DRAINAGE CALCULATIONS AND STORMWATER MANAGEMENT PLAN

For:

PROPOSED MIXED-USE DEVELOPMENT
ASSESSORS PARCEL MAP 29, BLOCK 329, LOT 9
655 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

Located:

655 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

Submitted to:

TOWN OF WEYMOUTH

Prepared For:

TRINITY GREEN DEVELOPMENT
180 CANTON AVE.
MILTON, MASSACHUSETTS 02186

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January 12, 2021

TABLE OF CONTENTS

Drainage Calculations and Stormwater Management Plan
Washington Street
Weymouth, Massachusetts

Project Summary

The project proponent, Trinity Green Development, proposes to redevelop 655 Washington Street in Weymouth, Massachusetts consisting of one (1) parcel as shown on the Weymouth Assessor's Map 29, Block 329, Lot 9 comprising of approximately 3.73 acres. The site is located entirely within the Limited Business Zoning District (B-1), and the Commercial Corridor Overlay District (CCOD).

The proposed development will consist of the construction of a four-story approximately 240,000 square foot mixed-use building and site improvement which will consist of the construction of bituminous concrete parking and access driveways, installation of subsurface stormwater management systems, utilities, site grading and professional landscaping.

This report contains stormwater runoff calculations for the pre-development and post-development conditions and includes the sizing of the proposed stormwater best management practices (BMPs). The proposed and existing site conditions are illustrated on the project *site plans* entitled "Site Development Plan, Proposed Mixed-Use Development, (Assessor's Map 29, Block 329, Lot 9, Washington Street, Weymouth, Massachusetts", prepared by McKenzie Engineering Group, Inc. dated January 12, 2021.

Refer to Figure 1- USGS Locus Map for the location of the parcel.

Pre-Development Condition

The parcel is currently developed comprised of The Boston Motel and a substantial amount of bituminous concrete pavement and the southern portion of the site being partially wooded. Developed areas slope towards Washington Street (Route 53) at the northeast property line, while wooded areas have naturally sloping terrain towards wetlands at the northwest property line. The topography of the site ranges in elevation from approximately 103 ft. (NAVD 88) south of the site to an elevation of approximately 89 ft. along Washington Street at the northern portion of the site. Portions of runoff emanating from the site flow in a northeasterly direction to the closed drainage system on Washington Street, and northwesterly to the bordering vegetated wetlands. The limit of bordering vegetated wetland resource area on the site was delineated by Environmental Consulting and Restoration, LLC on October 6, 2020. Refer to Appendix E: - Wetland Delineation Report for supporting data.

A stormwater drainage system currently exists on site which captures runoff from the site, runoff from offsite tributary areas, as well as an inlet pipe from the wetlands located at the northwest property line. The on-site drainage system conveys untreated stormwater to the closed drainage system within Washington Street (Route 53).

The site is located within the Zone X of the Flood Insurance Rate Map, as shown on the current FEMA Flood Insurance Rate Map Panel No. 25021C0229E with an effective date of July 17, 2012. Refer to Figure 2 – FEMA Flood Map.

The soil types as identified by the Soil Survey, Norfolk County, MA prepared by the NRCS Soil Conservation Service (NRCS) are classified as 602-Urban Land, 0 to 15 percent slopes with hydrologic soil group (HSG) A; and 653-Udorthents, sandy with hydrologic soil group (HSG) A. Soil testing conducted by McKenzie Engineering Group, Inc. (MEG) on December 23, 2020 identified the soils to be loamy sand (HSG) B.

Refer to Figure 3 - Soil Map for the NRCS delineation of soil types and Appendix E – Soil Testing Results for supporting data.

In the pre- and post- development stormwater analysis, the watershed area analyzed was approximately 4.79 acres consisting of the subject parcel to be developed and offsite tributary areas to the north and south. The watershed consists of two (2) sub-catchments. Refer to Pre-Development Watershed Delineation Plan WS-1 in Appendix A for a delineation of drainage subareas for the pre-development design condition.

The SCS Technical Release 20 (TR-20) and Technical Release 55 (TR-55) method-based program "HydroCAD" was employed to develop pre- and post-development peak flows. Drainage calculations were prepared for the pre-development condition for the 2, 10, 25 and 100-year, Type III storm events. Refer to Appendix A for computer results, soil characteristics, cover descriptions and times of concentrations for all subareas.

Post-Development Condition

The proposed development will consist of the construction of a four-story approximately 240,000 square foot mixed-use building and site improvement which will consist of the construction of bituminous concrete parking and access driveways, installation of subsurface stormwater management systems, utilities, site grading and professional landscaping. The project will access utility infrastructure located in Washington Street, including water, electric, telephone and cable. The stormwater management system has been designed to fully comply with all standards of the Department of Environment Protection's Stormwater Management Regulations.

Watershed areas were analyzed in the post-development condition to design low impact stormwater management facilities to mitigate impacts resulting from developing the property. The objective in designing the proposed drainage facilities for the project was to maintain existing drainage patterns to the extent practicable and to ensure that the post-development rates of runoff are less than pre-development rates at the design points.

Refer to the Post-Development Watershed Plan WS-2 in Appendix B for a delineation of post-development drainage subareas. The design points for the post-development design conditions correspond to those analyzed for the pre-development design condition.

The proposed system utilizes deep sump hooded catch basins, proprietary pre-treatment units and subsurface infiltration chamber systems. The infiltration systems are designed to accommodate peak flows generated by all storms up to and including the 100-year storm event. Refer to site plans for the drainage system design. All BMPs shall be supported by a comprehensive Construction Phase Pollution Prevention and Erosion Control Plan and Post-Development BMP Operation and Maintenance Plan.

Drainage calculations were prepared by employing the SCS TR-20 Methods for the 1, 2, 10, 25 and 100-year, type III storm events. Refer to Appendix B for computer results.

A comparison of the pre-development and post-development peak rates of runoff indicate that the peak rates of runoff for the post-development condition at all Design Points will be less than the pre-development condition for all storm events.

Stormwater Best Management Practices (BMP's)

Treatment stream for the development shall consist of deep sump hooded catch basins a proprietary pre-treatment unit, and subsurface infiltration tank systems to achieve the required removal of at least 80% of the total suspended solids (TSS) and mitigate the anticipated pollutant loading.

Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Erosion and Sedimentation Controls

Compost filter tube (Silt sock) erosion control barriers will be placed at the limit of work prior to the commencement of any construction activity. The integrity of the silt sock will be maintained by periodic inspection and replacement as necessary. The silt sock will remain in place until the first course of pavement has been placed and all side slopes have been loamed and seeded and vegetation has been established. Refer to the Erosion Control details on the Site Development Plans and BMP Operation and Maintenance Plan for proposed erosion control measures to be employed for the project.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

The proposed development will not introduce any new untreated discharges to a wetland area or waters of the Commonwealth of Massachusetts. All discharges from the site will be treated through proposed stormwater quality controls such as deep sump hooded catch basins, pre-treatment structures and subsurface infiltration tank systems including the establishment of proper maintenance procedures.

Standard 2 – Peak Rate Attenuation

In the pre-development and post-development stormwater analysis, the watershed area analyzed was approximately 4.79 acres consisting of the subject parcel to be developed and offsite tributary areas. Refer to Existing Watershed Delineation Plan WS-1 for a delineation of drainage subareas for the pre-development design condition and refer to Post-Development Watershed Delineation Plan WS-2 for a delineation of drainage subareas for the post-development design condition.

Drainage calculations were performed by employing SCS TR-20 methods for the 1, 2, 10, 25, and 100-year Type III storm events. Refer to Appendix A and B for computer results. All drainage structures will be designed employing the Rational Method and the Mass. DPW Design Manual to accommodate peak flows generated by a minimum of a 25-year storm event or a 100-year storm event where applicable. The stormwater management systems were designed to accommodate peak flows generated by a 100-year storm event.

The peak rates of runoff are as follows:

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CFS	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
Design Point 1	*0.00*	*0.00*	*0.13*	0.07	*0.43*	0.22	*1.48*	1.01
Design Point 2	*6.04*	*5.72*	*11.40*	10.91	*15.70*	14.55	*24.57*	22.13

A comparison of the pre-development and post-development peak rates of runoff indicates that the peak rates of runoff for the post-development condition will be less than the pre-development condition for all storm events.

Pre-Development vs. Post-Development Volumes of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CF)	**Prop. (CF)**	**Exist. (CF)**	**Prop. (CF)**	**Exist. (CF)**	**Prop. (CF)**	**Exist. (CF)**	**Prop. (CF)**
Design Point 1	*136*	*78*	*1,175*	501	*2,542*	1,024	*6,410*	4,160
Design Point 2	*23,457*	*12,537*	*43,977*	28,409	*61,049*	42,395	*97,314*	73,769

Standard 3 – Groundwater Recharge

Runoff will be infiltrated by subsurface infiltration tanks, which will meet the Stormwater Guidelines for infiltration:

- Infiltration structures will be a minimum of four (4) feet above seasonal high groundwater.
- Utilize the "Simple Dynamic" method for sizing the storage volume, which takes into account the fact that stormwater is exfiltrating from the infiltration basin at the same time that the basin is filling.
- Hydraulic conductivity is based on soil data from the Geotechnical Report and values developed from Rawls, Brakensiek and Saxton, 1982, Estimation of Soil Water Properties, *Transactions of the American Society of Agricultural Engineers*, vol.25, no. 5.
- Refer to Appendix D for infiltration and drawdown calculations and Appendix E for soil data.

Groundwater Recharge Volume

Infiltration Tank System	Soil Type	Target Depth Factor (F) (in)	Total Impervious Area (sf)	Required Recharge Volume (cf)[1]	Provided Recharge Volume (cf)[2]
	B	0.35	146,706	4,279	
P-1					7,493
P-2					3,253
P-3					2,176
				4,279 (4,702 ADJ.)	**12,922**

1. Required Recharge Volume = Target Depth Factor x Impervious Area / (d+Kt) (Refer to supplemental calculations in Appendix D)
2. Provided Recharge Volume = Volume Provided from Bottom of System to invert of overflow pipe.

Per Standard 3, if stormwater runoff from less than 100% of the site's impervious cover is directed to the BMP intended to infiltrate the Required Recharge Volume, then the storage capacity of the infiltration BMP needs to be increased so that the BMP can capture more of the runoff from the impervious surfaces located with the contributing drainage area. The impervious cover directed towards the infiltration system is 91.00%; therefore, a capture area adjustment was made. Refer to Appendix D for Capture Area Adjustment calculations.

The infiltration tank systems will provide both water quality treatment and recharge. Per Standard 4, Water Quality, the BMP must be sized to treat or hold the Target Volume, the larger of the Required Water Quality Volume and the Required Recharge Volume. The Required Water Quality Volume is based on the half-inch of runoff and the Required Recharge Volume is based on 0.35-inches (Soil Type B); 0.50 inches if greater than 0.35 inches, therefore the Target Volume is the Required Water Quality Volume of 5,563 cubic feet. Refer to Appendix D supplemental calculations.

The proposed subsurface infiltration chambers and infiltration basin has been designed to completely drain within 72 hours. The drawdown analysis is based on the required recharge volume exfiltrating at the Rawls Rates based on the soil textural analysis conducted at the proposed exfiltration location. Refer to Appendix D for calculations.

Standard 4 – Water Quality

The Long-Term Pollution Prevention Plan has been incorporated into the Post-Development Operation and Maintenance Plan. Refer to Appendix F for BMP Operation and Maintenance Plans.

The stormwater management system design calls for the installation of 4'-deep sump catch basins with hooded outlets to collect runoff from the proposed roadways. Stormwater runoff from roadways will then be routed to proprietary treatment devices and/or a sediment forebay followed by infiltration tanks/basins. Removal rates for all paved surfaces are:

Deep Sump Catch Basins	25%
Proprietary Devices	70% (Per MASTEP Performance Evaluation for First Defense Units) (See Appendix D for Sizing and TSS Removal Charts)
Infiltration Tanks/Basins with Pretreatment/Forebay	80%

The stormwater management system will be designed to be in full compliance with the Standards of the DEP Stormwater Management Policy. A treatment stream consisting of deep-sump catch basins with hooded outlets and proprietary devices will ensure that the 44% TSS removal (total suspended solids) is removed prior to discharge to the infiltration facilities and to ensure that 80% TSS removal is accomplished. The proposed treatment stream will renovate the stormwater and improve the water quality by promoting the settlement of sediments and pollutants before runoff is released into the existing drainage system. Refer to Appendix D for TSS Removal Calculation Worksheets.

The Water Quality Volume (WQV) to be treated is equal to the impervious area draining to the water quality device multiplied by one half inch. The table below shows the volume required and provided with the proposed development. Refer to Appendix D for further calculations.

Water Quality Treatment Volume

Basin	Required WQ Volume (cf)	Proposed WQ Volume (cf)	
P-1	1,007	7,493	Subsurface infiltration system with pre-treatment
P-2	2,666	3,253	Subsurface infiltration system with pre-treatment
P-3	1,889	2,176	Subsurface infiltration system with pre-treatment
	5,563	**12,922**	

Standard 5 – Land Use with Higher Potential Pollutant Loads (LUHPPL)

The proposed project does not include land uses with higher potential pollutant loads. Not Applicable.

Standard 6 – Critical Areas

The proposed project does not discharge to any critical areas. Not Applicable.

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

The proposed project is not a redevelopment project. Not Applicable.

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

The project will require a NPDES Construction General Permit but the Stormwater Pollution Prevention Plan (SWPPP) has not been submitted. The SWPPP will be submitted prior to any proposed construction. A Construction Phase BMP Operation and Maintenance Plan will be provided as a basis for the SWPPP during final design.

Standard 9 – Operation and Maintenance Plan

The Long-Term Operation and Maintenance Plan is provided in Appendix F.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on site. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to the post-construction best management practices. Measures to prevent illicit discharges will be included in the Long-Term Pollution Prevention Plan.

FIGURE - 1

0 1000' 2000' 2500'

U.S. GEOLOGICAL SURVEY
7.5 X 15 MINUTE SERIES

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USGS LOCUS MAP

655 WASHINGTON STREET
(ASSESSOR'S PARCEL NO. 29-329-9-0)
WEYMOUTH, MASSACHUSETTS

FIGURE - 2

COMMUNITY PANEL NO: 25021C0229E
EFFECTIVE DATE: JULY 17, 2012

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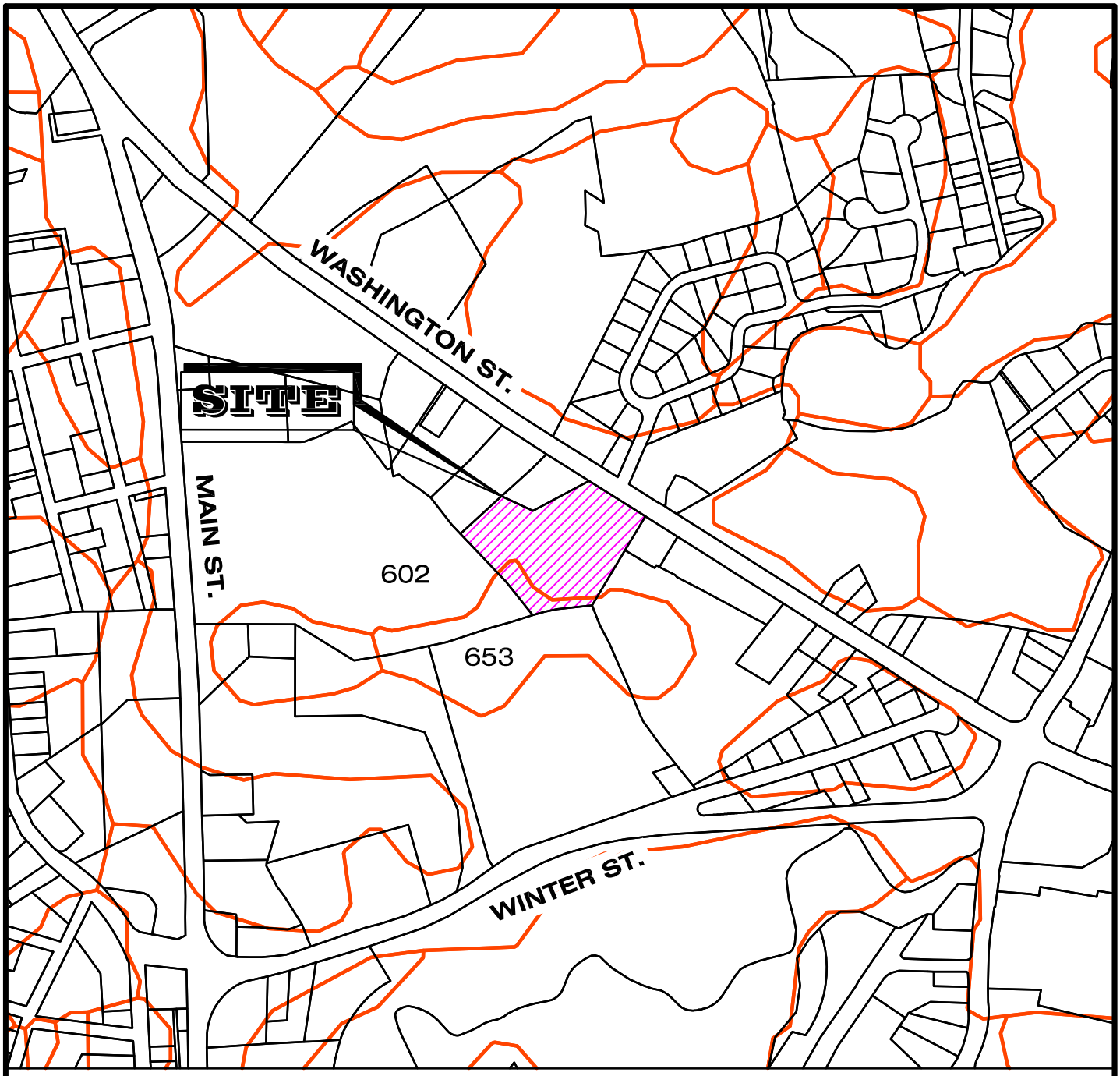
FEMA FLOOD MAP

655 WASHINGTON STREET
(ASSESSOR'S PARCEL NO. 29-329-9-0)
WEYMOUTH, MASSACHUSETTS



SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	A
653	UDORTHENTS, SANDY	A

FIGURE - 3

0 500' 1000' 1125'

NRCS SOIL SURVEY
NORFOLK COUNTY

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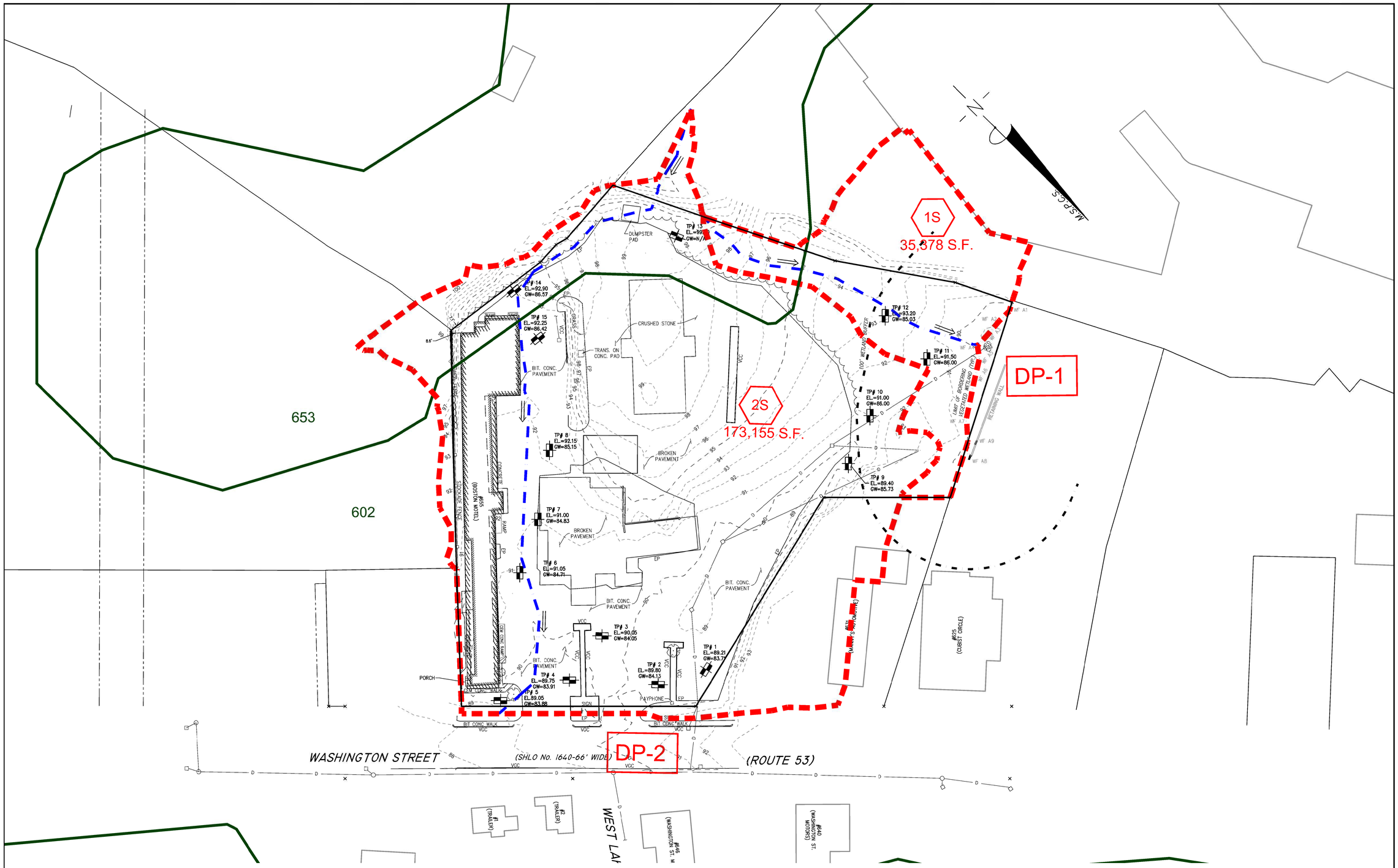
NRCS SOILS MAP

655 WASHINGTON STREET
(ASSESSOR'S PARCEL NO. 29-329-9-0)
WEYMOUTH, MASSACHUSETTS

A P P E N D I X A

Pre-Development Condition



SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	A
653	UDORTHENTS, SANDY	A

LEGEND

- TIME OF CONCENTRATION FLOW PATH
- LIMIT OF WATERSHED
- SOIL TYPE BOUNDARY

NOTES:

1. OFFSITE CONTOURS DOWNLOAD FROM MASSGIS LIDAR
2. OFFSITE STRUCTURES DOWNLOADED FROM MASSGIS

M:\MEG\2020 PROJECTS\220-164

TRINITY GREEN DEV., LLC - 655 WASHINGTON ST., WEYMOUTH\DWGS\220-164 WATERSHED.DWG

REV	DATE	DESCRIPTION	BY	APP
-	-	-	-	-

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PROP. MIXED-USE DEVELOPMENT

ASSESSORS PARCEL 29-329-9-0

655 WASHINGTON STREET

WEYMOUTH, MASSACHUSETTS

PROFESSIONAL SURVEYOR:

APPLICANT:
TRINITY GREEN DEVELOPMENT, LLC
180 CANTON AVE.
MILTON, MASSACHUSETTS 02186

NOT FOR CONSTRUCTION

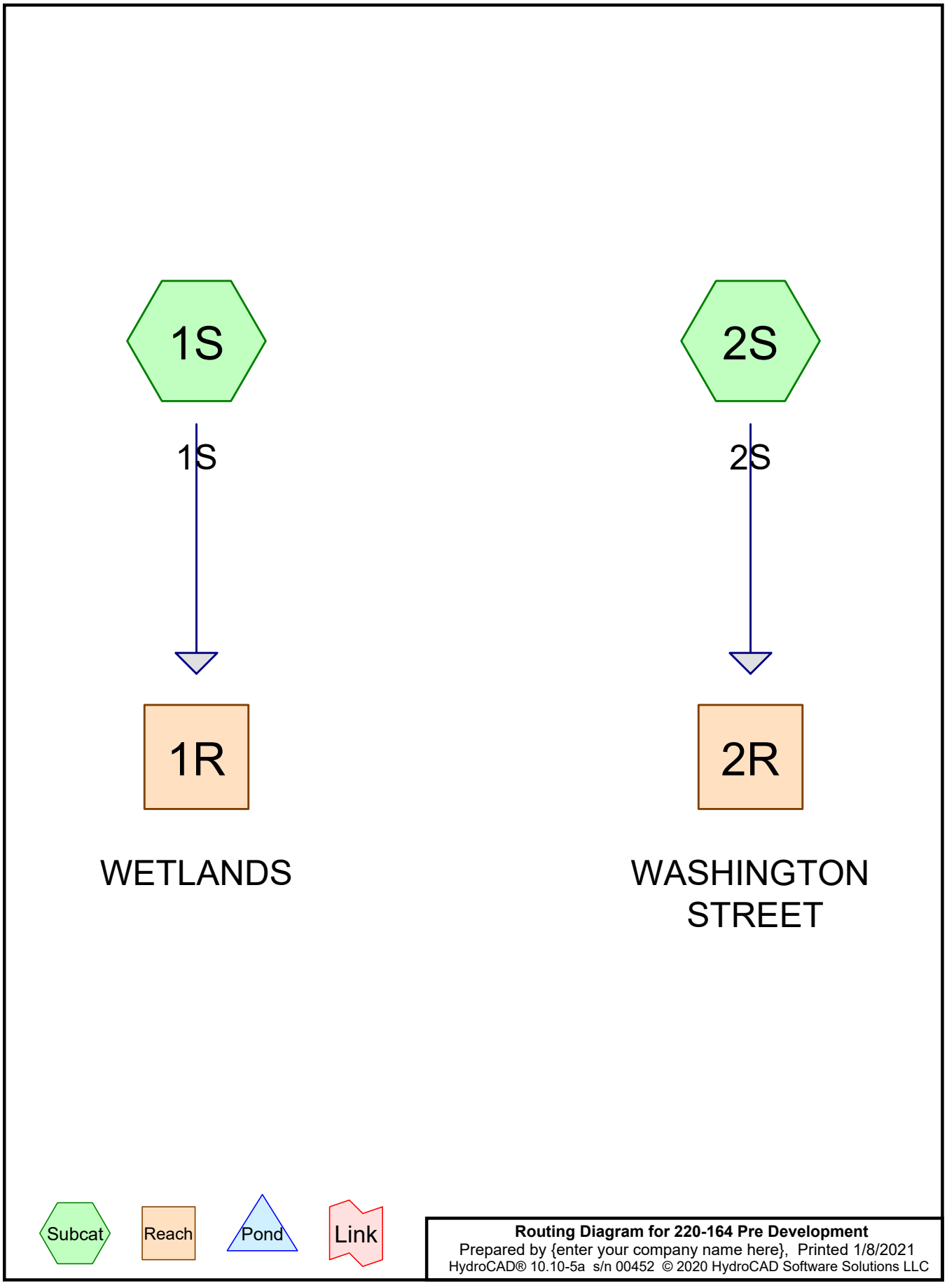
DRAWN BY:	RPL
DESIGNED BY:	RPL
CHECKED BY:	AJC
APPROVED BY:	BCM
DATE:	1/12/21
SCALE:	1"=40'
PROJECT NO.:	220-164

DWG. TITLE:

PRE-DEV. WATERSHED PLAN

DWG. NO:

WS-1



Routing Diagram for 220-164 Pre Development
Prepared by {enter your company name here}, Printed 1/8/2021
HydroCAD® 10.10-5a s/n 00452 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,719	77	1/8 acre lots, 65% imp, HSG A (2S)
7,879	39	>75% Grass cover, Good, HSG A (2S)
137,766	98	Paved parking, HSG A (1S, 2S)
57,169	30	Woods, Good, HSG A (1S, 2S)
208,533	**77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
208,533	HSG A	1S, 2S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
208,533		**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	Su Nu
5,719	0	0	0	0	5,719	1/8 acre lots, 65% imp	
7,879	0	0	0	0	7,879	>75% Grass cover, Good	
137,766	0	0	0	0	137,766	Paved parking	
57,169	0	0	0	0	57,169	Woods, Good	
208,533	**0**	**0**	**0**	**0**	**208,533**	**TOTAL AREA**	

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

Subcatchment1S: 1S Runoff Area=35,378 sf 22.52% Impervious Runoff Depth=0.05"
Flow Length=285' Tc=11.5 min CN=45 Runoff=0.00 cfs 136 cf

Subcatchment2S: 2S Runoff Area=173,155 sf 77.11% Impervious Runoff Depth=1.63"
Flow Length=651' Tc=12.5 min CN=83 Runoff=6.04 cfs 23,457 cf

Reach 1R: WETLANDS Inflow=0.00 cfs 136 cf
Outflow=0.00 cfs 136 cf

Reach 2R: WASHINGTONSTREET Inflow=6.04 cfs 23,457 cf
Outflow=6.04 cfs 23,457 cf

Total Runoff Area = 208,533 sf Runoff Volume = 23,593 cf Average Runoff Depth = 1.36"
32.15% Pervious = 67,050 sf 67.85% Impervious = 141,483 sf

Summary for Subcatchment 1S: 1S

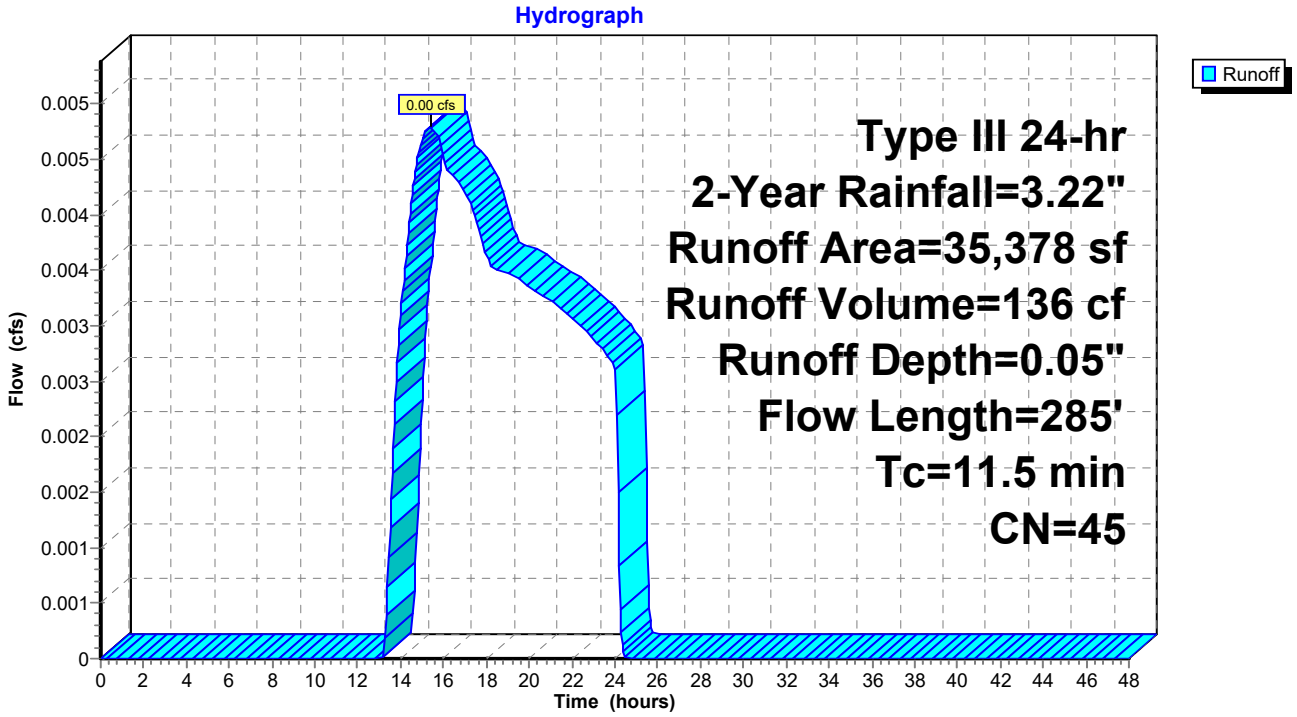
Runoff = 0.00 cfs @ 15.39 hrs, Volume= 136 cf, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
27,412	30	Woods, Good, HSG A
7,966	98	Paved parking, HSG A
35,378	45	Weighted Average
27,412		77.48% Pervious Area
7,966		22.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
4.0	235	0.0377	0.97		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
11.5	285	Total			

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

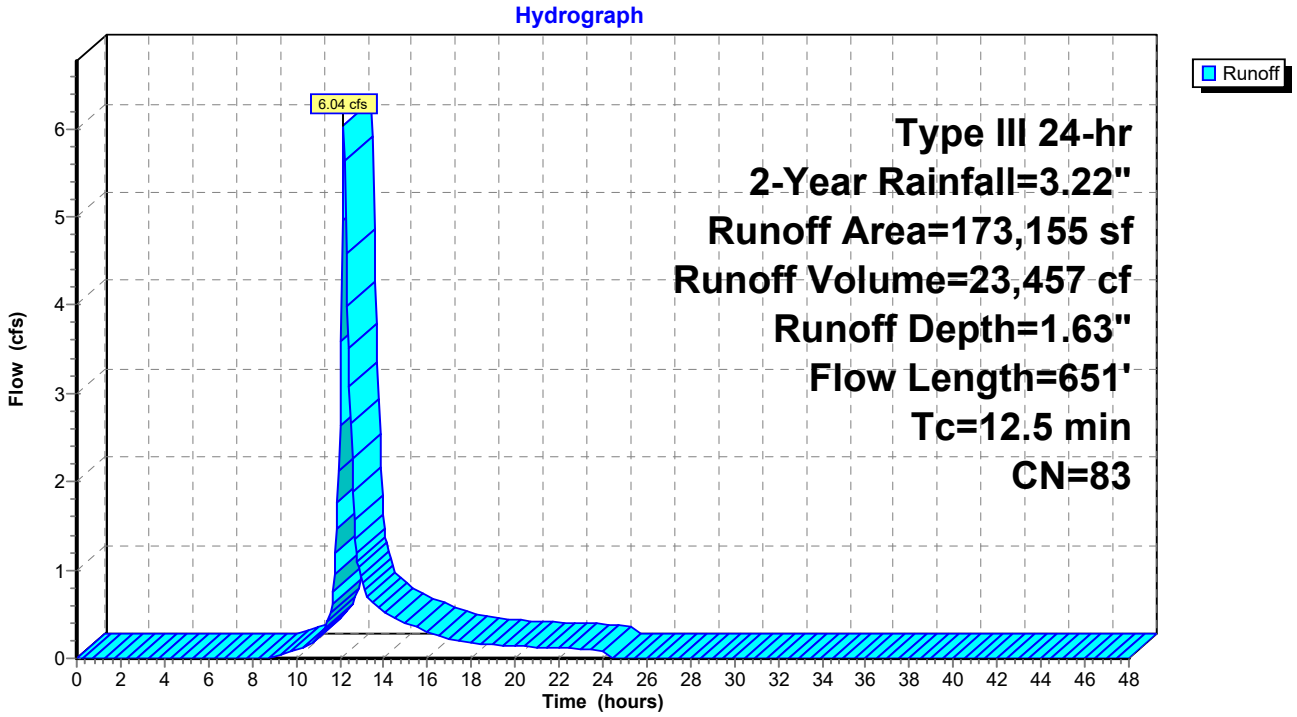
Runoff = 6.04 cfs @ 12.18 hrs, Volume= 23,457 cf, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
29,757	30	Woods, Good, HSG A
7,879	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
129,800	98	Paved parking, HSG A
173,155	83	Weighted Average
39,638		22.89% Pervious Area
133,517		77.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	180	0.0556	1.18		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
3.0	393	0.0114	2.17		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	28	0.0179	0.94		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Short Grass Pasture Kv= 7.0 fps
12.5	651	Total			

Subcatchment 2S: 2S



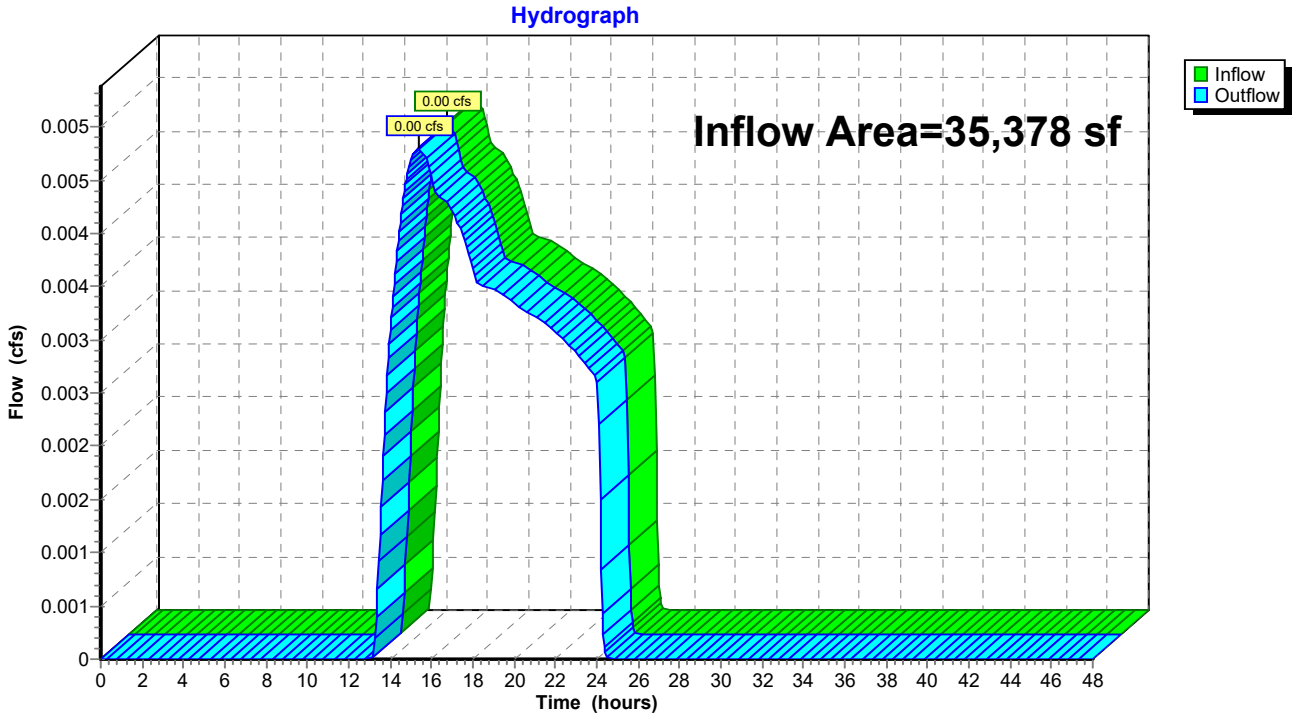
Summary for Reach 1R: WETLANDS

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

Inflow Area = 35,378 sf, 22.52% Impervious, Inflow Depth = 0.05" for 2-Year event
Inflow = 0.00 cfs @ 15.39 hrs, Volume= 136 cf
Outflow = 0.00 cfs @ 15.39 hrs, Volume= 136 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



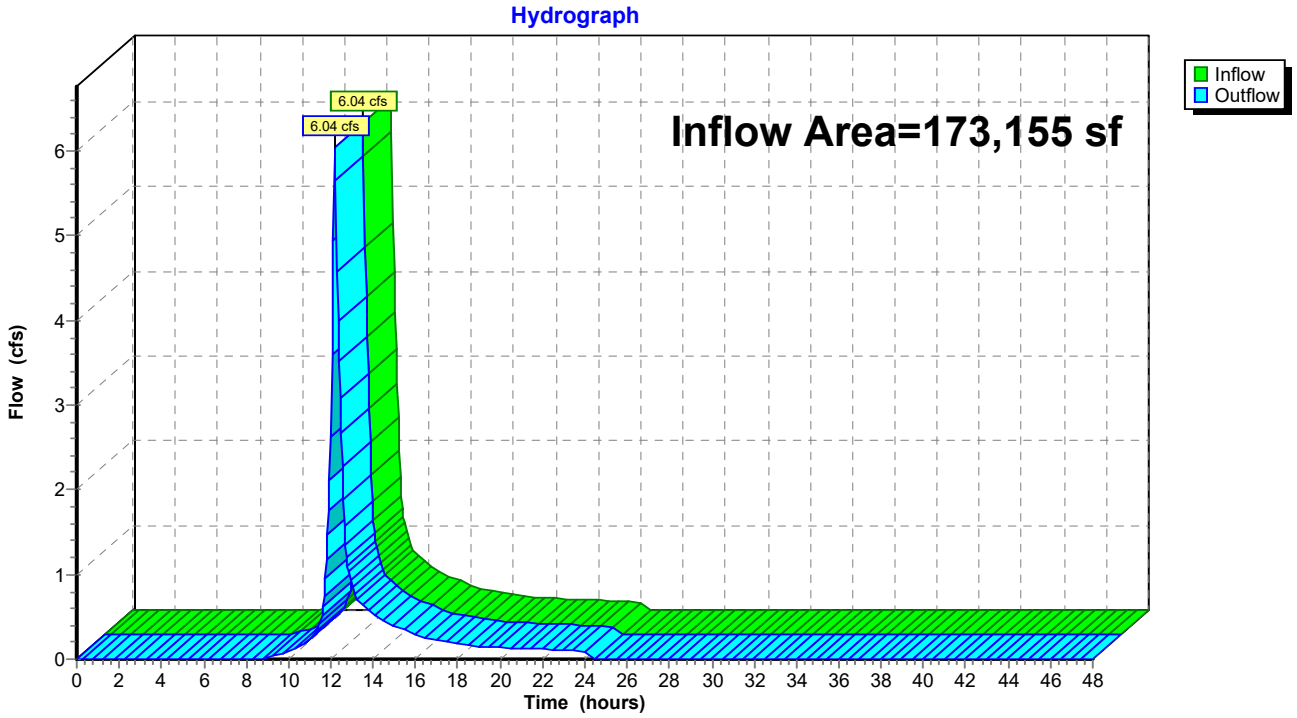
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 173,155 sf, 77.11% Impervious, Inflow Depth = 1.63" for 2-Year event
Inflow = 6.04 cfs @ 12.18 hrs, Volume= 23,457 cf
Outflow = 6.04 cfs @ 12.18 hrs, Volume= 23,457 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



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

Subcatchment1S: 1S Runoff Area=35,378 sf 22.52% Impervious Runoff Depth=0.40"
Flow Length=285' Tc=11.5 min CN=45 Runoff=0.13 cfs 1,175 cf

Subcatchment2S: 2S Runoff Area=173,155 sf 77.11% Impervious Runoff Depth=3.05"
Flow Length=651' Tc=12.5 min CN=83 Runoff=11.40 cfs 43,977 cf

Reach 1R: WETLANDS Inflow=0.13 cfs 1,175 cf
Outflow=0.13 cfs 1,175 cf

Reach 2R: WASHINGTONSTREET Inflow=11.40 cfs 43,977 cf
Outflow=11.40 cfs 43,977 cf

Total Runoff Area = 208,533 sf Runoff Volume = 45,152 cf Average Runoff Depth = 2.60"
32.15% Pervious = 67,050 sf 67.85% Impervious = 141,483 sf

Summary for Subcatchment 1S: 1S

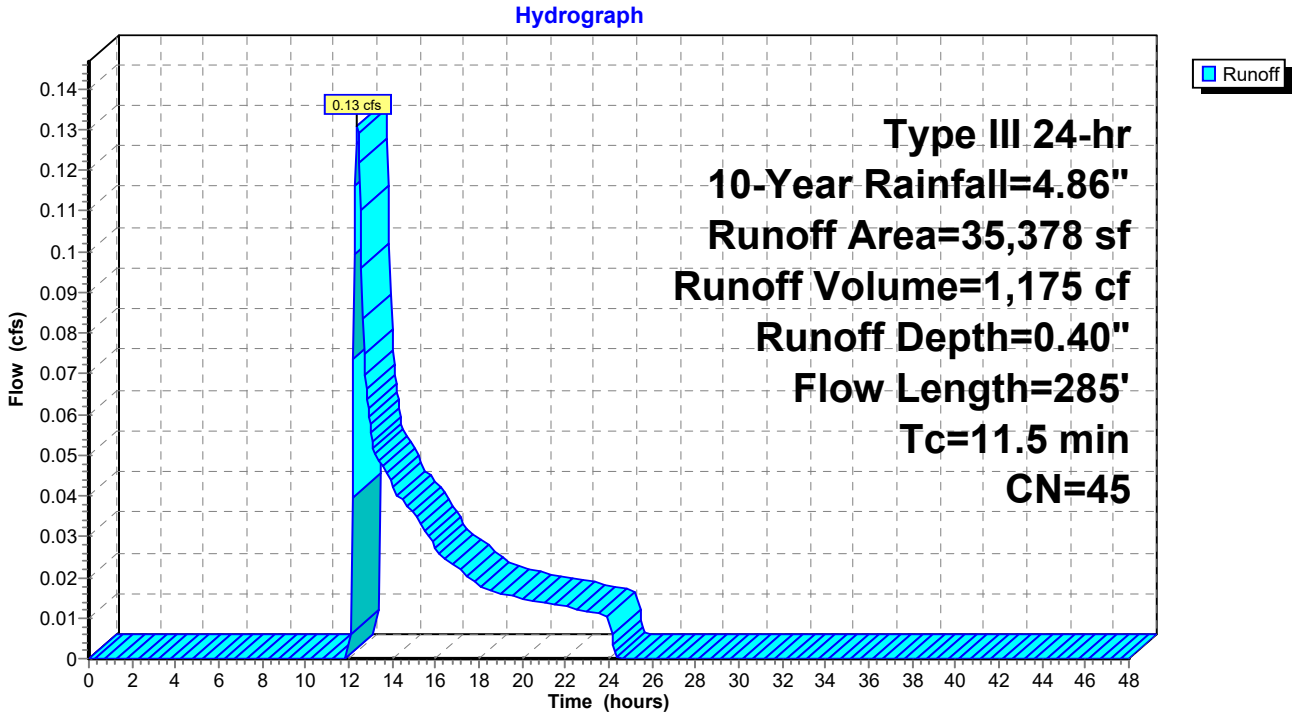
Runoff = 0.13 cfs @ 12.41 hrs, Volume= 1,175 cf, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
27,412	30	Woods, Good, HSG A
7,966	98	Paved parking, HSG A
35,378	45	Weighted Average
27,412		77.48% Pervious Area
7,966		22.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
4.0	235	0.0377	0.97		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
11.5	285	Total			

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

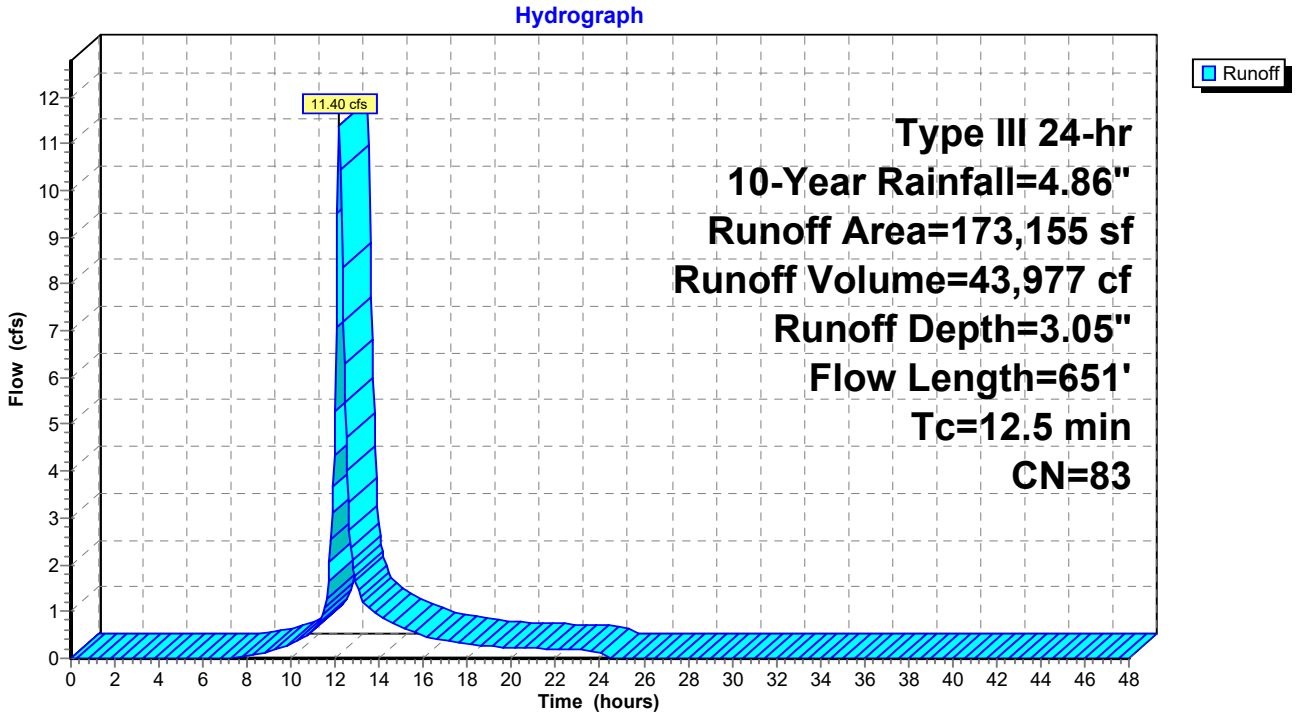
Runoff = 11.40 cfs @ 12.17 hrs, Volume= 43,977 cf, Depth= 3.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
29,757	30	Woods, Good, HSG A
7,879	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
129,800	98	Paved parking, HSG A
173,155	83	Weighted Average
39,638		22.89% Pervious Area
133,517		77.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	180	0.0556	1.18		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
3.0	393	0.0114	2.17		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	28	0.0179	0.94		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Short Grass Pasture Kv= 7.0 fps
12.5	651	Total			

Subcatchment 2S: 2S



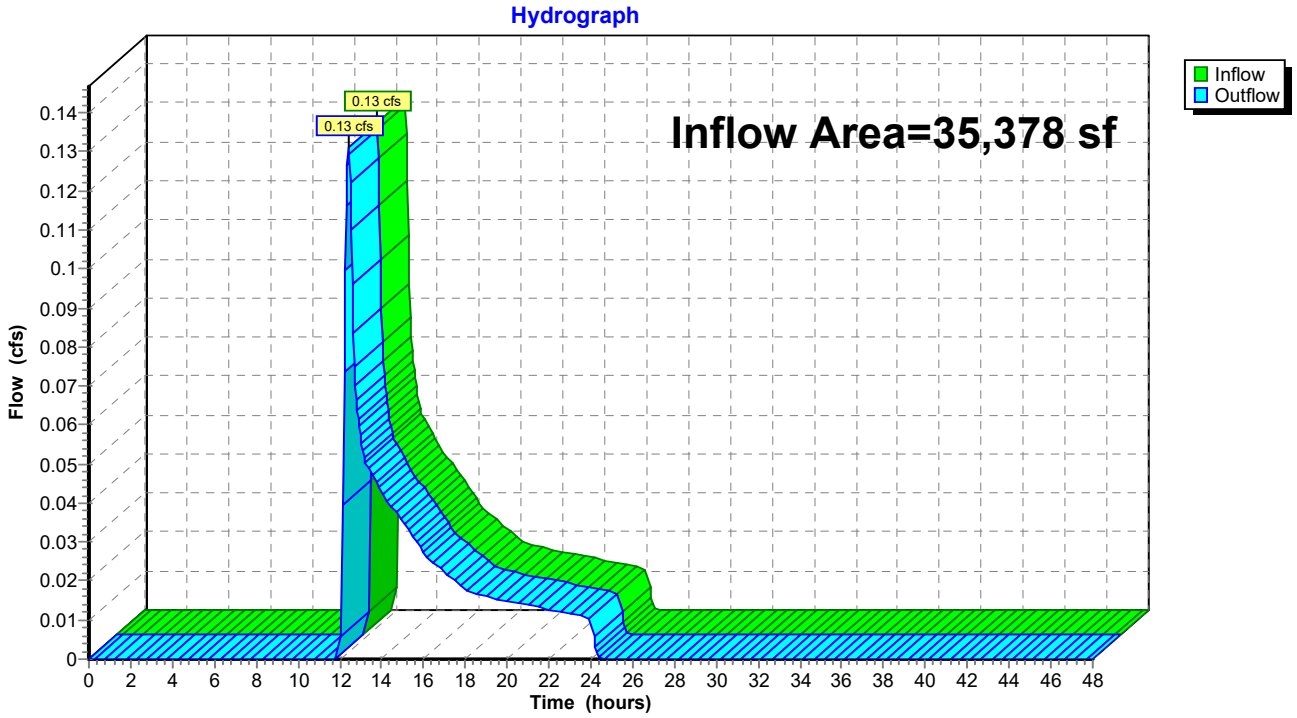
Summary for Reach 1R: WETLANDS

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

Inflow Area = 35,378 sf, 22.52% Impervious, Inflow Depth = 0.40" for 10-Year event
Inflow = 0.13 cfs @ 12.41 hrs, Volume= 1,175 cf
Outflow = 0.13 cfs @ 12.41 hrs, Volume= 1,175 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



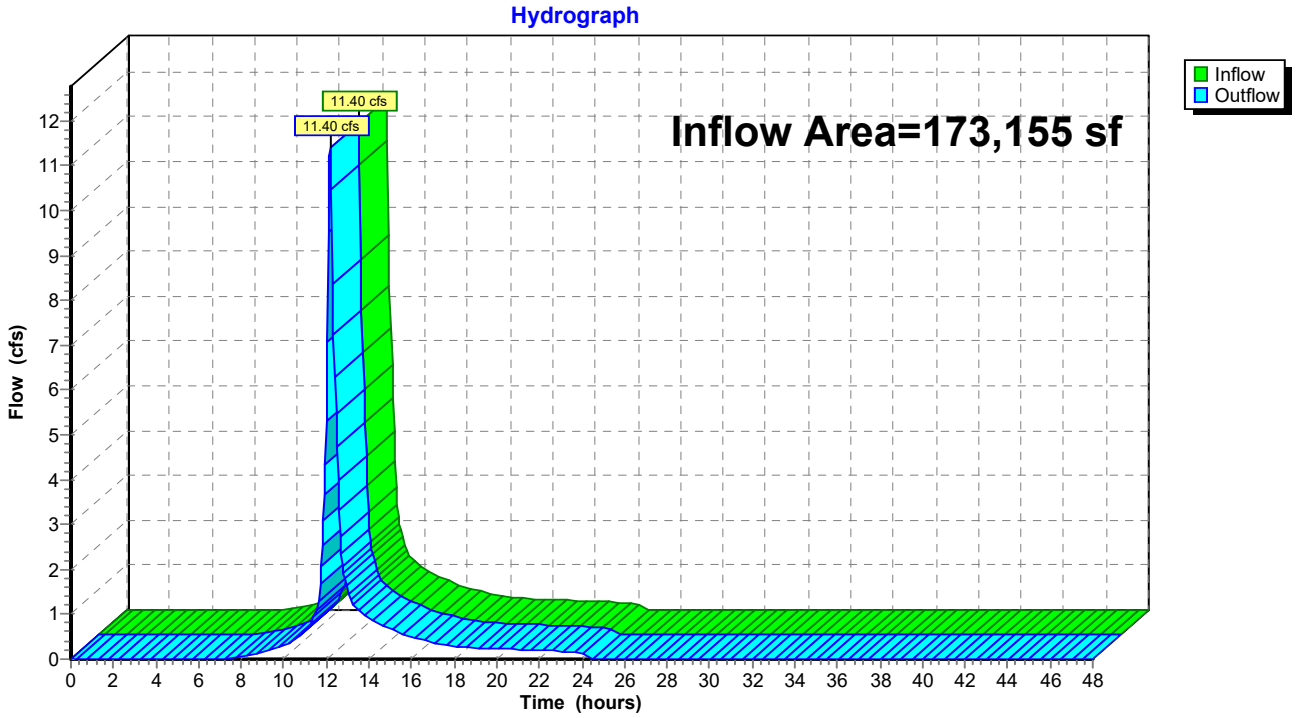
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 173,155 sf, 77.11% Impervious, Inflow Depth = 3.05" for 10-Year event
Inflow = 11.40 cfs @ 12.17 hrs, Volume= 43,977 cf
Outflow = 11.40 cfs @ 12.17 hrs, Volume= 43,977 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



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

Subcatchment1S: 1S Runoff Area=35,378 sf 22.52% Impervious Runoff Depth=0.86"
Flow Length=285' Tc=11.5 min CN=45 Runoff=0.43 cfs 2,542 cf

Subcatchment2S: 2S Runoff Area=173,155 sf 77.11% Impervious Runoff Depth=4.23"
Flow Length=651' Tc=12.5 min CN=83 Runoff=15.70 cfs 61,049 cf

Reach 1R: WETLANDS Inflow=0.43 cfs 2,542 cf
Outflow=0.43 cfs 2,542 cf

Reach 2R: WASHINGTONSTREET Inflow=15.70 cfs 61,049 cf
Outflow=15.70 cfs 61,049 cf

Total Runoff Area = 208,533 sf Runoff Volume = 63,590 cf Average Runoff Depth = 3.66"
32.15% Pervious = 67,050 sf 67.85% Impervious = 141,483 sf

Summary for Subcatchment 1S: 1S

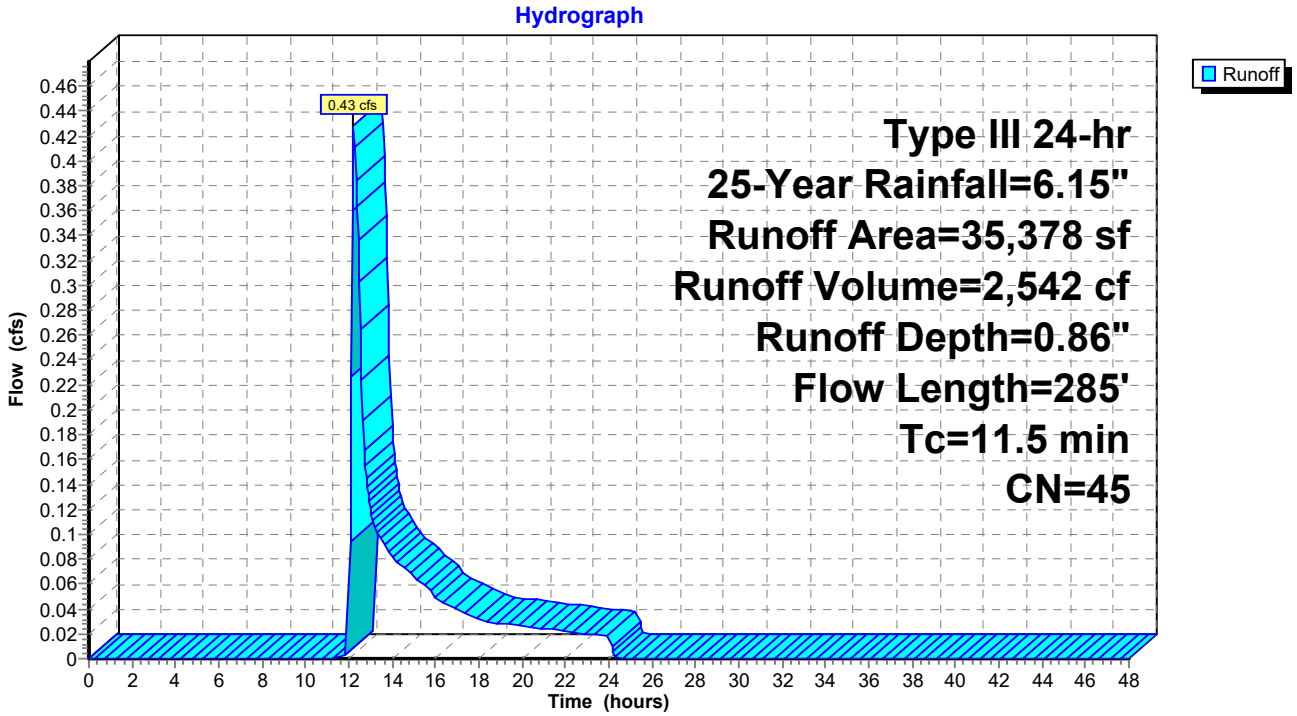
Runoff = 0.43 cfs @ 12.22 hrs, Volume= 2,542 cf, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
27,412	30	Woods, Good, HSG A
7,966	98	Paved parking, HSG A
35,378	45	Weighted Average
27,412		77.48% Pervious Area
7,966		22.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
4.0	235	0.0377	0.97		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
11.5	285	Total			

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

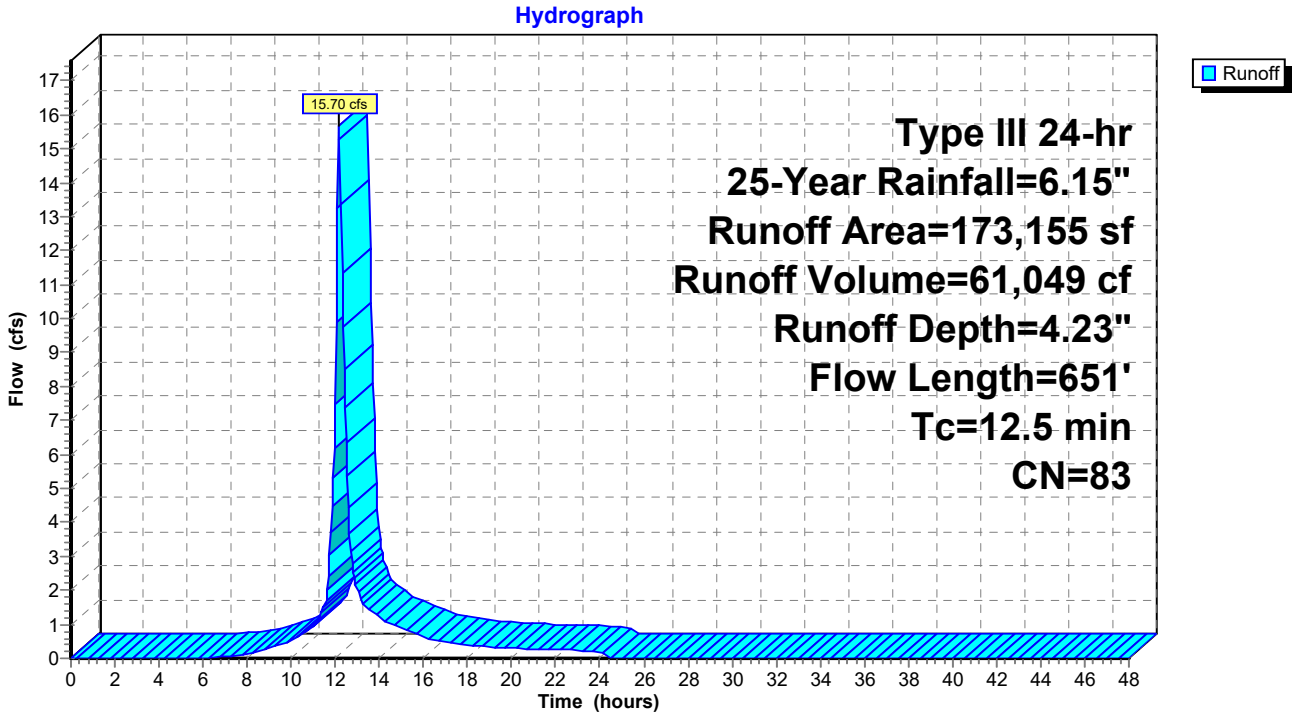
Runoff = 15.70 cfs @ 12.17 hrs, Volume= 61,049 cf, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
29,757	30	Woods, Good, HSG A
7,879	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
129,800	98	Paved parking, HSG A
173,155	83	Weighted Average
39,638		22.89% Pervious Area
133,517		77.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	180	0.0556	1.18		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
3.0	393	0.0114	2.17		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	28	0.0179	0.94		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Short Grass Pasture Kv= 7.0 fps
12.5	651	Total			

Subcatchment 2S: 2S



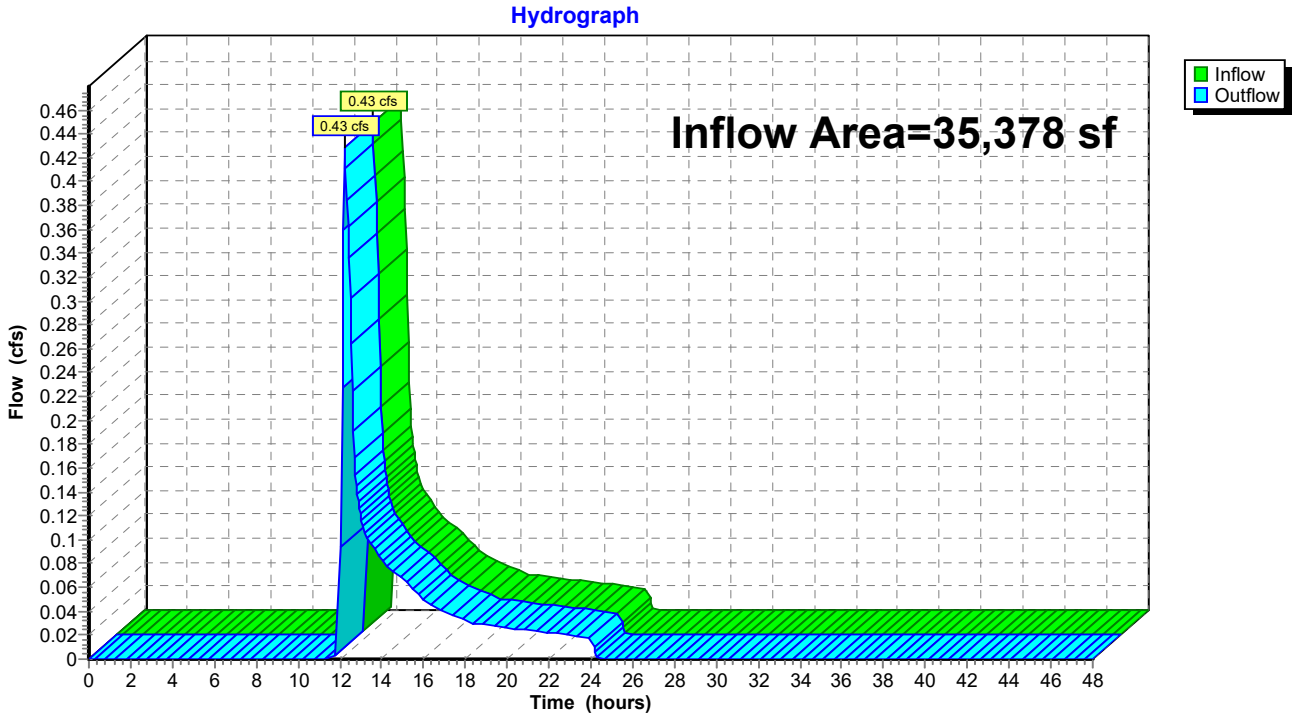
Summary for Reach 1R: WETLANDS

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

Inflow Area = 35,378 sf, 22.52% Impervious, Inflow Depth = 0.86" for 25-Year event
Inflow = 0.43 cfs @ 12.22 hrs, Volume= 2,542 cf
Outflow = 0.43 cfs @ 12.22 hrs, Volume= 2,542 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



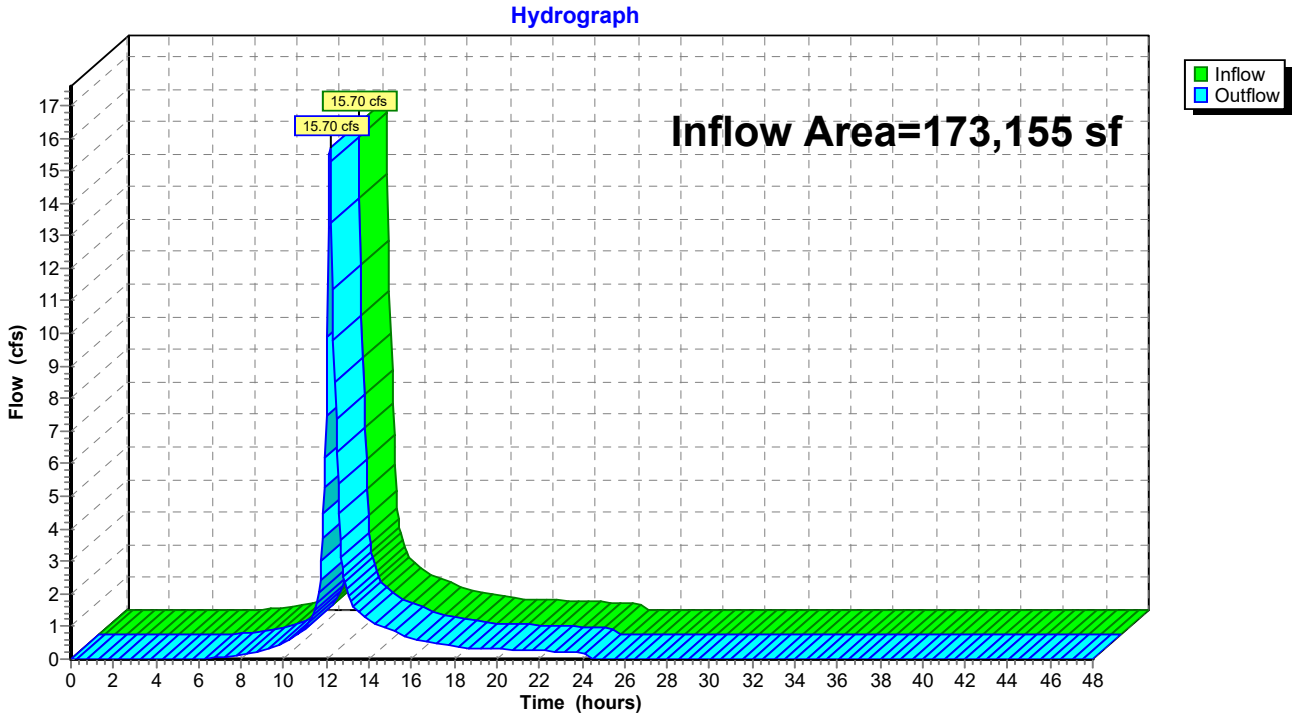
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 173,155 sf, 77.11% Impervious, Inflow Depth = 4.23" for 25-Year event
Inflow = 15.70 cfs @ 12.17 hrs, Volume= 61,049 cf
Outflow = 15.70 cfs @ 12.17 hrs, Volume= 61,049 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



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

Subcatchment1S: 1S Runoff Area=35,378 sf 22.52% Impervious Runoff Depth=2.17"
Flow Length=285' Tc=11.5 min CN=45 Runoff=1.48 cfs 6,410 cf

Subcatchment2S: 2S Runoff Area=173,155 sf 77.11% Impervious Runoff Depth=6.74"
Flow Length=651' Tc=12.5 min CN=83 Runoff=24.57 cfs 97,314 cf

Reach 1R: WETLANDS Inflow=1.48 cfs 6,410 cf
Outflow=1.48 cfs 6,410 cf

Reach 2R: WASHINGTONSTREET Inflow=24.57 cfs 97,314 cf
Outflow=24.57 cfs 97,314 cf

Total Runoff Area = 208,533 sf Runoff Volume = 103,724 cf Average Runoff Depth = 5.97"
32.15% Pervious = 67,050 sf 67.85% Impervious = 141,483 sf

Summary for Subcatchment 1S: 1S

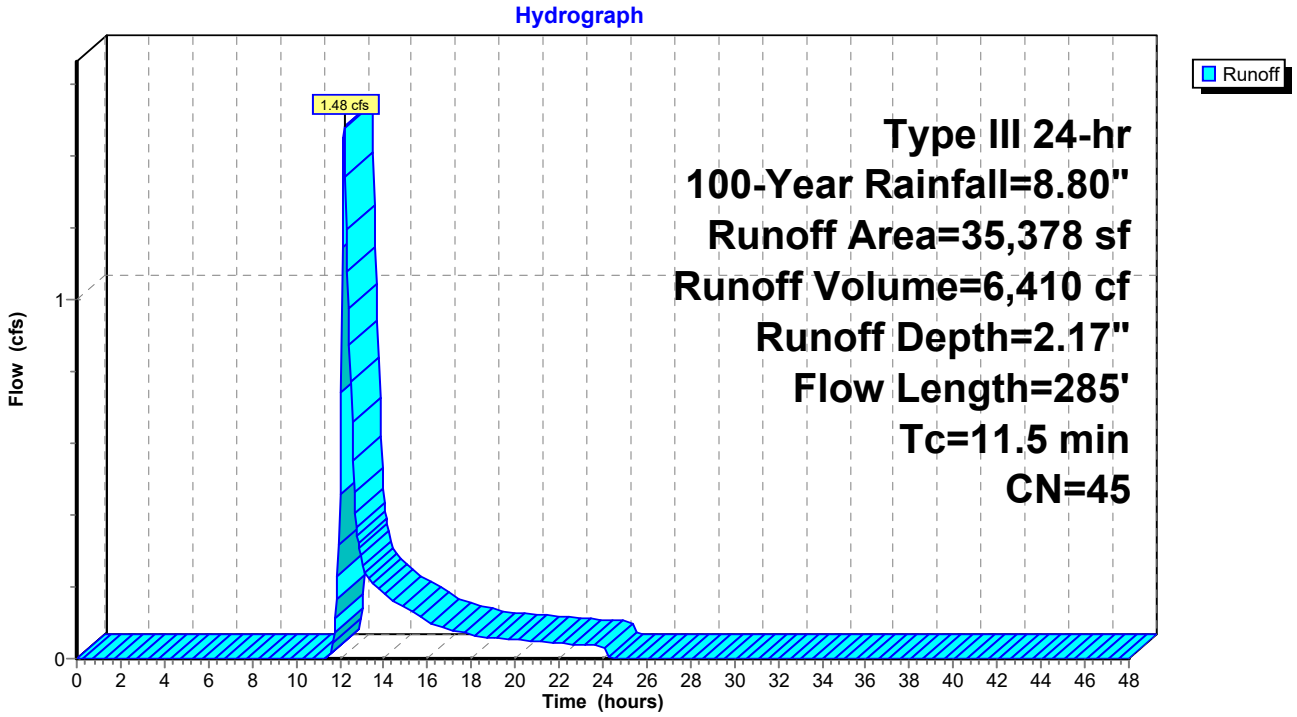
Runoff = 1.48 cfs @ 12.18 hrs, Volume= 6,410 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
27,412	30	Woods, Good, HSG A
7,966	98	Paved parking, HSG A
35,378	45	Weighted Average
27,412		77.48% Pervious Area
7,966		22.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0700	0.11		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
4.0	235	0.0377	0.97		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
11.5	285	Total			

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

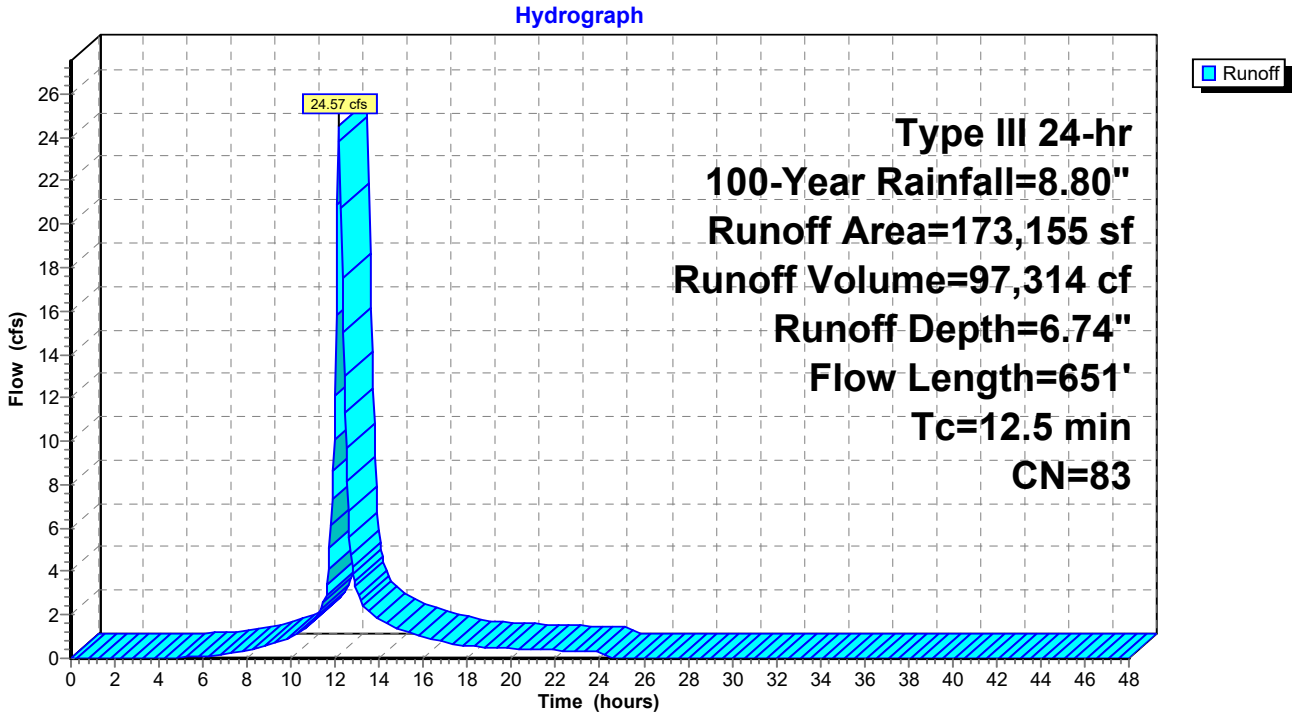
Runoff = 24.57 cfs @ 12.17 hrs, Volume= 97,314 cf, Depth= 6.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
29,757	30	Woods, Good, HSG A
7,879	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
129,800	98	Paved parking, HSG A
173,155	83	Weighted Average
39,638		22.89% Pervious Area
133,517		77.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
2.5	180	0.0556	1.18		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Woodland Kv= 5.0 fps
3.0	393	0.0114	2.17		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Paved Kv= 20.3 fps
0.5	28	0.0179	0.94		**Shallow Concentrated Flow, SHALLOW CONC. FLOW** Short Grass Pasture Kv= 7.0 fps
12.5	651	Total			

Subcatchment 2S: 2S



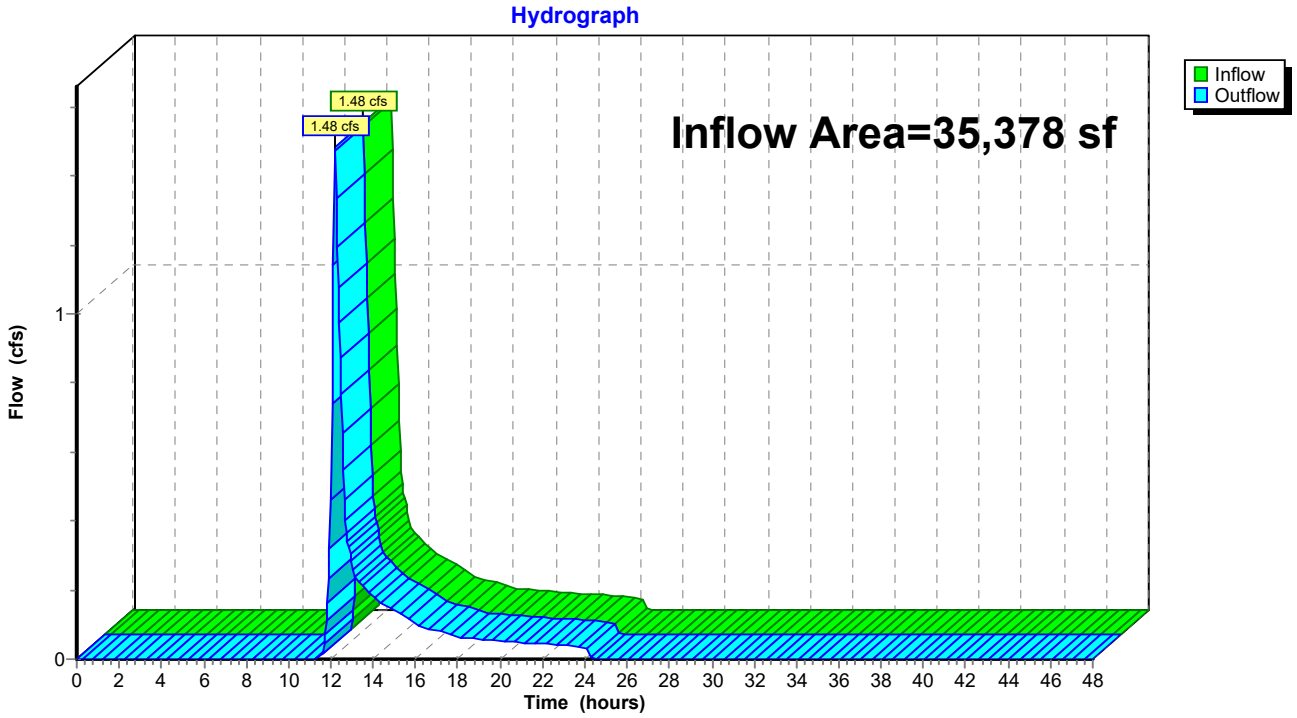
Summary for Reach 1R: WETLANDS

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

Inflow Area = 35,378 sf, 22.52% Impervious, Inflow Depth = 2.17" for 100-Year event
Inflow = 1.48 cfs @ 12.18 hrs, Volume= 6,410 cf
Outflow = 1.48 cfs @ 12.18 hrs, Volume= 6,410 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



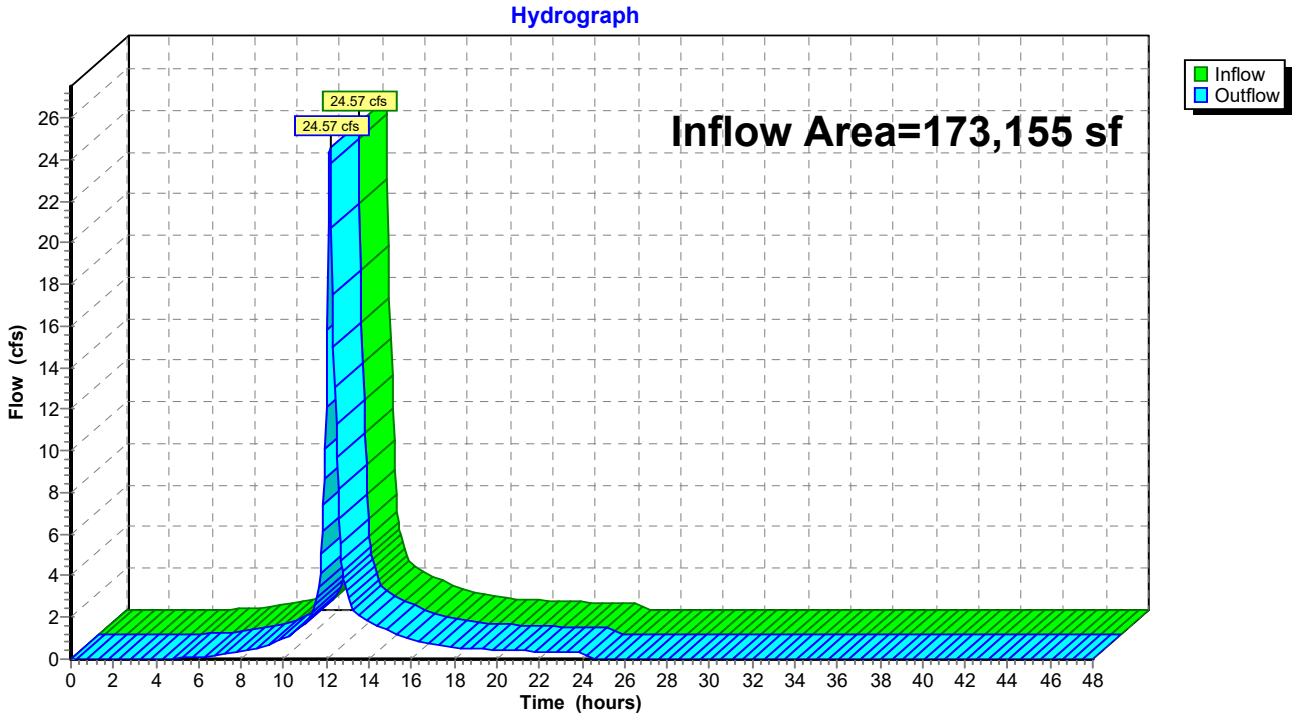
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 173,155 sf, 77.11% Impervious, Inflow Depth = 6.74" for 100-Year event
Inflow = 24.57 cfs @ 12.17 hrs, Volume= 97,314 cf
Outflow = 24.57 cfs @ 12.17 hrs, Volume= 97,314 cf, Atten= 0%, Lag= 0.0 min

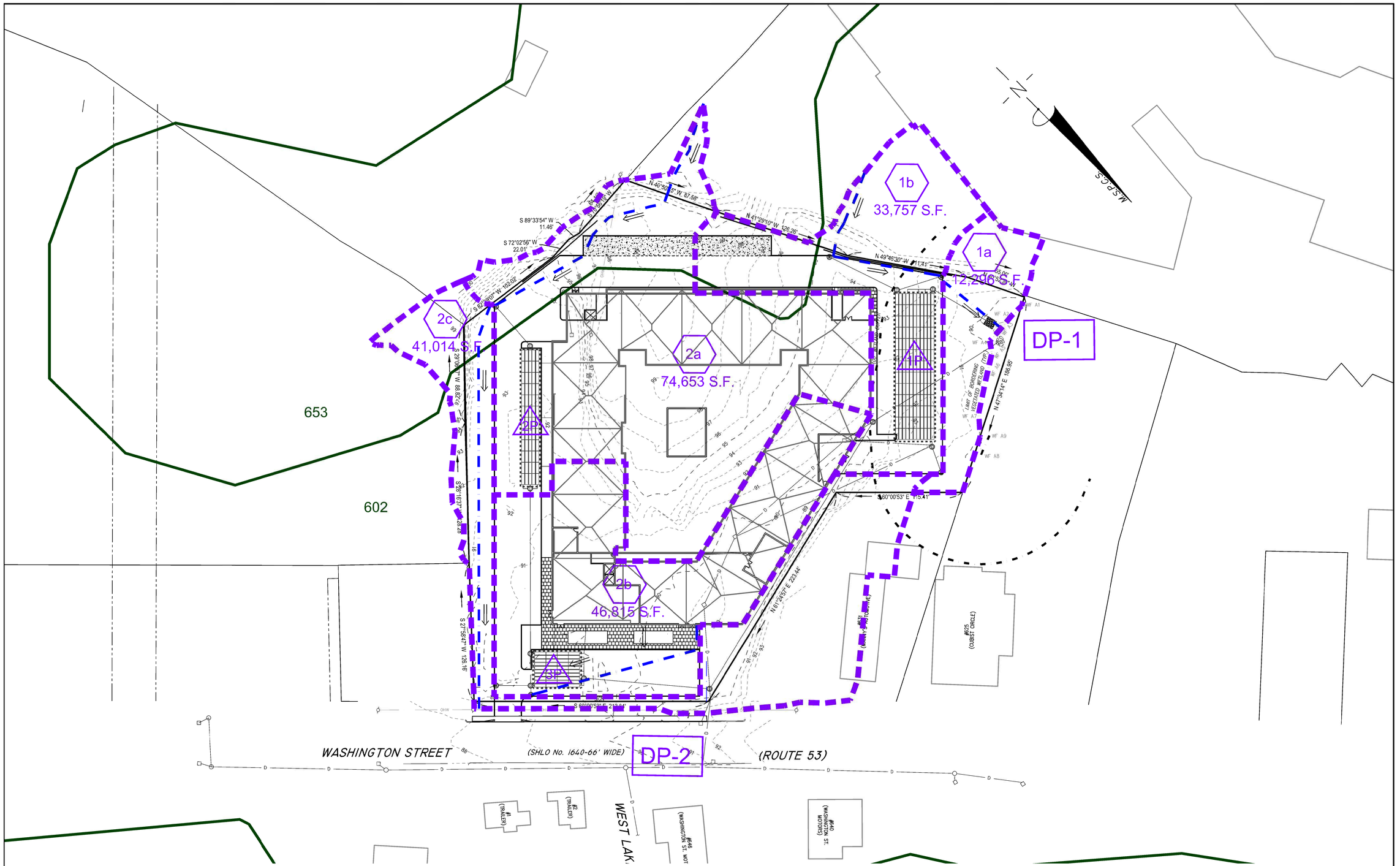
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 2R: WASHINGTON STREET



A P P E N D I X B

Post-Development Condition



SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	A
653	UDORTHENTS, SANDY	A

LEGEND

- TIME OF CONCENTRATION FLOW PATH
- LIMIT OF WATERSHED
- SOIL TYPE BOUNDARY

NOTES:

1. OFFSITE CONTOURS DOWNLOAD FROM MASSGIS LIDAR
2. OFFSITE STRUCTURES DOWNLOADED FROM MASSGIS

M:\MEG\2020 PROJECTS\220-164

TRINITY GREEN DEV., LLC – 655 WASHINGTON ST., WEYMOUTH\DWGS\220-164 WATERSHED.DWG

REV	DATE	DESCRIPTION	BY	APP
-	-	-	-	

MCKENZIE ENGINEERING GROUP
Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061
P: 781.792.3900
F: 781.792.0333
www.mckeng.com

PROP. MIXED-USE DEVELOPMENT
ASSESSORS PARCEL 29-329-9-0
655 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

PROFESSIONAL SURVEYOR:

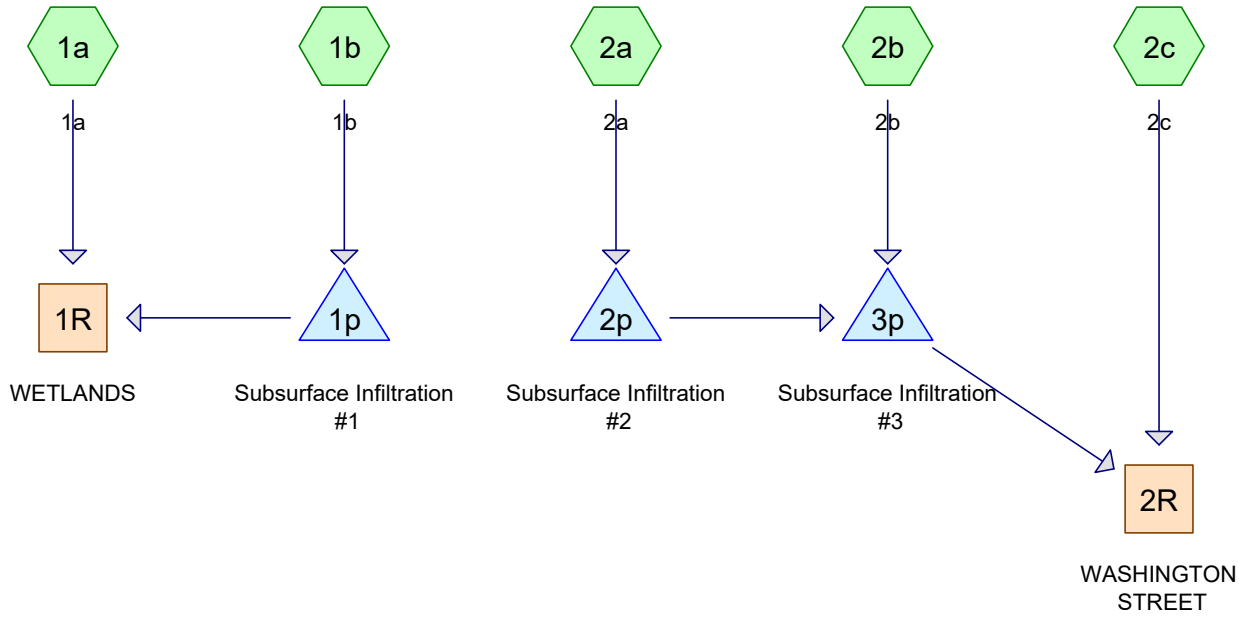
APPLICANT:
TRINITY GREEN DEVELOPMENT, LLC
180 CANTON AVE.
MILTON, MASSACHUSETTS 02186

NOT FOR CONSTRUCTION

DRAWN BY:	RPL
DESIGNED BY:	RPL
CHECKED BY:	AJC
APPROVED BY:	BCM
DATE:	1/12/21
SCALE:	1"=40'
PROJECT NO.:	220-164

DWG. TITLE:
POST-DEV. WATERSHED PLAN

DWG. NO:
WS-2



Subcat Reach Pond Link

Routing Diagram for 220-164 Post Development - AJC
Prepared by {enter your company name here}, Printed 1/8/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.22	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.86	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.15	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.80	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,719	77	1/8 acre lots, 65% imp, HSG A (2c)
36,861	39	>75% Grass cover, Good, HSG A (1a, 1b, 2a, 2b, 2c)
146,707	98	Paved parking, HSG A (1a, 1b, 2a, 2b, 2c)
19,247	30	Woods, Good, HSG A (1a, 1b, 2a, 2c)
208,534	**81**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
208,534	HSG A	1a, 1b, 2a, 2b, 2c
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
208,534		**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	Su Nu
5,719	0	0	0	0	5,719	1/8 acre lots, 65% imp	
36,861	0	0	0	0	36,861	>75% Grass cover, Good	
146,707	0	0	0	0	146,707	Paved parking	
19,247	0	0	0	0	19,247	Woods, Good	
208,534	**0**	**0**	**0**	**0**	**208,534**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1p	89.50	89.00	50.0	0.0100	0.013	0.0	12.0	0.0
2	2p	87.25	86.50	150.0	0.0050	0.013	0.0	24.0	0.0
3	3p	85.55	83.25	115.0	0.0200	0.013	0.0	24.0	0.0

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

Subcatchment1a: 1a Runoff Area=12,295 sf 16.18% Impervious Runoff Depth=0.08"
Flow Length=68' Tc=7.2 min CN=47 Runoff=0.00 cfs 78 cf

Subcatchment1b: 1b Runoff Area=33,757 sf 71.61% Impervious Runoff Depth=1.42"
Flow Length=181' Tc=7.5 min CN=80 Runoff=1.19 cfs 3,987 cf

Subcatchment2a: 2a Runoff Area=74,653 sf 85.71% Impervious Runoff Depth=2.10"
Flow Length=286' Tc=8.1 min CN=89 Runoff=3.85 cfs 13,063 cf

Subcatchment2b: 2b Runoff Area=46,815 sf 96.86% Impervious Runoff Depth=2.77"
Tc=5.0 min CN=96 Runoff=3.27 cfs 10,802 cf

Subcatchment2c: 2c Runoff Area=41,014 sf 36.41% Impervious Runoff Depth=0.38"
Flow Length=371' Slope=0.0100 '/' Tc=23.9 min CN=59 Runoff=0.16 cfs 1,304 cf

Reach 1R: WETLANDS Inflow=0.00 cfs 78 cf
Outflow=0.00 cfs 78 cf

Reach 2R: WASHINGTON STREET Inflow=5.72 cfs 12,537 cf
Outflow=5.72 cfs 12,537 cf

Pond 1p: Subsurface Infiltration #1 Peak Elev=88.45' Storage=909 cf Inflow=1.19 cfs 3,987 cf
Discarded=0.28 cfs 4,000 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 4,000 cf

Pond 2p: Subsurface Infiltration #2 Peak Elev=89.08' Storage=2,703 cf Inflow=3.85 cfs 13,063 cf
Discarded=0.12 cfs 7,414 cf Primary=3.61 cfs 5,652 cf Outflow=3.74 cfs 13,066 cf

Pond 3p: Subsurface Infiltration #3 Peak Elev=87.84' Storage=1,616 cf Inflow=5.84 cfs 16,454 cf
Discarded=0.08 cfs 5,227 cf Primary=5.69 cfs 11,233 cf Outflow=5.77 cfs 16,459 cf

Total Runoff Area = 208,534 sf Runoff Volume = 29,234 cf Average Runoff Depth = 1.68"
27.87% Pervious = 58,110 sf 72.13% Impervious = 150,424 sf

Summary for Subcatchment 1a: 1a

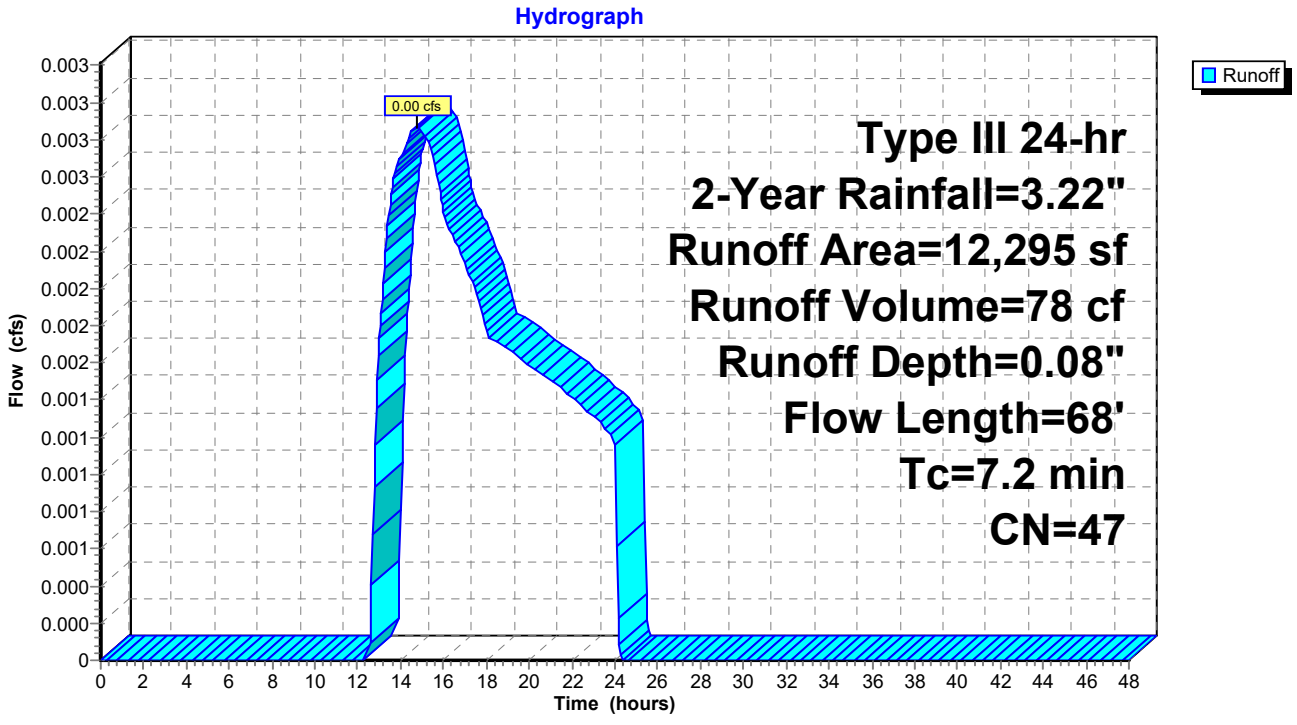
Runoff = 0.00 cfs @ 14.77 hrs, Volume= 78 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
2,030	30	Woods, Good, HSG A
8,276	39	>75% Grass cover, Good, HSG A
1,989	98	Paved parking, HSG A
12,295	47	Weighted Average
10,306		83.82% Pervious Area
1,989		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0118	0.12		**Sheet Flow, SHEET FLOW** Grass: Short n= 0.150 P2= 3.20"
0.3	18	0.0273	1.16		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
7.2	68	Total			

Subcatchment 1a: 1a



Summary for Subcatchment 1b: 1b

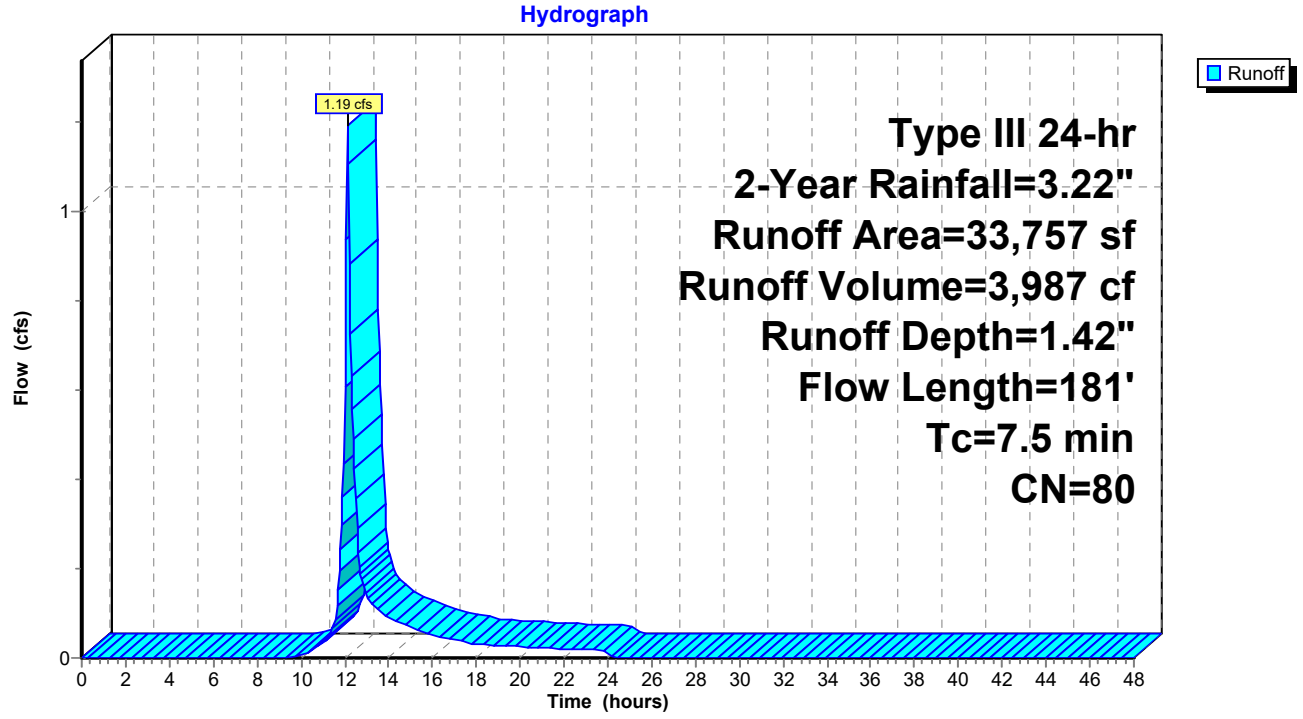
Runoff = 1.19 cfs @ 12.11 hrs, Volume= 3,987 cf, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
5,998	30	Woods, Good, HSG A
3,585	39	>75% Grass cover, Good, HSG A
24,174	98	Paved parking, HSG A
33,757	80	Weighted Average
9,583		28.39% Pervious Area
24,174		71.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.5	31	0.0500	1.12		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.5	100	0.0291	3.46		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
7.5	181	Total			

Subcatchment 1b: 1b



Summary for Subcatchment 2a: 2a

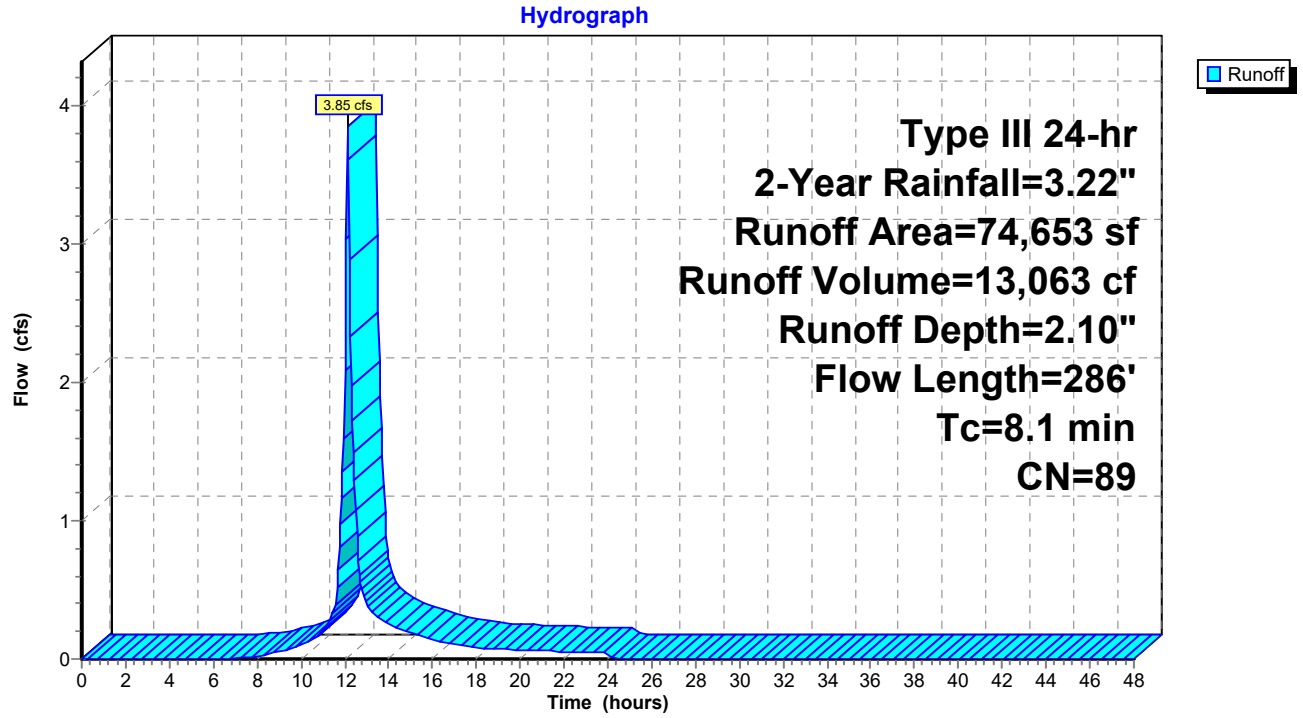
Runoff = 3.85 cfs @ 12.11 hrs, Volume= 13,063 cf, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
5,158	30	Woods, Good, HSG A
5,508	39	>75% Grass cover, Good, HSG A
63,987	98	Paved parking, HSG A
74,653	89	Weighted Average
10,666		14.29% Pervious Area
63,987		85.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	40	0.1000	1.58		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.7	83	0.0842	2.03		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	113	0.0354	3.82		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
8.1	286	Total			

Subcatchment 2a: 2a



Summary for Subcatchment 2b: 2b

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

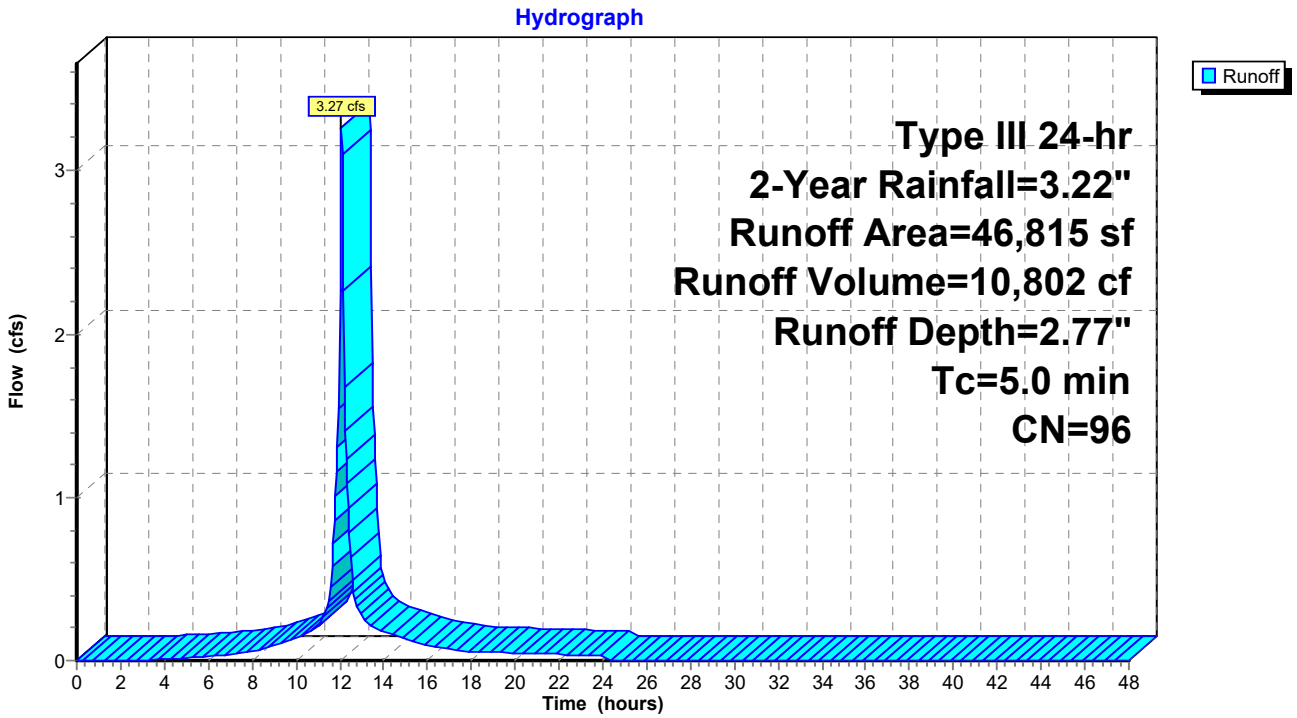
Runoff = 3.27 cfs @ 12.07 hrs, Volume= 10,802 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
1,472	39	>75% Grass cover, Good, HSG A
45,343	98	Paved parking, HSG A
46,815	96	Weighted Average
1,472		3.14% Pervious Area
45,343		96.86% Impervious Area

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

Subcatchment 2b: 2b



Summary for Subcatchment 2c: 2c

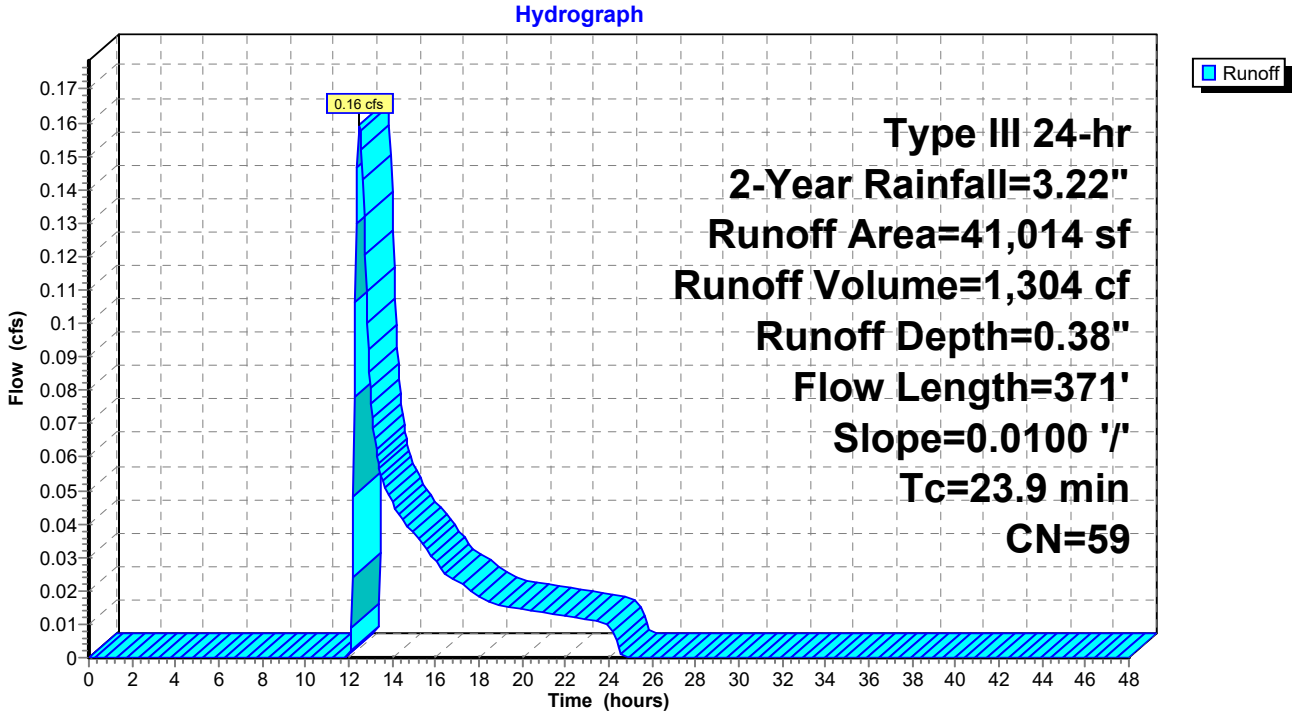
Runoff = 0.16 cfs @ 12.51 hrs, Volume= 1,304 cf, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

Area (sf)	CN	Description
6,061	30	Woods, Good, HSG A
18,020	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
11,214	98	Paved parking, HSG A
41,014	59	Weighted Average
26,083		63.59% Pervious Area
14,931		36.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
7.6	321	0.0100	0.70		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
23.9	371	Total			

Subcatchment 2c: 2c



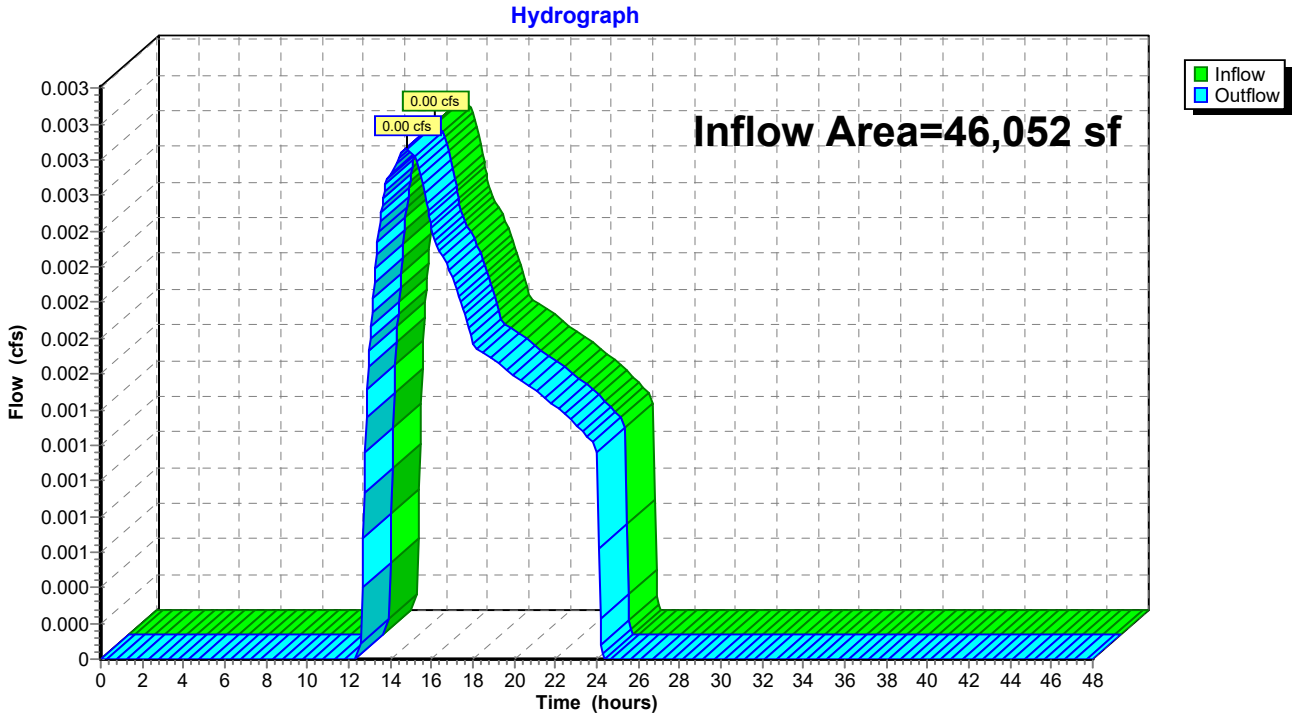
Summary for Reach 1R: WETLANDS

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

Inflow Area = 46,052 sf, 56.81% Impervious, Inflow Depth = 0.02" for 2-Year event
Inflow = 0.00 cfs @ 14.77 hrs, Volume= 78 cf
Outflow = 0.00 cfs @ 14.77 hrs, Volume= 78 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



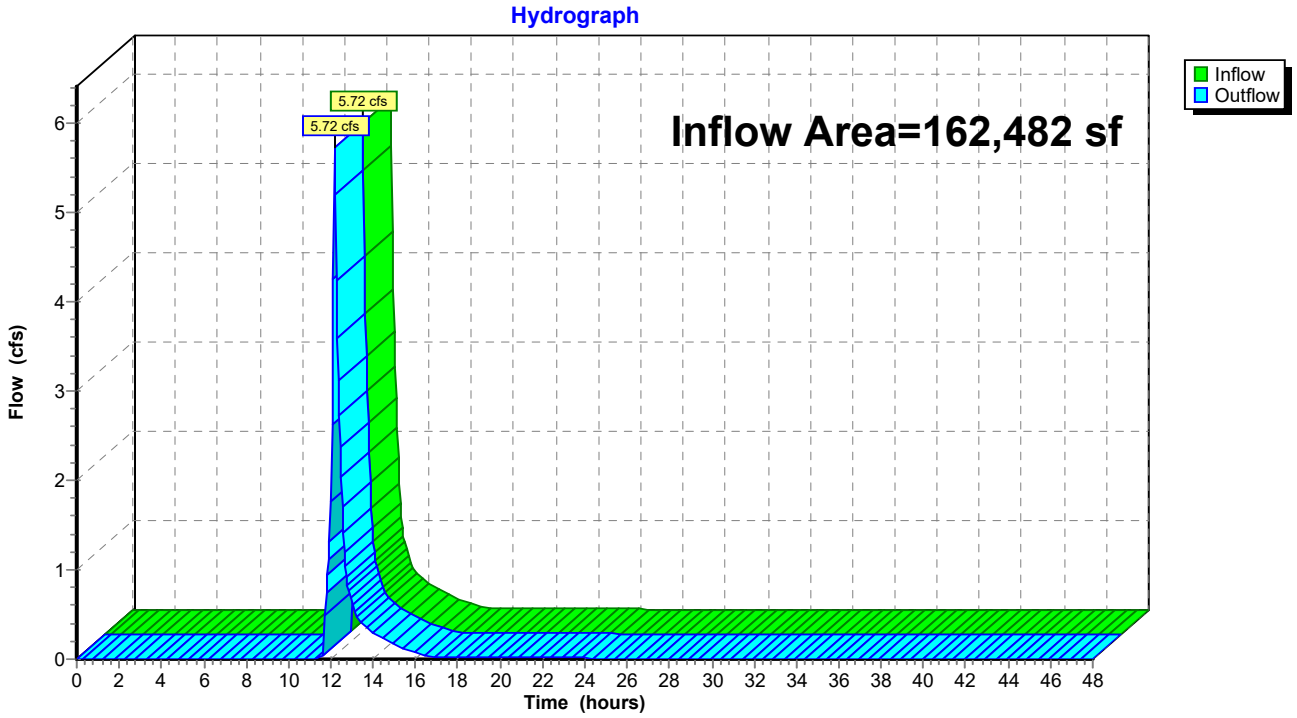
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 162,482 sf, 76.48% Impervious, Inflow Depth = 0.93" for 2-Year event
Inflow = 5.72 cfs @ 12.16 hrs, Volume= 12,537 cf
Outflow = 5.72 cfs @ 12.16 hrs, Volume= 12,537 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



Summary for Pond 1p: Subsurface Infiltration #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=98)

Inflow Area = 33,757 sf, 71.61% Impervious, Inflow Depth = 1.42" for 2-Year event
Inflow = 1.19 cfs @ 12.11 hrs, Volume= 3,987 cf
Outflow = 0.28 cfs @ 12.00 hrs, Volume= 4,000 cf, Atten= 76%, Lag= 0.0 min
Discarded = 0.28 cfs @ 12.00 hrs, Volume= 4,000 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 88.45' @ 12.56 hrs Surf.Area= 5,066 sf Storage= 909 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.5 min (862.3 - 843.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.00'	3,589 cf	**37.25'W x 136.00'L x 2.54'H Field A** 12,876 cf Overall - 3,905 cf Embedded = 8,971 cf x 40.0% Voids
#2A	88.50'	3,905 cf	**Cultec R-150XLHD** x 143 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		7,493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	89.50'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 89.50' / 89.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	90.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	88.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.28 cfs @ 12.00 hrs HW=88.04' (Free Discharge)
↑└**3=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=88.00' TW=0.00' (Dynamic Tailwater)
↑└**1=Culvert** (Controls 0.00 cfs)
↑└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1p: Subsurface Infiltration #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 11 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

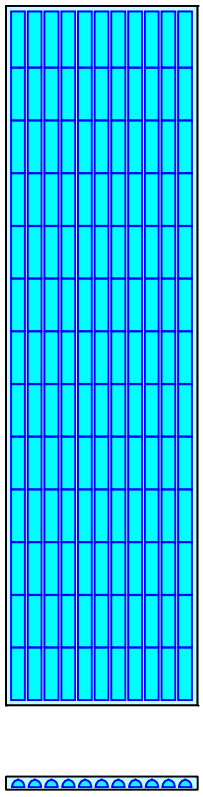
13 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 134.00' Row Length +12.0" End Stone x 2 = 136.00' Base Length
11 Rows x 33.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 37.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

143 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 11 Rows = 3,904.6 cf Chamber Storage

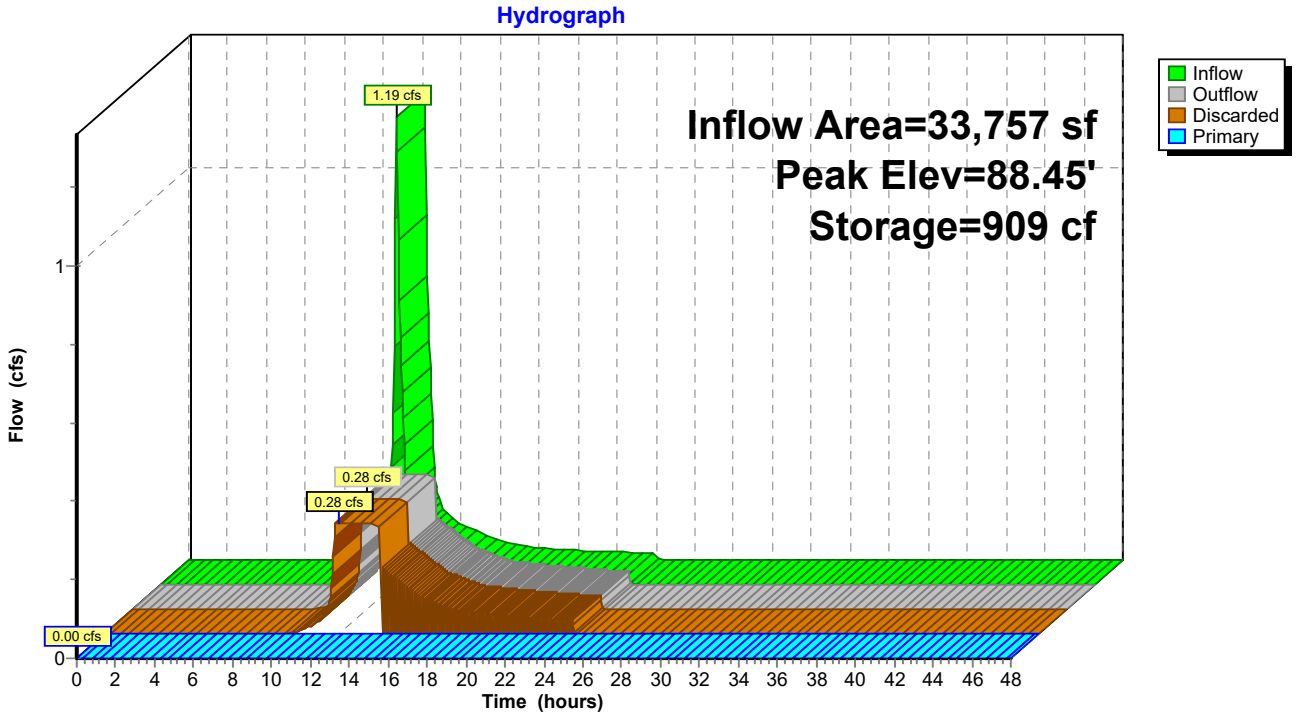
12,876.1 cf Field - 3,904.6 cf Chambers = 8,971.5 cf Stone x 40.0% Voids = 3,588.6 cf Stone Storage

Chamber Storage + Stone Storage = 7,493.2 cf = 0.172 af
Overall Storage Efficiency = 58.2%
Overall System Size = 136.00' x 37.25' x 2.54'

143 Chambers
476.9 cy Field
332.3 cy Stone



Pond 1p: Subsurface Infiltration #1



Summary for Pond 2p: Subsurface Infiltration #2

Inflow Area = 74,653 sf, 85.71% Impervious, Inflow Depth = 2.10" for 2-Year event
Inflow = 3.85 cfs @ 12.11 hrs, Volume= 13,063 cf
Outflow = 3.74 cfs @ 12.16 hrs, Volume= 13,066 cf, Atten= 3%, Lag= 2.9 min
Discarded = 0.12 cfs @ 10.65 hrs, Volume= 7,414 cf
Primary = 3.61 cfs @ 12.16 hrs, Volume= 5,652 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 89.08' @ 12.16 hrs Surf.Area= 2,232 sf Storage= 2,703 cf

Plug-Flow detention time= 104.7 min calculated for 13,053 cf (100% of inflow)
Center-of-Mass det. time= 104.8 min (917.6 - 812.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	87.15'	1,614 cf	**17.75'W x 125.75'L x 2.54'H Field A** 5,673 cf Overall - 1,639 cf Embedded = 4,034 cf x 40.0% Voids
#2A	87.65'	1,639 cf	**Cultec R-150XLHD** x 60 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 5 rows
		3,253 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.25'	**24.0" Round Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= 87.25' / 86.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.65'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	87.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 10.65 hrs HW=87.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=3.44 cfs @ 12.16 hrs HW=89.07' TW=87.82' (Dynamic Tailwater)
└**1=Culvert** (Passes 3.44 cfs of 11.57 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.44 cfs @ 2.11 fps)

Pond 2p: Subsurface Infiltration #2 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 5 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

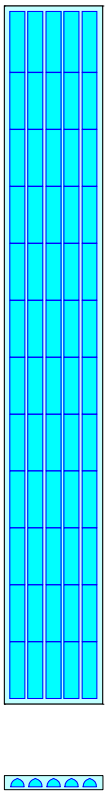
12 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 123.75' Row Length +12.0" End Stone x 2 = 125.75' Base Length
5 Rows x 33.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 17.75' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

60 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 5 Rows = 1,639.1 cf Chamber Storage

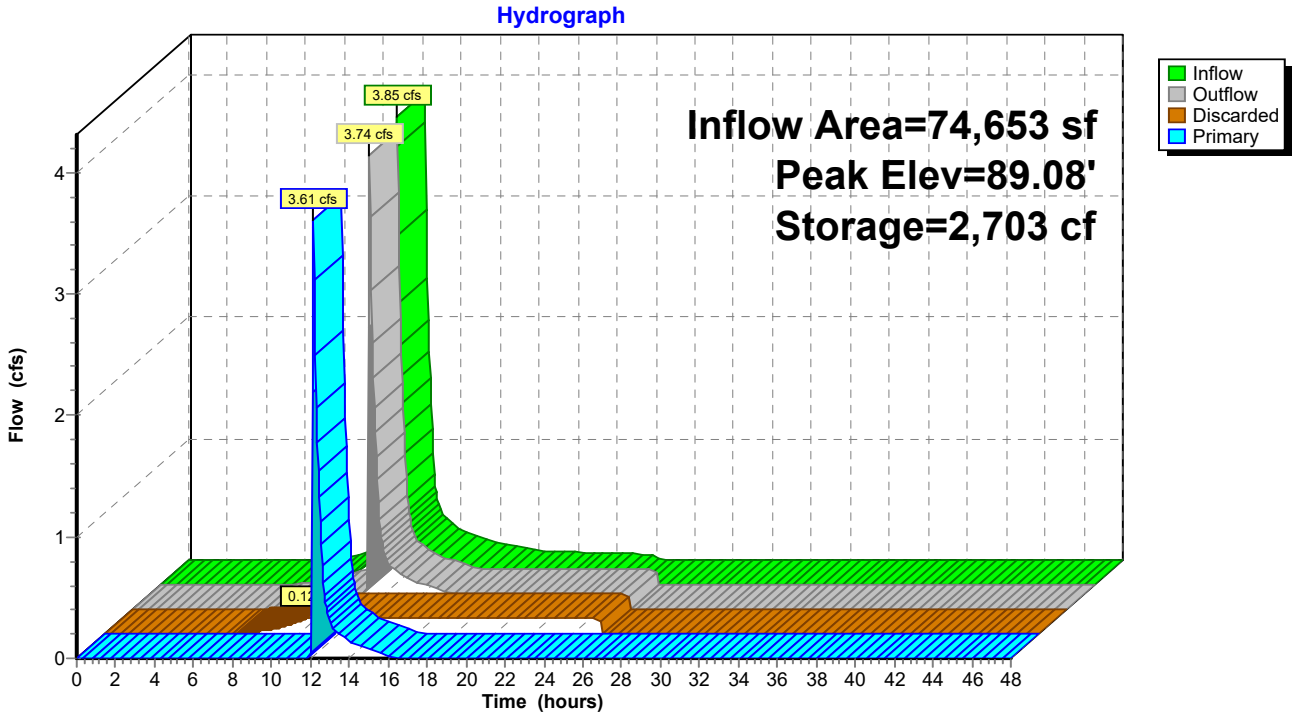
5,673.2 cf Field - 1,639.1 cf Chambers = 4,034.1 cf Stone x 40.0% Voids = 1,613.6 cf Stone Storage

Chamber Storage + Stone Storage = 3,252.7 cf = 0.075 af
Overall Storage Efficiency = 57.3%
Overall System Size = 125.75' x 17.75' x 2.54'

60 Chambers
210.1 cy Field
149.4 cy Stone



Pond 2p: Subsurface Infiltration #2



Summary for Pond 3p: Subsurface Infiltration #3

Inflow Area = 121,468 sf, 90.01% Impervious, Inflow Depth = 1.63" for 2-Year event
Inflow = 5.84 cfs @ 12.14 hrs, Volume= 16,454 cf
Outflow = 5.77 cfs @ 12.16 hrs, Volume= 16,459 cf, Atten= 1%, Lag= 1.2 min
Discarded = 0.08 cfs @ 9.25 hrs, Volume= 5,227 cf
Primary = 5.69 cfs @ 12.16 hrs, Volume= 11,233 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 87.84' @ 12.16 hrs Surf.Area= 1,488 sf Storage= 1,616 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 39.7 min (809.7 - 770.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.15'	1,070 cf	**34.00'W x 43.75'L x 2.54'H Field A** 3,781 cf Overall - 1,106 cf Embedded = 2,675 cf x 40.0% Voids
#2A	86.65'	1,106 cf	**Cultec R-150XLHD** x 40 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 10 rows
		2,176 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.55'	**24.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.55' / 83.25' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	87.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	86.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 9.25 hrs HW=86.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=5.52 cfs @ 12.16 hrs HW=87.82' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 5.52 cfs of 17.07 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 5.52 cfs @ 2.48 fps)

Pond 3p: Subsurface Infiltration #3 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 10 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

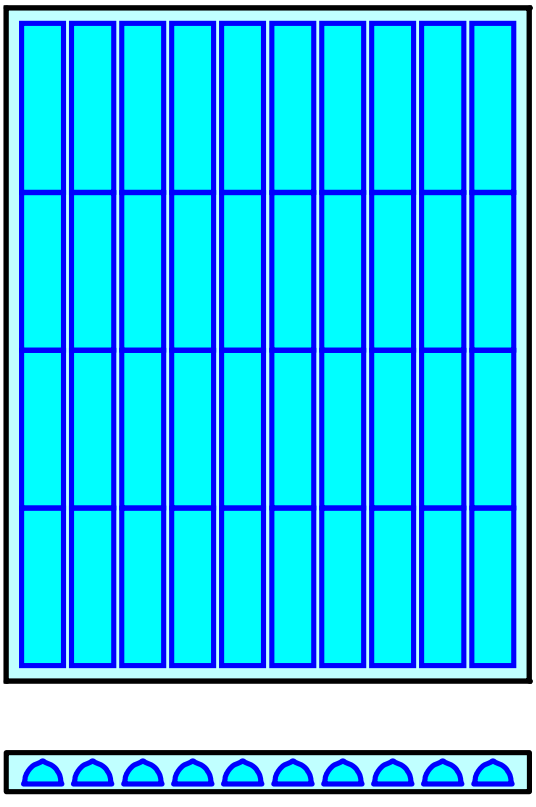
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
10 Rows x 33.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 10 Rows = 1,106.0 cf Chamber Storage

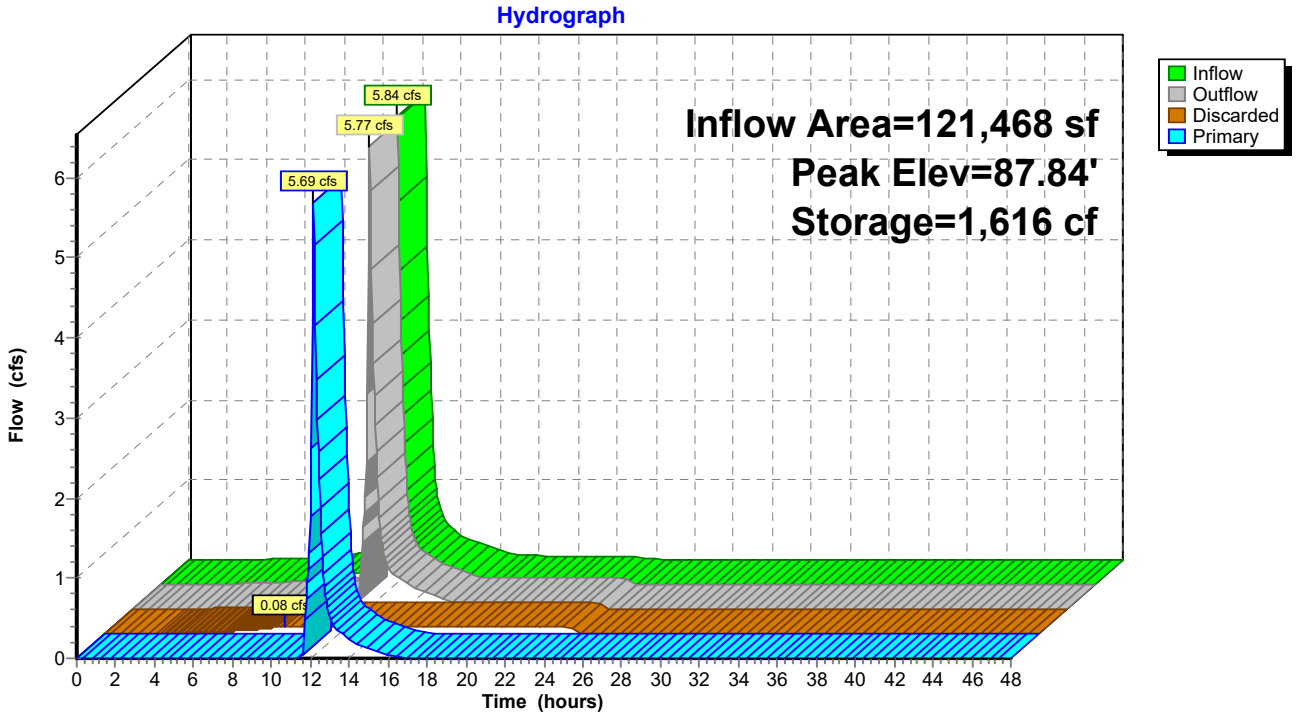
3,780.7 cf Field - 1,106.0 cf Chambers = 2,674.8 cf Stone x 40.0% Voids = 1,069.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,175.9 cf = 0.050 af
Overall Storage Efficiency = 57.6%
Overall System Size = 43.75' x 34.00' x 2.54'

40 Chambers
140.0 cy Field
99.1 cy Stone



Pond 3p: Subsurface Infiltration #3



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

Subcatchment1a: 1a Runoff Area=12,295 sf 16.18% Impervious Runoff Depth=0.49"
Flow Length=68' Tc=7.2 min CN=47 Runoff=0.07 cfs 501 cf

Subcatchment1b: 1b Runoff Area=33,757 sf 71.61% Impervious Runoff Depth=2.77"
Flow Length=181' Tc=7.5 min CN=80 Runoff=2.36 cfs 7,795 cf

Subcatchment2a: 2a Runoff Area=74,653 sf 85.71% Impervious Runoff Depth=3.64"
Flow Length=286' Tc=8.1 min CN=89 Runoff=6.54 cfs 22,633 cf

Subcatchment2b: 2b Runoff Area=46,815 sf 96.86% Impervious Runoff Depth=4.39"
Tc=5.0 min CN=96 Runoff=5.05 cfs 17,140 cf

Subcatchment2c: 2c Runoff Area=41,014 sf 36.41% Impervious Runoff Depth=1.16"
Flow Length=371' Slope=0.0100 '/' Tc=23.9 min CN=59 Runoff=0.69 cfs 3,950 cf

Reach 1R: WETLANDS Inflow=0.07 cfs 501 cf
Outflow=0.07 cfs 501 cf

Reach 2R: WASHINGTON STREET Inflow=10.91 cfs 28,409 cf
Outflow=10.91 cfs 28,409 cf

Pond 1p: Subsurface Infiltration #1 Peak Elev=88.91' Storage=2,689 cf Inflow=2.36 cfs 7,795 cf
Discarded=0.28 cfs 7,796 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 7,796 cf

Pond 2p: Subsurface Infiltration #2 Peak Elev=89.28' Storage=2,881 cf Inflow=6.54 cfs 22,633 cf
Discarded=0.12 cfs 9,031 cf Primary=6.26 cfs 13,610 cf Outflow=6.39 cfs 22,640 cf

Pond 3p: Subsurface Infiltration #3 Peak Elev=88.15' Storage=1,854 cf Inflow=10.75 cfs 30,750 cf
Discarded=0.08 cfs 6,296 cf Primary=10.66 cfs 24,459 cf Outflow=10.74 cfs 30,755 cf

Total Runoff Area = 208,534 sf Runoff Volume = 52,019 cf Average Runoff Depth = 2.99"
27.87% Pervious = 58,110 sf 72.13% Impervious = 150,424 sf

Summary for Subcatchment 1a: 1a

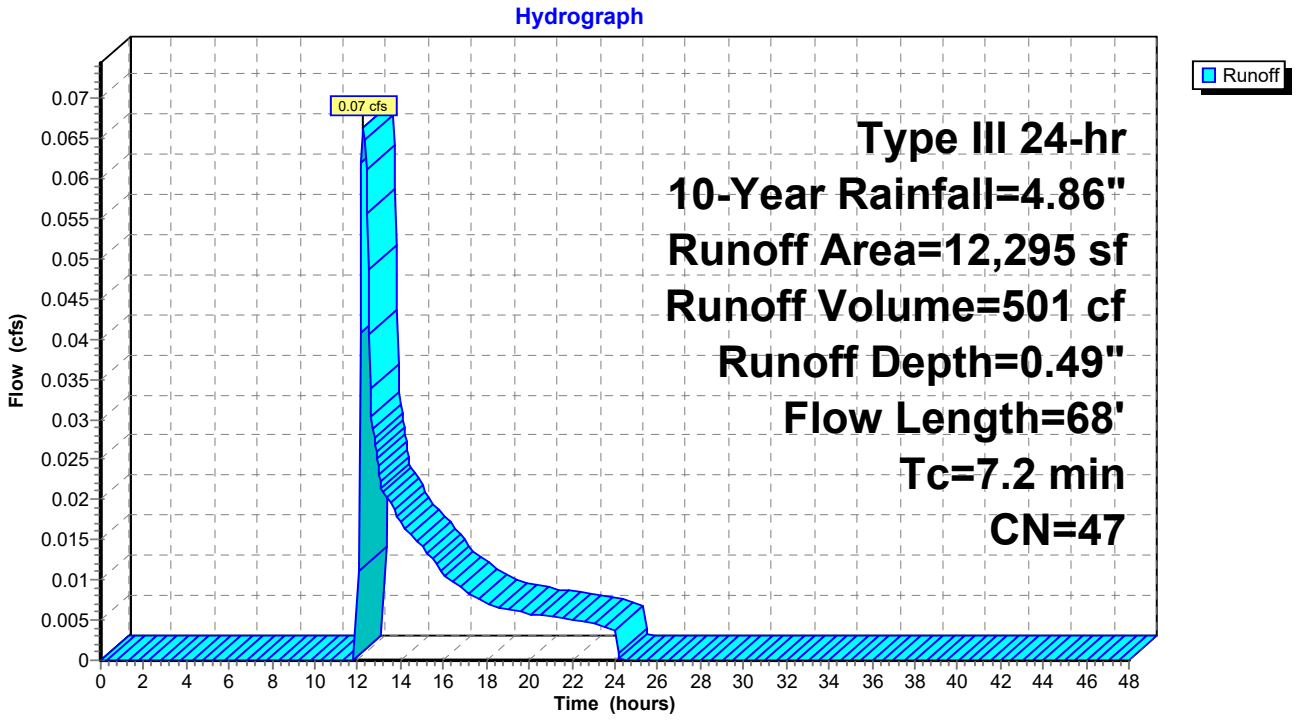
Runoff = 0.07 cfs @ 12.28 hrs, Volume= 501 cf, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
2,030	30	Woods, Good, HSG A
8,276	39	>75% Grass cover, Good, HSG A
1,989	98	Paved parking, HSG A
12,295	47	Weighted Average
10,306		83.82% Pervious Area
1,989		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0118	0.12		**Sheet Flow, SHEET FLOW** Grass: Short n= 0.150 P2= 3.20"
0.3	18	0.0273	1.16		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
7.2	68	Total			

Subcatchment 1a: 1a



Summary for Subcatchment 1b: 1b

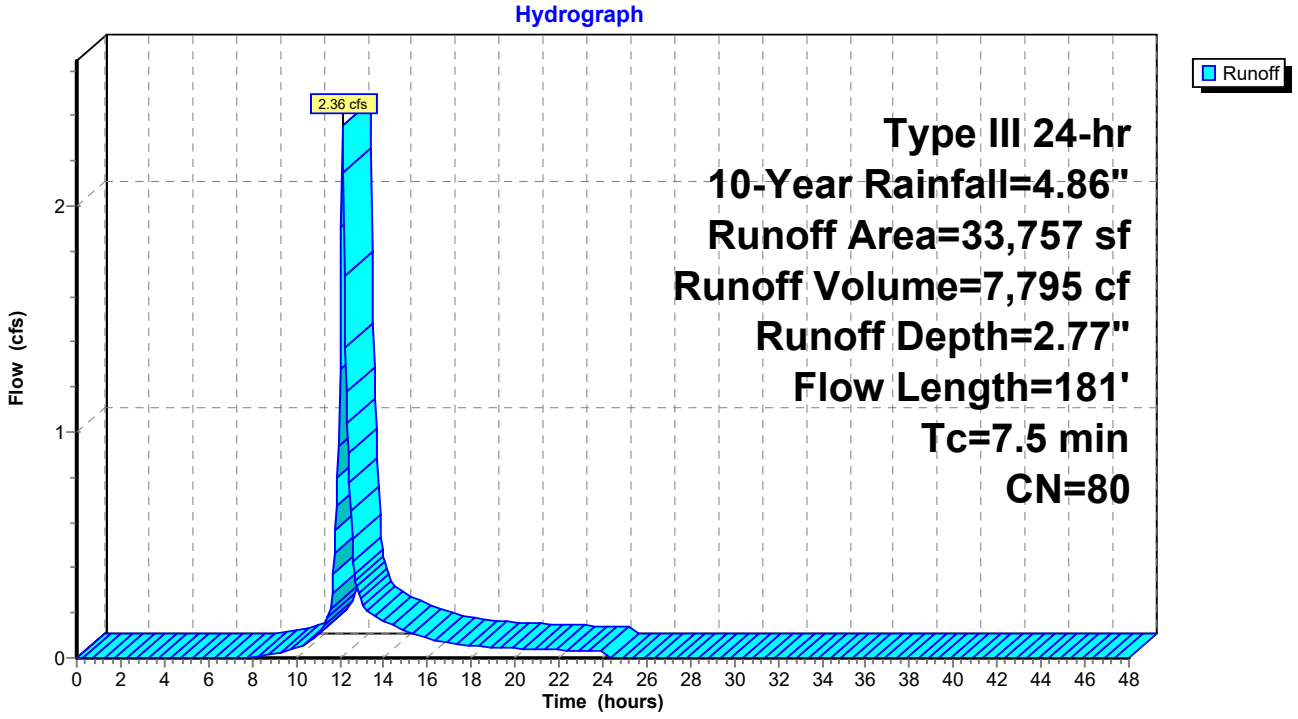
Runoff = 2.36 cfs @ 12.11 hrs, Volume= 7,795 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
5,998	30	Woods, Good, HSG A
3,585	39	>75% Grass cover, Good, HSG A
24,174	98	Paved parking, HSG A
33,757	80	Weighted Average
9,583		28.39% Pervious Area
24,174		71.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.5	31	0.0500	1.12		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.5	100	0.0291	3.46		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
7.5	181	Total			

Subcatchment 1b: 1b



Summary for Subcatchment 2a: 2a

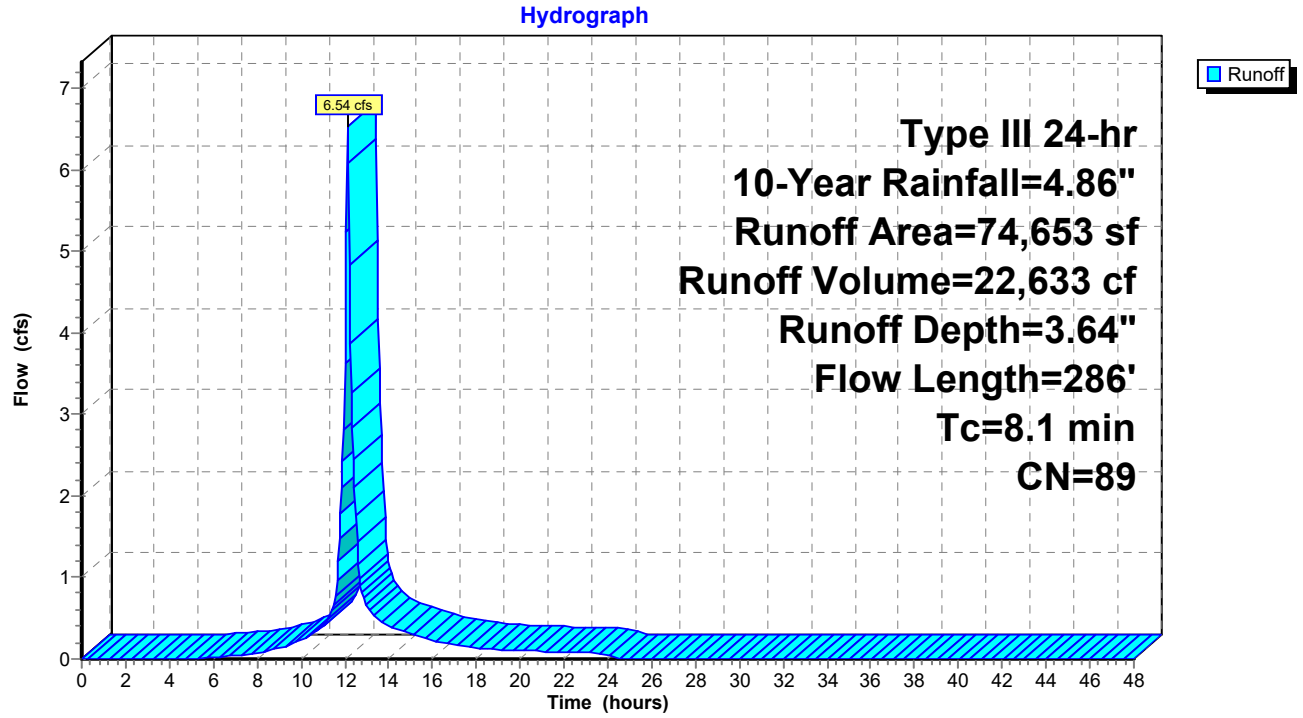
Runoff = 6.54 cfs @ 12.11 hrs, Volume= 22,633 cf, Depth= 3.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
5,158	30	Woods, Good, HSG A
5,508	39	>75% Grass cover, Good, HSG A
63,987	98	Paved parking, HSG A
74,653	89	Weighted Average
10,666		14.29% Pervious Area
63,987		85.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	40	0.1000	1.58		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.7	83	0.0842	2.03		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	113	0.0354	3.82		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
8.1	286	Total			

Subcatchment 2a: 2a



Summary for Subcatchment 2b: 2b

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

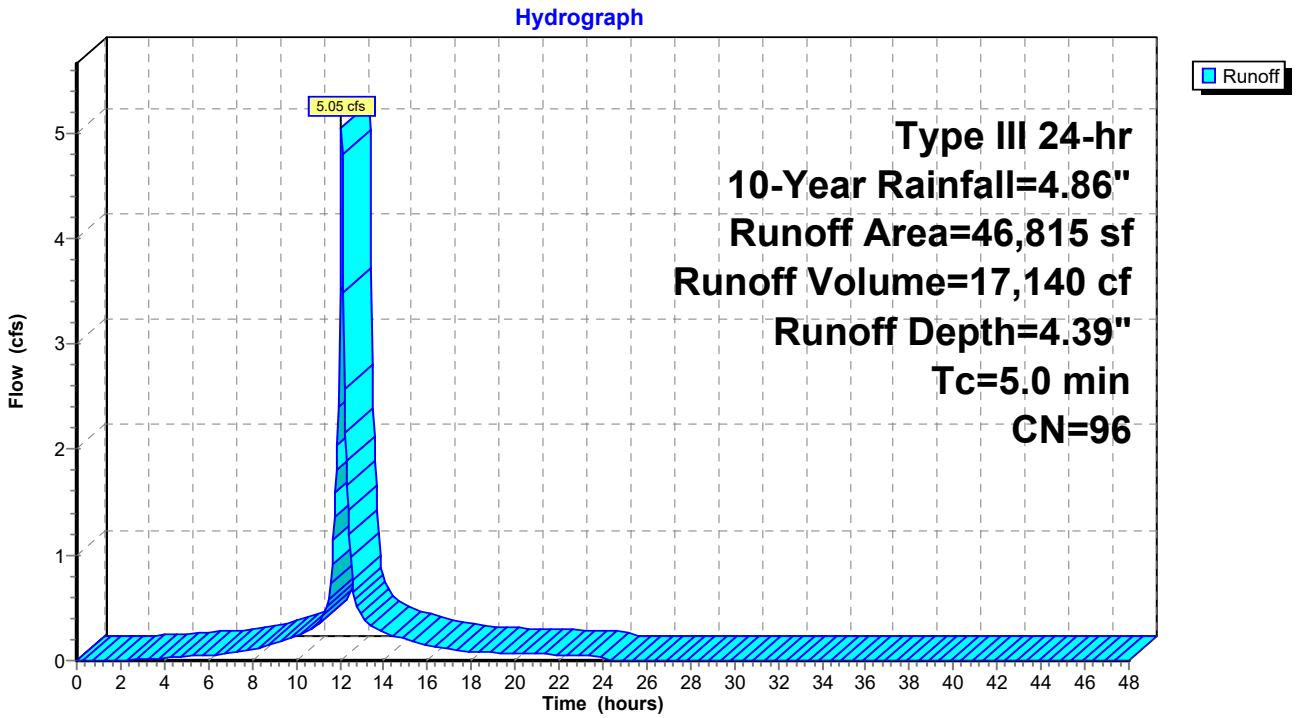
Runoff = 5.05 cfs @ 12.07 hrs, Volume= 17,140 cf, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
1,472	39	>75% Grass cover, Good, HSG A
45,343	98	Paved parking, HSG A
46,815	96	Weighted Average
1,472		3.14% Pervious Area
45,343		96.86% Impervious Area

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

Subcatchment 2b: 2b



Summary for Subcatchment 2c: 2c

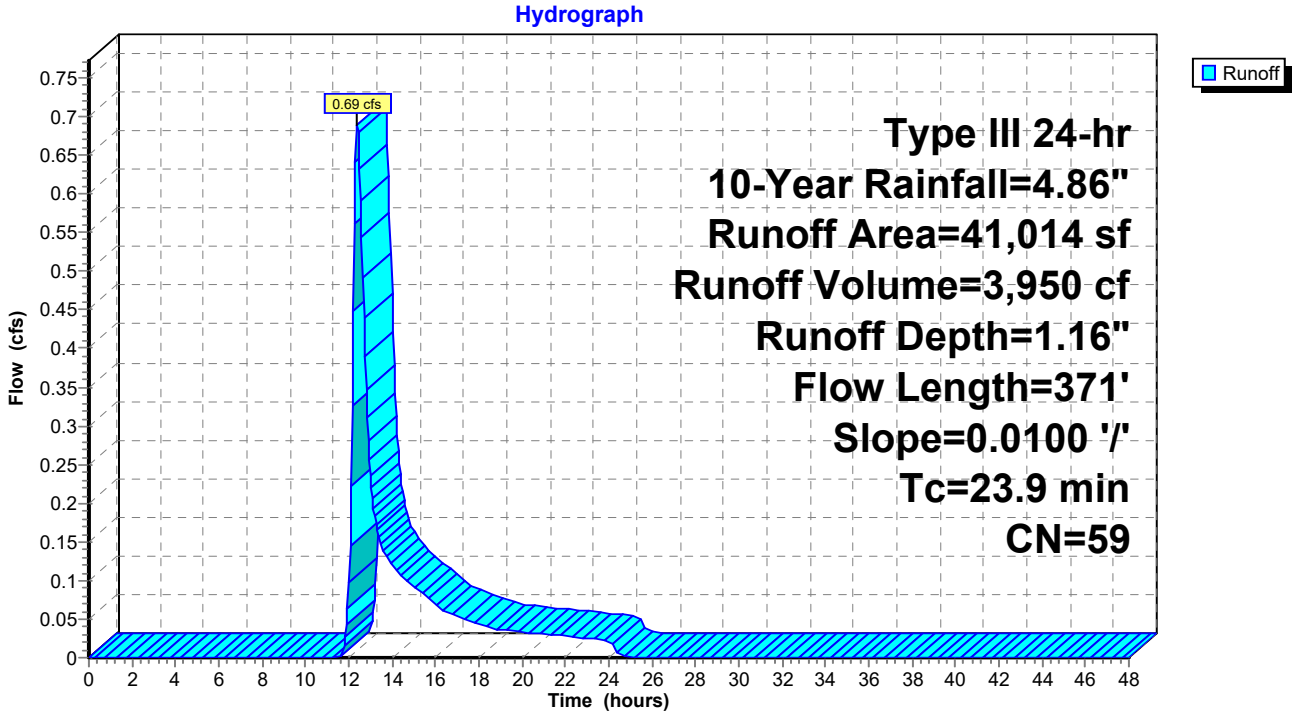
Runoff = 0.69 cfs @ 12.39 hrs, Volume= 3,950 cf, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

Area (sf)	CN	Description
6,061	30	Woods, Good, HSG A
18,020	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
11,214	98	Paved parking, HSG A
41,014	59	Weighted Average
26,083		63.59% Pervious Area
14,931		36.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
7.6	321	0.0100	0.70		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
23.9	371	Total			

Subcatchment 2c: 2c



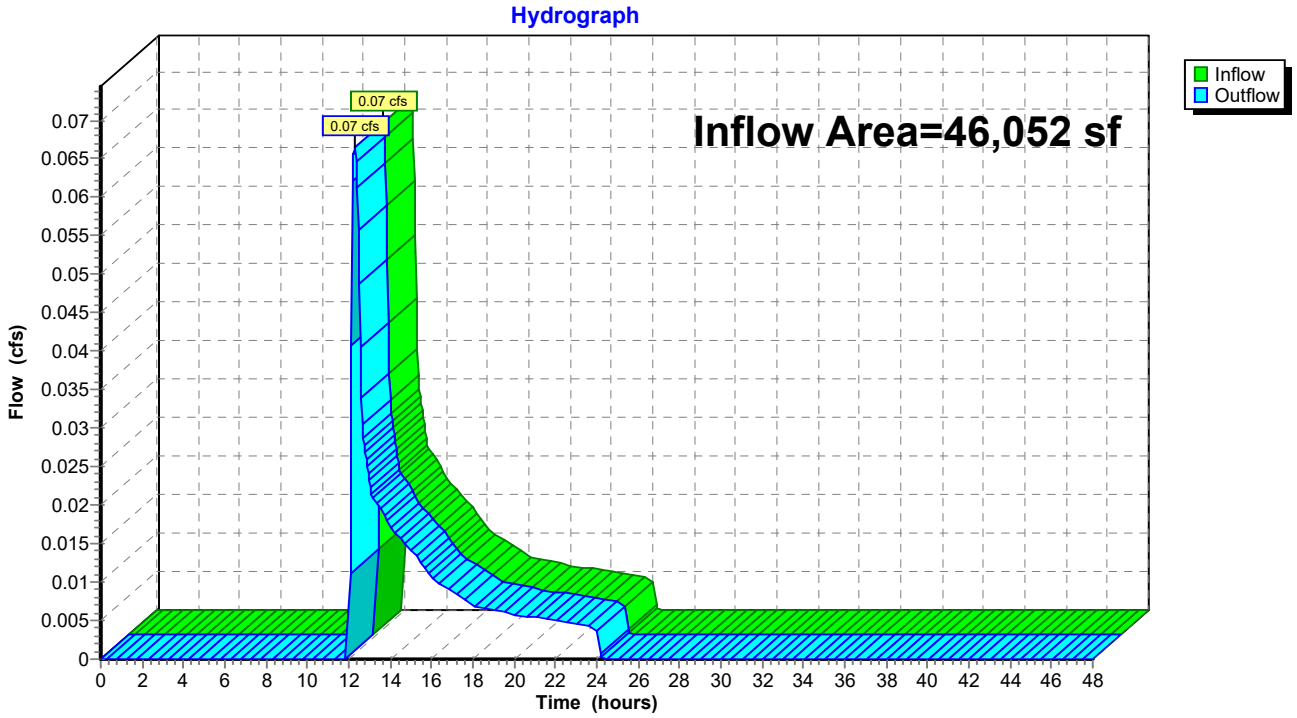
Summary for Reach 1R: WETLANDS

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

Inflow Area = 46,052 sf, 56.81% Impervious, Inflow Depth = 0.13" for 10-Year event
Inflow = 0.07 cfs @ 12.28 hrs, Volume= 501 cf
Outflow = 0.07 cfs @ 12.28 hrs, Volume= 501 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



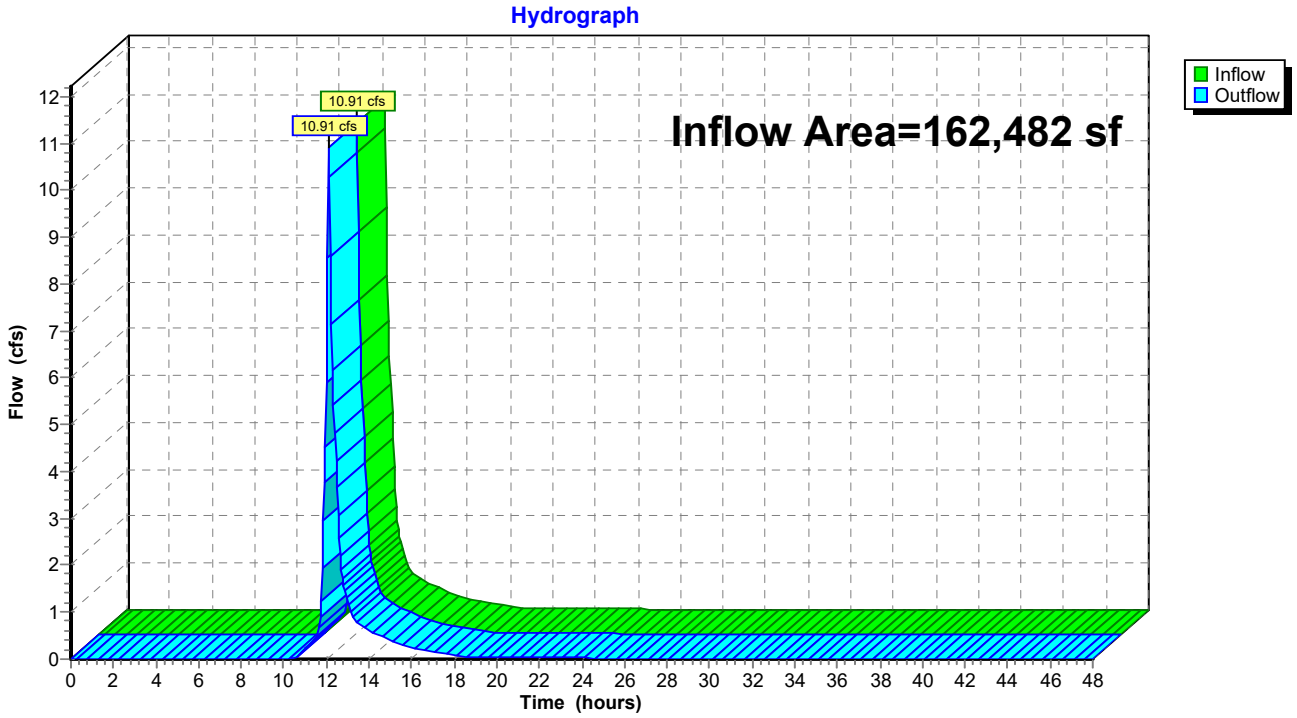
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 162,482 sf, 76.48% Impervious, Inflow Depth = 2.10" for 10-Year event
Inflow = 10.91 cfs @ 12.12 hrs, Volume= 28,409 cf
Outflow = 10.91 cfs @ 12.12 hrs, Volume= 28,409 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



Summary for Pond 1p: Subsurface Infiltration #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=64)

Inflow Area = 33,757 sf, 71.61% Impervious, Inflow Depth = 2.77" for 10-Year event
Inflow = 2.36 cfs @ 12.11 hrs, Volume= 7,795 cf
Outflow = 0.28 cfs @ 11.80 hrs, Volume= 7,796 cf, Atten= 88%, Lag= 0.0 min
Discarded = 0.28 cfs @ 11.80 hrs, Volume= 7,796 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 88.91' @ 12.90 hrs Surf.Area= 5,066 sf Storage= 2,689 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 73.4 min (897.8 - 824.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.00'	3,589 cf	**37.25'W x 136.00'L x 2.54'H Field A** 12,876 cf Overall - 3,905 cf Embedded = 8,971 cf x 40.0% Voids
#2A	88.50'	3,905 cf	**Cultec R-150XLHD** x 143 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		7,493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	89.50'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 89.50' / 89.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	90.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	88.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.28 cfs @ 11.80 hrs HW=88.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=88.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1p: Subsurface Infiltration #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 11 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

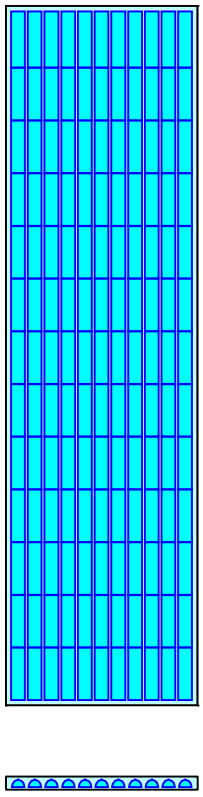
13 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 134.00' Row Length +12.0" End Stone x 2 = 136.00' Base Length
11 Rows x 33.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 37.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

143 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 11 Rows = 3,904.6 cf Chamber Storage

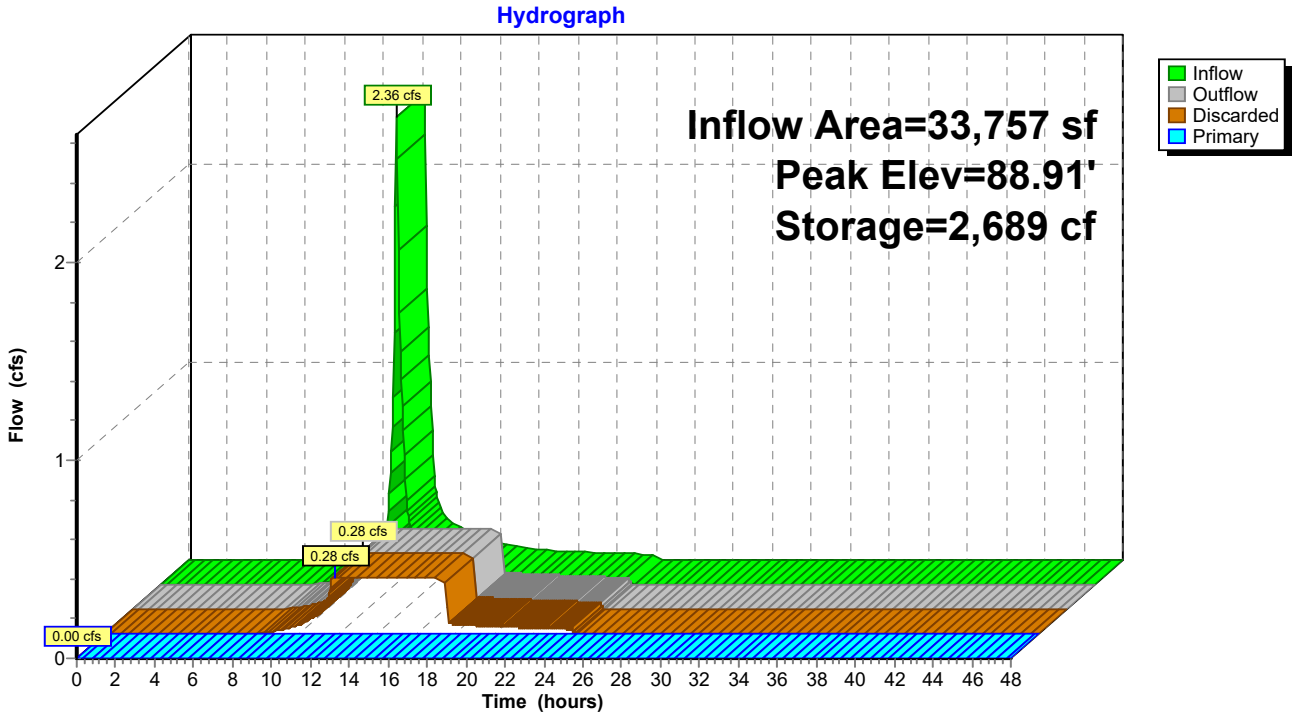
12,876.1 cf Field - 3,904.6 cf Chambers = 8,971.5 cf Stone x 40.0% Voids = 3,588.6 cf Stone Storage

Chamber Storage + Stone Storage = 7,493.2 cf = 0.172 af
Overall Storage Efficiency = 58.2%
Overall System Size = 136.00' x 37.25' x 2.54'

143 Chambers
476.9 cy Field
332.3 cy Stone



Pond 1p: Subsurface Infiltration #1



Summary for Pond 2p: Subsurface Infiltration #2

Inflow Area = 74,653 sf, 85.71% Impervious, Inflow Depth = 3.64" for 10-Year event
Inflow = 6.54 cfs @ 12.11 hrs, Volume= 22,633 cf
Outflow = 6.39 cfs @ 12.13 hrs, Volume= 22,640 cf, Atten= 2%, Lag= 1.3 min
Discarded = 0.12 cfs @ 9.25 hrs, Volume= 9,031 cf
Primary = 6.26 cfs @ 12.13 hrs, Volume= 13,610 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 89.28' @ 12.13 hrs Surf.Area= 2,232 sf Storage= 2,881 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 81.0 min (878.4 - 797.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	87.15'	1,614 cf	**17.75'W x 125.75'L x 2.54'H Field A** 5,673 cf Overall - 1,639 cf Embedded = 4,034 cf x 40.0% Voids
#2A	87.65'	1,639 cf	**Cultec R-150XLHD** x 60 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 5 rows
		3,253 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.25'	**24.0" Round Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= 87.25' / 86.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.65'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	87.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 9.25 hrs HW=87.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=6.13 cfs @ 12.13 hrs HW=89.27' TW=88.12' (Dynamic Tailwater)
└**1=Culvert** (Passes 6.13 cfs of 12.74 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 6.13 cfs @ 2.57 fps)

Pond 2p: Subsurface Infiltration #2 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 5 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

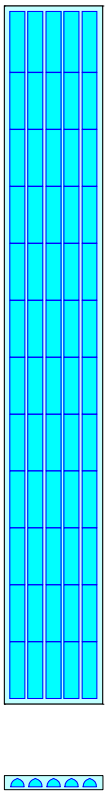
12 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 123.75' Row Length +12.0" End Stone x 2 = 125.75' Base Length
5 Rows x 33.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 17.75' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

60 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 5 Rows = 1,639.1 cf Chamber Storage

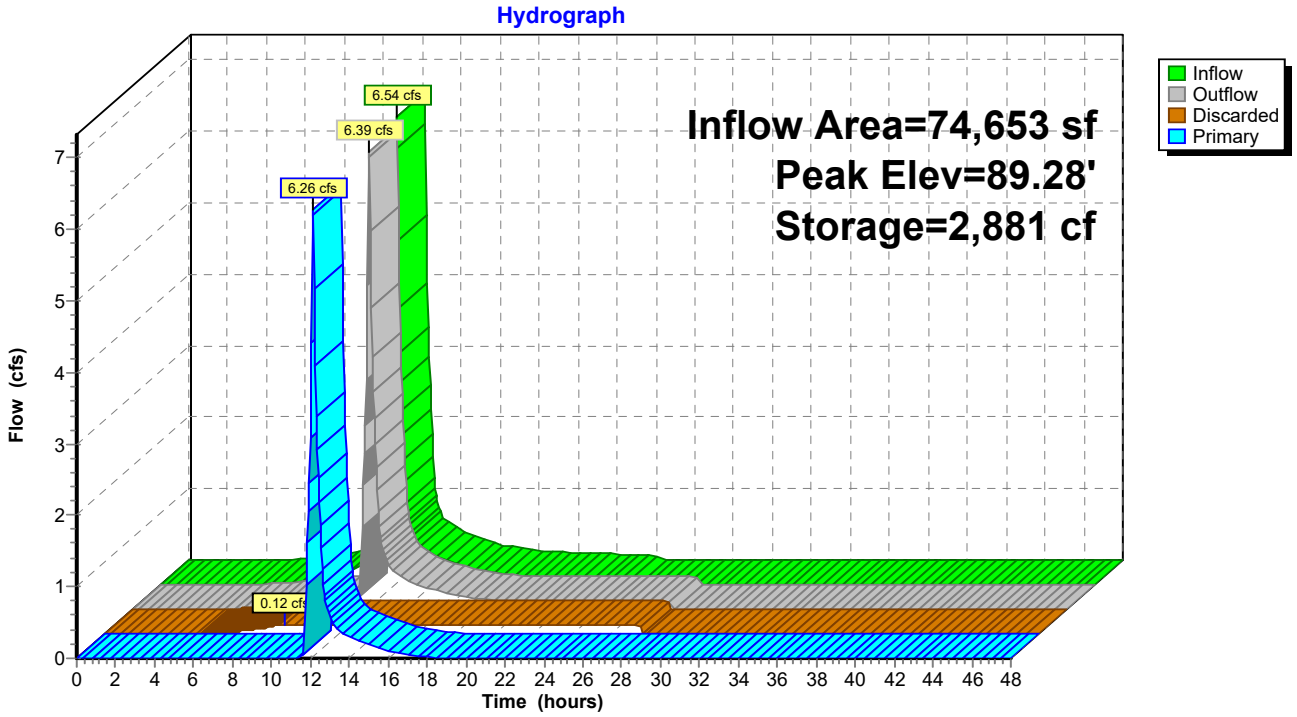
5,673.2 cf Field - 1,639.1 cf Chambers = 4,034.1 cf Stone x 40.0% Voids = 1,613.6 cf Stone Storage

Chamber Storage + Stone Storage = 3,252.7 cf = 0.075 af
Overall Storage Efficiency = 57.3%
Overall System Size = 125.75' x 17.75' x 2.54'

60 Chambers
210.1 cy Field
149.4 cy Stone



Pond 2p: Subsurface Infiltration #2



Summary for Pond 3p: Subsurface Infiltration #3

Inflow Area = 121,468 sf, 90.01% Impervious, Inflow Depth = 3.04" for 10-Year event
Inflow = 10.75 cfs @ 12.10 hrs, Volume= 30,750 cf
Outflow = 10.74 cfs @ 12.11 hrs, Volume= 30,755 cf, Atten= 0%, Lag= 0.6 min
Discarded = 0.08 cfs @ 7.80 hrs, Volume= 6,296 cf
Primary = 10.66 cfs @ 12.11 hrs, Volume= 24,459 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 88.15' @ 12.11 hrs Surf.Area= 1,488 sf Storage= 1,854 cf

Plug-Flow detention time= 29.7 min calculated for 30,723 cf (100% of inflow)
Center-of-Mass det. time= 29.9 min (793.9 - 763.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.15'	1,070 cf	**34.00'W x 43.75'L x 2.54'H Field A** 3,781 cf Overall - 1,106 cf Embedded = 2,675 cf x 40.0% Voids
#2A	86.65'	1,106 cf	**Cultec R-150XLHD** x 40 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 10 rows
		2,176 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.55'	**24.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.55' / 83.25' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	87.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	86.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 7.80 hrs HW=86.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=10.38 cfs @ 12.11 hrs HW=88.13' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 10.38 cfs of 19.03 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 10.38 cfs @ 3.07 fps)

Pond 3p: Subsurface Infiltration #3 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 10 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

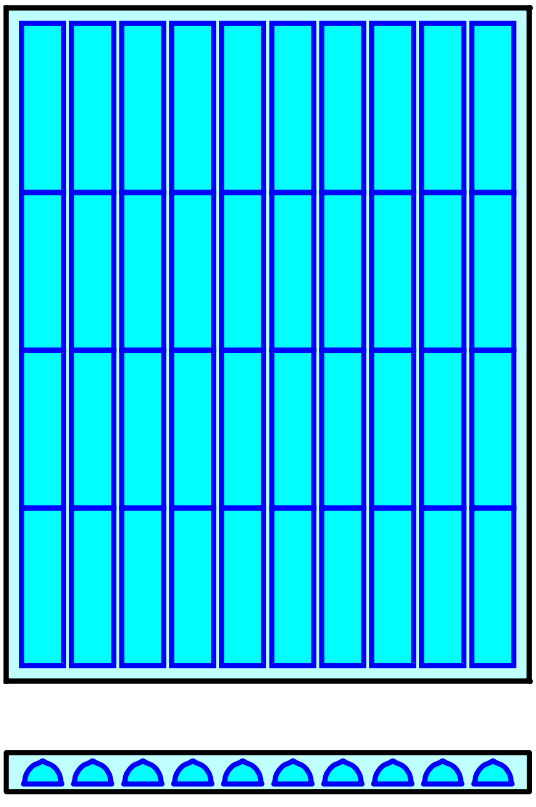
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
10 Rows x 33.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 10 Rows = 1,106.0 cf Chamber Storage

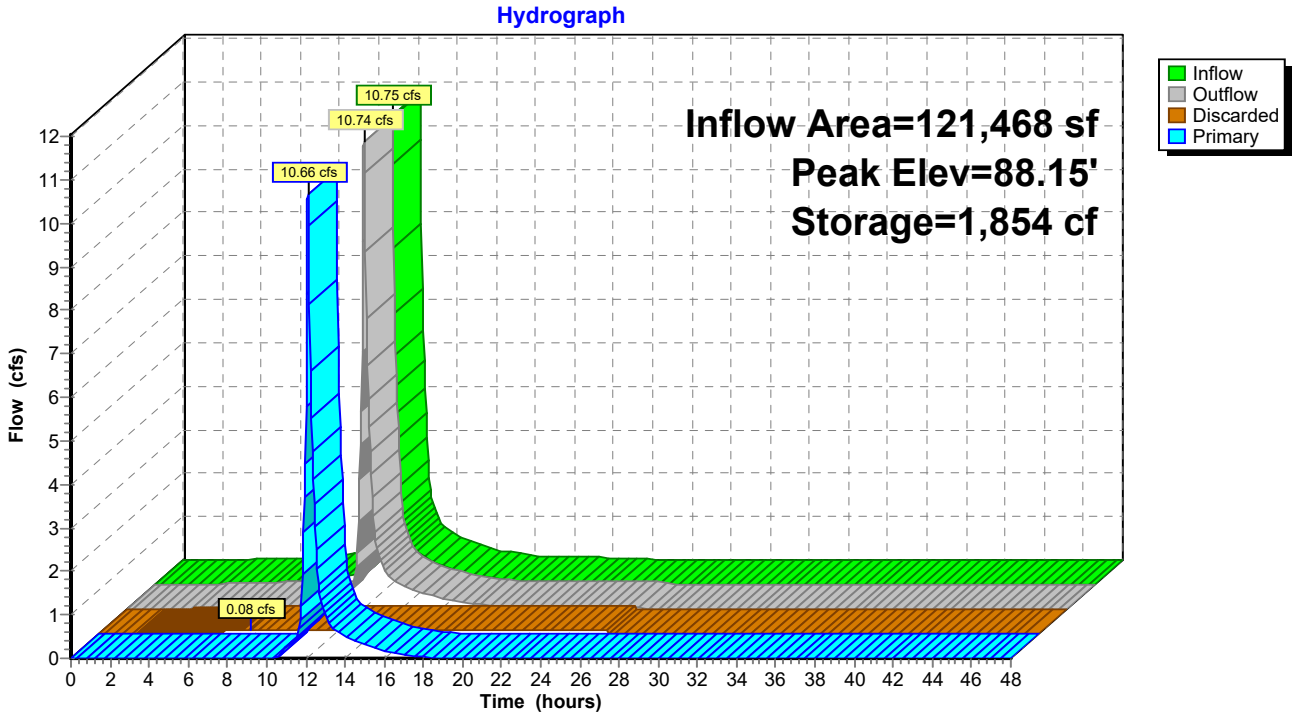
3,780.7 cf Field - 1,106.0 cf Chambers = 2,674.8 cf Stone x 40.0% Voids = 1,069.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,175.9 cf = 0.050 af
Overall Storage Efficiency = 57.6%
Overall System Size = 43.75' x 34.00' x 2.54'

40 Chambers
140.0 cy Field
99.1 cy Stone



Pond 3p: Subsurface Infiltration #3



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

Subcatchment1a: 1a Runoff Area=12,295 sf 16.18% Impervious Runoff Depth=1.00"
Flow Length=68' Tc=7.2 min CN=47 Runoff=0.22 cfs 1,024 cf

Subcatchment1b: 1b Runoff Area=33,757 sf 71.61% Impervious Runoff Depth=3.92"
Flow Length=181' Tc=7.5 min CN=80 Runoff=3.32 cfs 11,018 cf

Subcatchment2a: 2a Runoff Area=74,653 sf 85.71% Impervious Runoff Depth=4.88"
Flow Length=286' Tc=8.1 min CN=89 Runoff=8.65 cfs 30,364 cf

Subcatchment2b: 2b Runoff Area=46,815 sf 96.86% Impervious Runoff Depth=5.68"
Tc=5.0 min CN=96 Runoff=6.45 cfs 22,147 cf

Subcatchment2c: 2c Runoff Area=41,014 sf 36.41% Impervious Runoff Depth=1.94"
Flow Length=371' Slope=0.0100 '/' Tc=23.9 min CN=59 Runoff=1.25 cfs 6,614 cf

Reach 1R: WETLANDS Inflow=0.22 cfs 1,024 cf
Outflow=0.22 cfs 1,024 cf

Reach 2R: WASHINGTON STREET Inflow=14.55 cfs 42,395 cf
Outflow=14.55 cfs 42,395 cf

Pond 1p: Subsurface Infiltration #1 Peak Elev=89.34' Storage=4,382 cf Inflow=3.32 cfs 11,018 cf
Discarded=0.28 cfs 11,030 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 11,030 cf

Pond 2p: Subsurface Infiltration #2 Peak Elev=89.41' Storage=3,001 cf Inflow=8.65 cfs 30,364 cf
Discarded=0.12 cfs 9,875 cf Primary=8.33 cfs 20,498 cf Outflow=8.45 cfs 30,373 cf

Pond 3p: Subsurface Infiltration #3 Peak Elev=88.34' Storage=1,964 cf Inflow=14.10 cfs 42,644 cf
Discarded=0.08 cfs 6,867 cf Primary=13.99 cfs 35,781 cf Outflow=14.08 cfs 42,648 cf

Total Runoff Area = 208,534 sf Runoff Volume = 71,168 cf Average Runoff Depth = 4.10"
27.87% Pervious = 58,110 sf 72.13% Impervious = 150,424 sf

Summary for Subcatchment 1a: 1a

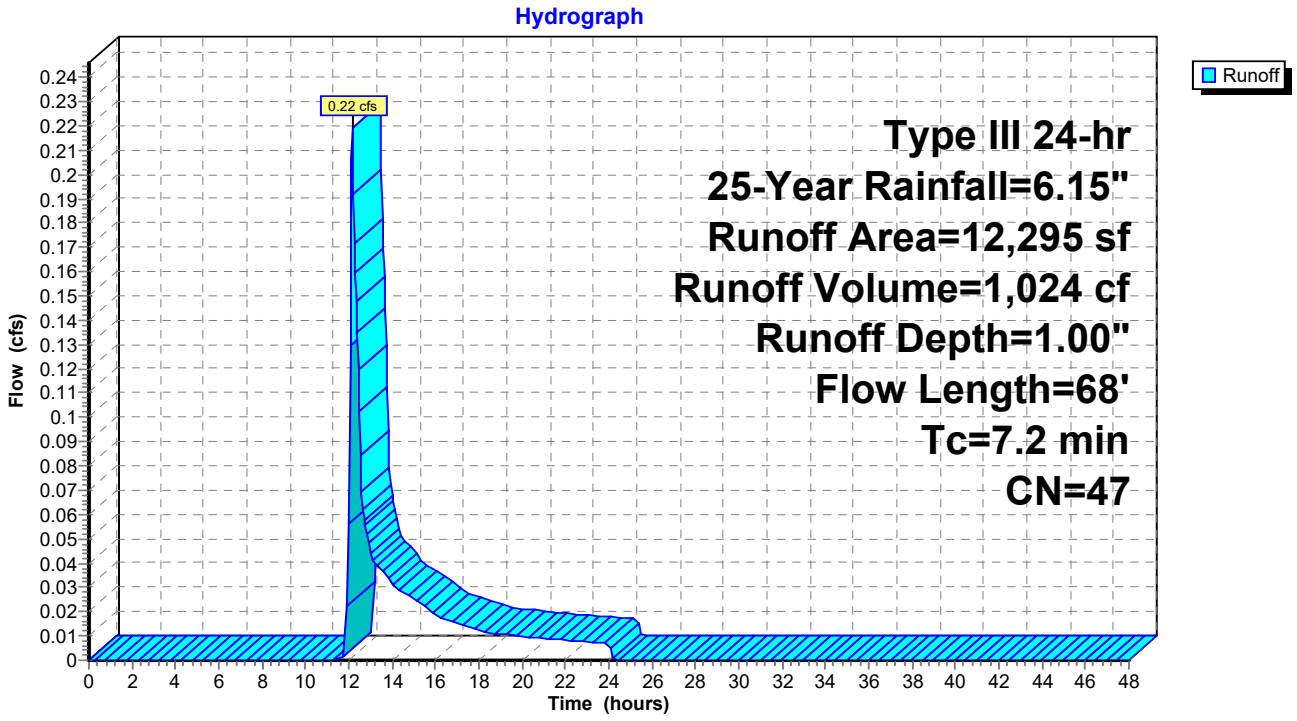
Runoff = 0.22 cfs @ 12.14 hrs, Volume= 1,024 cf, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
2,030	30	Woods, Good, HSG A
8,276	39	>75% Grass cover, Good, HSG A
1,989	98	Paved parking, HSG A
12,295	47	Weighted Average
10,306		83.82% Pervious Area
1,989		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0118	0.12		**Sheet Flow, SHEET FLOW** Grass: Short n= 0.150 P2= 3.20"
0.3	18	0.0273	1.16		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
7.2	68	Total			

Subcatchment 1a: 1a



Summary for Subcatchment 1b: 1b

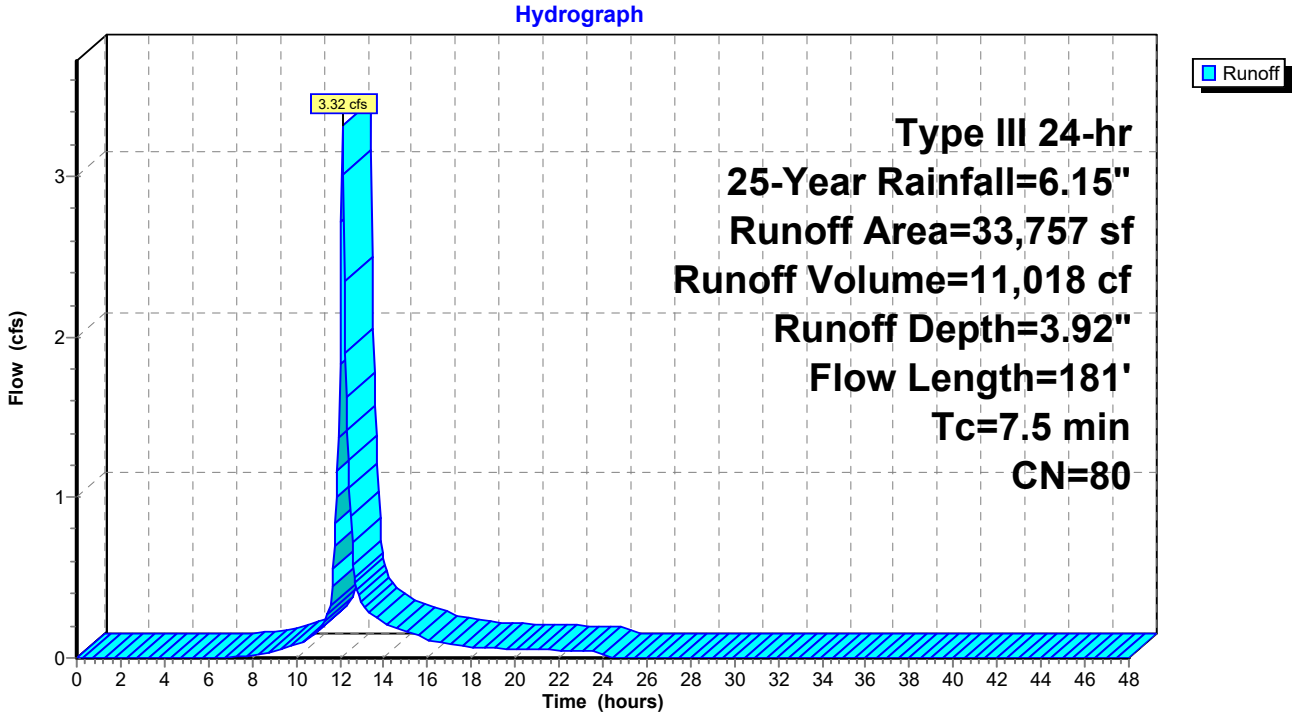
Runoff = 3.32 cfs @ 12.11 hrs, Volume= 11,018 cf, Depth= 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
5,998	30	Woods, Good, HSG A
3,585	39	>75% Grass cover, Good, HSG A
24,174	98	Paved parking, HSG A
33,757	80	Weighted Average
9,583		28.39% Pervious Area
24,174		71.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.5	31	0.0500	1.12		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.5	100	0.0291	3.46		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
7.5	181	Total			

Subcatchment 1b: 1b



Summary for Subcatchment 2a: 2a

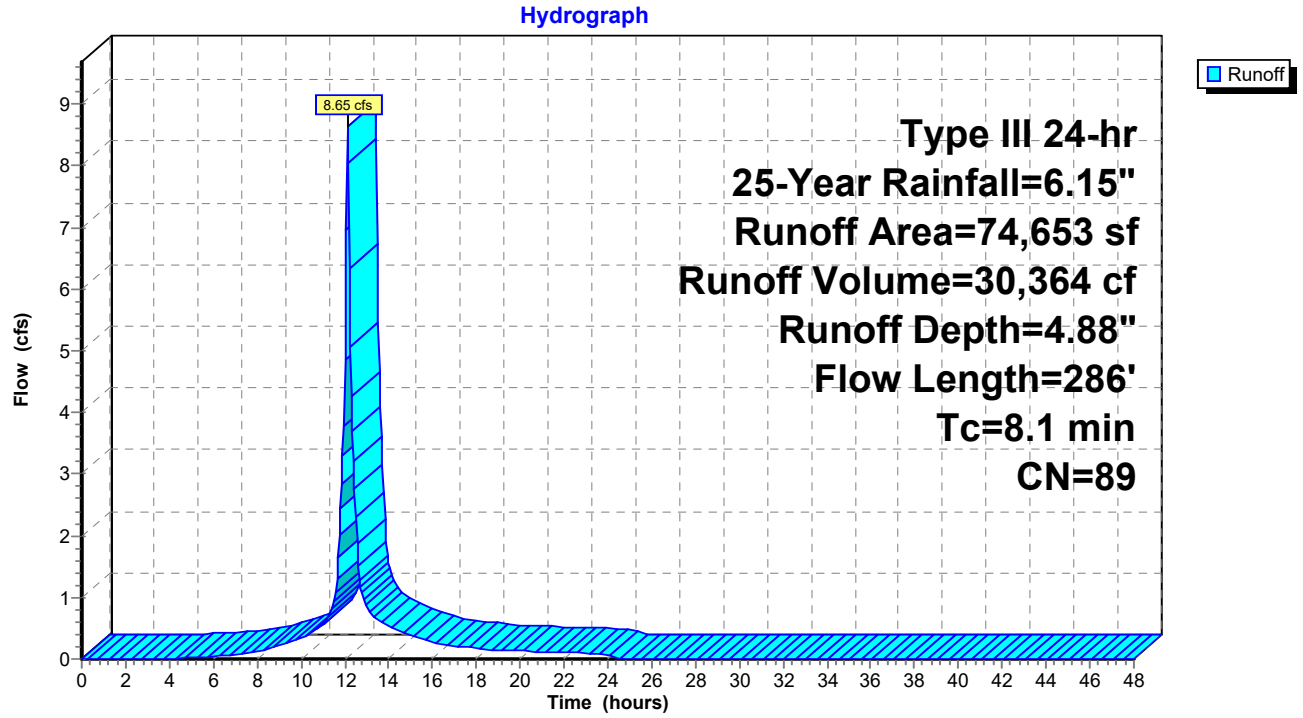
Runoff = 8.65 cfs @ 12.11 hrs, Volume= 30,364 cf, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
5,158	30	Woods, Good, HSG A
5,508	39	>75% Grass cover, Good, HSG A
63,987	98	Paved parking, HSG A
74,653	89	Weighted Average
10,666		14.29% Pervious Area
63,987		85.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	40	0.1000	1.58		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.7	83	0.0842	2.03		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	113	0.0354	3.82		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
8.1	286	Total			

Subcatchment 2a: 2a



Summary for Subcatchment 2b: 2b

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

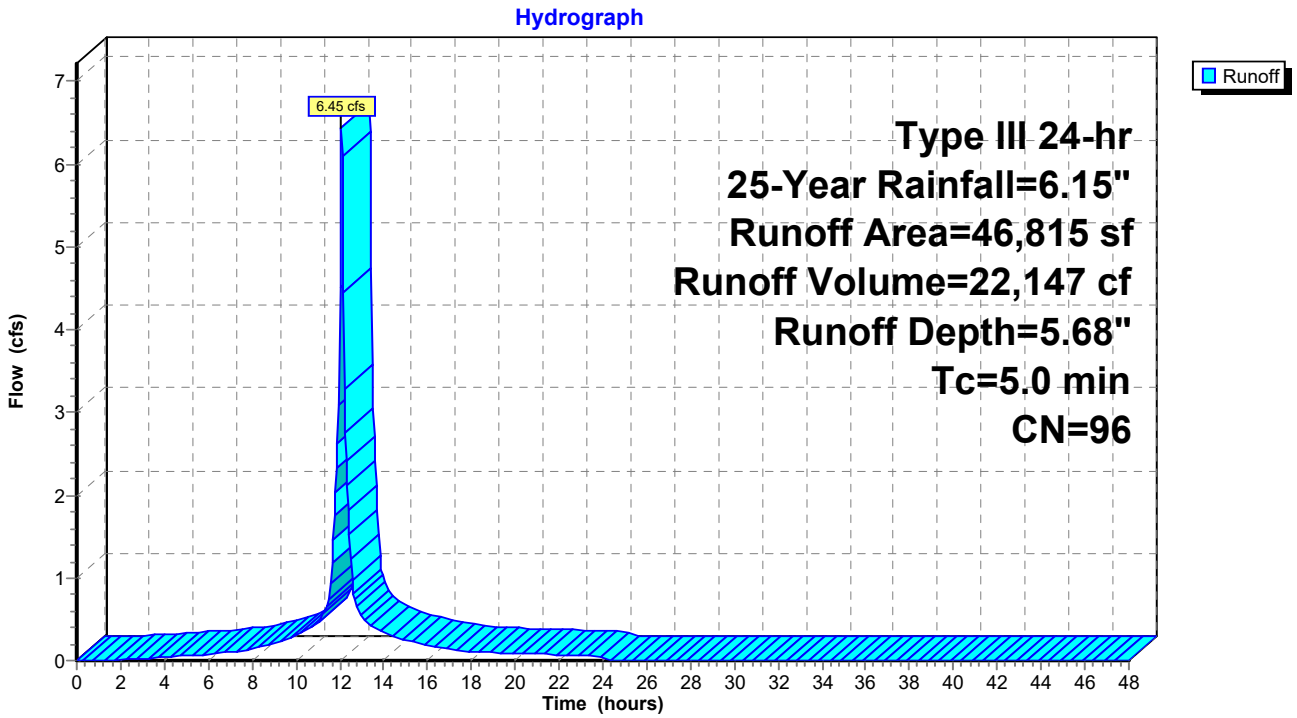
Runoff = 6.45 cfs @ 12.07 hrs, Volume= 22,147 cf, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
1,472	39	>75% Grass cover, Good, HSG A
45,343	98	Paved parking, HSG A
46,815	96	Weighted Average
1,472		3.14% Pervious Area
45,343		96.86% Impervious Area

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

Subcatchment 2b: 2b



Summary for Subcatchment 2c: 2c

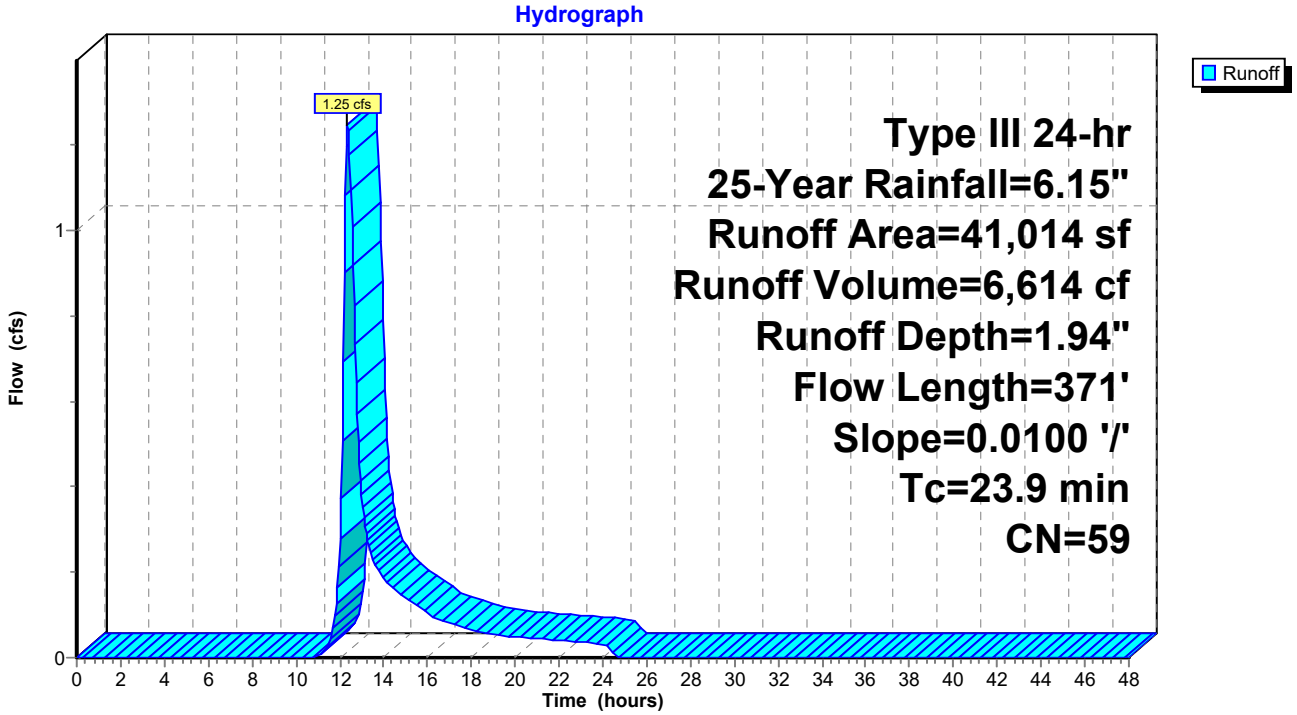
Runoff = 1.25 cfs @ 12.36 hrs, Volume= 6,614 cf, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

Area (sf)	CN	Description
6,061	30	Woods, Good, HSG A
18,020	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
11,214	98	Paved parking, HSG A
41,014	59	Weighted Average
26,083		63.59% Pervious Area
14,931		36.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
7.6	321	0.0100	0.70		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
23.9	371	Total			

Subcatchment 2c: 2c



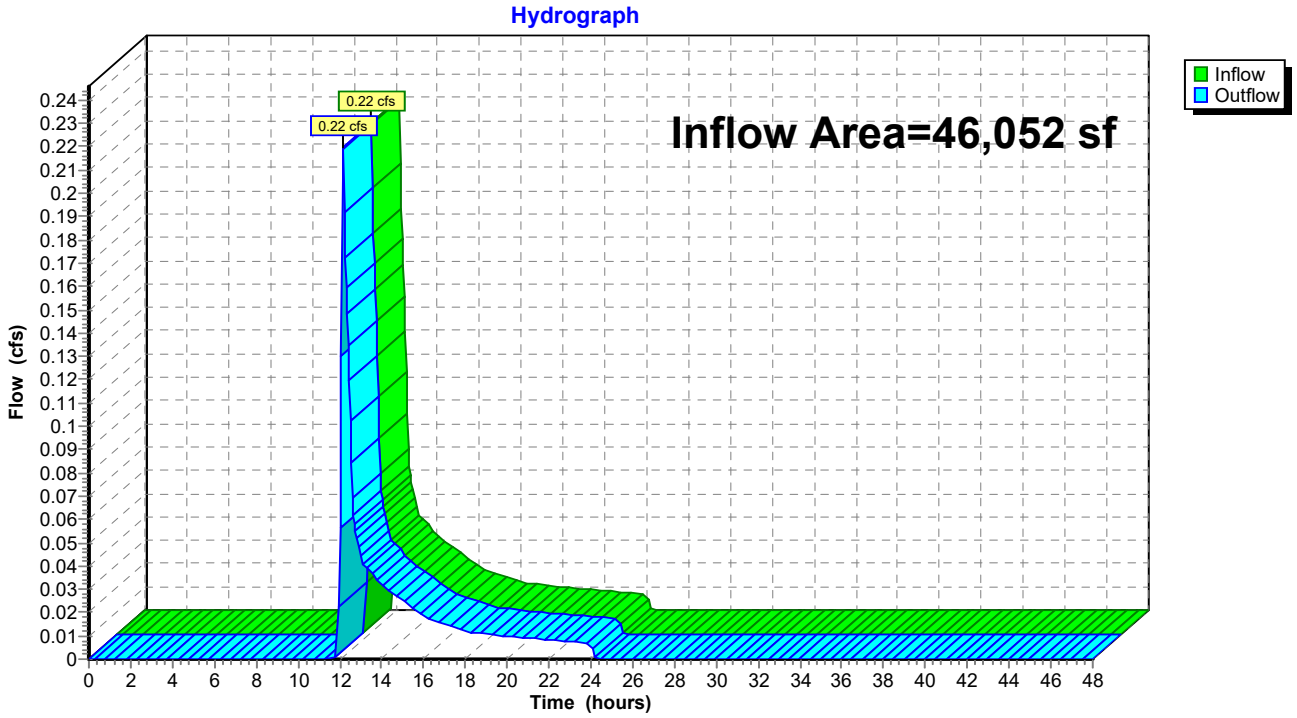
Summary for Reach 1R: WETLANDS

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

Inflow Area = 46,052 sf, 56.81% Impervious, Inflow Depth = 0.27" for 25-Year event
Inflow = 0.22 cfs @ 12.14 hrs, Volume= 1,024 cf
Outflow = 0.22 cfs @ 12.14 hrs, Volume= 1,024 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



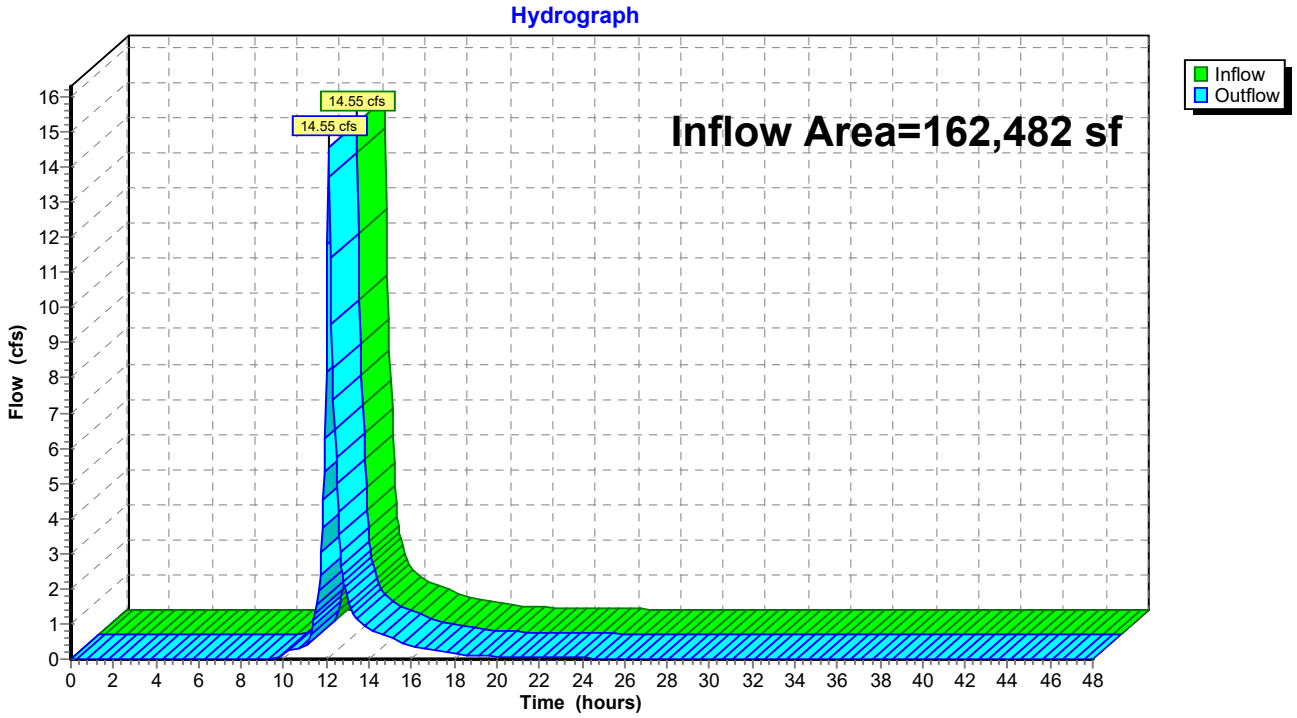
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 162,482 sf, 76.48% Impervious, Inflow Depth = 3.13" for 25-Year event
Inflow = 14.55 cfs @ 12.11 hrs, Volume= 42,395 cf
Outflow = 14.55 cfs @ 12.11 hrs, Volume= 42,395 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



Summary for Pond 1p: Subsurface Infiltration #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=35)

Inflow Area = 33,757 sf, 71.61% Impervious, Inflow Depth = 3.92" for 25-Year event
Inflow = 3.32 cfs @ 12.11 hrs, Volume= 11,018 cf
Outflow = 0.28 cfs @ 11.70 hrs, Volume= 11,030 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.28 cfs @ 11.70 hrs, Volume= 11,030 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 89.34' @ 13.31 hrs Surf.Area= 5,066 sf Storage= 4,382 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 132.1 min (946.6 - 814.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.00'	3,589 cf	**37.25'W x 136.00'L x 2.54'H Field A** 12,876 cf Overall - 3,905 cf Embedded = 8,971 cf x 40.0% Voids
#2A	88.50'	3,905 cf	**Cultec R-150XLHD** x 143 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		7,493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	89.50'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 89.50' / 89.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	90.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	88.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.28 cfs @ 11.70 hrs HW=88.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=88.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1p: Subsurface Infiltration #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 11 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

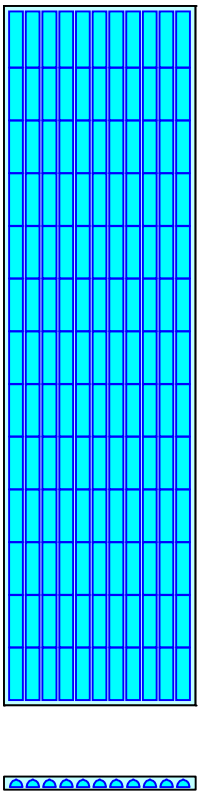
13 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 134.00' Row Length +12.0" End Stone x 2 = 136.00' Base Length
11 Rows x 33.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 37.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

143 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 11 Rows = 3,904.6 cf Chamber Storage

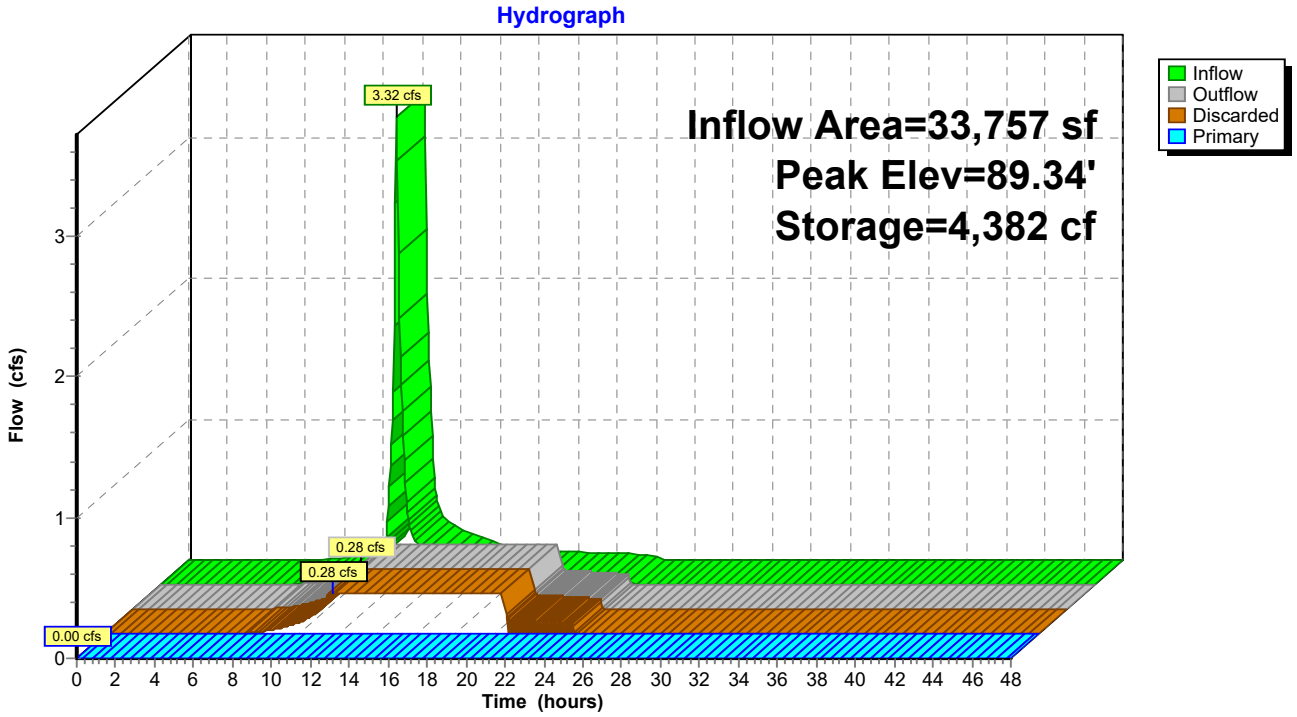
12,876.1 cf Field - 3,904.6 cf Chambers = 8,971.5 cf Stone x 40.0% Voids = 3,588.6 cf Stone Storage

Chamber Storage + Stone Storage = 7,493.2 cf = 0.172 af
Overall Storage Efficiency = 58.2%
Overall System Size = 136.00' x 37.25' x 2.54'

143 Chambers
476.9 cy Field
332.3 cy Stone



Pond 1p: Subsurface Infiltration #1



Summary for Pond 2p: Subsurface Infiltration #2

Inflow Area = 74,653 sf, 85.71% Impervious, Inflow Depth = 4.88" for 25-Year event
Inflow = 8.65 cfs @ 12.11 hrs, Volume= 30,364 cf
Outflow = 8.45 cfs @ 12.13 hrs, Volume= 30,373 cf, Atten= 2%, Lag= 1.2 min
Discarded = 0.12 cfs @ 8.45 hrs, Volume= 9,875 cf
Primary = 8.33 cfs @ 12.13 hrs, Volume= 20,498 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 89.41' @ 12.13 hrs Surf.Area= 2,232 sf Storage= 3,001 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 69.3 min (858.6 - 789.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	87.15'	1,614 cf	**17.75'W x 125.75'L x 2.54'H Field A** 5,673 cf Overall - 1,639 cf Embedded = 4,034 cf x 40.0% Voids
#2A	87.65'	1,639 cf	**Cultec R-150XLHD** x 60 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 5 rows
		3,253 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.25'	**24.0" Round Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= 87.25' / 86.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.65'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	87.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 8.45 hrs HW=87.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=8.14 cfs @ 12.13 hrs HW=89.40' TW=88.30' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.14 cfs of 13.30 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 8.14 cfs @ 2.83 fps)

Pond 2p: Subsurface Infiltration #2 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 5 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

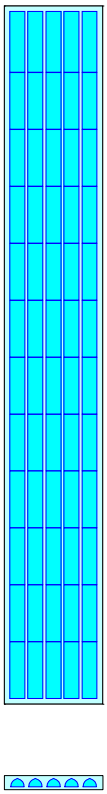
12 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 123.75' Row Length +12.0" End Stone x 2 = 125.75' Base Length
5 Rows x 33.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 17.75' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

60 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 5 Rows = 1,639.1 cf Chamber Storage

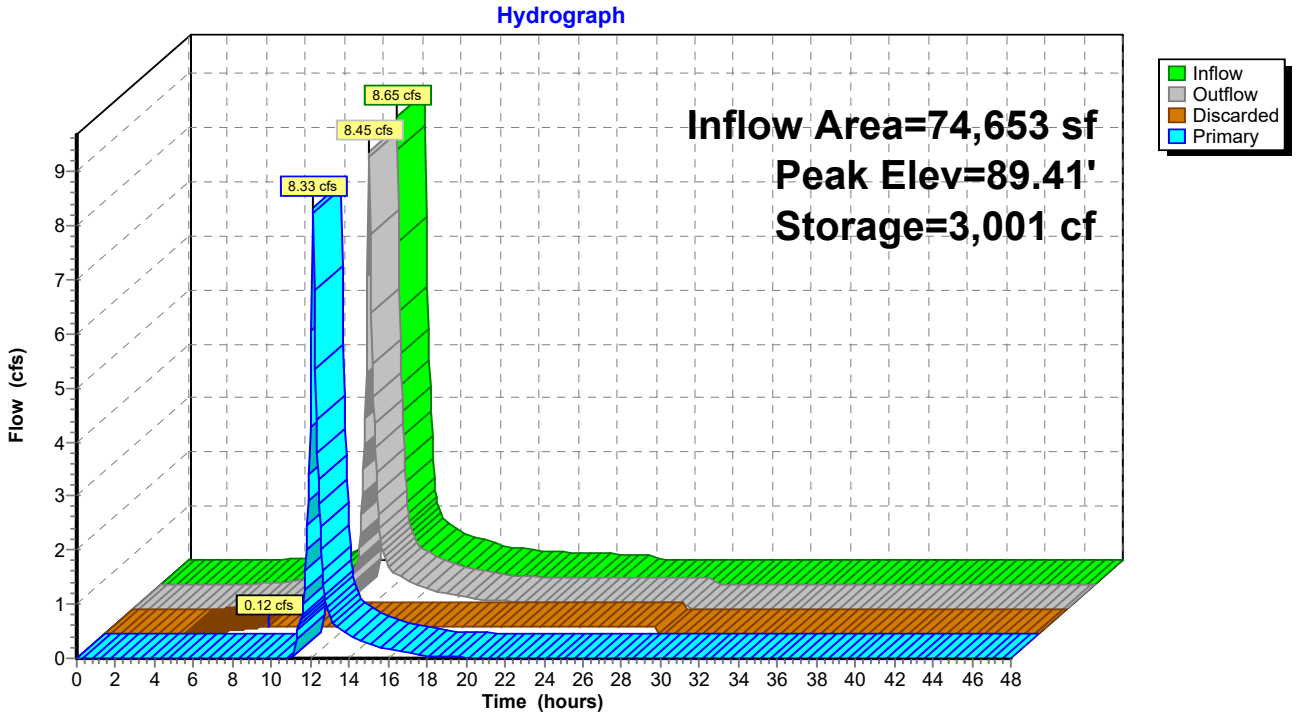
5,673.2 cf Field - 1,639.1 cf Chambers = 4,034.1 cf Stone x 40.0% Voids = 1,613.6 cf Stone Storage

Chamber Storage + Stone Storage = 3,252.7 cf = 0.075 af
Overall Storage Efficiency = 57.3%
Overall System Size = 125.75' x 17.75' x 2.54'

60 Chambers
210.1 cy Field
149.4 cy Stone



Pond 2p: Subsurface Infiltration #2



Summary for Pond 3p: Subsurface Infiltration #3

Inflow Area = 121,468 sf, 90.01% Impervious, Inflow Depth = 4.21" for 25-Year event
Inflow = 14.10 cfs @ 12.10 hrs, Volume= 42,644 cf
Outflow = 14.08 cfs @ 12.11 hrs, Volume= 42,648 cf, Atten= 0%, Lag= 0.5 min
Discarded = 0.08 cfs @ 6.80 hrs, Volume= 6,867 cf
Primary = 13.99 cfs @ 12.11 hrs, Volume= 35,781 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 88.34' @ 12.11 hrs Surf.Area= 1,488 sf Storage= 1,964 cf

Plug-Flow detention time= 25.0 min calculated for 42,604 cf (100% of inflow)
Center-of-Mass det. time= 25.2 min (787.8 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.15'	1,070 cf	**34.00'W x 43.75'L x 2.54'H Field A** 3,781 cf Overall - 1,106 cf Embedded = 2,675 cf x 40.0% Voids
#2A	86.65'	1,106 cf	**Cultec R-150XLHD** x 40 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 10 rows
		2,176 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.55'	**24.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.55' / 83.25' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	87.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	86.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 6.80 hrs HW=86.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=13.69 cfs @ 12.11 hrs HW=88.32' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 13.69 cfs of 20.12 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 13.69 cfs @ 3.38 fps)

Pond 3p: Subsurface Infiltration #3 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 10 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

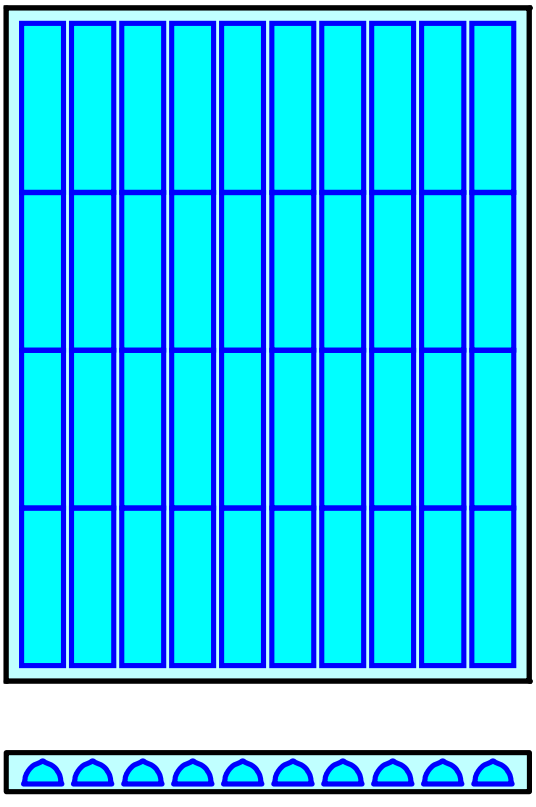
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
10 Rows x 33.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 10 Rows = 1,106.0 cf Chamber Storage

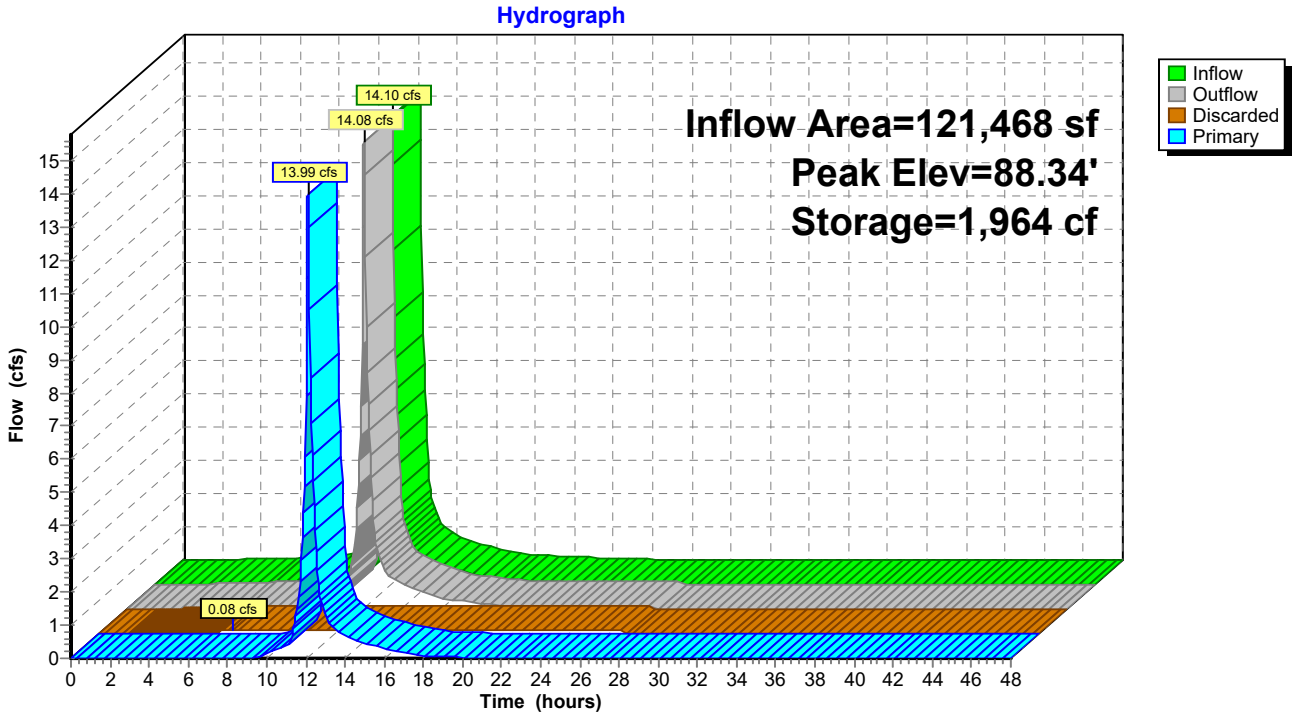
3,780.7 cf Field - 1,106.0 cf Chambers = 2,674.8 cf Stone x 40.0% Voids = 1,069.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,175.9 cf = 0.050 af
Overall Storage Efficiency = 57.6%
Overall System Size = 43.75' x 34.00' x 2.54'

40 Chambers
140.0 cy Field
99.1 cy Stone



Pond 3p: Subsurface Infiltration #3



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

Subcatchment1a: 1a Runoff Area=12,295 sf 16.18% Impervious Runoff Depth=2.40"
Flow Length=68' Tc=7.2 min CN=47 Runoff=0.68 cfs 2,463 cf

Subcatchment1b: 1b Runoff Area=33,757 sf 71.61% Impervious Runoff Depth=6.38"
Flow Length=181' Tc=7.5 min CN=80 Runoff=5.33 cfs 17,944 cf

Subcatchment2a: 2a Runoff Area=74,653 sf 85.71% Impervious Runoff Depth=7.47"
Flow Length=286' Tc=8.1 min CN=89 Runoff=12.93 cfs 46,490 cf

Subcatchment2b: 2b Runoff Area=46,815 sf 96.86% Impervious Runoff Depth=8.32"
Tc=5.0 min CN=96 Runoff=9.29 cfs 32,455 cf

Subcatchment2c: 2c Runoff Area=41,014 sf 36.41% Impervious Runoff Depth=3.82"
Flow Length=371' Slope=0.0100 '/' Tc=23.9 min CN=59 Runoff=2.59 cfs 13,070 cf

Reach 1R: WETLANDS Inflow=1.01 cfs 4,160 cf
Outflow=1.01 cfs 4,160 cf

Reach 2R: WASHINGTON STREET Inflow=22.13 cfs 73,769 cf
Outflow=22.13 cfs 73,769 cf

Pond 1p: Subsurface Infiltration #1 Peak Elev=90.41' Storage=7,223 cf Inflow=5.33 cfs 17,944 cf
Discarded=0.28 cfs 16,269 cf Primary=0.82 cfs 1,698 cf Outflow=1.10 cfs 17,967 cf

Pond 2p: Subsurface Infiltration #2 Peak Elev=89.66' Storage=3,222 cf Inflow=12.93 cfs 46,490 cf
Discarded=0.12 cfs 10,785 cf Primary=12.53 cfs 35,708 cf Outflow=12.66 cfs 46,494 cf

Pond 3p: Subsurface Infiltration #3 Peak Elev=88.68' Storage=2,170 cf Inflow=20.95 cfs 68,163 cf
Discarded=0.08 cfs 7,466 cf Primary=20.81 cfs 60,699 cf Outflow=20.90 cfs 68,165 cf

Total Runoff Area = 208,534 sf Runoff Volume = 112,420 cf Average Runoff Depth = 6.47"
27.87% Pervious = 58,110 sf 72.13% Impervious = 150,424 sf

Summary for Subcatchment 1a: 1a

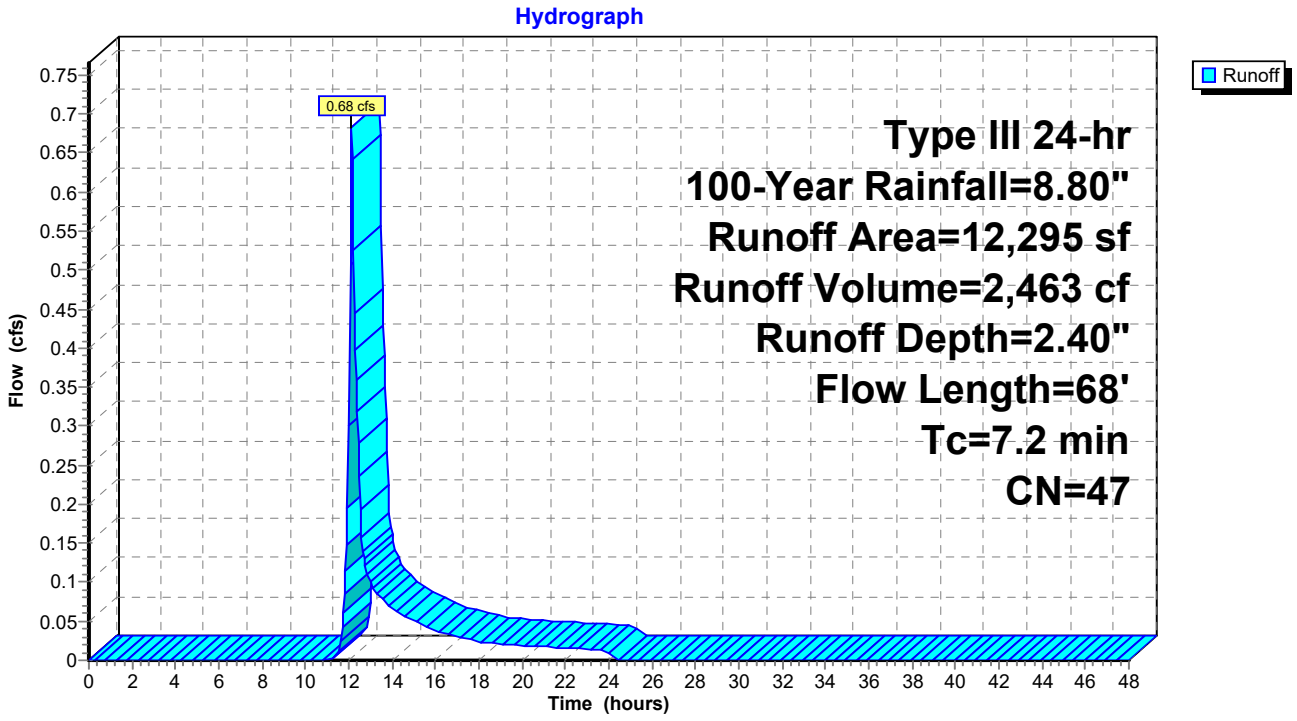
Runoff = 0.68 cfs @ 12.12 hrs, Volume= 2,463 cf, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
2,030	30	Woods, Good, HSG A
8,276	39	>75% Grass cover, Good, HSG A
1,989	98	Paved parking, HSG A
12,295	47	Weighted Average
10,306		83.82% Pervious Area
1,989		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0118	0.12		**Sheet Flow, SHEET FLOW** Grass: Short n= 0.150 P2= 3.20"
0.3	18	0.0273	1.16		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
7.2	68	Total			

Subcatchment 1a: 1a



Summary for Subcatchment 1b: 1b

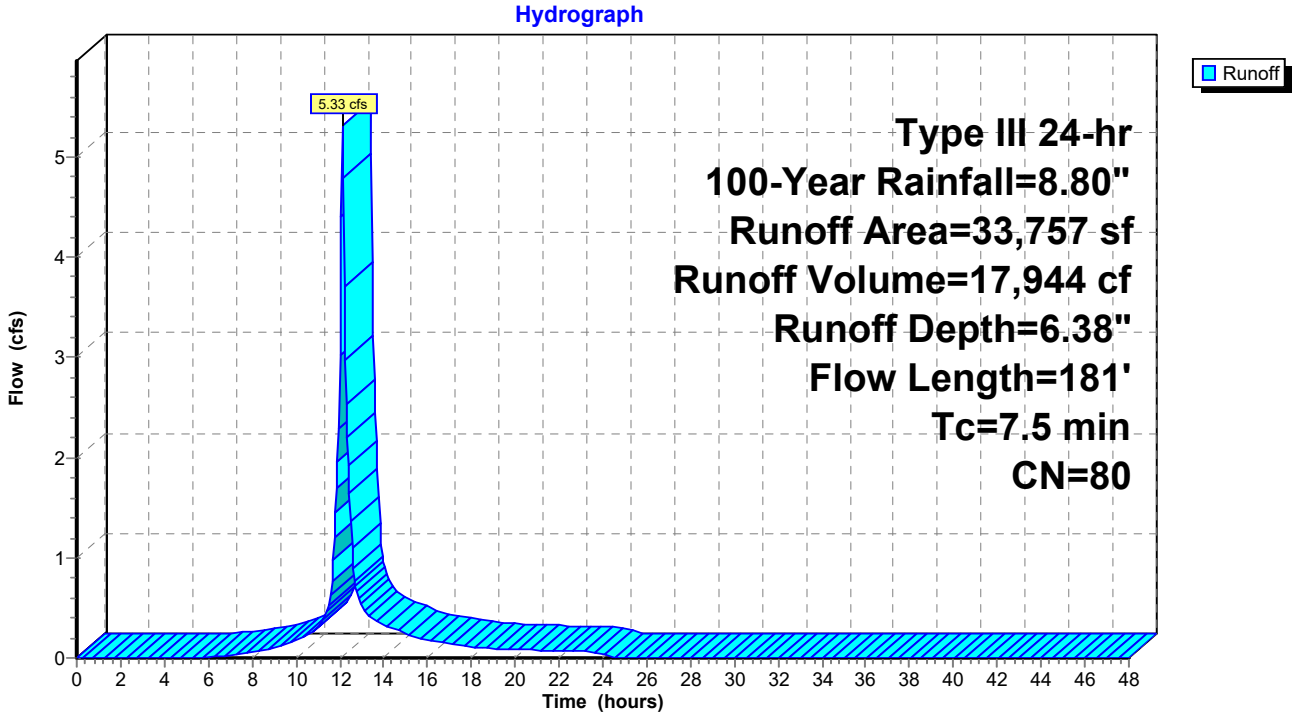
Runoff = 5.33 cfs @ 12.11 hrs, Volume= 17,944 cf, Depth= 6.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
5,998	30	Woods, Good, HSG A
3,585	39	>75% Grass cover, Good, HSG A
24,174	98	Paved parking, HSG A
33,757	80	Weighted Average
9,583		28.39% Pervious Area
24,174		71.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.5	31	0.0500	1.12		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.5	100	0.0291	3.46		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
7.5	181	Total			

Subcatchment 1b: 1b



Summary for Subcatchment 2a: 2a

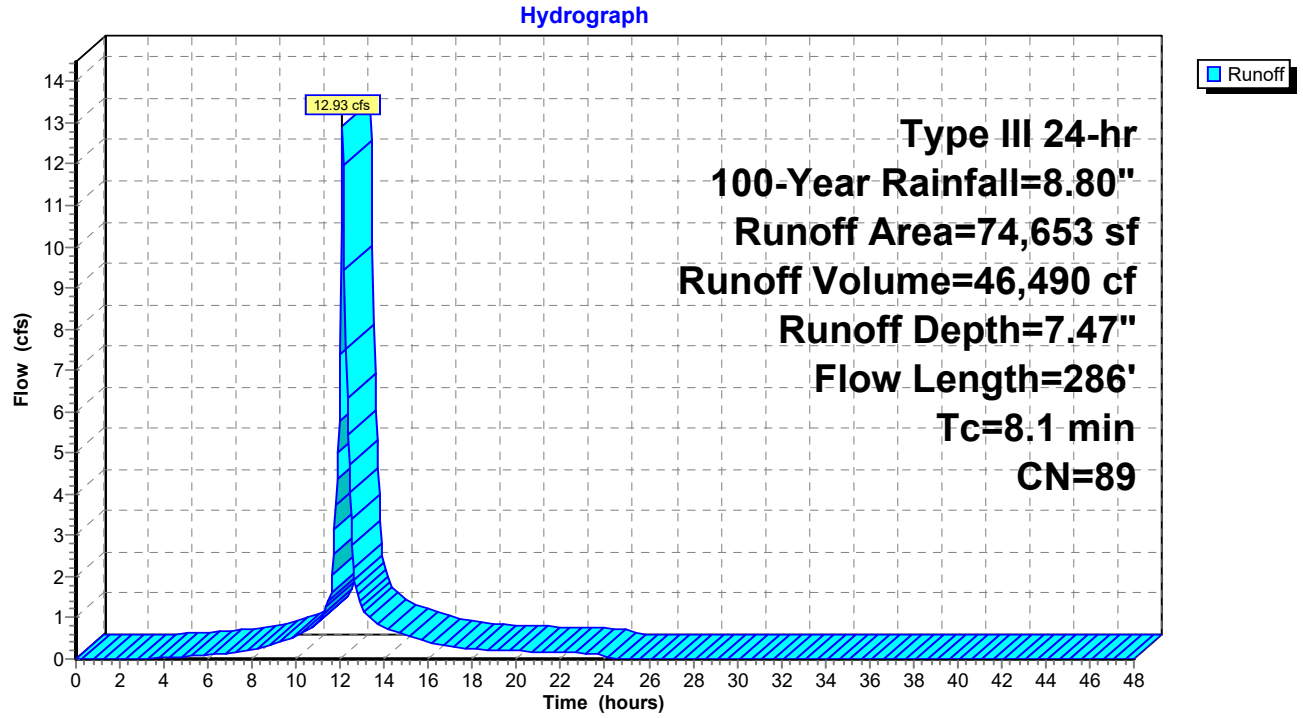
Runoff = 12.93 cfs @ 12.11 hrs, Volume= 46,490 cf, Depth= 7.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
5,158	30	Woods, Good, HSG A
5,508	39	>75% Grass cover, Good, HSG A
63,987	98	Paved parking, HSG A
74,653	89	Weighted Average
10,666		14.29% Pervious Area
63,987		85.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
0.4	40	0.1000	1.58		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Woodland Kv= 5.0 fps
0.7	83	0.0842	2.03		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
0.5	113	0.0354	3.82		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Paved Kv= 20.3 fps
8.1	286	Total			

Subcatchment 2a: 2a



Summary for Subcatchment 2b: 2b

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

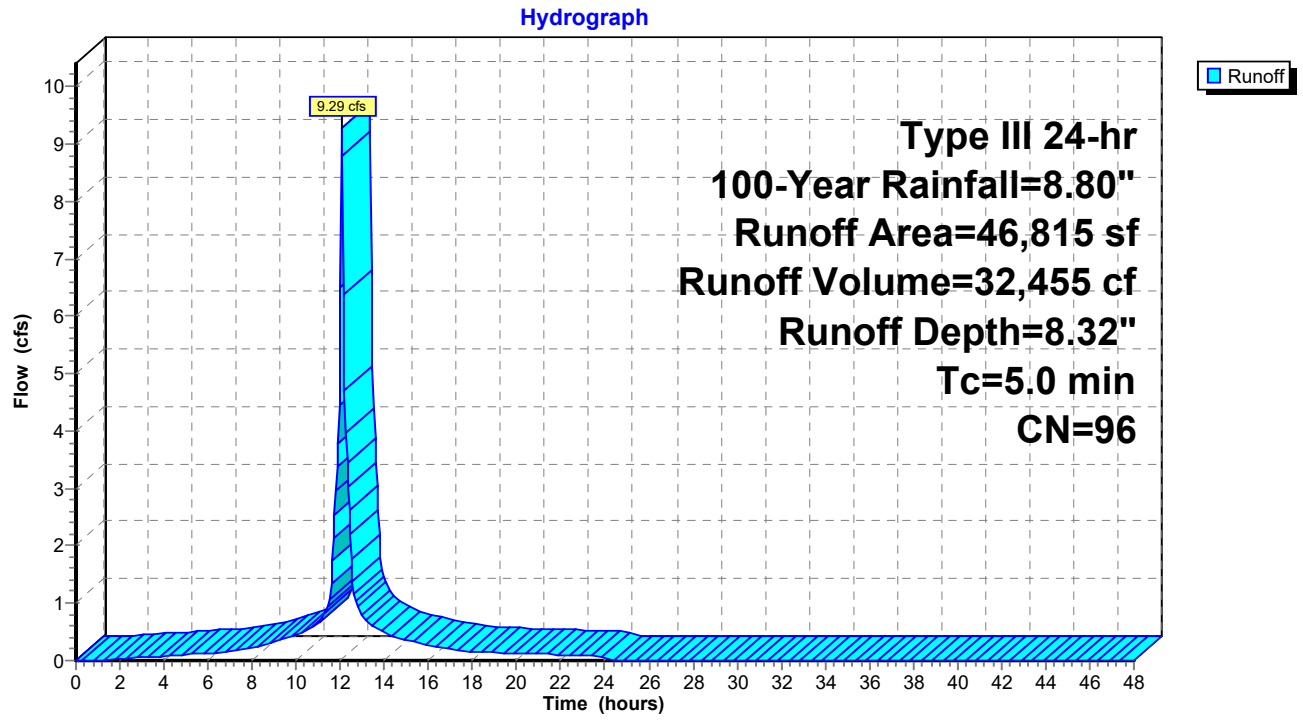
Runoff = 9.29 cfs @ 12.07 hrs, Volume= 32,455 cf, Depth= 8.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
1,472	39	>75% Grass cover, Good, HSG A
45,343	98	Paved parking, HSG A
46,815	96	Weighted Average
1,472		3.14% Pervious Area
45,343		96.86% Impervious Area

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

Subcatchment 2b: 2b



Summary for Subcatchment 2c: 2c

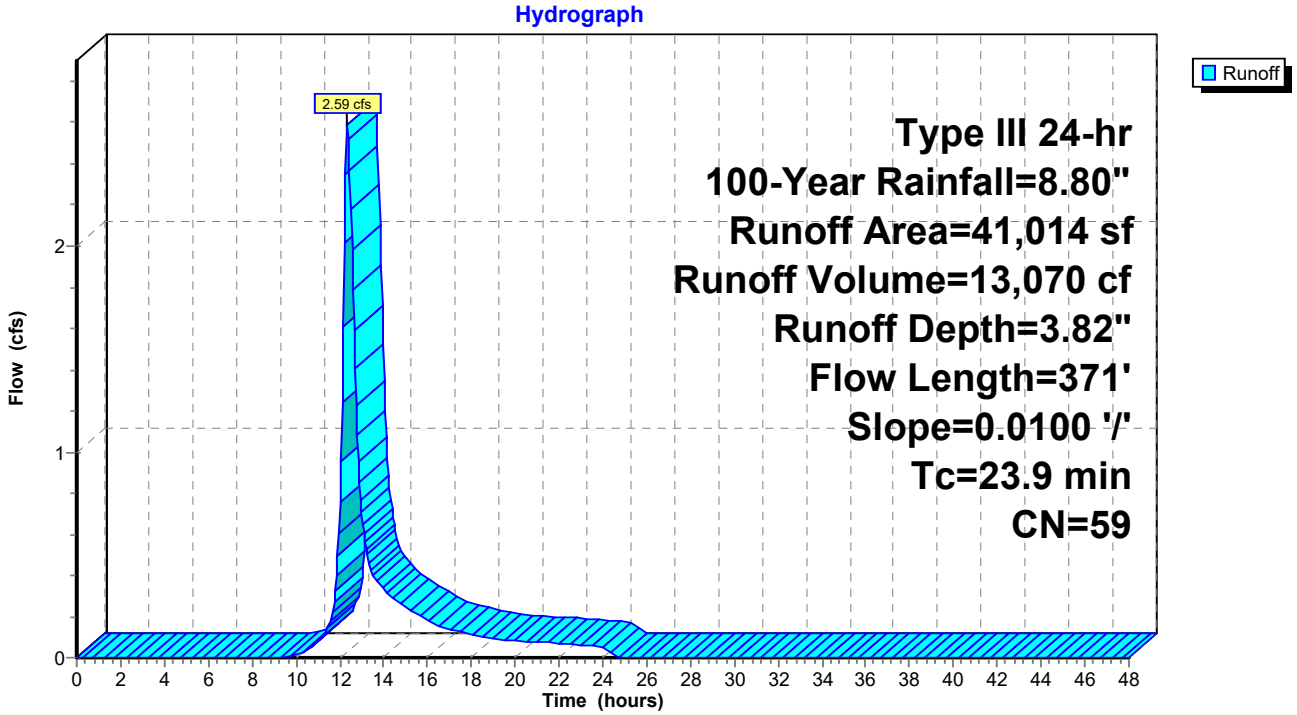
Runoff = 2.59 cfs @ 12.35 hrs, Volume= 13,070 cf, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

Area (sf)	CN	Description
6,061	30	Woods, Good, HSG A
18,020	39	>75% Grass cover, Good, HSG A
5,719	77	1/8 acre lots, 65% imp, HSG A
11,214	98	Paved parking, HSG A
41,014	59	Weighted Average
26,083		63.59% Pervious Area
14,931		36.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 3.20"
7.6	321	0.0100	0.70		**Shallow Concentrated Flow, SHALLOW CONC FLOW** Short Grass Pasture Kv= 7.0 fps
23.9	371	Total			

Subcatchment 2c: 2c



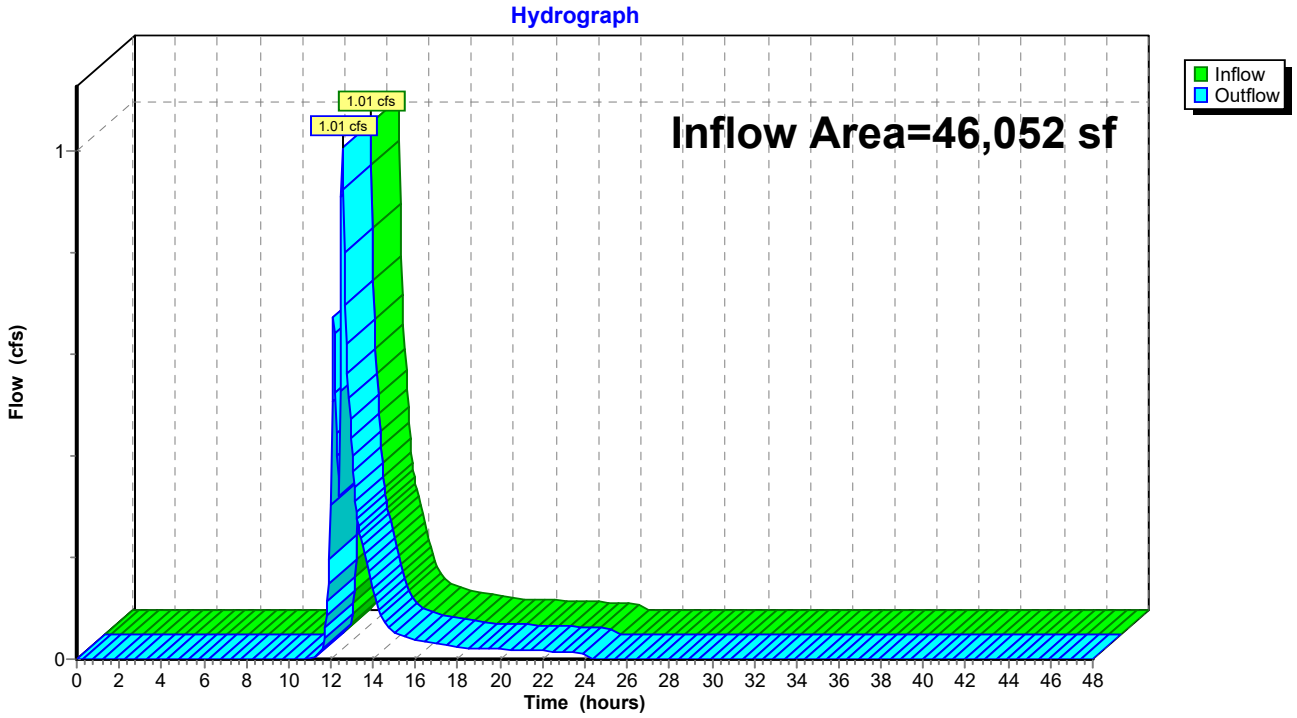
Summary for Reach 1R: WETLANDS

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

Inflow Area = 46,052 sf, 56.81% Impervious, Inflow Depth = 1.08" for 100-Year event
Inflow = 1.01 cfs @ 12.55 hrs, Volume= 4,160 cf
Outflow = 1.01 cfs @ 12.55 hrs, Volume= 4,160 cf, Atten= 0%, Lag= 0.0 min

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

Reach 1R: WETLANDS



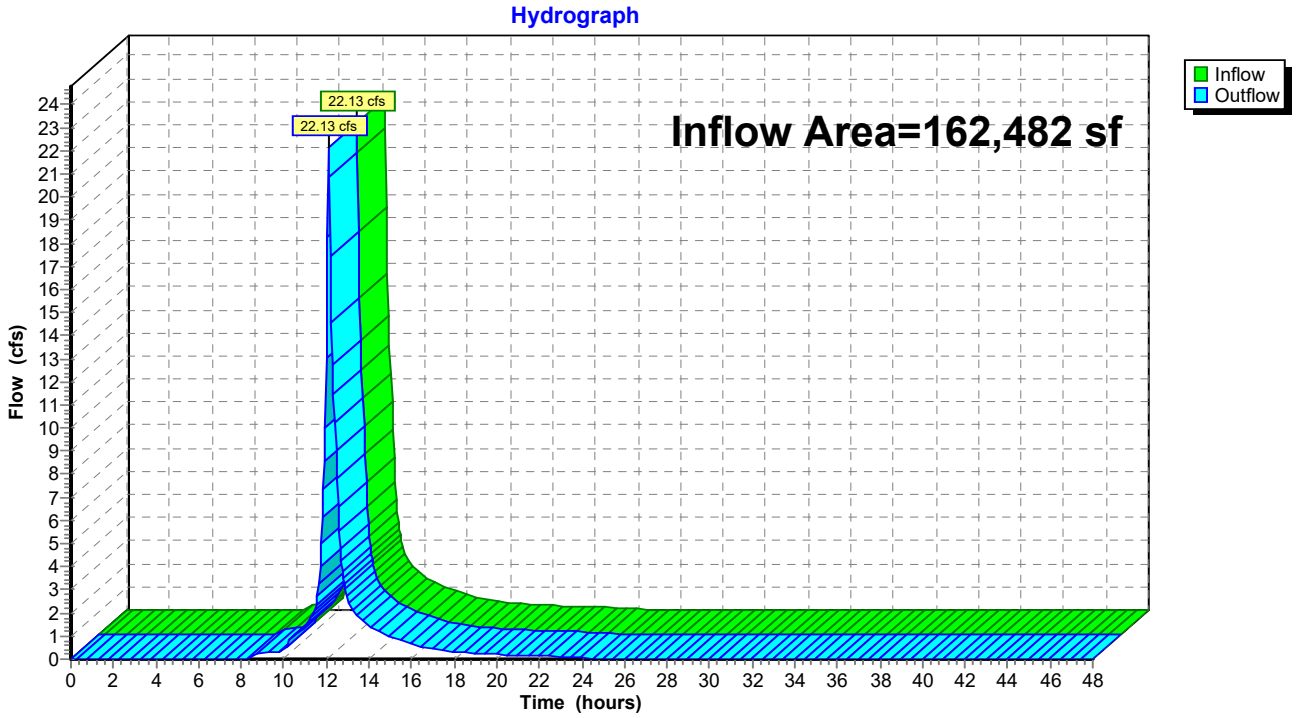
Summary for Reach 2R: WASHINGTON STREET

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

Inflow Area = 162,482 sf, 76.48% Impervious, Inflow Depth = 5.45" for 100-Year event
Inflow = 22.13 cfs @ 12.11 hrs, Volume= 73,769 cf
Outflow = 22.13 cfs @ 12.11 hrs, Volume= 73,769 cf, Atten= 0%, Lag= 0.0 min

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

Reach 2R: WASHINGTON STREET



Summary for Pond 1p: Subsurface Infiltration #1

Inflow Area = 33,757 sf, 71.61% Impervious, Inflow Depth = 6.38" for 100-Year event
Inflow = 5.33 cfs @ 12.11 hrs, Volume= 17,944 cf
Outflow = 1.10 cfs @ 12.56 hrs, Volume= 17,967 cf, Atten= 79%, Lag= 27.3 min
Discarded = 0.28 cfs @ 11.25 hrs, Volume= 16,269 cf
Primary = 0.82 cfs @ 12.56 hrs, Volume= 1,698 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 90.41' @ 12.56 hrs Surf.Area= 5,066 sf Storage= 7,223 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 205.7 min (1,006.5 - 800.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.00'	3,589 cf	**37.25'W x 136.00'L x 2.54'H Field A** 12,876 cf Overall - 3,905 cf Embedded = 8,971 cf x 40.0% Voids
#2A	88.50'	3,905 cf	**Cultec R-150XLHD** x 143 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 11 rows
		7,493 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	89.50'	**12.0" Round Culvert** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 89.50' / 89.00' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	90.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	88.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.28 cfs @ 11.25 hrs HW=88.03' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.80 cfs @ 12.56 hrs HW=90.41' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.80 cfs of 2.34 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 1.29 fps)

Pond 1p: Subsurface Infiltration #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 11 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

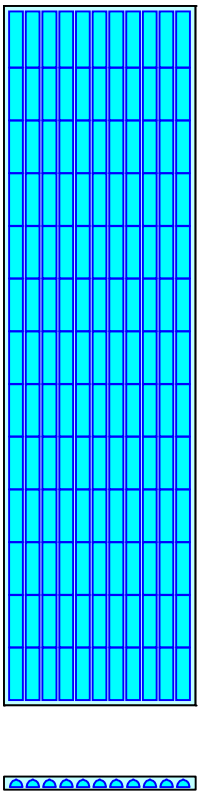
13 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 134.00' Row Length +12.0" End Stone x 2 = 136.00' Base Length
11 Rows x 33.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 37.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

143 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 11 Rows = 3,904.6 cf Chamber Storage

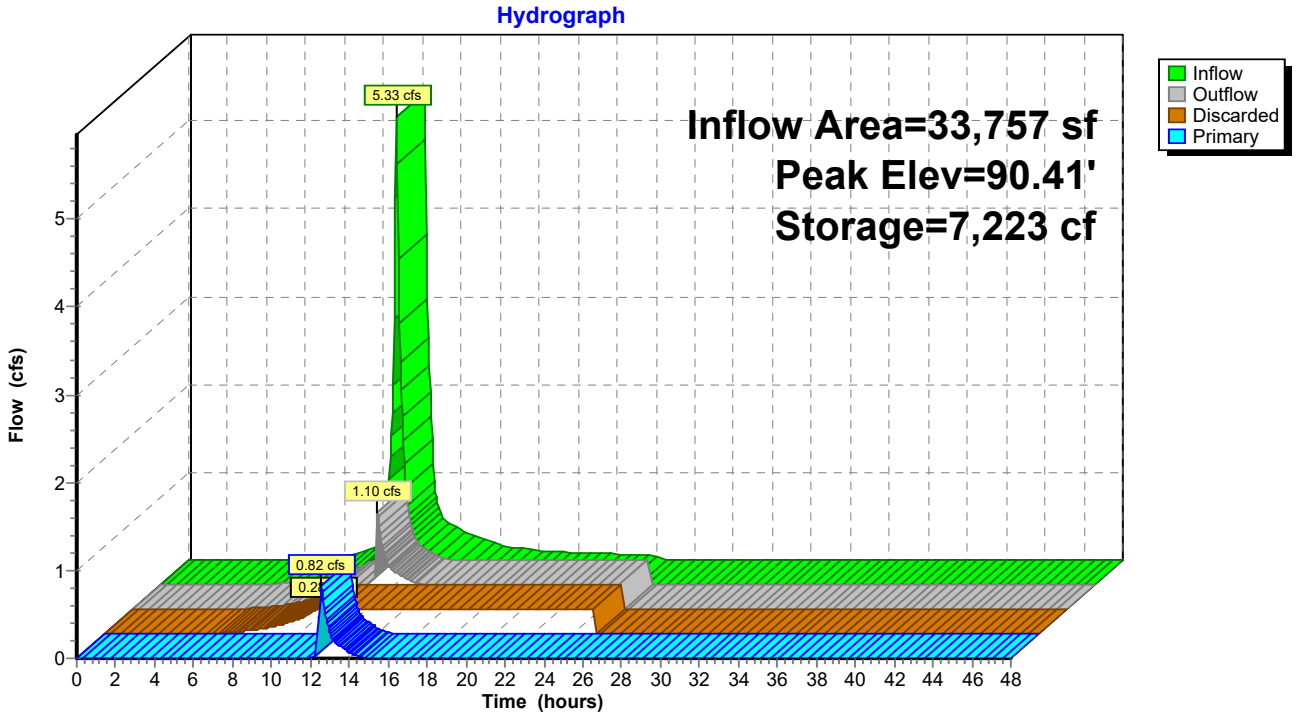
12,876.1 cf Field - 3,904.6 cf Chambers = 8,971.5 cf Stone x 40.0% Voids = 3,588.6 cf Stone Storage

Chamber Storage + Stone Storage = 7,493.2 cf = 0.172 af
Overall Storage Efficiency = 58.2%
Overall System Size = 136.00' x 37.25' x 2.54'

143 Chambers
476.9 cy Field
332.3 cy Stone



Pond 1p: Subsurface Infiltration #1



Summary for Pond 2p: Subsurface Infiltration #2

Inflow Area = 74,653 sf, 85.71% Impervious, Inflow Depth = 7.47" for 100-Year event
Inflow = 12.93 cfs @ 12.11 hrs, Volume= 46,490 cf
Outflow = 12.66 cfs @ 12.13 hrs, Volume= 46,494 cf, Atten= 2%, Lag= 1.0 min
Discarded = 0.12 cfs @ 6.95 hrs, Volume= 10,785 cf
Primary = 12.53 cfs @ 12.13 hrs, Volume= 35,708 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 89.66' @ 12.13 hrs Surf.Area= 2,232 sf Storage= 3,222 cf

Plug-Flow detention time= 51.1 min calculated for 46,445 cf (100% of inflow)
Center-of-Mass det. time= 51.4 min (829.6 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	87.15'	1,614 cf	**17.75'W x 125.75'L x 2.54'H Field A** 5,673 cf Overall - 1,639 cf Embedded = 4,034 cf x 40.0% Voids
#2A	87.65'	1,639 cf	**Cultec R-150XLHD** x 60 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 5 rows
		3,253 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	87.25'	**24.0" Round Culvert** L= 150.0' Ke= 0.500 Inlet / Outlet Invert= 87.25' / 86.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	88.65'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	87.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.12 cfs @ 6.95 hrs HW=87.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=12.25 cfs @ 12.13 hrs HW=89.64' TW=88.64' (Dynamic Tailwater)
└**1=Culvert** (Passes 12.25 cfs of 13.84 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 12.25 cfs @ 3.25 fps)

Pond 2p: Subsurface Infiltration #2 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 5 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

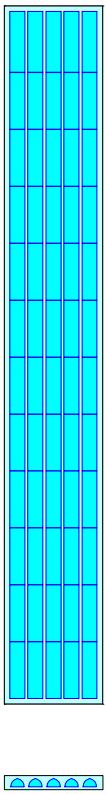
12 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 123.75' Row Length +12.0" End Stone x 2 = 125.75' Base Length
5 Rows x 33.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 17.75' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

60 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 5 Rows = 1,639.1 cf Chamber Storage

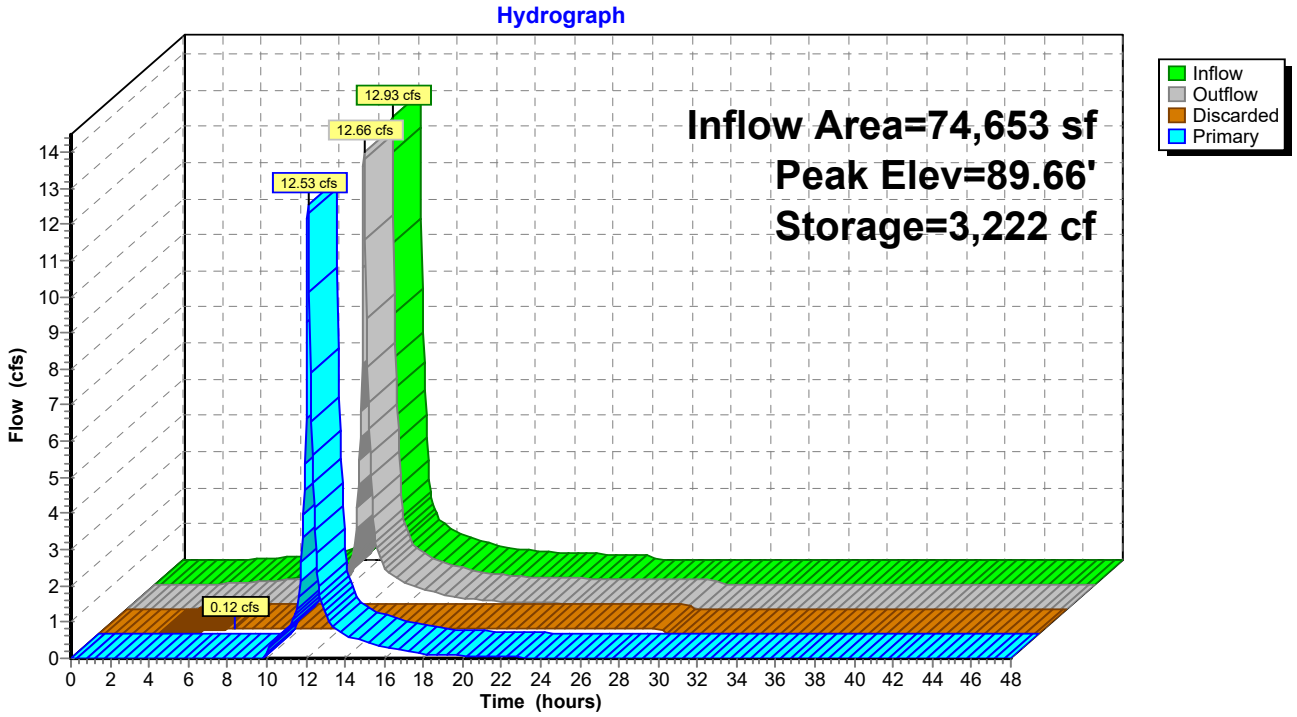
5,673.2 cf Field - 1,639.1 cf Chambers = 4,034.1 cf Stone x 40.0% Voids = 1,613.6 cf Stone Storage

Chamber Storage + Stone Storage = 3,252.7 cf = 0.075 af
Overall Storage Efficiency = 57.3%
Overall System Size = 125.75' x 17.75' x 2.54'

60 Chambers
210.1 cy Field
149.4 cy Stone



Pond 2p: Subsurface Infiltration #2



Summary for Pond 3p: Subsurface Infiltration #3

Inflow Area = 121,468 sf, 90.01% Impervious, Inflow Depth = 6.73" for 100-Year event
Inflow = 20.95 cfs @ 12.10 hrs, Volume= 68,163 cf
Outflow = 20.90 cfs @ 12.11 hrs, Volume= 68,165 cf, Atten= 0%, Lag= 0.5 min
Discarded = 0.08 cfs @ 4.75 hrs, Volume= 7,466 cf
Primary = 20.81 cfs @ 12.11 hrs, Volume= 60,699 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 88.68' @ 12.11 hrs Surf.Area= 1,488 sf Storage= 2,170 cf

Plug-Flow detention time= 18.4 min calculated for 68,094 cf (100% of inflow)
Center-of-Mass det. time= 18.6 min (781.0 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	86.15'	1,070 cf	**34.00'W x 43.75'L x 2.54'H Field A** 3,781 cf Overall - 1,106 cf Embedded = 2,675 cf x 40.0% Voids
#2A	86.65'	1,106 cf	**Cultec R-150XLHD** x 40 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 10 rows
		2,176 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	85.55'	**24.0" Round Culvert** L= 115.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 85.55' / 83.25' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	87.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	86.15'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 4.75 hrs HW=86.18' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=20.42 cfs @ 12.11 hrs HW=88.66' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 20.42 cfs of 21.99 cfs potential flow)
└**2=Sharp-Crested Rectangular Weir** (Weir Controls 20.42 cfs @ 3.89 fps)

Pond 3p: Subsurface Infiltration #3 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 10 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

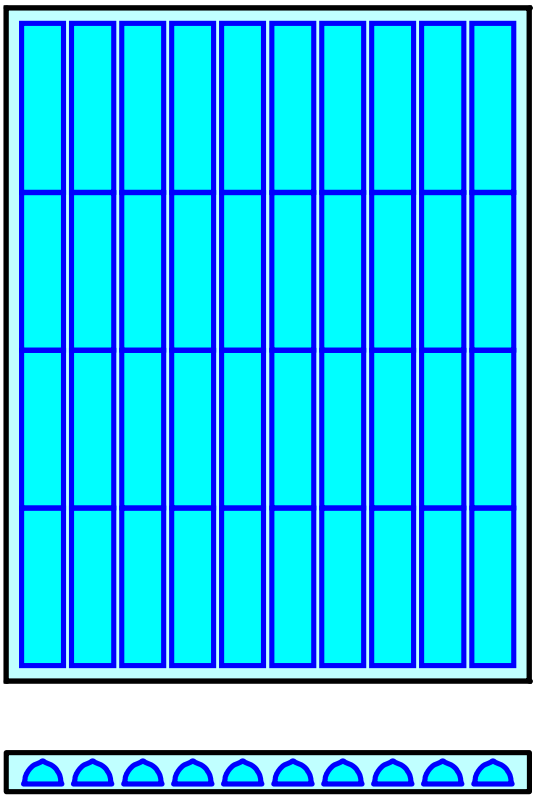
4 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 41.75' Row Length +12.0" End Stone x 2 = 43.75' Base Length
10 Rows x 33.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.00' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

40 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 10 Rows = 1,106.0 cf Chamber Storage

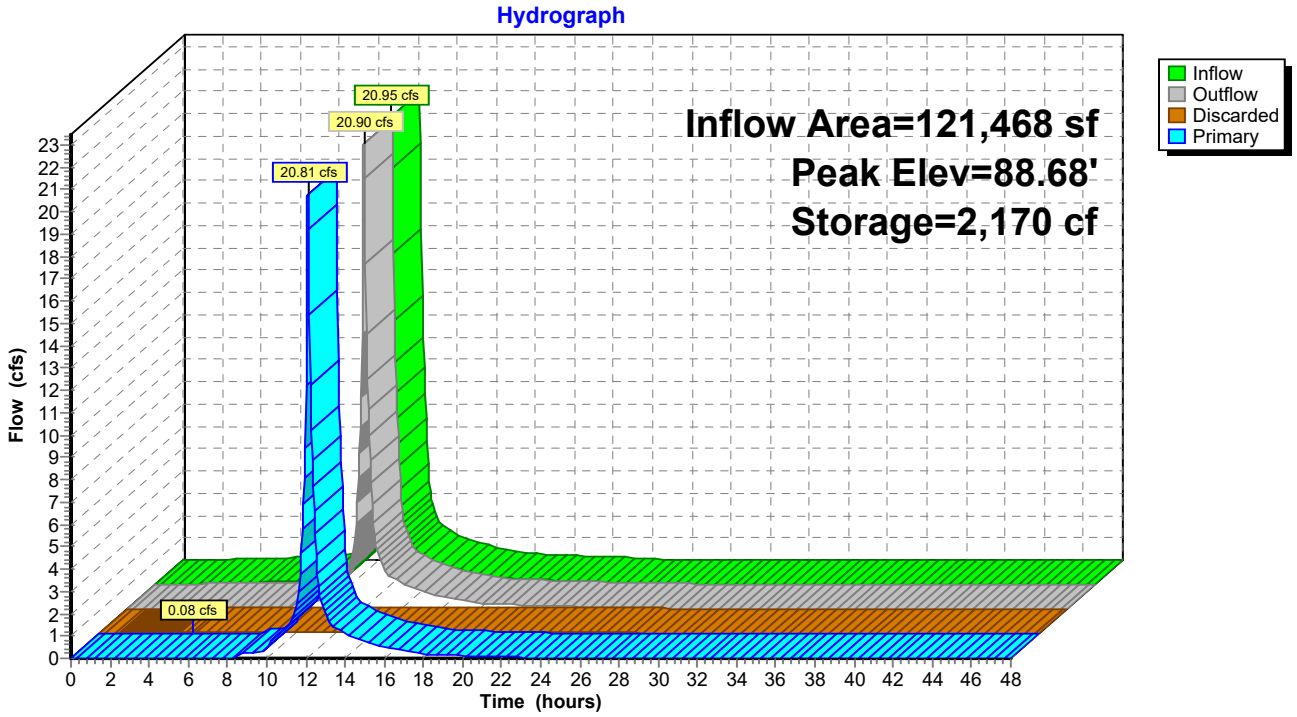
3,780.7 cf Field - 1,106.0 cf Chambers = 2,674.8 cf Stone x 40.0% Voids = 1,069.9 cf Stone Storage

Chamber Storage + Stone Storage = 2,175.9 cf = 0.050 af
Overall Storage Efficiency = 57.6%
Overall System Size = 43.75' x 34.00' x 2.54'

40 Chambers
140.0 cy Field
99.1 cy Stone



Pond 3p: Subsurface Infiltration #3



A P P E N D I X C

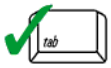
Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



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 applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[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 before commencing any land disturbance activity on the site.

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

Checklist for Stormwater Report

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.

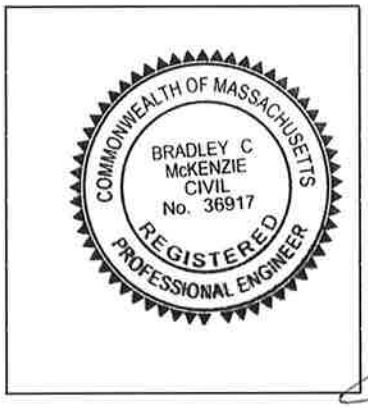
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



1-12-21

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

Checklist for Stormwater Report

Checklist (continued)

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): Subsurface Infiltration Chambers

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.

Checklist for Stormwater Report

Checklist (continued)

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.

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ 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.

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.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ 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.

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.

Checklist for Stormwater Report

Checklist (continued)

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.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ 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;
- ☐ 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;

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

A P P E N D I X D

Illicit Discharge Compliance Statement
Supplemental BMP Calculations

Illicit Discharge Compliance Statement

I, Bradley C. McKenzie, P.E., hereby notify the Weymouth Conservation Commission that I have not witnessed, nor am aware of any existing illicit discharges at the site known as Map 29, Block 329, Lot 9 Washington Street in Weymouth, Massachusetts. I also hereby certify that the development of said property as illustrated on the final plans entitled "Site Development Plan, Proposed Mixed-Use Development, Map 29, Block 329, Lot 9 Washington Street Weymouth, MA," prepared by McKenzie Engineering Group. Inc. dated January 12, 2021 and as revised and approved by the Weymouth Conservation Commission and maintenance thereof in accordance with the "Construction Phase Operations and Maintenance Plan" and "Long-Term Operations and Maintenance Plan" prepared by McKenzie Engineering Group, Inc. dated January 12, 2021 and as revised and approved by the Weymouth Conservation Commission will not create any new illicit discharges. There is no warranty implied regarding future illicit discharges that may occur as a result of improper construction or maintenance of the stormwater management system or unforeseen accidents.

Name: Bradley C. McKenzie, P.E.

Company: McKenzie Engineering Group, Inc.

Title: ~~Principle~~ President

Signature:

Date: 1-12-21

MCKENZIE ENGINEERING GROUP

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150 Longwater Drive, Suite 101
Norwell, MA 02061

WASHINGTON STREET
ASSESSORS PARCEL MAP 29, BLOCK 329, LOT 9
WEYMOUTH, MA

1/8/2021
REVISED

REQUIRED RECHARGE VOLUME (CF) *"STATIC METHOD"*

WATERSHED #	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) A SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) B SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) C SOIL	IMPERVIOUS AREA (SF)	TARGET DEPTH FACTOR (F) D SOIL		REQUIRED RECHARGE VOLUME (CF)
TOTAL SITE		0.60	146,706	0.35		0.25		0.10		4,279
		0.60		0.35		0.25		0.10		0
		0.60		0.35		0.25		0.10		0
							TOTAL			**4,279**

CAPTURE ADJUSTMENT

WATERSHED #	TOTAL IMPERVIOUS AREA (SF)	TOTAL IMPERVIOUS COLLECTED	% DIRECTED TOWARDS INFILTRATION SYSTEM	STANDARD NO. 3 <100% - > 65% CAPTURED	CAPTURE ADJUSTMENT	ADJUSTED REQUIRED RECHARGE VOLUME (CF)
TOTAL SITE	146,706	133,504	91.00%	**CAPTURE ADJUSTMENT REQUIRED**	1.10	4,702

* Required Water Quality Volume based on 0.5 inches of runoff; Required Recharge Volume based on 0.25 & 0.35 inches (0.25&0.35<0.50); Target Volume is Required Water Quality Volume of 5,563CF

PROVIDED RECHARGE VOLUME (CF)
BELOW LOWEST INVERT

	REQUIRED RECHARGE VOLUME (CF)	POND	STORAGE VOLUME PROVIDED (CF)	NET STORAGE VOLUME PROVIDED (CF)
	1,007	P-1	7,493	6,486
	2,666	P-2	3,253	587
	1,889	P-3	2,176	287
TOTAL	**5,563**		**12,922**	**7,359**

Stage-Area-Storage for Pond 1p: Subsurface Infiltration #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
88.00	**5,066**	0
88.05	5,066	101
88.10	5,066	203
88.15	5,066	304
88.20	5,066	405
88.25	5,066	507
88.30	5,066	608
88.35	5,066	709
88.40	5,066	811
88.45	5,066	912
88.50	5,066	1,013
88.55	5,066	1,224
88.60	5,066	1,432
88.65	5,066	1,639
88.70	5,066	1,845
88.75	5,066	2,049
88.80	5,066	2,253
88.85	5,066	2,456
88.90	5,066	2,659
88.95	5,066	2,861
89.00	5,066	3,061
89.05	5,066	3,260
89.10	5,066	3,458
89.15	5,066	3,654
89.20	5,066	3,848
89.25	5,066	4,040
89.30	5,066	4,230
89.35	5,066	4,417
89.40	5,066	4,601
89.45	5,066	4,781
89.50	5,066	4,959
89.55	5,066	5,132
89.60	5,066	5,301
89.65	5,066	5,466
89.70	5,066	5,624
89.75	5,066	5,776
89.80	5,066	5,920
89.85	5,066	6,052
89.90	5,066	6,174
89.95	5,066	6,287
90.00	5,066	6,396
90.05	5,066	6,497
90.10	5,066	6,598
90.15	5,066	6,700
90.20	5,066	6,801
90.25	5,066	6,902
90.30	5,066	7,003
90.35	5,066	7,105
90.40	5,066	7,206
90.45	5,066	7,307
90.50	5,066	**7,409**

Stage-Area-Storage for Pond 2p: Subsurface Infiltration #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
87.15	**2,232**	0
87.20	2,232	45
87.25	2,232	89
87.30	2,232	134
87.35	2,232	179
87.40	2,232	223
87.45	2,232	268
87.50	2,232	312
87.55	2,232	357
87.60	2,232	402
87.65	2,232	446
87.70	2,232	537
87.75	2,232	627
87.80	2,232	716
87.85	2,232	804
87.90	2,232	892
87.95	2,232	980
88.00	2,232	1,067
88.05	2,232	1,154
88.10	2,232	1,241
88.15	2,232	1,327
88.20	2,232	1,413
88.25	2,232	1,498
88.30	2,232	1,583
88.35	2,232	1,666
88.40	2,232	1,749
88.45	2,232	1,830
88.50	2,232	1,911
88.55	2,232	1,990
88.60	2,232	2,068
88.65	2,232	2,145
88.70	2,232	2,220
88.75	2,232	2,293
88.80	2,232	2,364
88.85	2,232	2,433
88.90	2,232	2,499
88.95	2,232	2,561
89.00	2,232	2,618
89.05	2,232	2,672
89.10	2,232	2,722
89.15	2,232	2,769
89.20	2,232	2,814
89.25	2,232	2,858
89.30	2,232	2,903
89.35	2,232	2,948
89.40	2,232	2,992
89.45	2,232	3,037
89.50	2,232	3,082
89.55	2,232	3,126
89.60	2,232	3,171
89.65	2,232	**3,216**

Stage-Area-Storage for Pond 3p: Subsurface Infiltration #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
86.15	**1,488**	0
86.20	1,488	30
86.25	1,488	59
86.30	1,488	89
86.35	1,488	119
86.40	1,488	149
86.45	1,488	178
86.50	1,488	208
86.55	1,488	238
86.60	1,488	268
86.65	1,488	298
86.70	1,488	358
86.75	1,488	418
86.80	1,488	478
86.85	1,488	537
86.90	1,488	596
86.95	1,488	655
87.00	1,488	714
87.05	1,488	772
87.10	1,488	830
87.15	1,488	888
87.20	1,488	946
87.25	1,488	1,003
87.30	1,488	1,059
87.35	1,488	1,115
87.40	1,488	1,171
87.45	1,488	1,225
87.50	1,488	1,279
87.55	1,488	1,333
87.60	1,488	1,385
87.65	1,488	1,436
87.70	1,488	1,486
87.75	1,488	1,535
87.80	1,488	1,583
87.85	1,488	1,629
87.90	1,488	1,673
87.95	1,488	1,715
88.00	1,488	1,753
88.05	1,488	1,789
88.10	1,488	1,822
88.15	1,488	1,854
88.20	1,488	1,883
88.25	1,488	1,913
88.30	1,488	1,943
88.35	1,488	1,973
88.40	1,488	2,002
88.45	1,488	2,032
88.50	1,488	2,062
88.55	1,488	2,092
88.60	1,488	2,121
88.65	1,488	**2,151**

MCKENZIE ENGINEERING GROUP

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WASHINGTON STREET
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WEYMOUTH, MA **REVISED**

DRAWDOWN WITHIN 72 HOURS ANALYSIS

POND	RAWLS RATE (IN/HR)	STORAGE VOLUME PROVIDED (CF)	BOTTOM AREA (FT2)	DRAWDOWN (HR)
P-1	2.41	7,493	5,066	7
P-2	2.41	3,253	2,232	7
P-3	2.41	2,176	1,488	7

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WASHINGTON STREET
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WEYMOUTH, MA **REVISED**

WATER QUALITY VOLUME ANALYSIS

POND	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	WATER QUALITY VOLUME REQUIRED (CF)	TREATMENT VOLUME PROVIDED (CF) UP TO INVERT ELEVATION	NET TREATMENT VOLUME PROVIDED (CF)
P-1	24,174	0.50	1,007	7,493	6,486
P-2	63,987	0.50	2,666	3,253	587
P-3	45,343	0.50	1,889	2,176	287
TOTAL	**133,504**		**5,563**	**12,922**	**7,359**

Figure 4: for First 1-inch Runoff, Table of qu values for Ia/P Curve = 0.034, listed by tc, for Type III Storm Distribution

Tc (Hours)	qu (csm/in)
0.01	835
0.03	835
0.05	831
0.067	814
0.083	795
0.1	774
0.116	755
0.133	736
0.15	717
0.167	700
0.183	685
0.2	669
0.217	654
0.233	641
0.25	628
0.3	593
0.333	572
0.35	563
0.4	536
0.416	528
0.5	491
0.583	460
0.6	454
0.667	433
0.7	424
0.8	398
0.9	376
1	356
1.1	339
1.2	323
1.3	309
1.4	296
1.5	285
1.6	274
1.7	264
1.8	255
1.9	247
2	239
2.1	232
2.2	225
2.3	219
2.4	213
2.5	207
2.6	202

Tc (Hours)	qu (csm/in)
2.7	197
2.8	192
2.9	187
3	183
3.1	179
3.2	175
3.3	171
3.4	168
3.5	164
3.6	161
3.7	158
3.8	155
3.9	152
4	149
4.1	146
4.2	144
4.3	141
4.4	139
4.5	137
4.6	134
4.7	132
4.8	130
4.9	128
5	126
5.1	124
5.2	122
5.3	120
5.4	119
5.5	117
5.6	115
5.7	114
5.8	112
5.9	111
6	109
6.1	108
6.2	106
6.3	105
6.4	104
6.5	102
6.6	101
6.7	100
6.8	99
6.9	98
7	96

Tc (Hours)	qu (csm/in)
7.1	95
7.2	94
7.3	93
7.4	92
7.5	91
7.6	90
7.7	89
7.8	88
7.9	87
8	86
8.1	85
8.2	84
8.3	84
8.4	83
8.5	82
8.6	81
8.7	80
8.8	79
8.9	79
9	78
9.1	77
9.2	76
9.3	76
9.4	75
9.5	74
9.6	74
9.7	73
9.8	72
9.9	72
10	71

First Defense®

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Components

1. Inlet Grate (optional)
2. Inlet Chute
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Precast Vortex Chamber
6. Internal Bypass
7. Outlet Chute
8. Outlet Pipe
9. Oil and Floatables Storage
10. Sediment Storage Sump

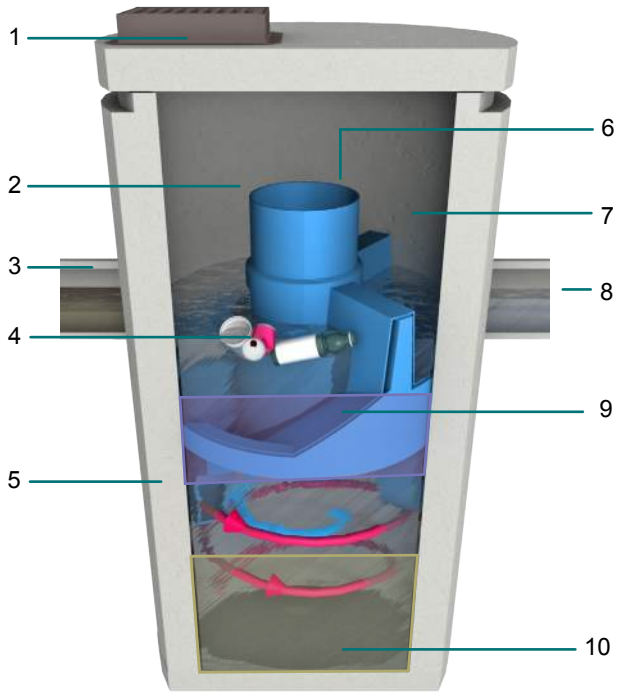

Fig.1 The First Defense® has internal components designed to efficiently capture pollutants and prevent washout at peak flows.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

How it Works

The First Defense® has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An integral bypass conveys infrequent peak flows directly to the outlet chute, eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

First Defense®

Maintenance

The First Defense® needs minimal maintenance, but like all structural best management practices maintenance is necessary for the long-term protection of the environment.

Sediments captured by the First Defense® are stored in the sump; floatable trash and hydrocarbons are stored on the surface of the standing water. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (**Fig.2**).

More information can be found in the First Defense® Operation and Maintenance Manual, available at hydro-int.com/firstdefense.

Fig.2 Maintenance is performed with a vactor truck.

First Defense® Sizing & Design

Design Options for Inlet and Internal Bypass Arrangements

For maximum flexibility the First Defense® inlet and internal bypass arrangements are available in two configurations (**Fig.3a & 3b**). Model parameters and design criteria are shown in **Table 1**.

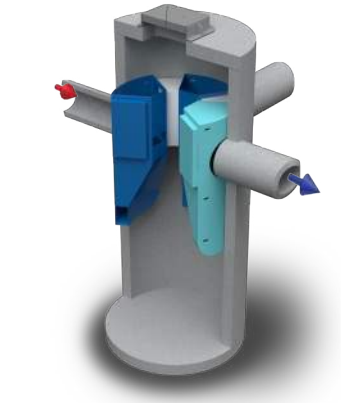

Fig.3a Inlet configurations for all models include options for inlet grates and multiple inlet pipes.

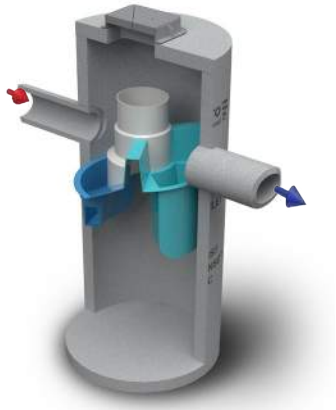

Fig.3b First Defense®-*HC* with higher capacity internal bypass and larger maximum pipe diameter.

Free *Stormwater Separator Sizing Calculator* for Engineers

This simple online tool will recommend the best separatror, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Table 1. First Defense® Models and Design Criteria.

First Defense® Model Number	Diameter	Typical Flow Rates for TSS Treatment		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		106µm	230µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-4	4 / 1.2	0.7 / 20	1.2 / 34	6 / 170	18 / 450	180 / 681	0.7 / 0.5	3.1 / 1.1	4.97 / 1.5
FD-4HC				18 / 510	24 / 600	191 / 723		2.3 - 3.9 / 0.7 - 1.2	
FD-6	6 / 1.8	2.2 / 63	3.8 / 108	18 / 510	24 / 600	420 / 1,590	1.6 / 1.2	4.0 / 1.2	5.97 / 1.8
FD-6HC				32 / 906	30 / 750	496 / 1,878		3.0 - 5.1 / 0.9 - 1.6	

[1]Contact Hydro International when larger pipe sizes are required.

[2]Contact Hydro International when custom sediment storage capacity is required.

[3]The minimum distance for the 4HC and 6HC models depends on pipe diameter.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

MCKENZIE ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

Standard 4: Total Suspended Solids Calculation:
Subsurface Tank P-1

NAME: Washington St. Parcel 29-329-9
Weymouth, MA
CLIENT: Trinity Green Development
COUNTY: Norfolk

Proj. No.: 220-164
Date: 1/11/2021
Revised: 1/11/2021
Computed by: RPL
Checked by: BCM

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Subsurface Infiltration Structure w/ Pre-treat.	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

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

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

MCKENZIE ENGINEERING GROUP

Standard 4: Total Suspended Solids Calculation:
Subsurface Tank P-2

NAME: Washington St. Parcel 29-329-9
Weymouth, MA
CLIENT: Trinity Green Development
COUNTY: Norfolk

Proj. No.: 220-164
Date: 1/11/2021
Revised: 1/11/2021
Computed by: RPL
Checked by: BCM

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Subsurface Infiltration Structure w/ Pre-treat.	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

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

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

MCKENZIE ENGINEERING GROUP

Assinippi Office Park
150 Longwater Drive, Suite 101
Norwell, MA 02061

Standard 4: Total Suspended Solids Calculation:
Subsurface Tank P-3

NAME: Washington St. Parcel 29-329-9
Weymouth, MA
CLIENT: Trinity Green Development
COUNTY: Norfolk

Proj. No.: 220-164
Date: 1/11/2021
Revised: 1/11/2021
Computed by: RPL
Checked by: BCM

TSS Removal Calculation

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Subsurface Infiltration Structure w/ Pre-treat.	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

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

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

UNIVERSITY OF MASSACHUSETTS
AT AMHERST
Water Resources Research Center
Blaisdell House, UMass
310 Hicks Way
Amherst, MA 01003

Massachusetts Stormwater Evaluation Project

(413) 545-5532
(413) 545-2304 FAX
www.mastep.net

MASTEP Technology Review

Technology Name: Hydro International First Defense

Studies Reviewed: Hydro International First Defense Testing Using Maine DEP Protocol Utilizing OK-110 Feed Sand. November 2004, testing conducted October 2004.

Hydro International First Defense Ok-110 Sand TSS (SSC) Removal Confirmation Test. Jeff Dennis, Maine DEP.

First Defense Performance Evaluation –Hydro International February 2011

Date: March 15, 2011

Reviewer: Sarah Titus, Updated by Jerry Schoen

Rating: 2

Brief rationale for rating: This rating is primarily based on the 2011 study report by Hydro International. This study was conducted by the manufacturer on a full scale 4' diameter model using a laboratory testing protocol that closely followed NJ DEP recommended protocol, which protocol is considered by MASTEP as the laboratory analog to TARP Tier II field protocol. The study was well run. 5 runs were conducted at flow rates ranging from 25% - 125% of the design treatment flow rate using OK-110 Silica sand.

TARP Requirements Not Met*:

- OK-110 contains particle size distribution slightly larger than is recommended.
- Although witnessed by a 3rd party, this test was conducted by the manufacturer.
- Influent sediment concentration ranges from approximately 40 to approximately 200 mg/l. This is lower than required, but in one respect produces a more demanding test than the recommended 100-300 range, as lower concentrations are generally harder to treat effectively.

Other notes:

- A Quality Assurance Project Plan was prepared and appears to have been followed during the test.
- Scour tests were conducted according to recommended protocol. No scour was detected.
- Samples were analyzed for both SSC and TSS; removal rates were 71% and 70% respectively/

* Criteria also based on NJDEP laboratory testing guidelines.

A P P E N D I X E

Soil Testing Data
Wetland Delineation Report

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green Dev.
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 (Hole #) | 12/23/20 (Date) | 8:15AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: EOP right Parking Lot - entrance

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet | Property Line 10' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 68" Depth Weeping from Pit | 78" Depth Standing Water in Hole

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			
0-36"	Urban Fill	--	--	-	-	-	--	--	--	--	Pavement/Fill
36-64"	C1	LS	10YR 5/3	-	-	-	5	15	Mass	Fri	Cobbly & Loose
64-110"	C2	SL	10YR 6/2	66"	7.5YR 5/6	5	5	5	Mass	Fri	Sandy Loam with Gravel pockets

Additional Notes: Groundwater not seen, stony fill over till over bedrock. Ledge at 96" on northside of hole

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 (Hole #) | 12/23/20 (Date) | 8:30AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Parking Lot/Landscaping - Middle near entrance

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 20' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 86" Depth Weeping from Pit _____ Depth Standing Water in Hole

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			
0-24"	Urban Fill	--	--	-	-	-	----	--	--	--	
24-36"	Bw	LS	10YR 5/6	-	-	-	5	10	Loose	Fri	
36-70"	C1	Sand	10YR 5/4	-	-	-	10	15	Mass	Fri	Loose and gravel pockets
70-110"	C2	GLS	10YR 6/3	68"	7.5YR5/6	5%	15	10	Mass	Fri	Fine Sand with gravel and boulders

Additional Notes: Weeping at 86" and standing

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 1	Obs. Hole # 2
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	66+ inches	68+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 66"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 36"/72" inches Lower boundary: 110"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green Dev.
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 (Hole #) | 12/23/20 (Date) | 9:00AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Middle Parking Lot - front entrance

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 65' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 96" Depth Weeping from Pit | 80" Depth Standing Water in Hole

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			
0-30"	Urban Fill	--	--	-	-	-	--	--	--	--	Pavement/Fill
30-40"	Bw	LS	10YR 5/6	-	-	-	5	15	Mass	Fri	weathered LS
40-72"	C1	SAND	10YR 5/6	-	-	-	15	15	SG	Loose	Loose Sandy & Gravel pockets
72-118"	C2	GLS	10YR 6/2	72"	7.5YR 5/6	2	20	10	Mass	Fri	Fine sand

Additional Notes: Weeping at 96" - depleted soil throughout below 72"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 4 (Hole #) | 12/23/20 (Date) | 9:15AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-10% (Slope (%))

Description of Location: Parking Lot/Landscaping - Middle near entrance

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 20' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 86" Depth Weeping from Pit _____ Depth Standing Water in Hole

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			
0-24"	Urban Fill	--	--	-	-	-	---	---	---	---	
24-36"	Bw	SL	10YR 5/6	-	-	-	5	10	Mass	Fri	
36-64"	C1	GLS	10YR 6/3	-	-	-	15	15	Mass	Fri	Gravel pockets
64-100"	C2	GLS	10YR 6/4	70"	7.5YR5/6	2%	15	30	Mass	Fri	Many boulders tighter till pack

Additional Notes: No weep / No standing water seen - Mottles at 70" +/-

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 3	Obs. Hole # 4
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	72+ inches	70+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number

_____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 70"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 24"/30" inches Lower boundary: 100"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green Dev.
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 5 (Hole #) | 12/23/20 (Date) | 9:30 AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Middle Parking Lot - front entrance

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet | Property Line 10' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

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			
0-10"	Ap	SL	10YR 3/2	-	-	-	2	2	Gran	Fri	
10-30"	Bw	SL	10YR 5/4	-	-	-	5	15	Mass	Fri	
30-60"	C1	GLS	10YR 6/3	-	-	-	15	15	SG	Loose	Loose Sandy & Gravel pockets
60-110"	C2	GLS	10YR 6/4	62"	7.5YR 5/6	2	20	10	Mass	Fri	Bouldery

Additional Notes: No Weep No Standing - Bouldery C2

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 6 (Hole #) | 12/23/20 (Date) | 9:45AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: In front of building

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 60' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 98" Depth Weeping from Pit 108" Depth Standing Water in Hole

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			
0-50"	FILL	--	--	-	-	-	--	--	--	--	Pavement
50-64"	C1	GLS	10YR 5/4	-	-	-	20	10	Mass	Fri	
64-122"	C2	GLS	10YR 6/3	76"	10YR 5/6	5	30	15	Mass	Fri	Gravelly Loose Sand/Gravel

Additional Notes: No weep / No standing water seen

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 5	Obs. Hole # 6
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	62+ inches	76+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number

_____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 62"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 10"/50" inches Lower boundary: 110"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 7 (Hole #) | 12/23/20 (Date) | 10:00 AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Middle - In front of Building

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet | Property Line 75' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 90" Depth Weeping from Pit | 102" Depth Standing Water in Hole

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			
0-40"	--	--	--	-	-	-	--	--	--	--	Pavement
40-64"	C1	SL	10YR 5/4	-	-	-	10	10	Mass	Fri	
64-122"	C2	GLS	10YR 6/3	74"	7.5YR5/6	5	30	15	Mass	V. Fri	Loose Sandy & Gravel pockets

Additional Notes: Standing at 102" - gravelly material, loose

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 8 (Hole #) | 12/23/20 (Date) | 10:15AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-10% (Slope (%)

Description of Location: In front of building - Towards rear

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 80' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 98" Depth Weeping from Pit 108" Depth Standing Water in Hole

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			
0-50"	FILL	--	--	-	-	-	--	--	--	--	Pavement
50-120"	C	GLS	10YR 5/4	84"	7.5YR6/6	15	20	10	Mass	Fri	Gravelly Loose Sand/Gravel

Additional Notes: Standing at 108"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 7	Obs. Hole # 8
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	74+ inches	84+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 74"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 40"/50" inches Lower boundary: 120"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 9 (Hole #) | 12/23/20 (Date) | 10:30 AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Right Rear - at low point

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 25' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 44" Depth Weeping from Pit | 46" Depth Standing Water in Hole

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			
0-20"	--	--	--	-	-	-	--	--	--	--	Pavement
20-80"	C	LS	10YR 5/4	44"	7/5YR5/6	5	5	70	Mass	Fri	very stony / boulders

Additional Notes: Standing at 46" - many boulders

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 10 (Hole #) | 12/23/20 (Date) | 10:45AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-10% (Slope (%)

Description of Location: Rear Lot at EOP

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 80' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 66" Depth Weeping from Pit 70" Depth Standing Water in Hole

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			
0-40"	FILL	--	--	-	-	-	--	--	--	--	Pavement
40-90"	C	GLS	10YR 5/4	60"	7.5YR6/6	5	10	15	Mass	Fri	Many Boulders

Additional Notes: Standing at 70" - Angular boulders

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 9	Obs. Hole # 10
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	44+ inches	60+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number

_____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 44"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 20"/40" inches Lower boundary: 90"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 11 (Hole #) | 12/23/20 (Date) | 11:00 AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Right Rear - 50' Off WL

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet | Property Line 40' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 70" Depth Weeping from Pit | 76" Depth Standing Water in Hole

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			
0-10"	A	SL	--	-	-	-	--	--	--	--	Pavement
10-24"	Bw	GLS	10YR 5/6	-	-	-	--	--	Mass	Fri	Loose/gravelly
24-100"	C	LS	10YR 6/4	66"	7/5YR6/6	15	5	70	Mass	Fri	very stony / boulders

Additional Notes: Standing at 76" - many boulders t/out below 2'

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 12 (Hole #) | 12/23/20 (Date) | 11:15AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-10% (Slope (%)

Description of Location: Rear Lot off pavement towards rear PL

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 35' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 104" Depth Weeping from Pit 108" Depth Standing Water in Hole

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			
0-12"	A	Loam	10YR2/2	-	-	-	2	2	Gran	Fri	
12-30"	Bw	LS	10YR 5/4	-	-	-	10	10	Mass	Fri	
30-130"	C	Grav Sand	10YR 6/4	98"	7.5YR5/6	5	10	15	SG	Loose	Loose, some loam, loose packed with boulders

Additional Notes: Loose and sandy C

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 11	Obs. Hole # 12
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	66+ inches	98+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number

_____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 66"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 10"/12" inches Lower boundary: 100"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 13 (Hole #) | 12/23/20 (Date) | 11:30 AM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: Right Rear - 50' Off WL

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet | Property Line 25' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: -- Depth Weeping from Pit | -- Depth Standing Water in Hole

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			
0-70"	Fill	--	--	-	-	-	--	--	--	--	Urban Fill
70+	Cd	Rock	--	-	-	-	--	--	--	--	Bedrock

Additional Notes: Refusal at 70" - Bedrock

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: _____ Hole # _____ Date _____ Time _____ Weather _____ Latitude _____ Longitude:

1. Land Use: _____ (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
   Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

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			

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 13	Obs. Hole #_____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	70+ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 70"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☒ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: t/o inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Trinity Green Dev.
Owner Name

655 Washington Street
Street Address

Parcel ID 29-329-9-0
Map/Lot #

Weymouth
City

MA
State

02188
Zip Code

B. Site Information

1. (Check one) [X] New Construction [ ] Upgrade [ ] Repair

2. Soil Survey Available? [X] Yes [ ] No If yes: NRCS (Source) 602 (Soil Map Unit)

Urban Land
Soil Name

None
Soil Limitations

Friable Coarse Loamy ablation till from granite
Soil Parent material

Shoulder, Side Slope
Landform

3. Surficial Geological Report Available? [X] Yes [ ] No If yes: 2020 MassGIS (Year Published/Source) Till/Bedrock (Map Unit)

Till/Bedrock plain near Weymouth Fore River
Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? [ ] Yes [X] No

5. Within a velocity zone? [ ] Yes [X] No

6. Within a Mapped Wetland Area? [ ] Yes [X] No If yes, MassGIS Wetland Data Layer: (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/23/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Duxbury 79R well

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 14 (Hole #) | 12/23/20 (Date) | 12:00PM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-10% (Slope (%))

Description of Location: EOP off back of building

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet | Property Line 10' feet | Drinking Water Well >100' feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 76" Depth Weeping from Pit | 82" Depth Standing Water in Hole

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			
0-12"	A	SL	10YR2/2	-	-	-	2	2	Gran	Fri	
12-30"	Bw	LS	10YR 5/4	-	-	-	5	10	Mass	Fri	
30-102"	C	GLS	10YR 5/4	76"	7.5YR 5/6	10	15	15	Mass	Fri/Loose	Cobbly & Loose

Additional Notes: Standing at 82" - Loose sandy

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 15 (Hole #) | 12/23/20 (Date) | 12:15PM (Time) | 30 Sunny (Weather) | 42.2036° (Latitude) | -70.9507° (Longitude:)

1. Land Use: Commercial/Residential (e.g., woodland, agricultural field, vacant lot, etc.) | Parking Lot/Wooded (Vegetation) | Some Boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-10% (Slope (%)

Description of Location: Parking Lot/Landscaping - Middle near entrance

2. Soil Parent Material: Ablation Till | Ground Moraine (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >100' feet | Drainage Way >100' feet | Wetlands n/a feet
Property Line 50' feet | Drinking Water Well >100' feet | Other x feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 86" Depth Weeping from Pit | 92" Depth Standing Water in Hole

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			
0-40"	Urban Fill	--	--	-	-	-	--	--	--	--	Pavement
40-110"	C	GLS	10YR 5/4	70"	7.5YR4/6	15	20	10	Mass	Fri	GLS with boulders

Additional Notes: Weeping at 86" and standing at 92"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # 14	Obs. Hole # 15
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	76+ inches	70+ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number

_____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 70"+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 30"/40" inches Lower boundary: 102"+ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Austin Chartier, PE	12/23/2020
Signature of Soil Evaluator	Date
Austin Chartier, PE SE#14167	6/30/2023
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
None	N/A
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

ECR

Environmental Consulting & Restoration, LLC

WETLAND DELINEATION MEMO

TO: McKenzie Engineering Group

FROM: Brad Holmes

DATE: October 23, 2020

RE: 655 Washington Street, Weymouth

Per your request, Environmental Consulting & Restoration, LLC (ECR) performed a review of the existing conditions on and near the property located at 655 Washington Street in Weymouth (the site) on October 6, 2020. The purpose of the review was to identify wetland resource areas on and near the site. The site is located along the south side of Washington Street and contains open parking areas, motel building, etc. The site is surrounded by commercial properties. The weather on October 6th was sunny, clear, and warm (approximately 60 degrees) with no wind and dry site conditions. A Bordering Vegetated Wetland, which may be part of an unmaintained drainage system, is located on or near the western corner of the property abutting 625 Washington Street. ECR placed Bordering Vegetated Wetland (BVW) flags (pink/black striped) #A1 to #A9 along the landward limit of this wetland facing the site. The vegetated wetland was delineated following the methodology established by the Massachusetts Department of Environmental Protection (DEP) regulations found at 310 CMR 10.55 pertaining to the delineation of Bordering Vegetated Wetlands. The delineation was performed by analyzing vegetation, hydrology within 12 inches of the surface, and soil conditions within 20 inches of the surface. The wetland contains hydric soils, saturated soils, and dominant wetland indicator plants. As a result of ECR's wetland delineation at the site, ECR is able to confirm that the site contains the following wetland resource areas and areas of Conservation Commission jurisdiction:

- Bordering Vegetated Wetlands (BVW)
- 100-foot Buffer Zone to BVW

Also review of the MassGIS wetlands database reveals the following:

1. The site is not located within Estimated/Priority Habitat for Rare Species according to the Massachusetts Natural Heritage & Endangered Species Program (MaNHESP).
2. The site does not contain Certified Vernal Pools according to the MaNHESP.
3. The site does not contain a U.S.G.S. mapped stream.
4. The site does not contain areas mapped as Land Subject to Flooding according to the FEMA Firm Maps.
5. The site is not located within an Area of Critical Environmental Concern.

Upon review of this wetland delineation memo, please contact me at (617) 529 – 3792 or brad@ecrwetlands.com with any questions or requests for additional information.

Thank you,
Brad Holmes, Professional Wetland Scientist #1464
Manager

A P P E N D I X F

Best Management Practices
Operation and Maintenance Plans

CONSTRUCTION PHASE POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN (BEST MANAGEMENT PRACTICES OPERATION AND MAINTENANCE PLAN)

for

655 Washington Street

In

Weymouth, Massachusetts
(Assessor's Map 29, Block 329, Lot 9)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Trinity Green Development
180 Canton Ave.
Milton, Massachusetts 02186

Prepared by:

MCKENZIE ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
150 Longwater Drive, Suite 101, Norwell, Massachusetts 02061
Tel.: (781) 792-3900 Facsimile: (781) 792-0333
www.mckeng.com

JANUARY 12, 2021

TABLE OF CONTENTS

Construction Phase Best Management Practices (BMP's)

Erosion and Sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control. These practices correspond with plans entitled "Site Development, (Assessor's Map 29, Block 329, Lot 9), Washington Street, Weymouth, Massachusetts", issued January 12, 2021 and as revised hereinafter referred to as the Site Plans.

Responsible Party Contact Information:

Stormwater Management System Owner:
Trinity Green Development, LLC
Timothy Russell
180 Canton Ave.
Milton, MA 02186
Phone: (617) 281-1833

Town of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Weymouth Conservation Commission
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5007

Weymouth Department of Municipal Licenses and Inspections
Jeffrey E. Richards, C.B.O., Director
Town Hall
75 Middle Street
Weymouth, MA 02189
Phone: (781) 340-5004

Structural Practices:

1) **Compost Filter Tube Barrier Controls** – A compost filter tube barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The sediment silt sack barrier should be installed as shown on the Construction Detail Plan.

   Compost Filter Tube Design/Installation Requirements *

   a) Locate the compost filter tube where identified on the plans.

   b) The compost filter tube line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the

silt sack should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

c) The compost filter tube shall be staked every 8 linear feet with 1-inch by 1-inch stakes.

d) Compost filter tubes should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season. Retained sediment must be removed and properly disposed of, or mulched and seeded.

Compost Filter Tube Inspection/Maintenance *

a) Compost filter tubes should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

b) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the compost filter tube. Take care to avoid undermining fence during cleanout.

c) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

d) Remove all compost filter tube materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform with the existing topography and vegetated.

2) **Sediment Fence Controls** – A sediment fence will be constructed along the limit of work as needed to prevent the spreading of fine sediments from the site. This control will be installed prior to major soil disturbance on the site. The sediment fence should be installed as shown on the Erosion Control Detail Plan and be Amoco woven polypropylene 1198 or equivalent.

Sediment Fence Design/Installation Requirements *

e) Locate the fence upland of the hay bale barriers and where identified on the plans.

f) The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation) to provide storage capacity.

g) Excavate a trench approximately 8 inches deep and 4 inches wide, or a V-trench; along the line of the fence, upslope side.

h) Fasten support wire fence (14 gauge with 6-inch mesh) securely to the upslope side of the fence posts with wire ties or staples. Wire should extend 6 inches into the trench.

i) Attach continuous length of fabric to upslope side of fence posts. Avoid joints, particularly at low points in the fence line. Where joints are necessary, fasten fabric securely to support posts and overlap to the next post.

j) Place the bottom one foot of fabric in the trench. Backfill with compacted earth or gravel.

k) Filter cloth shall be fastened securely to the woven wire fence with ties spaced every 24 inches at the top, mid-section, and bottom.

l) Sediment fences should be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized through one growing season and only following approval by the Engineering Department or their representative. Retained sediment must be removed and properly disposed of, or mulched and seeded.

Sediment Fence Inspection/Maintenance *

e) Silt fences should be inspected immediately after each rainfall event of 1-inch or greater, and at least daily during prolonged rainfall. Inspect the depth of sediment, fabric tears, if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground. Repair or replace as necessary.

f) Remove sediment deposits promptly after storm events to provide adequate storage volume for the next rain and to reduce pressure on the fence. Sediment will be removed from behind the sediment fence when it becomes about ½ foot deep at the fence. Take care to avoid undermining fence during cleanout.

g) If the fabric tears, decomposes, or in any way becomes ineffective, replace it immediately.

h) Remove all fencing materials after the contributing drainage area has been properly stabilized. Sediment deposits remaining after the fabric has been removed should be graded to conform to the existing topography and vegetation.

3) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the proposed entrance at Cordwainer Drive. The construction entrance will keep mud and sediment from being tracked off the construction site onto Cordwainer Drive by vehicles leaving the site. The stabilized construction entrance will be installed immediately after the clear and grubbing of the roadway entrance and associated roadway fill to maintain access to the site are completed. The stormwater runoff from the entrance will be diverted to a temporary sedimentation basin. The stabilized construction entrance shall be constructed as shown on the Construction Detail Plans.

Construction Entrance Design/Construction Requirements *

a) Grade foundation for positive drainage towards the temporary sedimentation basin.

b) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

c) Pad dimensions: The minimum length of the gravel pad should be 50 feet. The pad should extend the full width of the proposed roadway, or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater.

d) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

e) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area shall be located at the stabilized construction entrance.

f) Water employed in the washing process shall be directed to the temporary sedimentation basin/dewatering area as shown on the plans prior to discharge. Sediment should be prevented from entering any watercourses.

Construction Entrance Inspection/Maintenance *

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto Cordwainer Drive. This may require periodic topdressing with additional stone

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be topdressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the temporary sedimentation basin/dewatering area should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available. Any water pumped from the temporary sedimentation basin shall be directed into a sediment dirt bag or equivalent inlet protection prior to discharge. Discharge should not be across the disturbed construction site but rather to undisturbed areas.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) Broken road pavement on Cordwainer Drive shall be repaired immediately.

h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed and only following approval by the Public Works Department or their representative. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.

- Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently cease is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.

- Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction activity temporarily ceased.

- The contractor shall provide erosion control measures around all soil stockpiles.

1) **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stock piles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

   Temporary Seeding Planting Procedures *

   a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

   b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

c) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

d) Use effective mulch tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to a heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four hour period). Stands should be uniform and dense. Reseed and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	**Manufacturer**	**Product**	**Remarks**
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) **Land Grading** – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in

fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

f) Infiltration basins shall be excavated, graded and shaped to subgrade elevation and shall then be suitably protected with installation of erosion control measures to prevent sediment-laden runoff from washing into the basins. The basins shall also be protected from heavy equipment activity from this point forward. Prior to application of loam and seed to infiltration basin surfaces, the contractor shall remove any unsuitable soil such as silt or clay that may have been deposited during construction. The surface shall be scarified with a York rake or other small tractor mounted equipment. The loam and seed shall then be applied as required by this document.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling *** – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 2.5:1, as it will tend to erode.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

Permanent Seeding Seedbed Preparation

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and re-spread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil 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.

Permanent Seeding Grass Selection/Application

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydro-seeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance *

a) Frequently 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.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) 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.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

Fueling and Maintenance of Equipment and Vehicles:

1. Refueling/maintenance Rules – The site supervisor shall produce a written document received by all subcontractors and employees that delineates their responsibilities on site. This document shall include language that shall permit the maintenance of vehicles only in designated locations on the job site. In the event of mechanical failure of a vehicle, the vehicle shall be moved to the designated maintenance area on the site to perform maintenance. The site supervisor shall document receipt of these instructions by obtaining the signatures of subcontractors and individuals that may enter the site and the date in which they were notified of their responsibilities. Refueling for vehicles or equipment shall occur either within the designated washout area or shall utilize temporary drip protection measures at the location of fueling. The site supervisor or their representative shall be present at the time of any fueling procedure. The site supervisor shall have a fuel spill plan and measures on site to initiate containment and clean-up in the event a fuel spill occurs.

2. Installation Schedule: Prior to start of Work

3. Maintenance and Inspection: The site supervisor shall maintain a log of individuals receiving these instructions.

4. Specific Pollution Prevention Practices

   Pollution Prevention Practice # 1

   a. Description: Fueling operations shall take place in designated area(s) as shown on site maps. Provide temporary drip protection during fueling operations which take place outside of designated area(s). Materials necessary to address a spill shall be made readily available in a location known to the site supervisor or his/her designee.

   b. Installation: Fueling operation procedures shall be in effect throughout the project duration.

   c. Maintenance Requirements: All emergency response equipment listed in the Emergency Response Equipment Inventory shall be made readily available and kept in a designated location known to the site supervisor or his/her

designee. All such materials shall be replenished as necessary to the listed amounts.

Dust Control:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction access roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

The general contractor shall employ an on-site water vehicle for the control of dust as necessary.

Non-Stormwater Discharges:

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Soil Stockpiling:

Topsoil and subsoil from the driveway grading will be stockpiled in locations shown on the plans.

Stockpile Material Construction Procedure

1) Topsoil and subsoil that are stripped will be stockpiled for later distribution on disturbed areas.
2) The stockpiles will be located as shown on the plans. These locations will allow them to not interfere with work on the site.
3) Seed the stockpiles with a temporary erosion control mix if the stockpile is to remain undisturbed for more than 30 days. The stockpiles must be stable and the side slopes should not exceed 2:1.

4) Sediment Fence/Hay Bale Barrier erosion control measures should be placed surrounding each stockpile.

5) As needed, the stockpiled topsoil and subsoil are redistributed throughout the site.

Anticipated Construction Schedule:

To prevent excessive erosion and silting, the following construction sequence coupled with other widely accepted principals for reducing erosion and sedimentation shall be implemented in the development of the site.

1. Obtain all plan approvals and other applicable permits.
2. Flag the work limits and mark trees and buffer areas for protection.
3. Hold a pre-construction meeting prior to any construction activity.
4. Install stabilization practices for erosion and sediment control prior to commencing construction activities. Refer to "Erosion and Sedimentation Control Plan" and place siltation fence and haybale barriers at locations indicated on the site plans.
5. Clear and grub up as required for the construction of the driveway and related infrastructure.
6. Construct stabilized construction entrance.
7. Excavate topsoil and subsoil from cut and fill areas and stockpile on site in locations shown on the plan. consideration should be given to locating stockpiles on the uphill side of disturbed areas, where possible, to act as temporary diversions.
8. Construct cut and fill areas, installing haybale check dams at toes of all 3:1 or greater slopes, and at ends of all cut areas. All fill will be installed using 12" maximum compaction lifts. Place all slope protection where indicated on the plan. the stormwater extended detention basin shall be constructed immediately after the driveway rough grading is completed and the area has been cleared of vegetation.
9. Install closed drainage system and other utilities. All catch basins shall be covered with siltsack or equivalent inlet protection.
10. Grade driveway to subgrade elevation and construct side slopes. Apply temporary stabilization measures where warranted. Refer to "Erosion and Sedimentation Control Plan".
11. Place gravel subbase.
12. Place the bituminous concrete binder course on driveway and parking lot.
13. Grade slopes and stabilize cut areas at toe of slopes. blend all slopes into existing topography and loam and seed all disturbed areas. slopes greater than 3:1 shall be stabilized with jute mesh.
14. Place the final wearing course of pavement.
15. Complete fine grading of shoulders and place pavement in miscellaneous areas.
16. Remove temporary erosion control devices once adequate growth is established. adequate growth is defined as vegetation covering 75% or more of the ground surface.

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a design professional or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the Weymouth Highway Department.

Project Location: 655 Washington Street, Map 29, Block 329, Lot 9, Weymouth, MA **Date:**
Stormwater Management – Construction Phase
Best Management Practices – Inspection Schedule and Evaluation Checklist

Construction Practices

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed: (List Items)	Date of Cleaning/ Repair	Performed by
Silt Sock and Sediment Fence Controls	After heavy rainfall events (minimum weekly)			1. Sediment Fence Design/Installation Requirements 2. Sediment Fence Inspection/Maintenance	☐yes ☐no		
Stabilized Construction Entrance	After heavy rainfall events (minimum weekly)			1. Construction Entrance Design/ Construction Requirements 2. Construction Entrance Inspection/ Maintenance	☐yes ☐no		
Temporary Sedimentation Basins	After heavy rainfall events (minimum weekly)			1. Sediment Basin Inspection/ Maintenance	☐yes ☐no		
Temporary Seeding	After heavy rainfall events (minimum weekly)			1. Temporary Seeding Planting Procedures 2. Temporary Seeding Inspection/ Maintenance	☐yes ☐no		
Geotextiles	After heavy rainfall events (minimum weekly)			1. Geotextile Inspection/Maintenance	☐yes ☐no		
Mulching & Netting	After heavy rainfall events (minimum weekly)			1. Mulch Maintenance	☐yes ☐no		
Land Grading	After heavy rainfall events (minimum weekly)			1. Land Grading Stabilization Inspection/ Maintenance	☐yes ☐no		

Permanent Seeding	After heavy rainfall events (minimum weekly)			1. Permanent Seeding Inspection/ Maintenance	☐**yes** ☐**no**		
Dust Control	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		
Soil Stockpiling	After heavy rainfall events (minimum weekly)				☐**yes** ☐**no**		

(1) Refer to the Massachusetts Stormwater Handbook issued January 2, 2008.

Notes (Include deviations from : Definitive Subdivision Decision and Special Conditions and Approved Plan):

Stormwater Control Manager _____

Spill Containment and Management Plan

January 8, 2021

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Trinity Green Development, LLC Timothy Russell
Facility Manager (phone)	617-281-1833

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time_____ AM / PM

Exact location (Transformer #)_____

Type of equipment_____Make_____Size_____

S / N_____Weather Conditions_____

On or near water ☐ Yes If yes, name of body of water_____
☐ No

Type of chemical / oil spilled_____

Amount of chemical / oil spilled_____

Cause of spill_____

_____

_____

Measures taken to contain or clean up spill_____

_____

_____

Amount of chemical / oil recovered_____Method_____

Material collected as a result of clean up

_____drums containing_____

_____drums containing_____

_____drums containing_____

Location and method of debris disposal_____

_____

Name and address of any person, firm, or corporation suffering damages_____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring____

_____

Spill reported to General Office by_____Time_____AM / PM

Spill reported to DEP / National Response Center by_____

DEP Date____/_____/_____ Time_____ AM / PM Inspector_____

NRC Date____/_____/_____ Time_____ AM / PM Inspector_____

Additional comments_____

_____

_____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   NAME: _____ BEEPER: _____
   PHONE: _____ CELL PHONE: _____

   ALTERNATE:
   NAME: Timothy Russell ____ BEEPER: N/A _____
   PHONE: 617-281-1833 ____ CEL PHONE: N/A _____

2. FIRE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 337-5151

   POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 335-1212

   DEPARTMENT OF PUBLIC WORKS
   CONTACT: Director – Kenan Connell
   BUSINESS: (781) 337-5100
   ALTERNATE:

   CONSERVATION COMMISSION
   CONTACT: Mary Ellen Schloss
   BUSINESS: (781) 340-5007

   BOARD OF HEALTH
   CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
   BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (617) 556-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
   PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   EMERGENCY: (617) 223-7265
   BUSINESS: (617) 860-4300

POST-DEVELOPMENT BEST MANAGEMENT PRACTICE
OPERATION AND MAINTENANCE PLAN & LONG-TERM POLLUTION PREVENTION PLAN

for

655 Washington Street

In

Weymouth, Massachusetts
(Assessor's Map 29, Block 329, Lot 9)

Submitted to:

TOWN OF WEYMOUTH

Prepared for:

Trinity Green Development
180 Canton Ave.
Milton, Massachusetts 02186

Prepared by:

MCKENZIE ENGINEERING GROUP

Professional Civil Engineering • Project Management • Land Planning
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JANUARY 12, 2021

TABLE OF CONTENTS

Post-Development Best Management Practice
Operation and Maintenance Plan &
Long-Term Pollution Prevention Plan

Post-Development Best Management Practices (BMPs)
Operation and Maintenance Plan

Responsible Party/Property Owner/Developer contact information:
Property Owner: Trinity Green Development, LLC
180 Canton Ave.
Milton, MA 02186

Developer Contact Information:
Trinity Green Development, LLC
Timothy Russell
180 Canton Ave.
Milton, MA 02186
Phone: (617) 281-1833

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

BMPs included in the design consist of the use of:

- Paved areas maintenance
- Deep sump catch basins with hooded outlets
- Proprietary pretreatments units
- Subsurface infiltration tank systems
- Trench drains
- Outlet protection
- Restrictions on the use of pesticides and herbicides within the 100-foot buffer zone
- Snow removal

Operation:

Once the stormwater management systems have been constructed and the driveway and parking lot has been permanently stabilized and put into action, the operation of the stormwater management system will function as intended. Stormwater runoff is directed into the catch basins and closed drainage system to the First Defense units, and lastly to the subsurface infiltration systems. The subsurface stormwater management systems have been designed to attenuate peak flows for the 1-year through 100-year storm events.

Maintenance:

1. **Paved Areas** –Sweepers shall sweep paved areas periodically during dry weather to remove excess sediments and to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping shall be conducted primarily between March 15th and November 15th. Special attention should be made to sweeping paved surfaces in March and April before spring rains wash residual sand into the drainage system.

   The frequency of sweeping shall average:

   - Monthly if by a high-efficiency vacuum sweeper
   - Bi-weekly if by a regenerative air sweeper
   - Weekly if by a mechanical sweeper

   Salt used for de-icing on the parking lot during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities.

   Cost: The property owner should consult local sweeping contractors for detailed cost estimates.

2. **Catch Basins -** Catch basin grates shall be checked quarterly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposed of properly. Deep sump catch basins shall be inspected and cleaned bi-annually of all accumulated sediments. Catch basins with hoods shall be inspected annually to check oil build-up and outlet obstructions. Material shall be removed from catch basins and disposed of in accordance with all applicable regulations.

   Cost: Estimated $50 - $100 per cleaning as needed. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

3. **Proprietary Pretreatment Units –** The proprietary pretreatment units shall be inspected and maintained from the surface, without entry into the unit a minimum of annually and following heavy rain events. Perform maintenance once the stored volume reaches 15% of the unit capacity, or immediately in the event of a spill. Perform Maintenance at quarterly intervals during the first year of installation, so an accurate maintenance schedule can be established. Sediment and debris should be removed through the 12-inch diameter outlet pipe. Alternatively, oil and floatables should be removed through the 12-inch oil inspection port. The requirements for the disposal from the units should be in compliance with all local, state and federal regulations. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the First Defense units.

   Cost: Cleaning should be included along with the routine maintenance of the catch basins. The property owner should consult local vacuum cleaning contractors for detailed cost estimates.

4. **Subsurface Infiltration Tank System** –Proper maintenance of the subsurface infiltration system is essential to the long-term effectiveness of the infiltration function. The subsurface infiltration system shall have inspection ports and additional inspections should be scheduled during the first few months to ensure proper stabilization and function. Thereafter, they shall be checked semiannually and following heavy rainfalls, defined as a 1-year storm event exceeding 2.5 inches of rainfall within a twenty-four-hour period. Water levels in the chambers shall be checked to verify proper drainage. Ponding water in a chamber indicates failure from the bottom. If water remains within the chambers after 48-hours following a storm event, steps to restore the infiltration function shall be taken, as directed by a qualified stormwater management professional. In order to rectify the problem, accumulated sediment must be removed from the bottom of the chamber. The stone aggregate and filter fabric must be removed and replaced and the underlying soil layer must be scarified to encourage proper infiltration. Material removed from the system shall be disposed of in accordance with all applicable local, state, and federal regulations. Please refer to the Manufacturer's Manual for additional detail on proper inspection and maintenance of the ACF R-Tanks.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

5. **Trench Drains -** Trench drain grates shall be checked monthly and following heavy rainfalls to verify that the inlet openings are not clogged by debris. Debris shall be removed from the grates and disposal should be in compliance with all local, state and federal regulations.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

6. **Outlet Protection** - All outfall protection structures shall be inspected quarterly and following major storm events defined as a storm event exceeding one inch of rainfall within a twenty-four-hour period to check for signs for erosion. Any necessary repairs shall be performed promptly and cleaned to remove accumulated sediment as necessary. Material removed shall be disposed of in accordance with all applicable local, state, and federal regulations. Rip-Rap overflow structure shall be weeded and cleaned on a quarterly basis to ensure that water overflowing the spillway will not become obstructed by debris.

7. **Pesticides, Herbicides, and Fertilizers -** Pesticides and herbicides shall be used sparingly. Fertilizers should be restricted to the use of organic fertilizers only.

   All structural BMP's as identified on the site plans will be owned and maintained by the homeowner's association of the development and shall run with the title of the property.

   Cost: Included in the routine landscaping maintenance schedule. The Owner should consult local landscaping contractors for details.

8. **Snow Removal -** Snow accumulations removed from driveway and parking areas should be placed in upland areas only, where sand and other debris will remain after snowmelt for later removal. Excess snow should be removed from the site and properly disposed of in an approved snow disposal facility. Care must be exercised not to deposit snow in the following areas: in the rain gardens, bioswales, and where sand and debris can get into the watercourse.

Cost: The owner should consult local snow removal contractors for a detailed cost estimate.

Maintenance Responsibilities:

All post construction maintenance activities will be documented and kept on file in the form of an Evaluation Checklist, see attached form.

All structural BMPs as identified on the site plans will be owned and maintained by the developer or property owner. All post construction maintenance activities shall run with the title of the property.

Long-Term Pollution Prevention Plan

Good Housekeeping:

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.

Storage and Disposal of Household Waste and Toxics:

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to support the household hazardous product collection events sponsored by the Town of Weymouth.

MADEP has prepared several materials for homeowners on how to properly use and dispose of household hazardous materials:

http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:

DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.

- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
nickel cadmium batteries
(no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and
stains
Arts and crafts chemicals
Charcoal lighter fluid

Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish
removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

Vehicle Washing:

This management measure involves educating the general public on the water quality impacts of the outdoor washing of automobiles and how to avoid allowing polluted runoff to enter the storm drain system. Outdoor car washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions in many watersheds, as the detergent-rich water used to wash the grime off our cars flows down the street and into the storm drain. The following management practices will be encouraged:

- Washing cars on gravel, grass, or other permeable surfaces.
- Blocking off the storm drain during car washing and redirecting wash water onto grass or landscaping to provide filtration.
- Using hoses with nozzles that automatically turn off when left unattended.
- Using only biodegradable soaps.
- Minimize the amounts of soap and water used. Wash cars less frequently.
- Promote use of commercial car wash services.

Landscape Maintenance:

This management measure seeks to control the storm water impacts of landscaping and

lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).
- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the Town of Weymouth.
- Water only when necessary.
- Use automatic irrigation systems to reduce water use.

Integrated Pest Management (IPM):

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.
- Raise public awareness by referring homeowners to “A Homeowner’s Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way”, Massachusetts Department of Food and Agriculture, Pesticide Bureau or link **http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman>**

Pet Waste Management:

Pet waste management involves using a combination of pet waste collection programs, pet awareness and education, to alert residents to the proper disposal techniques for pet droppings. The following management practices will be encouraged:

- Raise awareness of homeowners that are also pet owners that they are encouraged to pick up after their pets and dispose of the waste either in the trash, including on their own lawns and walking trails.
- Provide signage along walking trails.

Proper Management of Deicing Chemicals and Snow:

Roadways shall be maintained by the Developer/Property Owners. The following deicing chemicals and snow storage practices will be encouraged:

- Select effective snow disposal sites adjacent to or on pervious surfaces in upland areas away from water resources and 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.
- No roadway deicing materials shall be stockpiled on site unless all storage areas are protected from exposure to rain, snow, snowmelt and runoff.
- Avoid dumping snow into any waterbody, including wetlands, cranberry bogs, detention/infiltration basins, and grassed swales/channels.
- Avoid disposing of snow on top of storm drain catch basins.

Project Location: 655 Washington Street Assessor's Map 29, Block 329, Lot 9, Weymouth, MA

Stormwater Management – Post Construction Phase

Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check (1)	Cleaning/Repair Needed: ☐yes ☐no (List Items)	Date of Cleaning/ Repair	Performed by
Street Sweeping Maintenance	4-times annually - specifically in Spring and Fall			1. Sediment build-up 2. Trash and debris 3. Minor Spills (vehicular)			
Deep Sump and Hooded Catch basin	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8" 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			
Proprietary Pretreatment Units	After heavy rainfall events (minimum annually)			1. Sediment level exceeds Manufacturer's specification 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Outlet blockages			
Subsurface Infiltration Tanks	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up 2. Standing Water greater than 48 hours			
Outlet Protection	Quarterly			1. Sediment build-up 2. Trash and debris 3. Displacement of rip rap 4. Excess vegetation			
Trench Drains	After heavy rainfall events (minimum quarterly)			1. Sediment level exceeds 8" 2. Trash and debris 3. Floatable oils or hydrocarbons 4. Grate or outlet blockages			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.

Notes (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan):

1.

Stormwater Control Manager _____ Stamp:

Spill Containment and Management Plan

January 8, 2021

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	Trinity Green Development, LLC Timothy Russell
Facility Manager (phone)	617-281-1833

Assessment - Initial Containment

The supervisor will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the Fire Department and then notify the Police Department, Department of Public Works, Board of Health and Conservation Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Contact:	Phone Number:
Fire Department:	911
Police Department:	911
Department of Public Works:	(781) 337-5100
Board of Health Phone:	(781) 335-2000
Conservation Commission Phone:	(781) 340-5007

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the facility office and readily accessible to all employees.

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/_____ Time_____ AM / PM

Exact location (Transformer #)_____

Type of equipment_____Make_____Size_____

S / N_____Weather Conditions_____

On or near water ☐ Yes If yes, name of body of water_____
☐ No

Type of chemical / oil spilled_____

Amount of chemical / oil spilled_____

Cause of spill_____

_____

_____

Measures taken to contain or clean up spill_____

_____

_____

Amount of chemical / oil recovered_____Method_____

Material collected as a result of clean up

_____drums containing_____

_____drums containing_____

_____drums containing_____

Location and method of debris disposal_____

_____

Name and address of any person, firm, or corporation suffering damages_____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring____

_____

Spill reported to General Office by_____Time_____AM / PM

Spill reported to DEP / National Response Center by_____

DEP Date____/_____/_____ Time_____ AM / PM Inspector_____

NRC Date____/_____/_____ Time_____ AM / PM Inspector_____

Additional comments_____

_____

_____

EMERGENCY RESPONSE EQUIPMENT
INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

--	SORBENT PADS	1 BALE
--	SAND BAGS (empty)	5
--	SPEEDI-DRI ABSORBENT	2 – 40LB BAGS
--	12” INFLATABLE PIPE PLUG	1
--	SQUARE END SHOVELS	1
--	PRY BAR	1
--	CATCH BASIN COVER	1

EMERGENCY NOTIFICATION PHONE NUMBERS

1. FACILITY MANAGER
   NAME: _____ BEEPER: _____
   PHONE: _____ CELL PHONE: _____

   ALTERNATE:
   NAME: Timothy Russell ____ BEEPER: N/A _____
   PHONE: 617-281-1833 ____ CEL PHONE: N/A _____

2. FIRE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 337-5151

   POLICE DEPARTMENT
   EMERGENCY: 911
   BUSINESS: (781) 335-1212

   DEPARTMENT OF PUBLIC WORKS
   CONTACT: Director – Kenan Connell
   BUSINESS: (781) 337-5100
   ALTERNATE:

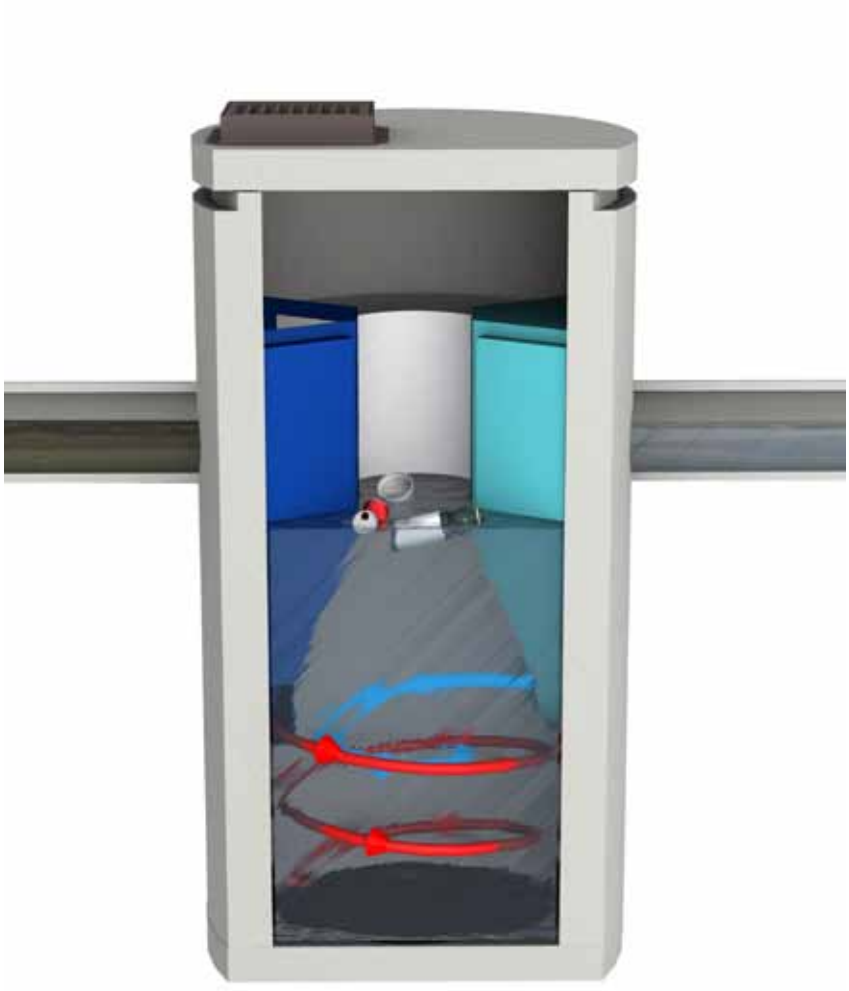
   CONSERVATION COMMISSION
   CONTACT: Mary Ellen Schloss
   BUSINESS: (781) 340-5007

   BOARD OF HEALTH
   CONTACT: Board of Health Agent Clerk – Clare LaMorte, RN
   BUSINESS: (781) 335-2000

3. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION
   EMERGENCY: (617) 556-1133
   SOUTHEAST REGION - LAKEVILLE OFFICE: (508) 946-2700

4. NATIONAL RESPONSE CENTER
   PHONE: (800) 424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   EMERGENCY: (617) 223-7265
   BUSINESS: (617) 860-4300



Operation and Maintenance Manual

First® Defense

Vortex Separator for Stormwater Treatment

Stormwater Solutions

Turning Water Around ...®

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

First Defense® by Hydro International

Capturing more than 25 years of separation design experience, the First Defense® is Hydro International's latest addition to its family of hydrodynamic vortex separators intended for stormwater applications. It has been developed with ease of installation and maintenance at the forefront without sacrificing performance or design flexibility.

All internal components are housed in either a 4-ft or 6-ft diameter precast manhole that is designed to withstand traffic loads. Each model can be used as a catch basin inlet or standard manhole with solid cover so that runoff can enter from an overhead grate, inlet pipe or both without diminishing performance.

The First Defense® has internal components that are designed to generate rotational flow within the device without requiring a tangential inlet. Flow within the precast chamber is controlled to prevent turbulence and its unique reverse-flow outlet intake ensures a longer retention time by preventing short-circuiting. An internal bypass prevents high flow re-suspension and washout and eliminates the need for additional bypass structures. The internals can easily be adjusted to change the angle between the inlet and outlet for storm drain directional changes and dual inlets can be accomodated in most cases. This simplifies grading and site design so that flow can be conveyed from isolated locations within the same site without increasing the number of structures.

For removal of fine sediment and associated pollutants, oil spills, trash and debris, the first choice in stormwater treatment systems is the First Defense®.

First Defense® Components

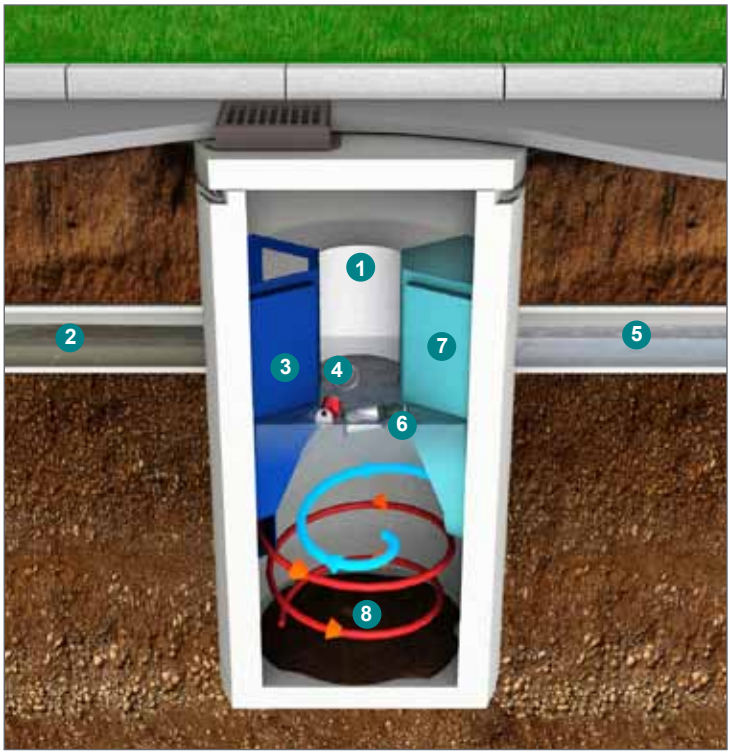
1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port (not pictured)**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Outlet Chute**
8. **Sediment Storage**

Benefits of the First Defense®

- Compact and flexible design
  - Can be used as a catch basin inlet and directional change manhole
  - Optional one or two inlets
  - Does not require a bypass structure
- Hydrodynamic Vortex Separation
  - Extended and structured flow path
  - Minimal headloss
  - Reduces turbulence and re-suspension
  - Reverse-flow outlet intake prevents short-circuiting
  - Improved efficiency for all flows
- Delivered Pre-assembled for easy and fast installation
- Simple to inspect and maintain
- Independently verified

Applications

- New developments and retrofits
- Utility yards
- Streets and roadways
- Parking lots
- Pre-treatment for filters, infiltration and storage
- Industrial and commercial facilities
- Wetlands protection



Operation

Introduction

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume. The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow internally-bypassed storm events. Accessories such as oil absorbant pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Wet Sump

The sump of the First Defense® retains a standing water level between storm events. The water in the sump prevents stored sediment from solidifying in the base of the unit. The clean-out procedure becomes more difficult and labor intensive if the system allows fine sediment to dry-out and consolidate. Dried sediment must be manually removed by maintenance crews. This is a labor intensive operation in a hazardous environment.

Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

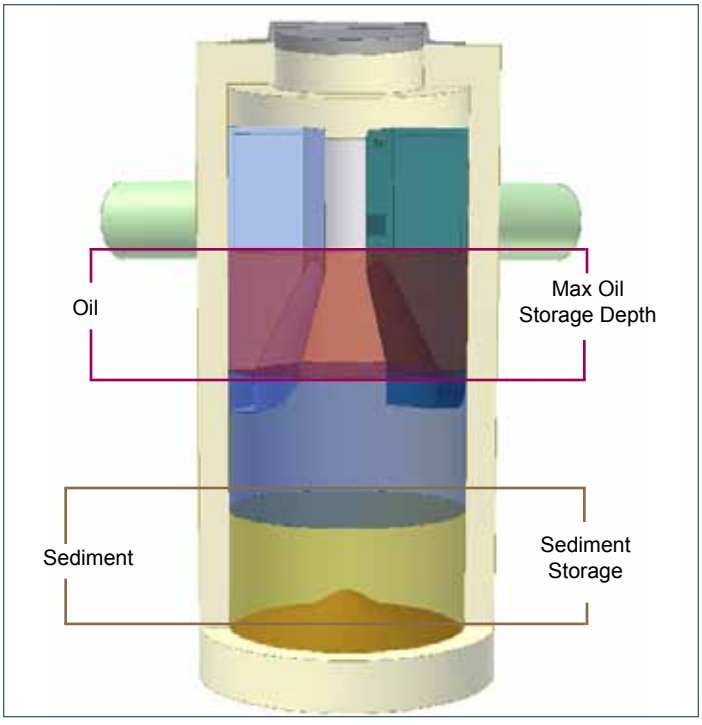


Fig.1 Pollutant storage volumes in the First Defense®.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Determining Your Maintenance Schedule

The frequency of cleanout is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil/flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 800 gallons.

Inspection

Inspection is a simple process that does not involve entry into the First Defense®. Maintenance crews should be familiar with the First Defense® and its components prior to inspection.

Scheduling

- It is important to inspect your First Defense® every six months during the first year of operation to determine your site-specific rate of pollutant accumulation.
- Typically, inspection may be conducted during any season of the year.

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge Judge®)
- Trash bag for removed floatables
- First Defense® Maintenance Log

Table 1. First Defense® Pollutant Storage Capacities and Maximum Cleanout Depths

Unit Diameter	Total Oil Storage	Oil Clean-out Depth	Total Sediment Storage	Sediment Clean-out Depth	Max. Liquid Volume Removed
(ft)	(gal)	(in)	(gal)	(in)	(gal)
4	180	<23.5	202	26	202-342
6	420	<23.5	626	36	626-1,046

NOTE

The total volume removed will depend on the oil accumulation level. Oil accumulation is typically much less than sediment, however removal of oil and sediment during the same service is recommended.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.2 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the outer annulus of the chamber.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

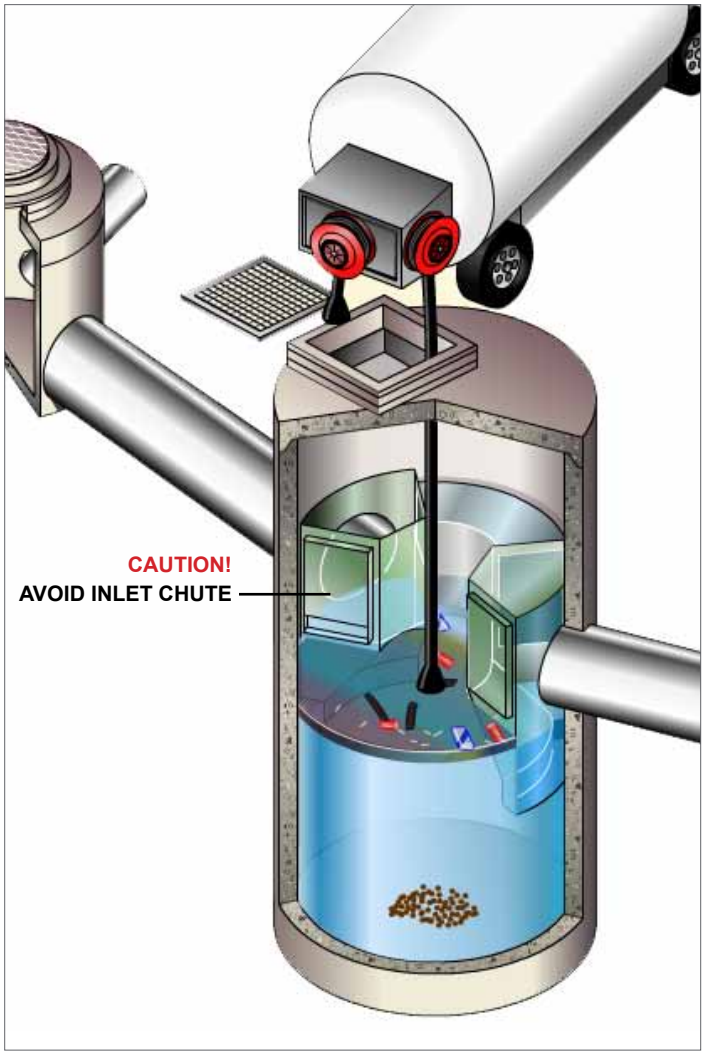


Fig.2 Floatables are removed with a vactor hose.

Floatables and Sediment Cleanout

Floatables cleanout is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.2).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump cleanout are typically conducted once a year during any season.

- Floatables and sump cleanout should occur as soon as possible following a spill in the contributing drainage area.

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.2) or with the skimmer or net (not pictured).

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.3).

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

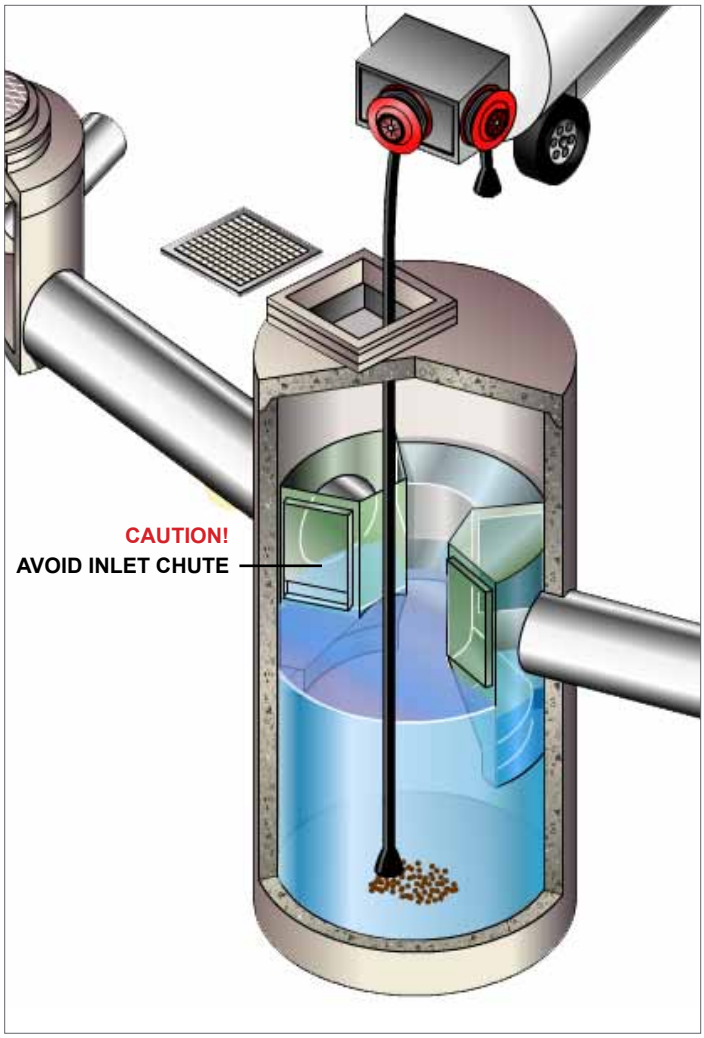


Fig.3 Sediment is removed with a vactor hose

Maintenance at a Glance

Activity	Frequency
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): **4-FT** **6-FT**

INLET (CIRCLE ALL THAT APPLY): **GRATE INLET (CATCH BASIN)** **INLET PIPE (FLOW THROUGH)**

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

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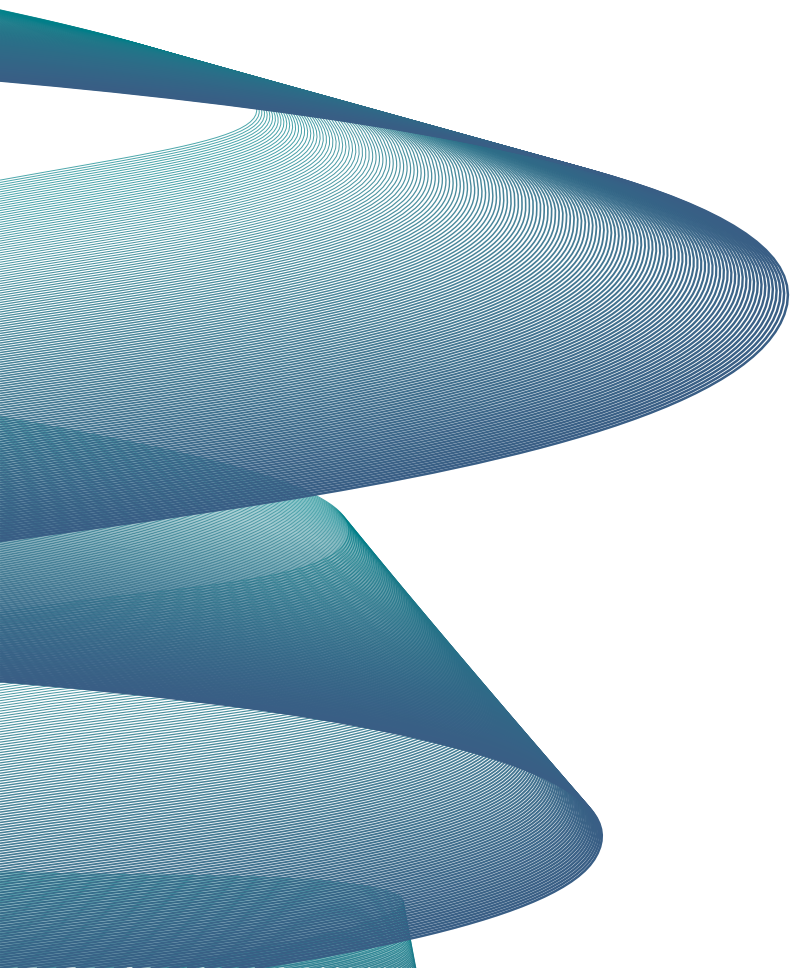
What is HX?

HX is Hydro Experience, it is the essence of Hydro. It's interwoven into every strand of Hydro's story, from our products to our people, our engineering pedigree to our approach to business and problem-solving.

HX is a stamp of quality and a mark of our commitment to optimum process performance. A Hydro solution is tried, tested and proven.

There is no equivalent to Hydro HX.



Stormwater Solutions

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stormwaterinquiry@hydro-int.com

www.hydro-int.com

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Contact Information:
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For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CULG008 05-17
May 2017

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. StormFilter Access
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.

WQMP
Operation & Maintenance (O&M) Plan

Project Name:_____

Prepared for:

Project Name: _____

Address:_____

City, State Zip:_____

Prepared on:

Date:_____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ____

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

BMP OPERATION & MAINTENANCE LOG

Project Name: _____

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		□ Clean stormwater management chambers and feed connectors of any debris. □ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	□ Year 9	Date:	
	□ Year 18	Date:	
	□ Year 27	Date:	
	□ Year 36	Date:	
	45 years after commissioning		□ Clean stormwater management chambers and feed connectors of any debris. □ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. □ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. □ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. □ Attain the appropriate approvals as required. □ Establish a new operation and maintenance schedule.
			Notes
	□ Year 45	Date:	

Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Month 1	Date:	
	□ Month 2	Date:	
	□ Month 3	Date:	
	□ Month 4	Date:	
	□ Month 5	Date:	
	□ Month 6	Date:	
	□ Month 7	Date:	
	□ Month 8	Date:	
	□ Month 9	Date:	
	□ Month 10	Date:	
	□ Month 11	Date:	
	□ Month 12	Date:	
	Spring and Fall		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	Yearly		□ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	□ Year 1	Date:	
	□ Year 2	Date:	
	□ Year 3	Date:	
	□ Year 4	Date:	
	□ Year 5	Date:	
	□ Year 6	Date:	
	□ Year 7	Date:	

CULTEC®

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