DRAINAGE CALCULATIONS AND STORMWATER MANAGEMENT PLAN

For:

MIXED USE BUILDING
ASSESSORS PARCEL ID 20-266-8
122 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

Located:

122 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

Submitted to:

CITY OF WEYMOUTH

Prepared For:

EJS INVESTMENTS, INC.
8 SHORESIDE ROAD
QUINCY, MASSACHUSETTS 02169

MCKENZIE ENGINEERING GROUP

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August 18, 2020
Revised October 28, 2020

TABLE OF CONTENTS

Drainage Calculations and Stormwater Management Plan
122 Washington Street
Weymouth, Massachusetts

Project Summary

The project proponent, EJS Investments, Inc. proposes to develop 122 Washington Street in Weymouth, Massachusetts consisting of one (1) parcel as shown on the Weymouth Assessor's Map as Parcel Number 20-266-8 comprising of approximately 0.63 acres. The site is located within the Business B-2, the Residential R-1, and the Village Center (VC) Overlay Zoning District.

The proposed development will consist of the demolition of an existing 2-story structure and the construction of a four-story mixed-use building with 1,141 square feet of retail and off-street parking on the first level, residential units and off-street parking on the second level, and residential units on levels three and four for a total of 28 units and 24,547 square feet. Access to the parking garage will be off of Washington Street with an external access ramp to the second level. Construction includes the installation of a subsurface stormwater management system, utilities, site grading and 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 "Proposed Mixed Use Building, (Assessor's Parcel ID 20-266-8, 122 Washington Street, Weymouth, Massachusetts", prepared by McKenzie Engineering Group, Inc. dated August 18, 2020, revised October 28, 2020.

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

Pre-Development Condition

The parcel is currently developed and consists of one (1) mixed used building with office space on the first floor, residential space on the second floor, and a bituminous concrete parking area, retaining walls, concrete and brick walkways and associated landscaping. Currently, the site is comprised of approximately 28% impervious surfaces. The existing structure has direct access to Washington Street.

The existing topography generally ranges in elevation from approximately 55 feet. (Weymouth Vertical Datum) in the northwest portion of the site to an elevation of approximately 91 feet. (Weymouth Vertical Datum) in the northeast portion of the site. The parcel slopes in a westerly direction from its northern boundary towards Washington Street and the abutting parcel to the north.

Review of available environmental databases such as MassGIS reveals that the site is not located within a mapped Natural Heritage Area, a Zone II Groundwater Recharge Area, the City of Weymouth Aquifer Protection District Zone, an Interim Wellhead Protection Area (IWPA), or a Contributing Watershed to Outstanding Resource Water (ORW).

The site is located within Zone X, Area of Minimal Flooding as shown on FEMA Flood Insurance Rate Map Panel No. 25021C0016E with an effective date of July 17, 2012. Refer to Figure 2 – FEMA Flood Map.

The Natural Resources Conservation Service (NRCS) has identified the soil on the site as 602, Urban land, 0 to15% slopes and does not further categorize the soil in terms of permeability or presence of groundwater, and 630C, Charlton-Hollis-Urban land complex, 3 to 15% slopes with hydrologic soil group (HSG) B C/D. Refer to Figure 3 - NRCS Soils Map. Soil testing conducted by McKenzie Engineering Group, Inc. (MEG) on June 12, 2020 identified the soils to be sandy loam.

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

The existing watershed analyzed in this report is comprised of approximately 0.817 acres which includes the subject parcel and offsite tributary areas to the east and south. The watershed consists of two sub-catchment areas and two (2) the closed drainage system within Washington Street and the abutting parcel to the north. Refer to the Pre-Development Watershed Plan WS-1 in Appendix A for a delineation of drainage subcatchments 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 mixed-use building with retail on the first level along with the construction of a parking/access ramp, installation of subsurface stormwater management system, utilities, site grading and landscaping. The project will access utility infrastructure located in Washington Street, including sewer, water, electric, gas, telephone and cable. The stormwater management system and will be designed to comply with all standards of the Department of Environment Protection's Stormwater Management Regulations to the maximum extent practicable for a re-development project and will utilize the existing closed drainage system in Washington Street.

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.

Parking areas will be contained within the building and will drain to oil/sediment traps prior to discharge into the municipal sewer system, as required. The site will be designed to comply with the Stormwater Management Regulations to the extent practicable as required under Standards 6 and 7 for a redevelopment project.

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 2, 10, 25 and 100-year, type III storm events. Refer to Appendix B for computer results.

Stormwater Best Management Practices (BMP's)

Treatment stream for the redevelopment shall consist of 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 redevelopment 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 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 0.817 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 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	*0.54*	0.08	*1.16*	0.84	*1.69*	1.52	*2.80*	2.74
Design Point 2	*0.52*	0.23	*1.11*	0.50	*1.61*	0.73	*2.67*	1.21

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 equal or 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. (AC-FT)	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**	**Exist. (AC-FT)**	**Prop. (AC-FT)**
Design Point 1	*0.041*	0.014	*0.084*	0.088	*0.122*	0.150	*0.205*	0.284
Design Point 2	*0.039*	0.018	*0.080*	0.036	*0.117*	0.053	*0.196*	0.089

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 “Static” method for sizing the storage volume, which assumes that there is no exfiltration until the entire recharge volume is filled to the elevation associated with the Required Recharge Volume.
- 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]
	C	0.25	22,822	475	
P-2					3,411
				475 (475 ADJ.)	**3,411**

1. Required Recharge Volume = Target Depth Factor x Impervious Area [Static Method] (Refer to supplemental calculations in Appendix D)
2. Provided Recharge Volume = Volume Provided from Bottom of System to lowest invert elevation.

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 100%; therefore, a capture area adjustment is not required. 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 0.25-inches (Soil Type C); 0.50 inches if greater than 0.25 inches, therefore the Target Volume is the Required Water Quality Volume of 951 cubic feet. Refer to Appendix D supplemental calculations.

The proposed subsurface infiltration system 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 E for BMP Operation and Maintenance Plans.

Stormwater runoff will be routed to proprietary treatment devices followed by the infiltration system. Removal rates for all paved surfaces are:

Proprietary Devices	70% (Per MASTEP Performance Evaluation for First Defense Units) (See Appendix D for Sizing and TSS Removal Charts)
Infiltration Tanks with Pretreatment	80%

The stormwater management system was designed to be in full compliance with the DEP Stormwater Management Policy. A treatment stream consisting of proprietary pre-treatment separator unit and a subsurface infiltration tank system will be employed to achieve the required removal of 80% total suspended solids. The proposed treatment streams will renovate the stormwater and improve the water quality by promoting the settlement of sediments and pollutants before runoff is released into down gradient wetlands. Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

The total required water quality treatment volume was calculated to be 951 cubic feet. The half-inch rule has been applied to the water quality volume calculations. The water quality treatment volume will be provided within the storm water management facilities as follows:

Water Quality Treatment Volume

Basin	Required WQ Volume (cf)	Proposed WQ Volume (cf)	
P-2	951	3,411	Subsurface infiltration system with pre-treatment
	951	**3,411**	

Pre-Treatment Water Quality Volume

First Defense Unit	Required WQ Flow Rate (cfs)	Proposed WQ Flow Rate (cfs)	
First Defense Unit (FD 1)	0.317	0.70	First Defense Unit - FD-4HC
	0.317	0.70	

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 considered a redevelopment project and as such meets the Stormwater Management Standards to the maximum extent practicable.

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

U.S. GEOLOGICAL SURVEY
7.5 X 15 MINUTE SERIES

MCKENZIE ENGINEERING GROUP
150 LONGWATER DRIVE, SUITE 101
NORWELL, MASSACHUSETTS 02061
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USGS LOCUS MAP

122 WASHINGTON STREET
ASSESSOR'S PARCEL ID 20-266-8
WEYMOUTH, MASSACHUSETTS

FIGURE - 2

0 500’ 1000’ 1250’

COMMUNITY PANEL NO: 25017C0529F
EFFECTIVE DATE: JULY 17, 2012

MCKENZIE ENGINEERING GROUP
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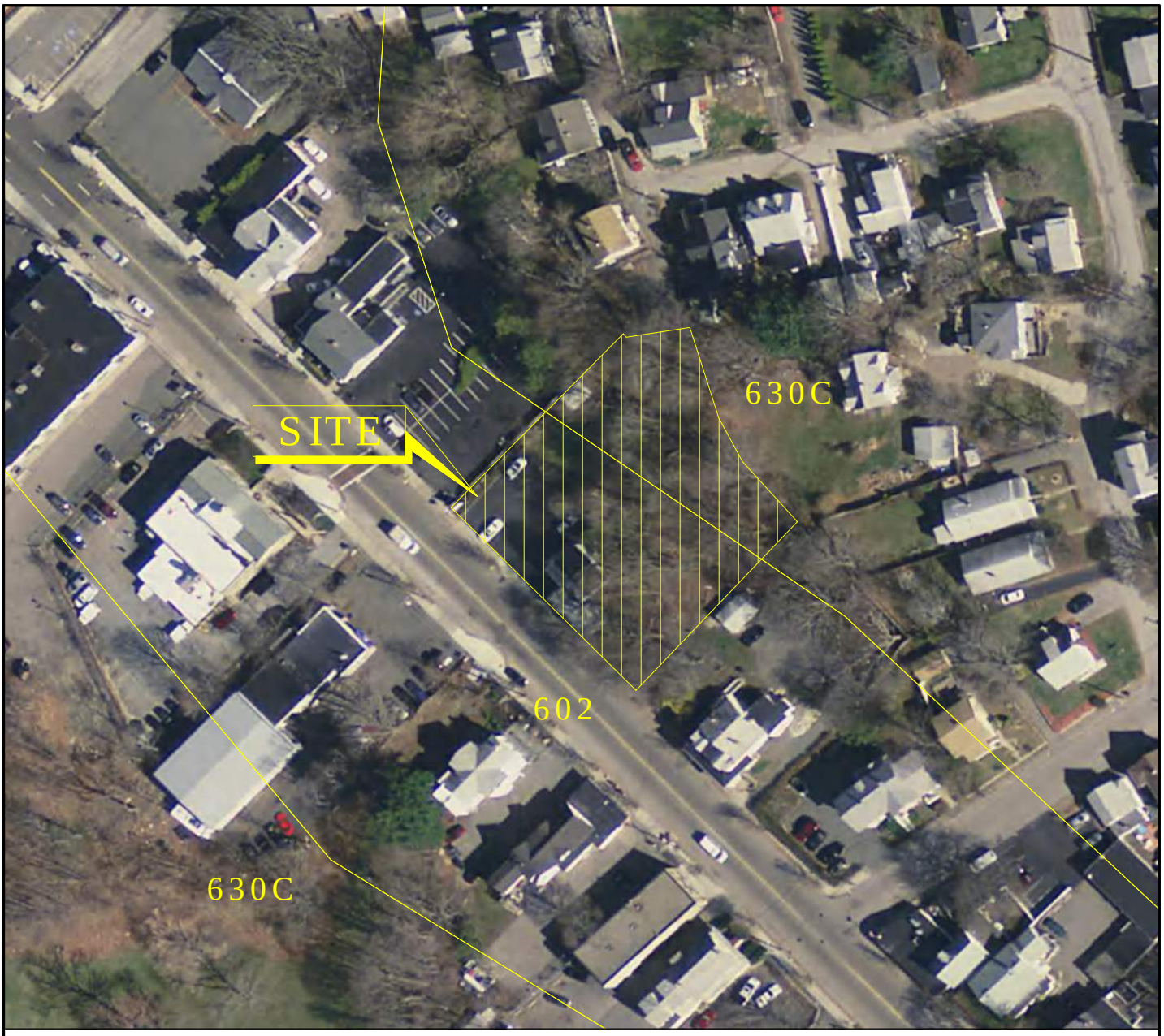
FEMA FLOOD MAP

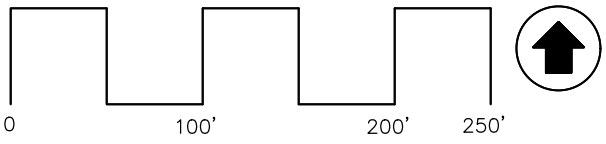
122 WASHINGTON STREET
ASSESSOR'S PARCEL ID 20-266-8
WEYMOUTH, MASSACHUSETTS



SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	D
630C	CHARLTON–HOLLIS–URBAN LAND COMPLEX, 3 TO 15 PERCENT SLOPES	B/C/D

FIGURE - 3



NRCS SOIL SURVEY
PLYMOUTH COUNTY

MCKENZIE ENGINEERING GROUP
150 LONGWATER DRIVE, SUITE 101
NORWELL, MASSACHUSETTS 02061
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NRCS SOILS MAP

122 WASHINGTON STREET
ASSESSOR'S PARCEL ID 20-266-8
WEYMOUTH, MASSACHUSETTS

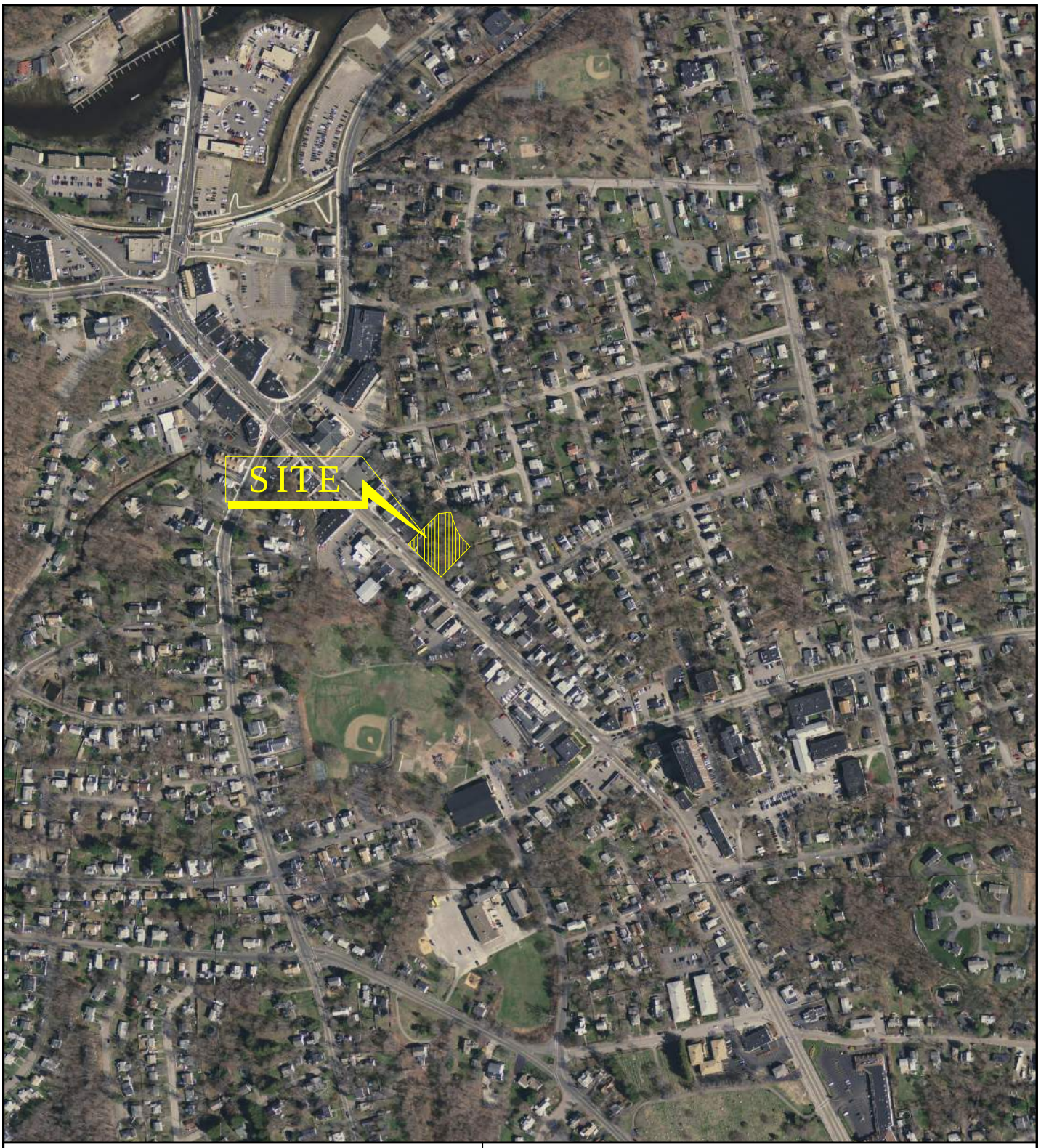

FIGURE - 4

0 500’ 1000’ 1250’

14TH EDITION MASSACHUSETTS
NATURAL HERITAGE ATLAS

MCKENZIE ENGINEERING GROUP
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NATURAL HERITAGE & ENDANGERED SPECIES MAP

122 WASHINGTON STREET
ASSESSOR'S PARCEL ID 20-266-8
WEYMOUTH, MASSACHUSETTS

A P P E N D I X A

Pre-Development Condition

APN 20-266-24 (RESIDENTIAL)
51 NORFOLK STREET
N/F GATELY HELEN E
B: 4766 P: 354
±0.1 AC

APN 20-266-15 (RESIDENTIAL)
12 KEITH STREET
N/F COLE MATTHEW B
B: 29081 P: 561
±0.47 AC

APN 20-266-25 (RESIDENTIAL)
49 NORFOLK STREET
N/F 49 NORFOLK STREET
B: 35488 P: 389
±0.11 AC

APN 20-266-14 (RESIDENTIAL)
8 KEITH STREET
N/F REALINI HEATHER
B: 34263 P: 60
±0.18 AC

APN 20-266-3 (FUNERAL HOME)
100 WASHINGTON STREET
N/F LUCID JAMES E TR
100 WASHINGTON STREET REALTY TRUST
B: 16189 P: 283
±0.4 AC

APN 20-266-6 (VACANT LOT)
0 WASHINGTON STREET
N/F LUCID JAMES E TR
100 WASHINGTON STREET REALTY TRUST
B: 16189 P: 283
±0.22 AC

APN 20-266-9 (MULTI USE RESIDENTIAL)
134 WASHINGTON STREET
N/F METRI NICHOLAS R
B: 23280 P: 54
±0.36 AC

APN 20-266-10 (MULTI USE RESIDENTIAL)
4 RICHMOND STREET
N/F GREELEY DONALD J & ANN MARIE P TRS OF THE GREELEY REVOC TRUST
B: 27719 P: 183
±0.22 AC

APN 20-266-8
122 WASHINGTON STREET
COUGHLIN H RICHARD & CHERYL TR
WASHINGTON ST REALTY TRUST
B: 10838 P: 730
±0.63 AC

S2
17,379 SF

S1
18,202 SF

DP-1

DP-2

630C

602

#116-122 EXISTING WOOD FRAME DWELLING

BITUMINOUS CONCRETE PARKING AREA

ZONE R-1
ZONE B-2

12" C.I. WATER MAIN

12"-PL-#60-2019 GAS MAIN

8" V.C.

MH PAVED OVER
R=56.72
DEPTH 7.6' (RECORD)

BENCHMARK
DRILL HOLE IN SIDEWALK
ELEV= 53.44
DATUM: WEYMOUTH CITY BASE

WASHINGTON (PUBLIC - 60' WIDE) STREET

SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	C ASSUMED
630C	CHARLTON-HOLLIS-URBAN LAND COMPLEX, 3 TO 15 PERCENT SLOPES	B C/D

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

REV	DATE	DESCRIPTION	BY	APP
1	10.26.2020	NO CHANGES	SBS	BCM

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PROPOSED MIXED USE BUILDING
(ASSESSOR'S PARCEL ID 20-266-8)
122 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

PROFESSIONAL SURVEYOR:

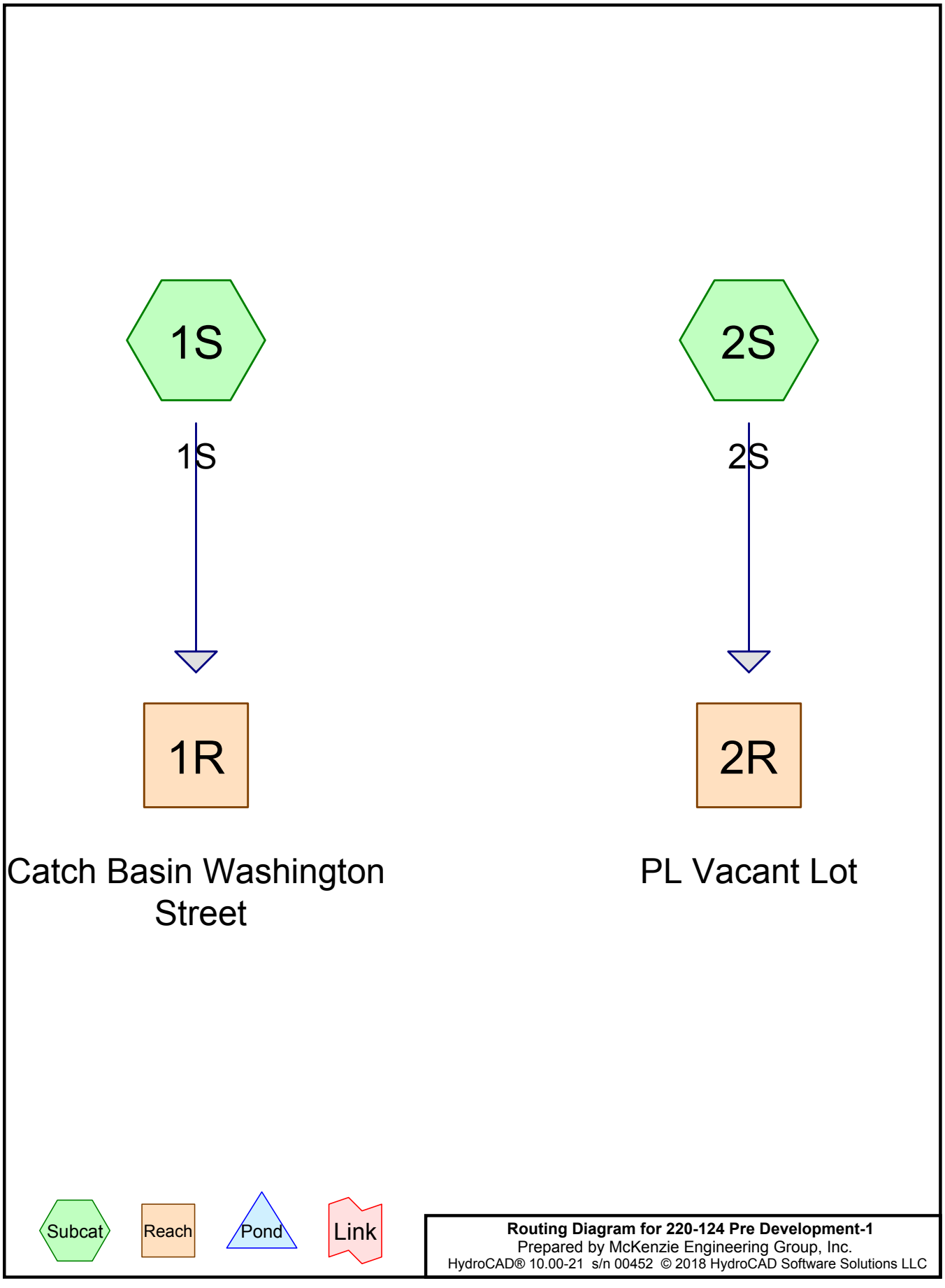
OWNERS/APPLICANT:
SATHUAN SA
122 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

NOT FOR CONSTRUCTION

DRAWN BY:	SBS
DESIGNED BY:	SBS
CHECKED BY:	BCM
APPROVED BY:	BCM
DATE:	AUGUST 18, 2020
SCALE:	1"=20
PROJECT NO.:	220-124

DWG. TITLE:
PRE-DEV. WATERSHED MAP

DWG. NO:
WS-1



Routing Diagram for 220-124 Pre Development-1
Prepared by McKenzie Engineering Group, Inc.

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.069	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.155	74	>75% Grass cover, Good, HSG C (OFFSITE) (1S, 2S)
0.107	98	Impervious surfaces, HSG C (1S, 2S)
0.028	98	Roofs, HSG C (1S, 2S)
0.006	98	Roofs, HSG C (OFFSITE) (2S)
0.427	70	Woods, Good, HSG C (1S, 2S)
0.026	70	Woods, Good, HSG C (OFFSITE) (1S)
0.817	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.817	HSG C	1S, 2S
0.000	HSG D	
0.000	Other	
0.817		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.224	0.000	0.000	0.224	>75% Grass cover, Good	1S, 2S
0.000	0.000	0.107	0.000	0.000	0.107	Impervious surfaces	1S, 2S
0.000	0.000	0.034	0.000	0.000	0.034	Roofs	1S, 2S
0.000	0.000	0.452	0.000	0.000	0.452	Woods, Good	1S, 2S
0.000	**0.000**	**0.817**	**0.000**	**0.000**	**0.817**	**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=18,202 sf 21.17% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=76 Runoff=0.54 cfs 0.041 af

Subcatchment2S: 2S Runoff Area=17,379 sf 13.08% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=76 Runoff=0.52 cfs 0.039 af

Reach 1R: Catch Basin Washington Street Inflow=0.54 cfs 0.041 af
Outflow=0.54 cfs 0.041 af

Reach 2R: PL Vacant Lot Inflow=0.52 cfs 0.039 af
Outflow=0.52 cfs 0.039 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.079 af Average Runoff Depth = 1.17"
82.78% Pervious = 0.676 ac 17.22% Impervious = 0.141 ac

Summary for Subcatchment 1S: 1S

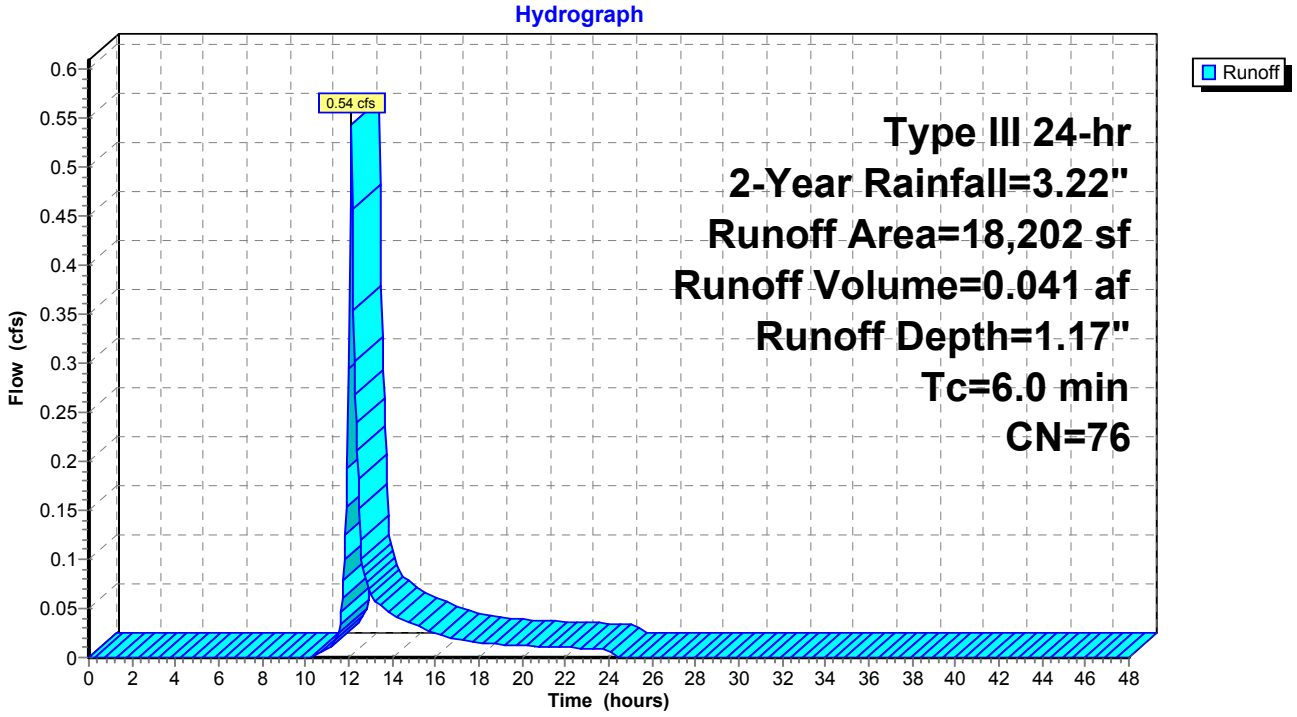
Runoff = 0.54 cfs @ 12.10 hrs, Volume= 0.041 af, Depth= 1.17"

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 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	852	74	>75% Grass cover, Good, HSG C
*	2,780	98	Impervious surfaces, HSG C
*	1,074	98	Roofs, HSG C
	11,603	70	Woods, Good, HSG C
	18,202	76	Weighted Average
	14,348		78.83% Pervious Area
	3,854		21.17% Impervious Area

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

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

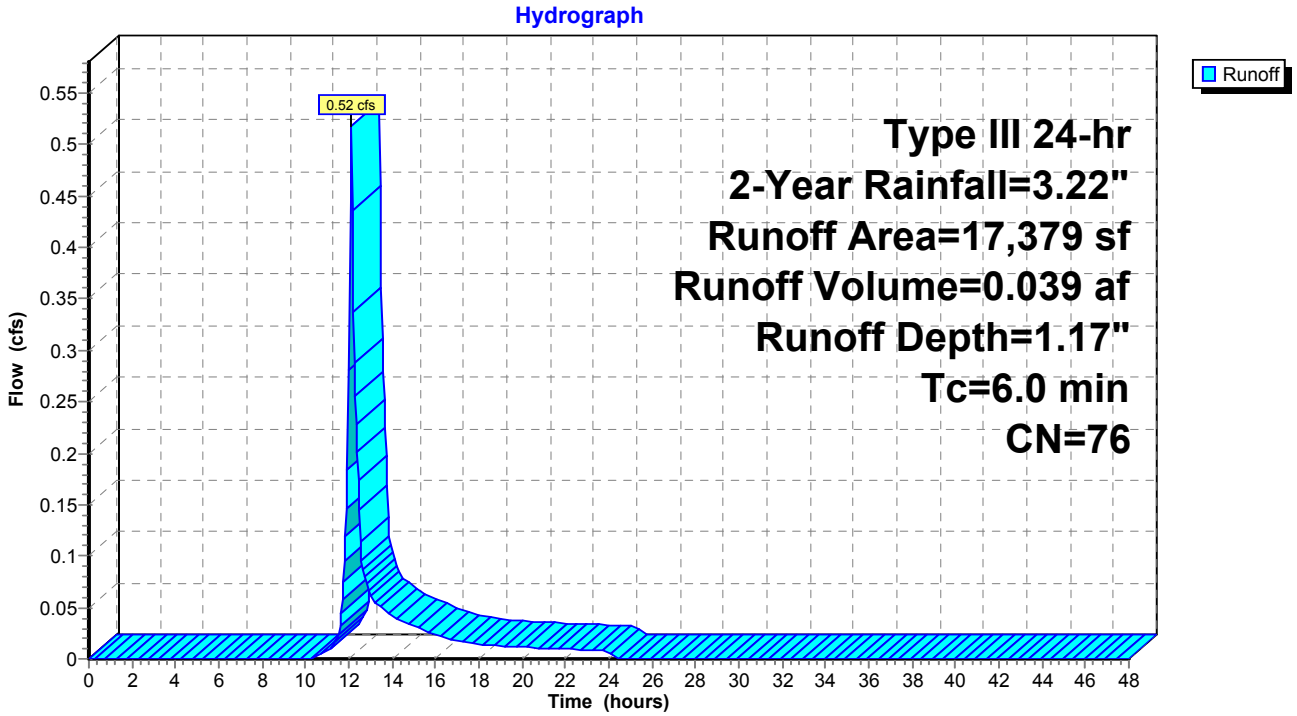
Runoff = 0.52 cfs @ 12.10 hrs, Volume= 0.039 af, Depth= 1.17"

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 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
*	396	70	Woods, Good, HSG C
*	144	98	Roofs, HSG C
*	2,140	74	>75% Grass cover, Good, HSG C
	6,590	70	Woods, Good, HSG C
*	1,875	98	Impervious surfaces, HSG C
	17,379	76	Weighted Average
	15,106		86.92% Pervious Area
	2,273		13.08% Impervious Area

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

Subcatchment 2S: 2S

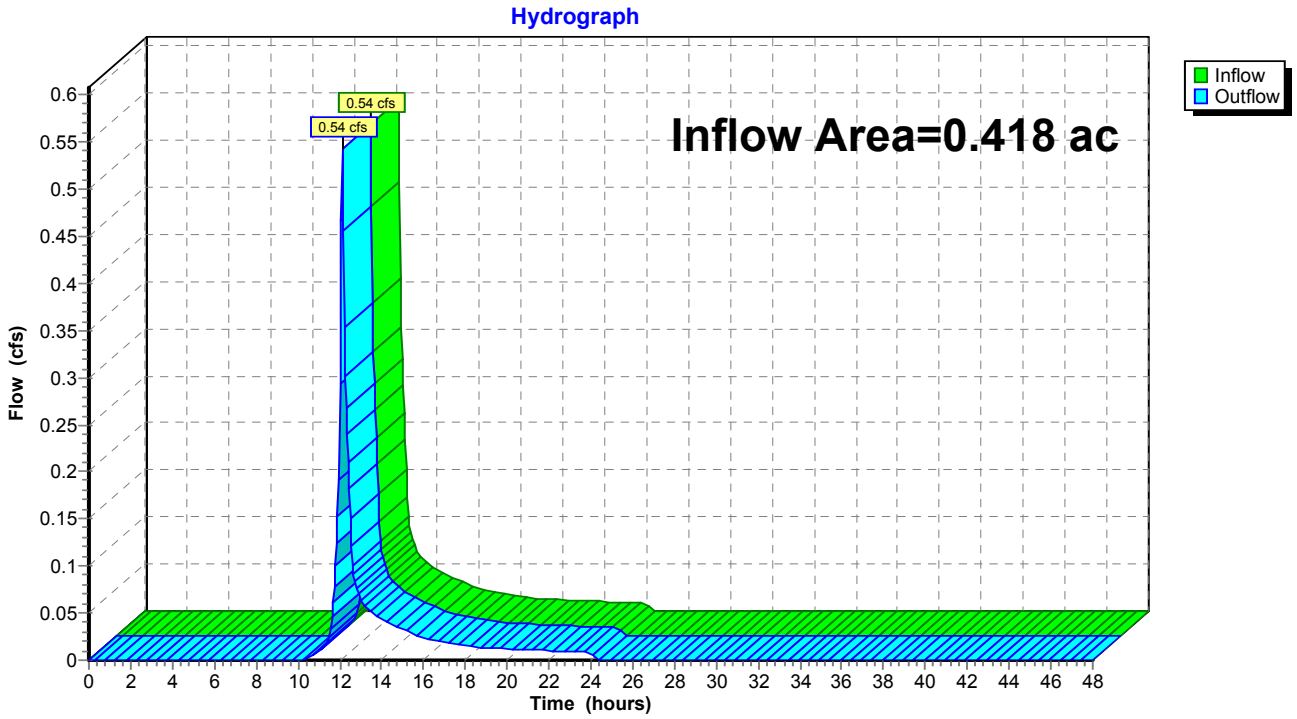


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.418 ac, 21.17% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 0.54 cfs @ 12.10 hrs, Volume= 0.041 af
Outflow = 0.54 cfs @ 12.10 hrs, Volume= 0.041 af, 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: Catch Basin Washington Street

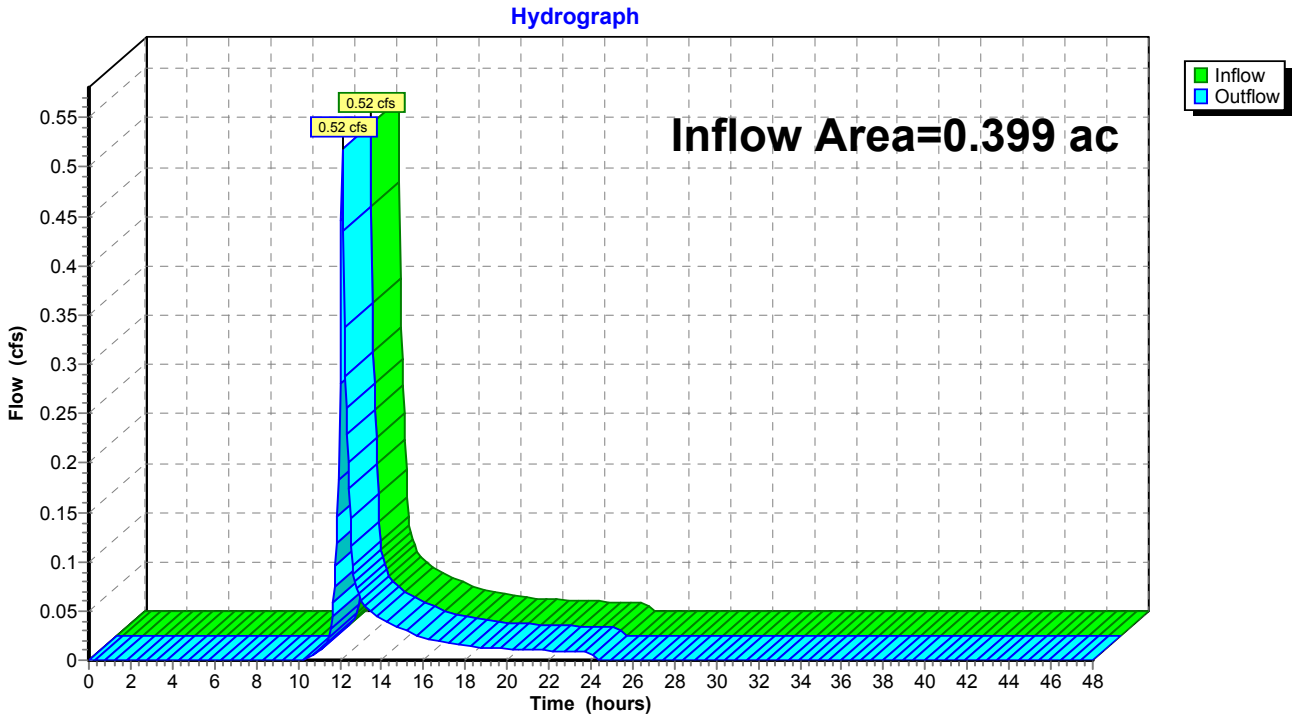


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.399 ac, 13.08% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 0.52 cfs @ 12.10 hrs, Volume= 0.039 af
Outflow = 0.52 cfs @ 12.10 hrs, Volume= 0.039 af, 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: PL Vacant Lot



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=18,202 sf 21.17% Impervious Runoff Depth=2.42"
Tc=6.0 min CN=76 Runoff=1.16 cfs 0.084 af

Subcatchment2S: 2S Runoff Area=17,379 sf 13.08% Impervious Runoff Depth=2.42"
Tc=6.0 min CN=76 Runoff=1.11 cfs 0.080 af

Reach 1R: Catch Basin Washington Street Inflow=1.16 cfs 0.084 af
Outflow=1.16 cfs 0.084 af

Reach 2R: PL Vacant Lot Inflow=1.11 cfs 0.080 af
Outflow=1.11 cfs 0.080 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.165 af Average Runoff Depth = 2.42"
82.78% Pervious = 0.676 ac 17.22% Impervious = 0.141 ac

Summary for Subcatchment 1S: 1S

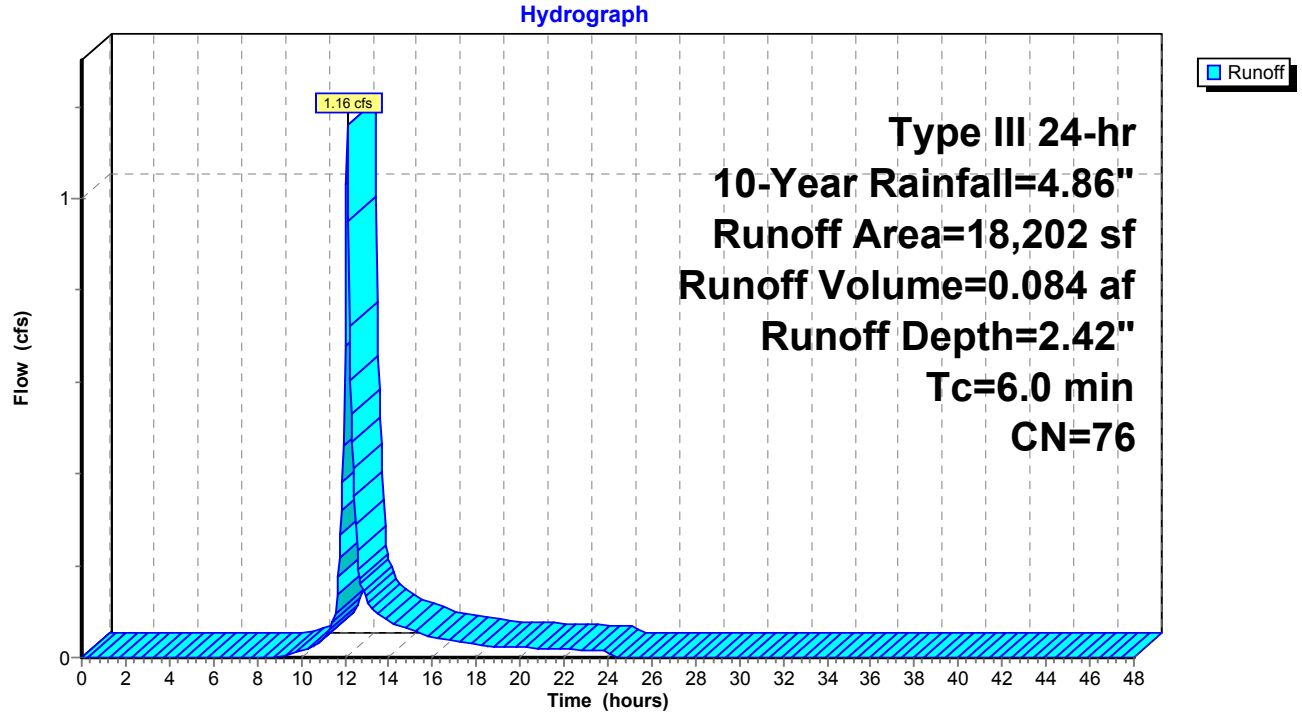
Runoff = 1.16 cfs @ 12.09 hrs, Volume= 0.084 af, Depth= 2.42"

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 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	852	74	>75% Grass cover, Good, HSG C
*	2,780	98	Impervious surfaces, HSG C
*	1,074	98	Roofs, HSG C
	11,603	70	Woods, Good, HSG C
	18,202	76	Weighted Average
	14,348		78.83% Pervious Area
	3,854		21.17% Impervious Area

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

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

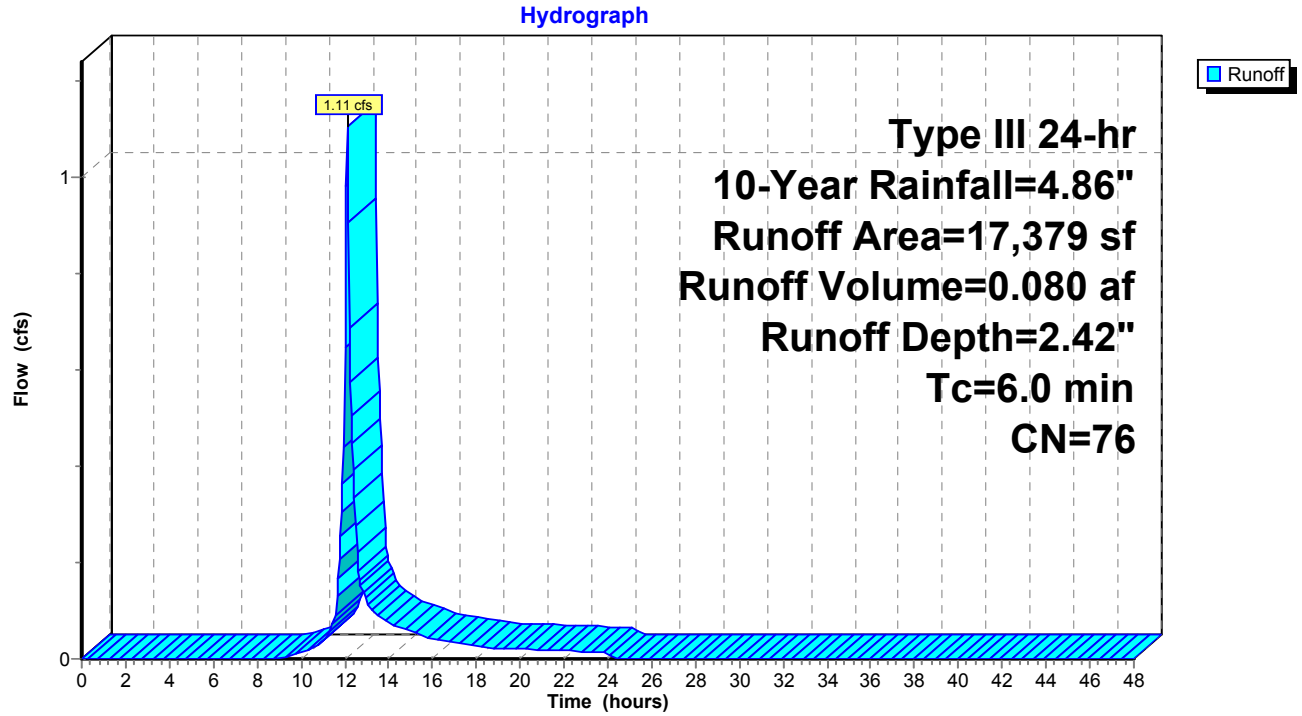
Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.080 af, Depth= 2.42"

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 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
*	396	70	Woods, Good, HSG C
*	144	98	Roofs, HSG C
*	2,140	74	>75% Grass cover, Good, HSG C
	6,590	70	Woods, Good, HSG C
*	1,875	98	Impervious surfaces, HSG C
	17,379	76	Weighted Average
	15,106		86.92% Pervious Area
	2,273		13.08% Impervious Area

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

Subcatchment 2S: 2S

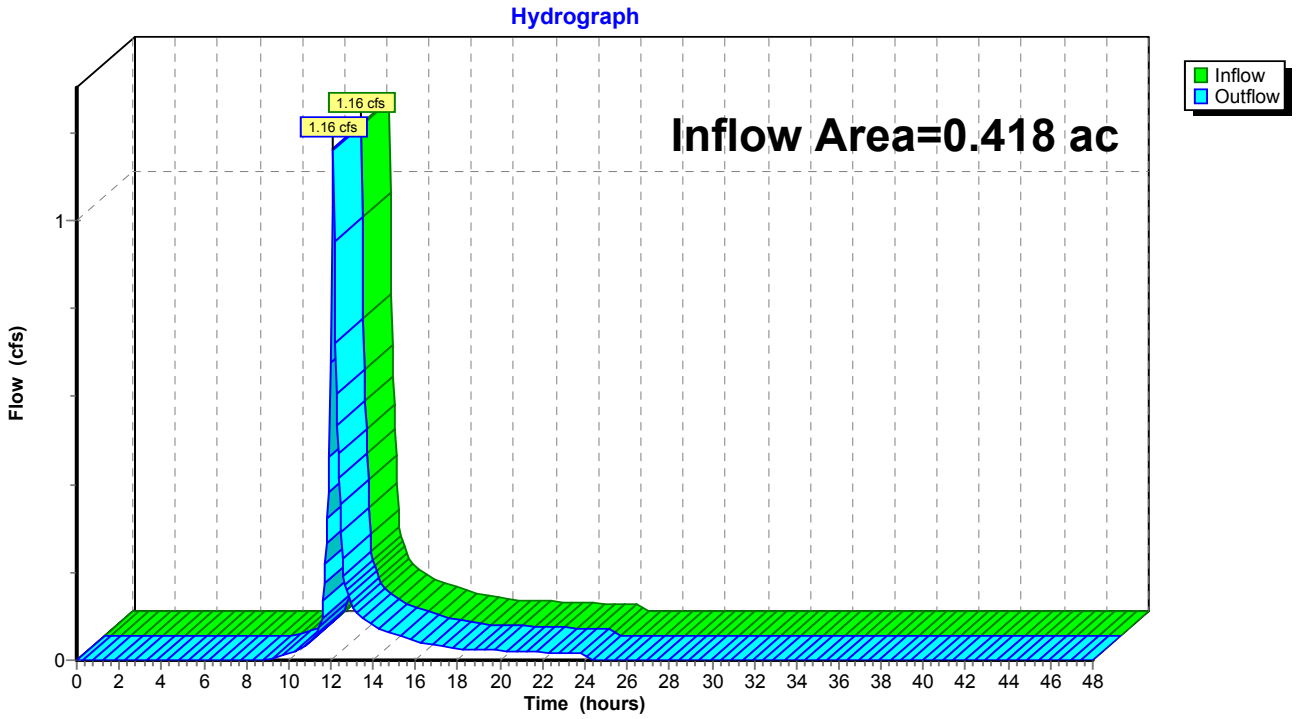


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.418 ac, 21.17% Impervious, Inflow Depth = 2.42" for 10-Year event
Inflow = 1.16 cfs @ 12.09 hrs, Volume= 0.084 af
Outflow = 1.16 cfs @ 12.09 hrs, Volume= 0.084 af, 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: Catch Basin Washington Street

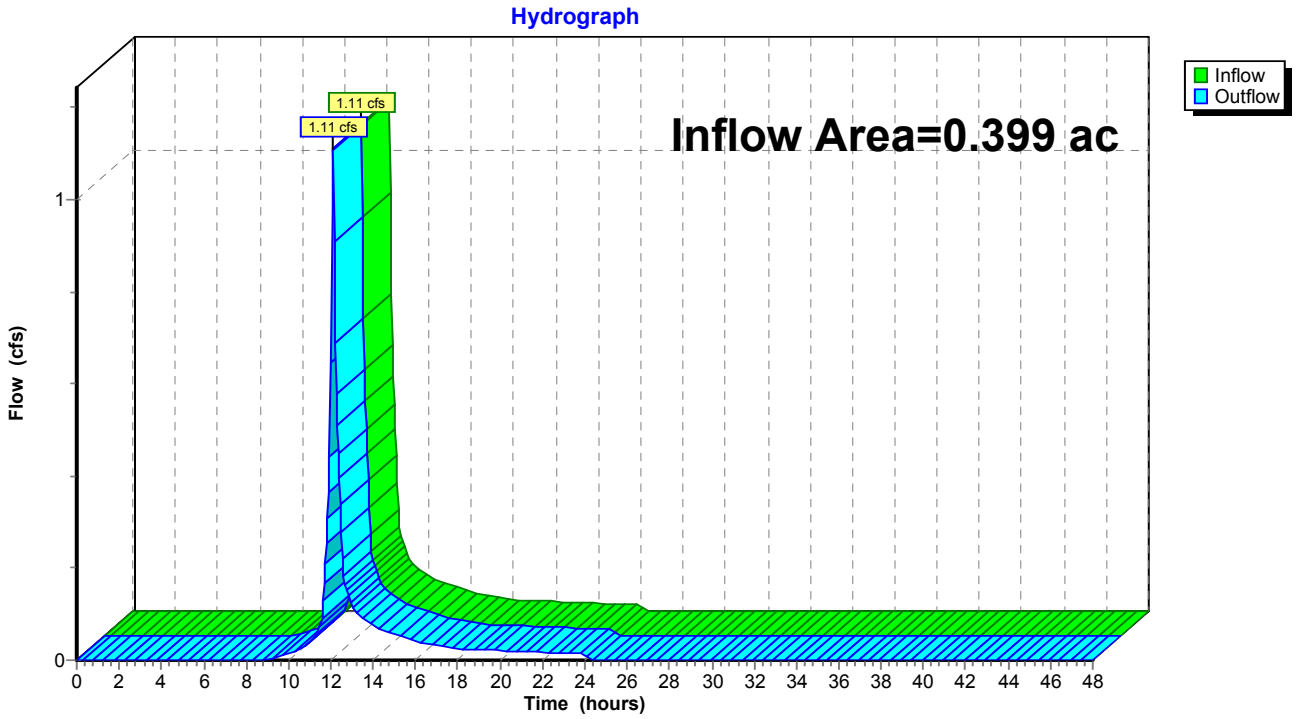


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.399 ac, 13.08% Impervious, Inflow Depth = 2.42" for 10-Year event
Inflow = 1.11 cfs @ 12.09 hrs, Volume= 0.080 af
Outflow = 1.11 cfs @ 12.09 hrs, Volume= 0.080 af, 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: PL Vacant Lot



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=18,202 sf 21.17% Impervious Runoff Depth=3.51"
Tc=6.0 min CN=76 Runoff=1.69 cfs 0.122 af

Subcatchment2S: 2S Runoff Area=17,379 sf 13.08% Impervious Runoff Depth=3.51"
Tc=6.0 min CN=76 Runoff=1.61 cfs 0.117 af

Reach 1R: Catch Basin Washington Street Inflow=1.69 cfs 0.122 af
Outflow=1.69 cfs 0.122 af

Reach 2R: PL Vacant Lot Inflow=1.61 cfs 0.117 af
Outflow=1.61 cfs 0.117 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.239 af Average Runoff Depth = 3.51"
82.78% Pervious = 0.676 ac 17.22% Impervious = 0.141 ac

Summary for Subcatchment 1S: 1S

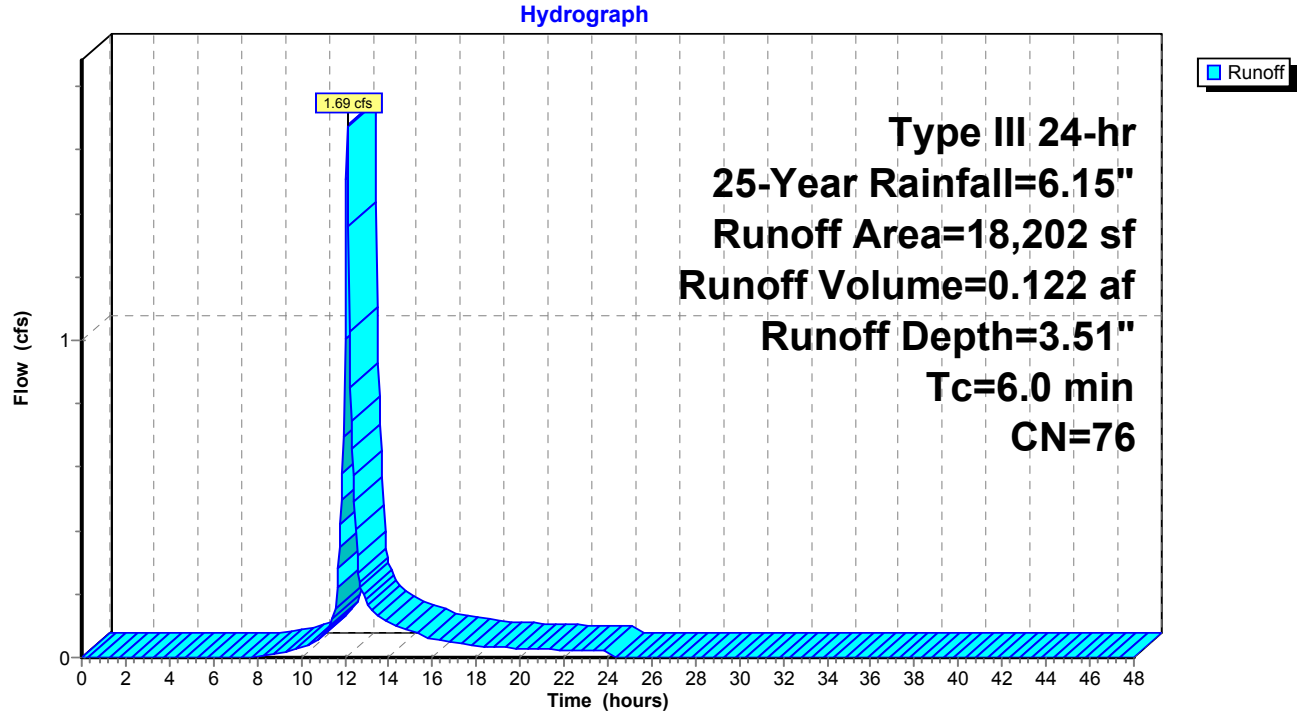
Runoff = 1.69 cfs @ 12.09 hrs, Volume= 0.122 af, Depth= 3.51"

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
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	852	74	>75% Grass cover, Good, HSG C
*	2,780	98	Impervious surfaces, HSG C
*	1,074	98	Roofs, HSG C
	11,603	70	Woods, Good, HSG C
	18,202	76	Weighted Average
	14,348		78.83% Pervious Area
	3,854		21.17% Impervious Area

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

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

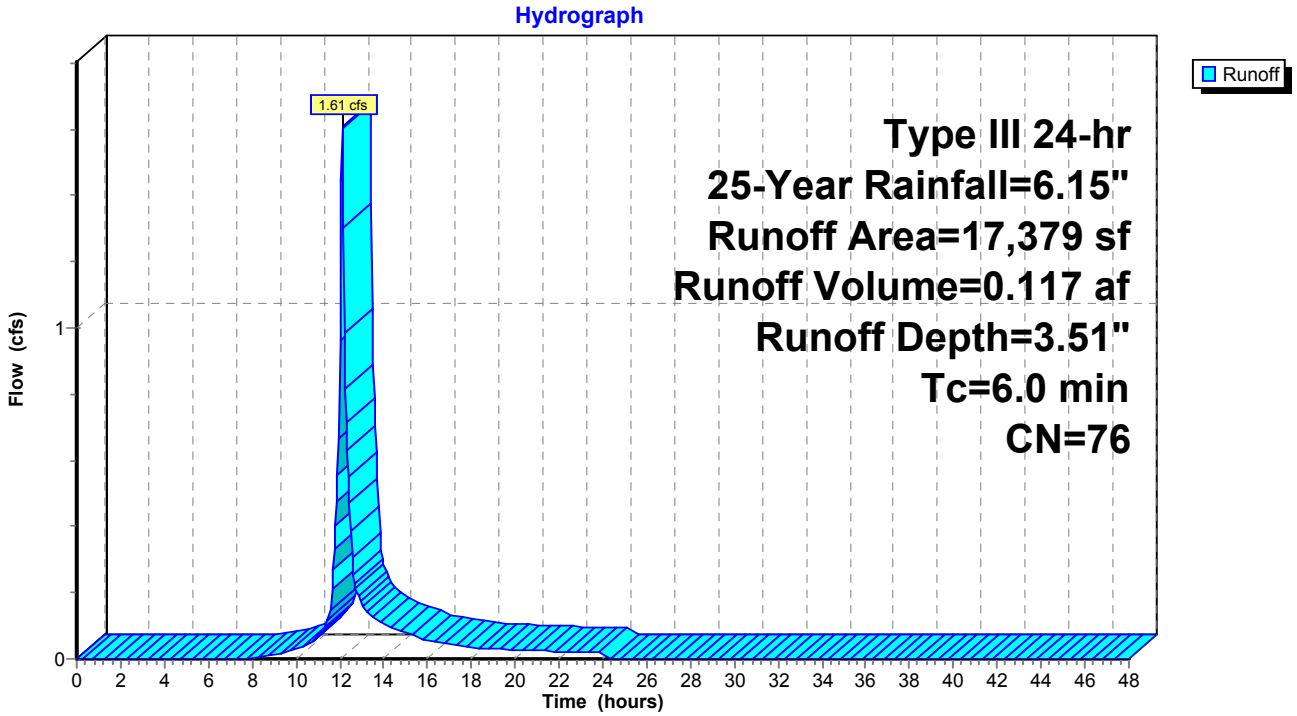
Runoff = 1.61 cfs @ 12.09 hrs, Volume= 0.117 af, Depth= 3.51"

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
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
*	396	70	Woods, Good, HSG C
*	144	98	Roofs, HSG C
*	2,140	74	>75% Grass cover, Good, HSG C
	6,590	70	Woods, Good, HSG C
*	1,875	98	Impervious surfaces, HSG C
	17,379	76	Weighted Average
	15,106		86.92% Pervious Area
	2,273		13.08% Impervious Area

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

Subcatchment 2S: 2S

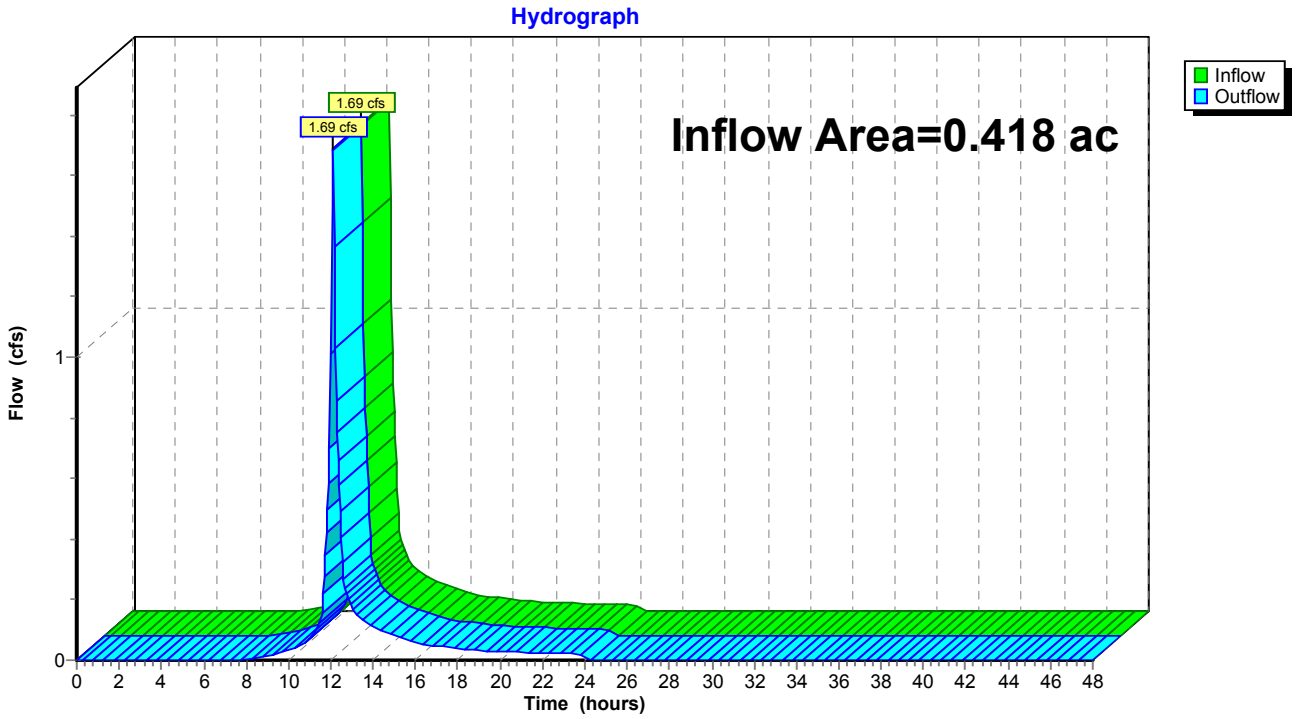


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.418 ac, 21.17% Impervious, Inflow Depth = 3.51" for 25-Year event
Inflow = 1.69 cfs @ 12.09 hrs, Volume= 0.122 af
Outflow = 1.69 cfs @ 12.09 hrs, Volume= 0.122 af, 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: Catch Basin Washington Street

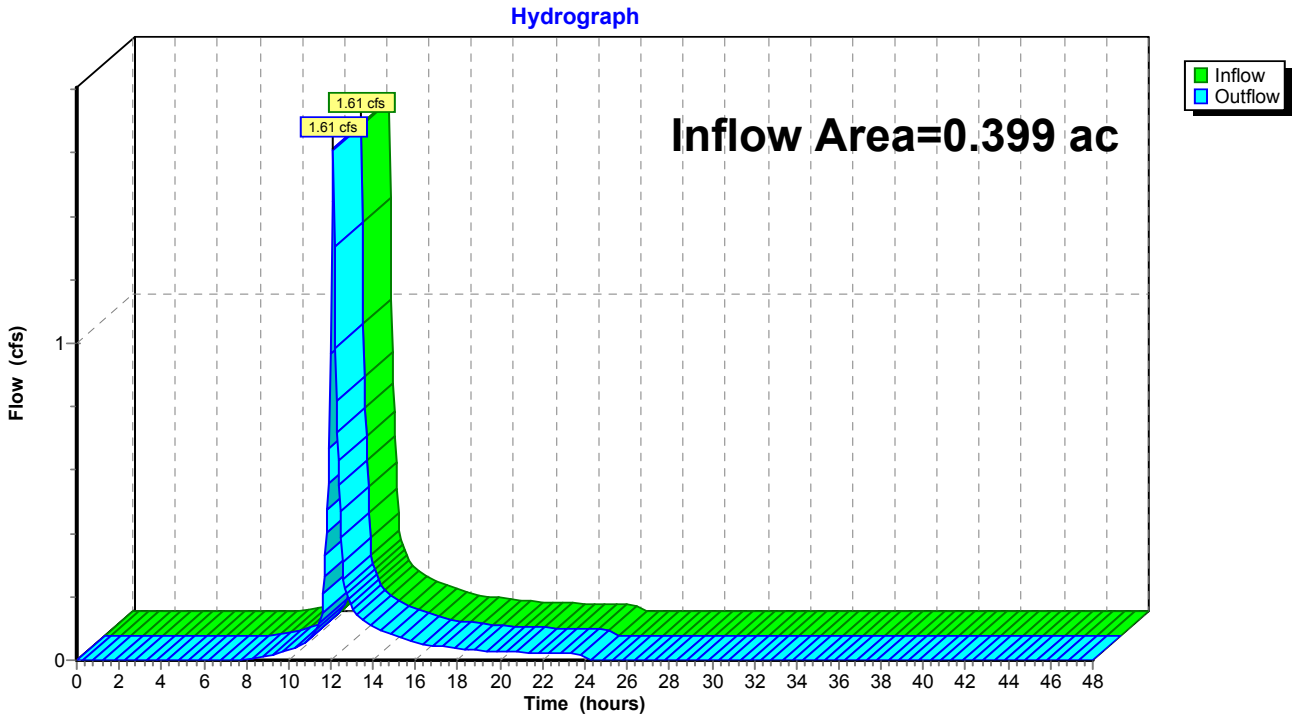


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.399 ac, 13.08% Impervious, Inflow Depth = 3.51" for 25-Year event
Inflow = 1.61 cfs @ 12.09 hrs, Volume= 0.117 af
Outflow = 1.61 cfs @ 12.09 hrs, Volume= 0.117 af, 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: PL Vacant Lot



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=18,202 sf 21.17% Impervious Runoff Depth=5.89"
Tc=6.0 min CN=76 Runoff=2.80 cfs 0.205 af

Subcatchment2S: 2S Runoff Area=17,379 sf 13.08% Impervious Runoff Depth=5.89"
Tc=6.0 min CN=76 Runoff=2.67 cfs 0.196 af

Reach 1R: Catch Basin Washington Street Inflow=2.80 cfs 0.205 af
Outflow=2.80 cfs 0.205 af

Reach 2R: PL Vacant Lot Inflow=2.67 cfs 0.196 af
Outflow=2.67 cfs 0.196 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.401 af Average Runoff Depth = 5.89"
82.78% Pervious = 0.676 ac 17.22% Impervious = 0.141 ac

Summary for Subcatchment 1S: 1S

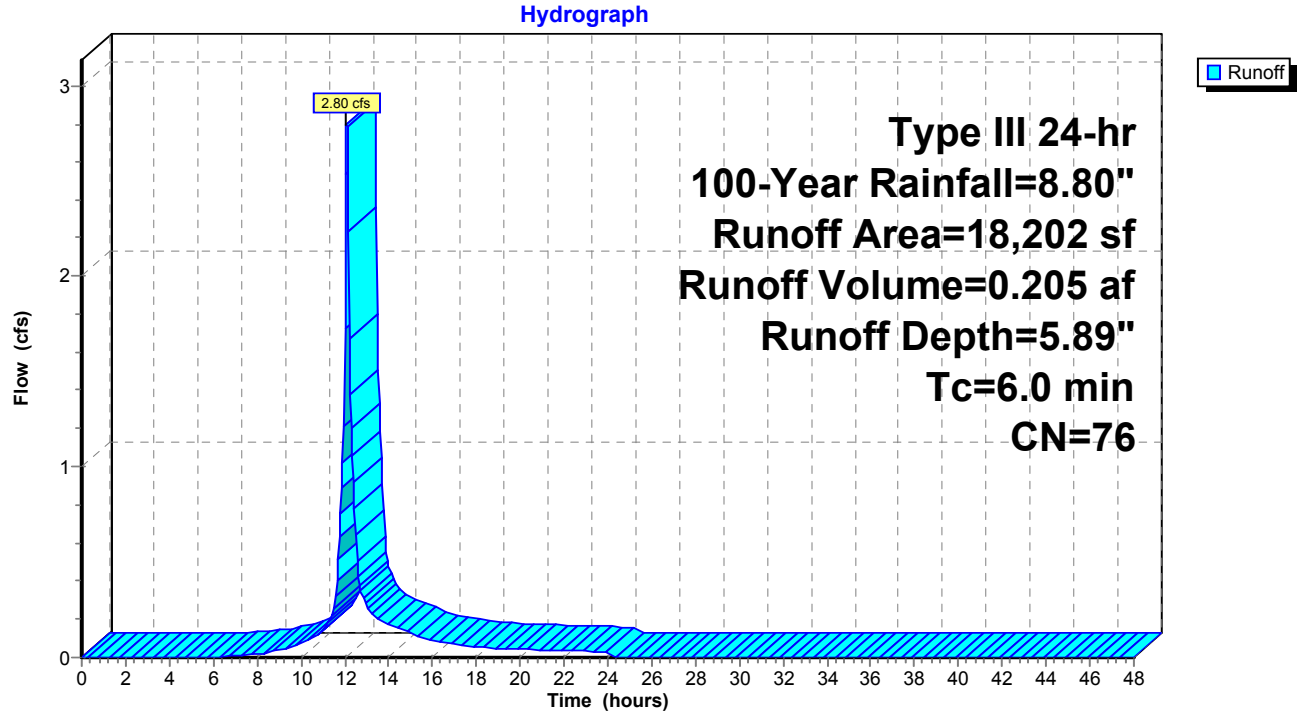
Runoff = 2.80 cfs @ 12.09 hrs, Volume= 0.205 af, Depth= 5.89"

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
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	852	74	>75% Grass cover, Good, HSG C
*	2,780	98	Impervious surfaces, HSG C
*	1,074	98	Roofs, HSG C
	11,603	70	Woods, Good, HSG C
	18,202	76	Weighted Average
	14,348		78.83% Pervious Area
	3,854		21.17% Impervious Area

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

Subcatchment 1S: 1S



Summary for Subcatchment 2S: 2S

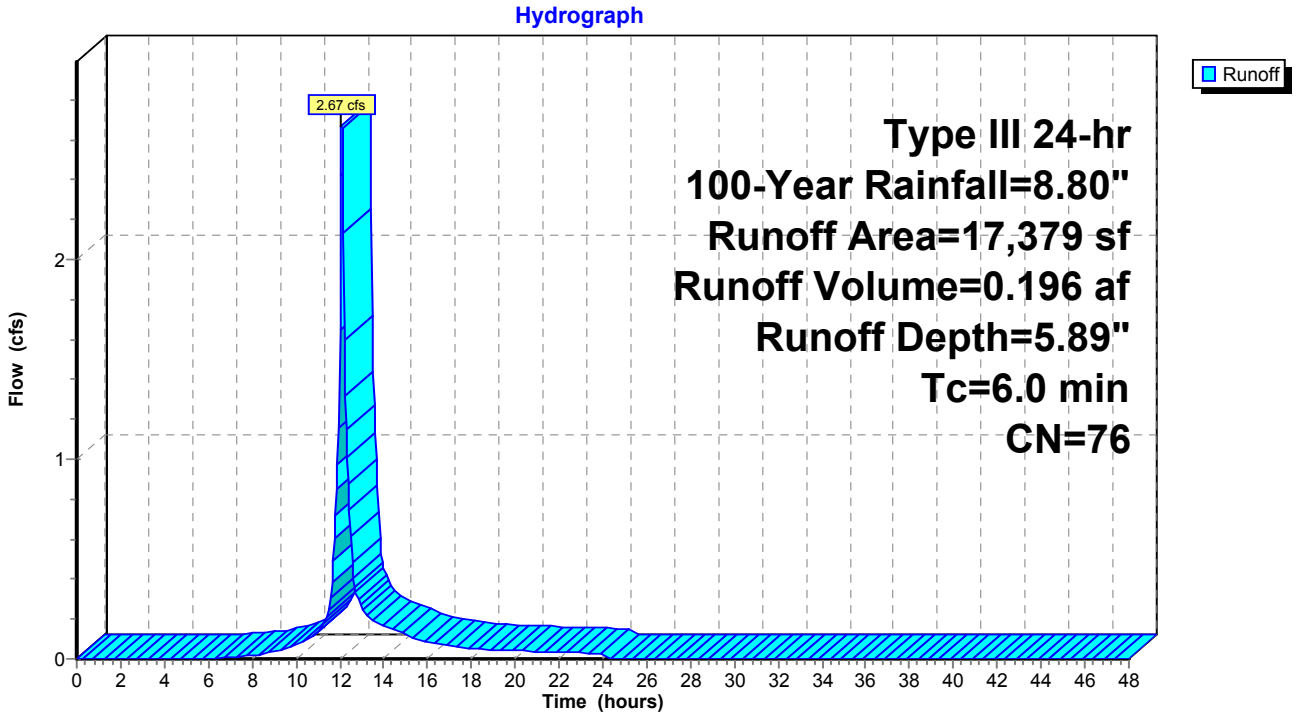
Runoff = 2.67 cfs @ 12.09 hrs, Volume= 0.196 af, Depth= 5.89"

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
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
*	396	70	Woods, Good, HSG C
*	144	98	Roofs, HSG C
*	2,140	74	>75% Grass cover, Good, HSG C
	6,590	70	Woods, Good, HSG C
*	1,875	98	Impervious surfaces, HSG C
	17,379	76	Weighted Average
	15,106		86.92% Pervious Area
	2,273		13.08% Impervious Area

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

Subcatchment 2S: 2S

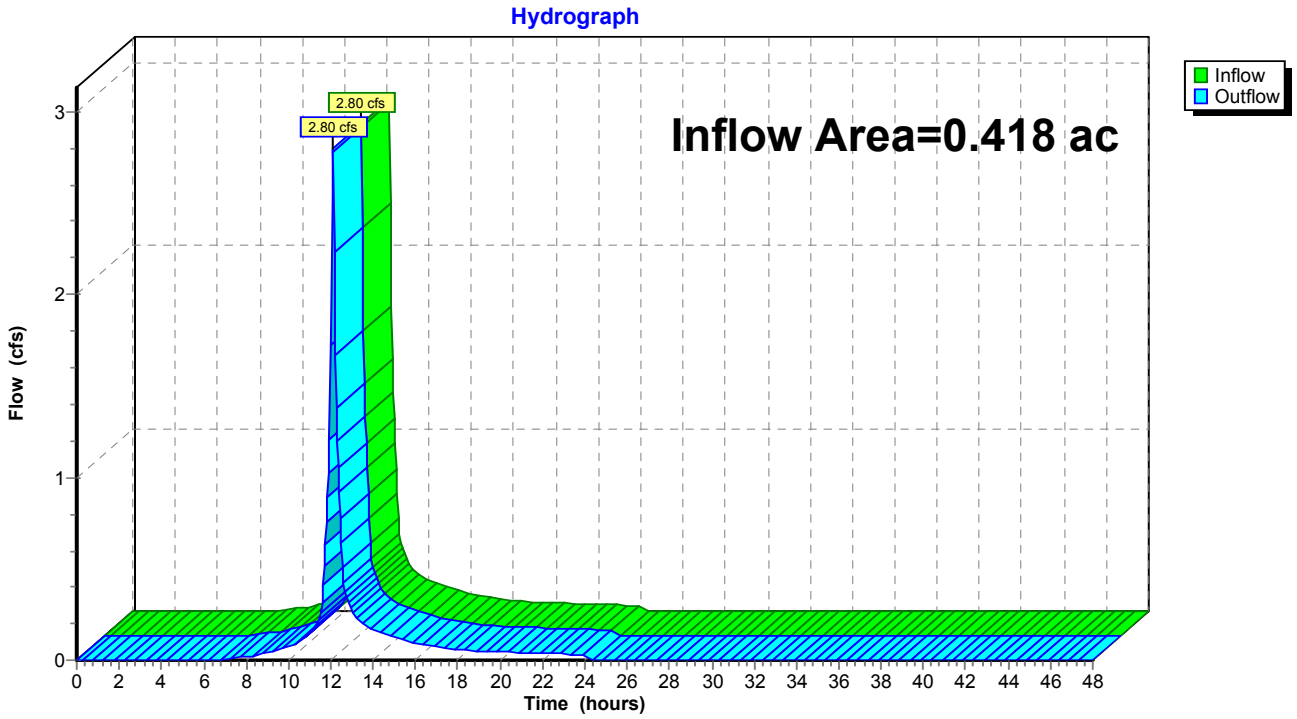


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.418 ac, 21.17% Impervious, Inflow Depth = 5.89" for 100-Year event
Inflow = 2.80 cfs @ 12.09 hrs, Volume= 0.205 af
Outflow = 2.80 cfs @ 12.09 hrs, Volume= 0.205 af, 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: Catch Basin Washington Street

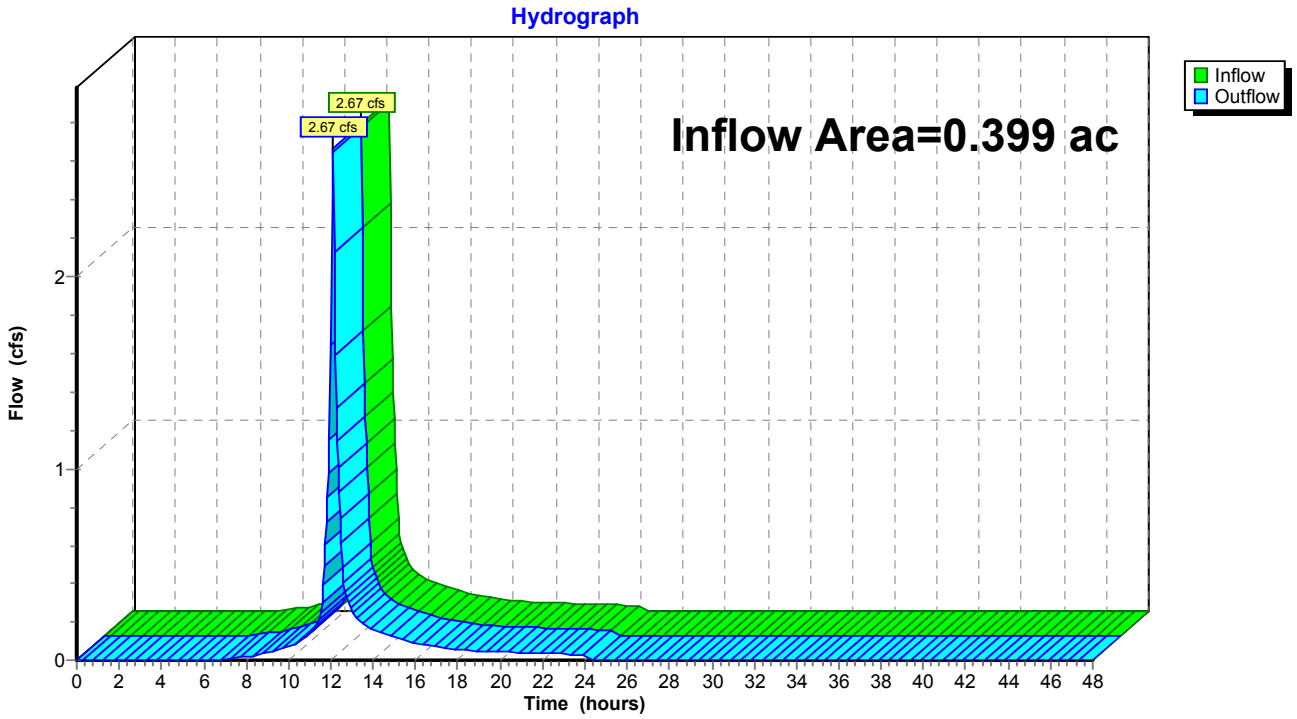


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.399 ac, 13.08% Impervious, Inflow Depth = 5.89" for 100-Year event
Inflow = 2.67 cfs @ 12.09 hrs, Volume= 0.196 af
Outflow = 2.67 cfs @ 12.09 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.0 min

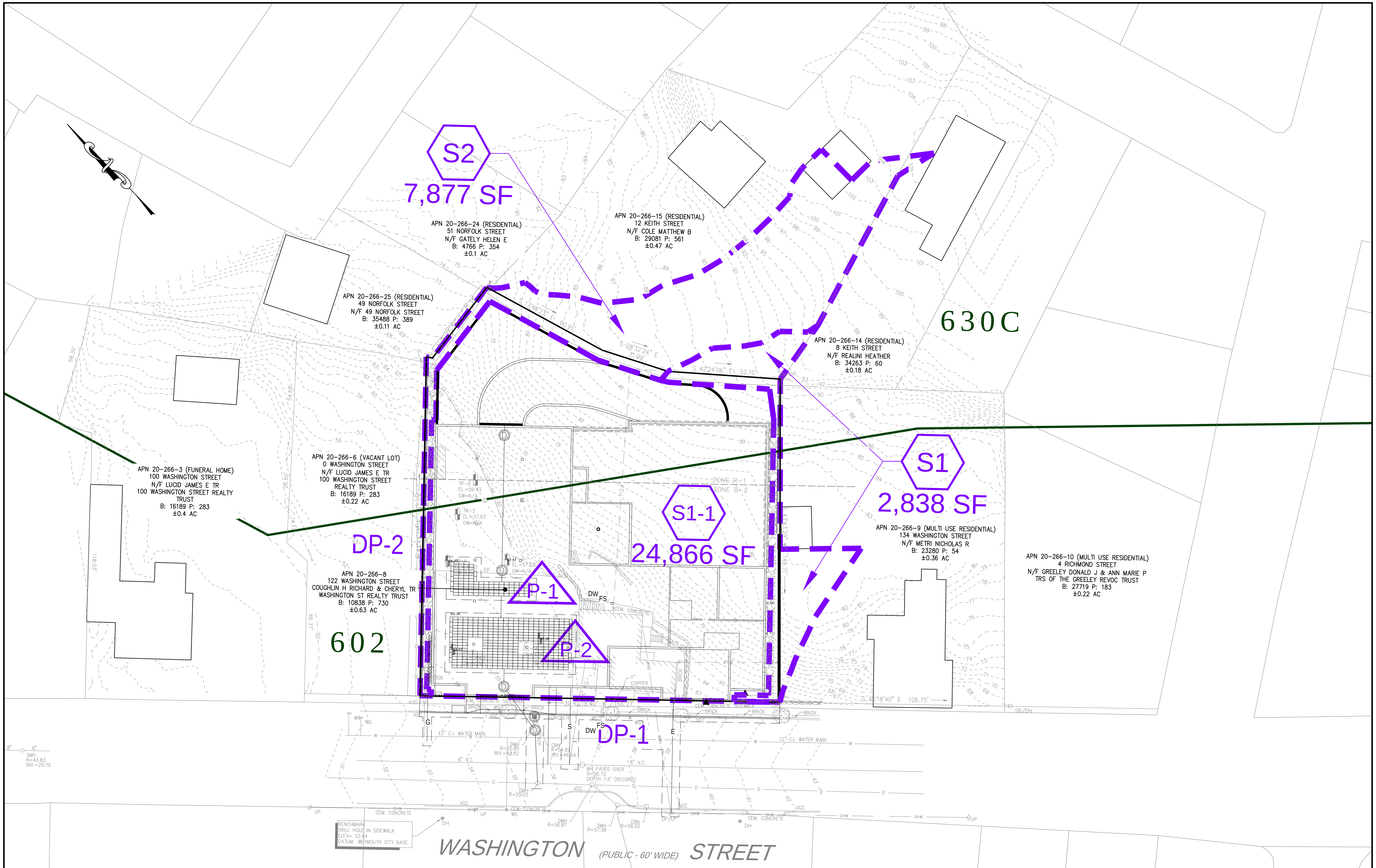
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 2R: PL Vacant Lot



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	C ASSUMED
630C	CHARLTON-HOLLIS-URBAN LAND COMPLEX, 3 TO 15 PERCENT SLOPES	B C/D

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\220-124 SA - 122 WASHINGTON ST., WEYMOUTH\DWGS\SUBMISSIONS\(R1)\220-124 WATERSHED (R1).DWG

REV	DATE	DESCRIPTION	BY	APP
1	10.26.2020	PLANNING BOARD	SBS	BCM

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

PROPOSED MIXED USE BUILDING
(ASSESSOR'S PARCEL ID 20-266-8)
122 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

PROFESSIONAL SURVEYOR:

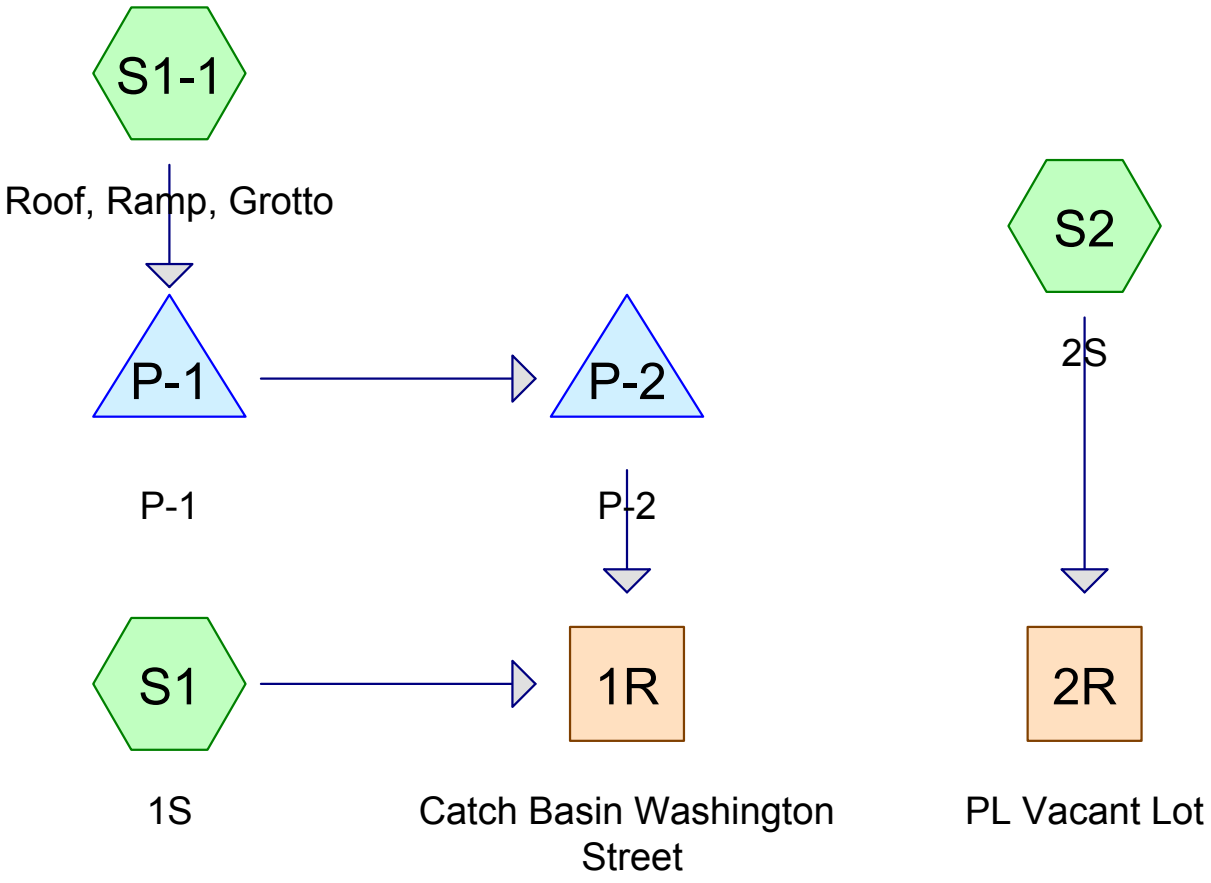
NOT FOR CONSTRUCTION

OWNERS/APPLICANT:
SATHUAN SA
122 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

DRAWN BY:	SBS
DESIGNED BY:	SBS
CHECKED BY:	BCM
APPROVED BY:	BCM
DATE:	AUGUST 18, 2020
SCALE:	1"=20
PROJECT NO.:	220-124

DWG. TITLE:
POST-DEV. WATERSHED MAP

DWG. NO:
WS-2



Subcat Reach Pond Link

Routing Diagram for 220-124 Post Development (R1)
Prepared by McKenzie Engineering Group, Inc.

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 (acres)	CN	Description (subcatchment-numbers)
0.089	74	>75% Grass cover, Good, HSG C (S1, S1-1, S2)
0.155	74	>75% Grass cover, Good, HSG C (OFFSITE) (S1, S2)
0.016	96	Gravel surface, HSG C (S1, S2)
0.051	98	Parking garage ramp, HSG C (S1-1)
0.468	98	Roofs, HSG C (S1-1)
0.006	98	Roofs, HSG C (OFFSITE) (S2)
0.001	98	Sidewalk, HSG C (S1)
0.005	98	Wall, HSC C (S1-1)
0.026	70	Woods, Good, HSG C (OFFSITE) (S1)
0.817	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.812	HSG C	S1, S1-1, S2
0.000	HSG D	
0.005	Other	S1-1
0.817		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.244	0.000	0.000	0.244	>75% Grass cover, Good	S1, S1-1, S2
0.000	0.000	0.016	0.000	0.000	0.016	Gravel surface	S1, S2
0.000	0.000	0.051	0.000	0.000	0.051	Parking garage ramp	S1-1
0.000	0.000	0.474	0.000	0.000	0.474	Roofs	S1-1, S2
0.000	0.000	0.001	0.000	0.000	0.001	Sidewalk	S1
0.000	0.000	0.000	0.000	0.005	0.005	Wall, HSC C	S1-1
0.000	0.000	0.026	0.000	0.000	0.026	Woods, Good	S1
0.000	**0.000**	**0.812**	**0.000**	**0.005**	**0.817**	**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	P-1	51.65	51.50	7.0	0.0214	0.012	0.0	12.0	0.0
2	P-2	46.90	46.64	20.0	0.0130	0.012	0.0	12.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

SubcatchmentS1: 1S Runoff Area=2,838 sf 1.48% Impervious Runoff Depth=1.11"
Tc=6.0 min CN=75 Runoff=0.08 cfs 0.006 af

SubcatchmentS1-1: Roof, Ramp, Grotto Runoff Area=24,866 sf 91.78% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=96 Runoff=1.68 cfs 0.132 af

SubcatchmentS2: 2S Runoff Area=7,877 sf 3.22% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=76 Runoff=0.23 cfs 0.018 af

Reach 1R: Catch Basin Washington Street Inflow=0.08 cfs 0.014 af
Outflow=0.08 cfs 0.014 af

Reach 2R: PL Vacant Lot Inflow=0.23 cfs 0.018 af
Outflow=0.23 cfs 0.018 af

Pond P-1: P-1 Peak Elev=52.38' Storage=280 cf Inflow=1.68 cfs 0.132 af
12.0" Round Culvert n=0.012 L=7.0' S=0.0214 '/' Outflow=1.59 cfs 0.132 af

Pond P-2: P-2 Peak Elev=51.65' Storage=3,537 cf Inflow=1.59 cfs 0.132 af
Discarded=0.03 cfs 0.124 af Primary=0.04 cfs 0.008 af Outflow=0.07 cfs 0.132 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.155 af Average Runoff Depth = 2.28"
35.03% Pervious = 0.286 ac 64.97% Impervious = 0.531 ac

Summary for Subcatchment S1: 1S

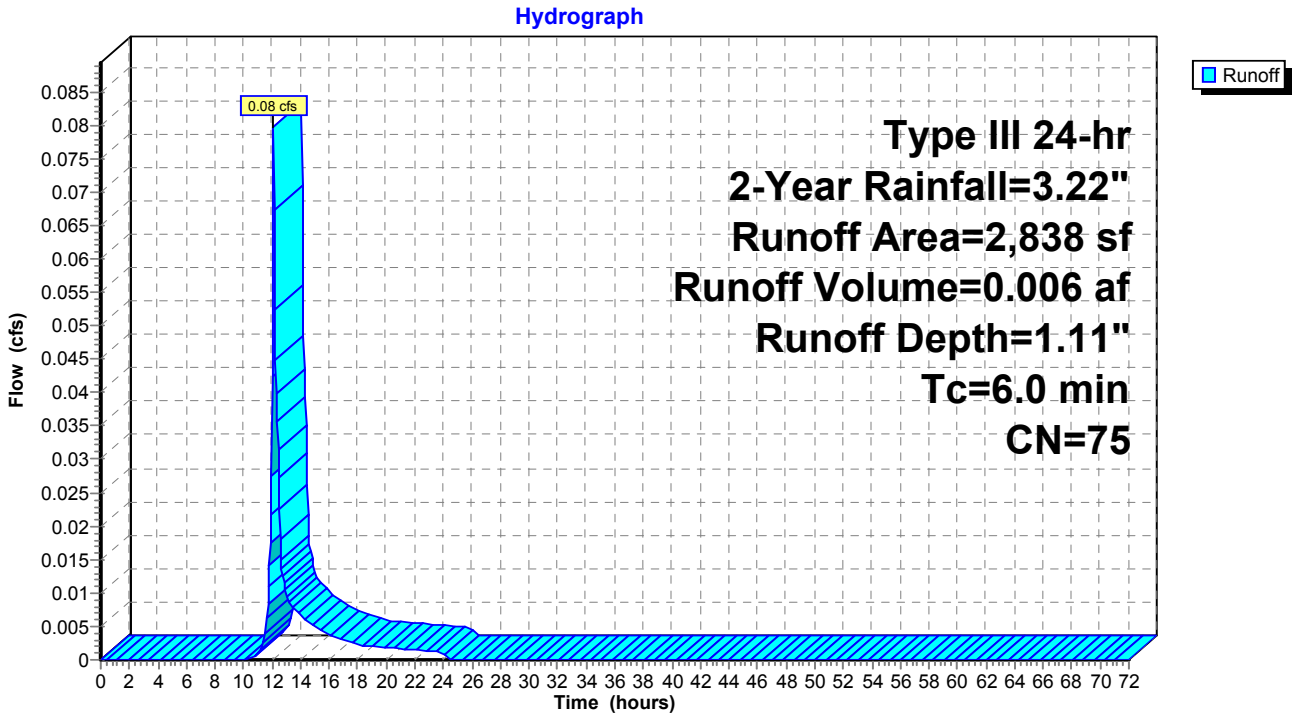
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
	607	74	>75% Grass cover, Good, HSG C
	296	96	Gravel surface, HSG C
*	42	98	Sidewalk, HSG C
	2,838	75	Weighted Average
	2,796		98.52% Pervious Area
	42		1.48% Impervious Area

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

Subcatchment S1: 1S



Summary for Subcatchment S1-1: Roof, Ramp, Grotto

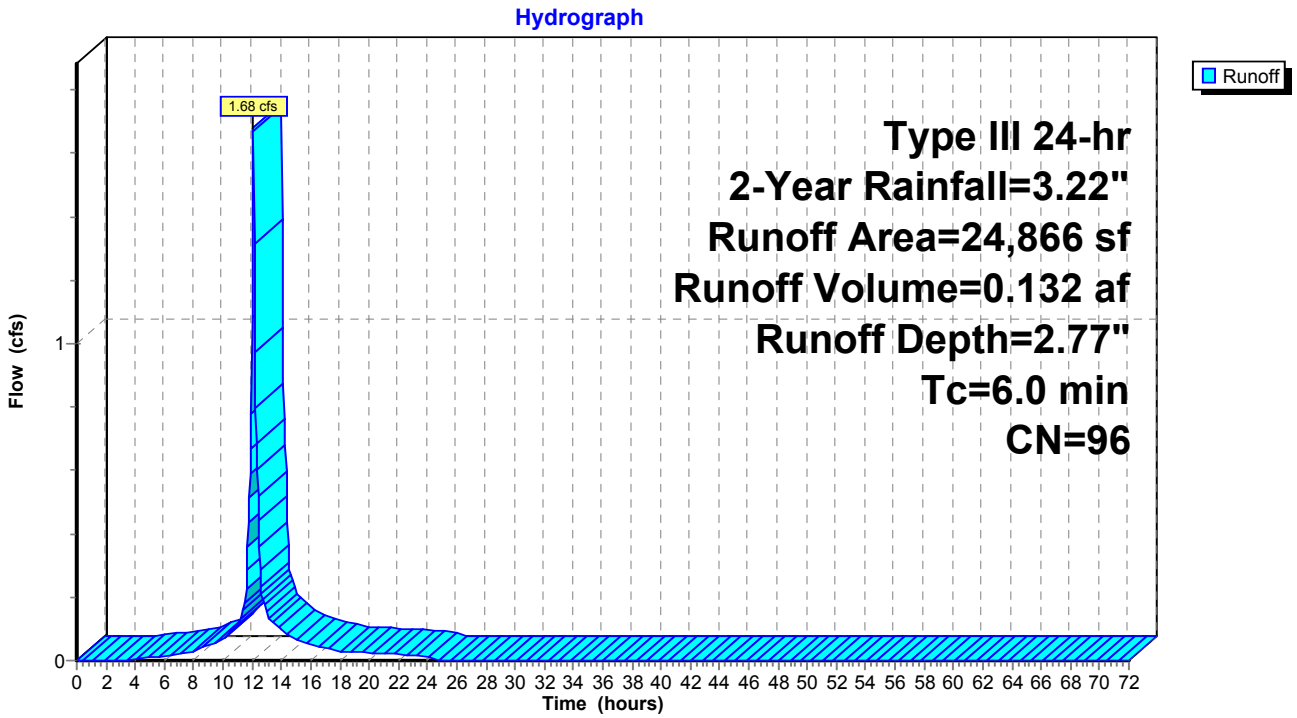
Runoff = 1.68 cfs @ 12.09 hrs, Volume= 0.132 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
	20,405	98	Roofs, HSG C
*	2,216	98	Parking garage ramp, HSG C
	2,044	74	>75% Grass cover, Good, HSG C
*	201	98	Wall, HSC C
	24,866	96	Weighted Average
	2,044		8.22% Pervious Area
	22,822		91.78% Impervious Area

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

Subcatchment S1-1: Roof, Ramp, Grotto



Summary for Subcatchment S2: 2S

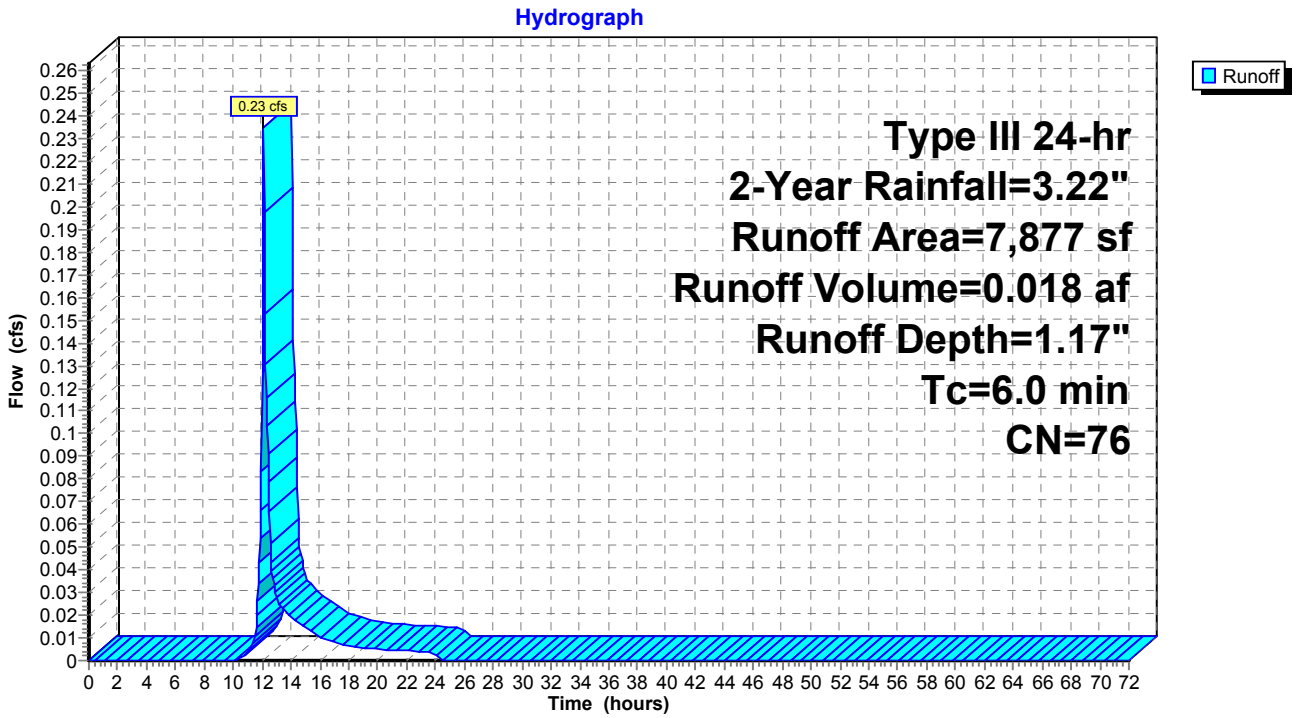
Runoff = 0.23 cfs @ 12.10 hrs, Volume= 0.018 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
	402	96	Gravel surface, HSG C
	1,241	74	>75% Grass cover, Good, HSG C
	7,877	76	Weighted Average
	7,623		96.78% Pervious Area
	254		3.22% Impervious Area

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

Subcatchment S2: 2S

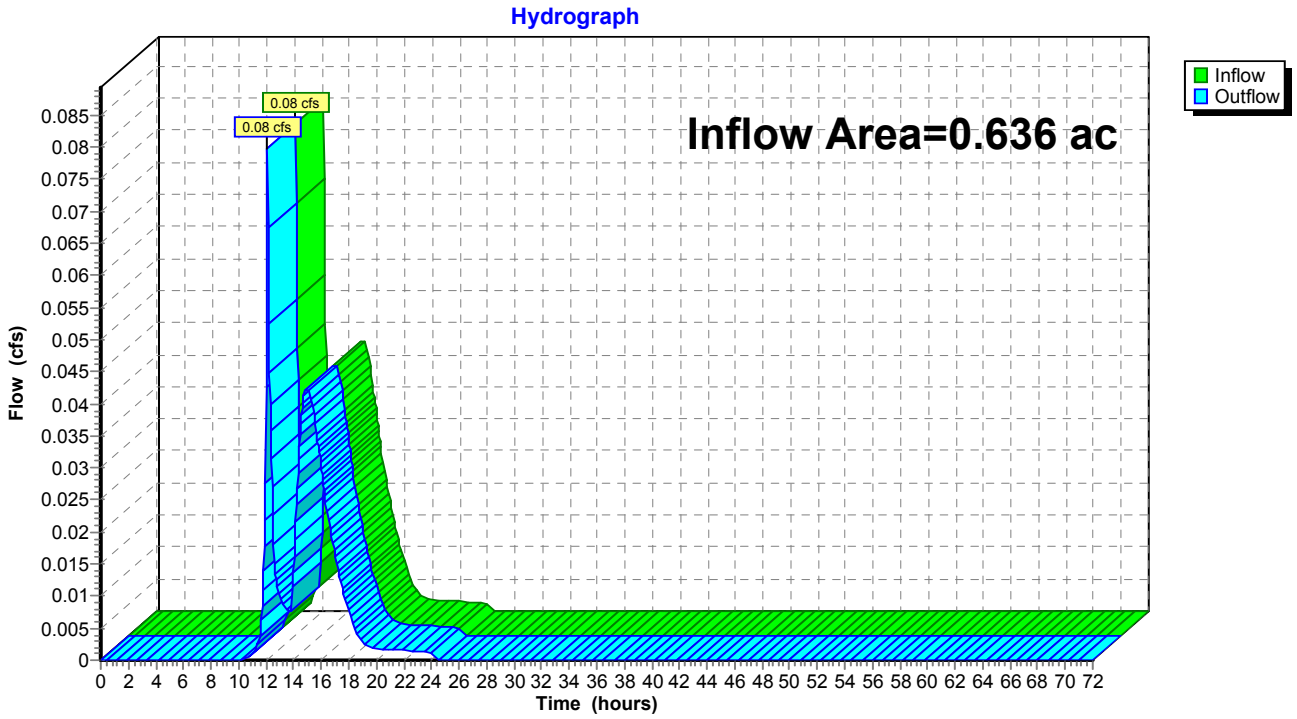


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.636 ac, 82.53% Impervious, Inflow Depth = 0.26" for 2-Year event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 0.014 af
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Catch Basin Washington Street

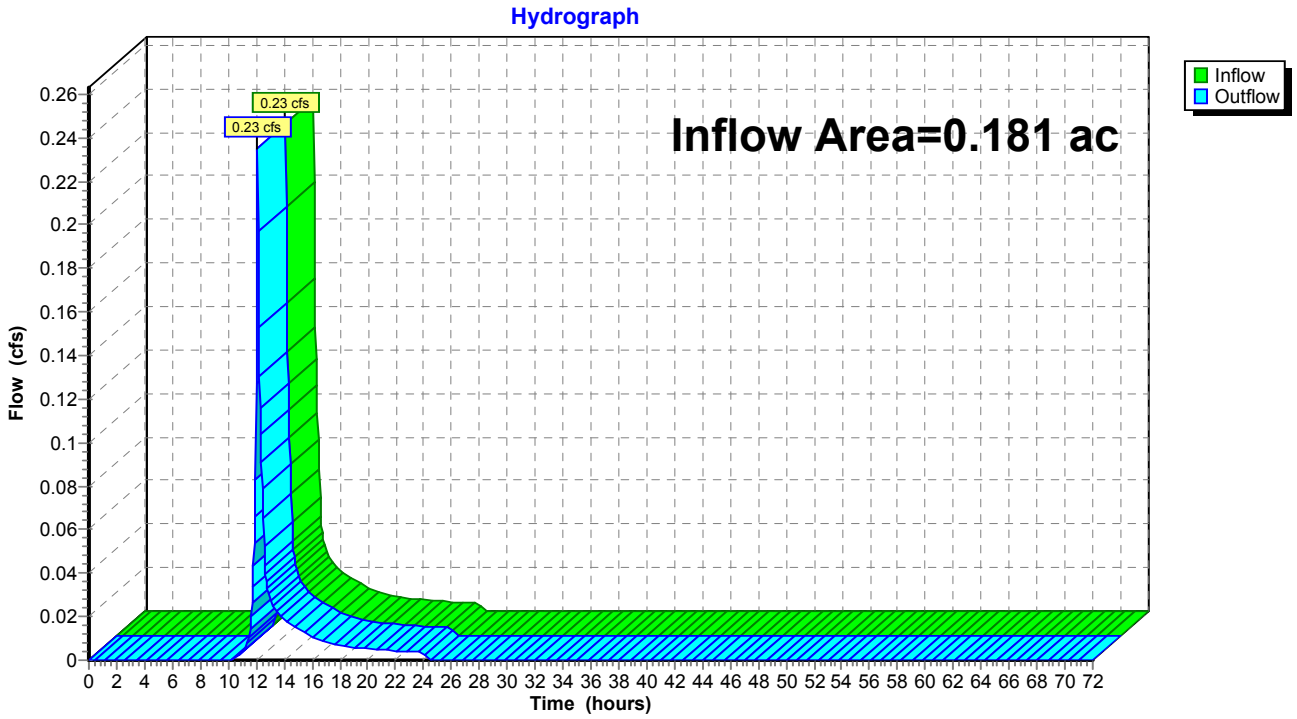


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.181 ac, 3.22% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 0.23 cfs @ 12.10 hrs, Volume= 0.018 af
Outflow = 0.23 cfs @ 12.10 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R: PL Vacant Lot



Summary for Pond P-1: P-1

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 2.77" for 2-Year event
Inflow = 1.68 cfs @ 12.09 hrs, Volume= 0.132 af
Outflow = 1.59 cfs @ 12.12 hrs, Volume= 0.132 af, Atten= 6%, Lag= 1.8 min
Primary = 1.59 cfs @ 12.12 hrs, Volume= 0.132 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 52.38' @ 12.12 hrs Surf.Area= 521 sf Storage= 280 cf

Plug-Flow detention time= 10.1 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 9.3 min (783.2 - 773.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.65'	328 cf	**11.87'W x 43.88'L x 2.44'H Field A** 1,273 cf Overall - 453 cf Embedded = 820 cf x 40.0% Voids
#2A	51.65'	431 cf	**ACF R-Tank HD 1** x 102 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 102 Chambers in 6 Rows
		759 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	51.65'	**12.0" Round Culvert** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 51.65' / 51.50' S= 0.0214 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=1.54 cfs @ 12.12 hrs HW=52.37' TW=50.12' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.54 cfs @ 3.56 fps)

Pond P-1: P-1 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 1 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf
Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf

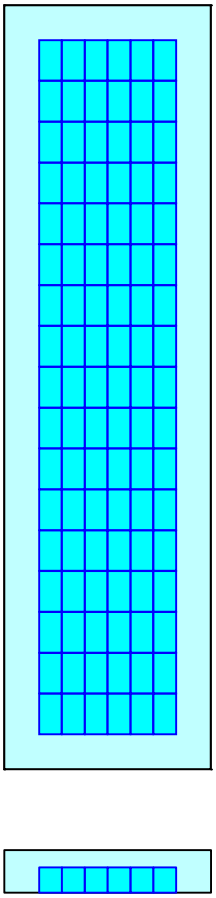
17 Chambers/Row x 2.35' Long = 39.88' Row Length +24.0" End Stone x 2 = 43.88' Base Length
6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width
17.3" Chamber Height + 12.0" Stone Cover = 2.44' Field Height

102 Chambers x 4.2 cf = 430.6 cf Chamber Storage
102 Chambers x 4.4 cf = 453.3 cf Displacement

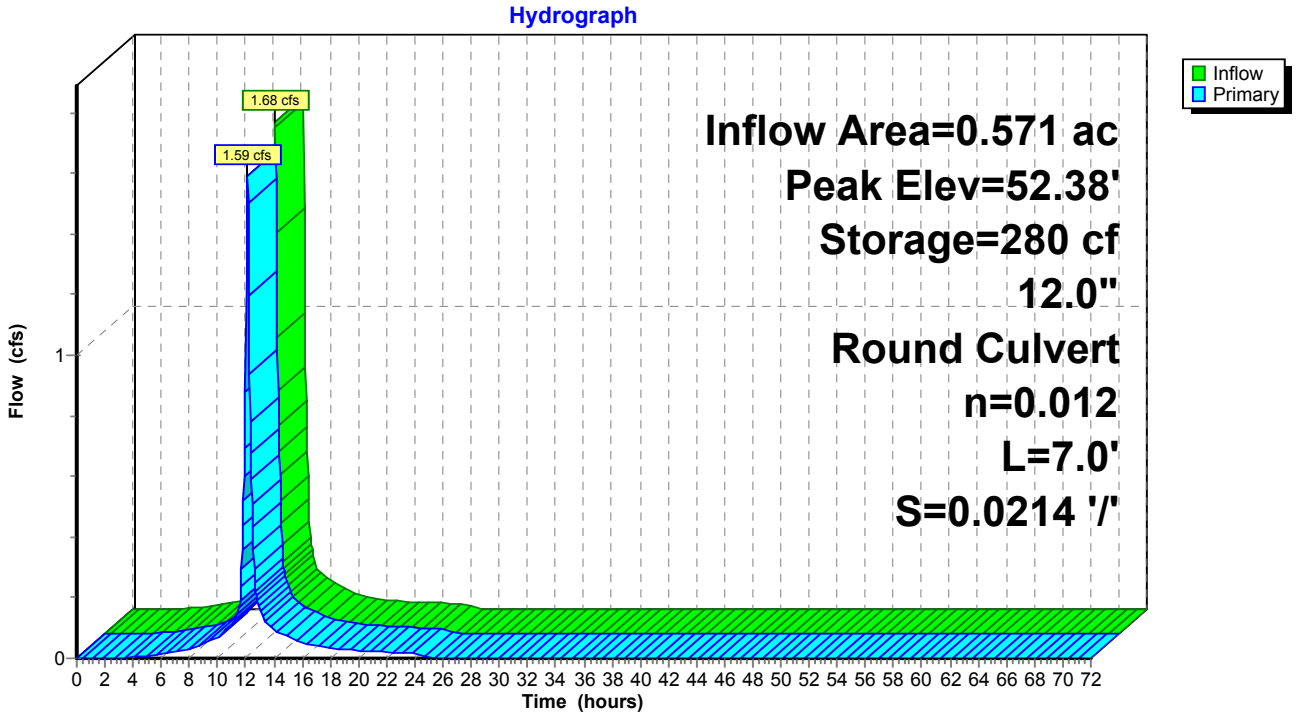
1,273.1 cf Field - 453.3 cf Chambers = 819.8 cf Stone x 40.0% Voids = 327.9 cf Stone Storage

Chamber Storage + Stone Storage = 758.6 cf = 0.017 af
Overall Storage Efficiency = 59.6%
Overall System Size = 43.88' x 11.87' x 2.44'

102 Chambers
47.2 cy Field
30.4 cy Stone



Pond P-1: P-1


Hydrograph
Inflow
Primary
1.68 cfs
1.59 cfs
Inflow Area=0.571 ac
Peak Elev=52.38'
Storage=280 cf
12.0"
Round Culvert
n=0.012
L=7.0'
S=0.0214 '/'
Flow (cfs)
0
1
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond P-2: P-2

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 2.77" for 2-Year event
Inflow = 1.59 cfs @ 12.12 hrs, Volume= 0.132 af
Outflow = 0.07 cfs @ 14.98 hrs, Volume= 0.132 af, Atten= 95%, Lag= 172.0 min
Discarded = 0.03 cfs @ 9.40 hrs, Volume= 0.124 af
Primary = 0.04 cfs @ 14.98 hrs, Volume= 0.008 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 51.65' @ 14.98 hrs Surf.Area= 1,471 sf Storage= 3,537 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 857.3 min (1,640.5 - 783.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.60'	1,301 cf	**27.62'W x 53.26'L x 5.53'H Field A** 8,140 cf Overall - 4,887 cf Embedded = 3,253 cf x 40.0% Voids
#2A	48.93'	4,642 cf	**ACF R-Tank HD 3** x 378 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 378 Chambers in 18 Rows
		5,944 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	46.90'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 46.90' / 46.64' S= 0.0130 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	51.55'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	53.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	48.60'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 9.40 hrs HW=48.66' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.04 cfs @ 14.98 hrs HW=51.65' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.04 cfs of 7.80 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.09 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-2: P-2 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

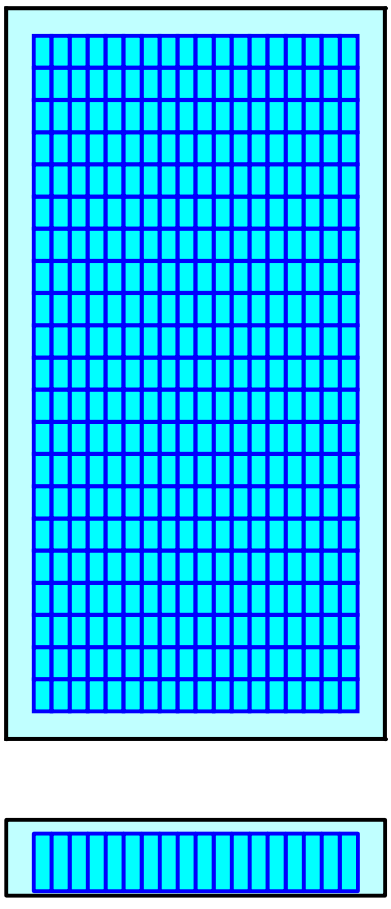
21 Chambers/Row x 2.35' Long = 49.26' Row Length +24.0" End Stone x 2 = 53.26' Base Length
18 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 27.62' Base Width
4.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.53' Field Height

378 Chambers x 12.3 cf = 4,642.4 cf Chamber Storage
378 Chambers x 12.9 cf = 4,886.8 cf Displacement

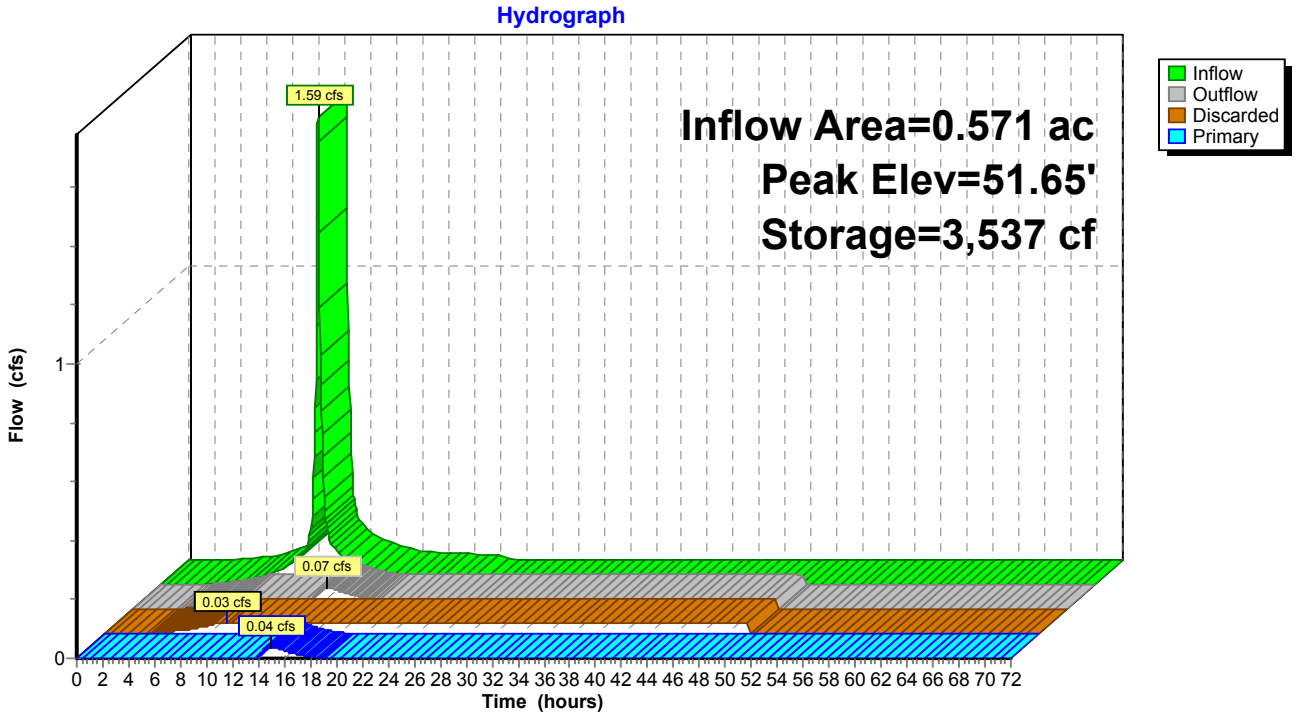
8,139.9 cf Field - 4,886.8 cf Chambers = 3,253.1 cf Stone x 40.0% Voids = 1,301.2 cf Stone Storage

Chamber Storage + Stone Storage = 5,943.7 cf = 0.136 af
Overall Storage Efficiency = 73.0%
Overall System Size = 53.26' x 27.62' x 5.53'

378 Chambers
301.5 cy Field
120.5 cy Stone



Pond P-2: P-2


Hydrograph
Inflow Area=0.571 ac
Peak Elev=51.65'
Storage=3,537 cf
1.59 cfs
0.07 cfs
0.03 cfs
0.04 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

SubcatchmentS1: 1S Runoff Area=2,838 sf 1.48% Impervious Runoff Depth=2.34"
Tc=6.0 min CN=75 Runoff=0.17 cfs 0.013 af

SubcatchmentS1-1: Roof, Ramp, Grotto Runoff Area=24,866 sf 91.78% Impervious Runoff Depth=4.39"
Tc=6.0 min CN=96 Runoff=2.60 cfs 0.209 af

SubcatchmentS2: 2S Runoff Area=7,877 sf 3.22% Impervious Runoff Depth=2.42"
Tc=6.0 min CN=76 Runoff=0.50 cfs 0.036 af

Reach 1R: Catch Basin Washington Street Inflow=0.84 cfs 0.088 af
Outflow=0.84 cfs 0.088 af

Reach 2R: PL Vacant Lot Inflow=0.50 cfs 0.036 af
Outflow=0.50 cfs 0.036 af

Pond P-1: P-1 Peak Elev=52.64' Storage=377 cf Inflow=2.60 cfs 0.209 af
12.0" Round Culvert n=0.012 L=7.0' S=0.0214 '/' Outflow=2.47 cfs 0.209 af

Pond P-2: P-2 Peak Elev=52.10' Storage=4,087 cf Inflow=2.47 cfs 0.209 af
Discarded=0.03 cfs 0.134 af Primary=0.78 cfs 0.075 af Outflow=0.81 cfs 0.209 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.258 af Average Runoff Depth = 3.79"
35.03% Pervious = 0.286 ac 64.97% Impervious = 0.531 ac

Summary for Subcatchment S1: 1S

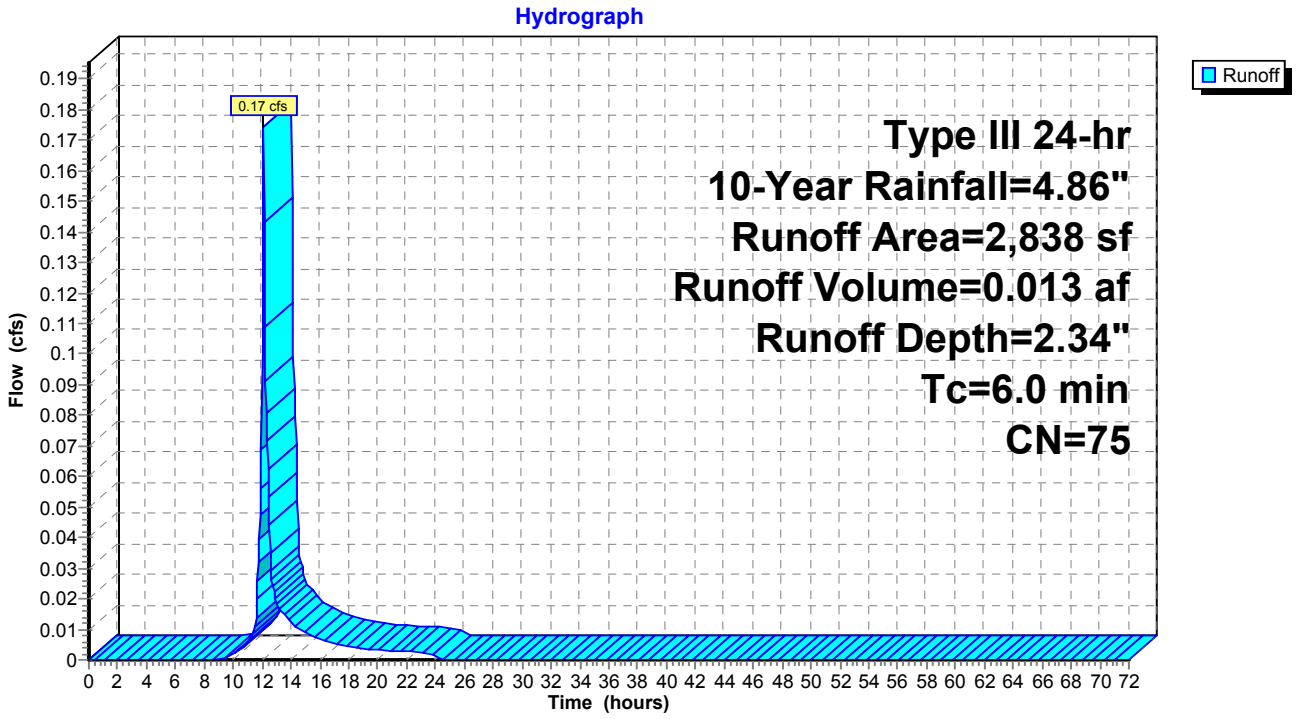
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.013 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
	607	74	>75% Grass cover, Good, HSG C
	296	96	Gravel surface, HSG C
*	42	98	Sidewalk, HSG C
	2,838	75	Weighted Average
	2,796		98.52% Pervious Area
	42		1.48% Impervious Area

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

Subcatchment S1: 1S



Summary for Subcatchment S1-1: Roof, Ramp, Grotto

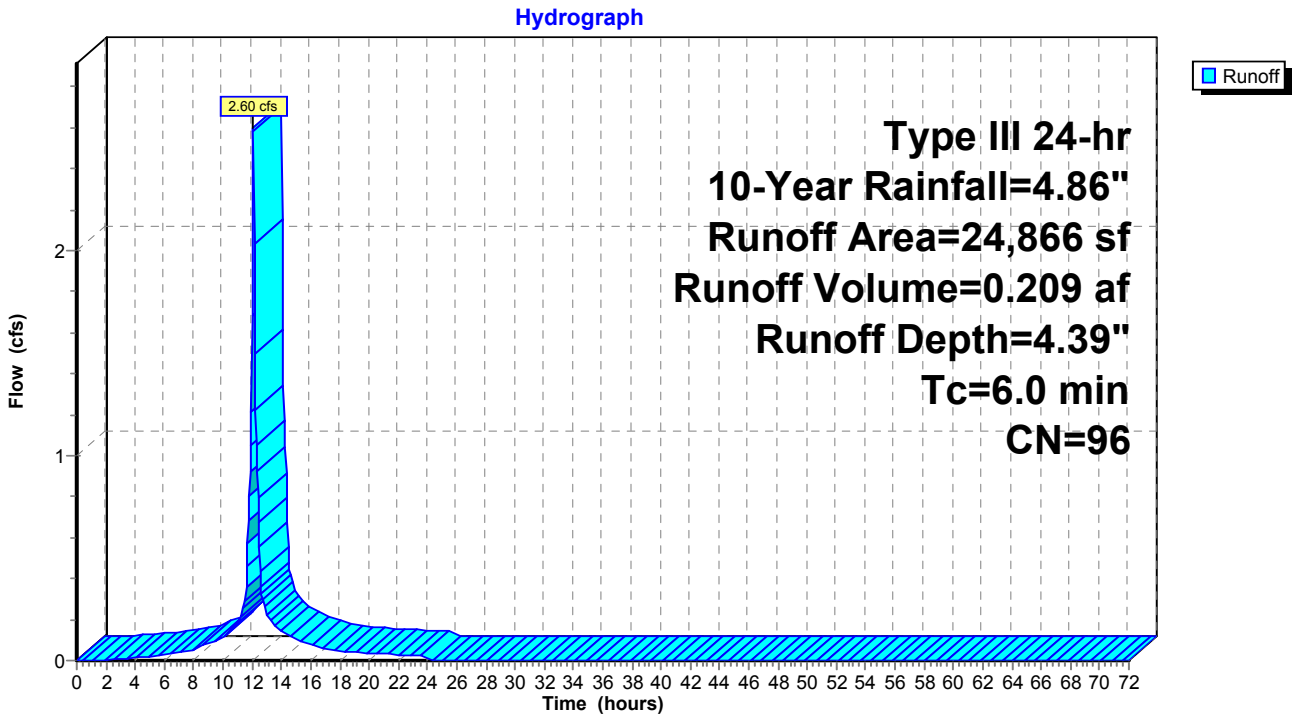
Runoff = 2.60 cfs @ 12.09 hrs, Volume= 0.209 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
	20,405	98	Roofs, HSG C
*	2,216	98	Parking garage ramp, HSG C
	2,044	74	>75% Grass cover, Good, HSG C
*	201	98	Wall, HSC C
	24,866	96	Weighted Average
	2,044		8.22% Pervious Area
	22,822		91.78% Impervious Area

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

Subcatchment S1-1: Roof, Ramp, Grotto



Summary for Subcatchment S2: 2S

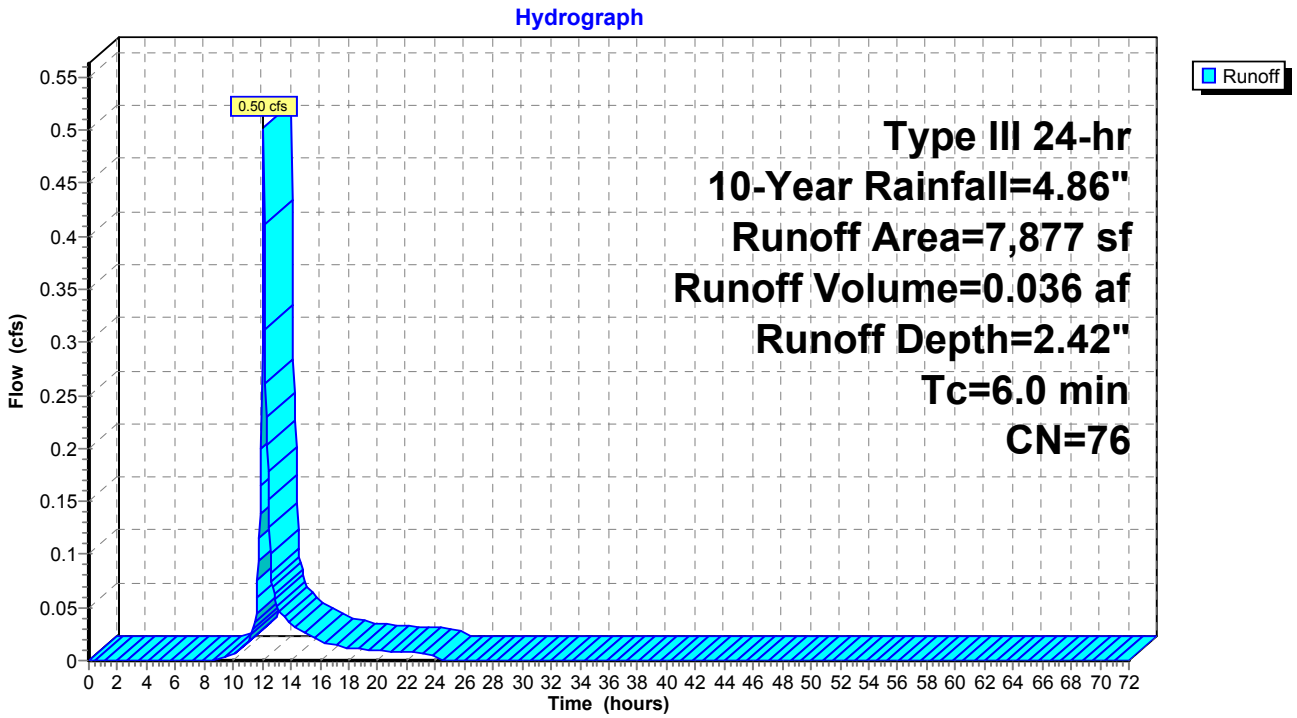
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.86"

	Area (sf)	CN	Description
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
	402	96	Gravel surface, HSG C
	1,241	74	>75% Grass cover, Good, HSG C
	7,877	76	Weighted Average
	7,623		96.78% Pervious Area
	254		3.22% Impervious Area

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

Subcatchment S2: 2S

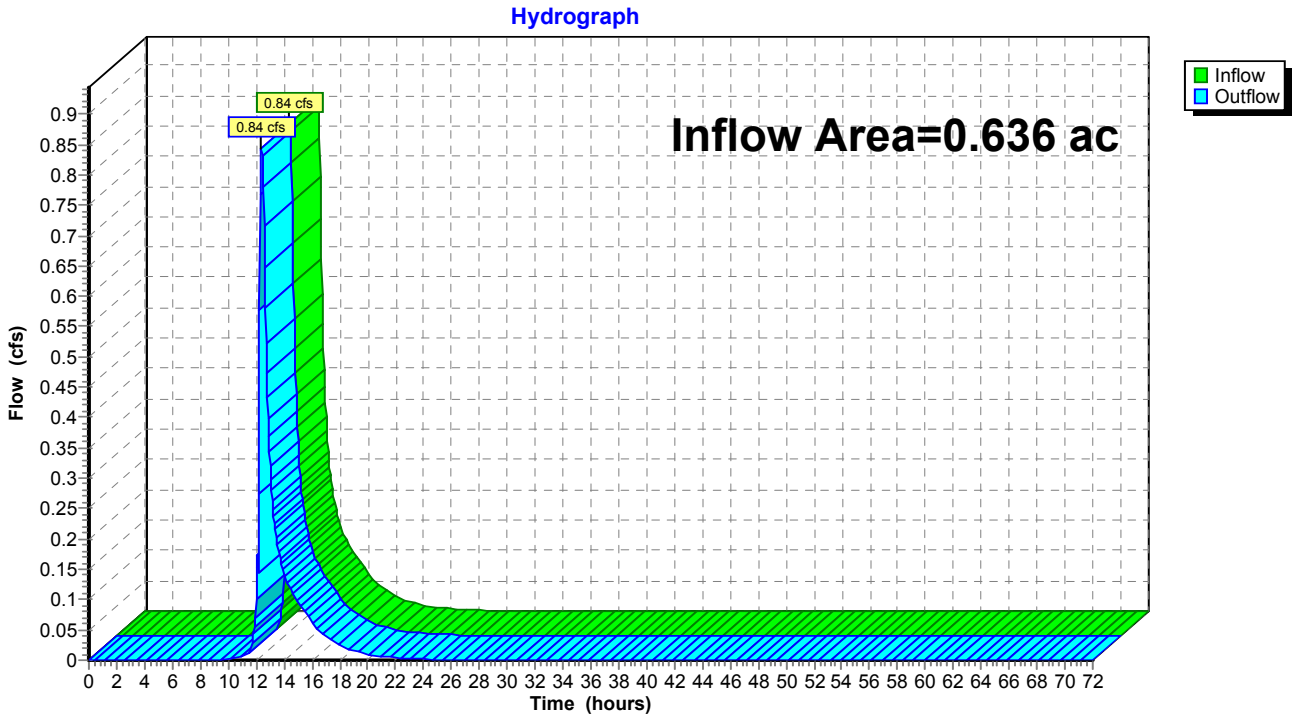


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.636 ac, 82.53% Impervious, Inflow Depth = 1.66" for 10-Year event
Inflow = 0.84 cfs @ 12.38 hrs, Volume= 0.088 af
Outflow = 0.84 cfs @ 12.38 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Catch Basin Washington Street

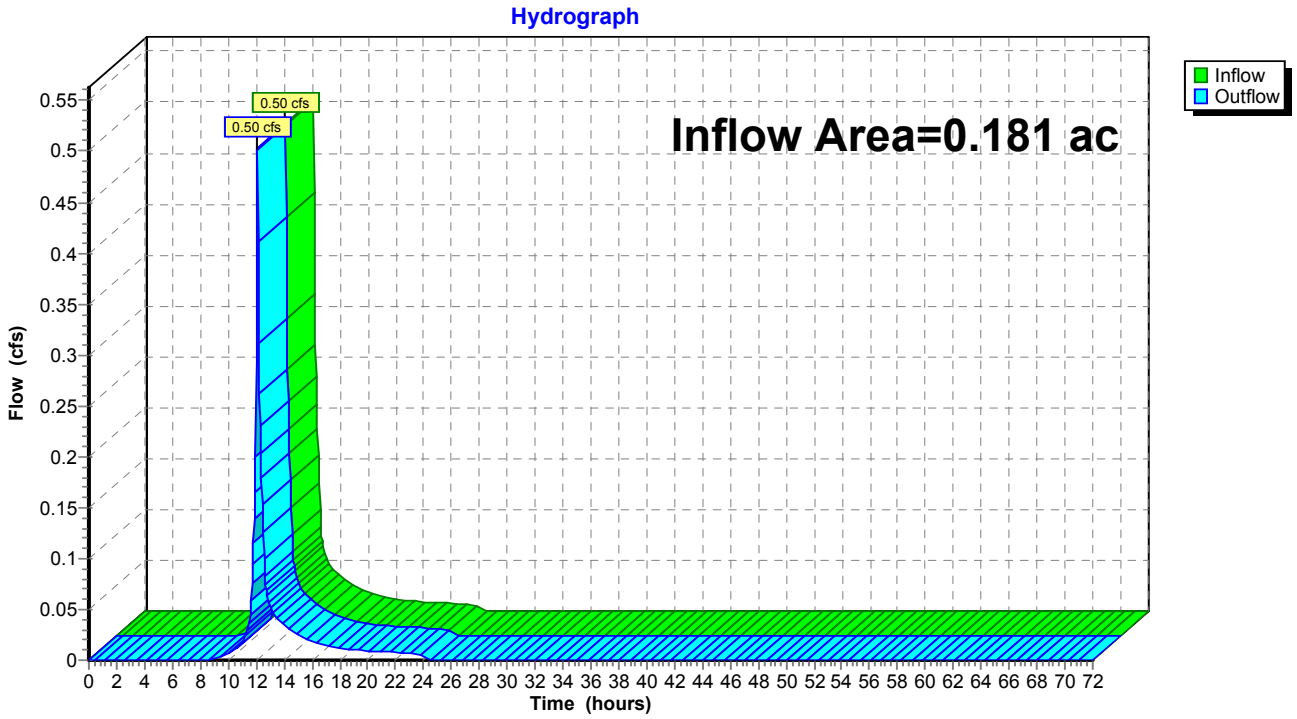


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.181 ac, 3.22% Impervious, Inflow Depth = 2.42" for 10-Year event
Inflow = 0.50 cfs @ 12.09 hrs, Volume= 0.036 af
Outflow = 0.50 cfs @ 12.09 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R: PL Vacant Lot



Summary for Pond P-1: P-1

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 4.39" for 10-Year event
Inflow = 2.60 cfs @ 12.09 hrs, Volume= 0.209 af
Outflow = 2.47 cfs @ 12.11 hrs, Volume= 0.209 af, Atten= 5%, Lag= 1.7 min
Primary = 2.47 cfs @ 12.11 hrs, Volume= 0.209 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 52.64' @ 12.11 hrs Surf.Area= 521 sf Storage= 377 cf

Plug-Flow detention time= 8.9 min calculated for 0.209 af (100% of inflow)
Center-of-Mass det. time= 8.0 min (771.1 - 763.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.65'	328 cf	**11.87'W x 43.88'L x 2.44'H Field A** 1,273 cf Overall - 453 cf Embedded = 820 cf x 40.0% Voids
#2A	51.65'	431 cf	**ACF R-Tank HD 1** x 102 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 102 Chambers in 6 Rows
		759 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	51.65'	**12.0" Round Culvert** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 51.65' / 51.50' S= 0.0214 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=2.41 cfs @ 12.11 hrs HW=52.62' TW=51.24' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 2.41 cfs @ 3.92 fps)

Pond P-1: P-1 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 1 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf
Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf

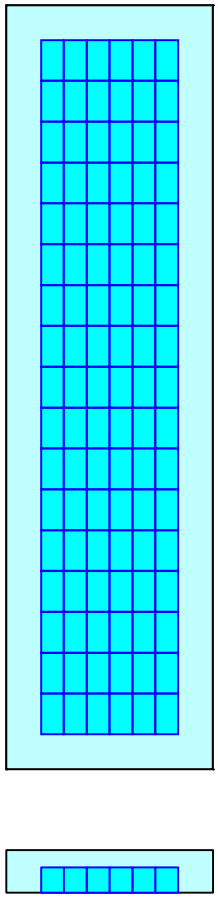
17 Chambers/Row x 2.35' Long = 39.88' Row Length +24.0" End Stone x 2 = 43.88' Base Length
6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width
17.3" Chamber Height + 12.0" Stone Cover = 2.44' Field Height

102 Chambers x 4.2 cf = 430.6 cf Chamber Storage
102 Chambers x 4.4 cf = 453.3 cf Displacement

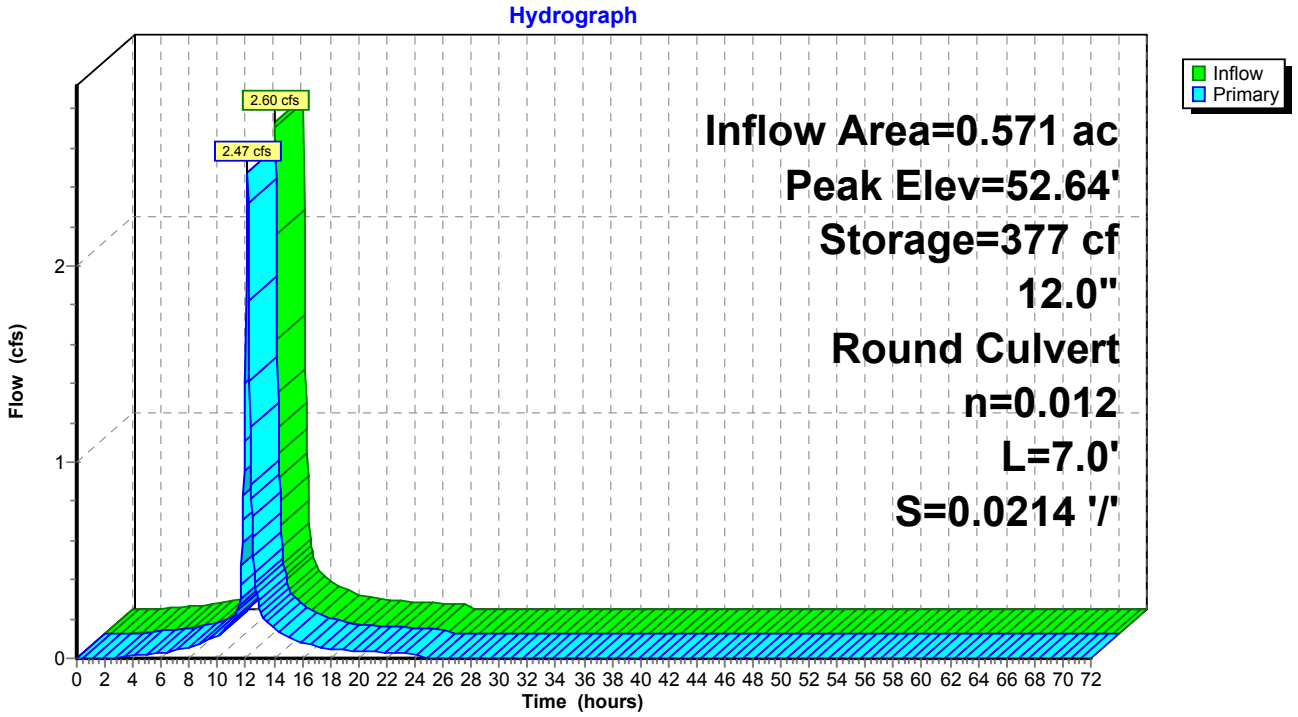
1,273.1 cf Field - 453.3 cf Chambers = 819.8 cf Stone x 40.0% Voids = 327.9 cf Stone Storage

Chamber Storage + Stone Storage = 758.6 cf = 0.017 af
Overall Storage Efficiency = 59.6%
Overall System Size = 43.88' x 11.87' x 2.44'

102 Chambers
47.2 cy Field
30.4 cy Stone



Pond P-1: P-1


Hydrograph
Inflow
Primary
2.60 cfs
2.47 cfs
Inflow Area=0.571 ac
Peak Elev=52.64'
Storage=377 cf
12.0"
Round Culvert
n=0.012
L=7.0'
S=0.0214 '/'
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond P-2: P-2

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 4.39" for 10-Year event
Inflow = 2.47 cfs @ 12.11 hrs, Volume= 0.209 af
Outflow = 0.81 cfs @ 12.40 hrs, Volume= 0.209 af, Atten= 67%, Lag= 17.1 min
Discarded = 0.03 cfs @ 7.85 hrs, Volume= 0.134 af
Primary = 0.78 cfs @ 12.40 hrs, Volume= 0.075 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 52.10' @ 12.40 hrs Surf.Area= 1,471 sf Storage= 4,087 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 601.1 min (1,372.1 - 771.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.60'	1,301 cf	**27.62'W x 53.26'L x 5.53'H Field A** 8,140 cf Overall - 4,887 cf Embedded = 3,253 cf x 40.0% Voids
#2A	48.93'	4,642 cf	**ACF R-Tank HD 3** x 378 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 378 Chambers in 18 Rows
		5,944 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	46.90'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 46.90' / 46.64' S= 0.0130 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	51.55'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	53.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	48.60'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 7.85 hrs HW=48.66' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.78 cfs @ 12.40 hrs HW=52.10' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.78 cfs of 8.20 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.78 cfs @ 2.53 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-2: P-2 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

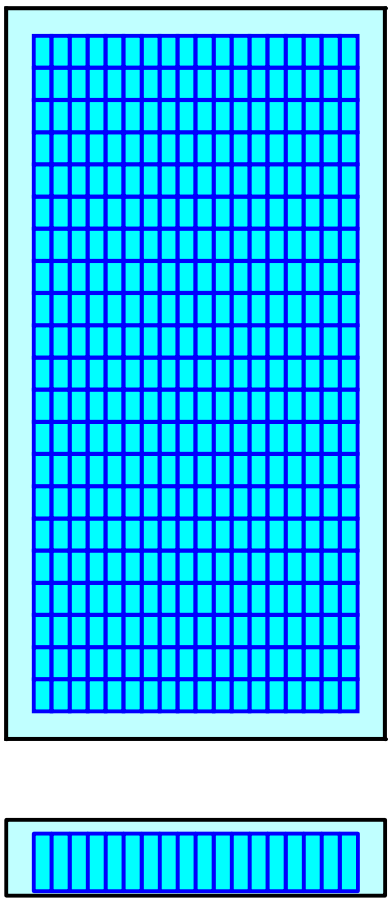
21 Chambers/Row x 2.35' Long = 49.26' Row Length +24.0" End Stone x 2 = 53.26' Base Length
18 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 27.62' Base Width
4.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.53' Field Height

378 Chambers x 12.3 cf = 4,642.4 cf Chamber Storage
378 Chambers x 12.9 cf = 4,886.8 cf Displacement

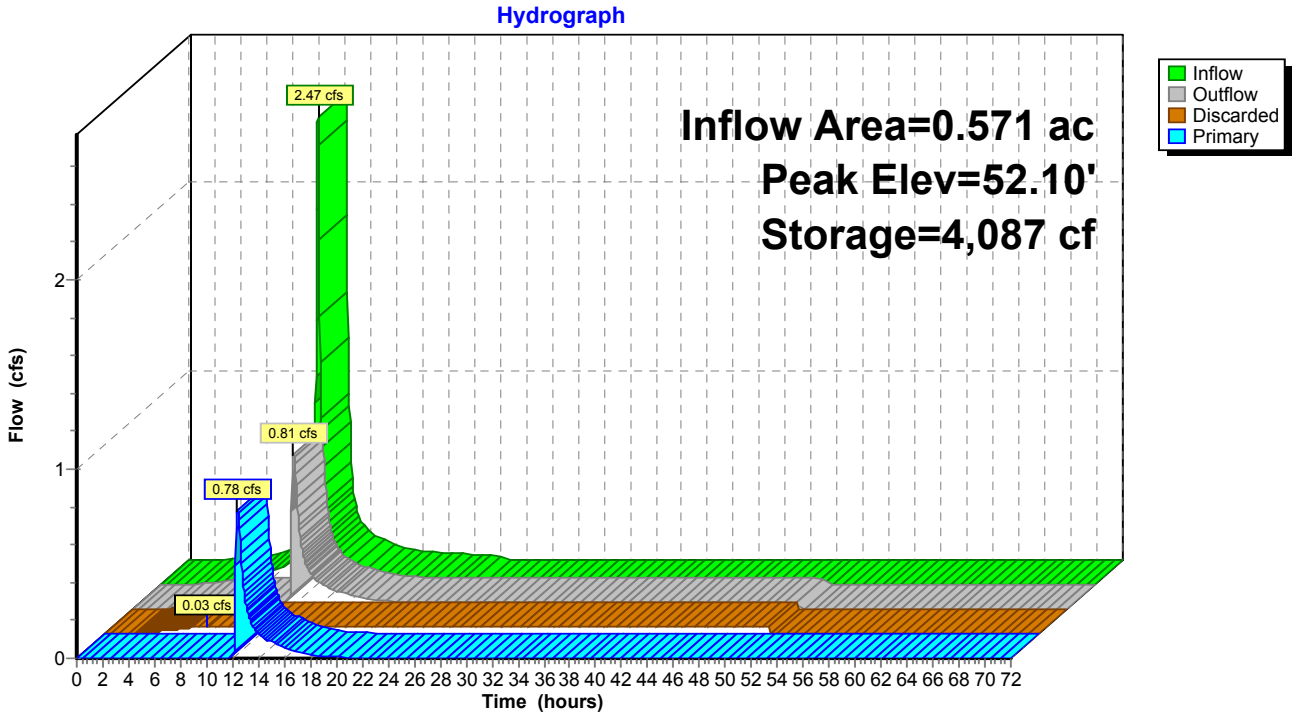
8,139.9 cf Field - 4,886.8 cf Chambers = 3,253.1 cf Stone x 40.0% Voids = 1,301.2 cf Stone Storage

Chamber Storage + Stone Storage = 5,943.7 cf = 0.136 af
Overall Storage Efficiency = 73.0%
Overall System Size = 53.26' x 27.62' x 5.53'

378 Chambers
301.5 cy Field
120.5 cy Stone



Pond P-2: P-2


Hydrograph
Inflow Area=0.571 ac
Peak Elev=52.10'
Storage=4,087 cf
2.47 cfs
0.81 cfs
0.78 cfs
0.03 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

SubcatchmentS1: 1S Runoff Area=2,838 sf 1.48% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=75 Runoff=0.26 cfs 0.019 af

SubcatchmentS1-1: Roof, Ramp, Grotto Runoff Area=24,866 sf 91.78% Impervious Runoff Depth=5.68"
Tc=6.0 min CN=96 Runoff=3.32 cfs 0.270 af

SubcatchmentS2: 2S Runoff Area=7,877 sf 3.22% Impervious Runoff Depth=3.51"
Tc=6.0 min CN=76 Runoff=0.73 cfs 0.053 af

Reach 1R: Catch Basin Washington Street Inflow=1.52 cfs 0.150 af
Outflow=1.52 cfs 0.150 af

Reach 2R: PL Vacant Lot Inflow=0.73 cfs 0.053 af
Outflow=0.73 cfs 0.053 af

Pond P-1: P-1 Peak Elev=52.85' Storage=456 cf Inflow=3.32 cfs 0.270 af
12.0" Round Culvert n=0.012 L=7.0' S=0.0214 '/' Outflow=3.12 cfs 0.270 af

Pond P-2: P-2 Peak Elev=52.57' Storage=4,664 cf Inflow=3.12 cfs 0.270 af
Discarded=0.03 cfs 0.138 af Primary=1.39 cfs 0.132 af Outflow=1.43 cfs 0.270 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.341 af Average Runoff Depth = 5.02"
35.03% Pervious = 0.286 ac 64.97% Impervious = 0.531 ac

Summary for Subcatchment S1: 1S

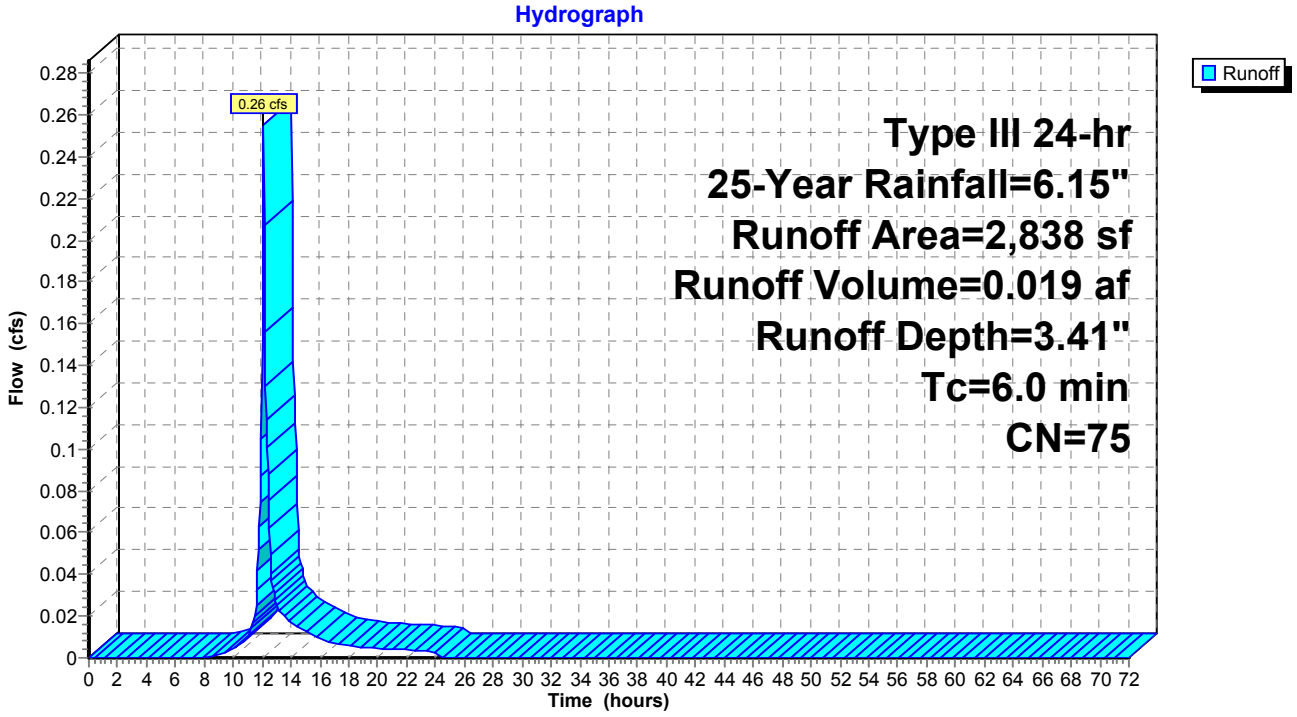
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.019 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
	607	74	>75% Grass cover, Good, HSG C
	296	96	Gravel surface, HSG C
*	42	98	Sidewalk, HSG C
	2,838	75	Weighted Average
	2,796		98.52% Pervious Area
	42		1.48% Impervious Area

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

Subcatchment S1: 1S



Summary for Subcatchment S1-1: Roof, Ramp, Grotto

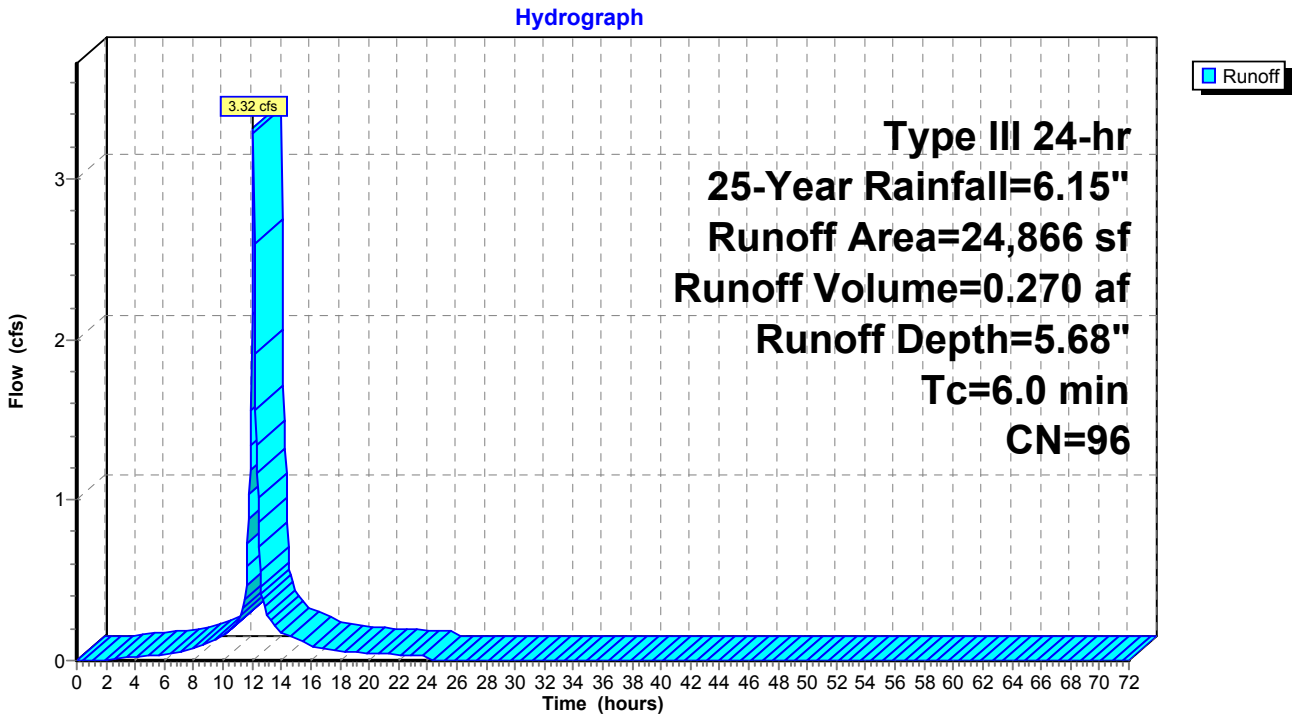
Runoff = 3.32 cfs @ 12.09 hrs, Volume= 0.270 af, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
	20,405	98	Roofs, HSG C
*	2,216	98	Parking garage ramp, HSG C
	2,044	74	>75% Grass cover, Good, HSG C
*	201	98	Wall, HSC C
	24,866	96	Weighted Average
	2,044		8.22% Pervious Area
	22,822		91.78% Impervious Area

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

Subcatchment S1-1: Roof, Ramp, Grotto



Summary for Subcatchment S2: 2S

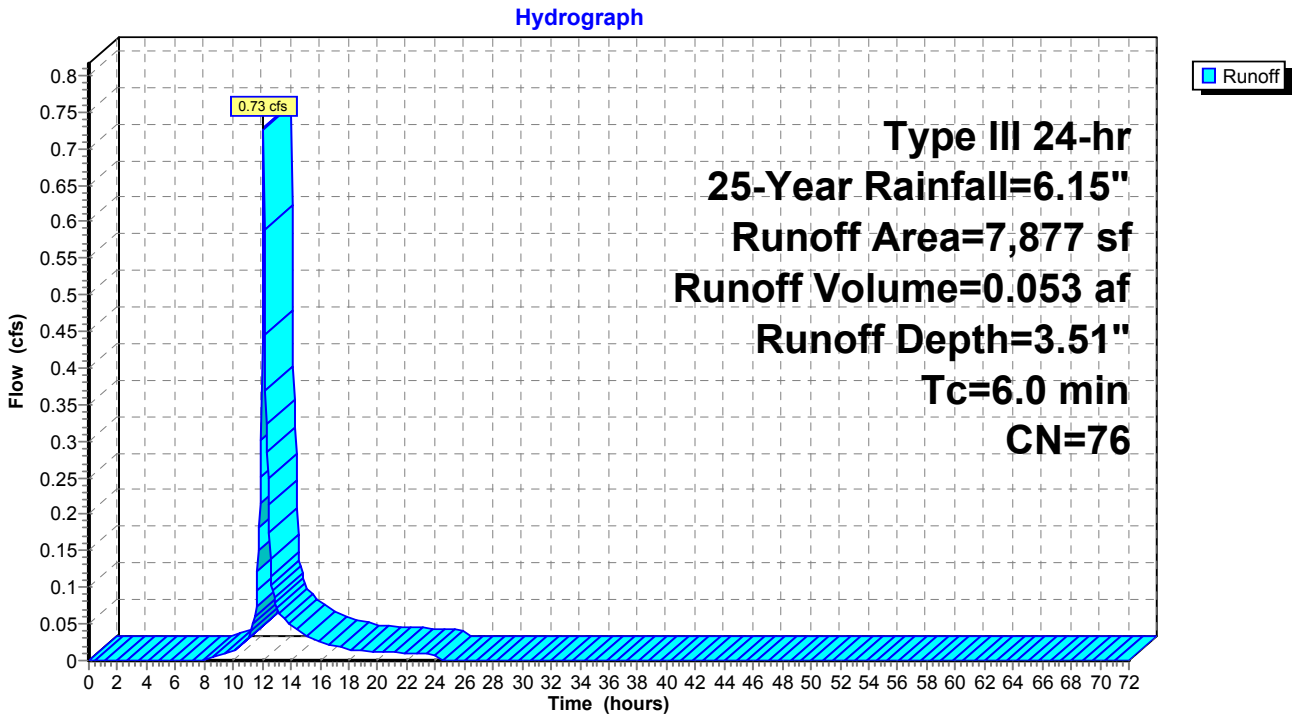
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.053 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.15"

	Area (sf)	CN	Description
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
	402	96	Gravel surface, HSG C
	1,241	74	>75% Grass cover, Good, HSG C
	7,877	76	Weighted Average
	7,623		96.78% Pervious Area
	254		3.22% Impervious Area

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

Subcatchment S2: 2S

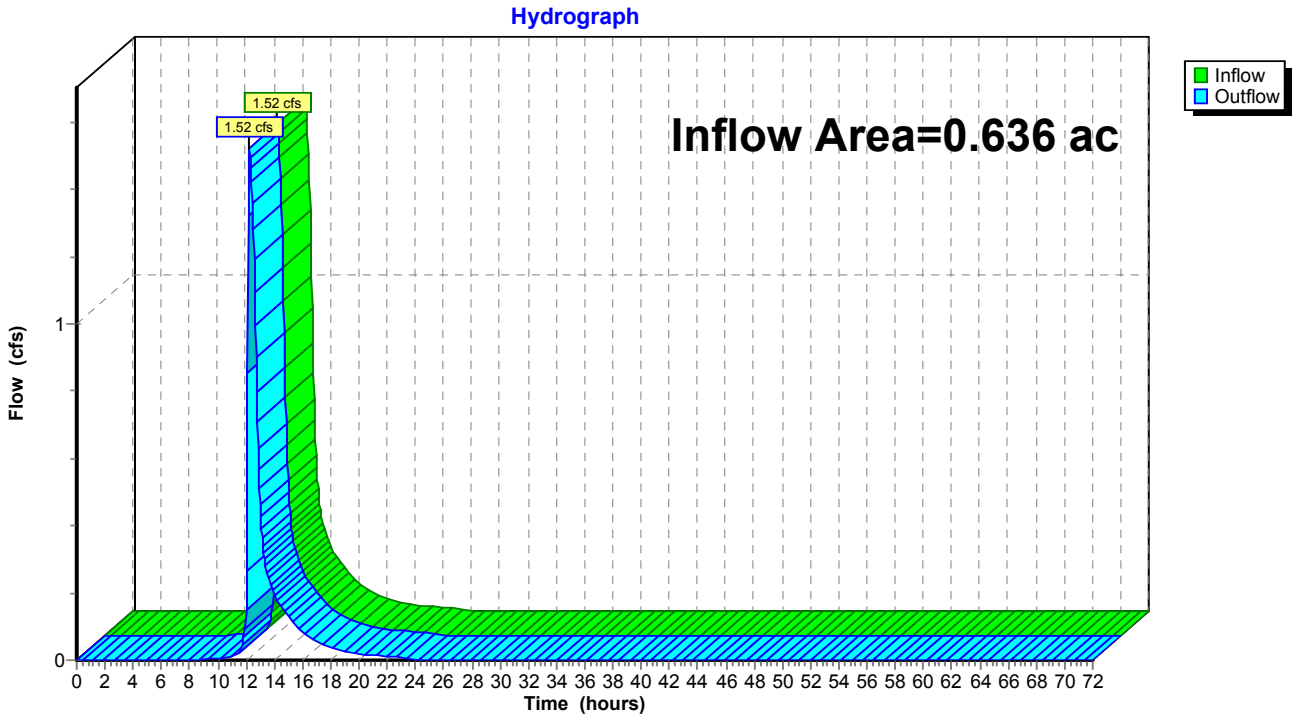


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.636 ac, 82.53% Impervious, Inflow Depth = 2.84" for 25-Year event
Inflow = 1.52 cfs @ 12.25 hrs, Volume= 0.150 af
Outflow = 1.52 cfs @ 12.25 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Catch Basin Washington Street

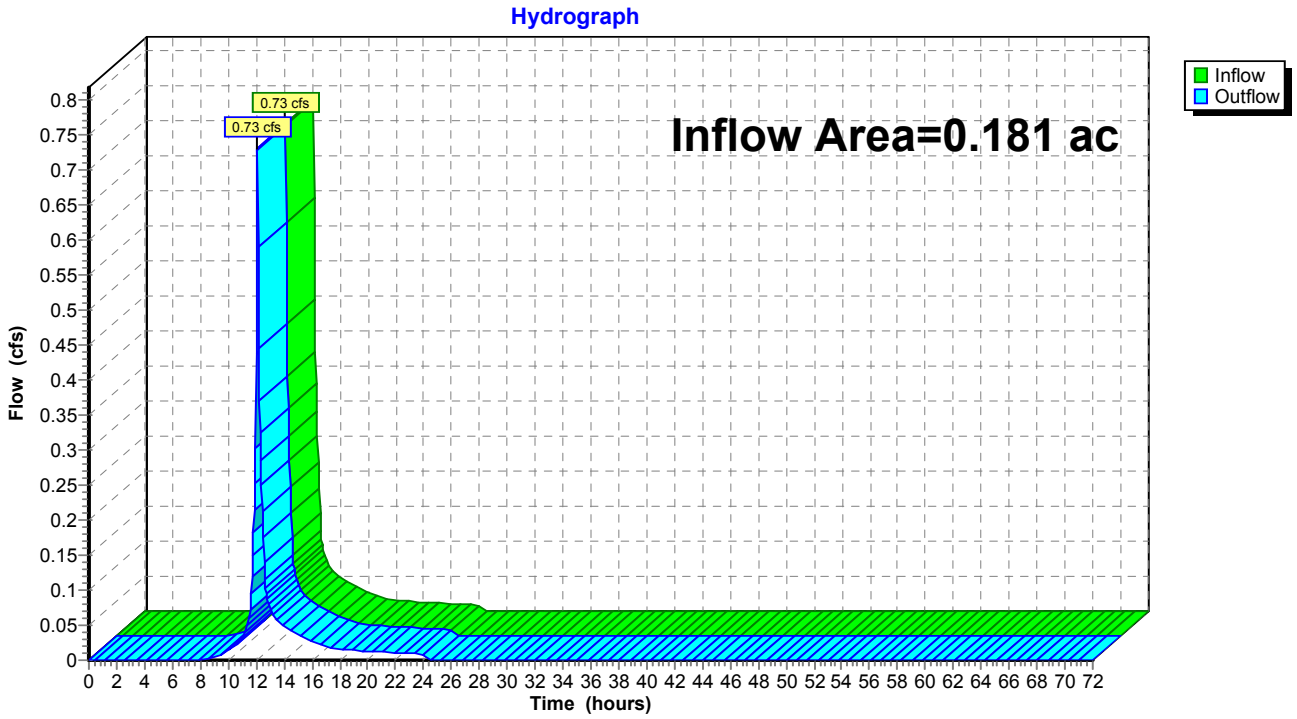


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.181 ac, 3.22% Impervious, Inflow Depth = 3.51" for 25-Year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 0.053 af
Outflow = 0.73 cfs @ 12.09 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R: PL Vacant Lot



Summary for Pond P-1: P-1

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 5.68" for 25-Year event
Inflow = 3.32 cfs @ 12.09 hrs, Volume= 0.270 af
Outflow = 3.12 cfs @ 12.12 hrs, Volume= 0.270 af, Atten= 6%, Lag= 1.8 min
Primary = 3.12 cfs @ 12.12 hrs, Volume= 0.270 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 52.85' @ 12.12 hrs Surf.Area= 521 sf Storage= 456 cf

Plug-Flow detention time= 7.4 min calculated for 0.270 af (100% of inflow)
Center-of-Mass det. time= 7.5 min (765.2 - 757.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.65'	328 cf	**11.87'W x 43.88'L x 2.44'H Field A** 1,273 cf Overall - 453 cf Embedded = 820 cf x 40.0% Voids
#2A	51.65'	431 cf	**ACF R-Tank HD 1** x 102 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 102 Chambers in 6 Rows
		759 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	51.65'	**12.0" Round Culvert** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 51.65' / 51.50' S= 0.0214 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=3.05 cfs @ 12.12 hrs HW=52.82' TW=52.11' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.05 cfs @ 4.16 fps)

Pond P-1: P-1 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 1 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf
Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf

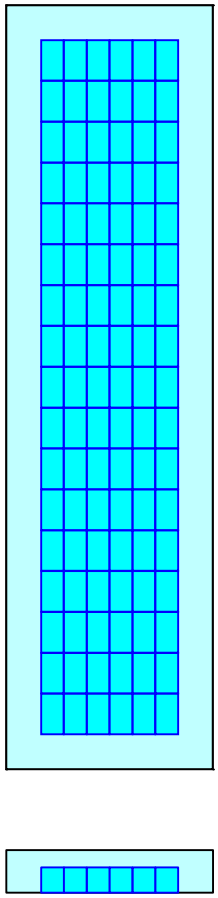
17 Chambers/Row x 2.35' Long = 39.88' Row Length +24.0" End Stone x 2 = 43.88' Base Length
6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width
17.3" Chamber Height + 12.0" Stone Cover = 2.44' Field Height

102 Chambers x 4.2 cf = 430.6 cf Chamber Storage
102 Chambers x 4.4 cf = 453.3 cf Displacement

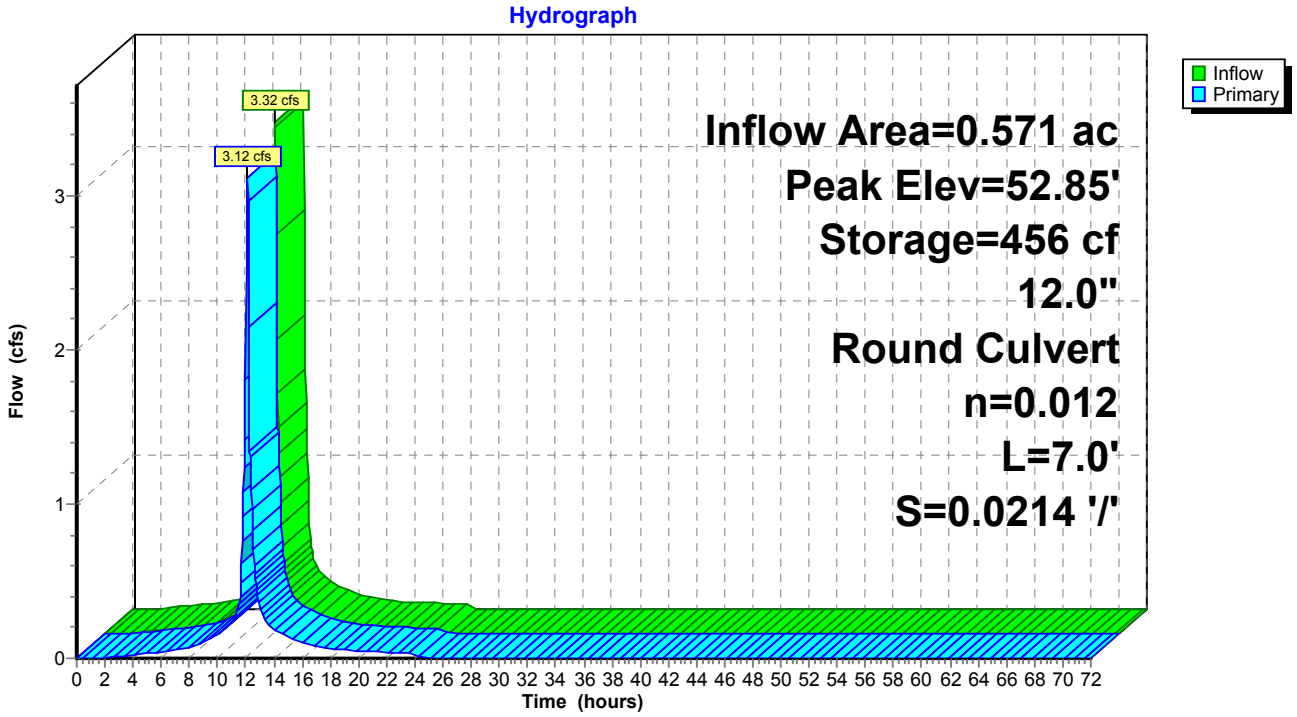
1,273.1 cf Field - 453.3 cf Chambers = 819.8 cf Stone x 40.0% Voids = 327.9 cf Stone Storage

Chamber Storage + Stone Storage = 758.6 cf = 0.017 af
Overall Storage Efficiency = 59.6%
Overall System Size = 43.88' x 11.87' x 2.44'

102 Chambers
47.2 cy Field
30.4 cy Stone



Pond P-1: P-1


Hydrograph
Inflow
Primary
3.32 cfs
3.12 cfs
Inflow Area=0.571 ac
Peak Elev=52.85'
Storage=456 cf
12.0"
Round Culvert
n=0.012
L=7.0'
S=0.0214 '/'
Flow (cfs)
0
1
2
3
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Summary for Pond P-2: P-2

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 5.68" for 25-Year event
Inflow = 3.12 cfs @ 12.12 hrs, Volume= 0.270 af
Outflow = 1.43 cfs @ 12.27 hrs, Volume= 0.270 af, Atten= 54%, Lag= 9.0 min
Discarded = 0.03 cfs @ 6.85 hrs, Volume= 0.138 af
Primary = 1.39 cfs @ 12.27 hrs, Volume= 0.132 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 52.57' @ 12.27 hrs Surf.Area= 1,471 sf Storage= 4,664 cf

Plug-Flow detention time= 485.2 min calculated for 0.270 af (100% of inflow)
Center-of-Mass det. time= 486.0 min (1,251.2 - 765.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.60'	1,301 cf	**27.62'W x 53.26'L x 5.53'H Field A** 8,140 cf Overall - 4,887 cf Embedded = 3,253 cf x 40.0% Voids
#2A	48.93'	4,642 cf	**ACF R-Tank HD 3** x 378 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 378 Chambers in 18 Rows
		5,944 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	46.90'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 46.90' / 46.64' S= 0.0130 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	51.55'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	53.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	48.60'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 6.85 hrs HW=48.66' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.39 cfs @ 12.27 hrs HW=52.56' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.39 cfs of 8.59 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.39 cfs @ 3.97 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P-2: P-2 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

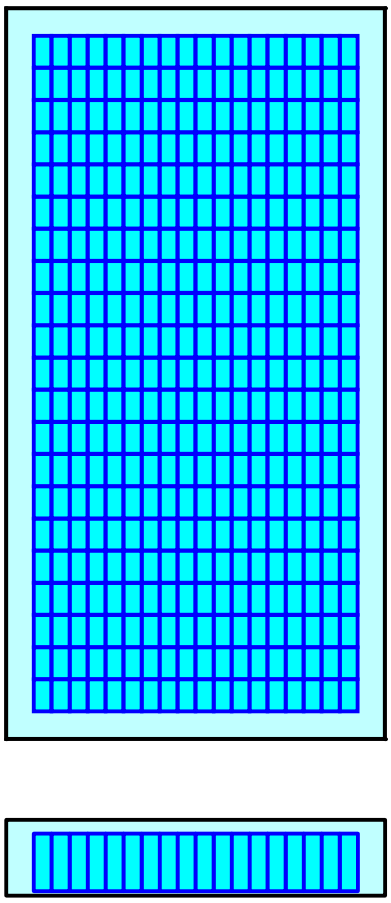
21 Chambers/Row x 2.35' Long = 49.26' Row Length +24.0" End Stone x 2 = 53.26' Base Length
18 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 27.62' Base Width
4.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.53' Field Height

378 Chambers x 12.3 cf = 4,642.4 cf Chamber Storage
378 Chambers x 12.9 cf = 4,886.8 cf Displacement

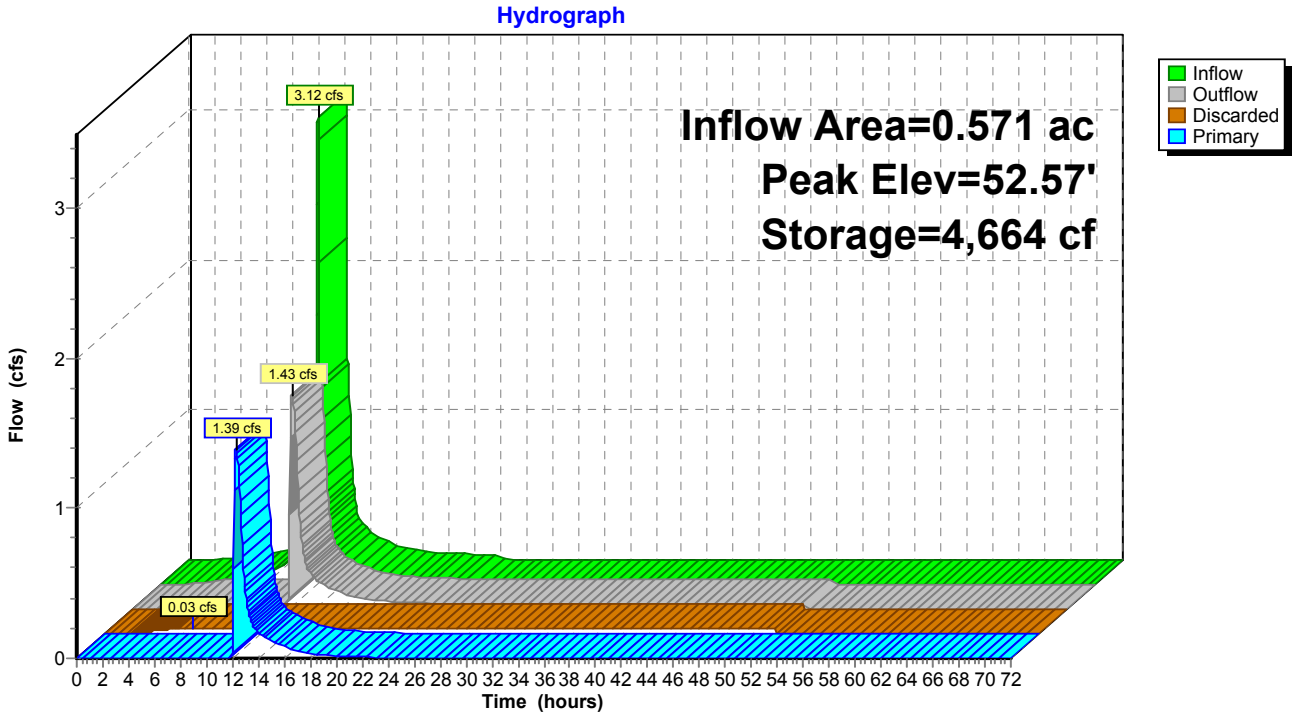
8,139.9 cf Field - 4,886.8 cf Chambers = 3,253.1 cf Stone x 40.0% Voids = 1,301.2 cf Stone Storage

Chamber Storage + Stone Storage = 5,943.7 cf = 0.136 af
Overall Storage Efficiency = 73.0%
Overall System Size = 53.26' x 27.62' x 5.53'

378 Chambers
301.5 cy Field
120.5 cy Stone



Pond P-2: P-2


Hydrograph
Inflow Area=0.571 ac
Peak Elev=52.57'
Storage=4,664 cf
3.12 cfs
1.43 cfs
1.39 cfs
0.03 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
1
2
3
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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

SubcatchmentS1: 1S Runoff Area=2,838 sf 1.48% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=75 Runoff=0.43 cfs 0.031 af

SubcatchmentS1-1: Roof, Ramp, Grotto Runoff Area=24,866 sf 91.78% Impervious Runoff Depth=8.32"
Tc=6.0 min CN=96 Runoff=4.79 cfs 0.396 af

SubcatchmentS2: 2S Runoff Area=7,877 sf 3.22% Impervious Runoff Depth=5.89"
Tc=6.0 min CN=76 Runoff=1.21 cfs 0.089 af

Reach 1R: Catch Basin Washington Street Inflow=2.74 cfs 0.284 af
Outflow=2.74 cfs 0.284 af

Reach 2R: PL Vacant Lot Inflow=1.21 cfs 0.089 af
Outflow=1.21 cfs 0.089 af

Pond P-1: P-1 Peak Elev=54.05' Storage=750 cf Inflow=4.79 cfs 0.396 af
12.0" Round Culvert n=0.012 L=7.0' S=0.0214 '/' Outflow=4.28 cfs 0.396 af

Pond P-2: P-2 Peak Elev=53.79' Storage=5,741 cf Inflow=4.28 cfs 0.396 af
Discarded=0.03 cfs 0.143 af Primary=2.50 cfs 0.253 af Outflow=2.53 cfs 0.396 af

Total Runoff Area = 0.817 ac Runoff Volume = 0.516 af Average Runoff Depth = 7.58"
35.03% Pervious = 0.286 ac 64.97% Impervious = 0.531 ac

Summary for Subcatchment S1: 1S

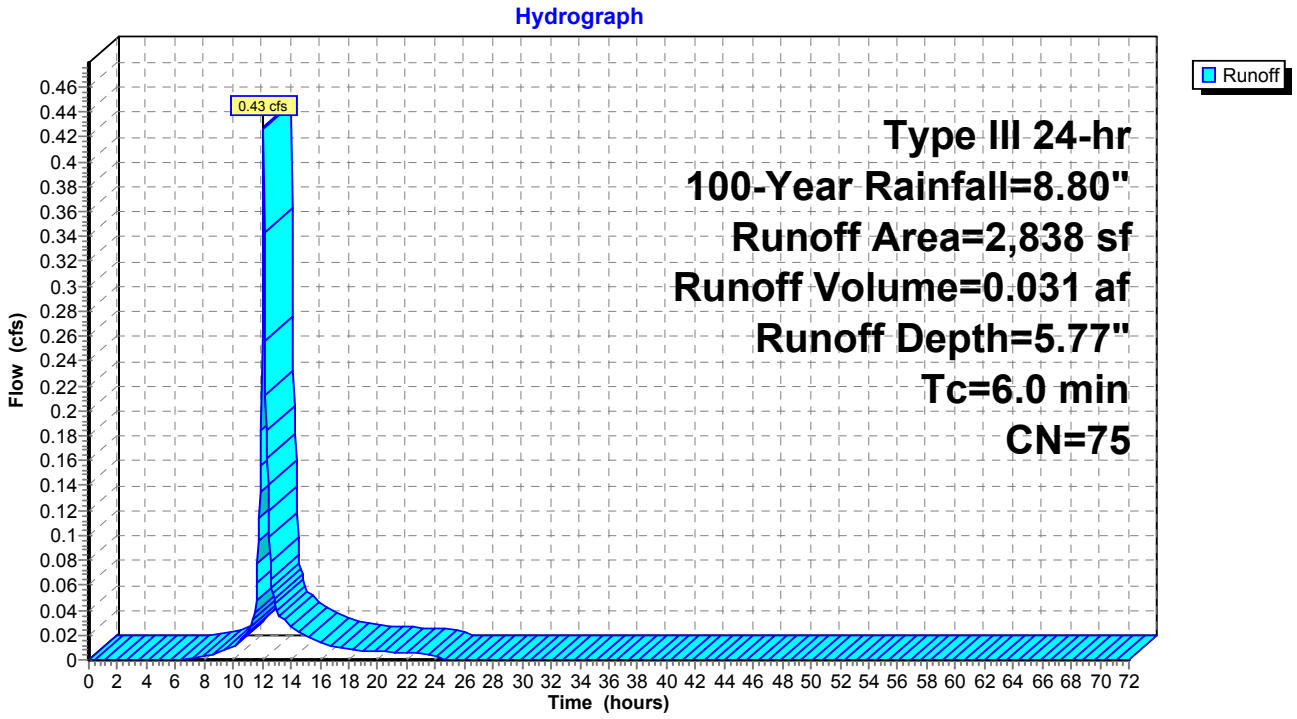
Runoff = 0.43 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 5.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	1,119	70	Woods, Good, HSG C (OFFSITE)
*	774	74	>75% Grass cover, Good, HSG C (OFFSITE)
	607	74	>75% Grass cover, Good, HSG C
	296	96	Gravel surface, HSG C
*	42	98	Sidewalk, HSG C
	2,838	75	Weighted Average
	2,796		98.52% Pervious Area
	42		1.48% Impervious Area

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

Subcatchment S1: 1S



Summary for Subcatchment S1-1: Roof, Ramp, Grotto

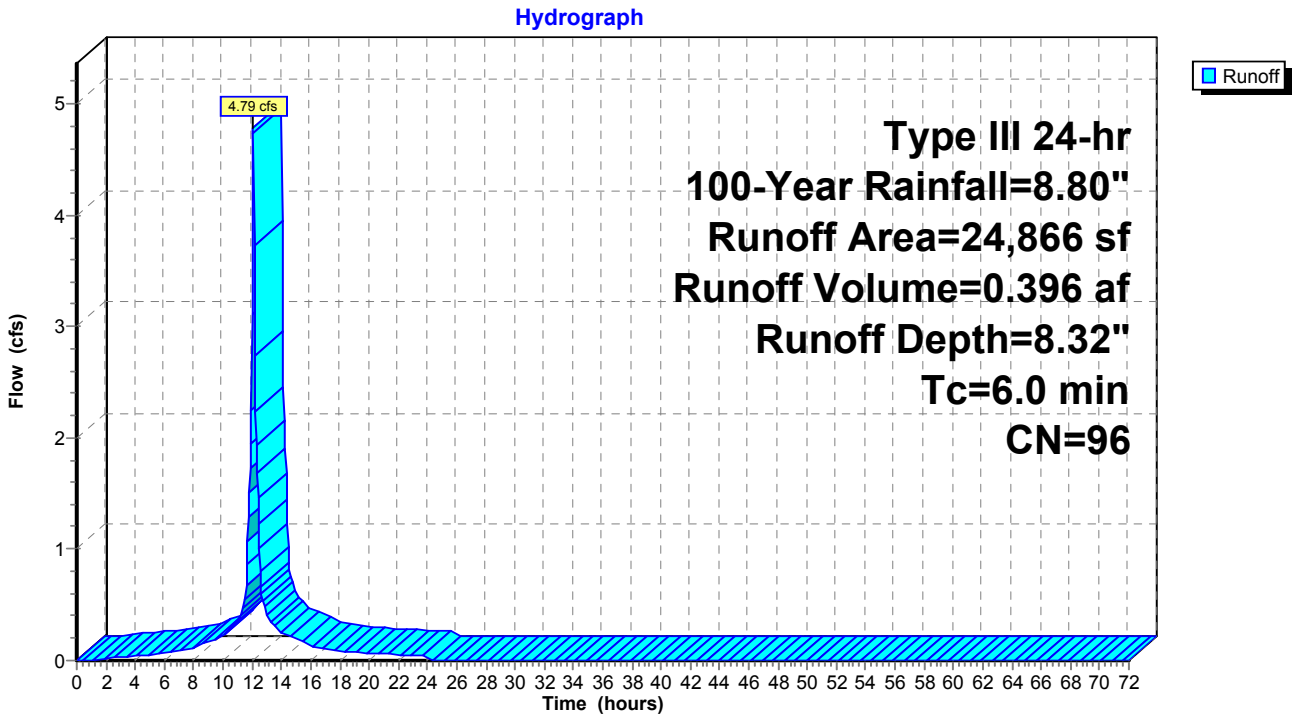
Runoff = 4.79 cfs @ 12.09 hrs, Volume= 0.396 af, Depth= 8.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
	20,405	98	Roofs, HSG C
*	2,216	98	Parking garage ramp, HSG C
	2,044	74	>75% Grass cover, Good, HSG C
*	201	98	Wall, HSC C
	24,866	96	Weighted Average
	2,044		8.22% Pervious Area
	22,822		91.78% Impervious Area

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

Subcatchment S1-1: Roof, Ramp, Grotto



Summary for Subcatchment S2: 2S

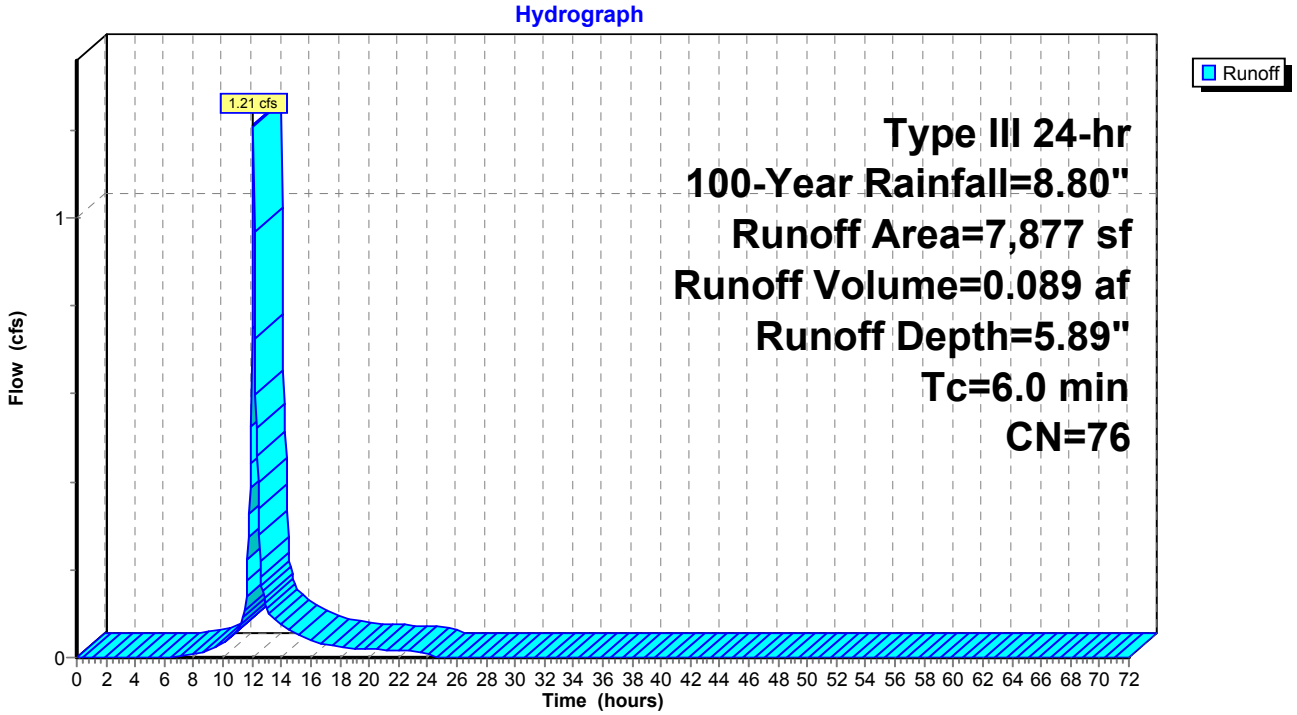
Runoff = 1.21 cfs @ 12.09 hrs, Volume= 0.089 af, Depth= 5.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.80"

	Area (sf)	CN	Description
*	5,980	74	>75% Grass cover, Good, HSG C (OFFSITE)
*	254	98	Roofs, HSG C (OFFSITE)
	402	96	Gravel surface, HSG C
	1,241	74	>75% Grass cover, Good, HSG C
	7,877	76	Weighted Average
	7,623		96.78% Pervious Area
	254		3.22% Impervious Area

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

Subcatchment S2: 2S

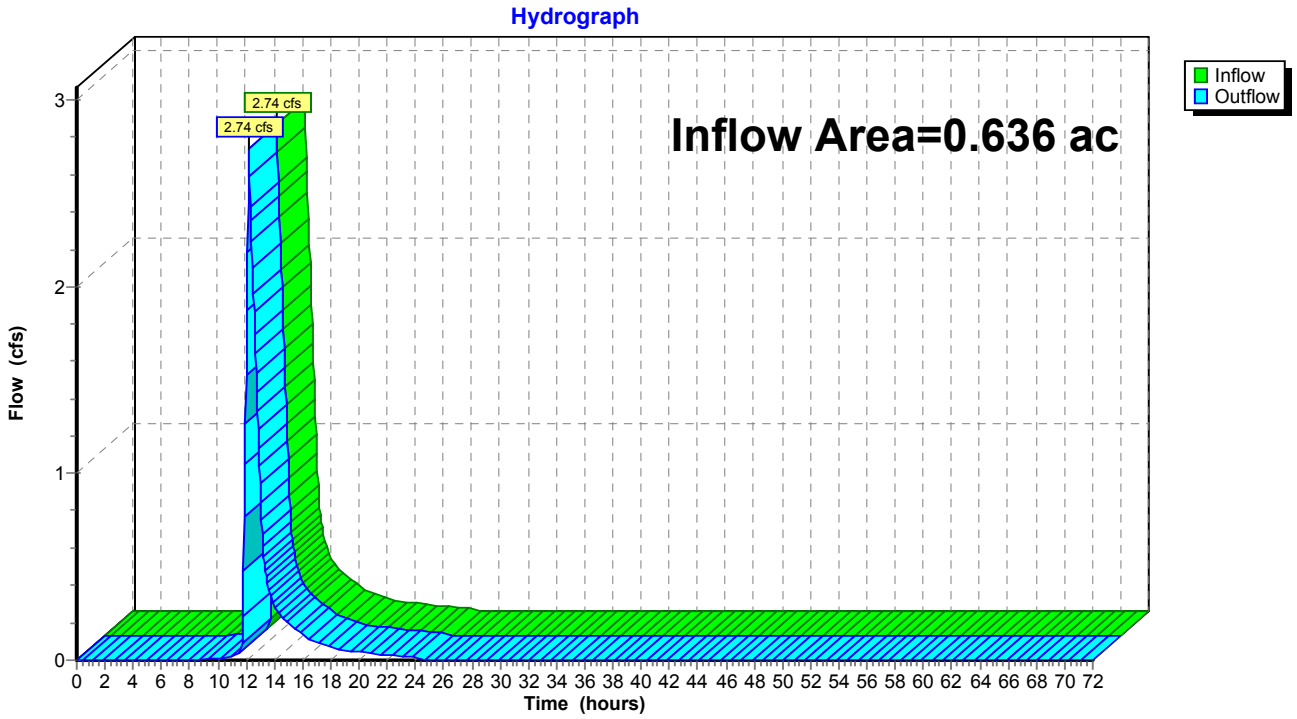


Summary for Reach 1R: Catch Basin Washington Street

Inflow Area = 0.636 ac, 82.53% Impervious, Inflow Depth = 5.36" for 100-Year event
Inflow = 2.74 cfs @ 12.21 hrs, Volume= 0.284 af
Outflow = 2.74 cfs @ 12.21 hrs, Volume= 0.284 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 1R: Catch Basin Washington Street

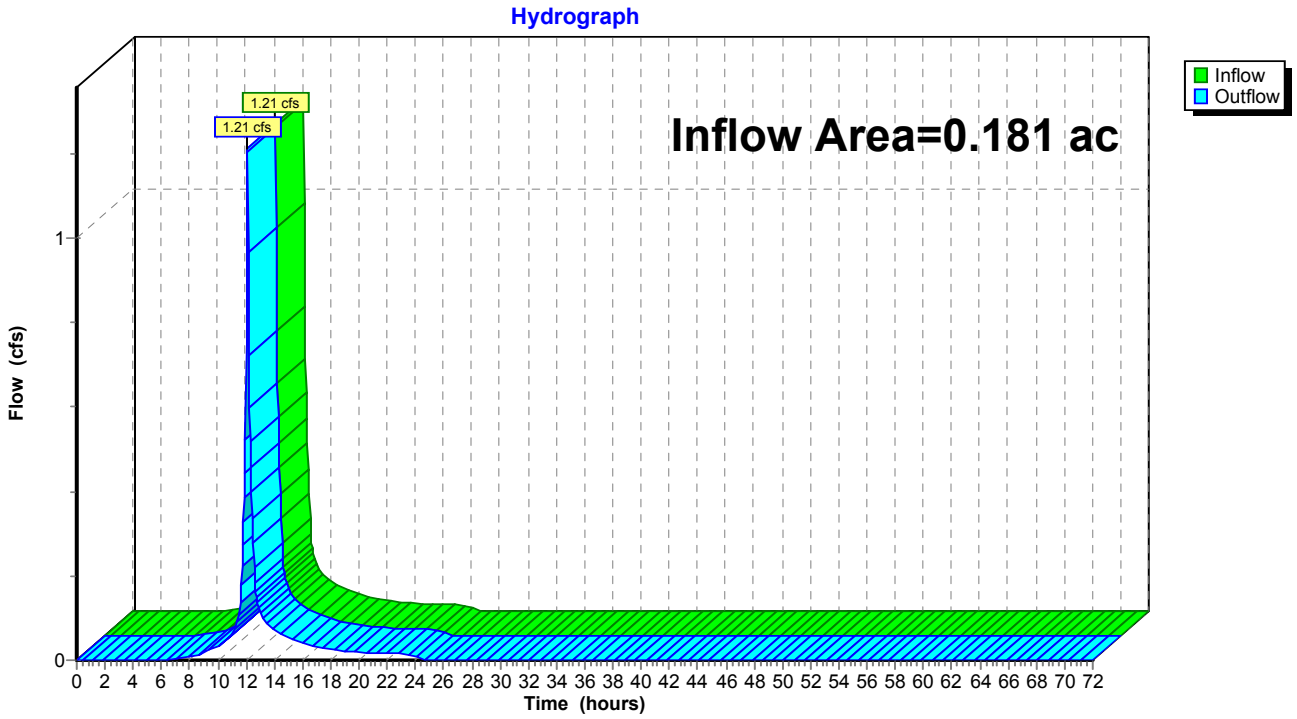


Summary for Reach 2R: PL Vacant Lot

Inflow Area = 0.181 ac, 3.22% Impervious, Inflow Depth = 5.89" for 100-Year event
Inflow = 1.21 cfs @ 12.09 hrs, Volume= 0.089 af
Outflow = 1.21 cfs @ 12.09 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Reach 2R: PL Vacant Lot



Summary for Pond P-1: P-1

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 8.32" for 100-Year event
Inflow = 4.79 cfs @ 12.09 hrs, Volume= 0.396 af
Outflow = 4.28 cfs @ 12.11 hrs, Volume= 0.396 af, Atten= 11%, Lag= 1.6 min
Primary = 4.28 cfs @ 12.11 hrs, Volume= 0.396 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 54.05' @ 12.15 hrs Surf.Area= 521 sf Storage= 750 cf

Plug-Flow detention time= 8.0 min calculated for 0.396 af (100% of inflow)
Center-of-Mass det. time= 7.1 min (757.7 - 750.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	51.65'	328 cf	**11.87'W x 43.88'L x 2.44'H Field A** 1,273 cf Overall - 453 cf Embedded = 820 cf x 40.0% Voids
#2A	51.65'	431 cf	**ACF R-Tank HD 1** x 102 Inside #1 Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf 102 Chambers in 6 Rows
		759 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	51.65'	**12.0" Round Culvert** L= 7.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 51.65' / 51.50' S= 0.0214 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=3.51 cfs @ 12.11 hrs HW=53.96' TW=53.10' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.51 cfs @ 4.47 fps)

Pond P-1: P-1 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 1 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 17.3"H => 1.80 sf x 2.35'L = 4.2 cf
Outside= 15.7"W x 17.3"H => 1.89 sf x 2.35'L = 4.4 cf

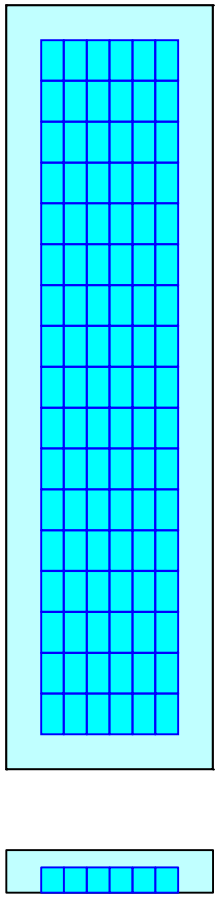
17 Chambers/Row x 2.35' Long = 39.88' Row Length +24.0" End Stone x 2 = 43.88' Base Length
6 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 11.87' Base Width
17.3" Chamber Height + 12.0" Stone Cover = 2.44' Field Height

102 Chambers x 4.2 cf = 430.6 cf Chamber Storage
102 Chambers x 4.4 cf = 453.3 cf Displacement

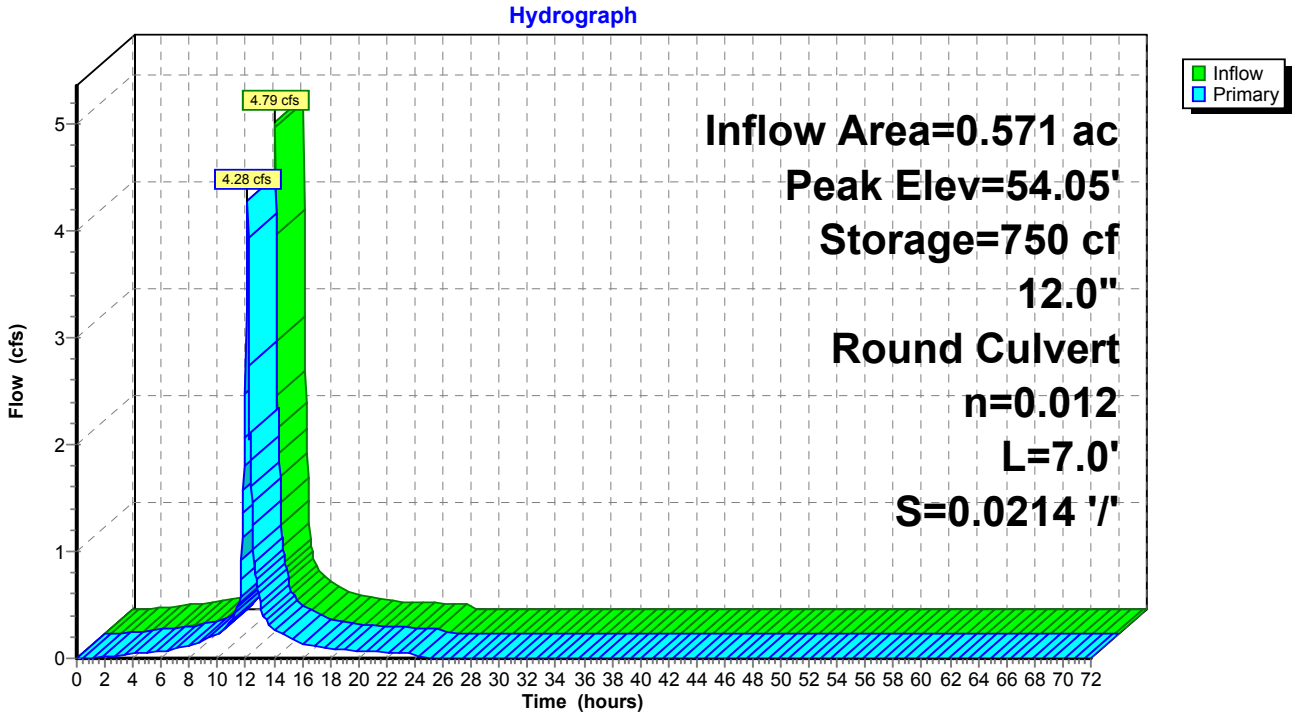
1,273.1 cf Field - 453.3 cf Chambers = 819.8 cf Stone x 40.0% Voids = 327.9 cf Stone Storage

Chamber Storage + Stone Storage = 758.6 cf = 0.017 af
Overall Storage Efficiency = 59.6%
Overall System Size = 43.88' x 11.87' x 2.44'

102 Chambers
47.2 cy Field
30.4 cy Stone



Pond P-1: P-1


Hydrograph
Inflow
Primary
4.79 cfs
4.28 cfs
Inflow Area=0.571 ac
Peak Elev=54.05'
Storage=750 cf
12.0"
Round Culvert
n=0.012
L=7.0'
S=0.0214 '/'
Flow (cfs)
0 1 2 3 4 5
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

Summary for Pond P-2: P-2

Inflow Area = 0.571 ac, 91.78% Impervious, Inflow Depth = 8.32" for 100-Year event
Inflow = 4.28 cfs @ 12.11 hrs, Volume= 0.396 af
Outflow = 2.53 cfs @ 12.21 hrs, Volume= 0.396 af, Atten= 41%, Lag= 6.1 min
Discarded = 0.03 cfs @ 4.75 hrs, Volume= 0.143 af
Primary = 2.50 cfs @ 12.21 hrs, Volume= 0.253 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 53.79' @ 12.22 hrs Surf.Area= 1,471 sf Storage= 5,741 cf

Plug-Flow detention time= 353.8 min calculated for 0.396 af (100% of inflow)
Center-of-Mass det. time= 354.7 min (1,112.4 - 757.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	48.60'	1,301 cf	**27.62'W x 53.26'L x 5.53'H Field A** 8,140 cf Overall - 4,887 cf Embedded = 3,253 cf x 40.0% Voids
#2A	48.93'	4,642 cf	**ACF R-Tank HD 3** x 378 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 378 Chambers in 18 Rows
		5,944 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	46.90'	**12.0" Round Culvert** L= 20.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 46.90' / 46.64' S= 0.0130 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	51.55'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	53.70'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Discarded	48.60'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 4.75 hrs HW=48.66' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.44 cfs @ 12.21 hrs HW=53.75' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.44 cfs of 9.53 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.30 cfs @ 6.58 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.15 cfs @ 0.74 fps)

Pond P-2: P-2 - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

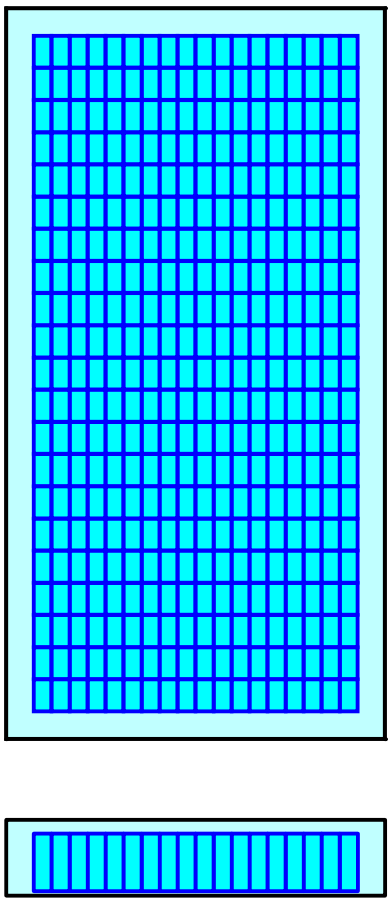
21 Chambers/Row x 2.35' Long = 49.26' Row Length +24.0" End Stone x 2 = 53.26' Base Length
18 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 27.62' Base Width
4.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.53' Field Height

378 Chambers x 12.3 cf = 4,642.4 cf Chamber Storage
378 Chambers x 12.9 cf = 4,886.8 cf Displacement

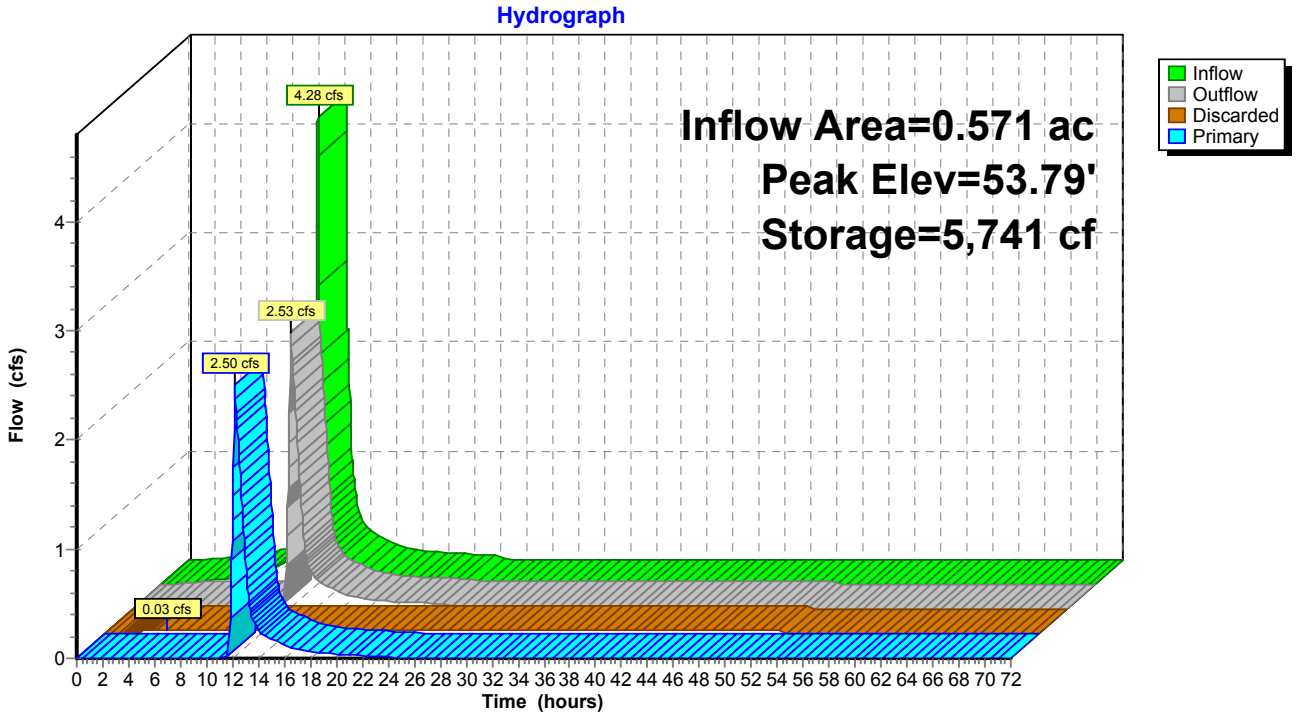
8,139.9 cf Field - 4,886.8 cf Chambers = 3,253.1 cf Stone x 40.0% Voids = 1,301.2 cf Stone Storage

Chamber Storage + Stone Storage = 5,943.7 cf = 0.136 af
Overall Storage Efficiency = 73.0%
Overall System Size = 53.26' x 27.62' x 5.53'

378 Chambers
301.5 cy Field
120.5 cy Stone



Pond P-2: P-2


Hydrograph
Inflow Area=0.571 ac
Peak Elev=53.79'
Storage=5,741 cf
4.28 cfs
2.53 cfs
2.50 cfs
0.03 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

A P P E N D I X C

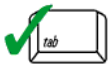
Checklist for Stormwater Report

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.

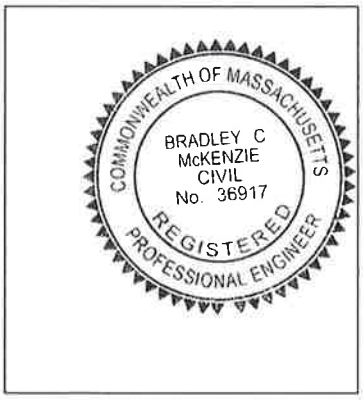
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Signature and Date 10-28-2020

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 Weymouthl Conservation Commission that I have not witnessed, nor am aware of any existing illicit discharges at the site known as Parcel ID 20-266-8 in Weymouth, Massachusetts. I also hereby certify that the development of said property as illustrated on the final plans entitled "Proposed Mixed Use Building, Assessor's Parcel ID 20-266-8, 122 Washington Street, Weymouth, Massachusetts," prepared by McKenzie Engineering Group. Inc. dated August 18, 2020 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 August 18, 2020 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: President

Signature:

Date: 10-28-2020

MCKENZIE ENGINEERING GROUP

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

122 WASHINGTON STREET
ASSESSORS PARCEL ID 20-266-8
WEYMOUTH, MA

8/18/2020
REVISED 10/28/2020

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		0.35	22,822	0.25		0.10		475
		0.60		0.35		0.25		0.10		0
		0.60		0.35		0.25		0.10		0
							TOTAL			**475**

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	22,822	22,822	100.00%	**NO CAPTURE ADJUSTMENT**	1.00	475

* Required Water Quality Volume based on 0.5 inches of runoff; Required Recharge Volume based on 0.25 (0.25<0.50); Target Volume is Required Water Quality Volume of 910 CF

PROVIDED RECHARGE VOLUME (CF)
BELOW LOWEST INVERT

	REQUIRED RECHARGE VOLUME (CF)	POND	STORAGE VOLUME PROVIDED (CF)	NET STORAGE VOLUME PROVIDED (CF)
	951	P-2	3,411	2,460
TOTAL	**951**		**3,411**	**2,460**

Stage-Area-Storage for Pond P-2: P-2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
48.60	**1,471**	0
48.70	1,471	59
48.80	1,471	118
48.90	1,471	177
49.00	1,471	278
49.10	1,471	401
49.20	1,471	524
49.30	1,471	647
49.40	1,471	769
49.50	1,471	892
49.60	1,471	1,015
49.70	1,471	1,138
49.80	1,471	1,261
49.90	1,471	1,384
50.00	1,471	1,507
50.10	1,471	1,629
50.20	1,471	1,752
50.30	1,471	1,875
50.40	1,471	1,998
50.50	1,471	2,121
50.60	1,471	2,244
50.70	1,471	2,367
50.80	1,471	2,489
50.90	1,471	2,612
51.00	1,471	2,735
51.10	1,471	2,858
51.20	1,471	2,981
51.30	1,471	3,104
51.40	1,471	3,226
51.50	1,471	3,349
51.60	1,471	3,472
51.70	1,471	3,595
51.80	1,471	3,718
51.90	1,471	3,841
52.00	1,471	3,964
52.10	1,471	4,086
52.20	1,471	4,209
52.30	1,471	4,332
52.40	1,471	4,455
52.50	1,471	4,578
52.60	1,471	4,701
52.70	1,471	4,823
52.80	1,471	4,946
52.90	1,471	5,069
53.00	1,471	5,192
53.10	1,471	5,315
53.20	1,471	5,395
53.30	1,471	5,454
53.40	1,471	5,512
53.50	1,471	5,571
53.60	1,471	5,630
53.70	1,471	5,689
53.80	1,471	5,748
53.90	1,471	5,807
54.00	1,471	5,866
54.10	1,471	**5,924**

MCKENZIE ENGINEERING GROUP

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

122 WASHINGTON STREET
ASSESSORS PARCEL ID 20-266-8
WEYMOUTH, MA

8/18/2020
REVISED 10/28/2020

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-2	22,822	0.50	951	3,411	2,460
TOTAL	**22,822**		**951**	**3,411**	**2,460**

WATER QUALITY VOLUME ANALYSIS - PROPRIETARY STORMWATER TREATMENTS UNITS (FIRST DEFENSE UNITS)

WATERSHED	IMPERVIOUS AREA (SF) CN=98	PRECIPITATION (IN)	qu (Fig 4) Tc 6 min. (CSM/IN)	AREA (SM)	WATER QUALITY REQUIRED (CFS)
P-2	22,822	0.50	774	8.186E-04	0.317

*Use 4' Diameter First Defense Units

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)	Tc (Hours)	qu (csm/in)	Tc (Hours)	qu (csm/in)
0.01	835	2.7	197	7.1	95
0.03	835	2.8	192	7.2	94
0.05	831	2.9	187	7.3	93
0.067	814	3	183	7.4	92
0.083	795	3.1	179	7.5	91
0.1	774	3.2	175	7.6	90
0.116	755	3.3	171	7.7	89
0.133	736	3.4	168	7.8	88
0.15	717	3.5	164	7.9	87
0.167	700	3.6	161	8	86
0.183	685	3.7	158	8.1	85
0.2	669	3.8	155	8.2	84
0.217	654	3.9	152	8.3	84
0.233	641	4	149	8.4	83
0.25	628	4.1	146	8.5	82
0.3	593	4.2	144	8.6	81
0.333	572	4.3	141	8.7	80
0.35	563	4.4	139	8.8	79
0.4	536	4.5	137	8.9	79
0.416	528	4.6	134	9	78
0.5	491	4.7	132	9.1	77
0.583	460	4.8	130	9.2	76
0.6	454	4.9	128	9.3	76
0.667	433	5	126	9.4	75
0.7	424	5.1	124	9.5	74
0.8	398	5.2	122	9.6	74
0.9	376	5.3	120	9.7	73
1	356	5.4	119	9.8	72
1.1	339	5.5	117	9.9	72
1.2	323	5.6	115	10	71
1.3	309	5.7	114		
1.4	296	5.8	112		
1.5	285	5.9	111		
1.6	274	6	109		
1.7	264	6.1	108		
1.8	255	6.2	106		
1.9	247	6.3	105		
2	239	6.4	104		
2.1	232	6.5	102		
2.2	225	6.6	101		
2.3	219	6.7	100		
2.4	213	6.8	99		
2.5	207	6.9	98		
2.6	202	7	96		

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

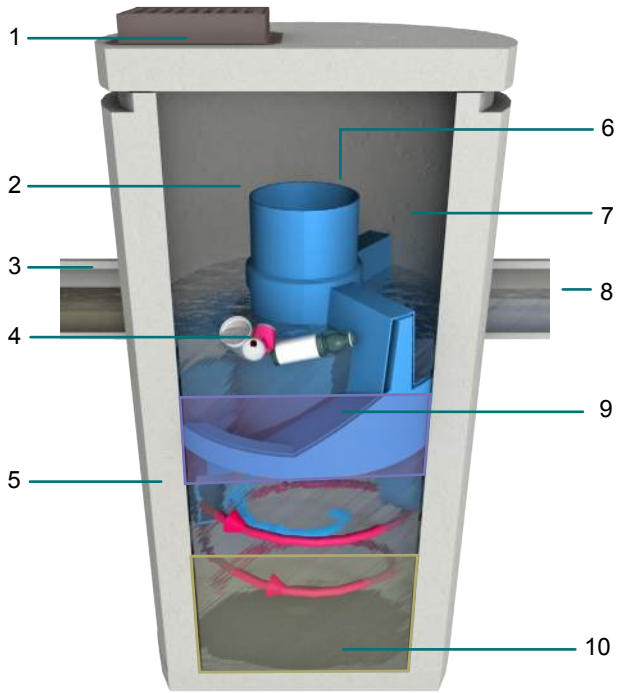


Fig.1 The First Defense® has internal components designed to efficiently capture pollutants and prevent washout at peak flows.

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**.

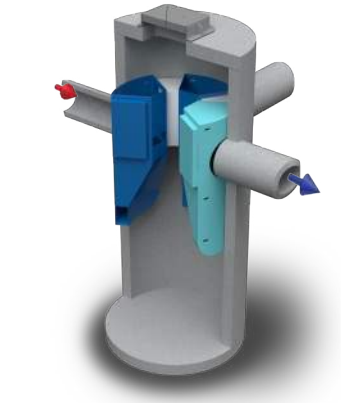


Fig.3a Inlet configurations for all models include options for inlet grates and multiple inlet pipes.

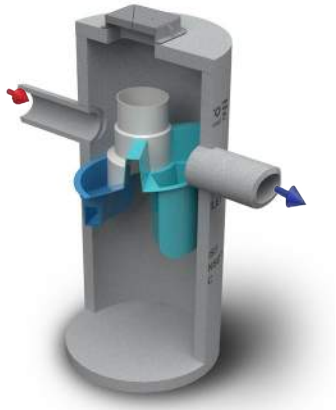


Fig.3b First Defense®-*HC* with higher capacity internal bypass and larger maximum pipe diameter.

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

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122 WASHINGTON STREET
ASSESSORS PARCEL ID 20-266-8
WEYMOUTH, MA

8/18/2020
REVISED 10/28/2020

DRAWDOWN WITHIN 72 HOURS ANALYSIS

POND	RAWLS RATE (IN/HR)	STORAGE VOLUME PROVIDED (CF)	BOTTOM AREA (FT2)	DRAWDOWN (HR)
P-2	1.02	3,411	1,674	24

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Norwell, MA 02061

Standard 4: Pretreatment Subsurface Chamber P-1

NAME: 122 Washington Street
Weymouth, MA
CLIENT: EJS Investments, Inc.
COUNTY: Plymouth

Proj. No.: 220-124
Date: 8/18/2020
Revised: 10/28/2020
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice	**0.70**	**1.00**	**0.70**	**0.30**

Total TSS Removal = **70%**

*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

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

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

NAME: 122 Washington Street
Weymouth, MA
CLIENT: EJS Investments, Inc.
COUNTY: Plymouth

Proj. No.: 220-124
Date: 8/18/2020
Revised: 10/28/2020
Computed by: SBS
Checked by: BCM

TSS Removal Calculation Worksheet

B BMP	C TSS Removal Rate	D Starting TSS Load (*F)	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice	**0.70**	**1.00**	**0.70**	**0.30**
Subsurface Infiltration Structure	**0.80**	**0.30**	**0.24**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**

Total TSS Removal = **94%**

*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.

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

Storm Drainage Computations

Name: 122 WASHINGTON STREET
ASSESSORS PARCEL ID 20-266-9
Client: EJS INVESTMENTS, INC

Proj. No.: **220-124**
Date: **18-Aug-20** **10/28/2020**
Computed by: **SBS**
Checked by: **BCM**

Design Parameters:
100 **Year Storm** Boston, MA
k_e= **0.5**

NOTE:

FD=First Defense Unit

DESCRIPTION	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE						
	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft
	TD-1	DMH-1	0.571	0.85	0.49	0.49	0.00	6.0	7.0	3.4	6.8	0.012	12	0.0250	6.1	7.8	2	0.05	59.60	57.60	57.55	57.8	1.8
	DMH-1	FD-1	-	-	-	0.49	0.13	6.0	7.0	3.4	7.9	0.012	12	0.0380	7.5	9.6	59	2.24	59.18	54.15	51.90	54.0	5.2
	FD-1	P-1	-	-	-	0.49	0.01	6.1	7.0	3.4	7.4	0.012	12	0.0330	7.0	8.9	3	0.10	54.80	51.90	51.80	53.5	1.3
	P-1	P-2	-	-	-	0.61	0.02	6.0	7.0	4.3	6.5	0.013	12	0.0210	5.2	6.6	7	0.15	55.00	49.00	48.85	50.1	4.9
	P-2	DMH-2	-	-	-	0.36	0.02	6.0	7.0	2.5	5.0	0.013	12	0.0160	4.5	5.7	6	0.10	55.00	49.00	48.90	50.1	4.9
	DMH-2	DMH-3	-	-	-	0.36	0.07	6.0	7.0	2.5	4.6	0.013	12	0.0130	4.1	5.2	20	0.26	54.80	46.90	46.64	47.1	7.7

A P P E N D I X E

Soil Testing Data

Commonwealth of Massachusetts
City/Town of

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

A. Facility Information

Sathuan Sa
Owner Name

122 Washington Street
Street Address

Parcel ID 20-268-8
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): 6/11/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Wayland well 2R

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 #) | 6/12/20 (Date) | 9:30AM (Time) | 75 Sunny (Weather) | 42°13'05"N (Latitude) | 70°57'56"W (Longitude:)

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

Description of Location: Parking Lot - Left of House

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 _____ 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			
0-68"	Urban Fill	--	--	-	-	-	10	40	Loose	Fri	
68-140"	C	FSL	10YR 5/3	-	-	-	5	25	Mass	Fri	Fine Sand Loam Ablation Till

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 #) | 6/12/20 (Date) | 10:00AM (Time) | 75 Sunny (Weather) | 42°13'05"N (Latitude) | 70°57'56"W (Longitude:)

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

Description of Location: Parking Lot/Landscaping - near 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 10' 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: _____ 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			
0-68"	Urban Fill	--	--	-	-	-	10	40	Loose	Fri	
68-130"	C	FSL	10YR 5/3	-	-	-	5	15	Mass	Fri	Fine Sand Loam Ablation Till

Additional Notes: Groundwater not seen, stony fill over till over bedrock

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)	140+ inches	130+ 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: 140 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: 68"/72" inches Lower boundary: 130"+ 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

Signature of Soil Evaluator

Date

Austin Chartier, PE SE#14167

Typed or Printed Name of Soil Evaluator / License #

6/30/2023

Expiration Date of License

None

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

Sathuan Sa
Owner Name

122 Washington Street
Street Address

Parcel ID 20-268-8
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): 6/11/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Wayland well 2R

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 #) | 6/12/20 (Date) | 10:30AM (Time) | 75 Sunny (Weather) | 42°13'05"N (Latitude) | 70°57'56"W (Longitude:)

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

Description of Location: Rear center of Parking Lot -in grass

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 _____ 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			
0-40"	Urban Fill	--	--	-	-	-	10	40	Loose	Fri	
40"+	Ledge Outcrop	--	--	-	-	-	--	--	--	--	Refusal/Bedrock

Additional Notes: Fill over bedrock, not wet

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 #) | 6/12/20 (Date) | 11:00AM (Time) | 75 Sunny (Weather) | 42°13'05"N (Latitude) | 70°57'56"W (Longitude:)

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

Description of Location: Rear left of Parking Lot - in grass

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 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: _____ 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			
0-60"	Urban Fill	--	--	-	-	-	10	40	Loose	Fri	
60"+	Ledge Outcrop	--	--	-	-	-	-	-	-	-	Bedrock

Additional Notes: Fill over bedrock, not wet

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)	40" 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: 140 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: _____ inches Lower boundary: 40/60" 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

Signature of Soil Evaluator

Date

Austin Chartier, PE SE#14167

Typed or Printed Name of Soil Evaluator / License #

6/30/2023

Expiration Date of License

None

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

Sathuan Sa
Owner Name

122 Washington Street
Street Address

Parcel ID 20-268-8
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): 6/11/20 (Month/Day/ Year) Range: [ ] Above Normal [X] Normal [ ] Below Normal

8. Other references reviewed: MassGIS, Wayland well 2R

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 #) | 6/12/20 (Date) | 11:30AM (Time) | 75 Sunny (Weather) | 42°13'05"N (Latitude) | 70°57'56"W (Longitude:)

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

Description of Location: Middle of lawn near shed

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			
0-20"	Urban Fill	--	--	-	-	-	10	40	Loose	Fri	
20"+	Ledge Outcrop	--	--	-	-	-	--	--	--	--	Refusal/Bedrock

Additional Notes: Fill over bedrock, not wet

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 #) | 6/12/20 (Date) | 11:45AM (Time) | 75 Sunny (Weather) | 42°13'05"N (Latitude) | 70°57'56"W (Longitude:)

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

Description of Location: Right of Shed

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 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: _____ 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			
0-20"	Urban Fill	--	--	-	-	-	10	40	Loose	Fri	
20"+	Ledge Outcrop	--	--	-	-	-	-	-	-	-	Bedrock

Additional Notes: Fill over bedrock, not wet

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)	20" inches	20" 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: 140 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: _____ inches Lower boundary: 20" 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

Signature of Soil Evaluator

Date

Austin Chartier, PE SE#14167

Typed or Printed Name of Soil Evaluator / License #

6/30/2023

Expiration Date of License

None

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:

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

122 Washington Street

In

Weymouth, Massachusetts
(Assessor's Parcel ID 20-266-8)

Submitted to:

CITY OF WEYMOUTH

Prepared for:

EJS Investments, Inc.
8 Shoreside Road
Quincy, Massachusetts 02169

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

October 28, 2020

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 "Proposed Mixed Use Building, (Assessor's Parcel ID 20-266-8), 122 Washington Street, Weymouth, Massachusetts", issued August 18, 2020 and as revised hereinafter referred to as the Site Plans.

Responsible Party Contact Information:

Stormwater Management System Owner:
EJS Investments, Inc.
8 Shoreside Road
Quincy, MA 02169
Phone: (401) 965-1744

City of Weymouth Contact Information:

Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

Weymouth Conservation Commission
City 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
City 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 Stetson Road. The construction entrance will keep mud and sediment from being tracked off the construction site onto Stetson Road 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 Stetson Road. 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 Stetson Road 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	Seeding Rate	Recommended Seeding	Seed Cover

	(lbs/1,000 sq.ft.)	(lbs/acre)	Dates	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, such as clean grain straw; 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. The preferred mulching material is straw. All netting shall be biodegradable or photodegradable.

Mulch (Hay or Straw) Materials and Installation

a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq.ft. is 90-100 lbs. (2-3 bales) and the application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

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) Straw or 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.

<u>Land Grading Stabilization Inspection/Maintenance *</u>

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 with straw applied at the rate of ½ tons per acre. 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).

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 Norwell Highway Department.

Project Location: 122 Washington Street, Parcel ID 20-266-8, 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

October 28, 2020

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	EJS Investments, Inc.
	8 Shoreside Road, Quincy, MA
Facility Manager (phone)	401-965-1744

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: EJS Investments, Inc. BEEPER: N/A _____
   PHONE: 401-965-1744 _____ 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

   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

122 Washington Street

In

Weymouth, Massachusetts
(Assessor's Parcel ID 20-266-8)

Submitted to:

CITY OF WEYMOUTH

Prepared for:

EJS Investments, Inc.
8 Shoreside Road
Quincy, Massachusetts 02169

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

October 28, 2020

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: EJS Investments, Inc.
8 Shoreside Road
Quincy, MA 02169

Developer Contact Information:
EJS Investments, Inc.
8 Shoreside Road
Quincy, MA 02169
Phone: (401) 965-1744

City of Weymouth Contact Information:
Weymouth Department of Public Works
120 Winter Street
Weymouth, MA 02188
Phone: 781-337-5100

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.

The BMP's will be owned and maintained by the Developer until such time the roadway is accepted by the City of Weymouth, then the City of Weymouth will own and maintain the BMP's located within the roadway layout.

BMPs included in the design consist of the use of:

- Deep sump catch basins with hooded outlets
- First Defense units
- Stormwater management basins
- Outlet protection at stormwater management basins
- Roadway pavement maintenance
- Restrictions on the use of pesticides and herbicides within the 100-foot buffer zone

Operation:

Once the stormwater management basins have been constructed and the subdivision roadway 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 storage portion of the basins. The stormwater management basins have been designed to attenuate peak flows for the 2-year through 100-year storm events, and will provide the required one foot of freeboard above the 100-year storm storage level.

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. Consult the Natick Board of Health for transfer station locations prior to disposing the separator contents. 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 Chamber 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 R-Tank chambers.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

5. **Trench Drains -** Trench drain 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 in accordance with all applicable regulations.

   Cost: The property owner should consult local landscape contractors for a detailed cost estimate.

6. **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.

7. **Snow Removal -** Snow accumulations removed from ramp 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 in areas 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. Annual inspection reports in the form of an Evaluation Checklist, see attached form, will be submitted to the City of Weymouth. Inspections shall be performed by a licensed engineer or similar professional (inspector).

Structural BMPs as identified on the site plans located within the roadway layout will be owned and maintained by the developer until such time that the roadway is accepted by the City of Weymouth, then the City of Weymouth will maintain the BMP's.

All BMPs located within drainage easements will be owned and maintained by the developer until such time that a homeowners association is created, then the homeowners association will maintain the BMPs.

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.
- Homeowner education outreach, including promoting recycling through the City of Weymouth Transfer Station.

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 City 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

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 City 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>**

Illicit Discharges:

Illicit discharges are non-stormwater discharges to the storm drain system which typically contain bacteria and other pollutants. All illicit discharges are prohibited. Any illicit discharges should be reported to MassDOT and/or the DPW as applicable to be addressed in accordance with their respective policies.

The following is a list of EPA allowed non-stormwater discharges. If the non-stormwater discharge is not listed, it is prohibited.

1. Water line flushing,
2. Landscape irrigation,
3. Diverted stream flows,
4. Rising ground waters,
5. Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
6. Uncontaminated pumped ground water,
7. Discharge from potable water sources,
8. Foundation drains,
9. Air conditioning condensation,
10. Irrigation water, springs,
11. Water from crawl space pumps,
12. Footing drains,
13. Lawn watering,

14. Flows from riparian habitats and wetlands,
15. Street wash water,
16. Discharges or flows from firefighting activities occur during emergency conditions.

Project Location: 122 Washington Street, Assessor's Parcel ID 20-266-8, 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 Chambers	After heavy rainfall events (minimum semi-annually)			1. Sediment build-up 2. Standing Water greater than 48 hours			
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

October 28, 2020

Initial Notification

In the event of a spill, the facility manager will be notified immediately.

Facility Managers (name)	EJS Investments, Inc.
	8 Shoreside Road, Quincy, MA
Facility Manager (phone)	401-965-1744

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: EJS Investments, Inc. BEEPER: N/A _____
   PHONE: 401-965-1744 _____ 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

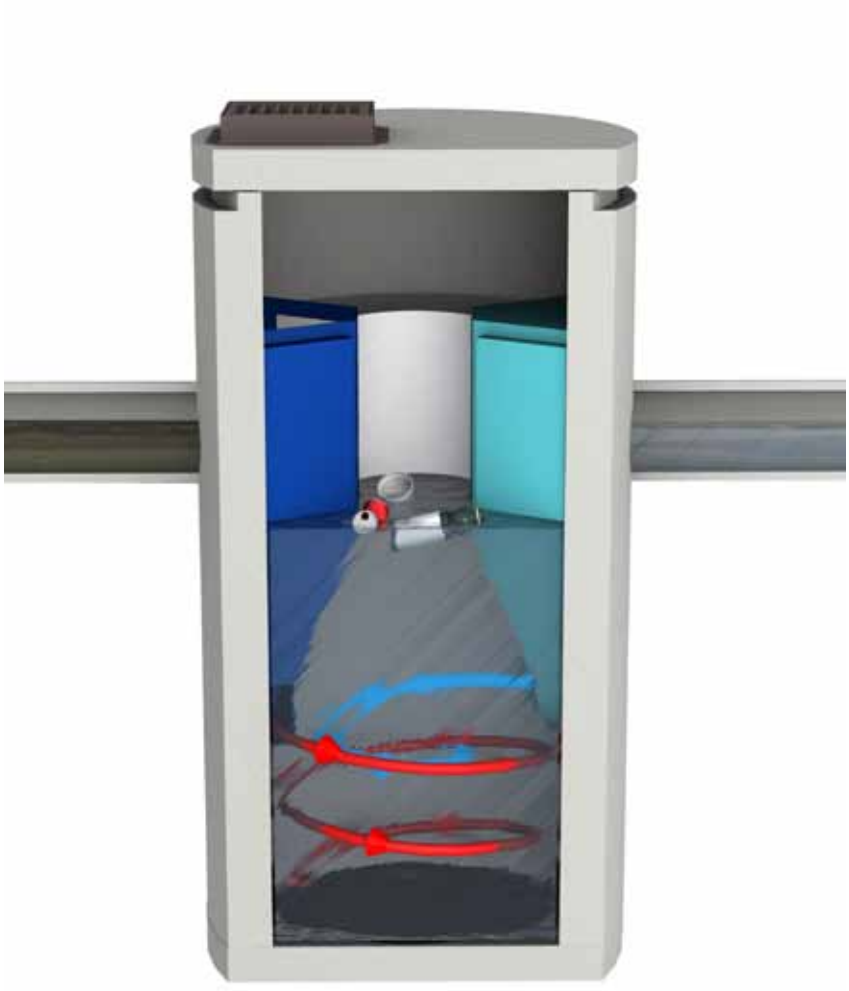
   CONSERVATION COMMISSION
   CONTACT: Mary Ellen Schloss
   BUSINESS: (781) 340-5007

   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

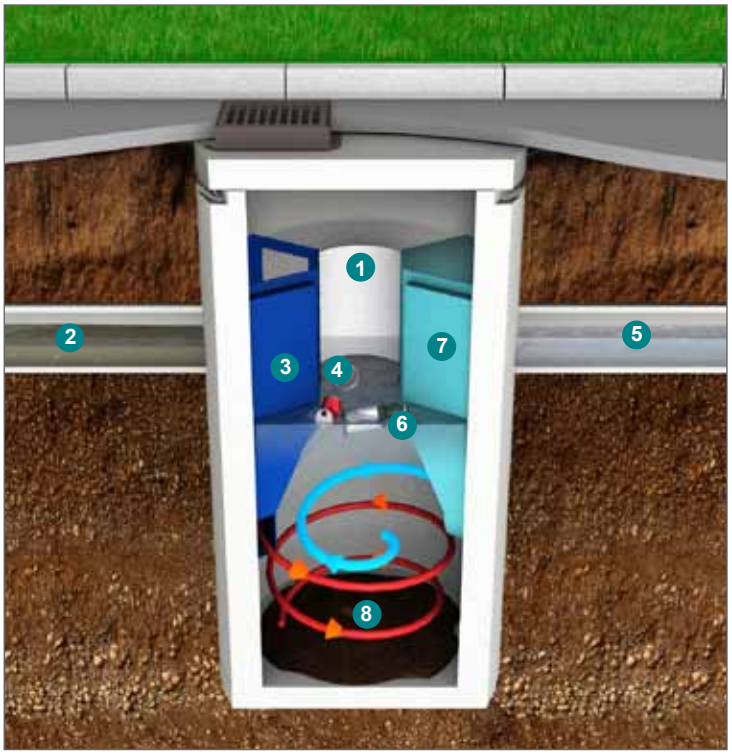
1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port (not pictured)**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Outlet Chute**
8. **Sediment Storage**

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.

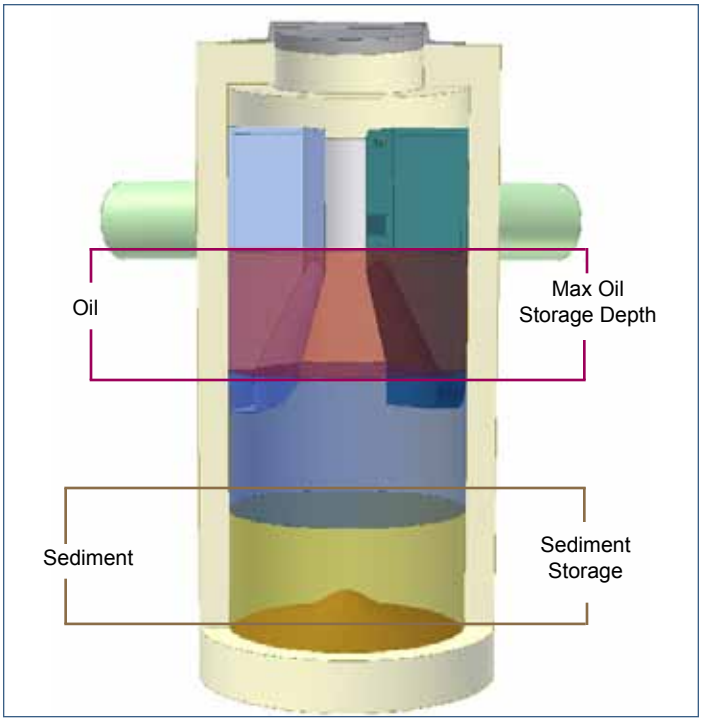


Fig.1 Pollutant storage volumes in the First Defense®.

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.

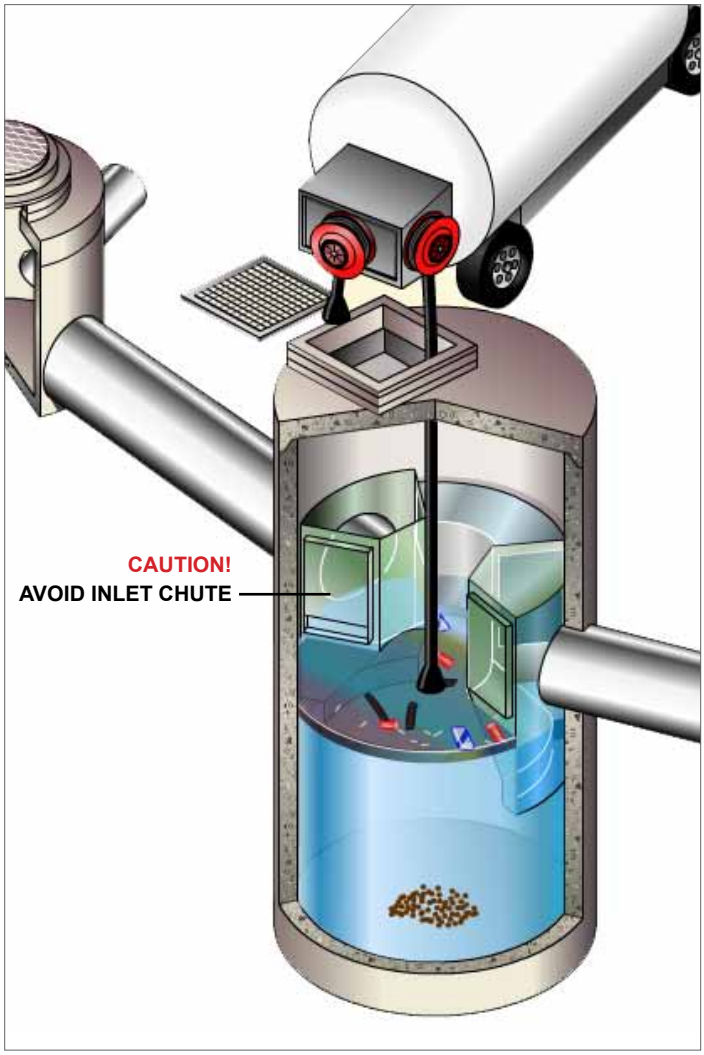


Fig.2 Floatables are removed with a vactor hose.

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.

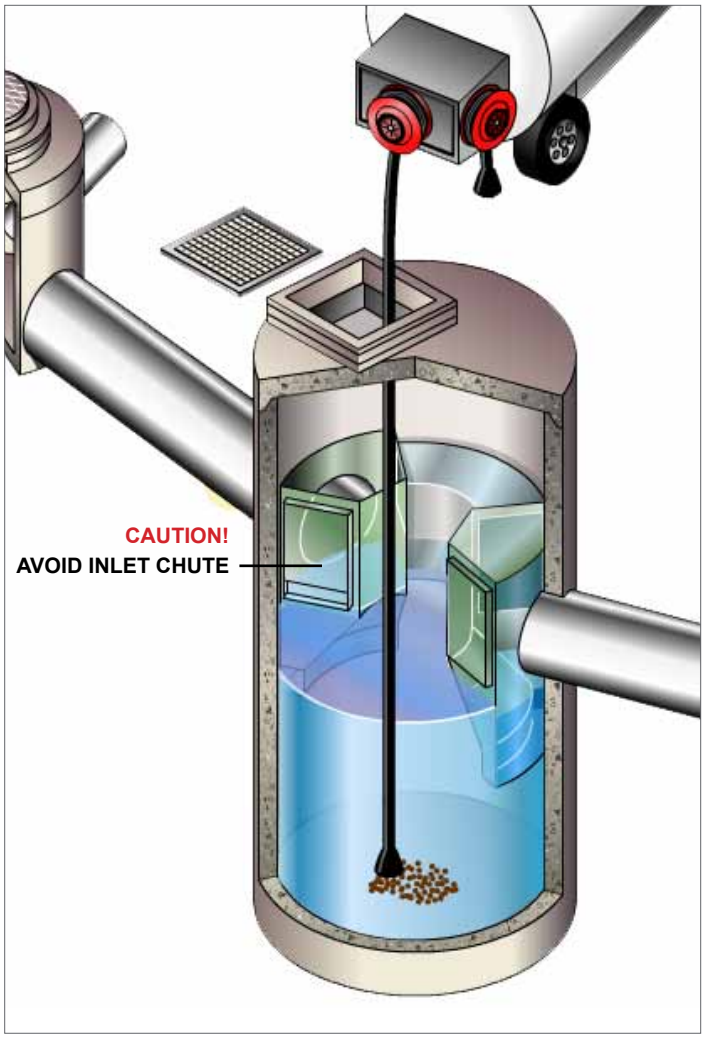


Fig.3 Sediment is removed with a vactor hose

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

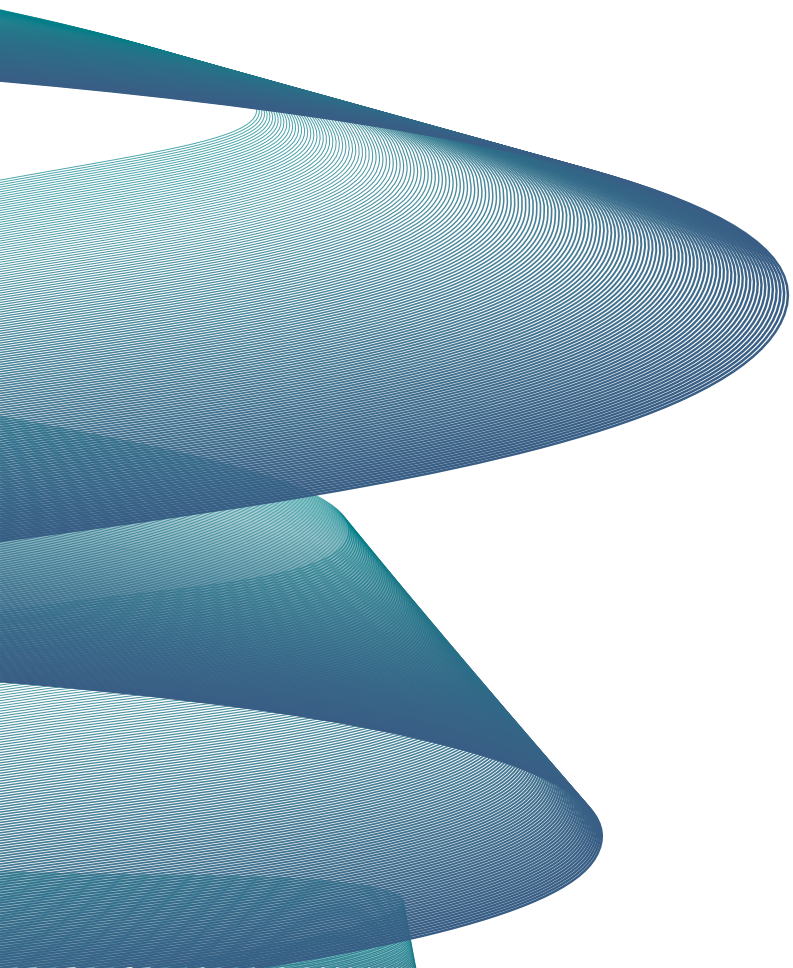
Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

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

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

FD_O+M_B1209

R-TANK OPERATION, INSPECTION & MAINTENANCE

Operation

Your ACF R-Tank System has been designed to function in conjunction with the engineered drainage system on your site, the existing municipal infrastructure, and/or the existing soils and geography of the receiving watershed. Unless your site included certain unique and rare features, the operation of your R-Tank System will be driven by naturally occurring systems and will function autonomously. However, upholding a proper schedule of Inspection & Maintenance is critical to ensuring continued functionality and optimum performance of the system.

Inspection

Both the R-Tank and all stormwater pre-treatment features incorporated into your site must be inspected regularly. Inspection frequency for your system must be determined based on the contributing drainage area, but should never exceed one year between inspections (six months during the first year of operation).

Inspections may be required more frequently for pre-treatment systems. You should refer to the manufacturer requirements for the proper inspection schedule.

With the right equipment your inspection and measurements can be accomplished from the surface without physically entering any confined spaces. If your inspection does require confined space entry, you MUST follow all local/regional requirements as well as OSHA standards.

R-Tank Systems may incorporate Inspection Ports, Maintenance Ports, and/or adjoining manholes. Each of these features are easily accessed by removing the lid at the surface. With the cover removed, a visual inspection can be performed to identify sediment deposits within the structure. Using a flashlight, ALL access points should be examined to complete a thorough inspection.

Inspection Ports
Usually located centrally in the R-Tank System, these perforated columns are designed to give the user a base-line sediment depth across the system floor.

Maintenance Ports
Usually located near the inlet and outlet connections, you'll likely find deeper deposits of heavier sediments when compared to the Inspection Ports.

Manholes
Most systems will include at least two manholes - one at the inlet and another at the outlet. There may be more than one location where stormwater enters the system, which would result in additional manholes to inspect.

Bear in mind that these manholes often include a sump below the invert of the pipe connecting to the R-Tank. These sumps are designed to capture sediment before it reaches the R-Tank, and they should be kept clean to ensure they function properly. However, existence of sediment in the sump does NOT necessarily mean sediment has accumulated in the R-Tank.

After inspecting the bottom of the structure, use a mirror on a pole (or some other device) to check for sediment or debris in the pipe connecting to the R-Tank.

R-TANK OPERATION INSPECTION & MAINTENANCE

If sediment or debris is observed in any of these structures, you should determine the depth of the material. This is typically accomplished with a stadia rod, but you should determine the best way to obtain the measurement.

All observations and measurements should be recorded on an Inspection Log kept on file. We've included a form you can use at the end of this guideline.

Maintenance

The R-Tank System should be back-flushed once sediment accumulation has reached 6" or 15% of the total system height. Use the chart below as a guideline to determine the point at which maintenance is required on your system.

R-Tank Unit	Height	Max Sediment Dept
Mini	9.5"	1.5"
Single	17"	3"
Double	34"	5"
Triple	50"	6"
Quad	67"	6"
Pent	84"	6"

Before any maintenance is performed on your system, be sure to plug the outlet pipe to prevent contamination of the adjacent systems.

To back-flush the R-Tank, water is pumped into the system through the Maintenance Ports as rapidly as possible. Water should be pumped into ALL Maintenance Ports. The turbulent action of the water moving through the R-Tank will suspend sediments which may then be pumped out.

If your system includes an Outlet Structure, this will be the ideal location to pump contaminated water out of the system. However, removal of back-flush water may be accomplished through the Maintenance Ports, as well.

For systems with large footprints that would require extensive volumes of water to properly flush the system, you should consider performing your maintenance within 24 hours of a rain event. Stormwater entering the system will aid in the suspension of sediments and reduce the volume of water required to properly flush the system.

Once removed, sediment-laden water may be captured for disposal or pumped through a Dirtbag™ (if permitted by the locality).

ACF ENVIRONMENTAL
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Step-By-Step Inspection & Maintenance Routine

1) **Inspection**
    a. Inspection Port
        i. Remove Cap
        ii. Use flashlight to detect sediment deposits
        iii. If present, measure sediment depth with stadia rod
        iv. Record results on Maintenance Log
        v. Replace Cap
    b. Maintenance Port/s
        i. Remove Cap
        ii. Use flashlight to detect sediment deposits
        iii. If present, measure sediment depth with stadia rod
        iv. Record results on Maintenance Log
        v. Replace Cap
        vi. Repeat for ALL Maintenance Ports
    c. Adjacent Manholes
        i. Remove Cover
        ii. Use flashlight to detect sediment deposits
        iii. If present, measure sediment depth with stadia rod, accounting for depth of sump (if present)
        iv. Inspect pipes connecting to R-Tank
        v. Record results on Maintenance Log
        vi. Replace Cover
        vii. Repeat for ALL Manholes that connect to the R-Tank

2) **Maintenance**
    a. Plug system outlet to prevent discharge of back-flush water
    b. Determine best location to pump out back-flush water
    c. Remove Cap from Maintenance Port
    d. Pump water as rapidly as possible (without over-topping port) into system until at least 1”
    of water covers system bottom
    e. Replace Cap
    f. Repeat at ALL Maintenance Ports
    g. Pump out back-flush water to complete back-flushing
    h. Vacuum all adjacent structures and any other structures or stormwater pre-treatment systems that require attention
    i. Sediment-laden water may be captured for disposal or pumped through a Dirtbag™.
    j. Replace any remaining Caps or Covers
    k. Record the back-flushing event in your Maintenance Log with any relevant specifics

R-Tank Maintenance Log

Site Name:_____

Location:_____

System Owner:_____

Company Responsible for Maintenance:_____

Contact:_____

Phone Number:_____

Date	Location	Depth to Bottom	Depth to Sediment	Sediment Depth	Observations/Notes	Initials

For more information about our products, contact Inside Sales at 800.448.3636 or email at info@acfenv.com