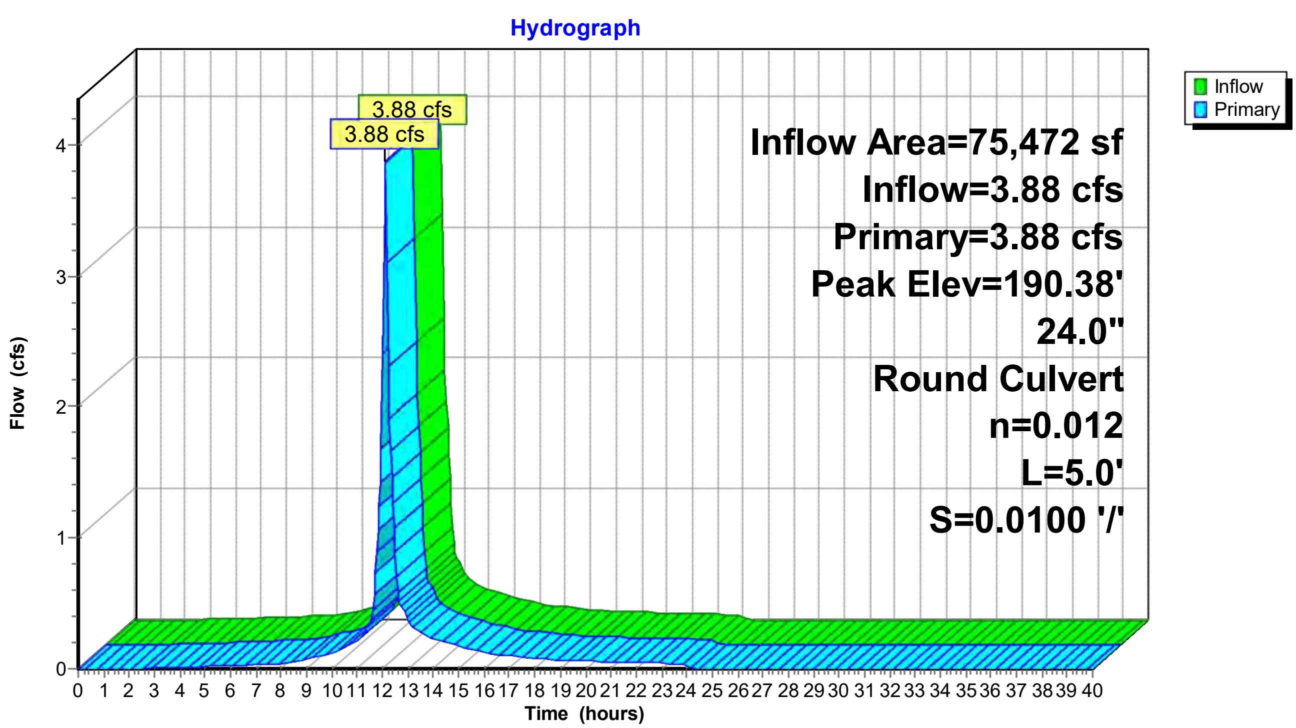
Inflow Area =	75,472 sf,	84.94% Impervious,	Inflow Depth = 2.08"	for 2 yr event	
Inflow =	3.88 cfs @	12.09 hrs,	Volume=	13,094 cf	
Outflow =	3.88 cfs @	12.09 hrs,	Volume=	13,094 cf,	Atten= 0%, Lag= 0.0 min
Primary =	3.88 cfs @	12.09 hrs,	Volume=	13,094 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 190.38' @ 12.09 hrs
Flood Elev= 194.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	189.36'	**24.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 189.36' / 189.31' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=3.79 cfs @ 12.09 hrs HW=190.36' TW=186.56' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.79 cfs @ 3.51 fps)

Pond 9: DMH



Summary for Pond 10: OGS

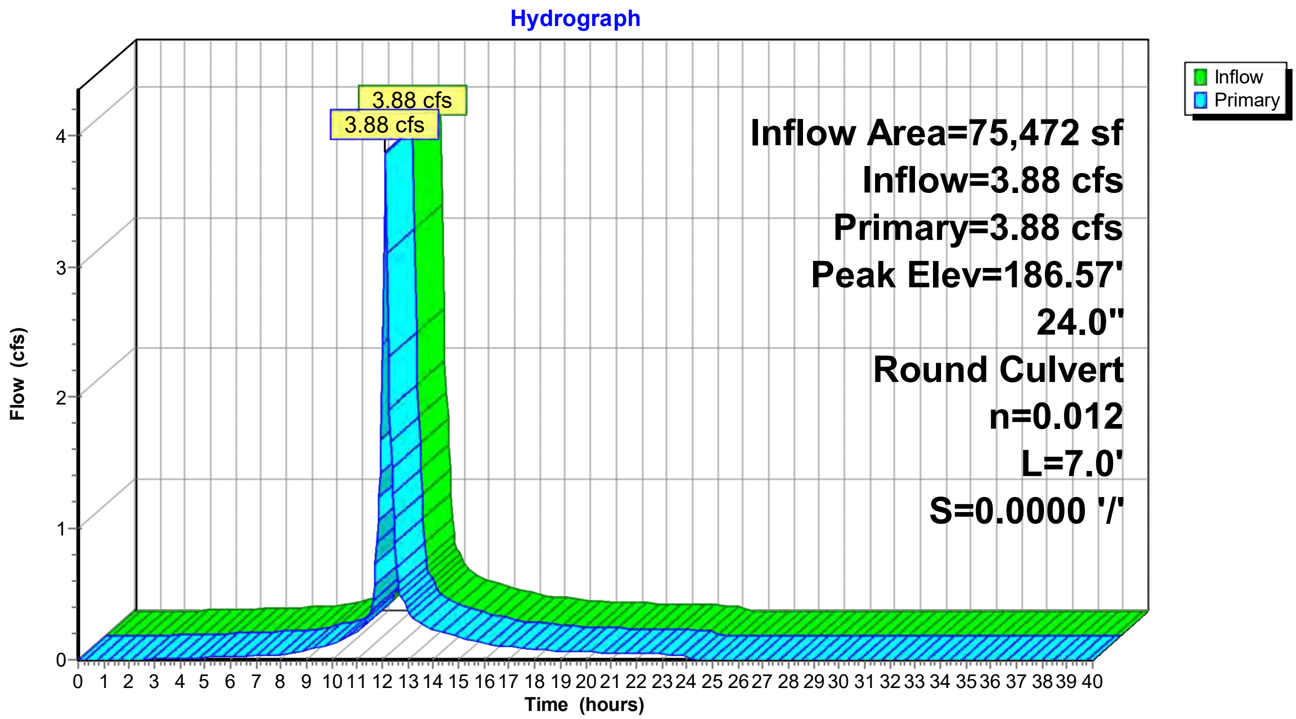
Inflow Area = 75,472 sf, 84.94% Impervious, Inflow Depth = 2.08" for 2 yr event
Inflow = 3.88 cfs @ 12.09 hrs, Volume= 13,094 cf
Outflow = 3.88 cfs @ 12.09 hrs, Volume= 13,094 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.88 cfs @ 12.09 hrs, Volume= 13,094 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.57' @ 12.09 hrs
Flood Elev= 194.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	185.50'	**24.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 185.50' / 185.50' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf

Primary OutFlow Max=3.79 cfs @ 12.09 hrs HW=186.56' TW=182.82' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.79 cfs @ 3.27 fps)

Pond 10: OGS



Summary for Pond 11: DMH

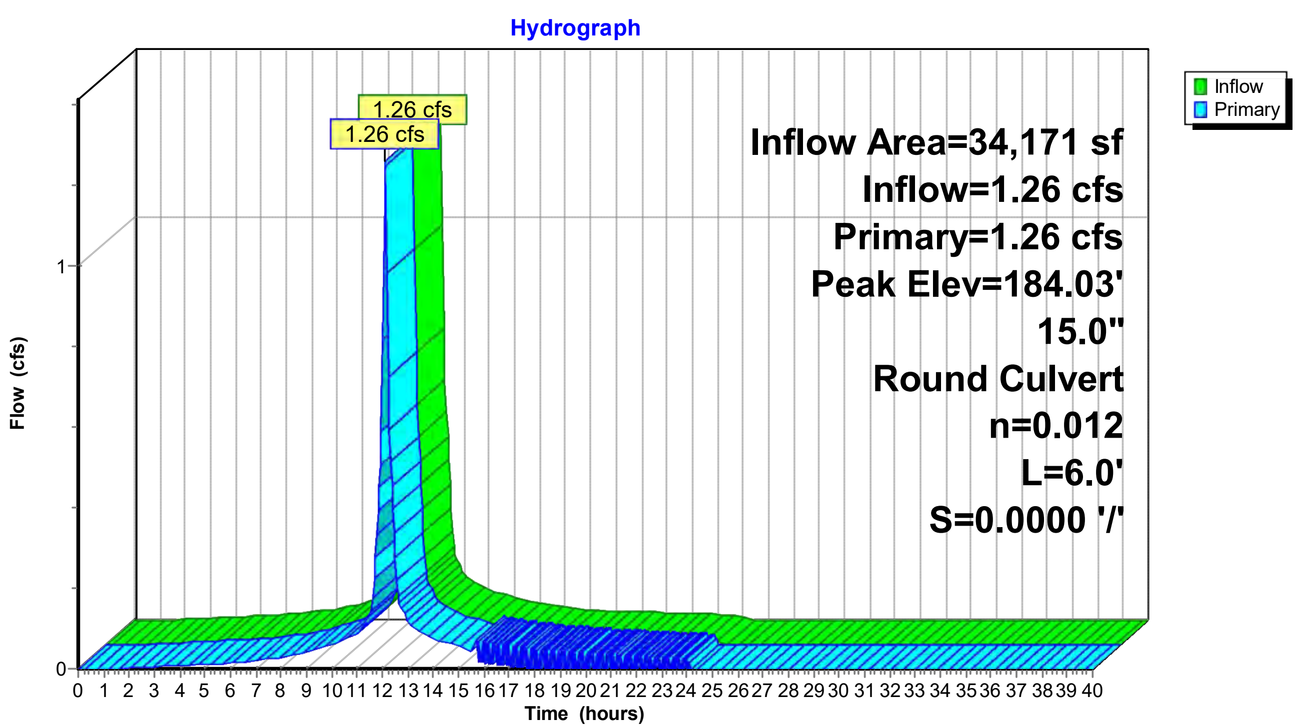
Inflow Area =	34,171 sf,	64.92% Impervious,	Inflow Depth = 1.64"	for 2 yr event
Inflow =	1.26 cfs @	12.09 hrs, Volume=	4,672 cf	
Outflow =	1.26 cfs @	12.09 hrs, Volume=	4,671 cf, Atten= 0%, Lag= 0.0 min	
Primary =	1.26 cfs @	12.09 hrs, Volume=	4,671 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 184.03' @ 14.53 hrs
Flood Elev= 195.58'

Device	Routing	Invert	Outlet Devices
#1	Primary	182.73'	**15.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 182.73' / 182.73' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.23 cfs @ 12.09 hrs HW=183.41' TW=182.80' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.23 cfs @ 2.59 fps)

Pond 11: DMH



Summary for Pond 12: CB

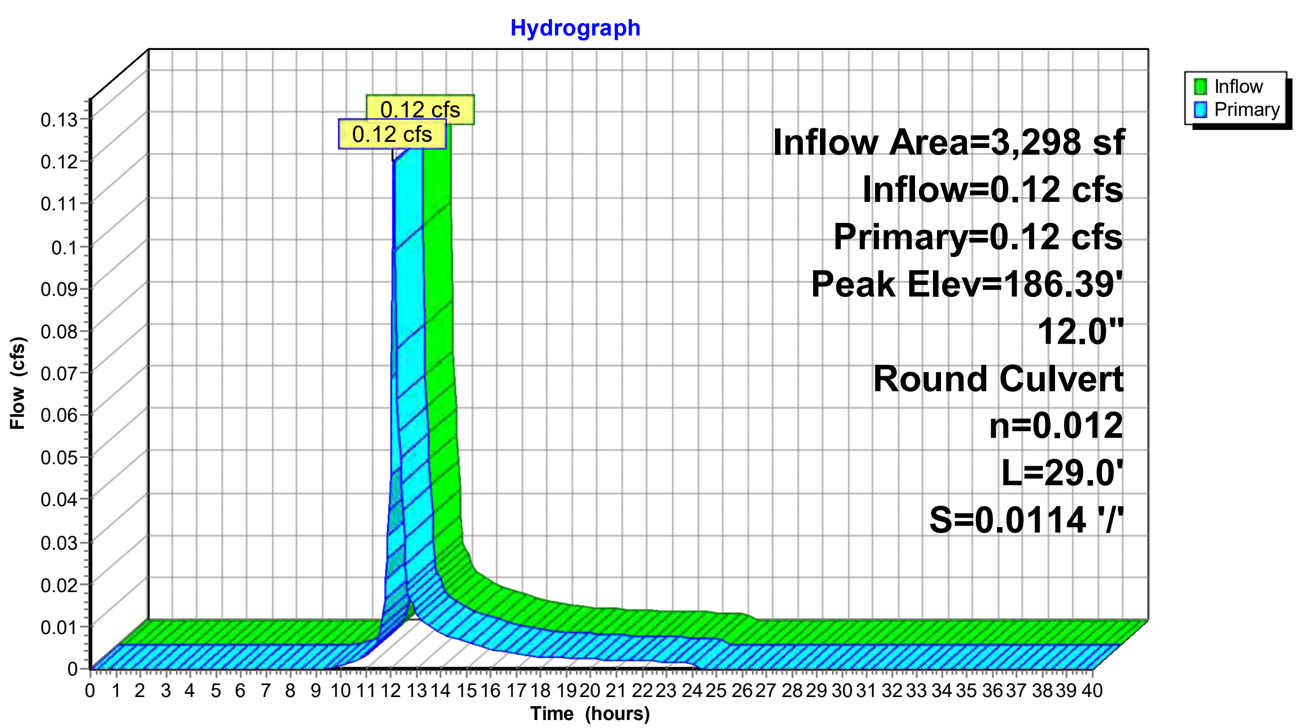
Inflow Area = 3,298 sf, 70.98% Impervious, Inflow Depth = 1.39" for 2 yr event
Inflow = 0.12 cfs @ 12.10 hrs, Volume= 382 cf
Outflow = 0.12 cfs @ 12.10 hrs, Volume= 382 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.10 hrs, Volume= 382 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.39' @ 12.11 hrs
Flood Elev= 189.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.20'	**12.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 186.20' / 185.87' S= 0.0114 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.11 cfs @ 12.10 hrs HW=186.38' TW=186.18' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.11 cfs @ 1.66 fps)

Pond 12: CB



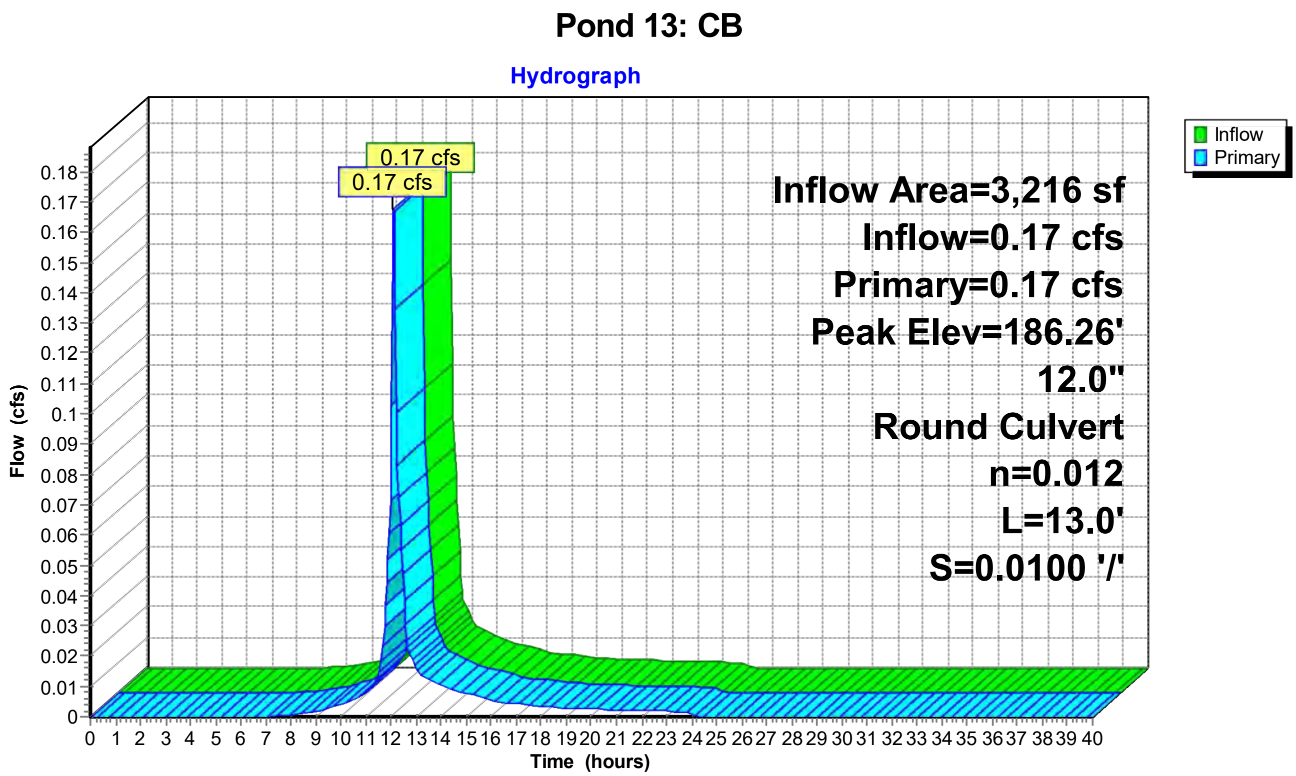
Summary for Pond 13: CB

Inflow Area =	3,216 sf,	84.86% Impervious,	Inflow Depth = 1.99"	for 2 yr event
Inflow =	0.17 cfs @	12.09 hrs, Volume=	533 cf	
Outflow =	0.17 cfs @	12.09 hrs, Volume=	533 cf,	Atten= 0%, Lag= 0.0 min
Primary =	0.17 cfs @	12.09 hrs, Volume=	533 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.26' @ 12.13 hrs
Flood Elev= 189.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.00'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 186.00' / 185.87' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 12.09 hrs HW=186.25' TW=186.18' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.13 cfs @ 1.30 fps)



Summary for Pond 14: DMH

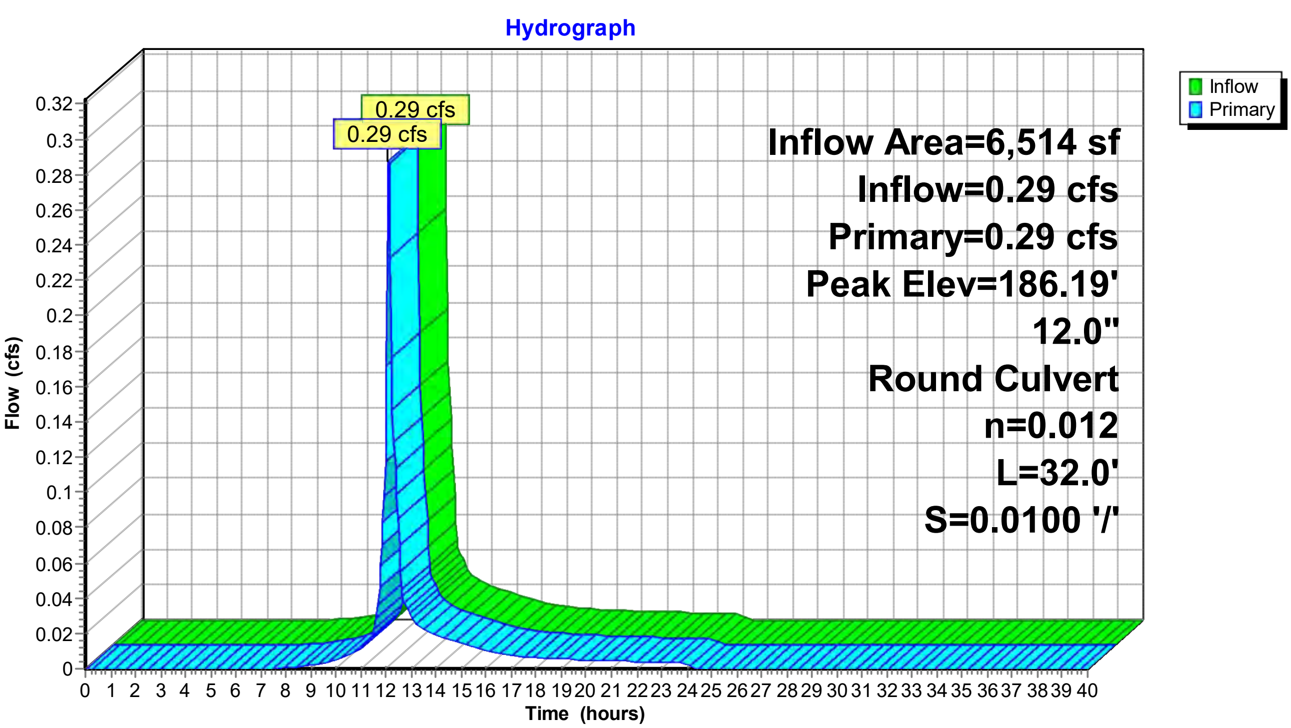
Inflow Area =	6,514 sf, 77.83% Impervious,	Inflow Depth = 1.69"	for 2 yr event
Inflow =	0.29 cfs @ 12.09 hrs, Volume=	916 cf	
Outflow =	0.29 cfs @ 12.09 hrs, Volume=	916 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.29 cfs @ 12.09 hrs, Volume=	916 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.19' @ 12.11 hrs
Flood Elev= 194.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	185.87'	**12.0" Round Culvert** L= 32.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 185.87' / 185.55' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.25 cfs @ 12.09 hrs HW=186.18' TW=186.01' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.25 cfs @ 1.80 fps)

Pond 14: DMH



Summary for Pond 15: CB

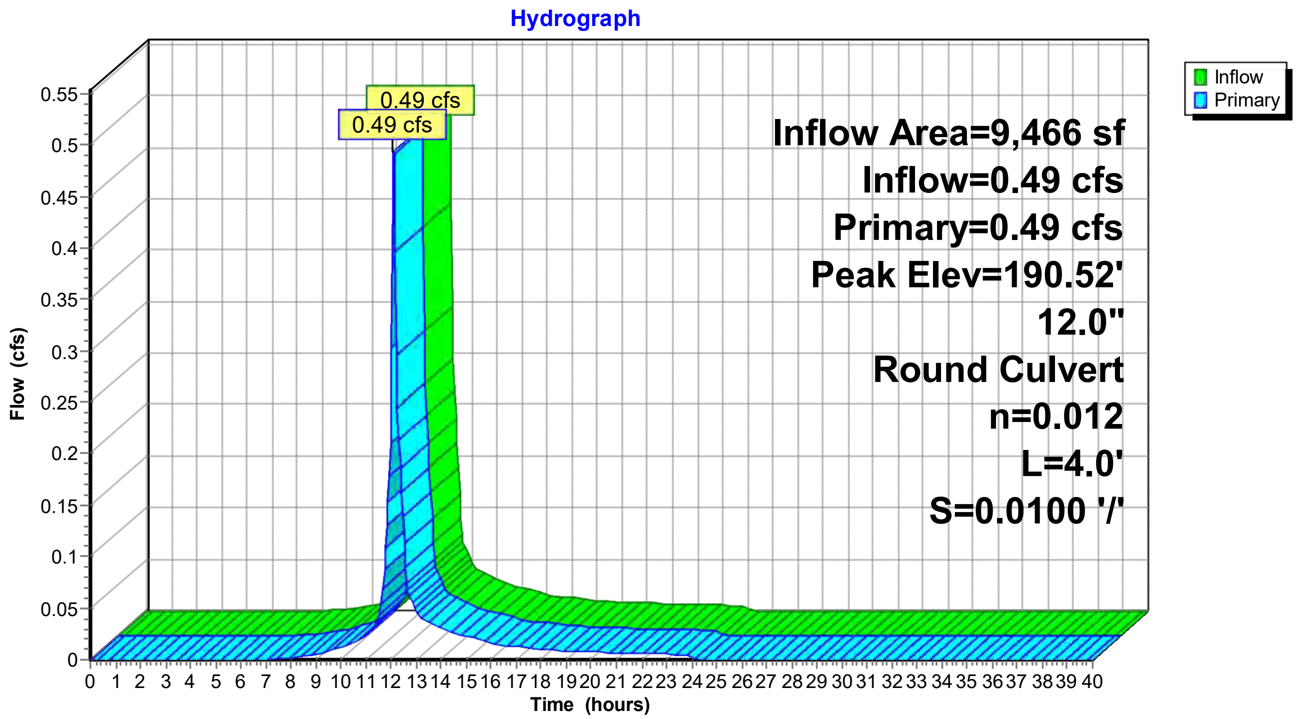
Inflow Area = 9,466 sf, 84.77% Impervious, Inflow Depth = 1.99" for 2 yr event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,570 cf
Outflow = 0.49 cfs @ 12.09 hrs, Volume= 1,570 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.09 hrs, Volume= 1,570 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 190.52' @ 12.09 hrs
Flood Elev= 193.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	190.10'	**12.0" Round Culvert** L= 4.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 190.10' / 190.06' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.48 cfs @ 12.09 hrs HW=190.51' TW=186.01' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.48 cfs @ 2.35 fps)

Pond 15: CB



Summary for Pond 16: DMH

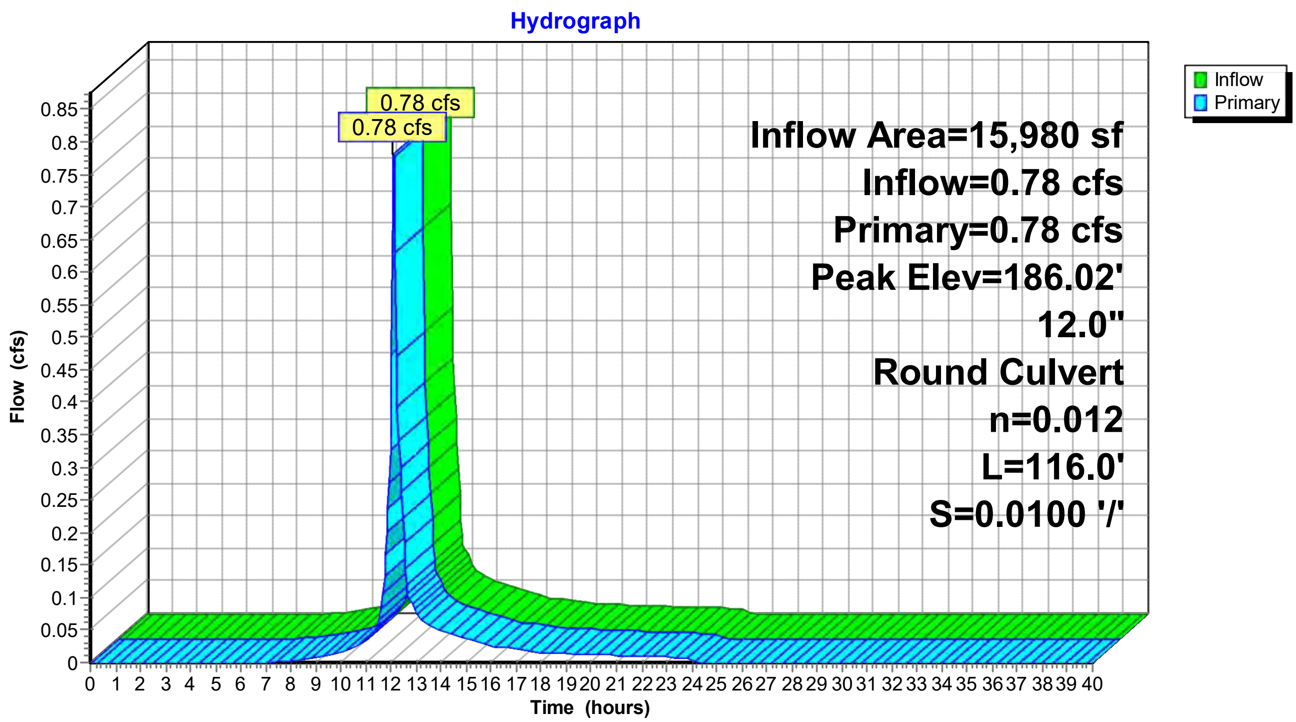
Inflow Area = 15,980 sf, 81.94% Impervious, Inflow Depth = 1.87" for 2 yr event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 2,486 cf
Outflow = 0.78 cfs @ 12.09 hrs, Volume= 2,486 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.78 cfs @ 12.09 hrs, Volume= 2,486 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.02' @ 12.10 hrs
Flood Elev= 193.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	185.55'	**12.0" Round Culvert** L= 116.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 185.55' / 184.39' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.74 cfs @ 12.09 hrs HW=186.01' TW=185.13' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.74 cfs @ 3.08 fps)

Pond 16: DMH



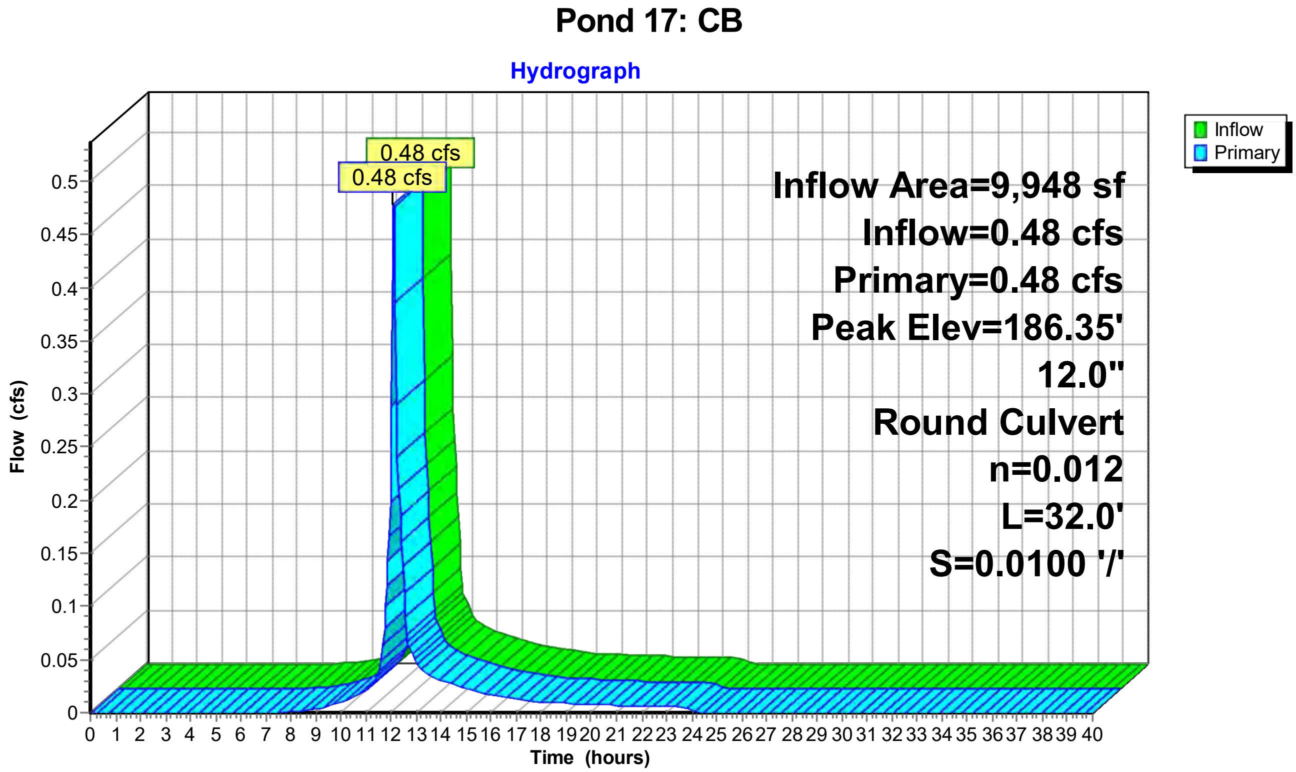
Summary for Pond 17: CB

Inflow Area = 9,948 sf, 80.86% Impervious, Inflow Depth = 1.83" for 2 yr event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 1,514 cf
Outflow = 0.48 cfs @ 12.09 hrs, Volume= 1,514 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.48 cfs @ 12.09 hrs, Volume= 1,514 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.35' @ 12.09 hrs
Flood Elev= 189.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.00'	**12.0" Round Culvert** L= 32.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 186.00' / 185.68' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.09 hrs HW=186.35' TW=185.13' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.47 cfs @ 2.88 fps)



Summary for Pond 18: CB

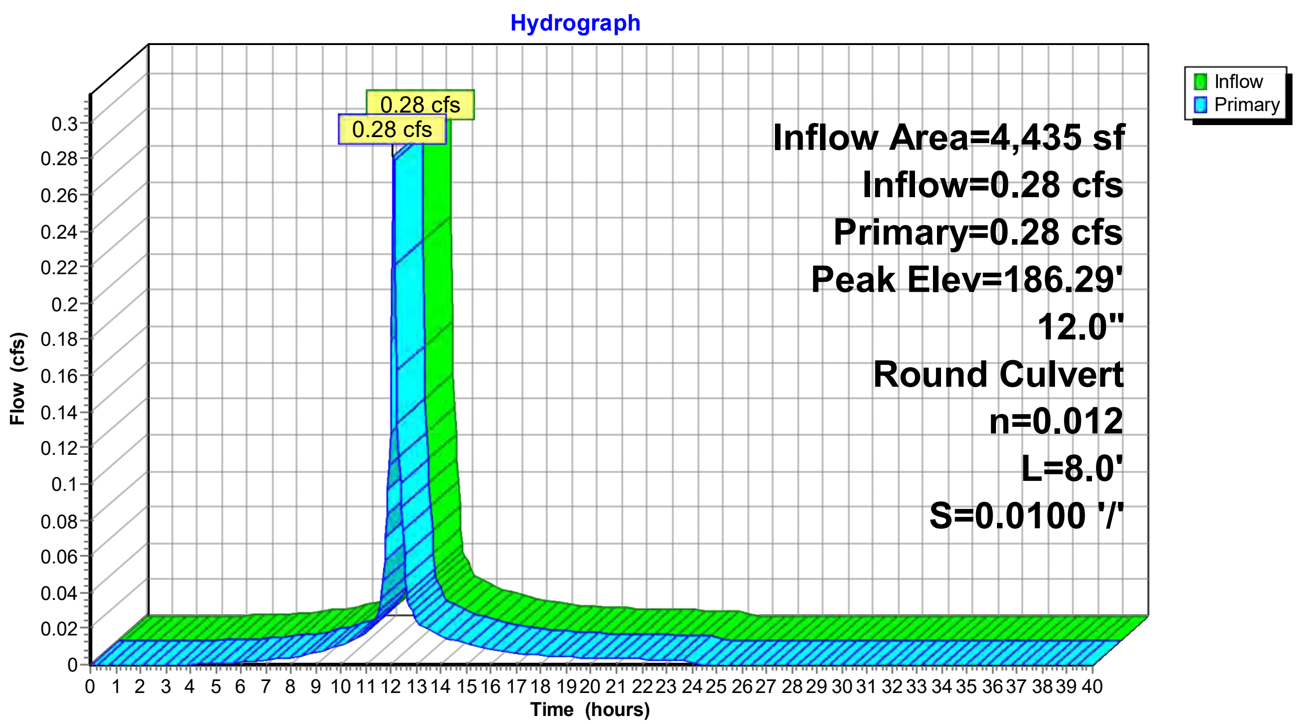
Inflow Area = 4,435 sf, 94.45% Impervious, Inflow Depth = 2.55" for 2 yr event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 941 cf
Outflow = 0.28 cfs @ 12.09 hrs, Volume= 941 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.09 hrs, Volume= 941 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 186.29' @ 12.09 hrs
Flood Elev= 189.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	186.00'	**12.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 186.00' / 185.92' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.09 hrs HW=186.29' TW=185.13' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.27 cfs @ 2.20 fps)

Pond 18: CB



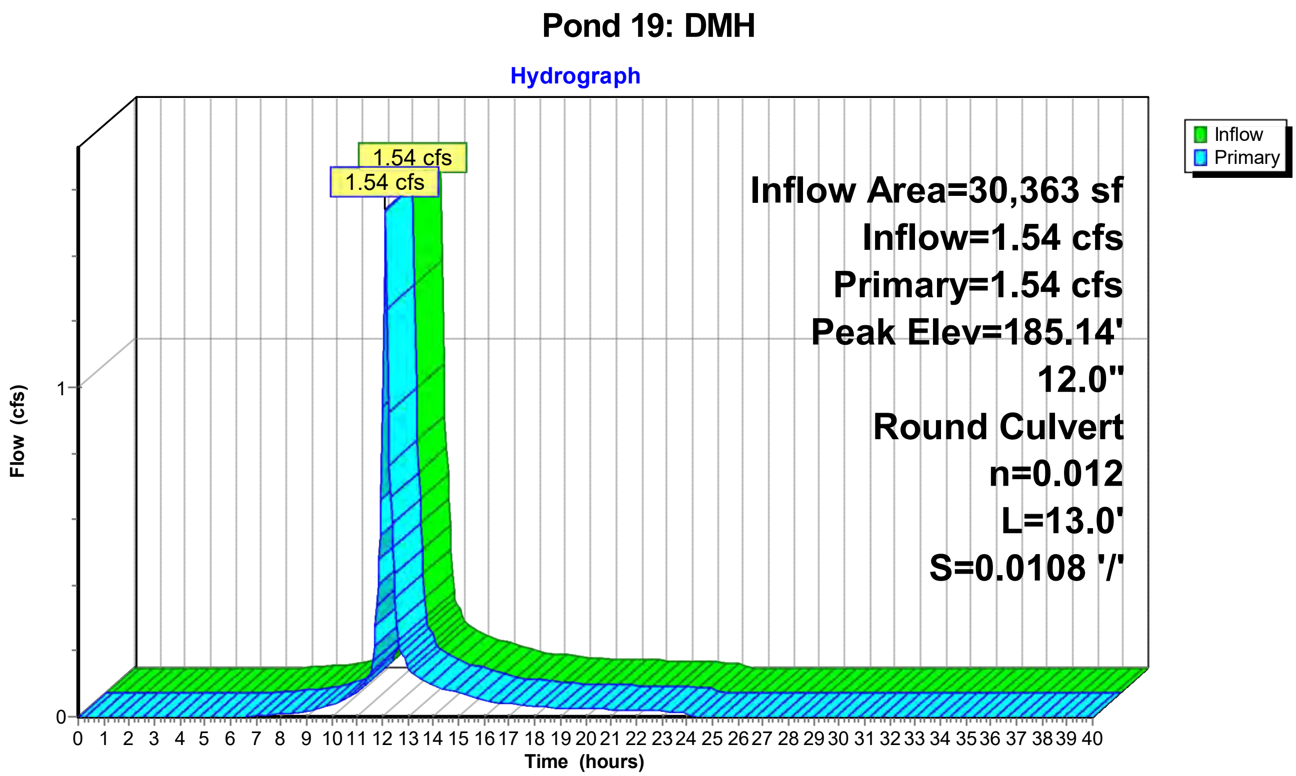
Summary for Pond 19: DMH

Inflow Area =	30,363 sf, 83.41% Impervious,	Inflow Depth = 1.95"	for 2 yr event	
Inflow =	1.54 cfs @ 12.09 hrs,	Volume=	4,942 cf	
Outflow =	1.54 cfs @ 12.09 hrs,	Volume=	4,942 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.54 cfs @ 12.09 hrs,	Volume=	4,942 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 185.14' @ 12.10 hrs
Flood Elev= 189.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	184.39'	**12.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 184.39' / 184.25' S= 0.0108 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.39 cfs @ 12.09 hrs HW=185.13' TW=184.86' (Dynamic Tailwater)
└1=Culvert (Outlet Controls 1.39 cfs @ 3.10 fps)



Summary for Pond 20: OGS

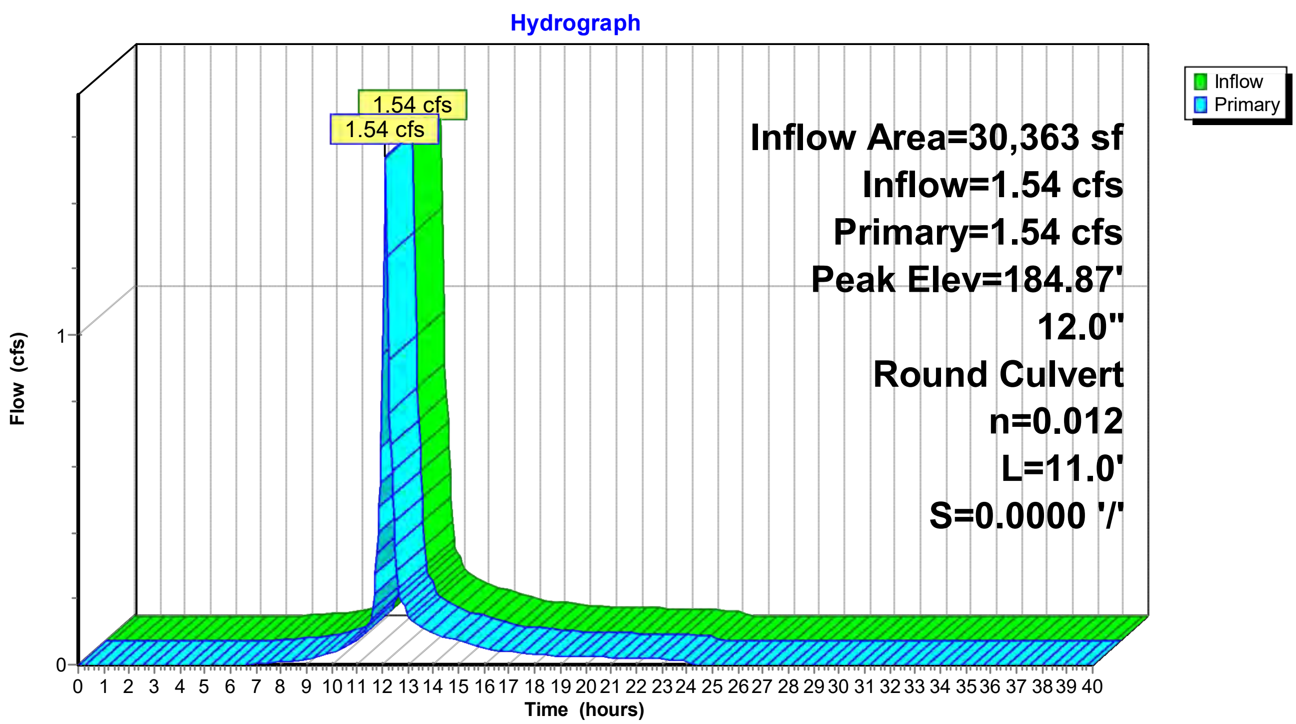
Inflow Area = 30,363 sf, 83.41% Impervious, Inflow Depth = 1.95" for 2 yr event
Inflow = 1.54 cfs @ 12.09 hrs, Volume= 4,942 cf
Outflow = 1.54 cfs @ 12.09 hrs, Volume= 4,942 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.54 cfs @ 12.09 hrs, Volume= 4,942 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 184.87' @ 12.09 hrs
Flood Elev= 189.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	184.00'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 184.00' / 184.00' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.51 cfs @ 12.09 hrs HW=184.86' TW=182.83' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.51 cfs @ 2.82 fps)

Pond 20: OGS



Summary for Pond 21: DMH

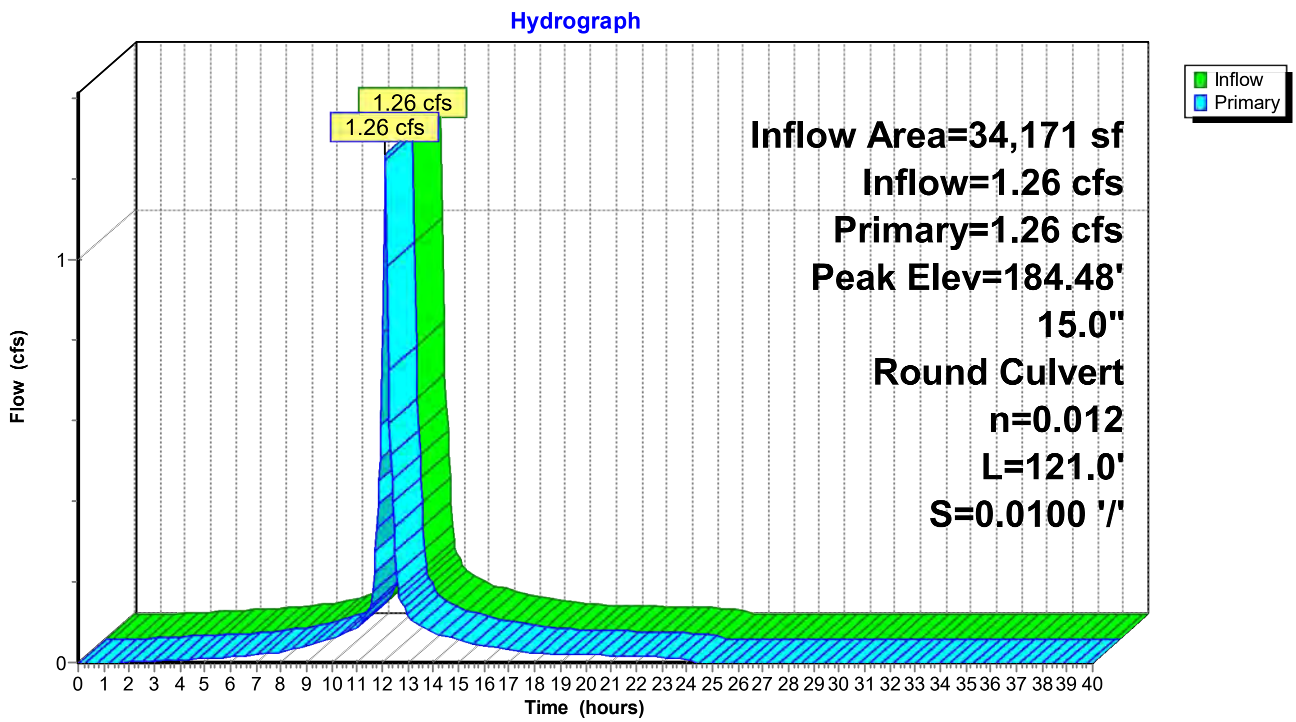
Inflow Area =	34,171 sf,	64.92% Impervious,	Inflow Depth = 1.64"	for 2 yr event
Inflow =	1.26 cfs @	12.09 hrs, Volume=	4,672 cf	
Outflow =	1.26 cfs @	12.09 hrs, Volume=	4,672 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.26 cfs @	12.09 hrs, Volume=	4,672 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 184.48' @ 12.09 hrs
Flood Elev= 199.27'

Device	Routing	Invert	Outlet Devices
#1	Primary	183.94'	**15.0" Round Culvert** L= 121.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 183.94' / 182.73' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf

Primary OutFlow Max=1.22 cfs @ 12.09 hrs HW=184.47' TW=183.41' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 1.22 cfs @ 3.61 fps)

Pond 21: DMH



Summary for Pond 22: DMH

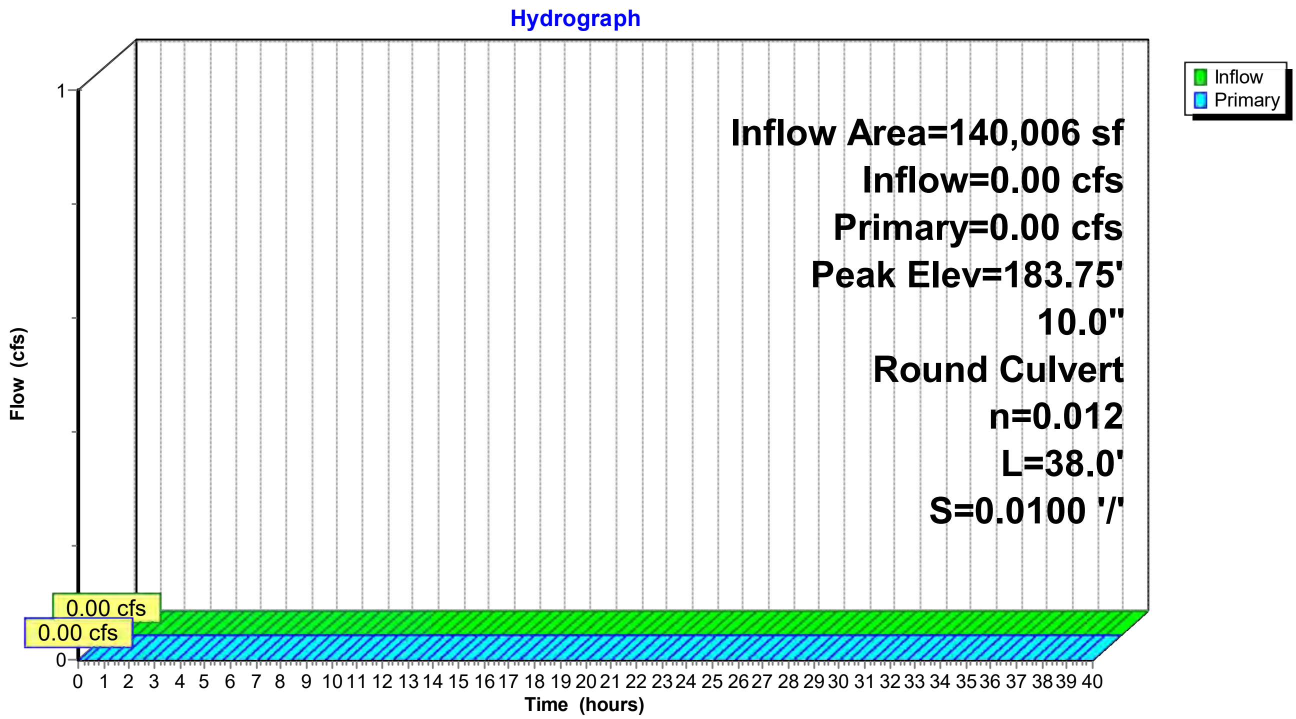
Inflow Area = 140,006 sf, 79.72% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 183.75' @ 0.00 hrs
Flood Elev= 194.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	183.75'	**10.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 183.75' / 183.37' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=183.75' TW=183.37' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 22: DMH



Summary for Pond 23: DMH

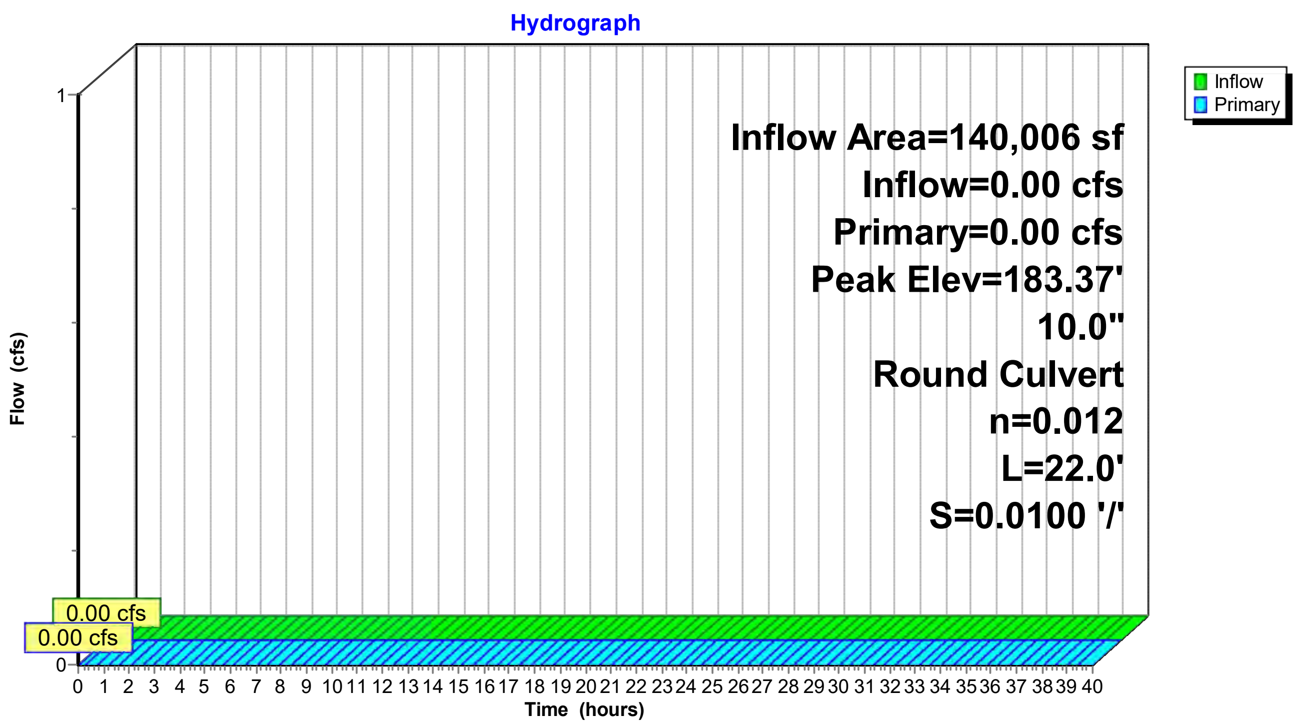
Inflow Area = 140,006 sf, 79.72% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 183.37' @ 0.00 hrs
Flood Elev= 194.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	183.37'	**10.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 183.37' / 183.15' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.55 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=183.37' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond 23: DMH

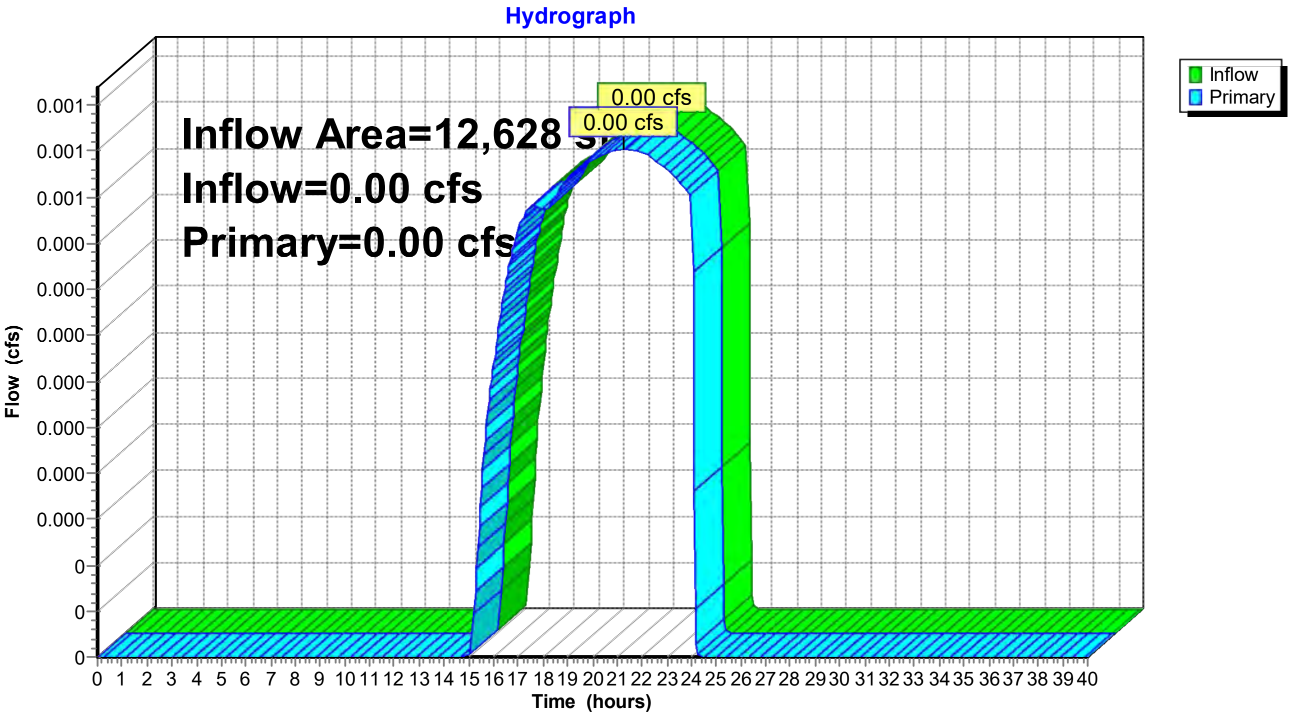


Summary for Link 1L:

Inflow Area = 12,628 sf, 6.92% Impervious, Inflow Depth = 0.01" for 2 yr event
Inflow = 0.00 cfs @ 21.24 hrs, Volume= 15 cf
Primary = 0.00 cfs @ 21.24 hrs, Volume= 15 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 1L:

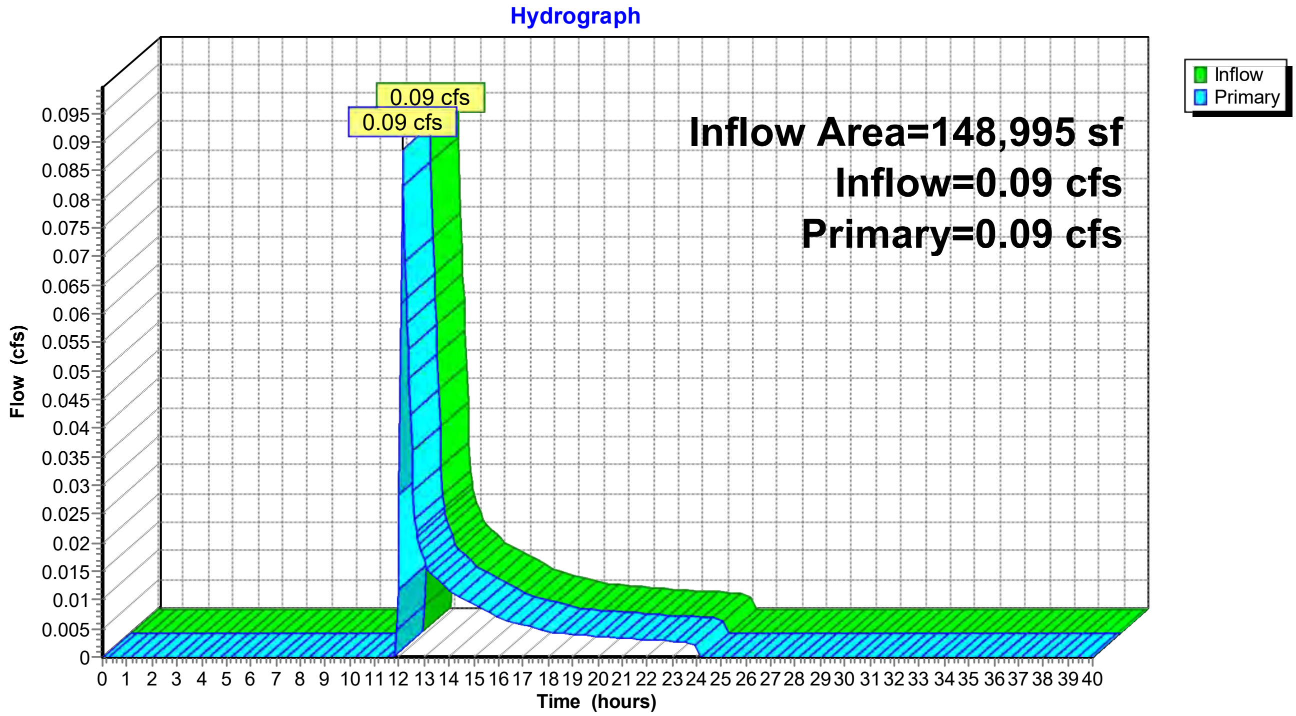


Summary for Link 2L:

Inflow Area = 148,995 sf, 77.48% Impervious, Inflow Depth = 0.03" for 2 yr event
Inflow = 0.09 cfs @ 12.12 hrs, Volume= 384 cf
Primary = 0.09 cfs @ 12.12 hrs, Volume= 384 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 2L:

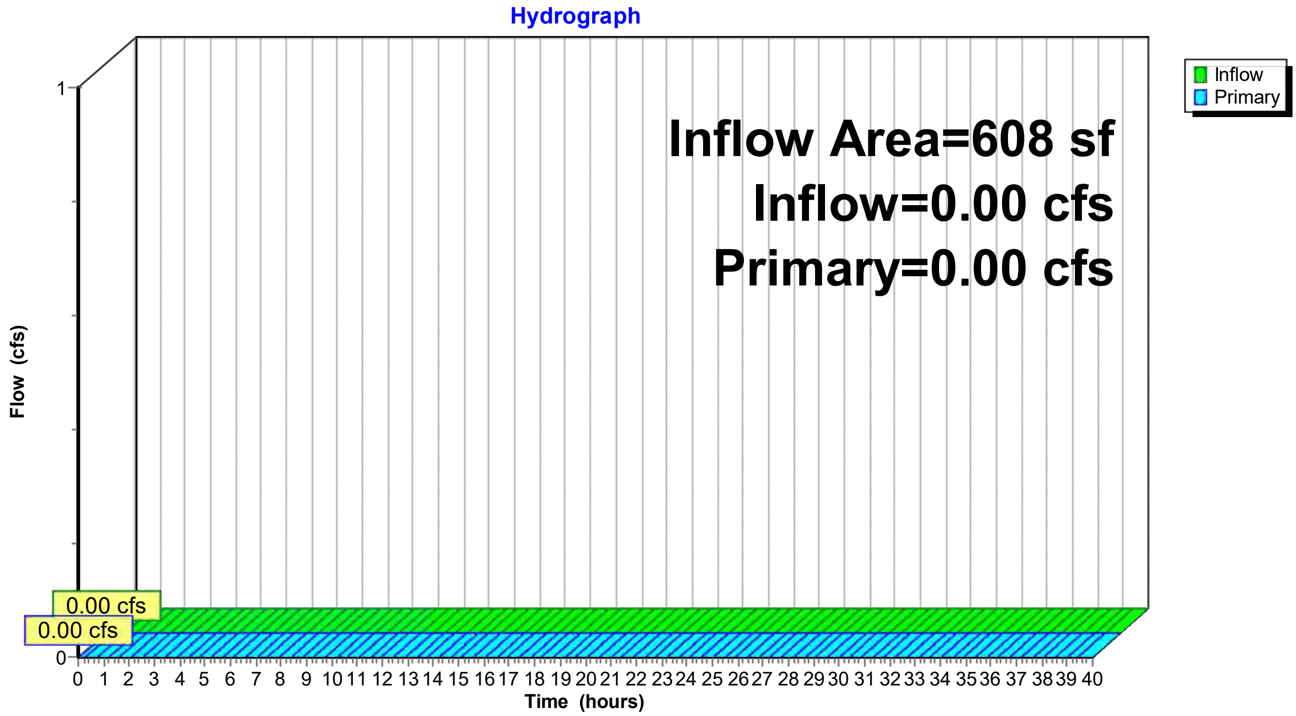


Summary for Link 3L:

Inflow Area = 608 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 3L:

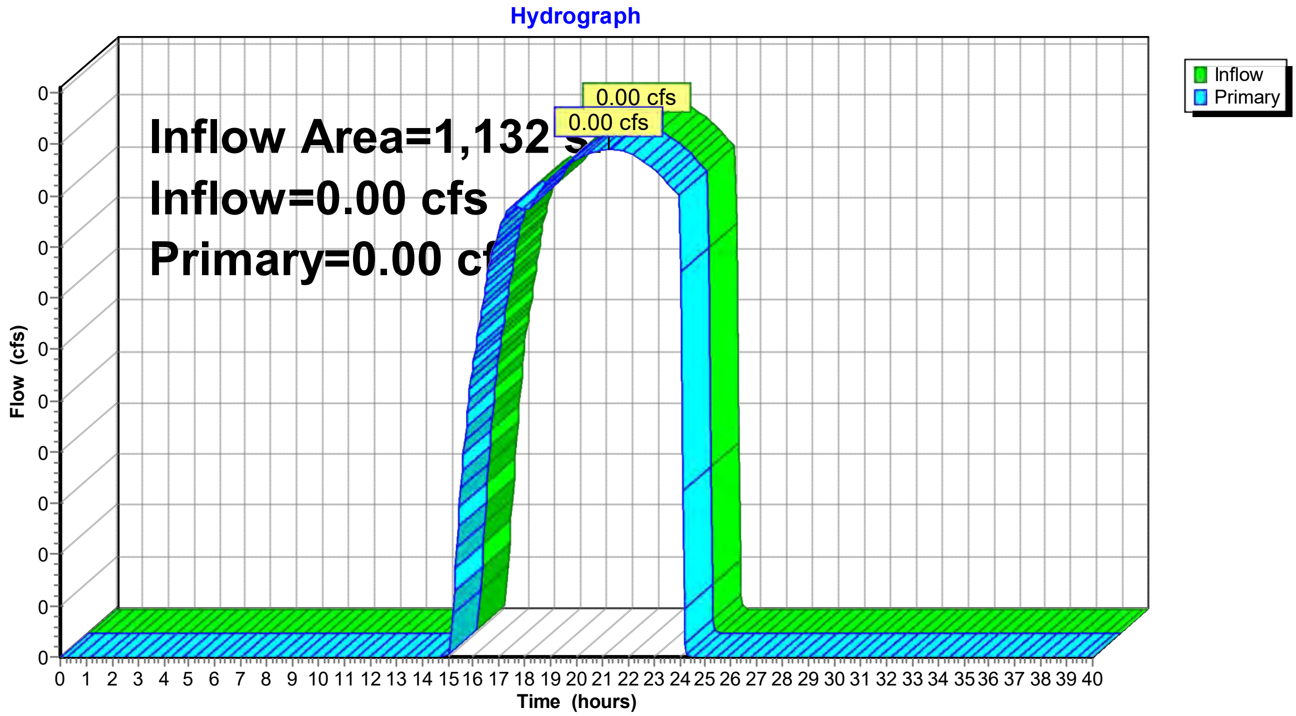


Summary for Link 4L:

Inflow Area = 1,132 sf, 7.42% Impervious, Inflow Depth = 0.01" for 2 yr event
Inflow = 0.00 cfs @ 21.24 hrs, Volume= 1 cf
Primary = 0.00 cfs @ 21.24 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs

Link 4L:



Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=12,628 sf 6.92% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=43 Runoff=0.02 cfs 238 cf

Subcatchment 2S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.46 cfs 5,270 cf

Subcatchment 3S: ROOF Runoff Area=3,914 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=0.39 cfs 1,391 cf

Subcatchment 4S: ROOF Runoff Area=16,016 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.58 cfs 5,691 cf

Subcatchment 5S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=98 Runoff=1.46 cfs 5,270 cf

Subcatchment 6S: Runoff Area=8,679 sf 65.86% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=78 Runoff=0.52 cfs 1,658 cf

Subcatchment 7S: Runoff Area=14,296 sf 76.44% Impervious Runoff Depth=2.82"
Tc=6.0 min CN=84 Runoff=1.06 cfs 3,355 cf

Subcatchment 8S: Runoff Area=11,190 sf 74.35% Impervious Runoff Depth=2.73"
Tc=6.0 min CN=83 Runoff=0.80 cfs 2,542 cf

Subcatchment 9S: Runoff Area=10,461 sf 79.30% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=86 Runoff=0.82 cfs 2,618 cf

Subcatchment 10S: Runoff Area=3,298 sf 70.98% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=81 Runoff=0.22 cfs 700 cf

Subcatchment 11S: Runoff Area=3,216 sf 84.86% Impervious Runoff Depth=3.30"
Tc=6.0 min CN=89 Runoff=0.27 cfs 883 cf

Subcatchment 12S: Runoff Area=9,466 sf 84.77% Impervious Runoff Depth=3.30"
Tc=6.0 min CN=89 Runoff=0.80 cfs 2,599 cf

Subcatchment 13S: Runoff Area=4,435 sf 94.45% Impervious Runoff Depth=3.92"
Tc=6.0 min CN=95 Runoff=0.42 cfs 1,451 cf

Subcatchment 14S: Runoff Area=9,948 sf 80.86% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=87 Runoff=0.80 cfs 2,569 cf

Subcatchment 15S: Runoff Area=1,132 sf 7.42% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=43 Runoff=0.00 cfs 21 cf

Subcatchment 16S: Runoff Area=608 sf 0.00% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=39 Runoff=0.00 cfs 6 cf

Subcatchment 17S: COURTYARD Runoff Area=15,427 sf 22.31% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=52 Runoff=0.14 cfs 762 cf

Subcatchment 18S: Runoff Area=8,989 sf 42.60% Impervious Runoff Depth=1.27"
Tc=6.0 min CN=64 Runoff=0.28 cfs 948 cf

Pond 1: CB Peak Elev=194.88' Inflow=0.52 cfs 1,658 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0101 '/' Outflow=0.52 cfs 1,658 cf

Pond 1P: Infiltration Pipe Network Peak Elev=185.14' Storage=16,097 cf Inflow=10.74 cfs 36,761 cf
Discarded=0.36 cfs 29,557 cf Primary=0.83 cfs 7,204 cf Outflow=1.18 cfs 36,761 cf

Pond 2: DMH Peak Elev=195.40' Inflow=3.04 cfs 10,961 cf
15.0" Round Culvert n=0.012 L=14.0' S=0.0393 '/' Outflow=3.04 cfs 10,961 cf

Pond 3: DGCB Peak Elev=194.89' Inflow=1.06 cfs 3,355 cf
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=1.06 cfs 3,355 cf

Pond 4: DMH Peak Elev=194.35' Inflow=4.62 cfs 15,974 cf
18.0" Round Culvert n=0.012 L=48.0' S=0.0100 '/' Outflow=4.62 cfs 15,974 cf

Pond 5: DMH Peak Elev=193.77' Inflow=4.62 cfs 15,974 cf
18.0" Round Culvert n=0.012 L=177.0' S=0.0100 '/' Outflow=4.62 cfs 15,974 cf

Pond 6: CB Peak Elev=194.53' Inflow=0.80 cfs 2,542 cf
12.0" Round Culvert n=0.012 L=7.0' S=0.0100 '/' Outflow=0.80 cfs 2,542 cf

Pond 7: DMH Peak Elev=192.12' Inflow=5.42 cfs 18,516 cf
18.0" Round Culvert n=0.012 L=109.0' S=0.0100 '/' Outflow=5.42 cfs 18,516 cf

Pond 8: CB Peak Elev=190.99' Inflow=0.82 cfs 2,618 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0100 '/' Outflow=0.82 cfs 2,618 cf

Pond 9: DMH Peak Elev=190.69' Inflow=6.24 cfs 21,134 cf
24.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=6.24 cfs 21,134 cf

Pond 10: OGS Peak Elev=186.89' Inflow=6.24 cfs 21,134 cf
24.0" Round Culvert n=0.012 L=7.0' S=0.0000 '/' Outflow=6.24 cfs 21,134 cf

Pond 11: DMH Peak Elev=185.14' Inflow=1.97 cfs 7,422 cf
15.0" Round Culvert n=0.012 L=6.0' S=0.0000 '/' Outflow=1.97 cfs 7,424 cf

Pond 12: CB Peak Elev=186.47' Inflow=0.22 cfs 700 cf
12.0" Round Culvert n=0.012 L=29.0' S=0.0114 '/' Outflow=0.22 cfs 700 cf

Pond 13: CB Peak Elev=186.37' Inflow=0.27 cfs 883 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0100 '/' Outflow=0.27 cfs 883 cf

Pond 14: DMH Peak Elev=186.33' Inflow=0.49 cfs 1,583 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.49 cfs 1,583 cf

Pond 15: CB Peak Elev=190.65' Inflow=0.80 cfs 2,599 cf
12.0" Round Culvert n=0.012 L=4.0' S=0.0100 '/' Outflow=0.80 cfs 2,599 cf

Pond 16: DMH Peak Elev=186.20' Inflow=1.30 cfs 4,183 cf
12.0" Round Culvert n=0.012 L=116.0' S=0.0100 '/' Outflow=1.30 cfs 4,183 cf

Pond 17: CB Peak Elev=186.47' Inflow=0.80 cfs 2,569 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.80 cfs 2,569 cf

Pond 18: CB Peak Elev=186.37' Inflow=0.42 cfs 1,451 cf
12.0" Round Culvert n=0.012 L=8.0' S=0.0100 '/' Outflow=0.42 cfs 1,451 cf

Pond 19: DMH Peak Elev=185.57' Inflow=2.52 cfs 8,202 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0108 '/' Outflow=2.52 cfs 8,202 cf

Pond 20: OGS Peak Elev=185.21' Inflow=2.52 cfs 8,202 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0000 '/' Outflow=2.52 cfs 8,202 cf

Pond 21: DMH Peak Elev=185.14' Inflow=1.97 cfs 7,422 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0100 '/' Outflow=1.97 cfs 7,422 cf

Pond 22: DMH Peak Elev=184.31' Inflow=0.83 cfs 7,204 cf
10.0" Round Culvert n=0.012 L=38.0' S=0.0100 '/' Outflow=0.83 cfs 7,204 cf

Pond 23: DMH Peak Elev=183.91' Inflow=0.83 cfs 7,204 cf
10.0" Round Culvert n=0.012 L=22.0' S=0.0100 '/' Outflow=0.83 cfs 7,204 cf

Link 1L: Inflow=0.02 cfs 238 cf
Primary=0.02 cfs 238 cf

Link 2L: Inflow=0.87 cfs 8,152 cf
Primary=0.87 cfs 8,152 cf

Link 3L: Inflow=0.00 cfs 6 cf
Primary=0.00 cfs 6 cf

Link 4L: Inflow=0.00 cfs 21 cf
Primary=0.00 cfs 21 cf

Total Runoff Area = 163,363 sf Runoff Volume = 37,972 cf Average Runoff Depth = 2.79"
28.74% Pervious = 46,958 sf 71.26% Impervious = 116,405 sf

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=12,628 sf 6.92% Impervious Runoff Depth=0.54"
Tc=6.0 min CN=43 Runoff=0.07 cfs 565 cf

Subcatchment 2S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=1.82 cfs 6,627 cf

Subcatchment 3S: ROOF Runoff Area=3,914 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=0.48 cfs 1,749 cf

Subcatchment 4S: ROOF Runoff Area=16,016 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=1.97 cfs 7,157 cf

Subcatchment 5S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=1.82 cfs 6,627 cf

Subcatchment 6S: Runoff Area=8,679 sf 65.86% Impervious Runoff Depth=3.23"
Tc=6.0 min CN=78 Runoff=0.74 cfs 2,335 cf

Subcatchment 7S: Runoff Area=14,296 sf 76.44% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=84 Runoff=1.42 cfs 4,555 cf

Subcatchment 8S: Runoff Area=11,190 sf 74.35% Impervious Runoff Depth=3.72"
Tc=6.0 min CN=83 Runoff=1.09 cfs 3,471 cf

Subcatchment 9S: Runoff Area=10,461 sf 79.30% Impervious Runoff Depth=4.03"
Tc=6.0 min CN=86 Runoff=1.09 cfs 3,514 cf

Subcatchment 10S: Runoff Area=3,298 sf 70.98% Impervious Runoff Depth=3.52"
Tc=6.0 min CN=81 Runoff=0.30 cfs 968 cf

Subcatchment 11S: Runoff Area=3,216 sf 84.86% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=89 Runoff=0.35 cfs 1,165 cf

Subcatchment 12S: Runoff Area=9,466 sf 84.77% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=89 Runoff=1.04 cfs 3,430 cf

Subcatchment 13S: Runoff Area=4,435 sf 94.45% Impervious Runoff Depth=5.01"
Tc=6.0 min CN=95 Runoff=0.53 cfs 1,853 cf

Subcatchment 14S: Runoff Area=9,948 sf 80.86% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=87 Runoff=1.06 cfs 3,428 cf

Subcatchment 15S: Runoff Area=1,132 sf 7.42% Impervious Runoff Depth=0.54"
Tc=6.0 min CN=43 Runoff=0.01 cfs 51 cf

Subcatchment 16S: Runoff Area=608 sf 0.00% Impervious Runoff Depth=0.34"
Tc=6.0 min CN=39 Runoff=0.00 cfs 17 cf

Subcatchment 17S: COURTYARD Runoff Area=15,427 sf 22.31% Impervious Runoff Depth=1.09"
Tc=6.0 min CN=52 Runoff=0.35 cfs 1,395 cf

Subcatchment 18S: Runoff Area=8,989 sf 42.60% Impervious Runoff Depth=1.98"
Tc=6.0 min CN=64 Runoff=0.45 cfs 1,485 cf

Pond 1: CB Peak Elev=194.99' Inflow=0.74 cfs 2,335 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0101 '/' Outflow=0.74 cfs 2,335 cf

Pond 1P: Infiltration Pipe Network Peak Elev=186.11' Storage=21,022 cf Inflow=14.07 cfs 48,274 cf
Discarded=0.36 cfs 32,027 cf Primary=1.55 cfs 16,251 cf Outflow=1.90 cfs 48,278 cf

Pond 2: DMH Peak Elev=195.54' Inflow=3.79 cfs 13,784 cf
15.0" Round Culvert n=0.012 L=14.0' S=0.0393 '/' Outflow=3.79 cfs 13,784 cf

Pond 3: DGCB Peak Elev=195.01' Inflow=1.42 cfs 4,555 cf
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=1.42 cfs 4,555 cf

Pond 4: DMH Peak Elev=194.57' Inflow=5.95 cfs 20,674 cf
18.0" Round Culvert n=0.012 L=48.0' S=0.0100 '/' Outflow=5.95 cfs 20,674 cf

Pond 5: DMH Peak Elev=193.96' Inflow=5.95 cfs 20,674 cf
18.0" Round Culvert n=0.012 L=177.0' S=0.0100 '/' Outflow=5.95 cfs 20,674 cf

Pond 6: CB Peak Elev=194.64' Inflow=1.09 cfs 3,471 cf
12.0" Round Culvert n=0.012 L=7.0' S=0.0100 '/' Outflow=1.09 cfs 3,471 cf

Pond 7: DMH Peak Elev=192.37' Inflow=7.04 cfs 24,144 cf
18.0" Round Culvert n=0.012 L=109.0' S=0.0100 '/' Outflow=7.04 cfs 24,144 cf

Pond 8: CB Peak Elev=191.09' Inflow=1.09 cfs 3,514 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0100 '/' Outflow=1.09 cfs 3,514 cf

Pond 9: DMH Peak Elev=190.92' Inflow=8.13 cfs 27,658 cf
24.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=8.13 cfs 27,658 cf

Pond 10: OGS Peak Elev=187.12' Inflow=8.13 cfs 27,658 cf
24.0" Round Culvert n=0.012 L=7.0' S=0.0000 '/' Outflow=8.13 cfs 27,658 cf

Pond 11: DMH Peak Elev=186.12' Inflow=2.65 cfs 9,771 cf
15.0" Round Culvert n=0.012 L=6.0' S=0.0000 '/' Outflow=2.65 cfs 9,771 cf

Pond 12: CB Peak Elev=186.57' Inflow=0.30 cfs 968 cf
12.0" Round Culvert n=0.012 L=29.0' S=0.0114 '/' Outflow=0.30 cfs 968 cf

Pond 13: CB Peak Elev=186.54' Inflow=0.35 cfs 1,165 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0100 '/' Outflow=0.35 cfs 1,165 cf

Pond 14: DMH Peak Elev=186.53' Inflow=0.66 cfs 2,133 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.66 cfs 2,133 cf

Pond 15: CB Peak Elev=190.74' Inflow=1.04 cfs 3,430 cf
12.0" Round Culvert n=0.012 L=4.0' S=0.0100 '/' Outflow=1.04 cfs 3,430 cf

Pond 16: DMH Peak Elev=186.49' Inflow=1.70 cfs 5,564 cf
12.0" Round Culvert n=0.012 L=116.0' S=0.0100 '/' Outflow=1.70 cfs 5,564 cf

Pond 17: CB Peak Elev=186.55' Inflow=1.06 cfs 3,428 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=1.06 cfs 3,428 cf

Pond 18: CB Peak Elev=186.42' Inflow=0.53 cfs 1,853 cf
12.0" Round Culvert n=0.012 L=8.0' S=0.0100 '/' Outflow=0.53 cfs 1,853 cf

Pond 19: DMH Peak Elev=186.17' Inflow=3.29 cfs 10,845 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0108 '/' Outflow=3.29 cfs 10,845 cf

Pond 20: OGS Peak Elev=186.13' Inflow=3.29 cfs 10,845 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0000 '/' Outflow=3.29 cfs 10,845 cf

Pond 21: DMH Peak Elev=186.12' Inflow=2.65 cfs 9,771 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0100 '/' Outflow=2.65 cfs 9,771 cf

Pond 22: DMH Peak Elev=184.62' Inflow=1.55 cfs 16,251 cf
10.0" Round Culvert n=0.012 L=38.0' S=0.0100 '/' Outflow=1.55 cfs 16,251 cf

Pond 23: DMH Peak Elev=184.18' Inflow=1.55 cfs 16,251 cf
10.0" Round Culvert n=0.012 L=22.0' S=0.0100 '/' Outflow=1.55 cfs 16,251 cf

Link 1L: Inflow=0.07 cfs 565 cf
Primary=0.07 cfs 565 cf

Link 2L: Inflow=1.65 cfs 17,736 cf
Primary=1.65 cfs 17,736 cf

Link 3L: Inflow=0.00 cfs 17 cf
Primary=0.00 cfs 17 cf

Link 4L: Inflow=0.01 cfs 51 cf
Primary=0.01 cfs 51 cf

Total Runoff Area = 163,363 sf Runoff Volume = 50,392 cf Average Runoff Depth = 3.70"
28.74% Pervious = 46,958 sf 71.26% Impervious = 116,405 sf

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S: Runoff Area=12,628 sf 6.92% Impervious Runoff Depth=0.75"
Tc=6.0 min CN=43 Runoff=0.13 cfs 789 cf

Subcatchment 2S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=2.02 cfs 7,368 cf

Subcatchment 3S: ROOF Runoff Area=3,914 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=0.53 cfs 1,944 cf

Subcatchment 4S: ROOF Runoff Area=16,016 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=2.18 cfs 7,957 cf

Subcatchment 5S: ROOF Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=98 Runoff=2.02 cfs 7,368 cf

Subcatchment 6S: Runoff Area=8,679 sf 65.86% Impervious Runoff Depth=3.76"
Tc=6.0 min CN=78 Runoff=0.86 cfs 2,717 cf

Subcatchment 7S: Runoff Area=14,296 sf 76.44% Impervious Runoff Depth=4.38"
Tc=6.0 min CN=84 Runoff=1.62 cfs 5,223 cf

Subcatchment 8S: Runoff Area=11,190 sf 74.35% Impervious Runoff Depth=4.28"
Tc=6.0 min CN=83 Runoff=1.24 cfs 3,989 cf

Subcatchment 9S: Runoff Area=10,461 sf 79.30% Impervious Runoff Depth=4.60"
Tc=6.0 min CN=86 Runoff=1.23 cfs 4,010 cf

Subcatchment 10S: Runoff Area=3,298 sf 70.98% Impervious Runoff Depth=4.07"
Tc=6.0 min CN=81 Runoff=0.35 cfs 1,118 cf

Subcatchment 11S: Runoff Area=3,216 sf 84.86% Impervious Runoff Depth=4.93"
Tc=6.0 min CN=89 Runoff=0.40 cfs 1,321 cf

Subcatchment 12S: Runoff Area=9,466 sf 84.77% Impervious Runoff Depth=4.93"
Tc=6.0 min CN=89 Runoff=1.18 cfs 3,888 cf

Subcatchment 13S: Runoff Area=4,435 sf 94.45% Impervious Runoff Depth=5.61"
Tc=6.0 min CN=95 Runoff=0.59 cfs 2,073 cf

Subcatchment 14S: Runoff Area=9,948 sf 80.86% Impervious Runoff Depth=4.71"
Tc=6.0 min CN=87 Runoff=1.20 cfs 3,904 cf

Subcatchment 15S: Runoff Area=1,132 sf 7.42% Impervious Runoff Depth=0.75"
Tc=6.0 min CN=43 Runoff=0.01 cfs 71 cf

Subcatchment 16S: Runoff Area=608 sf 0.00% Impervious Runoff Depth=0.50"
Tc=6.0 min CN=39 Runoff=0.00 cfs 26 cf

Subcatchment 17S: COURTYARD Runoff Area=15,427 sf 22.31% Impervious Runoff Depth=1.40"
Tc=6.0 min CN=52 Runoff=0.49 cfs 1,794 cf

Subcatchment 18S: Runoff Area=8,989 sf 42.60% Impervious Runoff Depth=2.41"
Tc=6.0 min CN=64 Runoff=0.56 cfs 1,803 cf

Pond 1: CB Peak Elev=195.05' Inflow=0.86 cfs 2,717 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0101 '/' Outflow=0.86 cfs 2,717 cf

Pond 1P: Infiltration Pipe Network Peak Elev=186.77' Storage=24,055 cf Inflow=15.90 cfs 54,672 cf
Discarded=0.36 cfs 33,175 cf Primary=1.85 cfs 21,500 cf Outflow=2.21 cfs 54,675 cf

Pond 2: DMH Peak Elev=195.62' Inflow=4.20 cfs 15,324 cf
15.0" Round Culvert n=0.012 L=14.0' S=0.0393 '/' Outflow=4.20 cfs 15,324 cf

Pond 3: DGCB Peak Elev=195.07' Inflow=1.62 cfs 5,223 cf
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=1.62 cfs 5,223 cf

Pond 4: DMH Peak Elev=194.70' Inflow=6.68 cfs 23,264 cf
18.0" Round Culvert n=0.012 L=48.0' S=0.0100 '/' Outflow=6.68 cfs 23,264 cf

Pond 5: DMH Peak Elev=194.07' Inflow=6.68 cfs 23,264 cf
18.0" Round Culvert n=0.012 L=177.0' S=0.0100 '/' Outflow=6.68 cfs 23,264 cf

Pond 6: CB Peak Elev=194.69' Inflow=1.24 cfs 3,989 cf
12.0" Round Culvert n=0.012 L=7.0' S=0.0100 '/' Outflow=1.24 cfs 3,989 cf

Pond 7: DMH Peak Elev=192.56' Inflow=7.92 cfs 27,252 cf
18.0" Round Culvert n=0.012 L=109.0' S=0.0100 '/' Outflow=7.92 cfs 27,252 cf

Pond 8: CB Peak Elev=191.19' Inflow=1.23 cfs 4,010 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0100 '/' Outflow=1.23 cfs 4,010 cf

Pond 9: DMH Peak Elev=191.03' Inflow=9.16 cfs 31,262 cf
24.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=9.16 cfs 31,262 cf

Pond 10: OGS Peak Elev=187.24' Inflow=9.16 cfs 31,262 cf
24.0" Round Culvert n=0.012 L=7.0' S=0.0000 '/' Outflow=9.16 cfs 31,262 cf

Pond 11: DMH Peak Elev=186.77' Inflow=3.03 cfs 11,106 cf
15.0" Round Culvert n=0.012 L=6.0' S=0.0000 '/' Outflow=3.03 cfs 11,106 cf

Pond 12: CB Peak Elev=186.80' Inflow=0.35 cfs 1,118 cf
12.0" Round Culvert n=0.012 L=29.0' S=0.0114 '/' Outflow=0.35 cfs 1,118 cf

Pond 13: CB Peak Elev=186.80' Inflow=0.40 cfs 1,321 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0100 '/' Outflow=0.40 cfs 1,321 cf

Pond 14: DMH Peak Elev=186.80' Inflow=0.75 cfs 2,439 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.75 cfs 2,439 cf

Pond 15: CB Peak Elev=190.78' Inflow=1.18 cfs 3,888 cf
12.0" Round Culvert n=0.012 L=4.0' S=0.0100 '/' Outflow=1.18 cfs 3,888 cf

Pond 16: DMH Peak Elev=186.80' Inflow=1.93 cfs 6,327 cf
12.0" Round Culvert n=0.012 L=116.0' S=0.0100 '/' Outflow=1.93 cfs 6,327 cf

Pond 17: CB Peak Elev=186.80' Inflow=1.20 cfs 3,904 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=1.20 cfs 3,904 cf

Pond 18: CB Peak Elev=186.80' Inflow=0.59 cfs 2,073 cf
12.0" Round Culvert n=0.012 L=8.0' S=0.0100 '/' Outflow=0.59 cfs 2,073 cf

Pond 19: DMH Peak Elev=186.80' Inflow=3.71 cfs 12,304 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0108 '/' Outflow=3.71 cfs 12,304 cf

Pond 20: OGS Peak Elev=186.78' Inflow=3.71 cfs 12,304 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0000 '/' Outflow=3.71 cfs 12,304 cf

Pond 21: DMH Peak Elev=186.78' Inflow=3.03 cfs 11,106 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0100 '/' Outflow=3.03 cfs 11,106 cf

Pond 22: DMH Peak Elev=184.81' Inflow=1.85 cfs 21,500 cf
10.0" Round Culvert n=0.012 L=38.0' S=0.0100 '/' Outflow=1.85 cfs 21,500 cf

Pond 23: DMH Peak Elev=184.31' Inflow=1.85 cfs 21,500 cf
10.0" Round Culvert n=0.012 L=22.0' S=0.0100 '/' Outflow=1.85 cfs 21,500 cf

Link 1L: Inflow=0.13 cfs 789 cf
Primary=0.13 cfs 789 cf

Link 2L: Inflow=2.01 cfs 23,303 cf
Primary=2.01 cfs 23,303 cf

Link 3L: Inflow=0.00 cfs 26 cf
Primary=0.00 cfs 26 cf

Link 4L: Inflow=0.01 cfs 71 cf
Primary=0.01 cfs 71 cf

Total Runoff Area = 163,363 sf Runoff Volume = 57,360 cf Average Runoff Depth = 4.21"
28.74% Pervious = 46,958 sf 71.26% Impervious = 116,405 sf

Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 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 1S:	Runoff Area=12,628 sf 6.92% Impervious Runoff Depth=0.87" Tc=6.0 min CN=43 Runoff=0.17 cfs 911 cf
Subcatchment 2S: ROOF	Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=2.12 cfs 7,738 cf
Subcatchment 3S: ROOF	Runoff Area=3,914 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=0.56 cfs 2,042 cf
Subcatchment 4S: ROOF	Runoff Area=16,016 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=2.29 cfs 8,357 cf
Subcatchment 5S: ROOF	Runoff Area=14,830 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=2.12 cfs 7,738 cf
Subcatchment 6S:	Runoff Area=8,679 sf 65.86% Impervious Runoff Depth=4.02" Tc=6.0 min CN=78 Runoff=0.92 cfs 2,910 cf
Subcatchment 7S:	Runoff Area=14,296 sf 76.44% Impervious Runoff Depth=4.67" Tc=6.0 min CN=84 Runoff=1.72 cfs 5,559 cf
Subcatchment 8S:	Runoff Area=11,190 sf 74.35% Impervious Runoff Depth=4.56" Tc=6.0 min CN=83 Runoff=1.32 cfs 4,250 cf
Subcatchment 9S:	Runoff Area=10,461 sf 79.30% Impervious Runoff Depth=4.89" Tc=6.0 min CN=86 Runoff=1.31 cfs 4,260 cf
Subcatchment 10S:	Runoff Area=3,298 sf 70.98% Impervious Runoff Depth=4.34" Tc=6.0 min CN=81 Runoff=0.37 cfs 1,193 cf
Subcatchment 11S:	Runoff Area=3,216 sf 84.86% Impervious Runoff Depth=5.22" Tc=6.0 min CN=89 Runoff=0.42 cfs 1,399 cf
Subcatchment 12S:	Runoff Area=9,466 sf 84.77% Impervious Runoff Depth=5.22" Tc=6.0 min CN=89 Runoff=1.24 cfs 4,118 cf
Subcatchment 13S:	Runoff Area=4,435 sf 94.45% Impervious Runoff Depth=5.91" Tc=6.0 min CN=95 Runoff=0.62 cfs 2,184 cf
Subcatchment 14S:	Runoff Area=9,948 sf 80.86% Impervious Runoff Depth=5.00" Tc=6.0 min CN=87 Runoff=1.26 cfs 4,143 cf
Subcatchment 15S:	Runoff Area=1,132 sf 7.42% Impervious Runoff Depth=0.87" Tc=6.0 min CN=43 Runoff=0.02 cfs 82 cf
Subcatchment 16S:	Runoff Area=608 sf 0.00% Impervious Runoff Depth=0.60" Tc=6.0 min CN=39 Runoff=0.00 cfs 30 cf

Subcatchment 17S: COURTYARD Runoff Area=15,427 sf 22.31% Impervious Runoff Depth=1.56"
Tc=6.0 min CN=52 Runoff=0.56 cfs 2,005 cf

Subcatchment 18S: Runoff Area=8,989 sf 42.60% Impervious Runoff Depth=2.63"
Tc=6.0 min CN=64 Runoff=0.61 cfs 1,967 cf

Pond 1: CB Peak Elev=195.09' Inflow=0.92 cfs 2,910 cf
12.0" Round Culvert n=0.012 L=79.0' S=0.0101 '/' Outflow=0.92 cfs 2,910 cf

Pond 1P: Infiltration Pipe Network Peak Elev=187.15' Storage=25,648 cf Inflow=16.82 cfs 57,897 cf
Discarded=0.36 cfs 33,711 cf Primary=1.98 cfs 24,191 cf Outflow=2.33 cfs 57,903 cf

Pond 2: DMH Peak Elev=195.67' Inflow=4.41 cfs 16,095 cf
15.0" Round Culvert n=0.012 L=14.0' S=0.0393 '/' Outflow=4.41 cfs 16,095 cf

Pond 3: DGCB Peak Elev=195.10' Inflow=1.72 cfs 5,559 cf
12.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=1.72 cfs 5,559 cf

Pond 4: DMH Peak Elev=194.77' Inflow=7.05 cfs 24,564 cf
18.0" Round Culvert n=0.012 L=48.0' S=0.0100 '/' Outflow=7.05 cfs 24,564 cf

Pond 5: DMH Peak Elev=194.14' Inflow=7.05 cfs 24,564 cf
18.0" Round Culvert n=0.012 L=177.0' S=0.0100 '/' Outflow=7.05 cfs 24,564 cf

Pond 6: CB Peak Elev=194.71' Inflow=1.32 cfs 4,250 cf
12.0" Round Culvert n=0.012 L=7.0' S=0.0100 '/' Outflow=1.32 cfs 4,250 cf

Pond 7: DMH Peak Elev=192.66' Inflow=8.37 cfs 28,814 cf
18.0" Round Culvert n=0.012 L=109.0' S=0.0100 '/' Outflow=8.37 cfs 28,814 cf

Pond 8: CB Peak Elev=191.24' Inflow=1.31 cfs 4,260 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0100 '/' Outflow=1.31 cfs 4,260 cf

Pond 9: DMH Peak Elev=191.09' Inflow=9.68 cfs 33,074 cf
24.0" Round Culvert n=0.012 L=5.0' S=0.0100 '/' Outflow=9.68 cfs 33,074 cf

Pond 10: OGS Peak Elev=187.29' Inflow=9.68 cfs 33,074 cf
24.0" Round Culvert n=0.012 L=7.0' S=0.0000 '/' Outflow=9.68 cfs 33,074 cf

Pond 11: DMH Peak Elev=187.16' Inflow=3.22 cfs 11,786 cf
15.0" Round Culvert n=0.012 L=6.0' S=0.0000 '/' Outflow=3.22 cfs 11,786 cf

Pond 12: CB Peak Elev=187.19' Inflow=0.37 cfs 1,193 cf
12.0" Round Culvert n=0.012 L=29.0' S=0.0114 '/' Outflow=0.37 cfs 1,193 cf

Pond 13: CB Peak Elev=187.19' Inflow=0.42 cfs 1,399 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0100 '/' Outflow=0.42 cfs 1,399 cf

Pond 14: DMH Peak Elev=187.19' Inflow=0.80 cfs 2,593 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=0.80 cfs 2,593 cf

Pond 15: CB Peak Elev=190.80' Inflow=1.24 cfs 4,118 cf
12.0" Round Culvert n=0.012 L=4.0' S=0.0100 '/' Outflow=1.24 cfs 4,118 cf

Pond 16: DMH Peak Elev=187.19' Inflow=2.04 cfs 6,711 cf
12.0" Round Culvert n=0.012 L=116.0' S=0.0100 '/' Outflow=2.04 cfs 6,711 cf

Pond 17: CB Peak Elev=187.19' Inflow=1.26 cfs 4,143 cf
12.0" Round Culvert n=0.012 L=32.0' S=0.0100 '/' Outflow=1.26 cfs 4,143 cf

Pond 18: CB Peak Elev=187.18' Inflow=0.62 cfs 2,184 cf
12.0" Round Culvert n=0.012 L=8.0' S=0.0100 '/' Outflow=0.62 cfs 2,184 cf

Pond 19: DMH Peak Elev=187.18' Inflow=3.92 cfs 13,037 cf
12.0" Round Culvert n=0.012 L=13.0' S=0.0108 '/' Outflow=3.92 cfs 13,037 cf

Pond 20: OGS Peak Elev=187.17' Inflow=3.92 cfs 13,037 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0000 '/' Outflow=3.92 cfs 13,037 cf

Pond 21: DMH Peak Elev=187.16' Inflow=3.22 cfs 11,786 cf
15.0" Round Culvert n=0.012 L=121.0' S=0.0100 '/' Outflow=3.22 cfs 11,786 cf

Pond 22: DMH Peak Elev=184.94' Inflow=1.98 cfs 24,191 cf
10.0" Round Culvert n=0.012 L=38.0' S=0.0100 '/' Outflow=1.98 cfs 24,191 cf

Pond 23: DMH Peak Elev=184.38' Inflow=1.98 cfs 24,191 cf
10.0" Round Culvert n=0.012 L=22.0' S=0.0100 '/' Outflow=1.98 cfs 24,191 cf

Link 1L: Inflow=0.17 cfs 911 cf
Primary=0.17 cfs 911 cf

Link 2L: Inflow=2.15 cfs 26,159 cf
Primary=2.15 cfs 26,159 cf

Link 3L: Inflow=0.00 cfs 30 cf
Primary=0.00 cfs 30 cf

Link 4L: Inflow=0.02 cfs 82 cf
Primary=0.02 cfs 82 cf

Total Runoff Area = 163,363 sf Runoff Volume = 60,887 cf Average Runoff Depth = 4.47"
28.74% Pervious = 46,958 sf 71.26% Impervious = 116,405 sf

2 | Stormwater Report Compliance Calculations

2.1 Standard 1 | No Untreated Discharges Or Erosion To Wetlands

Untreated Discharges

To document compliance that new discharges are adequately treated refer to calculations for Standards 4 through 6.

Erosion To Wetlands

Flow exiting the stormwater management area discharges to the town drainage system (Q_{100} = 2.1 cfs, V_{max}= 5.9 ft/s).

2.2 Standard 2 | Peak Rate Attenuation

Refer to Peak Rate of Runoff table below (see Mitigative Drainage Analysis)

Table 1.0: Peak Rate of Runoff | Comparison Location 1L

Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.01	0.15	0.50	0.84	1.03
Proposed Peak Rate of Runoff (cfs)	0.00	0.02	0.07	0.13	0.17
Difference	**-0.01**	**-0.13**	**-0.43**	**-0.71**	**-0.86**

Table 2.0: Peak Rate of Runoff | Comparison Location 2L

Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.18	0.96	1.92	2.56	2.88
Proposed Peak Rate of Runoff (cfs)	0.09	0.85	1.71	2.11	2.25
Difference	**-0.09**	**-0.11**	**-0.21**	**-0.45**	**-0.63**

Table 3.0: Peak Rate of Runoff | Comparison Location 3L

Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.00	0.04	0.15	0.24	0.29
Proposed Peak Rate of Runoff (cfs)	0.00	0.00	0.00	0.00	0.00
Difference	**0.00**	**-0.04**	**-0.15**	**-0.24**	**-0.29**

Table 4.0: Peak Rate of Runoff | Comparison Location 4L

Description	2 Year	10 Year	25 Year	50 Year	100 Year
Existing Peak Rate of Runoff (cfs)	0.00	0.04	0.13	0.19	0.22
Proposed Peak Rate of Runoff (cfs)	0.00	0.00	0.01	0.01	0.02
Difference	**0.00**	**-0.04**	**-0.12**	**-0.18**	**-0.20**

Table 5.0: Stormwater Management Area 1P | Infiltration Pipe Network Performance Table

24 Hour Type III Storm event	Peak Rate of Inflow (cfs)	Peak Rates of Outflow (cfs)				Peak Water Level (ft)
		Total (cfs)	Exfiltration (cfs)	8″ Outlet (cfs)		
2 year	6.69	0.36	0.36	0.00		184.03
10 year	10.74	1.18	0.36	0.83		185.14
25 year	14.07	1.90	0.36	1.55		186.11
50 year	15.9	2.21	0.36	1.85		186.77
100 year	16.82	2.33	0.36	1.98		187.15

2.3 Standard 3 | Stormwater Recharge

Recharge Volume:

$R_{v\ required}$ = (Impervious Area)(F)

Site consists of Hydrologic Soils Group A: F_A = 0.60 in.

***Site Impervious Area Draining to Recharge Facilities*:**

Stormwater Management Area 1P

$A_{imp\ A\ soils}$ = 111618 ft^2 (includes courtyard area)
$R_{v\ required}$ = [(111618)(0.60)/12] = 5581 ft^3
$R_{v\ provided}$ = 12341 ft^3 (volume below outlet)

Capture Area Adjustment

Total impervious area: 116405 ft^2
Site impervious areas draining to recharge facilities: 111618 ft^2
Ratio of total impervious area to site impervious areas draining to recharge facilities: (116405/111618) = 1.04

Total Recharge Volume Required

$A_{imp\ total}$ = 116405 ft^2
$R_{v\ required}$ = [(116405)(0.60)/12] = 5820 ft^3
Adjusted minimum required recharge volume = [(5820)(1.04)] = 6053 ft^3

Total Recharge Volume Provided

$R_{v\ provided}$ = 12341 ft^3

Capture Area Percentage:

Site impervious areas draining to recharge facilities: 111618 ft^2
Total impervious area: 116405 ft^2
Percent Captured: [(111618/116405)](100) = 96% > 65%

Drawdown Within 72 Hours:

$T_{drawdown}$ = [$R_{v\ total}$ / (K)(Bottom Area)]

Stormwater Management Area 1P

$R_{v\ 1P}$ = 25648 ft^3 (100 year water level)
K = 2.41 in/hr (Rawls Rate)
Bottom Area = 6395 ft^2 (see Mitigative Drainage Analysis)
$T_{drawdown}$ = 25648 / [(2.41)(6395)/12] = 20 hours < 72 hours

2.4 Standard 4 | Water Quality

Water Quality:

Water quality is provided through three structural stormwater best management practices.

1) Deep Sump Catch Basin with Hood/Trap
2) Oil Grit Separator
3) Subsurface Infiltration Pipe Network

Water Quality Volume:

$V_{wq\ required}$ = (D_{wq})(A_{imp})

Stormwater Management Area 1P

$V_{wq\ required}$ = [(58158)(1.00)/12] = 4847 ft^3
$V_{wq\ provided}$ = 12341 ft^3 (volume below outlet)

TSS Removal:

Pretreatment Chain 1 SWMA1P = 44%
- Deep Sump Catch Bain = 25%
- Oil Grit Separator = 25%

Treatment Chain 1 SWMA1P = 85%
- Deep Sump Catch Basin = 25%
- Subsurface Infiltration Pipe Network = 80%

TSS Removal Calculation Worksheet

Location: Pretreatment Chain 1 SWMA1P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Oil Grit Separator	**0.25**	**0.75**	**0.19**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**
	0.00	**0.56**	**0.00**	**0.56**

Total TSS Removal = **44%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **WAKE-0048**
Prepared By: **MEM**
Date: **9/21/2018**

*Equals remaining load from previous BMP (E) which enters the BMP

TSS Removal Calculation Worksheet

Location: Treatment Chain 1 SWMA1P

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Infiltration Basin	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = **85%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **WAKE-0048**
Prepared By: **MEM**
Date: **9/21/2018**

*Equals remaining load from previous BMP (E) which enters the BMP

Phosphorus Load Reduction:

The Phosphorous Load Reduction calculation is limited to watersheds tributary to stormwater management areas.

Stormwater Management Area 1P

IA - Impervious Area Characteristics

Subcatchment	Land Use	Area ft^2	HSG
2S	MFR	14830	A
3S	MFR	3914	A
4S	MFR	16016	A
5S	MFR	14830	A
6S	MFR	5716	A
7S	MFR	10928	A
8S	MFR	8320	A
9S	MFR	8296	A
10S	MFR	2341	A
11S	MFR	2729	A
12S	MFR	8024	A
13S	MFR	4189	A
14S	MFR	8044	A
17S	MFR	3441	A
Total		111618	

Stormwater Management Area 1P

PA - Pervious Area Characteristics

Subcatchment	Land Use	Area ft^2	HSG
2S	MFR	0	A
3S	MFR	0	A
4S	MFR	0	A
5S	MFR	0	A
6S	MFR	2963	A
7S	MFR	3368	A
8S	MFR	2870	A
9S	MFR	2165	A
10S	MFR	957	A
11S	MFR	487	A
12S	MFR	1442	A
13S	MFR	246	A
14S	MFR	1904	A
17S	MFR	11986	A
Total		28388	

BMP Volume = 12341 ft^3 (provided below lowest hydraulic outlet device)
BMP Volume$_{(IA\text{-}in)1}$ = [(12341 ft^3)(12 in/ft)]/(111618 ft^2) = 1.33 in
Interpolated runoff depth for A soils = 0.06
BMP Volume$_{(PA\text{-}ft^3)1}$ = [(28388 ft^3)(0.06 in)/(12 in/ft)] = 142 ft^3
BMP Volume$_{(IA\text{-}ft^3)1}$ = (12341 ft^3 – 142 ft^3) = 12199 ft^3
BMP Volume$_{(IA\text{-}in)2}$ = [(12199 ft^3)(12 in/ft)]/(111618 ft^2) = 1.31 in
% Difference = (1.33 in – 1.31 in) / (1.31 in) = 1.5% < 5%

BMP Reduction$_{(\%-P)}$ = 99% (from Table 3-14, Appendix F of the MA MS4 General Permit)
BMP Load = [(111618 ft^2)/(43560 ft^2/acre)](2.32 lbs/acre/year) +
[(28388 ft^2)/(43560 ft^2/acre)](0.03 lbs/acre/year) = 5.96 lbs/year
BMP Reduction$_{(lbs-P)}$ = (5.96 lbs/year)(0.99) = 5.90 lbs/year

2.5 Standard 5 | Land Uses With Higher Potential Pollutant Loading

This project is not considered a LUHPPL.

2.6 Standard 6 | Critical Areas

Stormwater discharge from this property is not within a Zone II, Interim Wellhead Protection Area of a public water supply or a critical area.

2.7 Standard 7 |Redevelopment

This project is not considered a redevelopment.

2.8 Standard 8 | Construction Period Controls

A Stormwater Pollution Prevention Plan (SWPPP) will be provided prior to land disturbance.

2.9 Standard 9 | Long Term Operation And Maintenance Plan

Refer to Section 4 Long Term Operation and Maintenance Plan.

2.10 Standard 10 |Illicit Discharges To Drainage System

There are no proposed illicit discharges into the Stormwater Management Systems to be constructed as shown on the site plan.

3 | MassDEP Stormwater Checklist

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
MATTHEW E MOORE
CIVIL
No. 45885
REGISTERED
PROFESSIONAL ENGINEER

7.5.2019

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of “country drainage” versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½” or 1” Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided. (see Massachusetts Stormwater Handbook, Volume 2, Chapter 2, page 86)

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

☒ Name of the stormwater management system owners;

☒ Party responsible for operation and maintenance;

☒ Schedule for implementation of routine and non-routine maintenance tasks;

- ☒ Plan showing the location of all stormwater BMPs maintenance access areas; (See Definitive/SWPPP plan set)
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached; (See section 1.7 of the Mitigative Drainage Analysis)

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

4 | Long Term Operation & Maintenance Plan

This Operation & Maintenance Plan is prepared to comply with provisions set forth in the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards. Furthermore, annual submittals of inspection data are to be submitted to the Wakefield Engineering Division Office.

Structural Best Management Practices (BMPs) require periodic maintenance to ensure proper function and efficiency in pollutant removal from stormwater discharges that would otherwise reach wetland resource areas untreated. Maintenance schedules found below are as recommended in MassDEP's Massachusetts Stormwater Handbook and as recommended in the manufacturer's specifications.

The stormwater management system owner and the party responsible for maintenance of the stormwater management system shall be DB5 Development Group, LLC and its designated employees.

4.1 The following BMPs provide pollutant removal and groundwater recharge

1. Deep Sump Catch Basin with Hood/Trap
2. Oil Grit Separator
3. Subsurface Infiltration Pipe Network

Deep-Sump Catch Basin with Hood/Trap

Inspect and/or clean at least four times per year with special consideration given to the end of foliage and snow removal seasons.

Sediments must also be removed once per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the sump or one half the depth of the invert of the outlet pipe.

Clamshell buckets and/or vacuum trucks are typically used to remove sediment in Massachusetts.

Cleanings may be taken to a landfill or other facility permitted by MassDEP to accept solid waste without any prior approval by MassDEP. However, some landfills require catch basin cleanings to be tested before they are accepted. For information on all of the MassDEP requirements pertaining to the disposal of catch basin cleanings go to
http://www.mass.gov/eea/agencies/massdep/recycle/regulations/management-of-catch-basin-cleanings.html

Oil Grit Separator

Inspect and maintain the Oil Grit Separator according to the MassDEP recommendations, see below.

Sediments and associated pollutants and trash are removed only when inlets or sumps are cleaned out, so regular maintenance is essential. Most studies have linked the failure of oil grit separators to the lack of regular maintenance. The more frequent the cleaning, the less likely sediments will be resuspended and subsequently discharged. In addition, frequent cleaning also makes more volume available for future storms and enhances overall performance.

Cleaning includes removal of accumulated oil and grease and sediment using a vacuum truck or other ordinary catch basin cleaning device.

In areas of high sediment loading, inspect and clean inlets after every major storm.

At a minimum, inspect oil grit separators monthly, and clean them out at least twice per year.

Polluted water or sediments removed from an oil grit separator should be disposed of in accordance with all applicable local, state and federal laws and regulations including M.G.L.c. 21C and 310 CMR 30.00.

Subsurface Infiltration Pipe Network
CMP detention systems should be cleaned when an inspection reveals accumulated sediment or trash is clogging the discharge orifice.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Systems are to be rinsed, including above the spring line, annually soon after the spring thaw, and after any additional use of salting agents, as part of the maintenance program for all systems where salting agents may accumulate inside the pipe.

Maintaining an underground detention or infiltration system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

4.2 The following BMPs are utilized to minimize impacts to wetland resource areas

Parking Lot Sweeping
Parking Lot sweeping will be conducted four times annually within the parking lot area. Special attention will be given to the spring (March or April) and late fall (November or December).

Snow Removal
Snow will be removed from parking areas and sidewalks during snow events. Snow will be stockpiled in the designated "Snow Storage" locations shown on the site plan. Snow disposal/removal shall be in compliance with MassDEP's Bureau of Water Resources guidelines, effective December 21, 2015. See Section 8 Snow Disposal Guidelines.

Provisions will be made to remove snow from the site when the designated areas have reached their capacity.

4.3 Permanent Seeding

Permanent Seeding & Plantings

Once final grades have been established and the weather permits, every effort shall be made to establish permanent vegetation on disturbed and exposed areas no later than September of that year, otherwise temporary seeding practices shall be used until permanent seeding practices can resume the following spring, April 1st through May 31st.

In addition to grass seed, tree and shrub plantings shall be an integral part of the permanent stabilization plan. Care shall be taken by the owner, builder, and/or site contractor to select trees, shrubs, and seed mixes that are best suited to the soil conditions on the site. Soil moisture, depth to seasonal groundwater, and exposure to sunlight shall be carefully considered when selecting species. In recent years, the emphasis on using plant species native to Massachusetts has grown. Information on the use of non-native and native species can be found on the web and in many local nursery catalogs.

Permanent seeding shall be performed in accordance with the guidelines set forth in the "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, May 2003, prepared by Franklin, Hampden, and Hampshire Conservation Districts."

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection (annual submittals to the Wakefield Engineering Division Office are required)

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Catch Basins / Grates

Structure Identification	Location	Catch basin at grade	Hood/trap installed	Sediment buildup (in.)	Overall condition
CB1	East Parking Field	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
DGCB3	East Parking Field	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB6	Northerly parking spaces	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB8	Northerly parking spaces	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB12	Main driveway entrance RT.	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB13	Main driveway entrance LT.	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection (annual submittals to the Wakefield Engineering Division Office are required)

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Catch Basins / Grates

Structure Identification	Location	Catch basin at grade	Hood/trap installed	Sediment buildup (in.)	Overall condition
CB15	West parking field Hopkins St	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB17	West parking field near Hopkins St	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB18	West parking field near Hopkins St	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection (annual submittals to the Wakefield Engineering Division Office are required)

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Oil Grit Separator

Structure Identification	Location	Sediment buildup inlet (in.)	Sediment buildup outlet (in.)	Overall condition
OGS10	West parking field			Poor☐ Fair☐ Good☐
OGS20	West parking field			Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

Refer to Sections above for frequency of inspection (annual submittals to the Wakefield Engineering Division Office are required)

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Subsurface Infiltration Pipe Network

Structure Identification	Location	Condition of stone bed	Filter fabric installed	Sediment buildup at inlet (in.)	Sediment buildup at outlet (in.)
SWMA1P	West parking field		Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		

Maintenance required

To be performed by: On or before:

5 | Long Term Pollution Prevention Plan

This Long Term Pollution Prevention Plan is prepared to comply with the provisions set forth in the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards. Structural Best Management Practices (BMPs) require periodic maintenance to ensure proper function and efficiency in pollutant removal from stormwater discharges that would otherwise reach wetland resource areas untreated.

Maintenance schedules found below are as recommended in Department of Environmental Protection's Massachusetts Stormwater Handbook and as recommended in manufacturer's specifications.

5.1 Street Sweeping

Parking lots & driveways shall be swept on a monthly average with special attention given to spring (March/April) and late fall (November/December).

5.2 Trash and Litter Cleanup

In addition to street sweeping of the parking lots & driveways, the owner shall perform trash and litter cleanup once per month in and around the site. Trash and litter shall be disposed of in the on-site dumpsters.

5.3 Ownership and Maintenance Responsibilities

After completion, the property owner(s) will assume full responsibility of continuing the operation and maintenance of the stormwater management system as well as the long term pollution prevention plan outlined below. The exception would be if a legal agreement is made with another party to perform such duties for the owner(s).

5.4 DEP Standard 4 Water Quality

The Long Term Pollution Prevention Plan includes the following:

Good housekeeping practices
Prevent or reduce pollutant runoff from reaching the wetland resource areas through street sweeping, stabilizing all disturbed areas with vegetative cover and catch basin cleaning.

Provisions for storing materials and waste products inside or under cover
All materials on site are to be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure. All waste products are to be placed in secure receptacles until they are emptied by a solid waste management company licensed in the Commonwealth of Massachusetts.

Vehicle washing controls
Vehicle washing will occur on-site as part of standard site operations. Floor drain(s) will discharge to an oil/gas trap where contaminants can be removed. All contaminants/hazardous waste shall be disposed of in a manner specified by local or State regulation or by the manufacturer. Site personnel shall be instructed in these practices.

Requirements for routine inspections and maintenance of Stormwater BMP's
Follow the procedures outlined in Section 4 Long Term Operation and Maintenance Plan and the provided Inspection and Maintenance Forms.

Spill prevention and response plans
Spill Prevention: As mentioned previously, all materials on site are to be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure. Products shall be kept in their original containers with the original manufacturer's label. Products should not be mixed unless recommended by the manufacturer. The manufacturer's recommendations for proper use, storage and disposal shall be followed at all times and, if possible, all of the product should be used up before proper disposal.

Response: The manufacturer's recommended methods for cleanup must be followed and spills cleaned up immediately after discovery. Spills shall be kept well ventilated and personnel must wear appropriate protective gear to prevent injury from contact with hazardous substances. Spills of toxic or hazardous material must be reported to the appropriate local and/or State agencies in accordance with the local and/or Commonwealth of Massachusetts regulations.

Requirements for storage and use of fertilizers, herbicides and pesticides
Consult the Town of Wakefield, MA Conservation Commission for any questions regarding these materials.

Fertilizers: Fertilizers are to be applied at the minimum amounts recommended by the manufacturer and once applied shall be worked into the soil to limit the possibility of entering the storm drains. Storage procedures are to be followed as previously stated and the contents of any partially used bags should be transferred to a sealable container, either bag or bin to avoid spilling.

Herbicides and Pesticides: Storage of these materials are to be as outlined previously and especially out of the reach of pets and children, away from damp areas where their containers may succumb to moisture or rust and should not be stored near food. These materials must not be placed in the trash or washed down the drain. Handle using rubber gloves and use an appropriate mask when using these products for extensive periods of time.

Provisions for maintenance of lawns, gardens, and other landscaped areas
These activities are left to the owner(s) to schedule and perform.

Pet waste management provisions
These activities are left to the owner(s) to schedule and perform.

Provisions for solid waste management
All waste products are to be placed in secure receptacles until they are emptied by a solid waste management company licensed in the Commonwealth of Massachusetts.

Snow disposal and plowing plans relative to Wetland Resource Areas
Snow disposal/removal shall be in compliance with MassDEP's Bureau of Water Resources guidelines, effective December 21, 2015. See Section 8 Snow Disposal Guidelines.

Winter Road Salt and/or Sand Use and Storage restrictions
Road Salt use must be in compliance with the Guidelines on Deicing Chemical (Road Salt) Storage effective date December 19, 1997, Guideline No. DWSG97-1 found in the BRP's Drinking Water Program.

Sand Use: Encourage the use of environmentally friendly alternatives such as calcium chloride and/or sand instead of road salt for melting ice whenever possible.

Street Sweeping schedules

Street sweeping should be performed by the owner(s) on a monthly average; however, at the very least sweeping must occur once a year in the spring and fall in order to minimize the amount of Total Suspended Solids load on the deep-sump catch basins and the other Best Management Practices tributary thereto.

Provisions for prevention of illicit discharges to the stormwater management systems

According to Standard 10 in the Massachusetts Stormwater Handbook, Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

Documentation that Stormwater BMP's are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from land uses with higher potential pollutant loads (LUHPPL)

Not applicable as this project does not meet the criteria for a LUHPPL.

Training for staff or personnel involved with implementing LTPPP

This responsibility lies with the owner(s) unless a legally-binding agreement is made with another party to perform such duties for the owner(s).

List of Emergency contacts for implementing Long-Term Pollution Prevention Plan

This responsibility lies with the owner(s) unless a legally-binding agreement is made with another party to perform such duties for the owner(s).

6 | Construction Period Pollution Prevention Plan & Erosion & Sediment Control

This Construction Period Pollution Prevention Plan and Erosion and Sediment Control Plan is prepared to comply with the provisions set forth in the Massachusetts Department of Environmental Protection (DEP) Stormwater Management Standards.

6.1 Site Description

Project name and location

Tarrant Lane
0 Tarrant Lane
Wakefield, Massachusetts

Applicant Name and Address

DB5 Development Group, LLC
9 Wildwood Road
Middleton, MA 01949

Description (Purpose and Types of Soil Disturbing Activities)

Project involves removing drainage devices and constructing an industrial building with associated access/egress drive, parking, utilities and stormwater management systems.
Soil disturbing activities include: Clearing and grubbing; installation of erosion and sediment control device; pavement installation; utility installation; building construction; stormwater management systems and preparation for final loaming and seeding.

Site Runoff Coefficient

The final composite runoff coefficient for the area of construction is approximately 0.9.

Site Area

The site is 3.75 acres of which 3.73 acres will be disturbed by construction activities.

Sequence of Major Activities

1. Install construction entrance
2. Install erosion control devices
3. Demolition
4. Clearing, cutting and grubbing
5. Rough grading
6. Utility Installation
7. Gravel and pavement base course installation
8. Building site preparation
9. Curbing and sidewalk construction
10. Finished grading and slope stabilization
11. Finished Paving
12. Loam and seed all disturbed areas
13. Final cleanup including inspection and cleanout of all stormwater structures

Name of Receiving Waters

None known

6.2 Erosion and Sediment Controls

In order to limit the amount of erosion and sedimentation that takes place during and after construction, it is important to implement a management plan, which will protect and limit the amount of land area that is devoid of vegetation at any given time.

Prior to Construction

Prior to start of construction activities, the owner, builder, and site contractor shall clearly identify areas that may be affected by the proposed clearing and earth moving activities by reviewing the approved grading plan as part of an initial site visit. During the site visit, the limit of work line shall be reviewed to confirm the type of erosion control measure to be used to protect downstream wetland resources and abutting property. Limits of tree clearing shall be verified during the initial site visit with emphasis on identifying "save areas" for existing trees and vegetation where practicable.

Erosion and Sediment Control Device

Siltfence is proposed as the primary erosion control device for this project (see detail provided on site plan). It is important for the owner, builder, and/or site contractor to have access to a supply of compost BMPs should the need arise for additional erosion and sediment control measures. A mulch sock or approved equal may be used along a slope and/or together with siltfence to protect against concentrated stormwater runoff over exposed surfaces. Erosion and sediment control devices shall be inspected every 7 days or within 24-hours of a 1/2-inch (or greater) rainfall event to ensure that they are operating properly. Should sediment levels begin to build up on the erosion control devices, it may be necessary to remove the accumulated sediment to ensure that the erosion control devices continue to operate as designed. Sediment shall be removed when it reaches one third the height of the fence.

Earth-moving Activities

After trees and other vegetation are cleared, earth-moving (or grading) activities can begin. The approved grading plan shall be used to help guide the site contractor during regrading activities. Often times it is helpful to have a land surveyor establish benchmark elevations and/or lines of grade to aid the site contractor during regrading activities. This is the time during which the site is most vulnerable to erosion. Therefore, it is important for the site contractor to finalize grading activities as soon as practicable following land clearing. Areas than remain exposed longer than 30 working days in an interim condition shall be stabilized in a temporary fashion. Once final grades have been established, permanent vegetation can be established.

Temporary Seeding

During construction it may be necessary to temporarily stabilize areas that will not be brought to final grade for a period longer than 30 working days. Temporary seeding is accomplished using fast-growing grass seed species such as ryegrass. Seeding shall be performed in accordance with the guidelines set forth in the attached **Temporary Seeding Guidance**, which is an excerpt from the publication entitled, "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, May 2003, prepared by Franklin, Hampden, and Hampshire Conservation Districts."

Permanent Seeding & Plantings

Once final grades have been established and the weather permits, every effort shall be made to establish permanent vegetation on disturbed and exposed areas. In addition to grass seed, tree and shrub plantings shall be an integral part of the permanent stabilization plan. Care shall be taken by the owner, builder, and/or site contractor to select trees, shrubs, and seed mixes that are best suited to the soil conditions on the site. Soil moisture, depth to seasonal groundwater, and exposure to sunlight shall be carefully considered when selecting species. In recent years, the emphasis on using plant species native to

Massachusetts has grown. Information on the use of non-native and native species can be found on the web and in many local nursery catalogs.

Permanent seeding shall be performed in accordance with the guidelines set forth in the attached **Permanent Seeding Guidance**, which is an excerpt from a publication entitled, "Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, May 2003, prepared by Franklin, Hampden, and Hampshire Conservation Districts."

Seeding, Permanent

The establishment of perennial vegetative cover on disturbed areas.

Purpose

Permanent seeding of grass and planting trees and shrubs provides stabilization to the soil by holding soil particles in place.

Vegetation reduces sediments and runoff to downstream areas by slowing the velocity of runoff and permitting greater infiltration of the runoff.

Vegetation also filters sediments, helps the soil absorb water, improves wildlife habitats, and enhances the aesthetics of a site.

Where Practice Applies

- Permanent seeding and planting is appropriate for any graded or cleared area where long-lived plant cover is needed to stabilize the soil.
- Areas which will not be brought to final grade for a year or more.
- Some areas where permanent seeding is especially important are filter strips, buffer areas, vegetated swales, steep slopes, and stream banks.
- This practice is effective on areas where soils are unstable because of their texture or structure, high water table, winds, or steep slope.

Advantages

Advantages of seeding over other means of establishing plants include the small initial establishment cost, the wide variety of grasses and legumes available, low labor requirement, and ease of establishment in difficult areas.

Seeding is usually the most economical way to stabilize large areas.

Well established grass and ground covers can give an aesthetically pleasing, finished look to a development.

Once established, the vegetation will serve to prevent erosion and retard the velocity of runoff.

Disadvantages/Problems

Disadvantages which must be dealt with are the potential for erosion during the establishment stage, a need to reseed areas that fail to establish, limited periods during the year suitable for seeding, and a need for water and appropriate climatic conditions during germination. Vegetation and mulch cannot prevent soil slippage and erosion if soil is not inherently stable.

Coarse, high grasses that are not mowed can create a fire hazard in some locales. Very short mowed grass, however, provides less stability and sediment filtering capacity.

Grass planted to the edge of a watercourse may encourage fertilizing and mowing near the water's edge and increase nutrient and pesticide contamination.

Depends initially on climate and weather for success.

May require regular irrigation to establish and maintain.

Planning considerations

Selection of the right plant materials for the site, good seedbed preparation, timing, and conscientious maintenance are important. Whenever possible, native species of plants should be used for landscaping. These plants are already adapted to the locale and survivability should be higher than with "introduced" species.

Native species are also less likely to require irrigation, which can be a large maintenance burden and is neither cost-effective nor ecologically sound.

If non-native plant species are used, they should be tolerant of a large range of growing conditions, as low-maintenance as possible, and not invasive.

Consider the microclimate within the development area. Low areas may be frost pockets and require hardier vegetation since cold air tends to sink and flow towards low spots. South-facing slopes may be more difficult to re-vegetate because they tend to be sunnier and drier.

Divert as much surface water as possible from the area to be planted.

Remove seepage water that would continue to have adverse effects on soil stability or the protecting vegetation. Subsurface drainage or other engineering practices may be needed. In this situation, a permit may be needed from the local Conservation Commission: check ahead of time to avoid construction delays.

Provide protection from equipment, trampling and other destructive agents.

Vegetation cannot be expected to supply an erosion control cover and prevent slippage on a soil that is not stable due to its texture, structure, water movement, or excessive slope.

Seeding Grasses and Legumes

Install needed surface runoff control measures such as gradient terraces, berms, dikes, level spreaders, waterways, and sediment basins prior to seeding or planting.

Seedbed Preparation

If infertile or coarse-textured subsoil will be exposed during land shaping, it is best to stockpile topsoil and respread it over the finished slope at a minimum 2- to 6-inch depth and roll it to provide a firm seedbed. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

Areas not to receive top soil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above. This can be done by rolling or cultipacking.

Cool Season Grasses

Cool Season Grasses grow rapidly in the cool weather of spring and fall, and set seed in June and July. Cool season grasses become dormant when summer temperatures persist above 85 degrees and moisture is scarce.

Lime and Fertilizer

Apply lime and fertilizer according to soil test and current Extension Service recommendations. In absence of a soil test, apply lime (a pH of 5.5 - 6.0 is desired) at a rate of 2.5 tons per acre and 10-20-20 analysis fertilizer at a rate of 500 pounds per acre (40 % of N to be in an organic or slow release form). Incorporate lime and fertilizer into the top 2-3 inches of soil.

Seeding Dates

Seeding operations should be performed within one of the following periods:

- April 1 - May 31,
- August 1 - September 10,
- November 1 - December 15 as a dormant seeding (seeding rates shall be increased by 50% for dormant seedings).

Seeding Methods

Seeding should be performed by one of the following methods. Seed should be planted to a depth of ¼ to ½ inches.

- Drill seedings,
- Broadcast and rolled, cultipacked or tracked with a small track piece of construction equipment,
- Hydroseeding, with subsequent tracking.

Mulch

Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas.

Warm Season Grasses

Warm Season Grasses begin growth slowly in the spring, grow rapidly in the hot summer months and set seed in the fall. Many warm season grasses are sensitive to frost in the fall, and the top growth may die back. Growth begins from the plant base the following spring.

Lime and Fertilizer

Lime to attain a pH of at least 5.5. Apply a 0-10-10 analysis fertilizer at the rate of 600 lbs./acre.

Incorporate both into the top 2-3 inches of soil. (30 lbs. of slow release nitrogen should be applied after emergence of grass in the late spring.)

Seeding Dates

Seeding operations should be performed as an early spring seeding (April 1-May 15) with the use of cold treated seed. A late fall early winter dormant seeding (November 1 - December 15) can also be made, however the seeding rate will need to be increased by 50%.

Seeding Methods

Seeding should be performed by one of the following methods:

- Drill seedings (de-awned or de-bearded seed should be used unless the drill is equipped with special features to accept awned seed).
- Broadcast seeding with subsequent rolling, cultipacking or tracking the seeding with small track construction equipment. Tracking should be oriented up and down the slope.
- Hydroseeding with subsequent tracking. If wood fiber mulch is used, it should be applied as a separate operation after seeding and tracking to assure good seed to soil contact.

Mulch

Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas.

Seed Mixtures for Permanent Cover

Recommended mixtures for permanent seeding are provided on the following pages. Select plant species which are suited to the site conditions and planned use. Soil moisture conditions, often the major limiting site factor, are usually classified as follows:

Dry - Sands and gravels to sandy loams. No effective moisture supply from seepage or a high water table.

Moist - Well drained to moderately well drained sandy loams, loams, and finer; or coarser textured material with moderate influence on root zone from seepage or a high water table.

Wet - All textures with a water table at or very near the soil surface, or with enduring seepage.

When other factors strongly influence site conditions, the plants selected must also be tolerant of these conditions.

Permanent Seeding Mixtures

Mix	Site	Seed Mixture	Seed, Pounds per: Acre	1,000 sf	Remarks
1	Dry	Little Bluestem			* Use Warm Season planting procedure.
		or Broomsedge	10	0.25	* Roadsides
		Tumble Lovegrass*	1	0.10	* Sand and Gravel Stabilization
		Switchgrass	10	0.25	* Clover requires inoculation with nitrogen-fixing bacteria
		Bush Clover*	2	0.10	
		Red Top	1	0.10	* Rates for this mix are for PLS.
2	Dry	Deertongue	15	0.35	* Use Warm Season planting procedures.
		Broomsedge	10	0.25	* Acid sites/Mine spoil
		Bush Clover*	2	0.10	* Clover requires inoculation with nitrogen-fixing bacteria.
		Red Top	1	0.10	*Rates for this mix are for PLS.
3	Dry	Big Bluestem	10	0.25	* Use Warm Season planting procedures.
		Indian Grass	10	0.25	* Eastern Prairie appearance
		Switchgrass	10	0.25	* Sand and Gravel pits.
		Little Bluestem	10	0.25	* Golf Course Wild Areas
		Red Top or	1	0.10	* Sanitary Landfill Cover seeding
		Perennial Ryegrass	10	0.25	* Wildlife Areas *OK to substitute Poverty Dropseed in place of Red Top/Ryegrass. *Rates for this mix are for PLS.
4	Dry	Flat Pea	25	0.60	* Use Cool Season planting procedures
		Red Top or	2	0.10	* Utility Rights-of-Ways (tends to suppress woody growth)
		Perennial Ryegrass	15	0.35	
5	Dry	Little Bluestem	5	0.10	* Use Warm Season planting procedures.
		Switchgrass	10	0.25	* Coastal sites
		Beach Pea*	20	0.45	* Rates for Bluestein and Switchgrass are for PLS.
		Perennial Ryegrass	10	0.25	
6	Dry - Moist	Red Fescue	10	0.25	* Use Cool Season planting procedure.
		Canada Bluegrass	10	0.25	* Provides quick cover but is non-aggressive; will tend to allow indigenous plant colonization.
		Perennial Ryegrass	10	0.25	
		Red Top	1	0.10	* General erosion control on variety of sites, including forest roads, skid trails and landings.
7	Moist-Wet	Switchgrass	10	0.25	* Use Warm Season planting procedure.
		Virginia Wild Rye	5	0.10	* Coastal plain/flood plain
		Big Bluestem	15	0.35	* Rates for Bluestem and Switchgrass are for PLS.
		Red Top	1	0.10	

Permanent Seeding Mixtures

Mix	Site	Seed Mixture	Seed, Pounds per: Acre	1,000 sf	Remarks
8	Moist	Creeping Bentgrass	5	0.10	* Use Cool Season planting procedures.
	Wet	Fringed Bromegrass	5	0.10	* Pond Banks
		Fowl Meadowgrass	5	0.10	* Waterways/ditch banks
		Bluejoint Reedgrass or Rice Cutgrass	2	0.10	
		Perennial Ryegrass	10	0.25	
9	Moist	Red Fescue	5	0.10	*Salt Tolerant
	Wet	Creeping Bentgrass	2	0.10	* Fescue and Bentgrass provide low growing appearance, while Switchgrass provides tall cover for wildlife.
		Switchgrass	8	0.20	
		Perennial Ryegrass	10	0.25	
10	Moist	Red Fescue	5	0.10	* Use Cool Season planting procedure.
	Wet	Creeping Bentgrass	5	0.10	* Trefoil requires inoculation with nitrogen fixing bacteria.
		Virginia Wild Rye	8	0.20	
		Wood Reed Grass*	1	0.10	* Suitable for forest access roads, skid trails and other partial shade situations.
		Showy Tick Trefoil*	1	0.10	
11	Moist	Creeping Bentgrass	5	0.10	* Use Cool Season planting procedure.
	Wet	Bluejoint Reed Grass	1	0.10	* Suitable for waterways, pond or ditch banks.
		Virginia Wild Rye	3	0.10	* Trefoil requires inoculation with nitrogen fixing bacteria.
		Fowl Meadow Grass	10	0.25	
		Showy Tick Trefoil*	1	0.10	
		Red Top	1	0.10	
12	Wet	Blue Joint Reed Grass	1	0.10	* Use Cool Season planting procedure.
		Canada Manna Grass	1	0.10	* OK to seed in saturated soil conditions, but not in standing water.
		Rice Cut Grass	1	0.10	
		Creeping Bent Grass	5	0.10	* Suitable as stabilization seeding for created wetland.
		Fowl Meadow Grass	5	0.10	* All species in this mix are native to Massachusetts.
13	Dry - Moist	American Beachgrass	18" centers	18' centers	*Vegetative planting with dormant culms, 3-5 culms per planting
14	Inter- Tidal	Smooth Cordgrass Saltmeadow Cordgrass	12-18" centers	12-18" centers	* Vegetative planting with transplants.

Notes:
* Species such as Tumble Lovegrass, Fringed Bromegrass, Wood Reedgrass, Bush Clover and Beach Pea, while known to be commercially available from specific seed suppliers, may not always be available from your particular seed suppliers. The local Natural Resources Conservation Service office may be able to help with a source of supply. In the event a particular species listed in a mix can not be obtained, however, it may be possible to substitute another species.

Seed mixtures by courtesy of Natural Resources Conservation Service, Amherst, MA.

(PLS) Pure Live Seed

Warm Season grass seed is sold and planted on the basis of pure live seed. An adjustment is made to the bulk rate of the seed to compensate for inert material and non-viable seed. Percent of pure live seed is calculated by multiplying the percent purity by the percent germination; **(% purity) x (% germination) = percent PLS.**

For example, if the seeding rate calls for 10 lbs./acre PLS and the seed lot has a purity of 70% and germination of 75%, the PLS factor is:

(.70 x .75) =.53

10 lbs. divided by .53 = approx. 19 lbs.

Therefore, 19 lbs of seed from the particular lot will need to be applied to obtain 10 lbs. of pure live seed.

Special Note

Tall Fescue, Reed Canary Grass, Crownvetch and Birdsfoot Trefoil are no longer recommended for general erosion control use in Massachusetts due to the invasive characteristics of each. If these species are used, it is recommended that the ecosystem of the site be analyzed for the effects species invasiveness may impose. The mixes listed in the above mixtures include either species native to Massachusetts or non-native species that are not perceived to be invasive, as per the Massachusetts Native Plant Advisory Committee.

Wetlands Seed Mixtures

For newly created wetlands, a wetlands specialist should design plantings to provide the best chance of success. Do not use introduced, invasive plants like reed canarygrass (Phalaris arundinacea) or purple loosestrife (Lythrum salicaria). Using plants such as these will cause many more problems than they will solve.

The following grasses all thrive in wetland situations:

- Fresh Water Cordgrass (*Spartina pectinata*)
- Marsh/Creeping Bentgrass (*Agrostis stolonifera, var. Palustric*)
- Broomsedge (*Andropogon virginicus*)
- Fringed Bromegrass (*Bromus ciliatus*)
- Blue Joint Reed Grass (*Calamagrostis cavedensis*)
- Fowl Meadow Grass (*Glyceria striata*)
- Riverbank Wild Rye (*Elymus riparius*)
- Rice Cutgrass (*Leersia oryzoides*)
- Stout Wood Reed (*Cinna arundinacea*)
- Canada Manna Grass (*Glyceria canadensis*)

A sample wetlands seed mix developed by The New England Environmental Wetland Plant Nursery is shown on the following page.

Wetland Seed Mixture

The New England Environmental Wetland Plant Nursery has developed a seed mixture which is specifically designed to be used in wetland replication projects and stormwater detention basins. It is composed of seeds from a variety of indigenous wetland species. Establishing a native wetland plant understory in these areas provides quick erosion control, wildlife food and cover, and helps to reduce the establishment of undesirable invasive species such as Phragmites and purple loosestrife (Lythrum salicaria). The species have been selected to represent varying degrees of drought tolerance, and will establish themselves based upon microtopography and the resulting variation in soil moisture.

Common Name (*Scientific Name*)	**% in Mix**	**Comments**
Lurid Sedge (*Carex lurida*)	30	A low ground cover that tolerates mesic sites in addition to saturated areas; prolific seeder in second growing season.
Fowl Meadow Grass (*Glyceria Canadensis*)	25	Prolific seed producer that is a valuable wildlife food source.
Fringed Sedge (*Carex crinita*)	10	A medium to large sedge that tolerates saturated areas; good seed producer.
Joe-Pye Weed (*Eupatoriadelphus maculatus*)	10	Flowering plant that is valuable for wildlife cover. Grows to 4 feet.
Brook Sedge (*Carex spp., Ovales group*)	10	Tolerates a wide range of hydrologic conditions.
Woolgrass (*Scirpus cyperinus*)	5	Tolerates fluctuating hydrology.
Boneset (*Eupatorium perfoliatum*)	5	Flowering Plant that is valuable for wildlife cover. Grows to 3 feet.
Tussock Sedge (*Carex stricta*)	<5	Grows in elevated hummocks on wet sites, may grow rhizomonously on drier sites.
Blue Vervain (*Verbena hastata*)	<5	A native plant that bears attractive, blue flowers.

The recommended application rate is one pound per 5,000 square feet when used as an understory cover. This rate should be increased to one pound per 2,500 square feet for detention basins and other sites which require a very dense cover. For best results, a late fall application is recommended. This mix is not recommended for standing water.

Maintenance

Inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

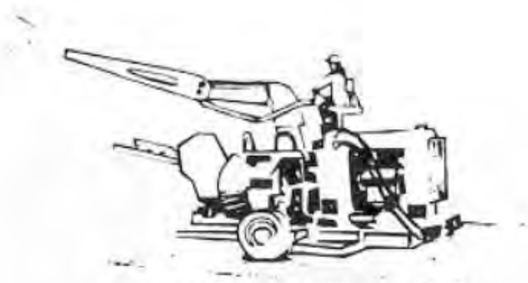
References

North Carolina Department of Environment, Health, and Natural Resources, ***Erosion and Sediment Control Field Manual***, Raleigh, NC, February 1991.

Personal communication, Richard J. DeVergilio, USDA, Natural Resources Conservation Service, Amherst, MA.

U.S. Environmental Protection Agency, ***Storm Water Management For Construction Activities***, EPA-832-R- 92-005, Washington, DC, September, 1992.

Washington State Department of Ecology, ***Stormwater Management Manual for the Puget Sound Basin***, Olympia, WA, February, 1992.

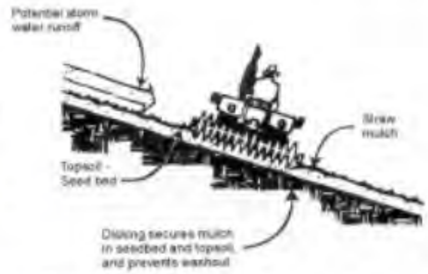


HYDRO-SEEDING

Seeding, Temporary

Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary cover for erosion control on disturbed areas.

Purpose



To temporarily stabilize areas that will not be brought to final grade for a period of more than 30 working days.
To stabilize disturbed areas before final grading or in a season not suitable for permanent seeding.
Temporary seeding controls runoff and erosion until permanent vegetation or other erosion control measures can be established.
Root systems hold down the soils so that they are less apt to be carried offsite by storm water runoff or wind.
Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction.

Where Practice Applies

On any cleared, unvegetated, or sparsely vegetated soil surface where vegetative cover is needed for less than one year. Applications of this practice include diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles.

Where permanent structures are to be installed or extensive re-grading of the area will occur prior to the establishment of permanent vegetation.

Areas which will not be subjected to heavy wear by construction traffic.

Areas sloping up to 10% for 100 feet or less, where temporary seeding is the only practice used.

Advantages

This is a relatively inexpensive form of erosion control but should only be used on sites awaiting permanent planting or grading. Those sites should have permanent measures used.

Vegetation will not only prevent erosion from occurring, but will also trap sediment in runoff from other parts of the site.

Temporary seeding offers fairly rapid protection to exposed areas.

Disadvantages/Problems

Temporary seeding is only viable when there is a sufficient window in time for plants to grow and establish cover. It depends heavily on the season and rainfall rate for success.

If sown on subsoil, growth will be poor unless heavily fertilized and limed. Because overfertilization can cause pollution of stormwater runoff, other practices such as mulching alone may be more appropriate. The potential for over-fertilization is an even worse problem in or near aquatic systems.

Once seeded, areas should not be travelled over.

Irrigation may be needed for successful growth. Regular irrigation is not encouraged because of the expense and the potential for erosion in areas that are not regularly inspected.

Planning Considerations

Temporary seedings provide protective cover for less than one year. Areas must be reseeded annual or planted with perennial vegetation.

Temporary seeding is used to protect earthen sediment control practices and to stabilize denuded areas that will not be brought into final grade for several weeks or months. Temporary seeding can provide a nurse crop for permanent vegetation, provide residue for soil protection and seedbed preparation, and help prevent dust production during construction.

Use low-maintenance native species wherever possible.

Planting should be timed to minimize the need for irrigation.

Sheet erosion, caused by the impact of rain on bare soil, is the source of most fine particles in sediment. To reduce this sediment load in runoff, the soil surface itself should be protected. The most efficient and economical means of controlling sheet and rill erosion is to establish vegetative cover. Annual plants which sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover. Temporary seeding is effective when combined with construction phasing so bare areas of the site are minimized at all times.

Temporary seeding may prevent costly maintenance operations on other erosion control systems. For example, sediment basin clean-outs will be reduced if the drainage area of the basin is seeded where grading and construction are not taking place. Perimeter dikes will be more effective if not choked with sediment.

Proper seedbed preparation and the use of quality seed are important in this practice just as in permanent seeding. Failure to carefully follow sound agronomic recommendations will often result in an inadequate stand of vegetation that provides little or no erosion control.

Soil that has been compacted by heavy traffic or machinery may need to be loosened. Successful growth usually requires that the soil be tilled before the seed is applied. Topsoiling is not necessary for temporary seeding; however, it may improve the chances of establishing temporary vegetation in an area.

Planting Procedures

Time of Planting

Planting should preferably be done between April 1 and June 30, and September 1 through September 30. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1 and March 31, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

Site Preparation

Before seeding, install needed surface runoff control measures such as gradient terraces, interceptor dike/swales, level spreaders, and sediment basins.

Seedbed Preparation

The seedbed should be firm with a fairly fine surface.

Perform all cultural operations across or at right angles to the slope. See **Topsoiling** and **Surface Roughening** for more information on seedbed preparation. A minimum of 2 to 4 inches of tilled topsoil is required.

Liming and Fertilization

Apply uniformly 2 tons of ground limestone per acre (100 lbs. per 1,000 Sq. Ft.) or according to soil test.

Apply uniformly 10-10-10 analysis fertilizer at the rate of 400 lbs. per acre (14 lbs. per 1,000 Sq. Ft.) or as indicated by soil test. Forty percent of the nitrogen should be in organic form.

Work in lime and fertilizer to a depth of 4 inches using any suitable equipment.

Seedings for Temporary Cover

Species	**Seeding Rates lbs/sq.ft.** 1,000 Sq.Ft.	Acre	**Recommended Seeding Dates**
Annual Ryegrass	1	40	April 1 to June 1 Aug. 15 to Sept. 15
Foxtail Millet	0.7	30	May 1 to June 30
Oats	2	80	April 1 to July 1 August 15 to Sept. 15
Winter Rye	3	120	Aug. 15 to Oct. 15

"Hydro-seeding" applications with appropriate seed-mulch-fertilizer mixtures may also be used.

Seeding

Select adapted species from the accompanying table.
Apply seed uniformly according to the rate indicated in the table by broadcasting, drilling or hydraulic application.
Cover seeds with suitable equipment as follows:

Rye grass	¼ inch
Millet	½ to ¾ inch
Oats	1 to 1-1/2 inches
Winter rye	1 to 1-1/2 inches.

Mulch

Use an effective mulch, such as clean grain straw; tacked and/or tied down with netting to protect seedbed and encourage plant growth.

Common Trouble Points

Lime and fertilizer not incorporated to at least 4 inches
May be lost to runoff or remain concentrated near the surface where they may inhibit germination.

Mulch rate inadequate or straw mulch not tacked down
Results in poor germination or failure, and erosion damage. Repair damaged areas, reseed and mulch.

Annual ryegrass used for temporary seeding
Ryegrass reseeds itself and makes it difficult to establish a good cover of permanent vegetation.

Seed not broadcast evenly or rate too low
Results in patchy growth and erosion.

Maintenance

Inspect within 6 weeks of planting to see if stands are adequate. Check for damage after heavy rains. Stands should be uniform and dense. Fertilize, reseed, and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather or on adverse sites. Water application rates should be controlled to prevent runoff.

Structural Practices
Silt fence with a mulch sock or approved equal shall be installed as shown on the approved Site Plan/NOI Plan to help prevent erosion and sedimentation of downstream resources.

Catch basins identified on the Site Plan shall be fitted with a siltsack or approved equal during construction to prevent the accumulation of sediments in the catch basin sump. Catch Basins shall be cleaned as specified in the Long Term Pollution Prevention Plan or the Long Term Operation and Maintenance Plan.

Stormwater Management
The stormwater runoff shall be managed through the use of several best management practices:

Deep Sump Catch Basin with Hood/Trap;
Oil Grit Separator;
Subsurface Infiltration Pipe Network;

6.3 Other Controls

Waste Materials
All waste materials shall be collected and stored in secure metal dumpsters rented from a licensed solid waste management company in Massachusetts. The dumpsters shall meet all local and state solid waste management regulations as outlined in 310 CMR 19.00. All trash and construction debris generated on site shall be disposed of in the dumpsters. The dumpsters shall be emptied as often as necessary during construction and transferred to an approved solid waste facility licensed to accept municipal solid waste and/or construction and demolition debris. No construction waste shall be buried on site. All personnel shall be instructed regarding the correct procedure for waste disposal.

Hazardous Waste
All hazardous waste materials shall be disposed of in a manner specified by local or State regulation or by the manufacturer. Site personnel shall be instructed in these practices.

Sanitary Waste
All sanitary shall be collected from portable units, as needed, by a licensed septage hauler in Massachusetts, in accordance with the requirements of the local Board of Health.

Offsite Vehicle Tracking
Construction entrance and exit shall be via Hopkins Street

6.4 Timing of Controls/Measures

As indicated in the Sequence of Major Activities, the installation of erosion and sediment control devices shall be in place prior to earth excavating activities.

6.5 Certification of Compliance with Federal, State, and Local Regulations

The Construction Period Pollution Prevention Plan reflects the requirements of The Massachusetts Department of Environmental Protections' (DEP) Stormwater Management Standards and the Massachusetts Wetlands Protection Act (310 CMR 10.00). There is no wetland filling associated with this project. Note that there are no other applicable State or Federal requirements for sediment and erosion control plans (or permits), or stormwater management plans (or permits) required for this project to the best of our knowledge.

6.6 Maintenance and Inspection Procedures

Erosion and Sediment Control Inspection and Maintenance Practices

The following items represent the inspection and maintenance practices that will be used to maintain sediment and erosion control.

1. All control measures shall be inspected at least once every fourteen (14) days and following any storm event of 0.5 inches or greater.
2. All measures shall be maintained in good working order; if a repair is necessary, it shall be initiated within 24 hours of the report.
3. Built up sediment shall be removed from silt fencing when it has reached one-third the height of the fence.
4. Silt fence shall be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly set in the ground.
5. The catch basin grates shall be inspected for grate elevation relative to current surface condition; condition of silt sack, and degree to which sediment has accumulated on the grate and in the sump of the catch basin.
6. Temporary and permanent seeding and any plantings shall be inspected for bare spots, washouts, and healthy growth.
7. A maintenance inspection report shall be prepared following each inspection. A copy of the form to be completed by the inspector is attached to this document.
8. DB5 Development Group, LLC shall select three individuals who will be responsible for inspections, maintenance and repair activities as well as who shall be responsible for filling out the inspection and maintenance report.
9. Personnel selected for inspection and maintenance responsibilities shall receive training from DB5 Development Group, LLC or their designated representative. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment control devices used on site in good working order.

6.7 Non Stormwater Discharges

It is expected that the following non-stormwater discharges will occur from the site during the construction period

1. Water from water line flushing.
2. Pavement wash waters.

All non-stormwater discharges shall be directed to the proposed site BMPs prior to discharge.

6.8 Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be present on site during construction

1. Concrete
2. Wood
3. Structural Steel
4. Masonry Block
5. Office Building Materials
6. Fiber Glass Insulation
7. Fertilizers
8. Petroleum Based Products
9. Cleaning Solvents
10. Paints (enamel and latex)
11. Tar
12. Waterproofing Materials

6.9 Spill Prevention

Material Management Practices

The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping

The following good housekeeping practices will be followed on site during the construction project.

1. A concerted effort shall be made to store only enough product required to complete a particular task.
2. All materials stored on site shall be stored in a neat and orderly fashion in their appropriate containers and, if possible, under a roof or other secure enclosure.
3. Products shall be kept in their original containers with the original manufacturer's label.
4. Substances shall not be mixed with one another unless recommended by the manufacturer.
5. Whenever possible, all of a product shall be used up before disposing of the container.
6. Manufacturer's recommendations for proper use and disposal shall be followed.
7. The site superintendent shall perform a daily site inspection to ensure proper use and disposal of materials on site.

Hazardous Products

The following practices are intended to reduce the risks associated with hazardous materials.

1. Products shall be kept in original containers unless they are not resealable.
2. Where feasible, the original labels and material safety data shall be retained, whereas they contain important product information.
3. If surplus product must be disposed, follow manufacturer's or local and state recommended methods for proper disposal.

Product Specific Practices

The following product specific practices shall be followed on site:

Petroleum Products

All on site vehicles shall be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. Petroleum products shall be stored in tightly sealed containers which are clearly labeled. Any bituminous concrete or asphalt substances used on site shall be applied according to the manufacturer's recommendations.

Fertilizers
Fertilizers shall be applied in the minimum amounts recommended by the manufacturer. Once applied, fertilizers shall be worked into the soil to limit exposure to stormwater. Storage shall be in a covered shed or trailer. The contents of any partially used bags of fertilizers shall be transferred to a sealable plastic bag or bin to avoid spills. Fertilizers shall be applied in the minimum amounts recommended by the manufacturer. Once applied, fertilizers shall be worked into the soil to limit exposure to stormwater. Storage shall be in a covered shed or trailer. The contents of any partially used bags of fertilizers shall be transferred to a sealable plastic bag or bin to avoid spills.

Paints
All containers shall be tightly sealed and stored when not required for use. Excess paint shall not be discharged into any catch basin, drain manhole, or any portion of the stormwater management system. Excess paint shall be properly disposed of according to manufacturer's recommendations or State and local regulations.

Concrete Trucks
Concrete trucks shall not be allowed to wash out or discharge surplus concrete or drum wash water on site.

Spill Control Practices
In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices shall be followed for spill prevention and cleanup:

1. Manufacturer's recommended methods for cleanup shall be readily available at the on site trailer and site personnel shall be made aware of the procedures and the location of the information.
2. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on site. Equipment and materials shall include, but not be limited to
3. brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
4. All spills shall be cleaned up immediately after discovery.
5. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
6. Spills of toxic or hazardous material shall be reported to the appropriate State and/or local authority in accordance with local and/or State regulations.
7. The spill prevention plan shall be adjusted to include measures to prevent a particular type of spill from reoccurring and how to clean up the spill if there is another occurrence. A description of the spill, what caused it, and the cleanup measures shall also be included.
8. DB5 Development Group, LLC or their assigned designee shall be the spill prevention and cleanup coordinator. DB5 Development Group, LLC shall designate at least three other site personnel who will be trained in the spill control practices identified above.

6.10 Pollution Prevention Plan Certificate

I certify under penalty of law that this document and all its attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed:____Date:___________________________________
DB5 Development Group, LLC

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Silt Fence/Silt Sock

From	To	Avg. depth of sediment (in.)	Tear	Posts secure	Overall condition
			Yes☐No☐	Yes☐No☐	Poor☐ Fair☐ Good☐
			Yes☐No☐	Yes☐No☐	Poor☐ Fair☐ Good☐
			Yes☐No☐	Yes☐No☐	Poor☐ Fair☐ Good☐
			Yes☐No☐	Yes☐No☐	Poor☐ Fair☐ Good☐
			Yes☐No☐	Yes☐No☐	Poor☐ Fair☐ Good☐
			Yes☐No☐	Yes☐No☐	Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Catch Basins / Grates

Structure Identification	Location	Catch basin at grade	Hood/trap installed	Sediment buildup (in.)	Overall condition
CB1	East Parking Field	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
DGCB3	East Parking Field	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB6	Northerly parking spaces	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB8	Northerly parking spaces	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB12	Main driveway entrance RT.	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB13	Main driveway entrance LT.	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Catch Basins / Grates

Structure Identification	Location	Catch basin at grade	Hood/trap installed	Sediment buildup (in.)	Overall condition
CB15	West parking field Hopkins St	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB17	West parking field near Hopkins St	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
CB18	West parking field near Hopkins St	Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐
		Yes☐No☐	Yes☐No☐		Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Oil Grit Separator

Structure Identification	Location	Sediment buildup inlet (in.)	Sediment buildup outlet (in.)	Overall condition
OGS10	West parking field			Poor☐ Fair☐ Good☐
OGS20	West parking field			Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐
				Poor☐ Fair☐ Good☐

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Inspector: Date:

Inspector Title:

Days since last rainfall: Amount of last rainfall:

Structural Controls: Subsurface Infiltration Pipe Network

Structure Identification	Location	Condition of stone bed	Filter fabric installed	Sediment buildup at inlet (in.)	Sediment buildup at outlet (in.)
SWMA1P	West parking field		Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		
			Yes☐No☐		

Maintenance required

To be performed by: On or before:

Inspection and Maintenance Form

To be completed every 14 days and within 24 hours of a rainfall event of 0.5 inches or greater

Changes required to the Construction Period Pollution Prevention Plan:

Reason for changes:

I certify under penalty of law that the above changes to the document and all its attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: Date:

7 | NRCS Web Soil Survey

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.


Custom Soil Resource Report
Map—Hydrologic Soil Group
307D
656
631C
103B
95
Hopkins St
Gazebo Cir
Exit 38b
Soil Map may not be valid at this scale.
Map Scale: 1:2,270 if printed on A landscape (11" x 8.5") sheet.
Meters
0 30 60 120 180
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84
21

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 16, Sep 14, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	0.9	6.1%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	C	1.1	7.5%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	A	5.8	38.3%
656	Udorthents-Urban land complex		7.2	48.1%
Totals for Area of Interest			**15.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

8 | Snow Disposal Guidelines

The following Snow Disposal Guidance is reproduced from the Mass.gov website:
https://www.mass.gov/guides/snow-disposal-guidance

The Massachusetts Department of Environmental Protection's Snow Disposal Guidance offers information on the proper steps to take when locating sites for the disposal of snow. Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. Public safety is of the utmost importance. However, care must be taken to ensure that collected snow, which may be contaminated with road salt, sand, litter, and automotive pollutants such as oil, is disposed of in a manner that will minimize threats to nearby sensitive resource areas.

In order to avoid potential contamination to wetlands, water supplies, and waterbodies, MassDEP recommends that municipalities and businesses identify and map appropriate upland snow disposal locations. To assist municipalities and businesses in this planning effort, and to avoid use of snow disposal at sites which compromise wetlands resources or public water supplies, MassDEP has developed this snow disposal mapping tool:

https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/

If a community or business demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions are authorized to issue Emergency Certifications under the Massachusetts Wetlands Protection Act for snow disposal in certain wetland resource areas. In such cases, Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency.

In the event of a regional or statewide severe weather event, MassDEP may also issue a broader Emergency Declaration under the Wetlands Protect Act which allows greater flexibility in snow disposal practices. Details of this approval process are found below.

Snow Disposal Guidance

Effective Date: December 21, 2015

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: BRP Snow Disposal Guideline No. BRPG01-01 issued March 8, 2001, and all previous snow disposal guidance.

Approved by: Douglas Fine, Assistant Commissioner for Water

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to public agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While we are all aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything we do on the land has the potential to impact our water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces that have functioning and maintained storm water management systems away from water resources and drinking water wells. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris which can be removed in the springtime. The following areas should be avoided:

- Avoid importing snow from outside a Zone II or Interim Wellhead Protection Area (IWPA) of a public water supply well or within 75 feet of a private well, where road salt may contaminate water supplies. Only snow from within the Zone II or IWPA should be disposed of within this resource area so as not to increase the potential for pollution of water supplies.

- Avoid dumping of snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

1. Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
2. Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
3. Sites located in upland locations that are not likely to impact sensitive environmental resources should be selected first.
4. If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist municipalities and businesses in identifying possible locations to potentially dispose of snow, should the need arise. The disposal locations depicted on these maps will also aid MassDEP and the Massachusetts Emergency Management Agency assist communities with snow disposal in the event of severe winter storm emergencies. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address: **https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/**.

By clicking on the link for the OLIVER Online Data Viewer, communities can select your town and overlay different resource areas. The MassGIS site includes MassDEP orthophoto maps depicting local wetland resources, hard copies of which were mailed to each Conservation Commission in the past.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- To filter pollutants out of the meltwater, wherever possible a 50-foot vegetative buffer strip should be maintained during the growth season between the disposal site and adjacent waterbodies.
- Debris should be cleared from the site prior to using the site for snow disposal.

Debris should be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.

3. SNOW DISPOSAL APPROVALS
Proper snow disposal may be undertaken through one of the following approval procedures:

1. Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained storm water management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until a community exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each municipality's routine snow management efforts.
2. Emergency Certifications – If a community or business demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions are authorized to issue Emergency Certifications under the Massachusetts Wetlands Protection Act for snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas, i.e. within flood plains. In such cases, Emergency Certifications can only be issued at the request of a public agency for the protection of the health or safety of citizens or by order of a public agency, and limited to those activities necessary to abate the emergency. Use the following guidelines in these emergency situations:
    a. Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    b. Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    c. Do not dispose of snow where trucks may cause shoreline damage or erosion.
    d. Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

3. Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows municipalities greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will assist MassDEP and the Massachusetts Emergency

Management Agency in helping communities identify appropriate snow disposal locations.

If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. A buffer of at least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody in these situations. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A municipality seeking to dispose of snow in a waterbody should take the following steps***:

a. Call the emergency contact phone number - 1-888-304-1133 - and notify the MEMA bunker personnel of the municipality's intent.
b. The MEMA bunker personnel will ask for some information about where the requested disposal will take place.
c. The MEMA bunker personnel will confirm that the disposal is consistent with MassDEP's Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP's website will also highlight the emergency contact phone number (1-888-304-1133) for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3249
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-767-2722
Western Regional Office, Springfield, 413-784-1100

9 | Deicing Chemical (Road Salt) Storage

The following Snow Disposal Guidance is reproduced from the Mass.gov website:
https://www.mass.gov/guides/guidelines-on-road-salt-storage

Effective Date: December 19, 1997
Guideline No. DWSG97-1

Applicability: Applies to all parties storing road salt or other chemical deicing agents.

Supersedes: Fact Sheet: DEICING CHEMICAL (ROAD SALT) STORAGE (January 1996)

Approved by: Arleen O'Donnell, Asst. Commissioner for Resource Protection

PURPOSE: To summarize salt storage prohibition standards around drinking water supplies and current salt storage practices.

APPLICABILITY: These guidelines are issued on behalf of the Bureau of Resource Protection's Drinking Water Program. They apply to all parties storing road salt or other chemical deicing agents.

The Road Salt Problem

Historically, there have been incidents in Massachusetts where improperly stored road salt has polluted public and private drinking water supplies. Recognizing the problem, state and local governments have taken steps in recent years to remediate impacted water supplies and to protect water supplies from future contamination. As a result of properly designing storage sheds, new incidents are uncommon. These guidelines summarize salt storage prohibition standards around drinking water supplies and current salt storage practices.

Salt Pile Restrictions in Water Supply Protection Areas

Uncovered storage of salt is forbidden by Massachusetts General Law Chapter 85, section 7A in areas that would threaten water supplies. The Drinking Water Regulations, 310 CMR 22.21(2)(b), also restrict deicing chemical storage within wellhead protection areas (Zone I and Zone II) for public water supply wells, as follows: "storage of sodium chloride, chemically treated abrasives or other chemicals used for the removal of ice and snow on roads [are prohibited], unless such storage is within a structure designed to prevent the generation and escape of contaminated runoff or leachate." For drinking water reservoirs, 310 CMR 22.20C prohibits, through local bylaw, uncovered or uncontained storage of road or parking lot de-icing and sanding materials within Zone A at new reservoirs and at those reservoirs increasing their withdrawals under MGL Chapter 21G, the Water Management Act.

For people on a low-sodium diet, 20 mg/L of sodium in drinking water is consistent with the bottled water regulations' meaning of "sodium free." At 20 mg/L, sodium contributes 10% or less to the sodium level in people on a sodium-restricted diet.

Salt Storage Best Management Practices

Components of an "environment-friendly" roadway deicing salt storage facility include:
the right site = a flat site;
adequate space for salt piles;

storage on a pad (impervious/paved area);
storage under a roof; and
runoff collection/containment.
For more information, see The Salt Storage Handbook, 6th ed. Virginia: Salt Institute, 2006.

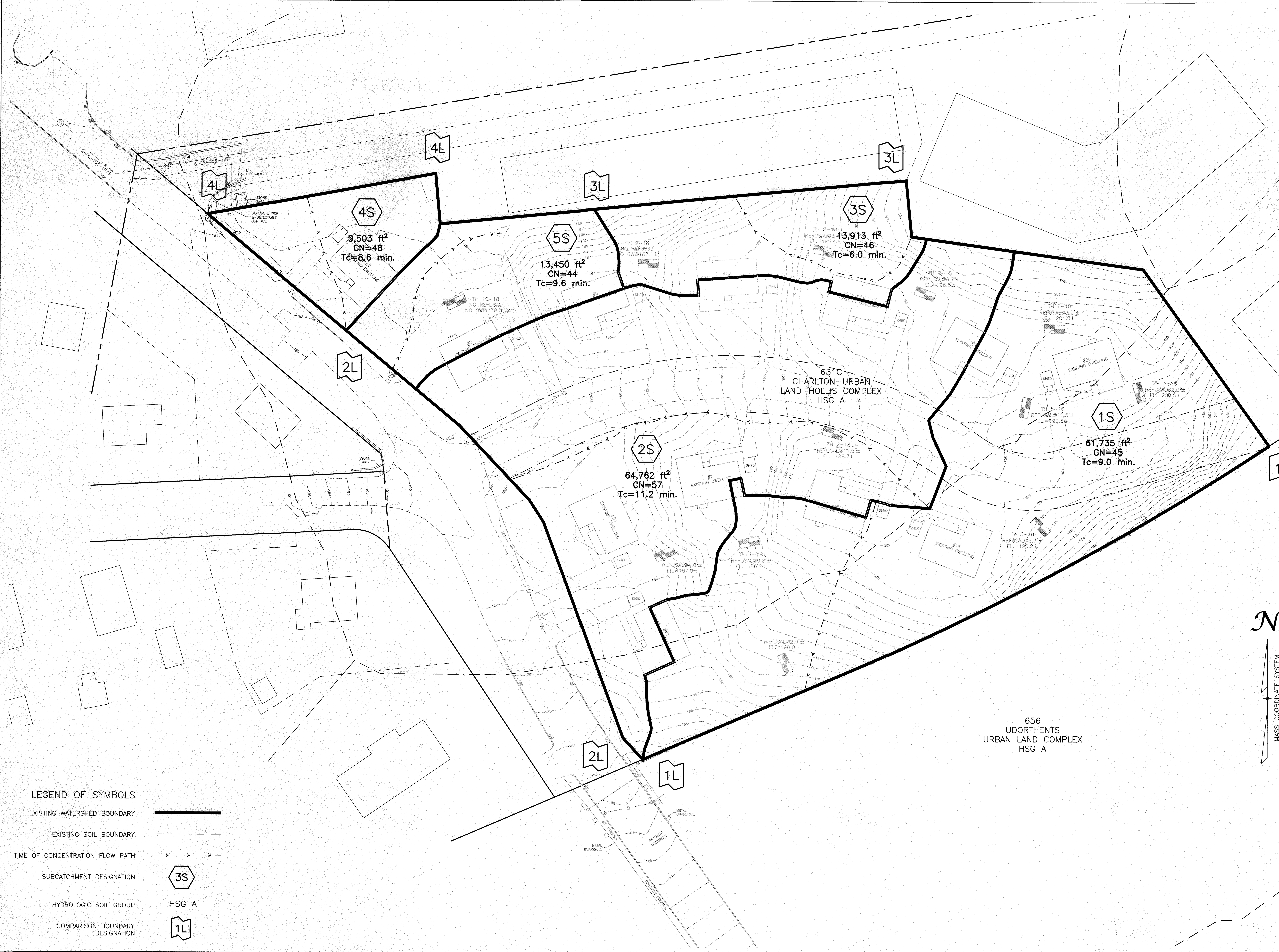
Salt Storage Practices of the Massachusetts Highway Department

The Massachusetts Highway Department (MHD) has 216 permanent salt storage sheds at 109 locations in the state. On leased land and state land under arteries and ramps, where the MHD cannot build sheds, salt piles are stored under impermeable material. This accounts for an additional 15 sites. The MHD also administers a program to assist municipalities with the construction of salt storage sheds. Of 351 communities, 201 municipalities have used state funds for salt storage facilities.

Appendix A – General Location Map

USGS Locus Map
0 Tarrant Lane
Wakefield, MA
Reading Quadrangle
10′ contour interval NAVD88

Appendix B – Site Maps



EXISTING CONDITION WATERSHED MAP
TARRANT LANE
TARRANT LANE, WAKEFIELD, MA

0' 15' 30' 60'
SCALE: 1"=30'
SEPTEMBER 14, 2018

DRAWING: W1

SHEET 1 OF 1

6		
5		
4		
3		
2	TOWN COMMENTS	7/5/2019
1	TOWN COMMENTS	4/8/2019

SEAL

COMMONWEALTH OF MASSACHUSETTS
MATTHEW E MOORE
CIVIL
No. 48885
REGISTERED PROFESSIONAL ENGINEER

7.5.2019

Designed By: MEM
Drawn By: MEM
Reviewed By: CPS
Project Manager: CPS
Job File Number: WAKE-0048
Drawing File Folder: WAKE48

- [ ] Drawing Issued for Review Only
- [x] Drawing Issued for Permit
- [ ] Drawing Issued for Construction

Owner:
DB5 Development Group, LLC
9 Wildwood Road
Middleton, MA 01949

Applicant:
DB5 Development Group, LLC
9 Wildwood Road
Middleton, MA 01949

WILLIAMS & SPARAGES
ENGINEERS | PLANNERS | SURVEYORS
189 NORTH MAIN STREET
SUITE 101
MIDDLETON, MA 01949
PHONE: (978) 539-8088
FAX: (978) 539-8200
WSENGINEERS.COM

15S
1,132 ft²
CN=43
Tc=6.0 min.
16S
608 ft²
CN=39
Tc=6.0 min.
4L
3L
14S
9,948 ft²
CN=87
Tc=6.0 min.
1P
9S
10,461 ft²
CN=86
Tc=6.0 min.
8S
11,190 ft²
CN=83
Tc=6.0 min.
2L
7S
14,296 ft²
CN=84
Tc=6.0 min.
6S
8,679 ft²
CN=78
Tc=6.0 min.
13S
4,435 ft²
CN=95
Tc=6.0 min.
12S
9,466 ft²
CN=89
Tc=6.0 min.
631C
CHARLTON-URBAN
LAND-HOLLIS COMPLEX
HSG A
4S
16,016 ft²
CN=98
Tc=6.0 min.
17S
15,427 ft²
CN=52
Tc=6.0 min.
5S
14,830 ft²
CN=48
Tc=6.0 min.
1L
18S
8,989 ft²
CN=64
Tc=6.0 min.
11S
3,216 ft²
CN=89
Tc=6.0 min.
10S
3,298 ft²
CN=81
Tc=6.0 min.
2S
14,830 ft²
CN=98
Tc=6.0 min.
3S
3,914 ft²
CN=98
Tc=6.0 min.
1S
12,628 ft²
CN=43
Tc=6.0 min.
656
UDORTHENTS
URBAN LAND COMPLEX
HSG A
N
MASS COORDINATE SYSTEM
GRID NORTH
NAD 27
LEGEND OF SYMBOLS
PROPOSED WATERSHED BOUNDARY
EXISTING SOIL BOUNDARY
TIME OF CONCENTRATION FLOW PATH
SUBCATCHMENT DESIGNATION
HYDROLOGIC SOIL GROUP
HSG A
COMPARISON BOUNDARY DESIGNATION
WILLIAMS & SPARAGES
ENGINEERS | PLANNERS | SURVEYORS
189 NORTH MAIN STREET
SUITE 101
MIDDLETON, MA 01949
Owner:
DBS Development Group, LLC
9 Wildwood Road
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Drawing Issued for Review Only
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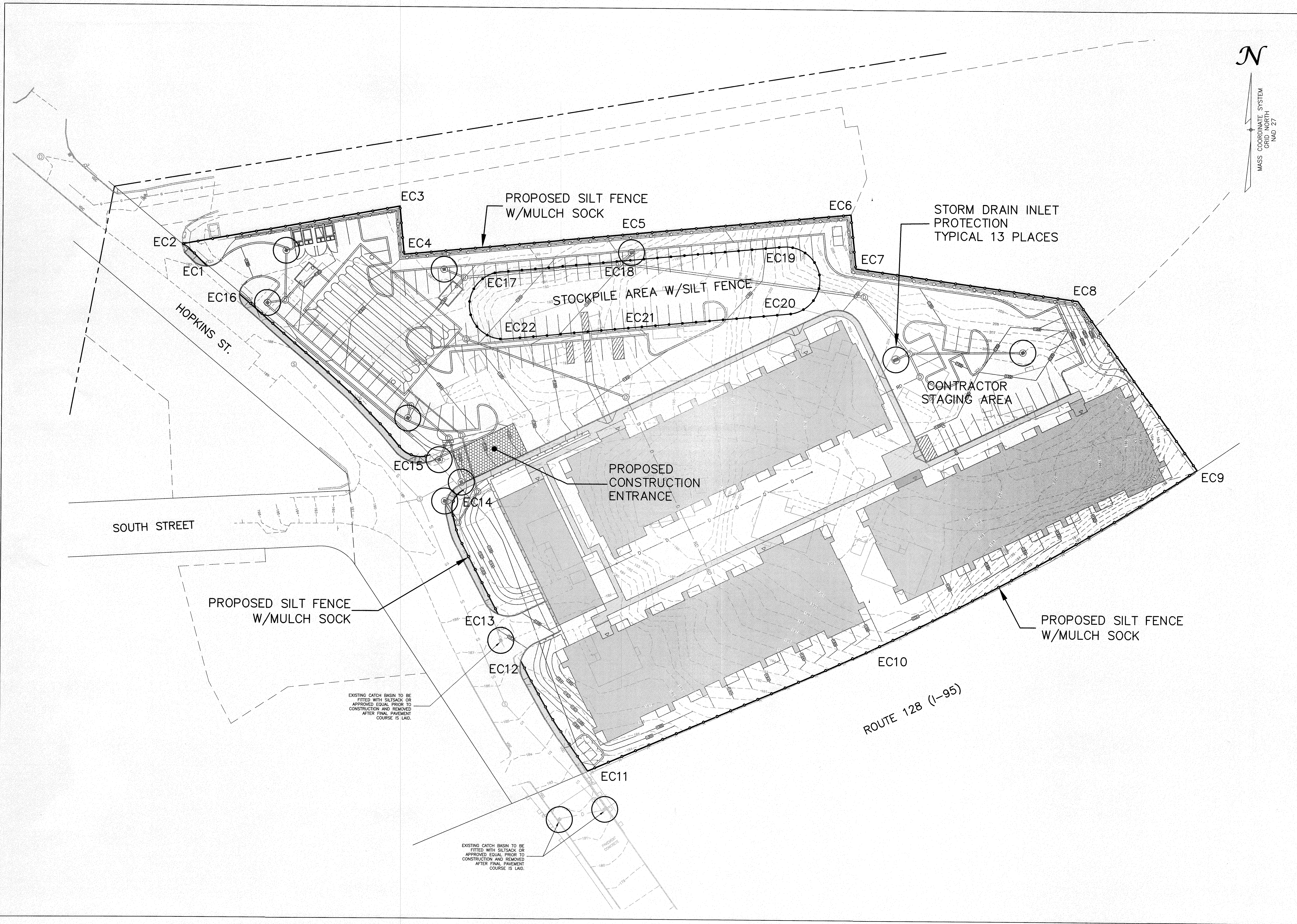
COMMONWEALTH OF MASSACHUSETTS
MATTHEW E. MOORE
CIVIL
7.5.2019
2 TOWN COMMENTS 7/5/2019
1 TOWN COMMENTS 4/8/2019
PROPOSED CONDITION WATERSHED MAP
TARRANT LANE
TARRANT LANE, WAKEFIELD, MA
SCALE: 1"=30'
SEPTEMBER 14, 2018
DRAWING: W2
SHEET 1 OF 1



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SEAL

COMMONWEALTH OF MASSACHUSETTS
MATTHEW E. MOORE
CIVIL
No. 45885
REGISTERED PROFESSIONAL ENGINEER

7-8-2019

6	
5	
4	
3	
2	
1	

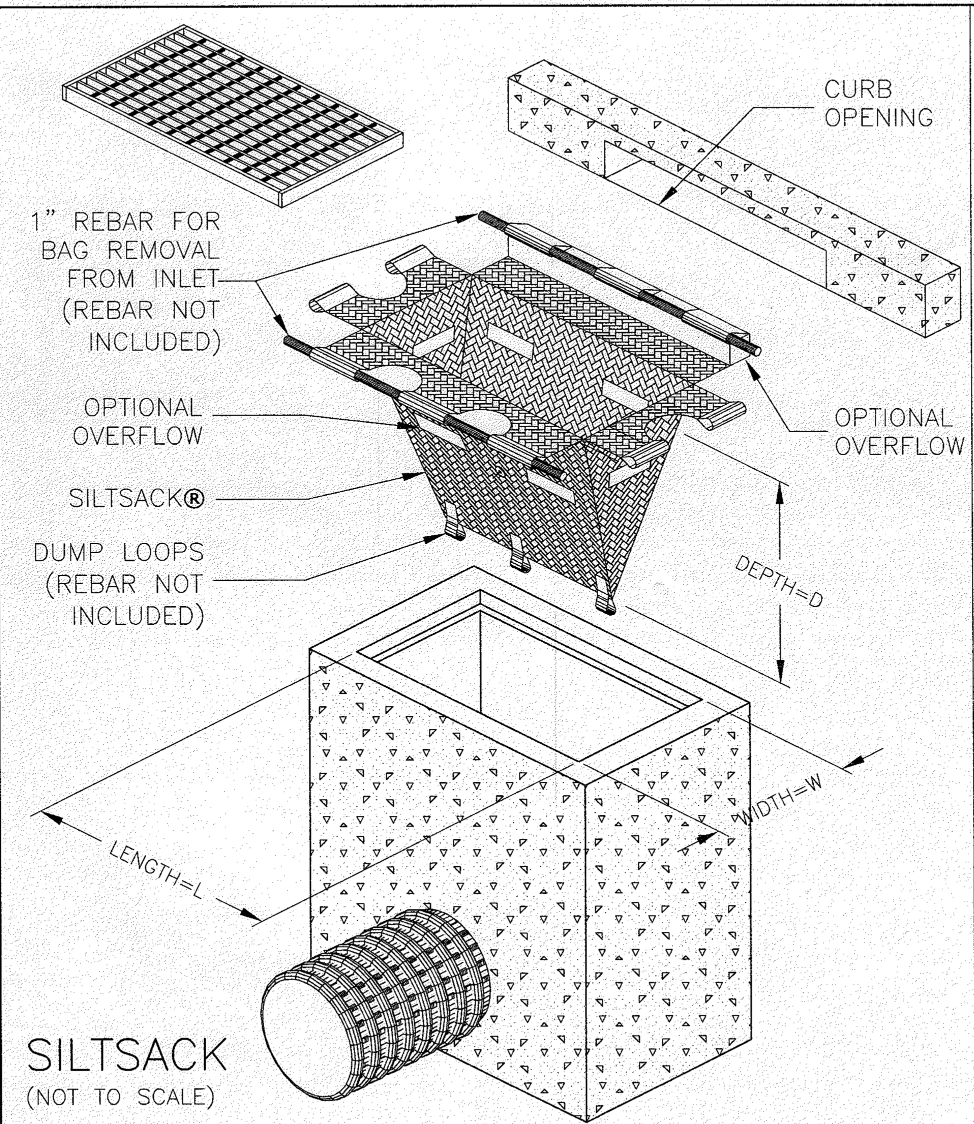
STORMWATER POLLUTION PREVENTION PLAN SITE MAP
TARRANT LANE APARTMENTS
0 TARRANT LANE, WAKEFIELD, MA

0' 15' 30' 60'
SCALE: 1"=30'

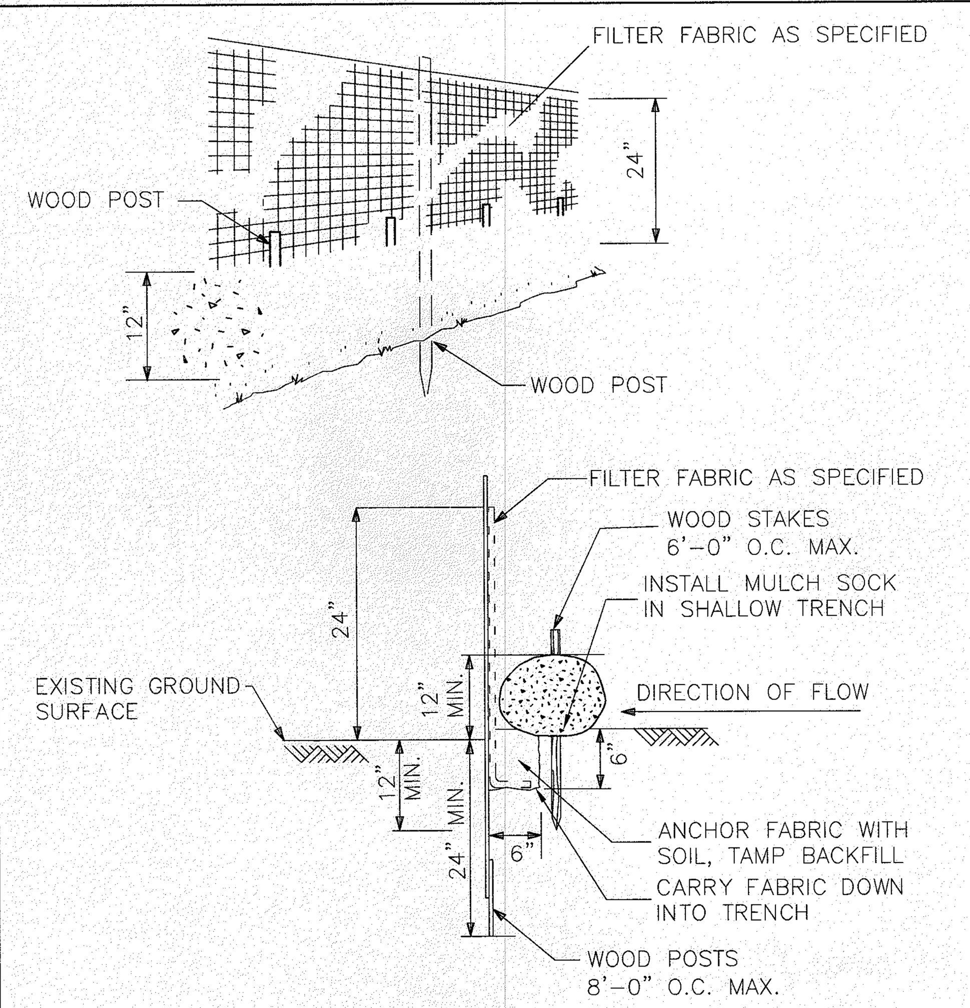
JULY 8, 2019

DRAWING: E1.1

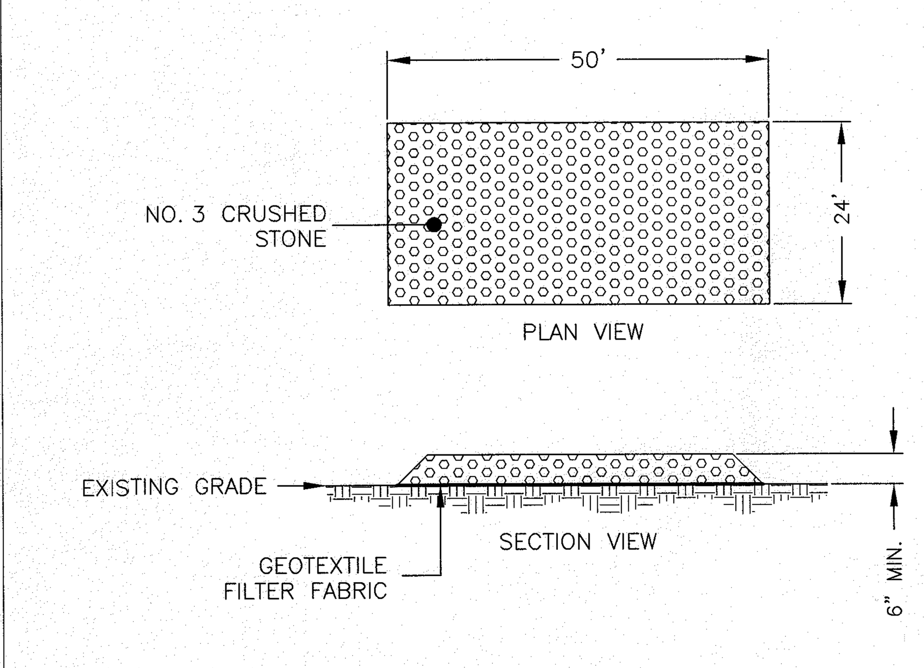
SHEET 1 OF 2



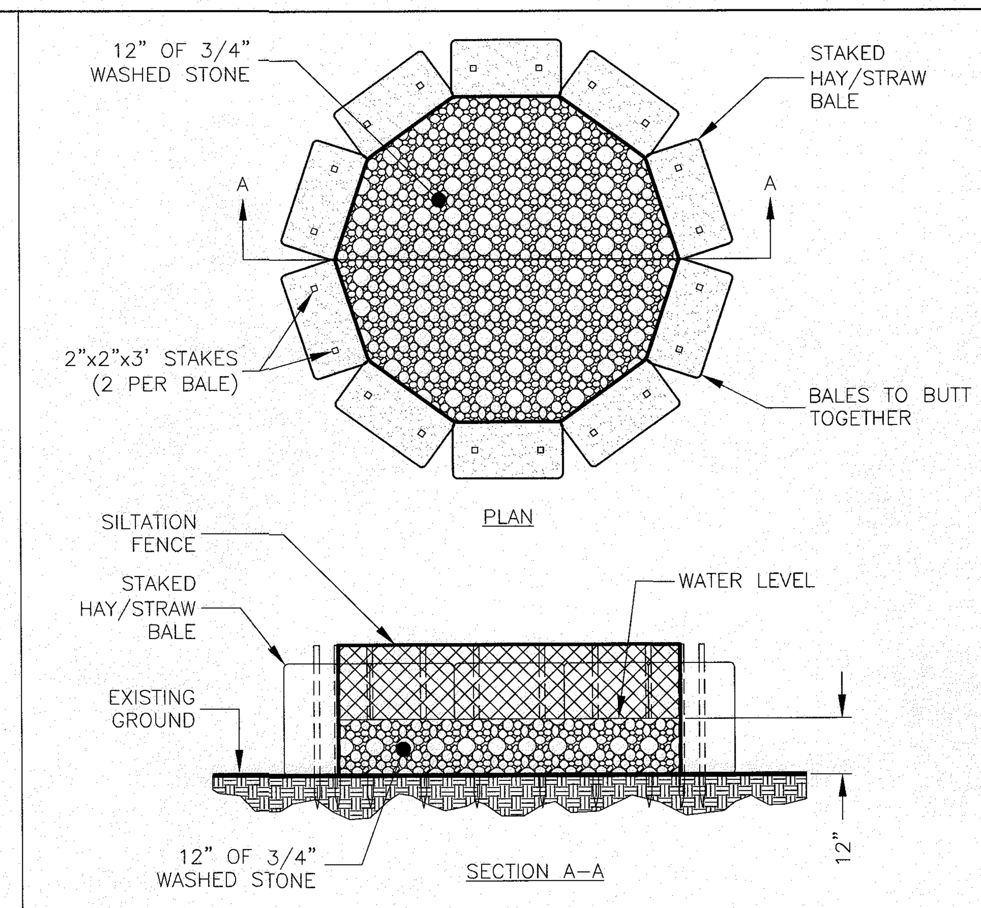
SILTSACK
(NOT TO SCALE)



SILTFENCE WITH MULCH SOCK
(NOT TO SCALE)

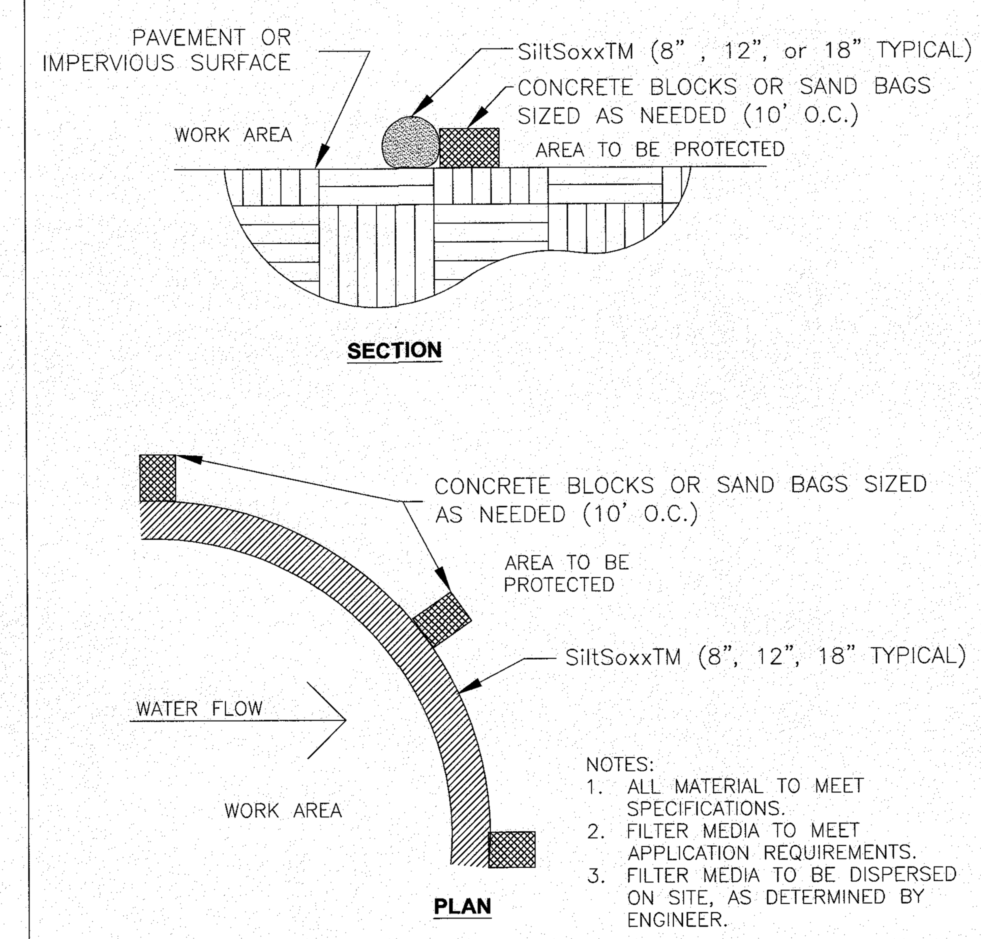


TRACKING PAD
(NOT TO SCALE)



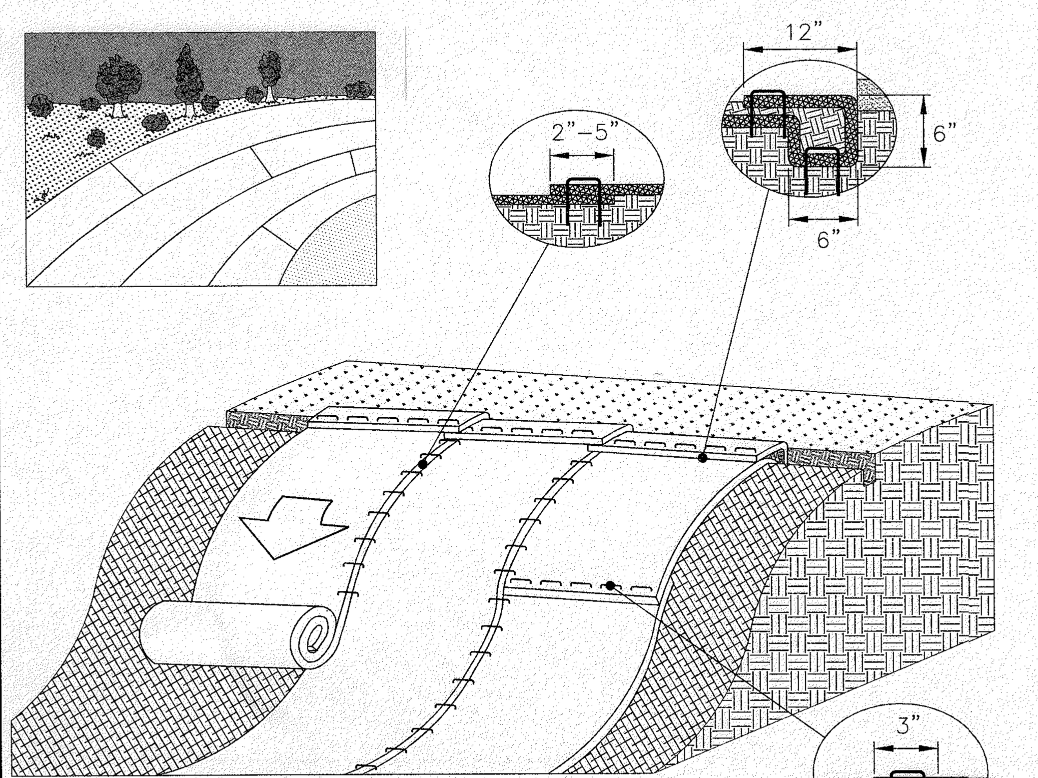
NOTES:
1. THE LOCATION OF THE DEWATERING AREA TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR WITH CONSERVATION COMMISSION APPROVAL.

DEWATERING DETAIL
(NOT TO SCALE)



NOTES:
1. ALL MATERIAL TO MEET SPECIFICATIONS.
2. FILTER MEDIA TO MEET APPLICATION REQUIREMENTS.
3. FILTER MEDIA TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

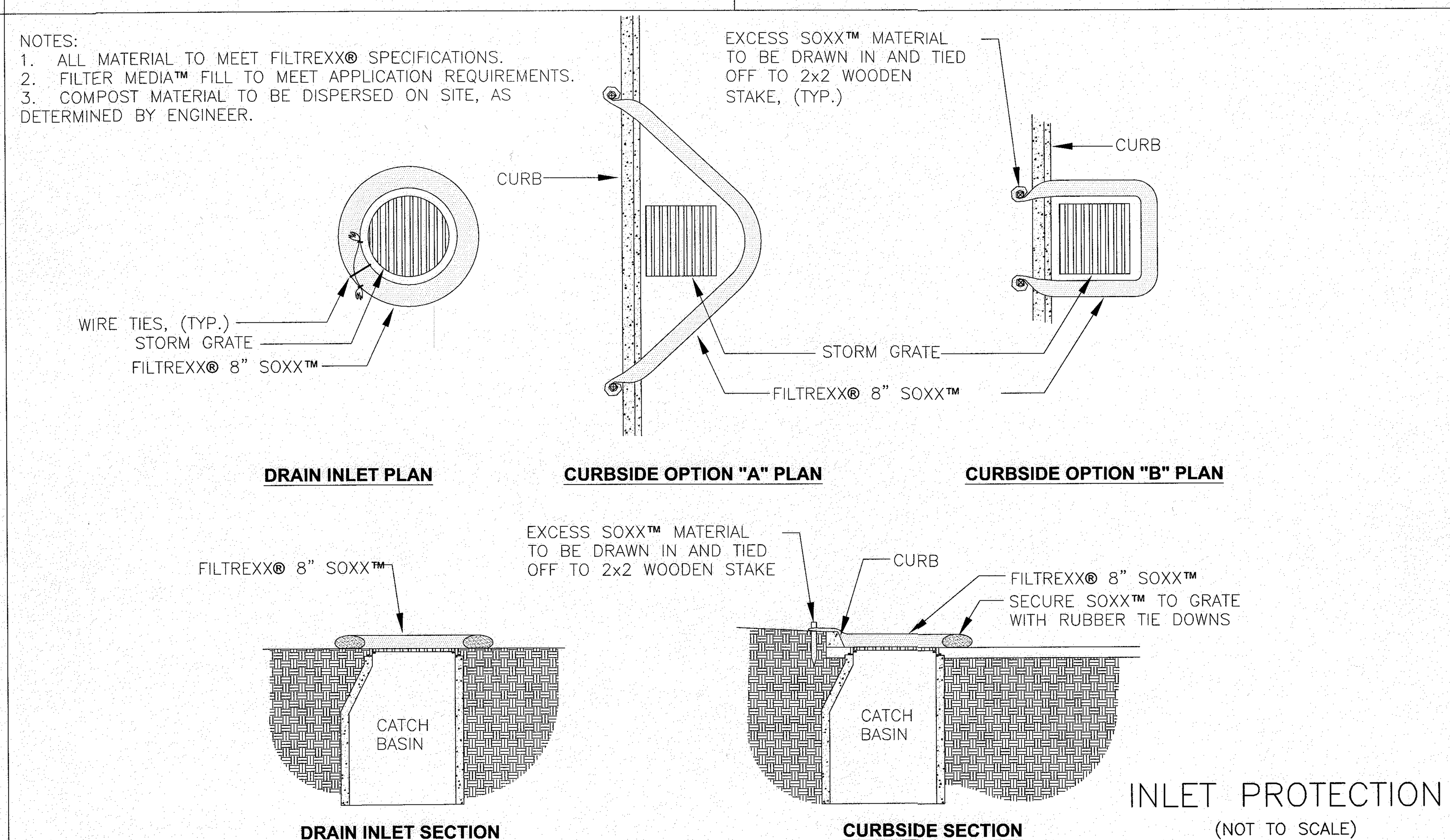
SEDIMENT CONTROL ON PAVEMENT
(NOT TO SCALE)



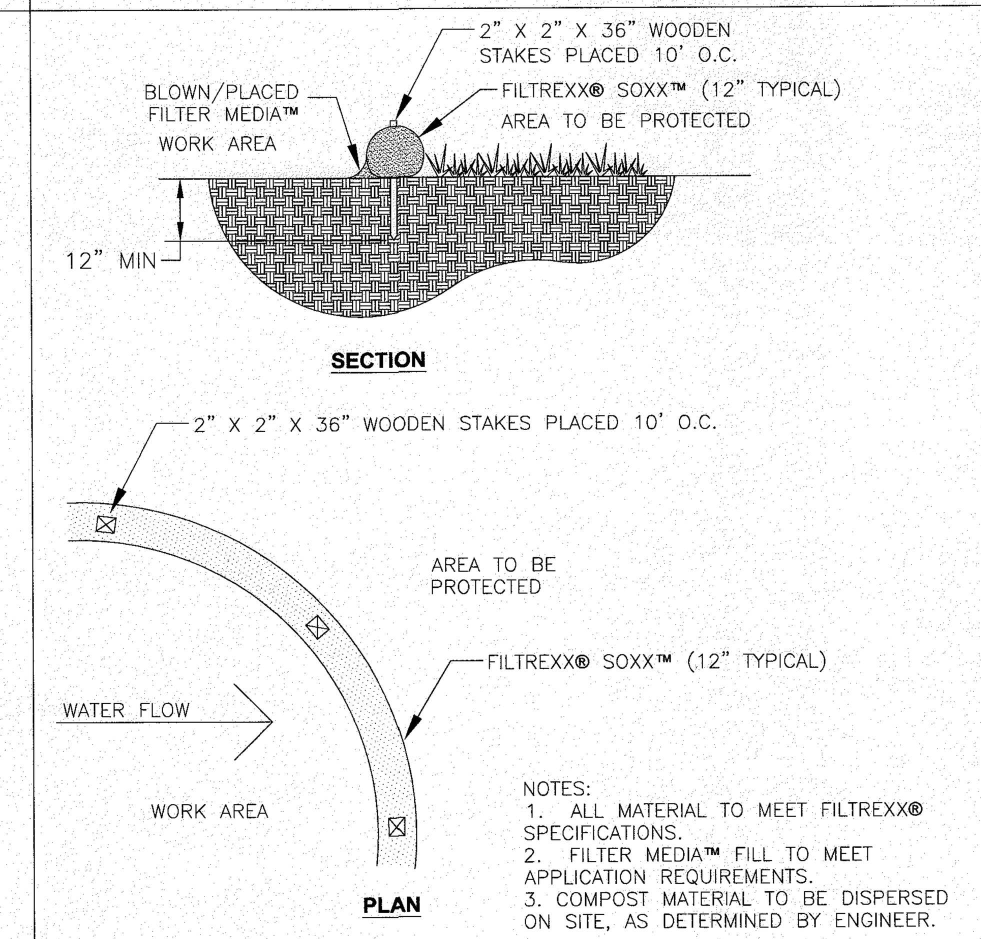
1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECPS), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECPS IN A 6"(15CM) DEEP X 6"(15CM) WIDE TRENCH WITH APPROXIMATELY 12" (30CM) OF RECPS EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECPS WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO THE COMPACTED SOIL AND FOLD THE REMAINING 12"(30CM) PORTION OF RECPS BACK OVER THE SEED AND COMPACTED SOIL. SECURE RECPS OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12"(30CM) APART ACROSS THE WIDTH OF THE RECPS.
3. ROLL THE RECPS (A) DOWN OR (B) HORIZONTALLY ACROSS THE SLOPE. RECPS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECPS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.
4. THE EDGES OF PARALLEL RECPS MUST BE STAPLED WITH APPROXIMATELY 2" - 5" (5-12.5CM) OVERLAP DEPENDING ON THE RECPS TYPE.
5. CONSECUTIVE RECPS SPLICED DOWN THE SLOPE MUST BE END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3"(7.5CM) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12"(30CM) APART ACROSS ENTIRE RECPS WIDTH.
6. IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6"(15CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECP'S.

EROSION CONTROL BLANKET
(NOT TO SCALE)

NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.



INLET PROTECTION
(NOT TO SCALE)



NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

SEDIMENT CONTROL
(NOT TO SCALE)

WILLIAMS & SPARAGES
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WSENGINEERS.COM

Owner:
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9 Wildwood Road
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Applicant:
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Middleton, MA 01949

Designed By: MEM
Drawn By: MEM
Reviewed By: CPS
Project Manager: CPS
Job File Number: WAKE-0048
Drawing File Folder: WAKE48

- Drawing Issued for Review Only
- Drawing Issued for Permit
- Drawing Issued for Construction

SEAL

COMMONWEALTH OF MASSACHUSETTS
MATTHEW E. MOORE
CIVIL
No. 48885
REGISTERED PROFESSIONAL ENGINEER

7.8.2019

STORMWATER POLLUTION PREVENTION PLAN SITE MAP
TARRANT LANE APARTMENTS
0 TARRANT LANE, WAKEFIELD, MA

6	
5	
4	
3	
2	
1	

SCALE: NONE

JULY 8, 2019

DRAWING: E1.2

SHEET 2 OF 2

Appendix C – Soil Logs

WAKE - 0048 Tarrant Lane 5-7-18

Soil Log

TH 1-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	fsl									
8-12	B	sl									
12-118	C	ls									
118+/-	Refusal										

Additional Notes:

Soil Log

TH 2-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	fsl									
8-12	B	sl									
12-138	C	ls									
138	Refusal										

Additional Notes: Weeping @ 132"

MRP

WAKE-0048 Tarrant Lane 5-7-18

TH3-18

Soil Log

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-23	Fill										
23-30	B	sl									
30-64	C	ls									
64	Refusal										

Additional Notes:

TH4-18

Soil Log

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	fsl									
6-24	C	ls									
24	Refusal										

Additional Notes:

MRP

WAKE-0048 Tarrant Lane

5-7-18

Soil Log

TH 5-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	fsl									
10-26	Bw	sl									
26-38	B/C	ls									
38-48	C1	sand									
48-126	C2	ls									
126	Refusal										

Additional Notes:

Soil Log

TH6-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	fsl									
8-36	C	ls									
36	Refusal										

Additional Notes:

MRP

WAKE-0048 Tarrant Lane 5-7-18

Soil Log

TH 7-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	fsl									
10-80	C	ls									
80	Refusal										

Additional Notes:

Soil Log

TH8-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-20	Fill										
20-27	A	fsl									
27-37	B	sl									
37-77	C	ls									
77	Refusal										

Additional Notes:

MRP

WAKE-0049 Tarrant Lane 5-7-18

Soil Log

TH9-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-88	Fill										
88-116+	C	Sand									

Additional Notes:

Soil Log

TH10-18

Depth (In)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-32	Fill										
32-36	Ab	fsl									
36-44	C1	ls									
44-104+	C2	Sand									

Additional Notes:

MRP

Appendix D – Open Channel Pipe Flow Calculations

Open Channel Pipe Flow Calculations

Pipe Segment	Pipe Slope (ft./ft.)	Pipe Size (in.)	Manning's n	$Q_{full\ flow}$ (ft^3/s)	$V_{full\ flow}$ (ft^3/s)	$Q_{10\ yr}$ (ft^3/s)	$Q_{25\ yr}$ (ft^3/s)
CB1-->DMH4	0.010	12	0.012	3.86	4.91	0.52	0.74
DMH2-->DMH4	0.039	15	0.012	13.82	11.26	3.04	3.79
DGCB3-->DMH4	0.010	12	0.012	3.86	4.91	1.06	1.42
DMH4-->DMH5	0.010	18	0.012	11.38	6.44	4.62	5.95
DMH5-->DMH7	0.010	18	0.012	11.38	6.44	4.62	5.95
CB6-->DMH7	0.010	12	0.012	3.86	4.91	0.80	1.09
DMH7-->DMH9	0.010	18	0.012	11.38	6.44	5.42	7.04
CB8-->DMH9	0.010	12	0.012	3.86	4.91	0.82	1.09
DMH9-->OGS10	0.010	24	0.012	24.51	7.80	6.24	8.13
OGS10-->SWMA1P	0.000	24	0.012	0.00	0.00	6.24	8.13
DMH11-->SWMA1P	0.000	15	0.012	0.00	0.00	1.97	2.65
CB12-->DMH14	0.011	12	0.012	4.05	5.15	0.22	0.30
CB13-->DMH14	0.010	12	0.012	3.86	4.91	0.27	0.35
DMH14-->DMH16	0.010	12	0.012	3.86	4.91	0.49	0.66
CB15-->DMH16	0.010	12	0.012	3.86	4.91	0.80	1.04
DMH16-->DMH19	0.010	12	0.012	3.86	4.91	1.30	1.70
CB17-->DMH19	0.010	12	0.012	3.86	4.91	0.80	1.06
CB18-->DMH19	0.010	12	0.012	3.86	4.91	0.42	0.53
DMH21-->DMH11	0.010	15	0.012	7.00	5.70	1.97	2.65
DMH19-->OGS20	0.011	12	0.012	4.05	5.15	2.52	3.29
OGS20-->SWMA1P	0.000	12	0.012	0.00	0.00	2.52	3.29
SWMA1P-->DMH22	0.010	8	0.012	1.31	3.75	0.83	1.55
DMH22-->DMH23	0.010	10	0.012	2.37	4.35	0.83	1.55
DMH23-->DMH25	0.010	10	0.012	2.37	4.35	0.83	1.55