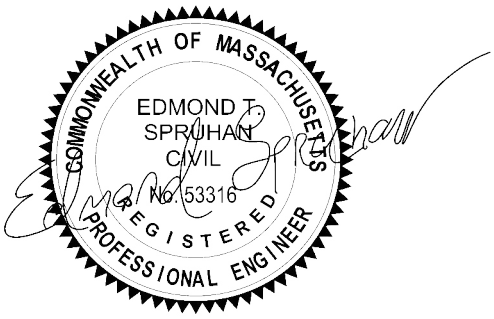
PETER NOLAN & ASSOCIATES LLC.

STORMWATER REPORT

19-21 ORCHARD STREET, NEWTON, MA



Prepared By: Peter Nolan & Associates, LLC

1/2/2017

Contents

1.0 Introduction

Peter Nolan & Associates, LLC has prepared this Storm water Report for the proposed redevelopment project located at 19-21 Orchard Street, Newton, Massachusetts.

The proposed development involves demolishing the existing two family dwelling and replacing it with a new two-family dwelling. The storm water system has been designed to exceed the requirements of the City of Newton Engineering Division.

2.0 Existing Conditions

The existing property is located at 19-21 Orchard Street, Newton, Massachusetts. The site slopes from the easterly property line towards Charlesbank Road. There is currently no existing drainage system on site so all rainwater runoff scours across the surface at grade. An existing watershed map which identifies the areas used for calculation can be found on sheet 4 of the plan set.

The paved section of Orchard street slopes entirely towards the two catch basins located near the intersection of Orchard Street and Charlesbank Road. This was the area used when analyzing the existing city main drain.

3.0 Proposed Conditions – Storm Water Management System

In order to reduce the overall flowrate and volume from the site for a proposed 100 year (8.78") rainstorm event, a stormwater recharge system has been designed. All roof runoff and pavement runoff are to be routed to 4 storm-tech units onsite. Due to the ledge located all across the site, an overflow line connected to the city drain main has been proposed. A copy of the HydroCAD calculations can be found in Appendix A of this report. As you can see in the following summary table, the post construction conditions will reduce the overall flowrate and volume from the site.

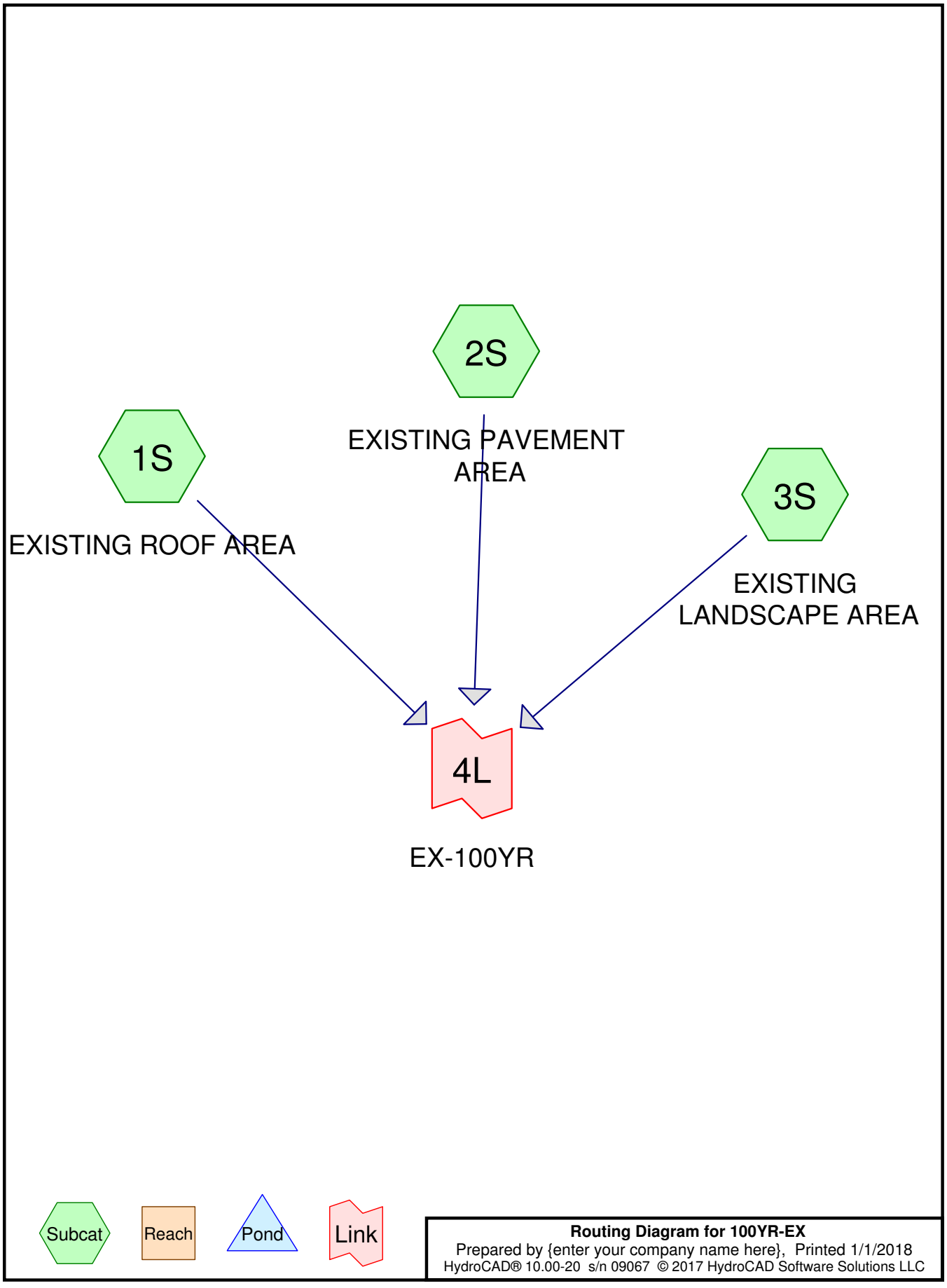
In addition to designing the system for this site, an analysis was performed on the existing drain main in the street. There is currently a 12" RCP pipe that flows in a southerly direction from a drain manhole near the intersection of Charlesbank and Orchard. It has been assumed that all the runoff from Orchard Street runs into the two catch basins located on Orchard and flow into the existing drain main.

The proposed analysis assumes that the overflow from the designed storm-tech systems is also routed into the drain main. The analysis shows that the peak elevation in the drain main reaches an elevation of 42.52'. This is approximately 0.1' above the top of the drain main line. This means that after approximately 12 hours during a 100-year storm event, there may be ponding at the city drain catch basin. This will, however, drain quickly, and the system will again perform as designed.

The alternative to connecting the overflow to the city main would to use popup emitters. The issue with using this solution is that it can cause ponding and unsafe conditions on the sidewalk and street. In either case, however, we have demonstrated that there is a decrease in flowrate and volume for the proposed conditions.

	Summary Table (Onsite)			
	Rainfall Intensity		Volume of Runoff	
	EXISTING	PROPOSED	EXISTING	PROPOSED
100 Year Storm (8.78 in/hr)	2.18 cfs	2.14 cfs	7,132 cf	6,754 cf

Appendix A – HydroCAD Calculations


2S
EXISTING PAVEMENT AREA
1S
EXISTING ROOF AREA
3S
EXISTING LANDSCAPE AREA
4L
EX-100YR
Subcat
Reach
Pond
Link
Routing Diagram for 100YR-EX
Prepared by {enter your company name here}, Printed 1/1/2018
HydroCAD® 10.00-20 s/n 09067 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,178	80	>75% Grass cover, Good, HSG D (3S)
1,164	98	Paved parking, HSG D (2S)
2,028	98	Roofs, HSG D (1S)
12,370	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
12,370	HSG D	1S, 2S, 3S
0	Other	
12,370		**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	Sub Num
0	0	0	9,178	0	9,178	>75% Grass cover, Good	
0	0	0	1,164	0	1,164	Paved parking	
0	0	0	2,028	0	2,028	Roofs	
0	**0**	**0**	**12,370**	**0**	**12,370**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EXISTING ROOF AREA Runoff Area=2,028 sf 100.00% Impervious Runoff Depth>8.54"
Tc=5.0 min CN=98 Runoff=0.40 cfs 1,443 cf

Subcatchment 2S: EXISTING PAVEMENT Runoff Area=1,164 sf 100.00% Impervious Runoff Depth>8.54"
Tc=5.0 min CN=98 Runoff=0.23 cfs 828 cf

Subcatchment 3S: EXISTING LANDSCAPE Runoff Area=9,178 sf 0.00% Impervious Runoff Depth>6.36"
Tc=5.0 min CN=80 Runoff=1.55 cfs 4,861 cf

Link 4L: EX-100YR Inflow=2.18 cfs 7,132 cf
Primary=2.18 cfs 7,132 cf

Total Runoff Area = 12,370 sf Runoff Volume = 7,132 cf Average Runoff Depth = 6.92"
74.20% Pervious = 9,178 sf 25.80% Impervious = 3,192 sf

Summary for Subcatchment 1S: EXISTING ROOF AREA

[49] Hint: Tc<2dt may require smaller dt

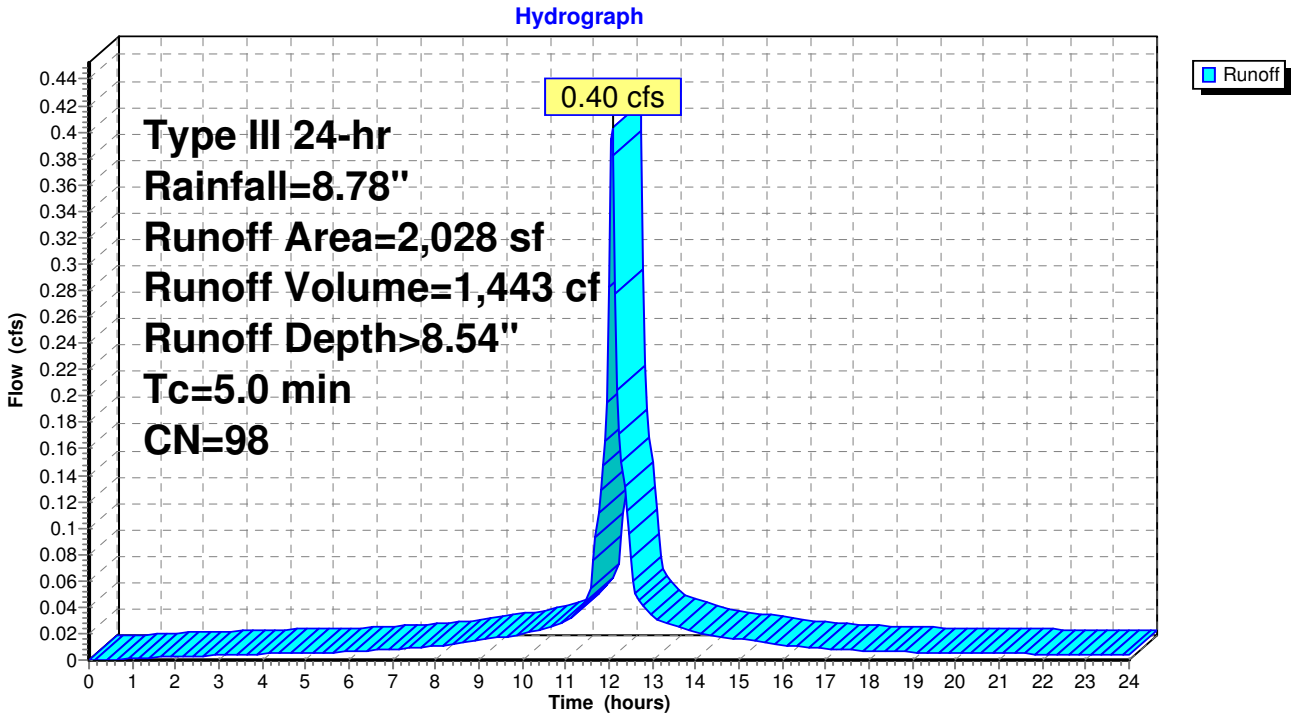
Runoff = 0.40 cfs @ 12.07 hrs, Volume= 1,443 cf, Depth> 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
2,028	98	Roofs, HSG D
2,028		100.00% Impervious Area

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

Subcatchment 1S: EXISTING ROOF AREA



Summary for Subcatchment 2S: EXISTING PAVEMENT AREA

[49] Hint: Tc<2dt may require smaller dt

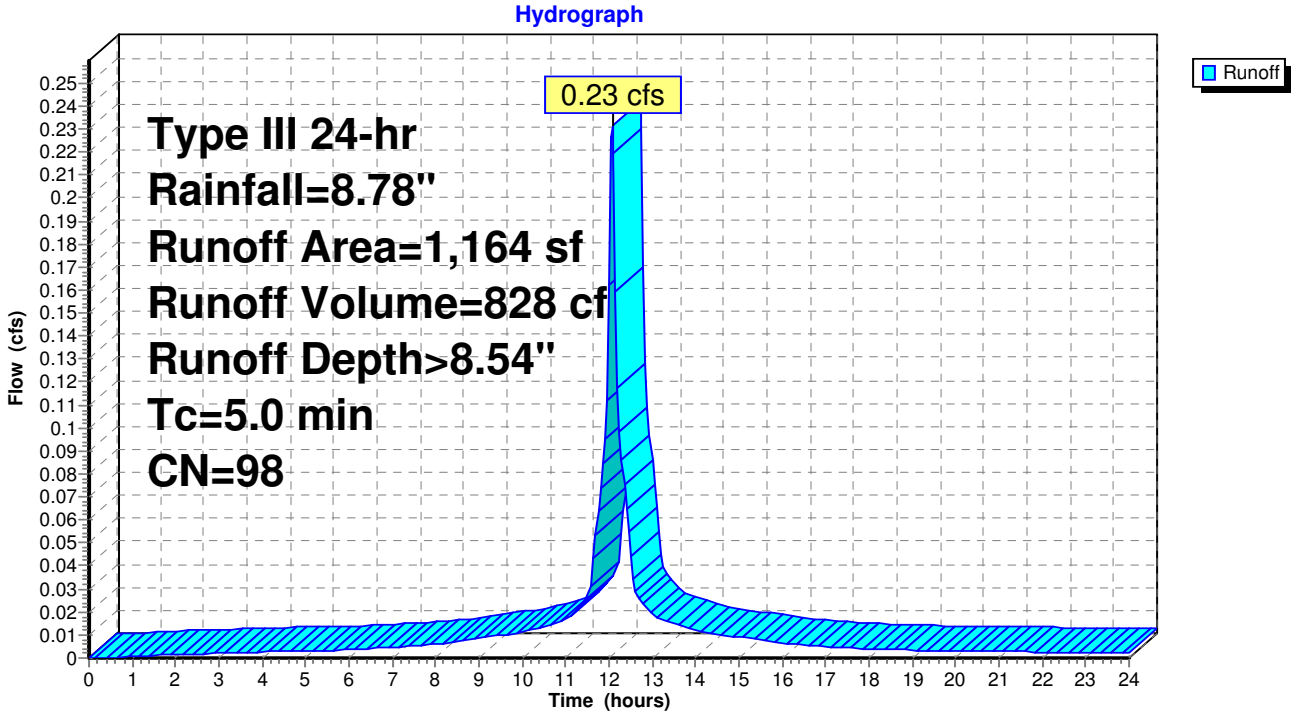
Runoff = 0.23 cfs @ 12.07 hrs, Volume= 828 cf, Depth> 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
1,164	98	Paved parking, HSG D
1,164		100.00% Impervious Area

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

Subcatchment 2S: EXISTING PAVEMENT AREA



Summary for Subcatchment 3S: EXISTING LANDSCAPE AREA

[49] Hint: Tc<2dt may require smaller dt

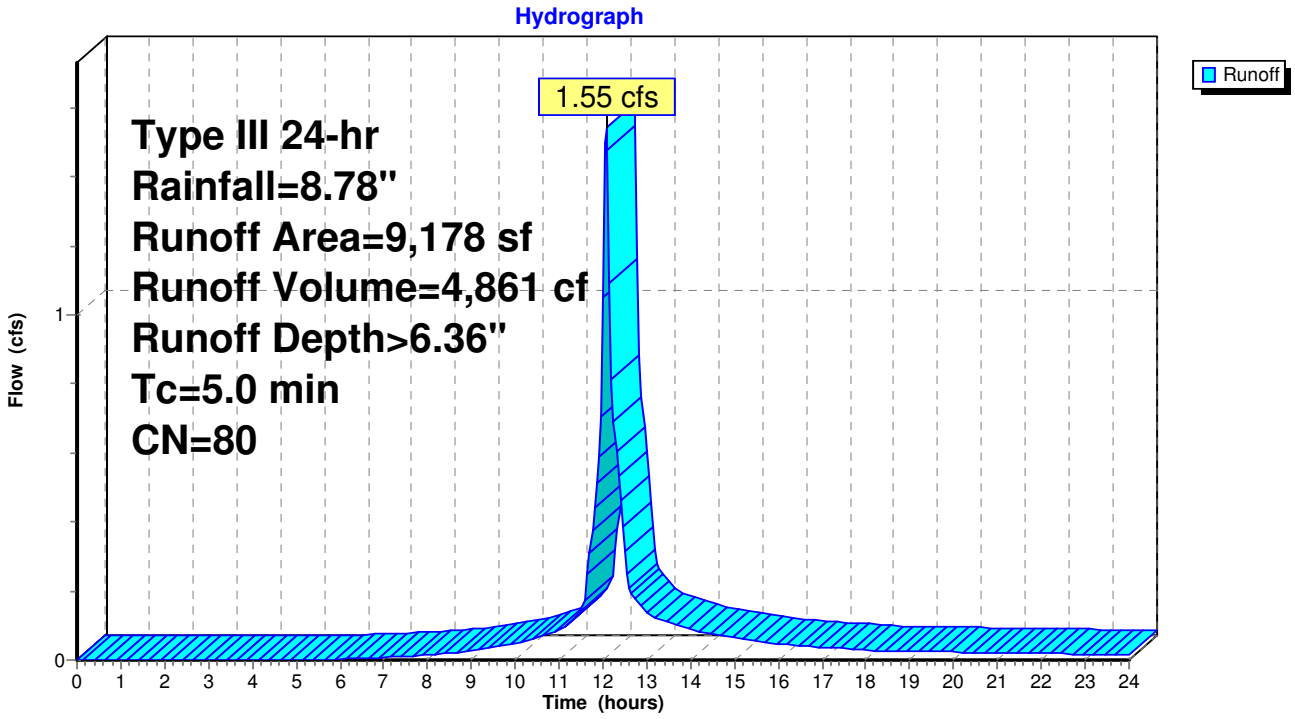
Runoff = 1.55 cfs @ 12.07 hrs, Volume= 4,861 cf, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
9,178	80	>75% Grass cover, Good, HSG D
9,178		100.00% Pervious Area

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

Subcatchment 3S: EXISTING LANDSCAPE AREA

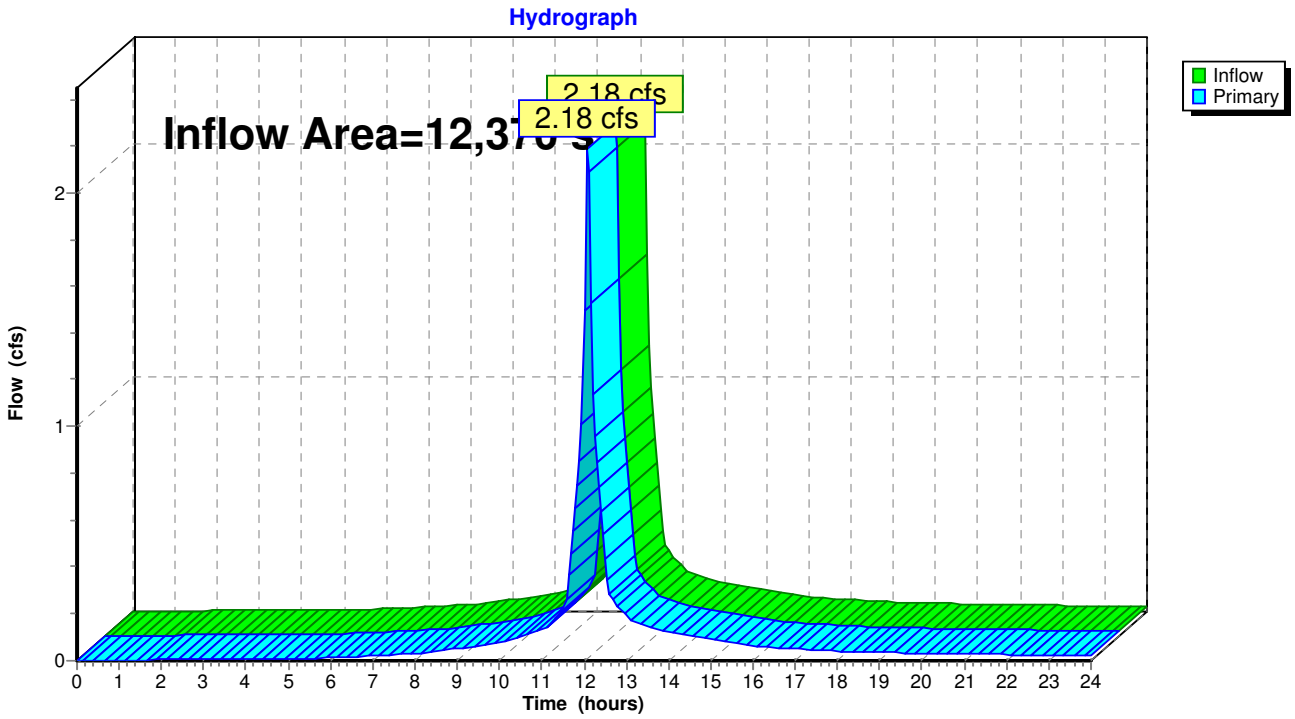


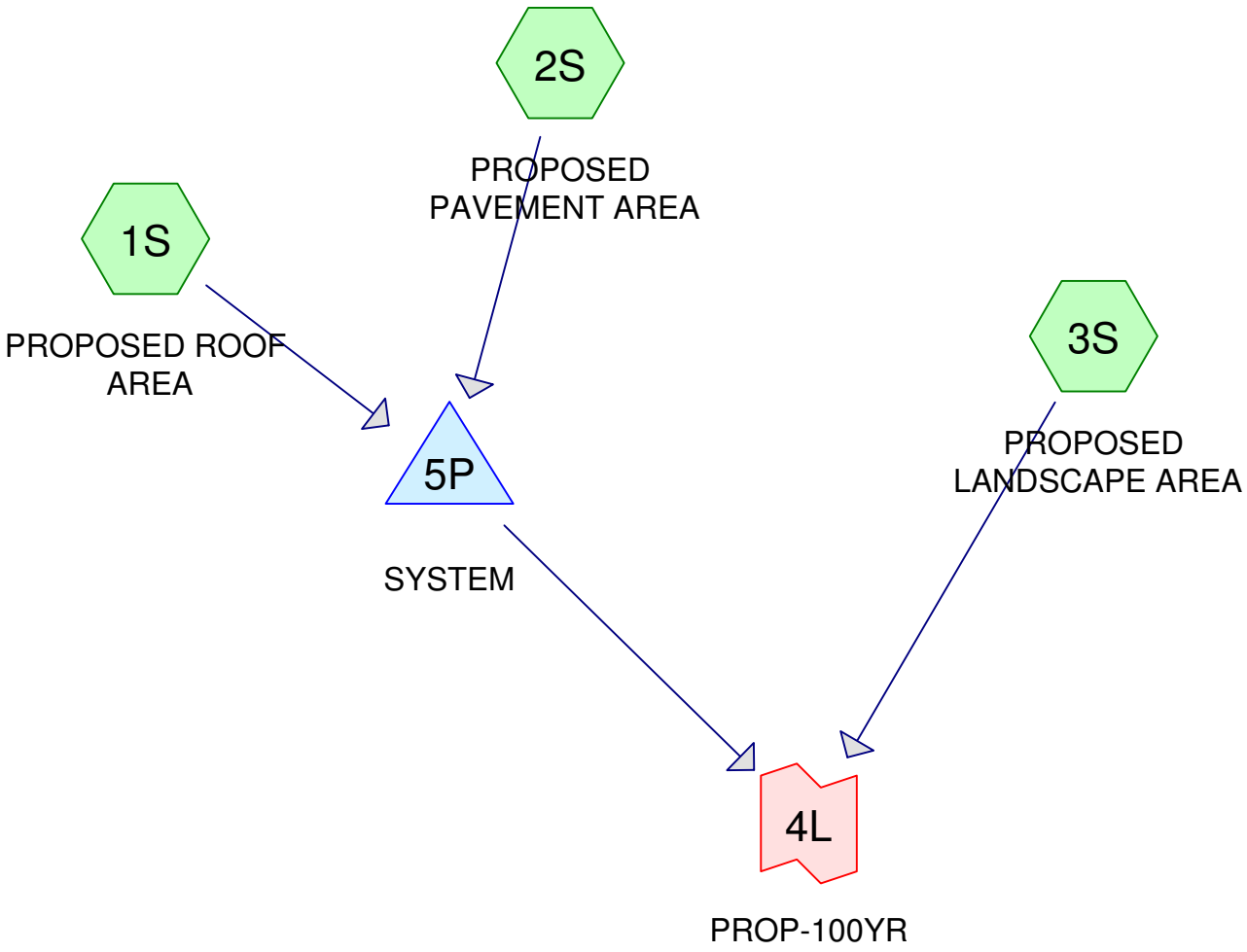
Summary for Link 4L: EX-100YR

Inflow Area = 12,370 sf, 25.80% Impervious, Inflow Depth > 6.92"
Inflow = 2.18 cfs @ 12.07 hrs, Volume= 7,132 cf
Primary = 2.18 cfs @ 12.07 hrs, Volume= 7,132 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 4L: EX-100YR





Subcat Reach Pond Link

Routing Diagram for 100YR-PROP
Prepared by {enter your company name here}, Printed 1/1/2018

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
7,865	80	>75% Grass cover, Good, HSG D (3S)
1,039	98	Paved parking, HSG D (2S)
3,466	98	Roofs, HSG D (1S)
12,370	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
12,370	HSG D	1S, 2S, 3S
0	Other	
12,370		**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	Sub Num
0	0	0	7,865	0	7,865	>75% Grass cover, Good	
0	0	0	1,039	0	1,039	Paved parking	
0	0	0	3,466	0	3,466	Roofs	
0	**0**	**0**	**12,370**	**0**	**12,370**	**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	5P	47.00	43.00	34.5	0.1159	0.010	8.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PROPOSED ROOF Runoff Area=3,466 sf 100.00% Impervious Runoff Depth>8.54"
Tc=5.0 min CN=98 Runoff=0.69 cfs 2,465 cf

Subcatchment 2S: PROPOSED Runoff Area=1,039 sf 100.00% Impervious Runoff Depth>8.54"
Tc=5.0 min CN=98 Runoff=0.21 cfs 739 cf

Subcatchment 3S: PROPOSED LANDSCAPE Runoff Area=7,865 sf 0.00% Impervious Runoff Depth>6.36"
Tc=5.0 min CN=80 Runoff=1.33 cfs 4,166 cf

Pond 5P: SYSTEM Peak Elev=47.78' Storage=699 cf Inflow=0.90 cfs 3,204 cf
Discarded=0.00 cfs 12 cf Primary=0.84 cfs 2,589 cf Outflow=0.84 cfs 2,600 cf

Link 4L: PROP-100YR Inflow=2.14 cfs 6,754 cf
Primary=2.14 cfs 6,754 cf

Total Runoff Area = 12,370 sf Runoff Volume = 7,370 cf Average Runoff Depth = 7.15"
63.58% Pervious = 7,865 sf 36.42% Impervious = 4,505 sf

Summary for Subcatchment 1S: PROPOSED ROOF AREA

[49] Hint: Tc<2dt may require smaller dt

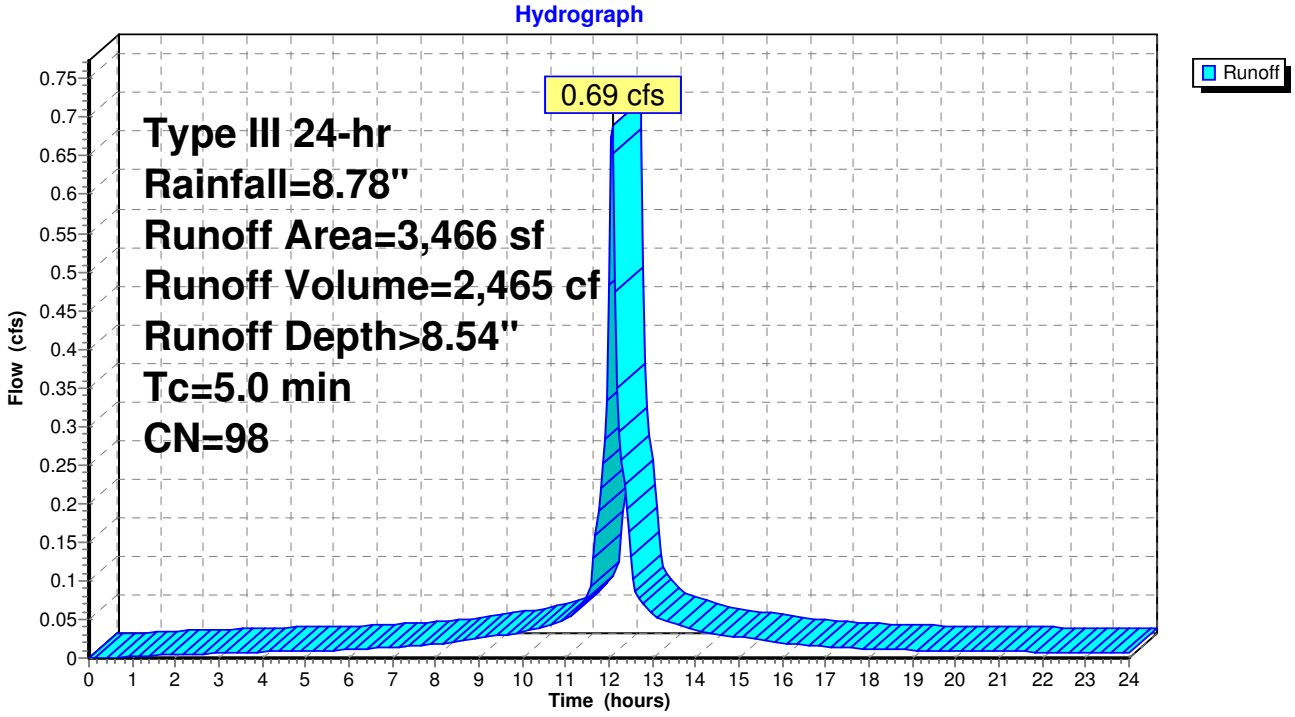
Runoff = 0.69 cfs @ 12.07 hrs, Volume= 2,465 cf, Depth> 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
3,466	98	Roofs, HSG D
3,466		100.00% Impervious Area

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

Subcatchment 1S: PROPOSED ROOF AREA



Summary for Subcatchment 2S: PROPOSED PAVEMENT AREA

[49] Hint: Tc<2dt may require smaller dt

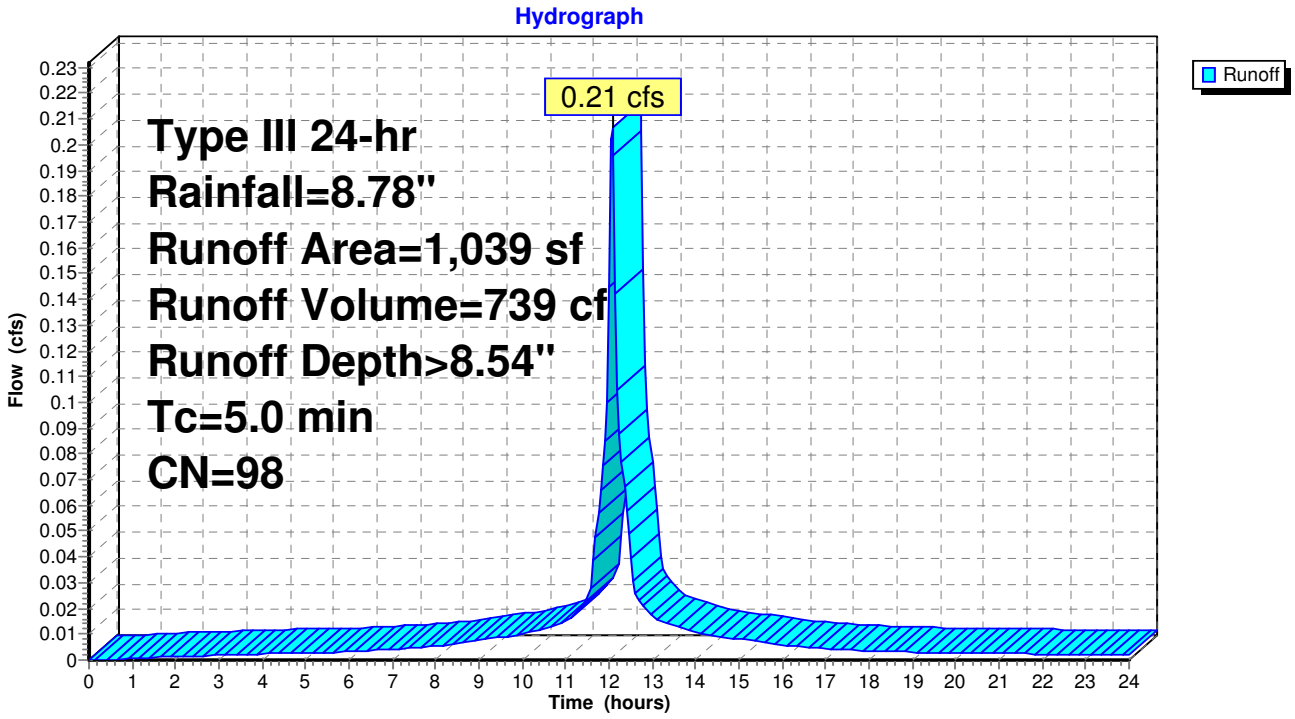
Runoff = 0.21 cfs @ 12.07 hrs, Volume= 739 cf, Depth> 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
1,039	98	Paved parking, HSG D
1,039		100.00% Impervious Area

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

Subcatchment 2S: PROPOSED PAVEMENT AREA



Summary for Subcatchment 3S: PROPOSED LANDSCAPE AREA

[49] Hint: Tc<2dt may require smaller dt

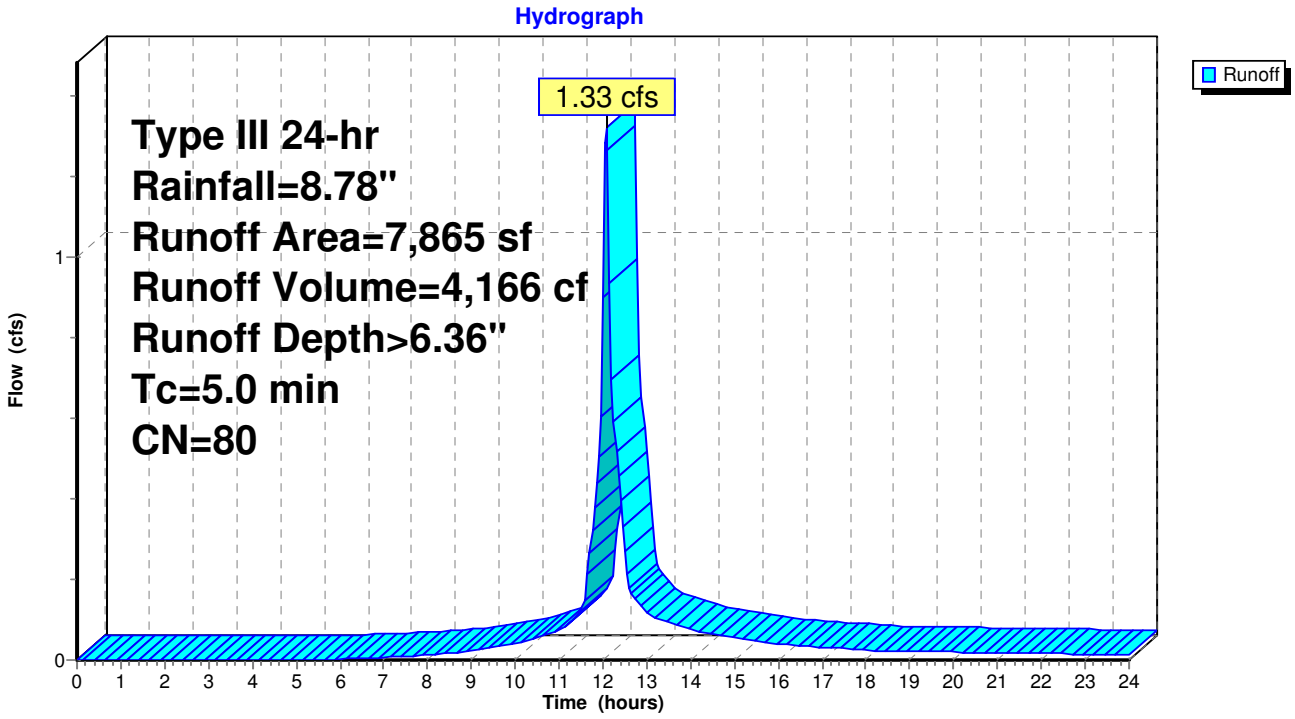
Runoff = 1.33 cfs @ 12.07 hrs, Volume= 4,166 cf, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
7,865	80	>75% Grass cover, Good, HSG D
7,865		100.00% Pervious Area

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

Subcatchment 3S: PROPOSED LANDSCAPE AREA



Summary for Pond 5P: SYSTEM

Inflow Area = 4,505 sf,100.00% Impervious, Inflow Depth > 8.54"
Inflow = 0.90 cfs @ 12.07 hrs, Volume= 3,204 cf
Outflow = 0.84 cfs @ 12.10 hrs, Volume= 2,600 cf, Atten= 6%, Lag= 1.8 min
Discarded = 0.00 cfs @ 1.35 hrs, Volume= 12 cf
Primary = 0.84 cfs @ 12.10 hrs, Volume= 2,589 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 47.78' @ 12.10 hrs Surf.Area= 308 sf Storage= 699 cf

Plug-Flow detention time= 145.6 min calculated for 2,600 cf (81% of inflow)
Center-of-Mass det. time= 70.3 min (809.2 - 738.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	43.00'	542 cf	**7.00'W x 44.00'L x 5.00'H Field A** 1,540 cf Overall - 184 cf Embedded = 1,356 cf x 40.0% Voids
#2A	45.00'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		726 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	43.00'	**0.020 in/hr Exfiltration over Horizontal area**
#2	Primary	47.00'	**8.0" Round Culvert** L= 34.5' Ke= 1.000 Inlet / Outlet Invert= 47.00' / 43.00' S= 0.1159 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Discarded OutFlow Max=0.00 cfs @ 1.35 hrs HW=43.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.84 cfs @ 12.10 hrs HW=47.78' (Free Discharge)
2=Culvert (Inlet Controls 0.84 cfs @ 2.41 fps)

Pond 5P: SYSTEM - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

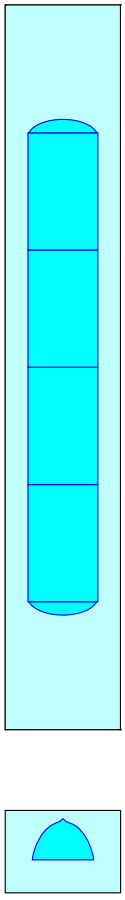
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +83.4" End Stone x 2 = 44.00' Base Length
1 Rows x 51.0" Wide + 16.5" Side Stone x 2 = 7.00' Base Width
24.0" Base + 30.0" Chamber Height + 6.0" Cover = 5.00' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

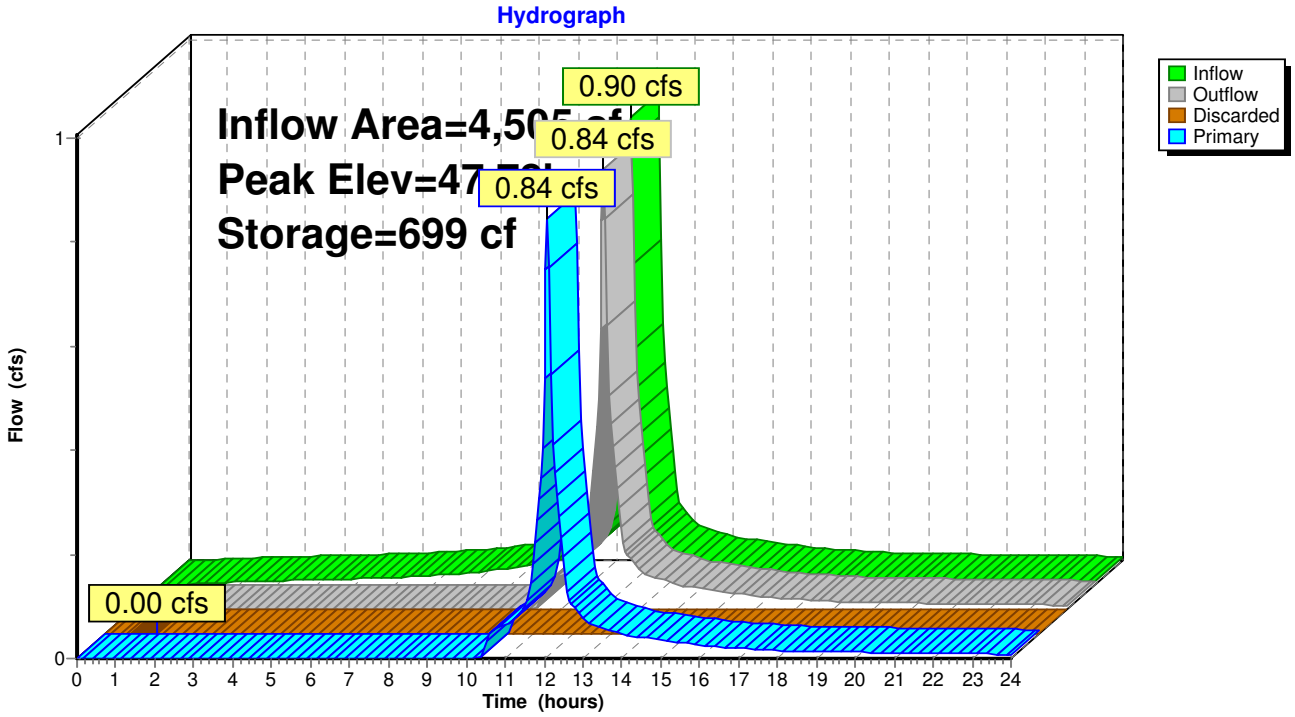
1,539.9 cf Field - 183.8 cf Chambers = 1,356.1 cf Stone x 40.0% Voids = 542.4 cf Stone Storage

Chamber Storage + Stone Storage = 726.2 cf = 0.017 af
Overall Storage Efficiency = 47.2%
Overall System Size = 44.00' x 7.00' x 5.00'

4 Chambers
57.0 cy Field
50.2 cy Stone



Pond 5P: SYSTEM

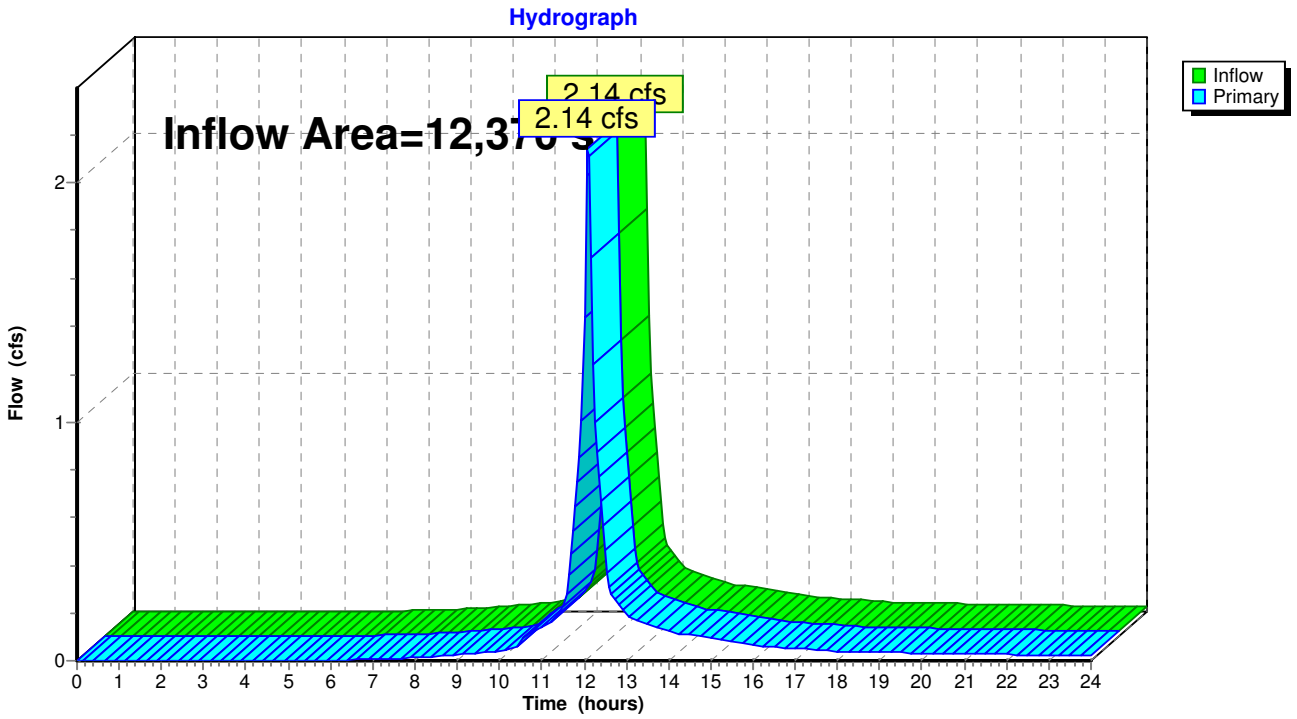


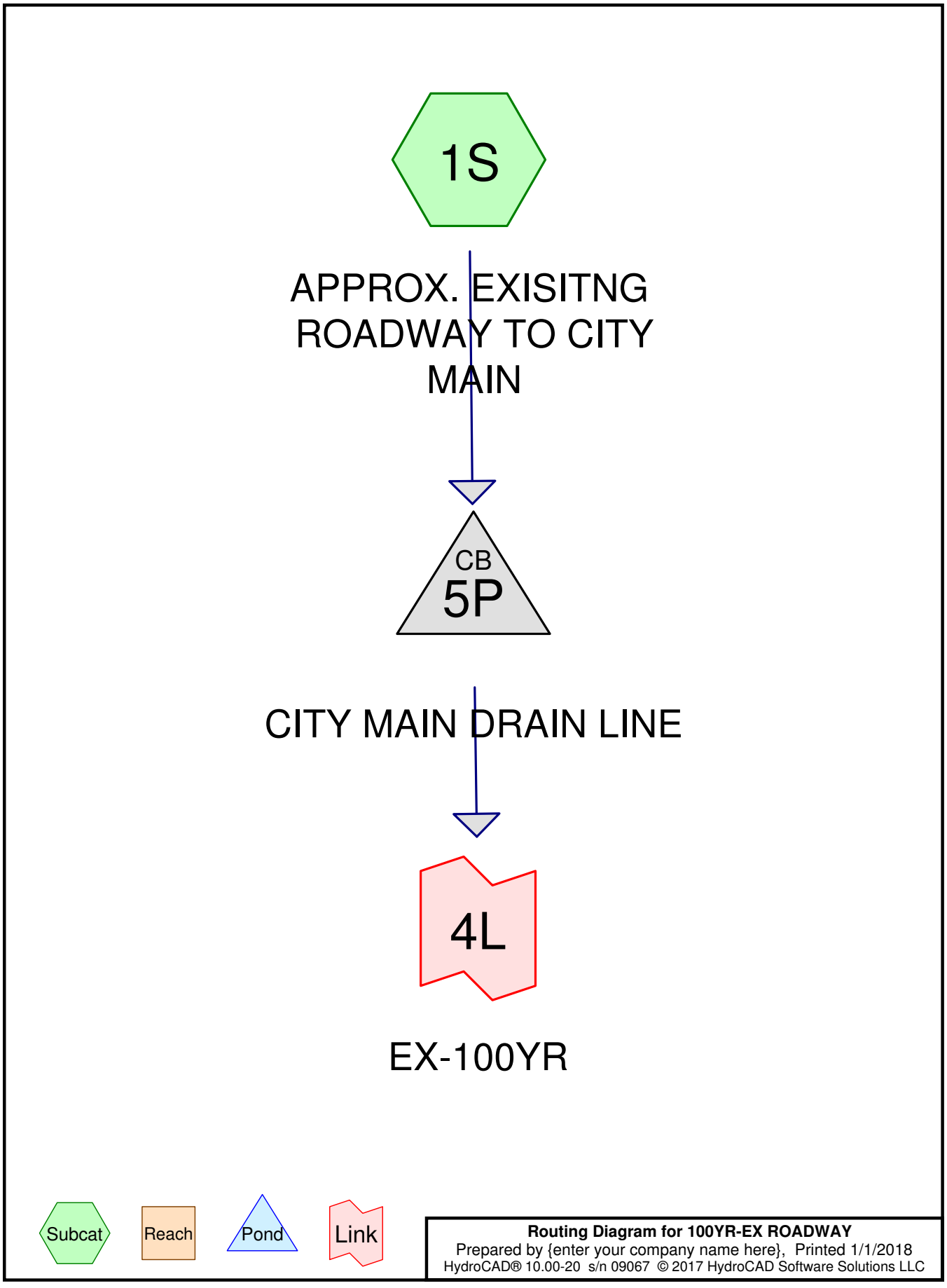
Summary for Link 4L: PROP-100YR

Inflow Area = 12,370 sf, 36.42% Impervious, Inflow Depth > 6.55"
Inflow = 2.14 cfs @ 12.08 hrs, Volume= 6,754 cf
Primary = 2.14 cfs @ 12.08 hrs, Volume= 6,754 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 4L: PROP-100YR





Routing Diagram for 100YR-EX ROADWAY
Prepared by {enter your company name here}, Printed 1/1/2018

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
7,032	98	Roofs, HSG D (1S)
7,032	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
7,032	HSG D	1S
0	Other	
7,032		**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	Subcatchment Numbers
0	0	0	7,032	0	7,032	Roofs	1S
0	**0**	**0**	**7,032**	**0**	**7,032**	**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	5P	41.42	39.15	84.3	0.0269	0.011	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: APPROX. EXISITNG Runoff Area=7,032 sf 100.00% Impervious Runoff Depth>8.54"
Tc=5.0 min CN=98 Runoff=1.40 cfs 5,002 cf

Pond 5P: CITY MAIN DRAIN LINE Peak Elev=42.17' Inflow=1.40 cfs 5,002 cf
12.0" Round Culvert n=0.011 L=84.3' S=0.0269 '/' Outflow=1.40 cfs 5,002 cf

Link 4L: EX-100YR Inflow=1.40 cfs 5,002 cf
Primary=1.40 cfs 5,002 cf

Total Runoff Area = 7,032 sf Runoff Volume = 5,002 cf Average Runoff Depth = 8.54"
0.00% Pervious = 0 sf 100.00% Impervious = 7,032 sf

Summary for Subcatchment 1S: APPROX. EXISITNG ROADWAY TO CITY MAIN

[49] Hint: Tc<2dt may require smaller dt

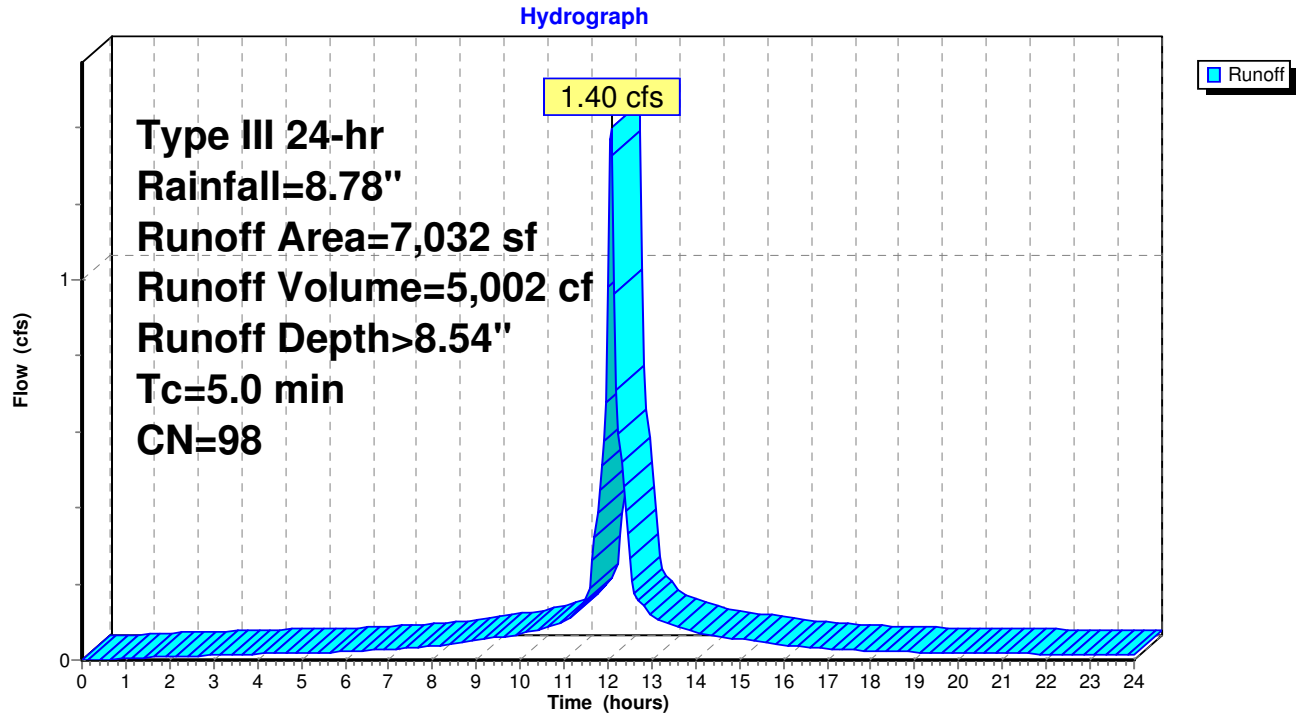
Runoff = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf, Depth> 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
7,032	98	Roofs, HSG D
7,032		100.00% Impervious Area

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

Subcatchment 1S: APPROX. EXISITNG ROADWAY TO CITY MAIN



Summary for Pond 5P: CITY MAIN DRAIN LINE

[57] Hint: Peaked at 42.17' (Flood elevation advised)

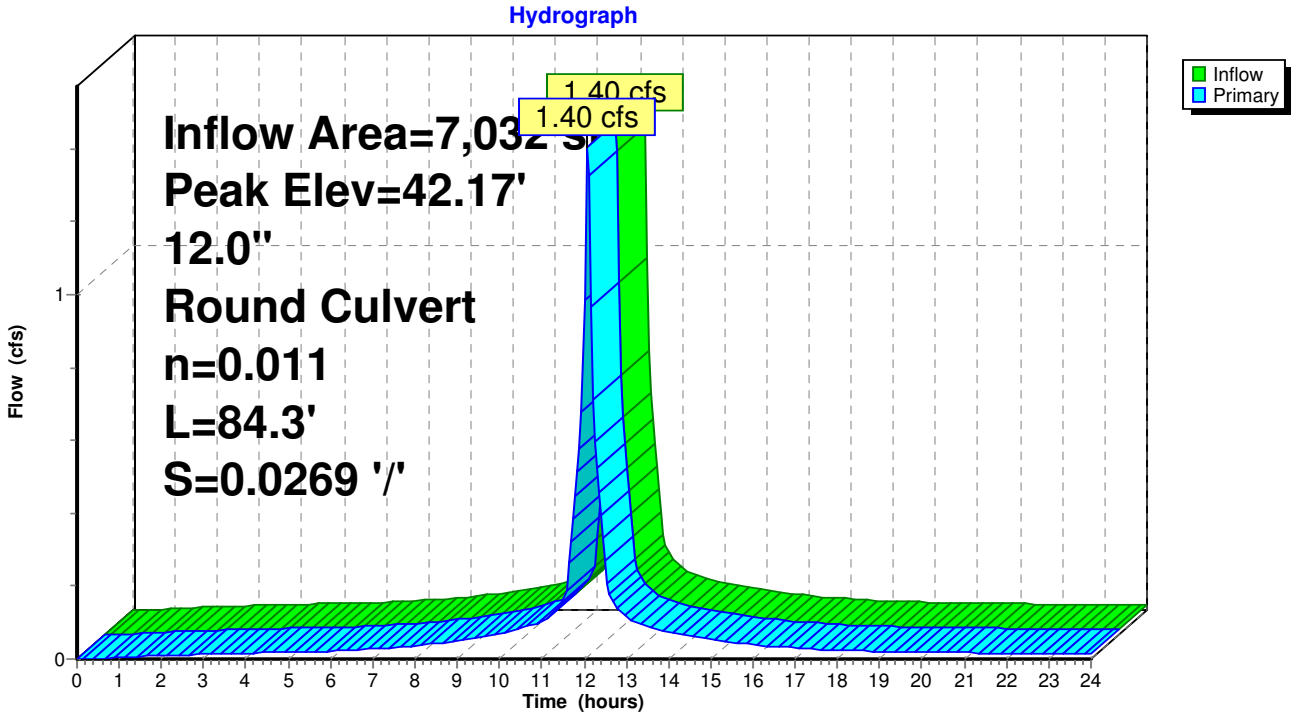
Inflow Area = 7,032 sf,100.00% Impervious, Inflow Depth > 8.54"
Inflow = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf
Outflow = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 42.17' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	41.42'	**12.0" Round Culvert** L= 84.3' Ke= 1.000 Inlet / Outlet Invert= 41.42' / 39.15' S= 0.0269 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=1.35 cfs @ 12.07 hrs HW=42.15' (Free Discharge)
1=Culvert (Inlet Controls 1.35 cfs @ 2.19 fps)

Pond 5P: CITY MAIN DRAIN LINE

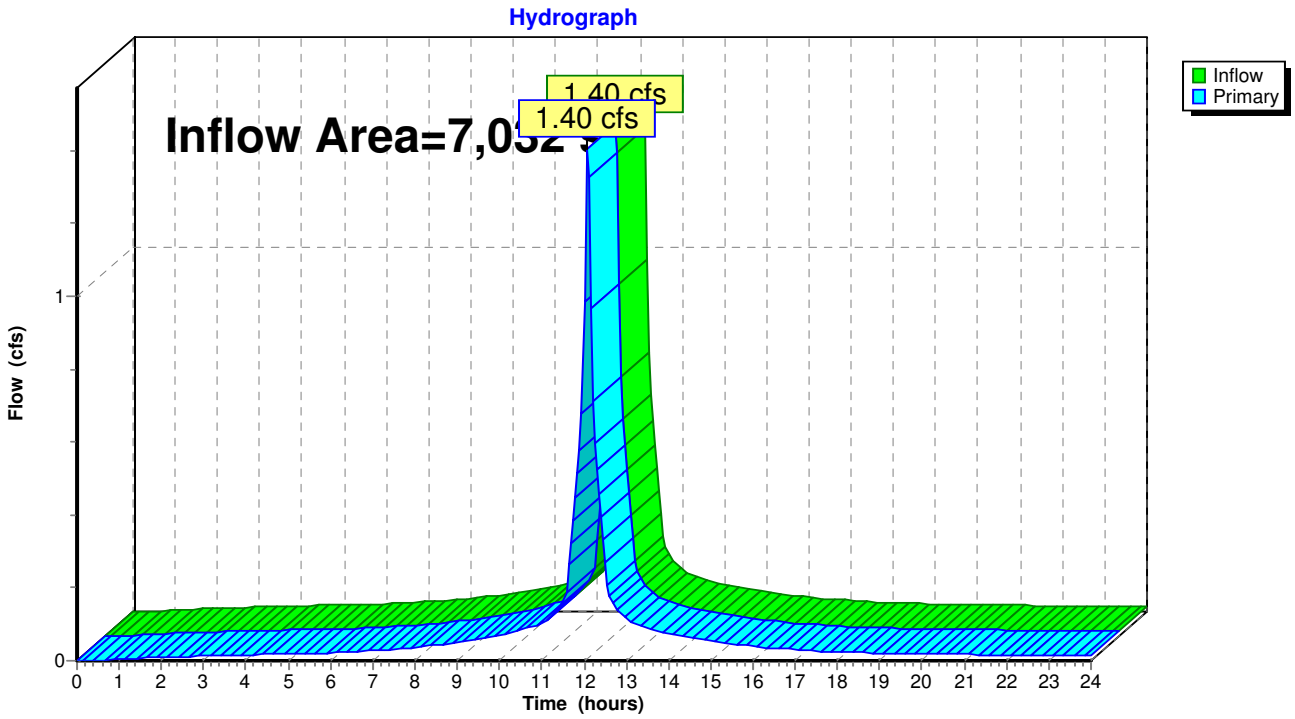


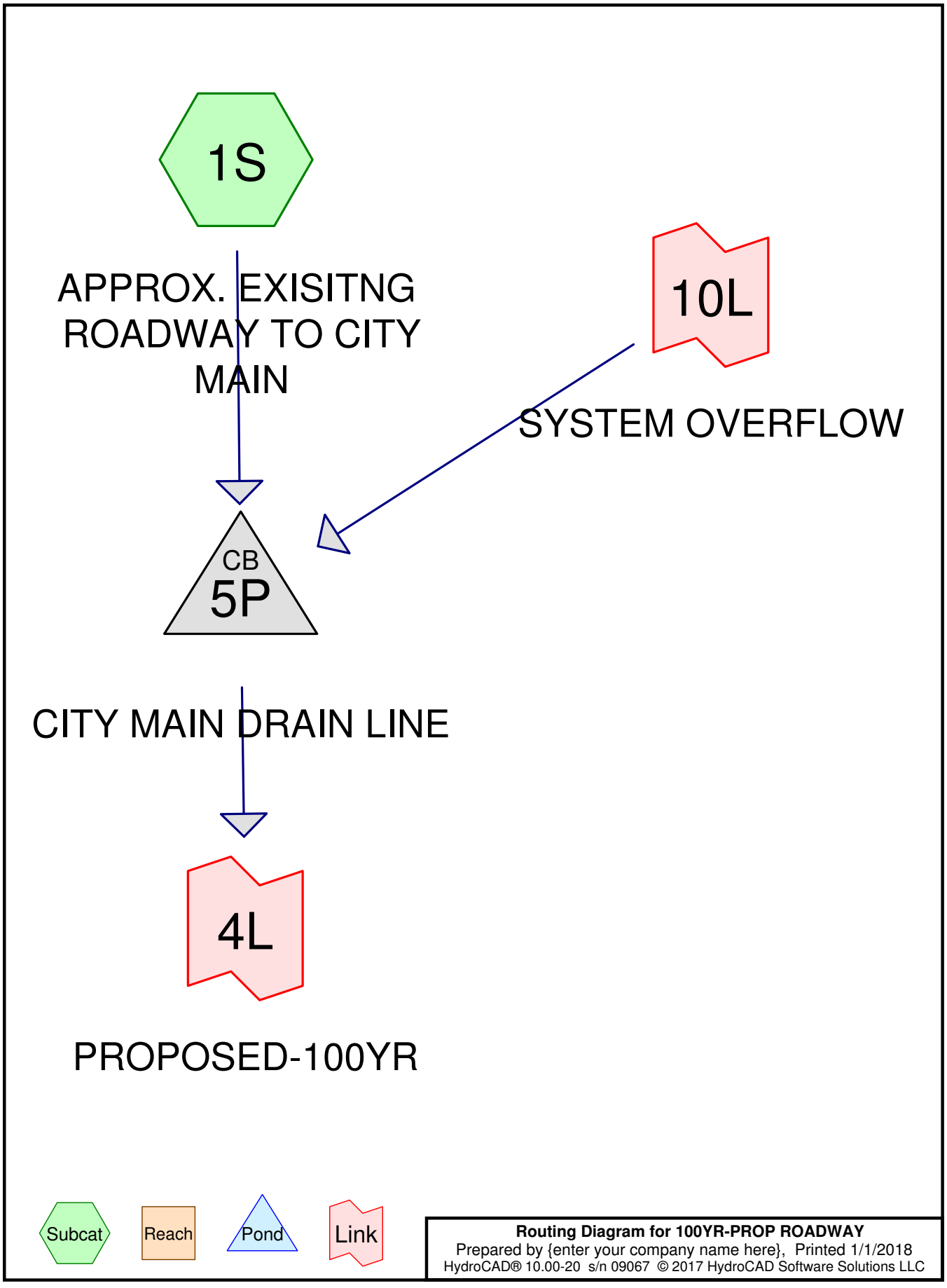
Summary for Link 4L: EX-100YR

Inflow Area = 7,032 sf,100.00% Impervious, Inflow Depth > 8.54"
Inflow = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf
Primary = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 4L: EX-100YR





Routing Diagram for 100YR-PROP ROADWAY
Prepared by {enter your company name here}, Printed 1/1/2018

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
7,032	98	Roofs, HSG D (1S)
7,032	**98**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
7,032	HSG D	1S
0	Other	
7,032		**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	Subcatchment Numbers
0	0	0	7,032	0	7,032	Roofs	1S
0	**0**	**0**	**7,032**	**0**	**7,032**	**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	5P	41.42	39.15	84.3	0.0269	0.011	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: APPROX. EXISITNG Runoff Area=7,032 sf 100.00% Impervious Runoff Depth>8.54"
Tc=5.0 min CN=98 Runoff=1.40 cfs 5,002 cf

Pond 5P: CITY MAIN DRAIN LINE Peak Elev=42.52' Inflow=2.21 cfs 7,591 cf
12.0" Round Culvert n=0.011 L=84.3' S=0.0269 '/' Outflow=2.21 cfs 7,591 cf

Link 4L: PROPOSED-100YR Inflow=2.21 cfs 7,591 cf
Primary=2.21 cfs 7,591 cf

Link 10L: SYSTEM Primary Outflow Imported from 100YR-PROP~Pond 5P.hce Inflow=0.84 cfs 2,589 cf
Area= 4,505 sf 100.00% Imperv. Primary=0.84 cfs 2,589 cf

Total Runoff Area = 7,032 sf Runoff Volume = 5,002 cf Average Runoff Depth = 8.54"
0.00% Pervious = 0 sf 100.00% Impervious = 7,032 sf

Summary for Subcatchment 1S: APPROX. EXISITNG ROADWAY TO CITY MAIN

[49] Hint: Tc<2dt may require smaller dt

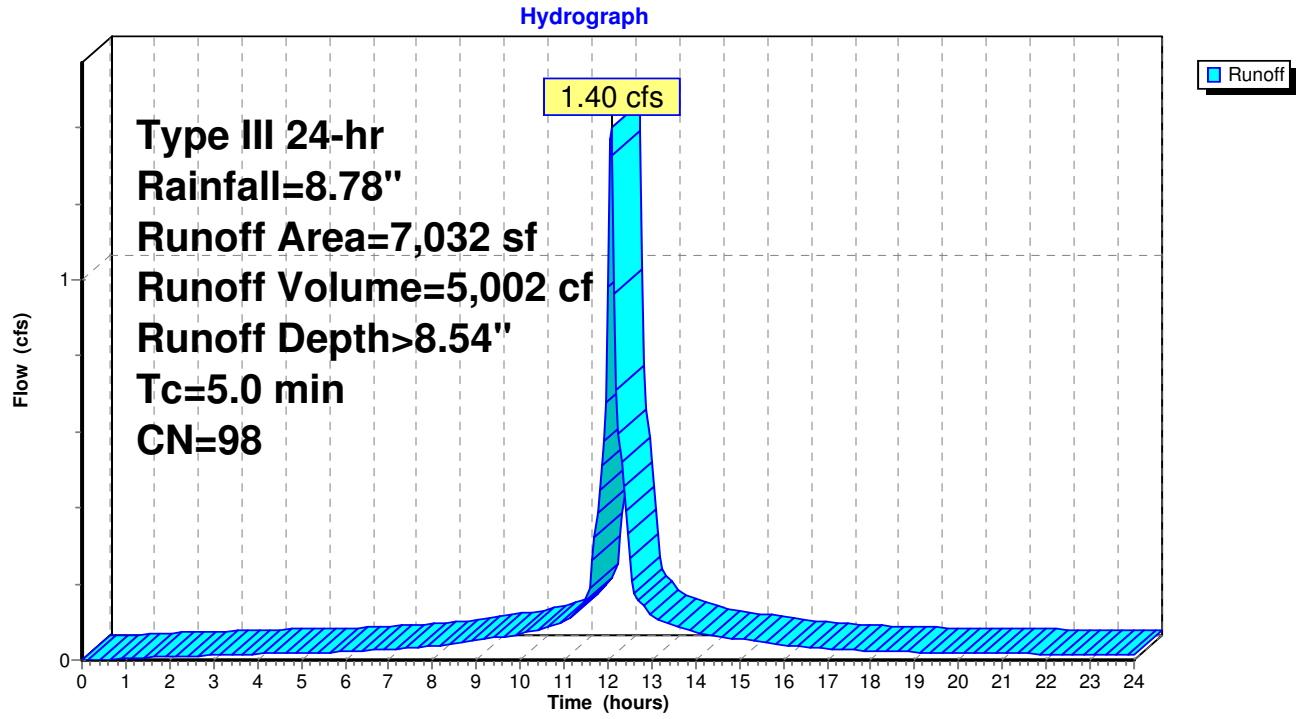
Runoff = 1.40 cfs @ 12.07 hrs, Volume= 5,002 cf, Depth> 8.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr Rainfall=8.78"

Area (sf)	CN	Description
7,032	98	Roofs, HSG D
7,032		100.00% Impervious Area

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

Subcatchment 1S: APPROX. EXISITNG ROADWAY TO CITY MAIN



Summary for Pond 5P: CITY MAIN DRAIN LINE

[57] Hint: Peaked at 42.52' (Flood elevation advised)

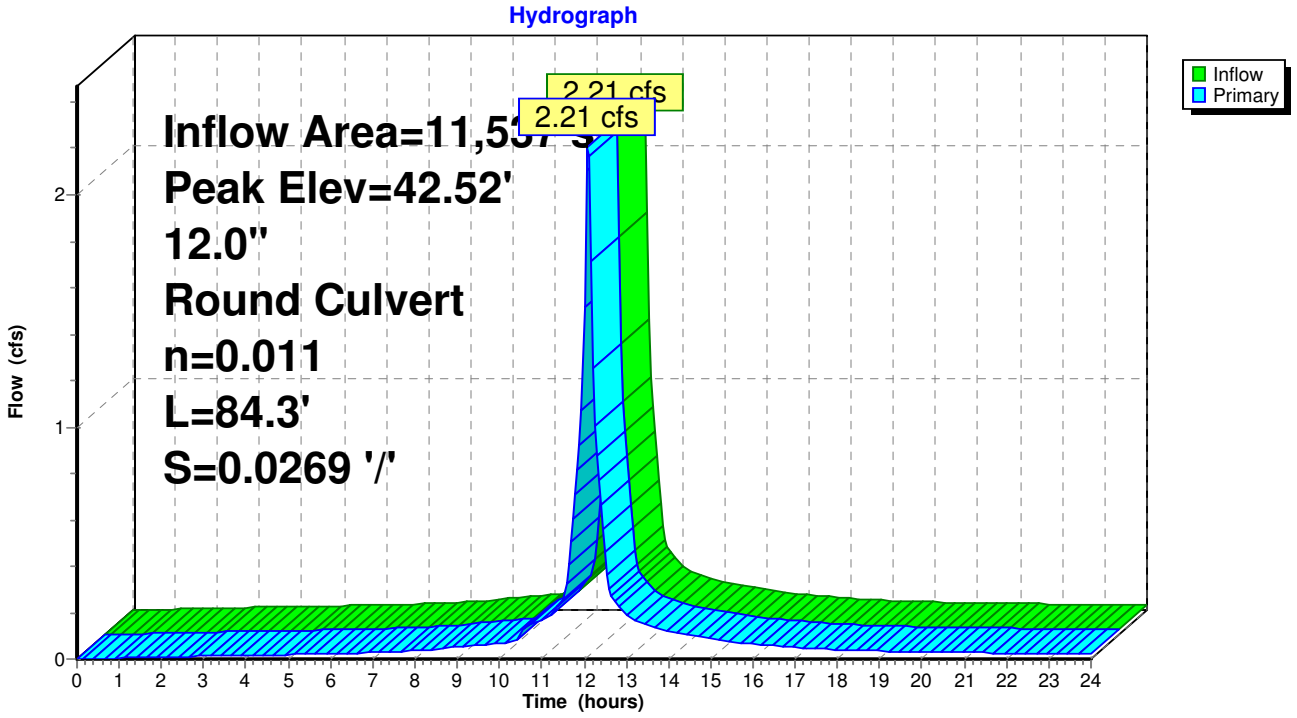
Inflow Area =	11,537 sf,100.00% Impervious,	Inflow Depth >	7.90"		
Inflow =	2.21 cfs @	12.08 hrs,	Volume=	7,591 cf	
Outflow =	2.21 cfs @	12.08 hrs,	Volume=	7,591 cf,	Atten= 0%, Lag= 0.0 min
Primary =	2.21 cfs @	12.08 hrs,	Volume=	7,591 cf	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 42.52' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	41.42'	**12.0" Round Culvert** L= 84.3' Ke= 1.000 Inlet / Outlet Invert= 41.42' / 39.15' S= 0.0269 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

Primary OutFlow Max=2.15 cfs @ 12.08 hrs HW=42.49' (Free Discharge)
1=Culvert (Inlet Controls 2.15 cfs @ 2.73 fps)

Pond 5P: CITY MAIN DRAIN LINE

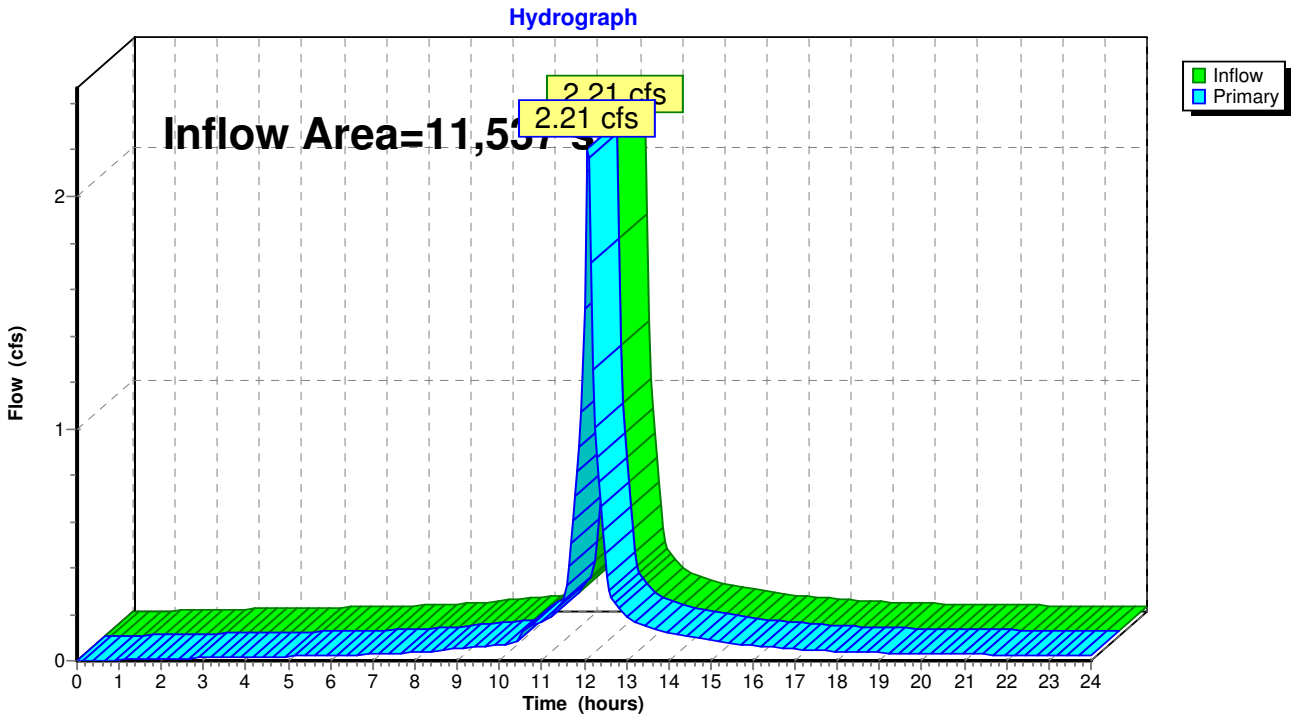


Summary for Link 4L: PROPOSED-100YR

Inflow Area = 11,537 sf,100.00% Impervious, Inflow Depth > 7.90"
Inflow = 2.21 cfs @ 12.08 hrs, Volume= 7,591 cf
Primary = 2.21 cfs @ 12.08 hrs, Volume= 7,591 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link 4L: PROPOSED-100YR



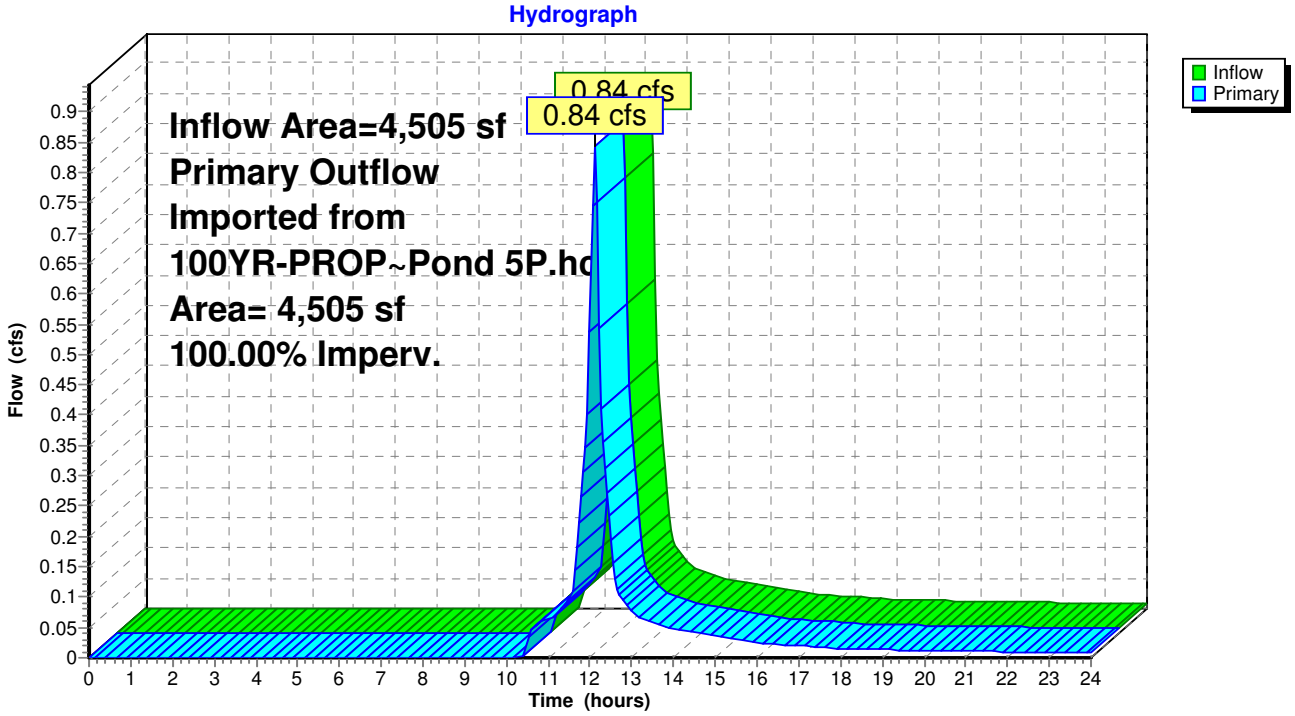
Summary for Link 10L: SYSTEM OVERFLOW

Inflow Area = 4,505 sf,100.00% Impervious, Inflow Depth > 6.90"
Inflow = 0.84 cfs @ 12.10 hrs, Volume= 2,589 cf
Primary = 0.84 cfs @ 12.10 hrs, Volume= 2,589 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Primary Outflow Imported from 100YR-PROP~Pond 5P.hce

Link 10L: SYSTEM OVERFLOW



Appendix B – Storm Water Operations & Maintenance Plan

Introduction

The following Storm water Operations & Maintenance plan is for 19-21 Orchard Street, Newton, MA. All erosion and sediment control measures to be used are to be constructed and installed according to the 'Massachusetts Erosion and Sediment Control Guidelines for Urban and Sub-Urban Areas.'

All erosion and sediment control measures must be installed prior to commencement of any work. All sediment and erosion control measures shall remain in place until the entire site has been stabilized. The site is deemed stabilized when all landscaped areas have been loamed and seeded with vegetation having had the chance to establish itself. Any proposed paved areas shall have its subbase installed prior to the removal of these control measures.

Property Owners:
Responsible Party: Current or future owners.

Operations & Maintenance

The following operations and maintenance plan has been developed in order preserve the drainage infrastructure that will be constructed and to ensure proper the drainage and infiltration system continues to function as designed.

- **Before & During Construction:**
    - Significant efforts shall be made to only disturb the minimum amount of area necessary to reduce potential erosion and sediment runoff. The control of dust in disturbed areas shall consist of at the least, wetting of disturbed soil.
    - A stabilized construction entrance shall be installed to reduce the tracking of material onto the main road, in if necessary, a wheel wash station put in place.
    - Hay wattles shall be installed per the site plan to prevent sediment from being washed off site.
    - All drainage structures shall be protected by filter fabric (or equal) to prevent sedimentation from entering the drainage system during the construction period.
    - Driveway and pavement areas shall be swept to remove sediments prior to introduction into the storm water management system.
    - Drainage structures shall be inspected daily, and cleaned as necessary of all sedimentation and construction materials during the construction period.
    - The contractor is required to contact the engineer of record for drainage system inspection at least 72 hours prior to backfilling in order to receive inspection signoff.

- **Post Construction:**
    - Once the construction is completed, it is the owner's responsibility to maintain the items outlined below to ensure the efficiency and integrity of the drainage systems.
        - All drainage structures and pipes shall be inspected on a semi-annual basis. The inspector shall take note of any debris/sediment/clogging and shall document the condition of each structure. Based upon the observed condition, the inspector shall make recommendations if any further action is required.

        - All drainage structures, including manholes and catch basins, shall be cleaned of all sand, debris, and sediment on at least a semi-annual basis, or when the structure is approximately 50% full, whichever comes first. Material shall be disposed of off-site according to local regulations.