

Technical Memorandum – Stormwater Management Report

Submitted: October 18, 2012

From: Jamie Sullivan, P.E.
John Hession, P.E.

Re: **Special Permit with Site Plan Review Application**
Cobble Hill Redevelopment
90 Washington Street, Somerville, MA

This Stormwater Management Report (the Report) has been prepared to demonstrate compliance with the City of Somerville Zoning Ordinance regarding stormwater management and drainage design required for the Special Permit with Site Plan Review Application. In addition, the Project's stormwater management design utilized the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Handbook as a guide.

PROJECT DESCRIPTION

The Applicant, Corcoran Jennison Companies, is proposing to redevelop the existing Cobble Hill Center parcel located at 90 Washington Street, Somerville, Massachusetts. The parcel currently consists of an approximately 12,500 square foot retail building and associated parking and circulation areas. The Applicant proposes to redevelop the parcel in order to construct a multi-story, mixed-use building (the Project). As proposed, the Project consists of a 159-unit residential facility with approximately 13,200 square feet of first floor retail space, landscape improvements, ancillary parking spaces (179 spaces), and utility and stormwater management improvements to support the redevelopment.

SITE DESCRIPTION

The Project site is located on a 3.93-acre parcel of land (the Site) located at 90 Washington Street, Somerville, Massachusetts (see Exhibit 1). This parcel is part of the existing Cobble Hill Apartment/Cobble Hill Center lot (10.03 acres) and is being created as the result of a land subdivision. The Site lies within the surface watershed of the Charles River and is bounded by Washington Street to the north, New Washington Street to the south and west, and Cobble Hill Apartments to the east.

Existing topography within the Site ranges from approximately elevation 15 along the eastern property line to elevation 25 between the retail center and the apartment buildings. Topography along the perimeter of the Site follows the roadway profile ranging from elevation 14 along Washington Street to elevation 21 along New Washington Street. Refer to the USGS Quadrangle Map (Exhibit 2) and the Existing Conditions Plan, which is part of the Site Plans.

Exhibit 1: Site Locus



Image Source: MassGIS

Exhibit 2: USGS Topographic Map



Image Source: MassGIS

Based on the available information and field observations, there are no known wetland resource areas or associated buffers located on the site.

The project is not located within the 100-year flood plain as shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the City of Somerville, Massachusetts, Map # 25017C0439E, dated June 4, 2010 (see Exhibit 3).

Exhibit 3: FEMA FIRM

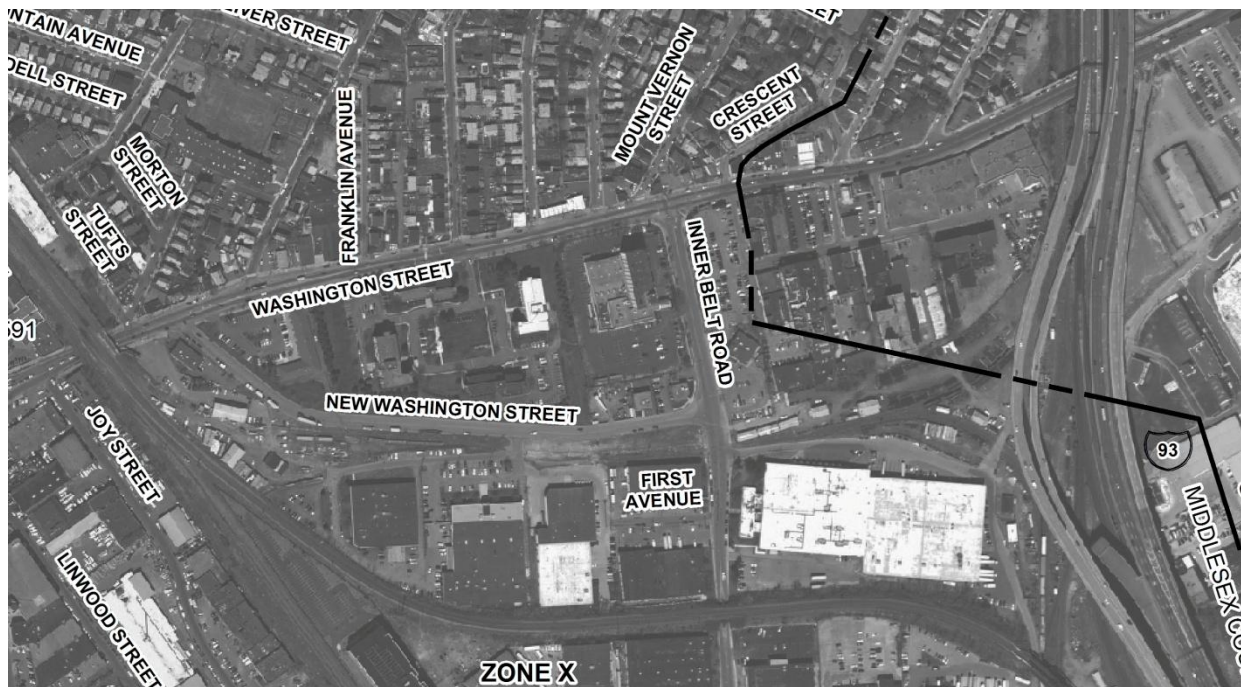


Image Source: FEMA FIRM # 25017C0439E

According to the National Resources Conservation Service (NRCS) Web Soil Survey, 100% of the Site is classified as Urban Land, Wet substratum (#603). Urban Land refers to land which has been excavated and filled.

EBI completed eight (8) soil borings at the Site in May 2012. The borings were located to provide good geographic coverage of the Subject Property. Two of the borings (EB-1 and EB-4) were completed as temporary 1-inch groundwater monitoring wells. The boring logs and location map are presented in the Technical Appendix.

The subsurface soils consisted of urban fill materials with varying amounts of sand with gravel, clays, brick, concrete, and coal/coal ash. The urban fill materials varied in thickness and were underlain by silty sands and clay. Groundwater was generally encountered at approximately 8-10 feet below grade; however no groundwater was encountered in boring EB-3, likely due to the presence of dense clays at this boring location.

HYDROLOGIC ANALYSIS

Existing Conditions

Under existing conditions, the Site is developed as a retail strip center and a mix of impervious and pervious surfaces, with generally rolling topography. Stormwater run-off either sheet flows offsite or is captured in a series of catch basins and routed to the City's closed drainage system within the adjacent street right-of-ways. None of the existing stormwater runoff from the Site is treated or detained prior to discharging offsite.

Currently, the Site is divided into eight (8) drainage areas as stormwater runoff flows to two (2) Design Points, which have been identified as DP-1 (New Washington Street) and DP-2 (Washington Street). Table 1 below provides a summary of existing conditions hydrologic data.

Table 1
Existing Conditions Hydrologic Data

<i>Drainage Area</i>	<i>Discharge Location</i>	<i>Design Point</i>	<i>Area (acres)</i>	<i>Curve Number</i>	<i>Time of Concentration (min)</i>
EX-1	New Washington St.	DP-1	0.95	94	5.0
EX-2	Cobble Hill Drn Sys./New Wash.	DP-1	0.94	87	9.3
EX-3	Cobble Hill Drn Sys./New Wash.	DP-1	1.23	87	25.1
EX-4	Overland – New Wash. St.	DP-1	0.16	80	5.0
EX-5	Overland – New Wash. St.	DP-1	0.21	80	5.0
EX-6	Overland – Washington St.	DP-2	0.48	88	5.0
EX-7	Overland – Washington St.	DP-2	0.13	91	5.0
EX-8	Overland – New Wash. St.	DP-2	0.02	84	5.0

Proposed Conditions

In the proposed condition, previously untreated runoff from new parking areas is directed to new control measures providing the required water quality treatment and providing groundwater recharge. The proposed site layout will result in a net increase in impervious cover types. This increase is offset by providing adequate detention and recharge through a subsurface infiltration basin to match or reduce run-off rates and volumes to existing condition levels.

In the proposed condition, the Site is divided into eight (8) drainage areas that discharge treated stormwater flows to the two (2) existing (2) Design Points. Table 2 summarizes the proposed conditions hydrologic data for the Project.

Table 2
Proposed Conditions Hydrologic Data

<i>Drainage Area</i>	<i>Discharge Location</i>	<i>Design Point</i>	<i>Area (acres)</i>	<i>Curve Number</i>	<i>Time of Concentration (min)</i>
PR-1	New Washington St.	DP-1	0.25	91	5.0
PR-2	New Washington St.	DP-1	0.37	94	5.0
PR-3	Subsurface Infiltration Basin	DP-1	0.60	94	5.0
PR-4	Cobble Hill Drn Sys./New Wash.	DP-1	1.47	92	14.3
PR-5	New Washington St.	DP-1	0.21	80	5.0
PR-6	Washington Street	DP-2	0.19	97	5.0
PR-7	Washington Street	DP-2	0.33	91	5.0
PR-8	Subsurface Infiltration Basin	DP-1	0.69	98	5.0

Integrated into the site design is a comprehensive stormwater management system that has been developed in accordance with the City's standards and the Massachusetts Stormwater Handbook, as practicable. The strategy utilizes Low Impact Development (LID) techniques and stormwater Best Management Practices (BMP's) to increase groundwater recharge, control stormwater quantity and improve stormwater quality. Landscape islands are incorporated within the parking areas as a means to create a disconnection between impervious surfaces.

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25 and 100-years. The results of the analysis, as summarized in Table 3 and 4 below, indicate that there is no increase in peak discharge rates and volumes between the existing and proposed conditions

Table 3
Peak Discharge Rates (cubic feet per second)

<i>Design Point</i>	<i>2-year</i>	<i>10-year</i>	<i>25-year</i>	<i>100-year</i>
Design Point 1: New Washington Street				
Existing	5.68	9.44	11.68	14.56
Proposed	4.25	7.00	8.61	11.57
Design Point 2: Washington Street				
Existing	1.43	2.38	2.93	3.64
Proposed	1.43	2.22	2.69	3.28

Table 4
Stormwater Volume Analysis (acre feet)

<i>Design Point</i>	<i>2-year</i>	<i>10-year</i>	<i>25-year</i>	<i>100-year</i>
Design Point 1: New Washington Street				
Existing	0.57	0.95	1.19	1.49
Proposed	0.42	0.71	0.89	1.15
Design Point 2: Washington Street				
Existing	0.10	0.17	0.21	0.26
Proposed	0.10	0.16	0.20	0.25

Computations and supporting information including storm drainage calculations are included in the Technical Appendix.

WATER QUALITY & GROUNDWATER RECHARGE

The proposed stormwater management system has been designed to treat the one-inch Water Quality Volume, while providing a minimum of 80% Total Suspended Solids (TSS) removal for stormwater runoff from all proposed paved impervious surfaces prior to discharge. In addition, the system provides the required recharge volume.

The majority of the parking lot and site roadway runoff will be collected in a series of deep-sump hooded catch basins, piped to proprietary particle separator BMP's (Stormceptor) prior to discharging to the City's closed drainage system within the adjacent street right-of-ways. Runoff from the building's non-metallic roof and a portion of the surface parking lot will be collected and routed to a subsurface infiltration system to infiltrate runoff and increase groundwater recharge on site. The clean roof run-off will be routed directly to the infiltration system while parking lot drainage will be pre-treated through a proprietary particle separator prior to infiltration.

Stormwater recharge for the proposed redevelopment is provided through infiltration of the building's non-metallic roof runoff and portions of the parking lot. Run-off from approximately 56,350 square feet (sq. ft.) of impervious area will be directed to a proposed subsurface infiltration system, utilizing the StormTech SC-740. Since the infiltration system is also being used to attenuate peak discharges rates, the entire provided recharge volume was used to calculate the system drawdown time, which was within the 72-hour requirement.

Please refer to the Technical Appendix for computations and supporting information regarding the sizing of BMPs suitable for treatment of runoff and the recharge and drawdown calculations. A long-term pollution prevention plan is also included as part of the overall water quality treatment strategy.

HYDRAULIC ANALYSIS

The closed drainage system was designed for the 25-year storm event to provide adequate capacity to safely convey stormwater run-off to the City's system. The hydraulic analysis was conducted for the Project and drainage pipes were sized using Manning's Equation for full-flow capacity and the Rational Method. Storm drainage calculations for pipe sizing are included in the Technical Appendix of this report.

POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL

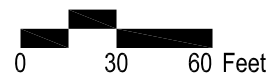
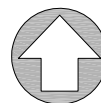
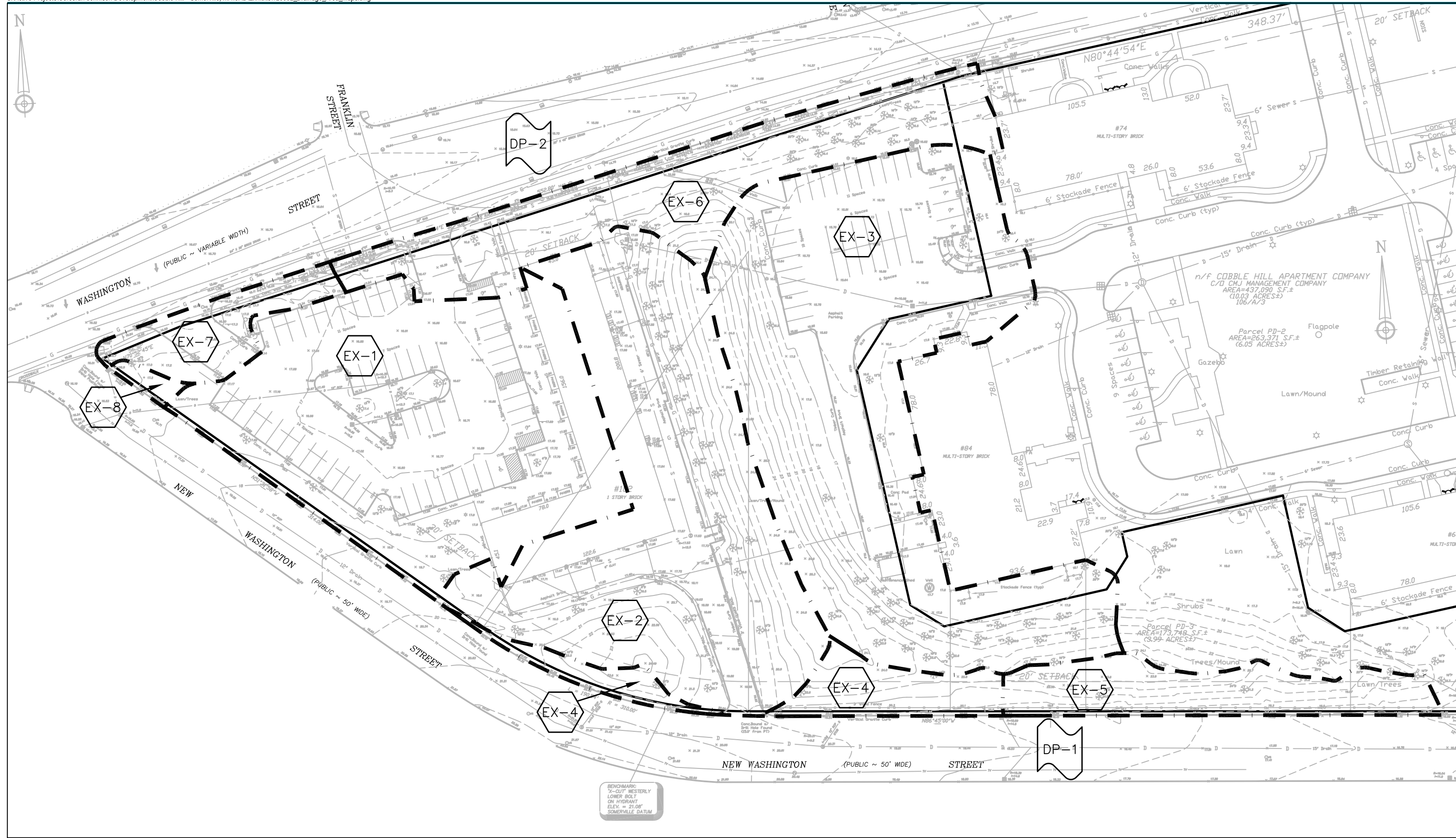
The Project will disturb approximately 3.7 acres of land and is required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. In lieu of the Stormwater Pollution Prevention Plan (SWPPP) required under NPDES, a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in the Technical Appendix.

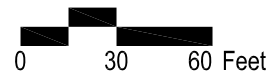
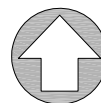
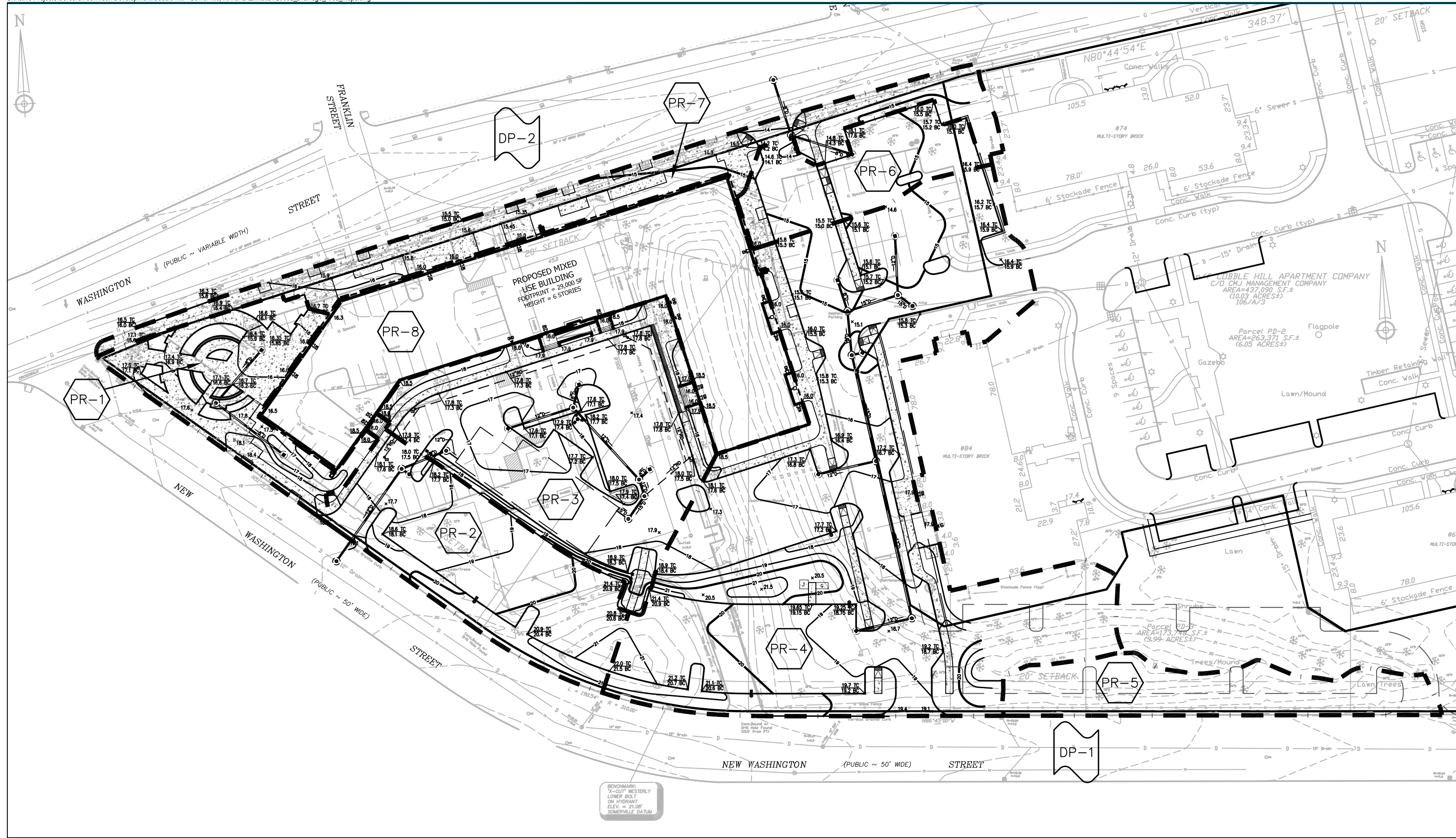
CONCLUSION & REGULATORY COMPLIANCE

The stormwater management plan presented herein and as shown on the Site Plans has been prepared in accordance with applicable local, state and federal regulations. The design includes Best Management Practices for maintaining stormwater runoff quality both during and after construction, and is designed to protect downstream and underlying receiving waters from stormwater related impacts.

Technical Appendix

- Figure 1 - Existing Conditions Drainage Areas
- Figure 2 - Proposed Conditions Drainage Areas
- USDA Soils Map and Legend
- Soil Evaluation Location Map and Boring Logs
- Hydrologic Analysis - HydroCAD Output
 - Existing Conditions
 - Proposed Conditions
- Recharge Requirement Calculation
- Water Quality Volume
- MASTEP Technology Review - Stormceptor
- TSS Removal Calculation Worksheet
- Storm Drainage Computations
- Construction Period Pollution Prevention & Erosion and Sediment Control Plan
- Stormwater Operation and Maintenance Plan





Hydrologic Soil Group—Middlesex County, Massachusetts, and Norfolk and Suffolk Counties, Massachusetts
(84 Washington Street - Soils and Hydro Soil Group)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Political Features

 Cities

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

MAP INFORMATION

Map Scale: 1:4,380 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 19N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 12, Feb 26, 2010

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 8, Jul 23, 2010

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 7/10/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
602	Urban land		6.6	6.8%
603	Urban land, wet substratum		77.9	80.3%
627C	Newport-Urban land complex, 3 to 15 percent slopes	C	0.2	0.2%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	B	3.1	3.2%
655	Udorthents, wet substratum		5.5	5.7%
Subtotals for Soil Survey Area			93.5	96.3%
Totals for Area of Interest			97.1	100.0%

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
603	Urban land, wet substratum, 0 to 3 percent slopes		2.8	2.9%
628C	Canton-Urban land complex, 3 to 15 percent slopes	B	0.8	0.8%
Subtotals for Soil Survey Area			3.6	3.7%
Totals for Area of Interest			97.1	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

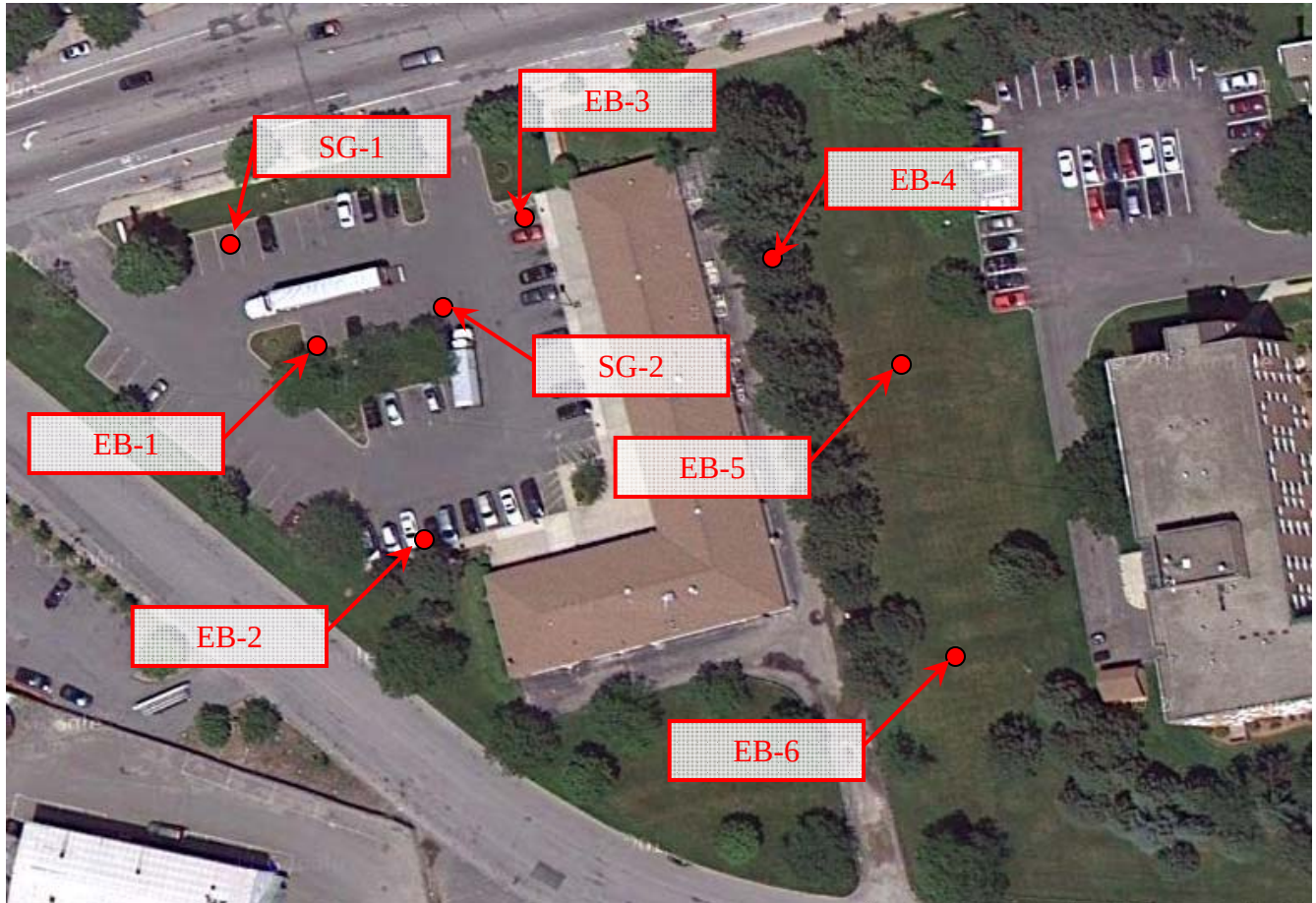
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Site Plan

90 Washington Street
Somerville, Massachusetts



Not to scale

SUBSURFACE PROFILE			SAMPLE					Well Construction
Depth	Description	Strata	No.	Rec.	SPT Blows	Type	FID/PID	
							Readings (ppm)	
							100300	
	Asphalt							
1	Tan/Gray, fn. SAND and SILT, cobbles, wood fragments, slight petroleum odor, dry							
2	sample colleted: 2-4'		S-1	2.5	NA	Core	0	
3								
4	Boring refusal encountered at multiple locations							
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								

Drilling Company: *Harvey Associates*

Date Started: 5/9/2012

Log of Borehole: EB-3

Drilling Foreman: *Doug*

Date Ended: 5/9/2012

EBI Consulting

EBI Geologist/Scientist: *B. White*

Project Location: *Somerville, MA*

21 B Street

Drilling Method: *Directpush*

Project Number: *12120128*

Burlington, MA

Borehole Diameter: 2"

Sheet: 1 of 1

SUBSURFACE PROFILE			SAMPLE					Well Construction
Depth	Description	Strata	No.	Rec.	SPT Blows	Type	FID/PID Readings (ppm)	
							100 300	
1	Asphalt							
2	Brown, fn. SAND and SILT, gravel, clay, cobbles, dry		S-1	4	NA	Core	0	
3								
4	Black/gray, CLAY, fn. sand, some coal, dry							
5								
6			S-2	3.5	NA	Core	0	
7								
8	Gray, CLAY, petroleum odor, damp							
9	Sample collected: 8-10'							
10			S-3	4	NA	Core	0	
11								
12	Tan, CLAY, dense, damp							
13	Refusal @ 15'		S-4	3	NA	Core	0	
14								
15								

Borehole Diameter: 2"

Sheet: 1 of 1

EBI Consulting
21 B Street
Burlington, MA

SUBSURFACE PROFILE			SAMPLE					Well Construction
Depth	Description	Strata	No.	Rec.	SPT Blows	Type	FID/PID Readings (ppm)	
							100	
1	Asphalt							Temp well set @ 16'
2	Black/gray, fn. sand, tr. clay, cobbles, rock, dry		S-1	3.5	NA	Core	0	
3								
4								
5	Black/brown, fn. SAND and SILT, cobbles, rocks, dry							
6			S-2	2.5	NA	Core	4	
7								
8								
9	Black, fn.-med. SAND, petroleum odor, wet @ 10'							
10	Sample collected: 8-10'		S-3	2.5	NA	Core	210	
11								
12								
13	Gray, fn.-med. SAND, some silt, petroleum odor, wet						45	
14			S-4	3.5	NA	Core		
15								
16								

Drilling Company: *Harvey Associates*

Date Started: 5/9/2012

Log of Borehole: EB-6

Drilling Foreman: *Doug*

Date Ended: 5/9/2012

EBI Consulting

EBI Geologist/Scientist: *B. White*

Project Location: *Somerville, MA*

21 B Street

Drilling Method: *Directpush*

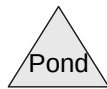
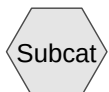
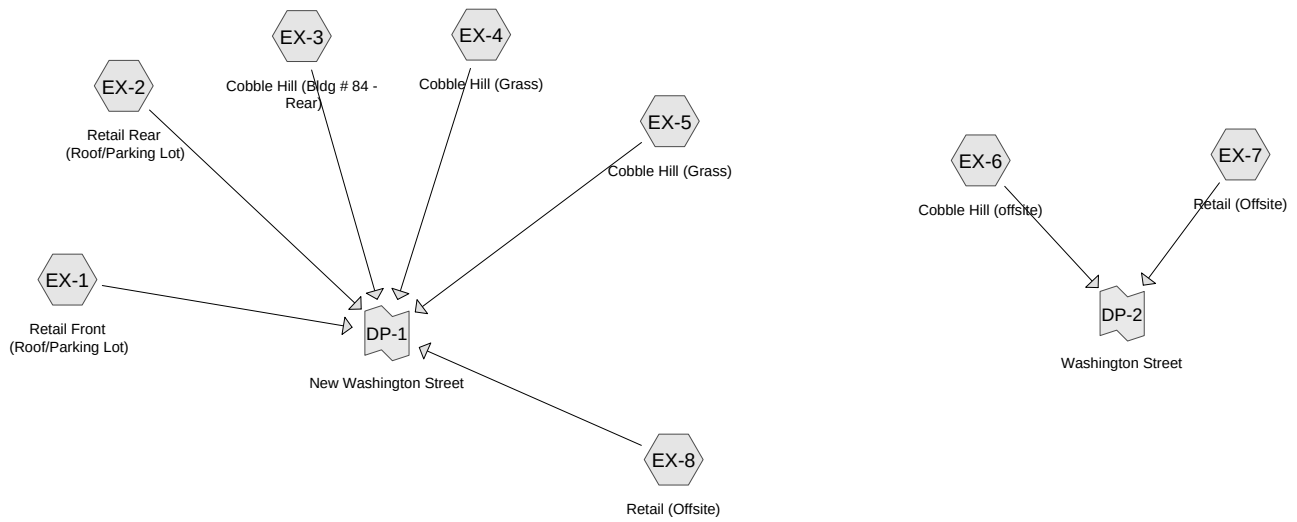
Project Number: *12120128*

Burlington, MA

Borehole Diameter: *2"*

Sheet: *1 of 1*

SUBSURFACE PROFILE			SAMPLE					Well Construction
Depth	Description	Strata	No.	Rec.	SPT Blows	Type	FID/PID Readings (ppm)	
							100 300	
0	Grass							
1	Black/brown, fn.-med. SAND, silt, gravel, brick, concrete, coal, wood, cobbles, dry							
2			S-1	3	NA	Core	0	
3								
4								
5	Black/brown, fn.-med. SAND, silt, gravel, brick, concrete, coal, wood, cobbles, wet @ 8'							
6	sample collected: 6-8'		S-2	2	NA	Core	0	
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								



Routing Diagram for Ex_Conditions_Somerville
 Prepared by EBI Consulting, Inc., Printed 10/11/2012
 HydroCAD® 10.00 s/n 07549 © 2011 HydroCAD Software Solutions LLC

Ex_Conditions_Somerville

Prepared by EBI Consulting, Inc.

Printed 10/11/2012

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.913	80	>75% Grass cover, Good, HSG D (EX-1, EX-2, EX-3, EX-4, EX-5)
0.420	84	50-75% Grass cover, Fair, HSG D (EX-6, EX-7, EX-8)
0.872	98	Paved parking, HSG D (EX-2, EX-3, EX-6, EX-7)
0.292	98	Roofs, HSG D (EX-1, EX-2, EX-3)
0.612	98	Unconnected pavement, HSG D (EX-1)
4.109	88	TOTAL AREA

Ex_Conditions_Somerville

Prepared by EBI Consulting, Inc.

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90 Washington Street, Somerville, MA

Type III 24-hr 2-yr Rainfall=3.10"

Printed 10/11/2012

Page 3

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Retail Front	Runoff Area=41,474 sf 78.28% Impervious Runoff Depth=2.45" Tc=5.0 min CN=94 Runoff=2.72 cfs 0.194 af
Subcatchment EX-2: Retail Rear	Runoff Area=40,864 sf 40.87% Impervious Runoff Depth=1.83" Flow Length=1,110' Tc=9.3 min CN=87 Runoff=1.79 cfs 0.143 af
Subcatchment EX-3: Cobble Hill (Bldg # 84	Runoff Area=53,449 sf 36.37% Impervious Runoff Depth=1.83" Flow Length=975' Tc=25.1 min CN=87 Runoff=1.61 cfs 0.187 af
Subcatchment EX-4: Cobble Hill (Grass)	Runoff Area=6,888 sf 0.00% Impervious Runoff Depth=1.33" Tc=5.0 min CN=80 Runoff=0.25 cfs 0.017 af
Subcatchment EX-5: Cobble Hill (Grass)	Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=1.33" Tc=5.0 min CN=80 Runoff=0.34 cfs 0.023 af
Subcatchment EX-6: Cobble Hill (offsite)	Runoff Area=20,858 sf 28.74% Impervious Runoff Depth=1.91" Tc=5.0 min CN=88 Runoff=1.11 cfs 0.076 af
Subcatchment EX-7: Retail (Offsite)	Runoff Area=5,493 sf 50.66% Impervious Runoff Depth=2.16" Tc=5.0 min CN=91 Runoff=0.33 cfs 0.023 af
Subcatchment EX-8: Retail (Offsite)	Runoff Area=707 sf 0.00% Impervious Runoff Depth=1.60" Tc=5.0 min CN=84 Runoff=0.03 cfs 0.002 af
Link DP-1: New Washington Street	Inflow=5.68 cfs 0.567 af Primary=5.68 cfs 0.567 af
Link DP-2: Washington Street	Inflow=1.43 cfs 0.099 af Primary=1.43 cfs 0.099 af

Total Runoff Area = 4.109 ac Runoff Volume = 0.666 af Average Runoff Depth = 1.94"
56.76% Pervious = 2.332 ac 43.24% Impervious = 1.777 ac

Ex_Conditions_Somerville

Prepared by EBI Consulting, Inc.

HydroCAD® 10.00 s/n 07549 © 2011 HydroCAD Software Solutions LLC

90 Washington Street, Somerville, MA

Type III 24-hr 2-yr Rainfall=3.10"

Printed 10/11/2012

Page 4

Summary for Subcatchment EX-1: Retail Front (Roof/Parking Lot)

Runoff = 2.72 cfs @ 12.07 hrs, Volume= 0.194 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
9,009	80	>75% Grass cover, Good, HSG D
26,670	98	Unconnected pavement, HSG D
5,795	98	Roofs, HSG D
41,474	94	Weighted Average
9,009		21.72% Pervious Area
32,465		78.28% Impervious Area
26,670		82.15% Unconnected

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

Summary for Subcatchment EX-2: Retail Rear (Roof/Parking Lot)

Runoff = 1.79 cfs @ 12.13 hrs, Volume= 0.143 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
24,163	80	>75% Grass cover, Good, HSG D
9,974	98	Paved parking, HSG D
6,727	98	Roofs, HSG D
40,864	87	Weighted Average
24,163		59.13% Pervious Area
16,701		40.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.0960	0.28		Sheet Flow, Overland - Grass Grass: Short n= 0.150 P2= 3.15"
2.6	297	0.0088	1.90		Shallow Concentrated Flow, Overland - Paved Paved Kv= 20.3 fps
3.6	761	0.0060	3.51	2.76	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
9.3	1,110	Total			

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Type III 24-hr 2-yr Rainfall=3.10"

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Summary for Subcatchment EX-3: Cobble Hill (Bldg # 84 - Rear)

Runoff = 1.61 cfs @ 12.35 hrs, Volume= 0.187 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
34,007	80	>75% Grass cover, Good, HSG D
19,248	98	Paved parking, HSG D
194	98	Roofs, HSG D
53,449	87	Weighted Average
34,007		63.63% Pervious Area
19,442		36.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	195	0.0284	0.15		Sheet Flow, Overland - Grass Grass: Dense n= 0.240 P2= 3.15"
1.7	217	0.0110	2.13		Shallow Concentrated Flow, Overland - Pavement Paved Kv= 20.3 fps
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
25.1	975	Total			

Summary for Subcatchment EX-4: Cobble Hill (Grass)

Runoff = 0.25 cfs @ 12.08 hrs, Volume= 0.017 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
6,888	80	>75% Grass cover, Good, HSG D
6,888		100.00% Pervious Area

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

Summary for Subcatchment EX-5: Cobble Hill (Grass)

Runoff = 0.34 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

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Type III 24-hr 2-yr Rainfall=3.10"

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Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

Summary for Subcatchment EX-6: Cobble Hill (offsite)

Runoff = 1.11 cfs @ 12.07 hrs, Volume= 0.076 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
14,864	84	50-75% Grass cover, Fair, HSG D
5,994	98	Paved parking, HSG D
20,858	88	Weighted Average
14,864		71.26% Pervious Area
5,994		28.74% Impervious Area

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

Summary for Subcatchment EX-7: Retail (Offsite)

Runoff = 0.33 cfs @ 12.07 hrs, Volume= 0.023 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
2,710	84	50-75% Grass cover, Fair, HSG D
2,783	98	Paved parking, HSG D
5,493	91	Weighted Average
2,710		49.34% Pervious Area
2,783		50.66% Impervious Area

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

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Type III 24-hr 2-yr Rainfall=3.10"

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Summary for Subcatchment EX-8: Retail (Offsite)

Runoff = 0.03 cfs @ 12.08 hrs, Volume= 0.002 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
707	84	50-75% Grass cover, Fair, HSG D
707		100.00% Pervious Area

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

Summary for Link DP-1: New Washington Street

Inflow Area = 3.504 ac, 44.95% Impervious, Inflow Depth = 1.94" for 2-yr event
 Inflow = 5.68 cfs @ 12.09 hrs, Volume= 0.567 af
 Primary = 5.68 cfs @ 12.09 hrs, Volume= 0.567 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington Street

Inflow Area = 0.605 ac, 33.31% Impervious, Inflow Depth = 1.96" for 2-yr event
 Inflow = 1.43 cfs @ 12.07 hrs, Volume= 0.099 af
 Primary = 1.43 cfs @ 12.07 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10-yr Rainfall=4.55"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Retail Front	Runoff Area=41,474 sf 78.28% Impervious Runoff Depth=3.86" Tc=5.0 min CN=94 Runoff=4.18 cfs 0.307 af
Subcatchment EX-2: Retail Rear	Runoff Area=40,864 sf 40.87% Impervious Runoff Depth=3.15" Flow Length=1,110' Tc=9.3 min CN=87 Runoff=3.05 cfs 0.246 af
Subcatchment EX-3: Cobble Hill (Bldg # 84	Runoff Area=53,449 sf 36.37% Impervious Runoff Depth=3.15" Flow Length=975' Tc=25.1 min CN=87 Runoff=2.74 cfs 0.322 af
Subcatchment EX-4: Cobble Hill (Grass)	Runoff Area=6,888 sf 0.00% Impervious Runoff Depth=2.50" Tc=5.0 min CN=80 Runoff=0.48 cfs 0.033 af
Subcatchment EX-5: Cobble Hill (Grass)	Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=2.50" Tc=5.0 min CN=80 Runoff=0.65 cfs 0.044 af
Subcatchment EX-6: Cobble Hill (offsite)	Runoff Area=20,858 sf 28.74% Impervious Runoff Depth=3.24" Tc=5.0 min CN=88 Runoff=1.85 cfs 0.129 af
Subcatchment EX-7: Retail (Offsite)	Runoff Area=5,493 sf 50.66% Impervious Runoff Depth=3.55" Tc=5.0 min CN=91 Runoff=0.52 cfs 0.037 af
Subcatchment EX-8: Retail (Offsite)	Runoff Area=707 sf 0.00% Impervious Runoff Depth=2.86" Tc=5.0 min CN=84 Runoff=0.06 cfs 0.004 af
Link DP-1: New Washington Street	Inflow=9.44 cfs 0.955 af Primary=9.44 cfs 0.955 af
Link DP-2: Washington Street	Inflow=2.38 cfs 0.167 af Primary=2.38 cfs 0.167 af

Total Runoff Area = 4.109 ac Runoff Volume = 1.122 af Average Runoff Depth = 3.28"
56.76% Pervious = 2.332 ac 43.24% Impervious = 1.777 ac

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Type III 24-hr 10-yr Rainfall=4.55"

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Summary for Subcatchment EX-1: Retail Front (Roof/Parking Lot)

Runoff = 4.18 cfs @ 12.07 hrs, Volume= 0.307 af, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
9,009	80	>75% Grass cover, Good, HSG D
26,670	98	Unconnected pavement, HSG D
5,795	98	Roofs, HSG D
41,474	94	Weighted Average
9,009		21.72% Pervious Area
32,465		78.28% Impervious Area
26,670		82.15% Unconnected

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

Summary for Subcatchment EX-2: Retail Rear (Roof/Parking Lot)

Runoff = 3.05 cfs @ 12.13 hrs, Volume= 0.246 af, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
24,163	80	>75% Grass cover, Good, HSG D
9,974	98	Paved parking, HSG D
6,727	98	Roofs, HSG D
40,864	87	Weighted Average
24,163		59.13% Pervious Area
16,701		40.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.0960	0.28		Sheet Flow, Overland - Grass Grass: Short n= 0.150 P2= 3.15"
2.6	297	0.0088	1.90		Shallow Concentrated Flow, Overland - Paved Paved Kv= 20.3 fps
3.6	761	0.0060	3.51	2.76	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
9.3	1,110	Total			

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Type III 24-hr 10-yr Rainfall=4.55"

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Summary for Subcatchment EX-3: Cobble Hill (Bldg # 84 - Rear)

Runoff = 2.74 cfs @ 12.35 hrs, Volume= 0.322 af, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
34,007	80	>75% Grass cover, Good, HSG D
19,248	98	Paved parking, HSG D
194	98	Roofs, HSG D
53,449	87	Weighted Average
34,007		63.63% Pervious Area
19,442		36.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	195	0.0284	0.15		Sheet Flow, Overland - Grass Grass: Dense n= 0.240 P2= 3.15"
1.7	217	0.0110	2.13		Shallow Concentrated Flow, Overland - Pavement Paved Kv= 20.3 fps
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
25.1	975	Total			

Summary for Subcatchment EX-4: Cobble Hill (Grass)

Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.033 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
6,888	80	>75% Grass cover, Good, HSG D
6,888		100.00% Pervious Area

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

Summary for Subcatchment EX-5: Cobble Hill (Grass)

Runoff = 0.65 cfs @ 12.07 hrs, Volume= 0.044 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

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Type III 24-hr 10-yr Rainfall=4.55"

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Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

Summary for Subcatchment EX-6: Cobble Hill (offsite)

Runoff = 1.85 cfs @ 12.07 hrs, Volume= 0.129 af, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
14,864	84	50-75% Grass cover, Fair, HSG D
5,994	98	Paved parking, HSG D
20,858	88	Weighted Average
14,864		71.26% Pervious Area
5,994		28.74% Impervious Area

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

Summary for Subcatchment EX-7: Retail (Offsite)

Runoff = 0.52 cfs @ 12.07 hrs, Volume= 0.037 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
2,710	84	50-75% Grass cover, Fair, HSG D
2,783	98	Paved parking, HSG D
5,493	91	Weighted Average
2,710		49.34% Pervious Area
2,783		50.66% Impervious Area

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

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Type III 24-hr 10-yr Rainfall=4.55"

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Summary for Subcatchment EX-8: Retail (Offsite)

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af, Depth= 2.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
707	84	50-75% Grass cover, Fair, HSG D
707		100.00% Pervious Area

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

Summary for Link DP-1: New Washington StreetInflow Area = 3.504 ac, 44.95% Impervious, Inflow Depth = 3.27" for 10-yr event
Inflow = 9.44 cfs @ 12.09 hrs, Volume= 0.955 af
Primary = 9.44 cfs @ 12.09 hrs, Volume= 0.955 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington StreetInflow Area = 0.605 ac, 33.31% Impervious, Inflow Depth = 3.31" for 10-yr event
Inflow = 2.38 cfs @ 12.07 hrs, Volume= 0.167 af
Primary = 2.38 cfs @ 12.07 hrs, Volume= 0.167 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 25-yr Rainfall=5.40"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Retail Front	Runoff Area=41,474 sf 78.28% Impervious Runoff Depth=4.70" Tc=5.0 min CN=94 Runoff=5.03 cfs 0.373 af
Subcatchment EX-2: Retail Rear	Runoff Area=40,864 sf 40.87% Impervious Runoff Depth=3.95" Flow Length=1,110' Tc=9.3 min CN=87 Runoff=3.80 cfs 0.308 af
Subcatchment EX-3: Cobble Hill (Bldg # 84	Runoff Area=53,449 sf 36.37% Impervious Runoff Depth=3.95" Flow Length=975' Tc=25.1 min CN=87 Runoff=3.41 cfs 0.403 af
Subcatchment EX-4: Cobble Hill (Grass)	Runoff Area=6,888 sf 0.00% Impervious Runoff Depth=3.24" Tc=5.0 min CN=80 Runoff=0.62 cfs 0.043 af
Subcatchment EX-5: Cobble Hill (Grass)	Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=3.24" Tc=5.0 min CN=80 Runoff=0.84 cfs 0.057 af
Subcatchment EX-6: Cobble Hill (offsite)	Runoff Area=20,858 sf 28.74% Impervious Runoff Depth=4.05" Tc=5.0 min CN=88 Runoff=2.29 cfs 0.162 af
Subcatchment EX-7: Retail (Offsite)	Runoff Area=5,493 sf 50.66% Impervious Runoff Depth=4.37" Tc=5.0 min CN=91 Runoff=0.64 cfs 0.046 af
Subcatchment EX-8: Retail (Offsite)	Runoff Area=707 sf 0.00% Impervious Runoff Depth=3.64" Tc=5.0 min CN=84 Runoff=0.07 cfs 0.005 af
Link DP-1: New Washington Street	Inflow=11.68 cfs 1.190 af Primary=11.68 cfs 1.190 af
Link DP-2: Washington Street	Inflow=2.93 cfs 0.208 af Primary=2.93 cfs 0.208 af

Total Runoff Area = 4.109 ac Runoff Volume = 1.398 af Average Runoff Depth = 4.08"
56.76% Pervious = 2.332 ac 43.24% Impervious = 1.777 ac

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Type III 24-hr 25-yr Rainfall=5.40"

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Summary for Subcatchment EX-1: Retail Front (Roof/Parking Lot)

Runoff = 5.03 cfs @ 12.07 hrs, Volume= 0.373 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
9,009	80	>75% Grass cover, Good, HSG D
26,670	98	Unconnected pavement, HSG D
5,795	98	Roofs, HSG D
41,474	94	Weighted Average
9,009		21.72% Pervious Area
32,465		78.28% Impervious Area
26,670		82.15% Unconnected

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

Summary for Subcatchment EX-2: Retail Rear (Roof/Parking Lot)

Runoff = 3.80 cfs @ 12.13 hrs, Volume= 0.308 af, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
24,163	80	>75% Grass cover, Good, HSG D
9,974	98	Paved parking, HSG D
6,727	98	Roofs, HSG D
40,864	87	Weighted Average
24,163		59.13% Pervious Area
16,701		40.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.0960	0.28		Sheet Flow, Overland - Grass Grass: Short n= 0.150 P2= 3.15"
2.6	297	0.0088	1.90		Shallow Concentrated Flow, Overland - Paved Paved Kv= 20.3 fps
3.6	761	0.0060	3.51	2.76	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
9.3	1,110	Total			

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Type III 24-hr 25-yr Rainfall=5.40"

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Summary for Subcatchment EX-3: Cobble Hill (Bldg # 84 - Rear)

Runoff = 3.41 cfs @ 12.35 hrs, Volume= 0.403 af, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
34,007	80	>75% Grass cover, Good, HSG D
19,248	98	Paved parking, HSG D
194	98	Roofs, HSG D
53,449	87	Weighted Average
34,007		63.63% Pervious Area
19,442		36.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	195	0.0284	0.15		Sheet Flow, Overland - Grass Grass: Dense n= 0.240 P2= 3.15"
1.7	217	0.0110	2.13		Shallow Concentrated Flow, Overland - Pavement Paved Kv= 20.3 fps
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
25.1	975	Total			

Summary for Subcatchment EX-4: Cobble Hill (Grass)

Runoff = 0.62 cfs @ 12.07 hrs, Volume= 0.043 af, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
6,888	80	>75% Grass cover, Good, HSG D
6,888		100.00% Pervious Area

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

Summary for Subcatchment EX-5: Cobble Hill (Grass)

Runoff = 0.84 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

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Type III 24-hr 25-yr Rainfall=5.40"

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Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

Summary for Subcatchment EX-6: Cobble Hill (offsite)

Runoff = 2.29 cfs @ 12.07 hrs, Volume= 0.162 af, Depth= 4.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
14,864	84	50-75% Grass cover, Fair, HSG D
5,994	98	Paved parking, HSG D
20,858	88	Weighted Average
14,864		71.26% Pervious Area
5,994		28.74% Impervious Area

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

Summary for Subcatchment EX-7: Retail (Offsite)

Runoff = 0.64 cfs @ 12.07 hrs, Volume= 0.046 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
2,710	84	50-75% Grass cover, Fair, HSG D
2,783	98	Paved parking, HSG D
5,493	91	Weighted Average
2,710		49.34% Pervious Area
2,783		50.66% Impervious Area

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

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Type III 24-hr 25-yr Rainfall=5.40"

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Summary for Subcatchment EX-8: Retail (Offsite)

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 0.005 af, Depth= 3.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
707	84	50-75% Grass cover, Fair, HSG D
707		100.00% Pervious Area

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

Summary for Link DP-1: New Washington Street

Inflow Area = 3.504 ac, 44.95% Impervious, Inflow Depth = 4.08" for 25-yr event

Inflow = 11.68 cfs @ 12.09 hrs, Volume= 1.190 af

Primary = 11.68 cfs @ 12.09 hrs, Volume= 1.190 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington Street

Inflow Area = 0.605 ac, 33.31% Impervious, Inflow Depth = 4.12" for 25-yr event

Inflow = 2.93 cfs @ 12.07 hrs, Volume= 0.208 af

Primary = 2.93 cfs @ 12.07 hrs, Volume= 0.208 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-yr Rainfall=6.50"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Retail Front	Runoff Area=41,474 sf 78.28% Impervious Runoff Depth=5.79" Tc=5.0 min CN=94 Runoff=6.12 cfs 0.460 af
Subcatchment EX-2: Retail Rear	Runoff Area=40,864 sf 40.87% Impervious Runoff Depth=5.00" Flow Length=1,110' Tc=9.3 min CN=87 Runoff=4.76 cfs 0.391 af
Subcatchment EX-3: Cobble Hill (Bldg # 84	Runoff Area=53,449 sf 36.37% Impervious Runoff Depth=5.00" Flow Length=975' Tc=25.1 min CN=87 Runoff=4.28 cfs 0.511 af
Subcatchment EX-4: Cobble Hill (Grass)	Runoff Area=6,888 sf 0.00% Impervious Runoff Depth=4.24" Tc=5.0 min CN=80 Runoff=0.81 cfs 0.056 af
Subcatchment EX-5: Cobble Hill (Grass)	Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=4.24" Tc=5.0 min CN=80 Runoff=1.09 cfs 0.075 af
Subcatchment EX-6: Cobble Hill (offsite)	Runoff Area=20,858 sf 28.74% Impervious Runoff Depth=5.11" Tc=5.0 min CN=88 Runoff=2.86 cfs 0.204 af
Subcatchment EX-7: Retail (Offsite)	Runoff Area=5,493 sf 50.66% Impervious Runoff Depth=5.45" Tc=5.0 min CN=91 Runoff=0.78 cfs 0.057 af
Subcatchment EX-8: Retail (Offsite)	Runoff Area=707 sf 0.00% Impervious Runoff Depth=4.67" Tc=5.0 min CN=84 Runoff=0.09 cfs 0.006 af
Link DP-1: New Washington Street	Inflow=14.56 cfs 1.498 af Primary=14.56 cfs 1.498 af
Link DP-2: Washington Street	Inflow=3.64 cfs 0.261 af Primary=3.64 cfs 0.261 af

Total Runoff Area = 4.109 ac Runoff Volume = 1.759 af Average Runoff Depth = 5.14"
56.76% Pervious = 2.332 ac 43.24% Impervious = 1.777 ac

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Type III 24-hr 100-yr Rainfall=6.50"

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Summary for Subcatchment EX-1: Retail Front (Roof/Parking Lot)

Runoff = 6.12 cfs @ 12.07 hrs, Volume= 0.460 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
9,009	80	>75% Grass cover, Good, HSG D
26,670	98	Unconnected pavement, HSG D
5,795	98	Roofs, HSG D
41,474	94	Weighted Average
9,009		21.72% Pervious Area
32,465		78.28% Impervious Area
26,670		82.15% Unconnected

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

Summary for Subcatchment EX-2: Retail Rear (Roof/Parking Lot)

Runoff = 4.76 cfs @ 12.13 hrs, Volume= 0.391 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
24,163	80	>75% Grass cover, Good, HSG D
9,974	98	Paved parking, HSG D
6,727	98	Roofs, HSG D
40,864	87	Weighted Average
24,163		59.13% Pervious Area
16,701		40.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	52	0.0960	0.28		Sheet Flow, Overland - Grass Grass: Short n= 0.150 P2= 3.15"
2.6	297	0.0088	1.90		Shallow Concentrated Flow, Overland - Paved Paved Kv= 20.3 fps
3.6	761	0.0060	3.51	2.76	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
9.3	1,110	Total			

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Type III 24-hr 100-yr Rainfall=6.50"

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Summary for Subcatchment EX-3: Cobble Hill (Bldg # 84 - Rear)

Runoff = 4.28 cfs @ 12.33 hrs, Volume= 0.511 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
34,007	80	>75% Grass cover, Good, HSG D
19,248	98	Paved parking, HSG D
194	98	Roofs, HSG D
53,449	87	Weighted Average
34,007		63.63% Pervious Area
19,442		36.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.3	195	0.0284	0.15		Sheet Flow, Overland - Grass Grass: Dense n= 0.240 P2= 3.15"
1.7	217	0.0110	2.13		Shallow Concentrated Flow, Overland - Pavement Paved Kv= 20.3 fps
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
25.1	975	Total			

Summary for Subcatchment EX-4: Cobble Hill (Grass)

Runoff = 0.81 cfs @ 12.07 hrs, Volume= 0.056 af, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
6,888	80	>75% Grass cover, Good, HSG D
6,888		100.00% Pervious Area

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

Summary for Subcatchment EX-5: Cobble Hill (Grass)

Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.075 af, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

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Type III 24-hr 100-yr Rainfall=6.50"

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Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

Summary for Subcatchment EX-6: Cobble Hill (offsite)

Runoff = 2.86 cfs @ 12.07 hrs, Volume= 0.204 af, Depth= 5.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
14,864	84	50-75% Grass cover, Fair, HSG D
5,994	98	Paved parking, HSG D
20,858	88	Weighted Average
14,864		71.26% Pervious Area
5,994		28.74% Impervious Area

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

Summary for Subcatchment EX-7: Retail (Offsite)

Runoff = 0.78 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
2,710	84	50-75% Grass cover, Fair, HSG D
2,783	98	Paved parking, HSG D
5,493	91	Weighted Average
2,710		49.34% Pervious Area
2,783		50.66% Impervious Area

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

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Type III 24-hr 100-yr Rainfall=6.50"

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Summary for Subcatchment EX-8: Retail (Offsite)

Runoff = 0.09 cfs @ 12.07 hrs, Volume= 0.006 af, Depth= 4.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
707	84	50-75% Grass cover, Fair, HSG D
707		100.00% Pervious Area

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

Summary for Link DP-1: New Washington Street

Inflow Area = 3.504 ac, 44.95% Impervious, Inflow Depth = 5.13" for 100-yr event

Inflow = 14.56 cfs @ 12.09 hrs, Volume= 1.498 af

Primary = 14.56 cfs @ 12.09 hrs, Volume= 1.498 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

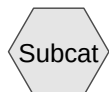
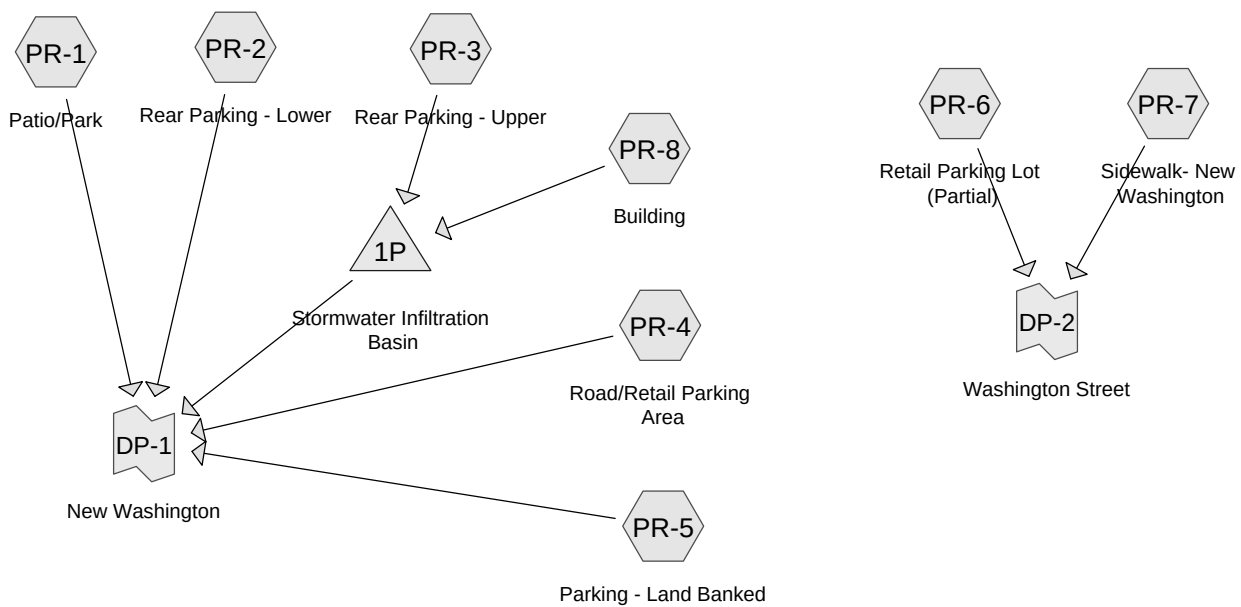
Summary for Link DP-2: Washington Street

Inflow Area = 0.605 ac, 33.31% Impervious, Inflow Depth = 5.18" for 100-yr event

Inflow = 3.64 cfs @ 12.07 hrs, Volume= 0.261 af

Primary = 3.64 cfs @ 12.07 hrs, Volume= 0.261 af, Atten= 0%, Lag= 0.0 min

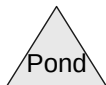
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs



Subcat



Reach



Pond



Link

Routing Diagram for Prop Conditions Somerville
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.180	80	>75% Grass cover, Good, HSG D (PR-1, PR-2, PR-3, PR-4, PR-5, PR-6, PR-7)
2.233	98	Paved parking, HSG D (PR-1, PR-2, PR-3, PR-4, PR-6, PR-7)
0.694	98	Roofs, HSG D (PR-8)
4.108	93	TOTAL AREA

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Type III 24-hr 2-yr Rainfall=3.10"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1: Patio/Park Runoff Area=10,823 sf 62.43% Impervious Runoff Depth=2.16"
Tc=5.0 min CN=91 Runoff=0.64 cfs 0.045 af

Subcatchment PR-2: Rear Parking - Lower Runoff Area=16,058 sf 78.19% Impervious Runoff Depth=2.45"
Tc=5.0 min CN=94 Runoff=1.05 cfs 0.075 af

Subcatchment PR-3: Rear Parking - Upper Runoff Area=26,139 sf 76.77% Impervious Runoff Depth=2.45"
Tc=5.0 min CN=94 Runoff=1.71 cfs 0.122 af

Subcatchment PR-4: Road/Retail Parking Runoff Area=63,913 sf 64.56% Impervious Runoff Depth=2.26"
Flow Length=945' Tc=14.3 min CN=92 Runoff=2.94 cfs 0.276 af

Subcatchment PR-5: Parking - Land Banked Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=1.33"
Tc=5.0 min CN=80 Runoff=0.34 cfs 0.023 af

Subcatchment PR-6: Retail Parking Lot Runoff Area=8,228 sf 96.39% Impervious Runoff Depth=2.76"
Tc=5.0 min CN=97 Runoff=0.58 cfs 0.043 af

Subcatchment PR-7: Sidewalk- New Runoff Area=14,289 sf 60.96% Impervious Runoff Depth=2.16"
Tc=5.0 min CN=91 Runoff=0.85 cfs 0.059 af

Subcatchment PR-8: Building Runoff Area=30,229 sf 100.00% Impervious Runoff Depth=2.87"
Tc=5.0 min CN=98 Runoff=2.16 cfs 0.166 af

Pond 1P: Stormwater Infiltration Basin Peak Elev=13.03' Storage=0.057 af Inflow=3.87 cfs 0.288 af
Discarded=0.96 cfs 0.287 af Primary=0.04 cfs 0.001 af Outflow=1.00 cfs 0.288 af

Link DP-1: New Washington Inflow=4.25 cfs 0.420 af
Primary=4.25 cfs 0.420 af

Link DP-2: Washington Street Inflow=1.43 cfs 0.103 af
Primary=1.43 cfs 0.103 af

Total Runoff Area = 4.108 ac Runoff Volume = 0.810 af Average Runoff Depth = 2.37"
28.74% Pervious = 1.180 ac 71.26% Impervious = 2.927 ac

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Type III 24-hr 2-yr Rainfall=3.10"

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Summary for Subcatchment PR-1: Patio/Park

Runoff = 0.64 cfs @ 12.07 hrs, Volume= 0.045 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
4,066	80	>75% Grass cover, Good, HSG D
6,757	98	Paved parking, HSG D
10,823	91	Weighted Average
4,066		37.57% Pervious Area
6,757		62.43% Impervious Area

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

Summary for Subcatchment PR-2: Rear Parking - Lower

Runoff = 1.05 cfs @ 12.07 hrs, Volume= 0.075 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
3,502	80	>75% Grass cover, Good, HSG D
12,556	98	Paved parking, HSG D
16,058	94	Weighted Average
3,502		21.81% Pervious Area
12,556		78.19% Impervious Area

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

Summary for Subcatchment PR-3: Rear Parking - Upper

Runoff = 1.71 cfs @ 12.07 hrs, Volume= 0.122 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
6,072	80	>75% Grass cover, Good, HSG D
20,067	98	Paved parking, HSG D
26,139	94	Weighted Average
6,072		23.23% Pervious Area
20,067		76.77% Impervious Area

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Type III 24-hr 2-yr Rainfall=3.10"

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

Summary for Subcatchment PR-4: Road/Retail Parking Area

Runoff = 2.94 cfs @ 12.19 hrs, Volume= 0.276 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
22,649	80	>75% Grass cover, Good, HSG D
41,264	98	Paved parking, HSG D
63,913	92	Weighted Average
22,649		35.44% Pervious Area
41,264		64.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	132	0.0750	0.21		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.15"
1.3	173	0.0200	2.28		Shallow Concentrated Flow, Pavement Unpaved Kv= 16.1 fps
0.3	77	0.0100	4.54	3.56	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
14.3	945	Total			

Summary for Subcatchment PR-5: Parking - Land Banked

Runoff = 0.34 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

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Type III 24-hr 2-yr Rainfall=3.10"

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Summary for Subcatchment PR-6: Retail Parking Lot (Partial)

Runoff = 0.58 cfs @ 12.07 hrs, Volume= 0.043 af, Depth= 2.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
297	80	>75% Grass cover, Good, HSG D
7,931	98	Paved parking, HSG D
8,228	97	Weighted Average
297		3.61% Pervious Area
7,931		96.39% Impervious Area

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

Summary for Subcatchment PR-7: Sidewalk- New Washington

Runoff = 0.85 cfs @ 12.07 hrs, Volume= 0.059 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
5,579	80	>75% Grass cover, Good, HSG D
8,710	98	Paved parking, HSG D
14,289	91	Weighted Average
5,579		39.04% Pervious Area
8,710		60.96% Impervious Area

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

Summary for Subcatchment PR-8: Building

Runoff = 2.16 cfs @ 12.07 hrs, Volume= 0.166 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
30,229	98	Roofs, HSG D
30,229		100.00% Impervious Area

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

Summary for Pond 1P: Stormwater Infiltration Basin

Inflow Area = 1.294 ac, 89.23% Impervious, Inflow Depth = 2.67" for 2-yr event
 Inflow = 3.87 cfs @ 12.07 hrs, Volume= 0.288 af
 Outflow = 1.00 cfs @ 12.42 hrs, Volume= 0.288 af, Atten= 74%, Lag= 21.2 min
 Discarded = 0.96 cfs @ 12.42 hrs, Volume= 0.287 af
 Primary = 0.04 cfs @ 12.42 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 13.03' @ 12.42 hrs Surf.Area= 0.087 ac Storage= 0.057 af

Plug-Flow detention time= 12.6 min calculated for 0.288 af (100% of inflow)
 Center-of-Mass det. time= 12.6 min (782.0 - 769.3)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	0.074 af	4.75'W x 7.12'L x 3.50'H Prisma toid x 112 0.304 af Overall - 0.119 af Embedded = 0.186 af x 40.0% Voids
#2	12.50'	0.119 af	StormTech SC-740 x 112 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 8 rows
		0.193 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	12.40'	12.0" Round RCP_Round 12" L= 210.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 12.40' / 9.30' S= 0.0148 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	14.00'	3.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	12.90'	4.0" Vert. Orifice/Grate C= 0.600
#4	Discarded	12.00'	0.090 in/hr Exfiltration X 112.00 over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.96 cfs @ 12.42 hrs HW=13.03' (Free Discharge)
 ↳ **4=Exfiltration** (Controls 0.96 cfs)

Primary OutFlow Max=0.04 cfs @ 12.42 hrs HW=13.03' (Free Discharge)
 ↳ **1=RCP_Round 12"** (Passes 0.04 cfs of 1.84 cfs potential flow)
 ↳ **2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
 ↳ **3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.20 fps)

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Type III 24-hr 2-yr Rainfall=3.10"

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Summary for Link DP-1: New Washington

Inflow Area = 3.591 ac, 70.88% Impervious, Inflow Depth = 1.40" for 2-yr event
Inflow = 4.25 cfs @ 12.12 hrs, Volume= 0.420 af
Primary = 4.25 cfs @ 12.12 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington Street

Inflow Area = 0.517 ac, 73.90% Impervious, Inflow Depth = 2.38" for 2-yr event
Inflow = 1.43 cfs @ 12.07 hrs, Volume= 0.103 af
Primary = 1.43 cfs @ 12.07 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10-yr Rainfall=4.55"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Patio/Park	Runoff Area=10,823 sf 62.43% Impervious Runoff Depth=3.55" Tc=5.0 min CN=91 Runoff=1.03 cfs 0.073 af
SubcatchmentPR-2: Rear Parking - Lower	Runoff Area=16,058 sf 78.19% Impervious Runoff Depth=3.86" Tc=5.0 min CN=94 Runoff=1.62 cfs 0.119 af
SubcatchmentPR-3: Rear Parking - Upper	Runoff Area=26,139 sf 76.77% Impervious Runoff Depth=3.86" Tc=5.0 min CN=94 Runoff=2.64 cfs 0.193 af
SubcatchmentPR-4: Road/Retail Parking	Runoff Area=63,913 sf 64.56% Impervious Runoff Depth=3.65" Flow Length=945' Tc=14.3 min CN=92 Runoff=4.66 cfs 0.446 af
SubcatchmentPR-5: Parking - Land Banked	Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=2.50" Tc=5.0 min CN=80 Runoff=0.65 cfs 0.044 af
SubcatchmentPR-6: Retail Parking Lot	Runoff Area=8,228 sf 96.39% Impervious Runoff Depth=4.20" Tc=5.0 min CN=97 Runoff=0.86 cfs 0.066 af
SubcatchmentPR-7: Sidewalk- New	Runoff Area=14,289 sf 60.96% Impervious Runoff Depth=3.55" Tc=5.0 min CN=91 Runoff=1.36 cfs 0.097 af
SubcatchmentPR-8: Building	Runoff Area=30,229 sf 100.00% Impervious Runoff Depth=4.31" Tc=5.0 min CN=98 Runoff=3.20 cfs 0.249 af
Pond 1P: Stormwater Infiltration Basin	Peak Elev=13.71' Storage=0.105 af Inflow=5.83 cfs 0.443 af Discarded=1.01 cfs 0.417 af Primary=0.34 cfs 0.026 af Outflow=1.35 cfs 0.443 af
Link DP-1: New Washington	Inflow=7.00 cfs 0.709 af Primary=7.00 cfs 0.709 af
Link DP-2: Washington Street	Inflow=2.22 cfs 0.163 af Primary=2.22 cfs 0.163 af

Total Runoff Area = 4.108 ac Runoff Volume = 1.289 af Average Runoff Depth = 3.76"
28.74% Pervious = 1.180 ac 71.26% Impervious = 2.927 ac

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Type III 24-hr 10-yr Rainfall=4.55"

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Summary for Subcatchment PR-1: Patio/Park

Runoff = 1.03 cfs @ 12.07 hrs, Volume= 0.073 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
4,066	80	>75% Grass cover, Good, HSG D
6,757	98	Paved parking, HSG D
10,823	91	Weighted Average
4,066		37.57% Pervious Area
6,757		62.43% Impervious Area

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

Summary for Subcatchment PR-2: Rear Parking - Lower

Runoff = 1.62 cfs @ 12.07 hrs, Volume= 0.119 af, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
3,502	80	>75% Grass cover, Good, HSG D
12,556	98	Paved parking, HSG D
16,058	94	Weighted Average
3,502		21.81% Pervious Area
12,556		78.19% Impervious Area

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

Summary for Subcatchment PR-3: Rear Parking - Upper

Runoff = 2.64 cfs @ 12.07 hrs, Volume= 0.193 af, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
6,072	80	>75% Grass cover, Good, HSG D
20,067	98	Paved parking, HSG D
26,139	94	Weighted Average
6,072		23.23% Pervious Area
20,067		76.77% Impervious Area

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Type III 24-hr 10-yr Rainfall=4.55"

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

Summary for Subcatchment PR-4: Road/Retail Parking Area

Runoff = 4.66 cfs @ 12.19 hrs, Volume= 0.446 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
22,649	80	>75% Grass cover, Good, HSG D
41,264	98	Paved parking, HSG D
63,913	92	Weighted Average
22,649		35.44% Pervious Area
41,264		64.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	132	0.0750	0.21		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.15"
1.3	173	0.0200	2.28		Shallow Concentrated Flow, Pavement Unpaved Kv= 16.1 fps
0.3	77	0.0100	4.54	3.56	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
14.3	945	Total			

Summary for Subcatchment PR-5: Parking - Land Banked

Runoff = 0.65 cfs @ 12.07 hrs, Volume= 0.044 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

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Type III 24-hr 10-yr Rainfall=4.55"

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Summary for Subcatchment PR-6: Retail Parking Lot (Partial)

Runoff = 0.86 cfs @ 12.07 hrs, Volume= 0.066 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
297	80	>75% Grass cover, Good, HSG D
7,931	98	Paved parking, HSG D
8,228	97	Weighted Average
297		3.61% Pervious Area
7,931		96.39% Impervious Area

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

Summary for Subcatchment PR-7: Sidewalk- New Washington

Runoff = 1.36 cfs @ 12.07 hrs, Volume= 0.097 af, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
5,579	80	>75% Grass cover, Good, HSG D
8,710	98	Paved parking, HSG D
14,289	91	Weighted Average
5,579		39.04% Pervious Area
8,710		60.96% Impervious Area

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

Summary for Subcatchment PR-8: Building

Runoff = 3.20 cfs @ 12.07 hrs, Volume= 0.249 af, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.55"

Area (sf)	CN	Description
30,229	98	Roofs, HSG D
30,229		100.00% Impervious Area

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Type III 24-hr 10-yr Rainfall=4.55"

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

Summary for Pond 1P: Stormwater Infiltration Basin

Inflow Area = 1.294 ac, 89.23% Impervious, Inflow Depth = 4.11" for 10-yr event
Inflow = 5.83 cfs @ 12.07 hrs, Volume= 0.443 af
Outflow = 1.35 cfs @ 12.45 hrs, Volume= 0.443 af, Atten= 77%, Lag= 22.8 min
Discarded = 1.01 cfs @ 12.45 hrs, Volume= 0.417 af
Primary = 0.34 cfs @ 12.45 hrs, Volume= 0.026 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 13.71' @ 12.45 hrs Surf.Area= 0.087 ac Storage= 0.105 af

Plug-Flow detention time= 20.9 min calculated for 0.443 af (100% of inflow)
Center-of-Mass det. time= 20.9 min (781.2 - 760.3)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	0.074 af	4.75'W x 7.12'L x 3.50'H Prisma toid x 112 0.304 af Overall - 0.119 af Embedded = 0.186 af x 40.0% Voids
#2	12.50'	0.119 af	StormTech SC-740 x 112 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 8 rows
		0.193 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	12.40'	12.0" Round RCP_Round 12" L= 210.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 12.40' / 9.30' S= 0.0148 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	14.00'	3.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	12.90'	4.0" Vert. Orifice/Grate C= 0.600
#4	Discarded	12.00'	0.090 in/hr Exfiltration X 112.00 over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=1.01 cfs @ 12.45 hrs HW=13.71' (Free Discharge)
↑**4=Exfiltration** (Controls 1.01 cfs)

Primary OutFlow Max=0.34 cfs @ 12.45 hrs HW=13.71' (Free Discharge)
↑**1=RCP_Round 12"** (Passes 0.34 cfs of 4.39 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
↑**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 3.87 fps)

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Type III 24-hr 10-yr Rainfall=4.55"

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Summary for Link DP-1: New Washington

Inflow Area = 3.591 ac, 70.88% Impervious, Inflow Depth = 2.37" for 10-yr event
Inflow = 7.00 cfs @ 12.12 hrs, Volume= 0.709 af
Primary = 7.00 cfs @ 12.12 hrs, Volume= 0.709 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington Street

Inflow Area = 0.517 ac, 73.90% Impervious, Inflow Depth = 3.78" for 10-yr event
Inflow = 2.22 cfs @ 12.07 hrs, Volume= 0.163 af
Primary = 2.22 cfs @ 12.07 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 25-yr Rainfall=5.40"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Patio/Park	Runoff Area=10,823 sf 62.43% Impervious Runoff Depth=4.37" Tc=5.0 min CN=91 Runoff=1.26 cfs 0.091 af
SubcatchmentPR-2: Rear Parking - Lower	Runoff Area=16,058 sf 78.19% Impervious Runoff Depth=4.70" Tc=5.0 min CN=94 Runoff=1.95 cfs 0.144 af
SubcatchmentPR-3: Rear Parking - Upper	Runoff Area=26,139 sf 76.77% Impervious Runoff Depth=4.70" Tc=5.0 min CN=94 Runoff=3.17 cfs 0.235 af
SubcatchmentPR-4: Road/Retail Parking	Runoff Area=63,913 sf 64.56% Impervious Runoff Depth=4.48" Flow Length=945' Tc=14.3 min CN=92 Runoff=5.65 cfs 0.548 af
SubcatchmentPR-5: Parking - Land Banked	Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=3.24" Tc=5.0 min CN=80 Runoff=0.84 cfs 0.057 af
SubcatchmentPR-6: Retail Parking Lot	Runoff Area=8,228 sf 96.39% Impervious Runoff Depth=5.05" Tc=5.0 min CN=97 Runoff=1.03 cfs 0.079 af
SubcatchmentPR-7: Sidewalk- New	Runoff Area=14,289 sf 60.96% Impervious Runoff Depth=4.37" Tc=5.0 min CN=91 Runoff=1.66 cfs 0.119 af
SubcatchmentPR-8: Building	Runoff Area=30,229 sf 100.00% Impervious Runoff Depth=5.16" Tc=5.0 min CN=98 Runoff=3.80 cfs 0.299 af
Pond 1P: Stormwater Infiltration Basin	Peak Elev=14.12' Storage=0.132 af Inflow=6.97 cfs 0.534 af Discarded=1.04 cfs 0.484 af Primary=0.84 cfs 0.049 af Outflow=1.88 cfs 0.534 af
Link DP-1: New Washington	Inflow=8.61 cfs 0.890 af Primary=8.61 cfs 0.890 af
Link DP-2: Washington Street	Inflow=2.69 cfs 0.199 af Primary=2.69 cfs 0.199 af

Total Runoff Area = 4.108 ac Runoff Volume = 1.573 af Average Runoff Depth = 4.59"
28.74% Pervious = 1.180 ac 71.26% Impervious = 2.927 ac

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Type III 24-hr 25-yr Rainfall=5.40"

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Summary for Subcatchment PR-1: Patio/Park

Runoff = 1.26 cfs @ 12.07 hrs, Volume= 0.091 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
4,066	80	>75% Grass cover, Good, HSG D
6,757	98	Paved parking, HSG D
10,823	91	Weighted Average
4,066		37.57% Pervious Area
6,757		62.43% Impervious Area

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

Summary for Subcatchment PR-2: Rear Parking - Lower

Runoff = 1.95 cfs @ 12.07 hrs, Volume= 0.144 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
3,502	80	>75% Grass cover, Good, HSG D
12,556	98	Paved parking, HSG D
16,058	94	Weighted Average
3,502		21.81% Pervious Area
12,556		78.19% Impervious Area

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

Summary for Subcatchment PR-3: Rear Parking - Upper

Runoff = 3.17 cfs @ 12.07 hrs, Volume= 0.235 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
6,072	80	>75% Grass cover, Good, HSG D
20,067	98	Paved parking, HSG D
26,139	94	Weighted Average
6,072		23.23% Pervious Area
20,067		76.77% Impervious Area

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Type III 24-hr 25-yr Rainfall=5.40"

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

Summary for Subcatchment PR-4: Road/Retail Parking Area

Runoff = 5.65 cfs @ 12.19 hrs, Volume= 0.548 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
22,649	80	>75% Grass cover, Good, HSG D
41,264	98	Paved parking, HSG D
63,913	92	Weighted Average
22,649		35.44% Pervious Area
41,264		64.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	132	0.0750	0.21		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.15"
1.3	173	0.0200	2.28		Shallow Concentrated Flow, Pavement Unpaved Kv= 16.1 fps
0.3	77	0.0100	4.54	3.56	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
14.3	945	Total			

Summary for Subcatchment PR-5: Parking - Land Banked

Runoff = 0.84 cfs @ 12.07 hrs, Volume= 0.057 af, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

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Type III 24-hr 25-yr Rainfall=5.40"

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Summary for Subcatchment PR-6: Retail Parking Lot (Partial)

Runoff = 1.03 cfs @ 12.07 hrs, Volume= 0.079 af, Depth= 5.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
297	80	>75% Grass cover, Good, HSG D
7,931	98	Paved parking, HSG D
8,228	97	Weighted Average
297		3.61% Pervious Area
7,931		96.39% Impervious Area

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

Summary for Subcatchment PR-7: Sidewalk- New Washington

Runoff = 1.66 cfs @ 12.07 hrs, Volume= 0.119 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
5,579	80	>75% Grass cover, Good, HSG D
8,710	98	Paved parking, HSG D
14,289	91	Weighted Average
5,579		39.04% Pervious Area
8,710		60.96% Impervious Area

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

Summary for Subcatchment PR-8: Building

Runoff = 3.80 cfs @ 12.07 hrs, Volume= 0.299 af, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
30,229	98	Roofs, HSG D
30,229		100.00% Impervious Area

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Type III 24-hr 25-yr Rainfall=5.40"

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

Summary for Pond 1P: Stormwater Infiltration Basin

Inflow Area = 1.294 ac, 89.23% Impervious, Inflow Depth = 4.95" for 25-yr event
Inflow = 6.97 cfs @ 12.07 hrs, Volume= 0.534 af
Outflow = 1.88 cfs @ 12.41 hrs, Volume= 0.534 af, Atten= 73%, Lag= 20.1 min
Discarded = 1.04 cfs @ 12.41 hrs, Volume= 0.484 af
Primary = 0.84 cfs @ 12.41 hrs, Volume= 0.049 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.12' @ 12.41 hrs Surf.Area= 0.087 ac Storage= 0.132 af

Plug-Flow detention time= 24.3 min calculated for 0.534 af (100% of inflow)
Center-of-Mass det. time= 24.3 min (780.9 - 756.7)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	0.074 af	4.75'W x 7.12'L x 3.50'H Prisma toid x 112 0.304 af Overall - 0.119 af Embedded = 0.186 af x 40.0% Voids
#2	12.50'	0.119 af	StormTech SC-740 x 112 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 8 rows
		0.193 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	12.40'	12.0" Round RCP_Round 12" L= 210.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 12.40' / 9.30' S= 0.0148 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	14.00'	3.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	12.90'	4.0" Vert. Orifice/Grate C= 0.600
#4	Discarded	12.00'	0.090 in/hr Exfiltration X 112.00 over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=1.04 cfs @ 12.41 hrs HW=14.12' (Free Discharge)
↑**4=Exfiltration** (Controls 1.04 cfs)

Primary OutFlow Max=0.83 cfs @ 12.41 hrs HW=14.12' (Free Discharge)
↑**1=RCP_Round 12"** (Passes 0.83 cfs of 4.44 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 1.13 fps)
↑**3=Orifice/Grate** (Orifice Controls 0.43 cfs @ 4.94 fps)

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Type III 24-hr 25-yr Rainfall=5.40"

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Summary for Link DP-1: New Washington

Inflow Area = 3.591 ac, 70.88% Impervious, Inflow Depth = 2.97" for 25-yr event
Inflow = 8.61 cfs @ 12.12 hrs, Volume= 0.890 af
Primary = 8.61 cfs @ 12.12 hrs, Volume= 0.890 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington Street

Inflow Area = 0.517 ac, 73.90% Impervious, Inflow Depth = 4.62" for 25-yr event
Inflow = 2.69 cfs @ 12.07 hrs, Volume= 0.199 af
Primary = 2.69 cfs @ 12.07 hrs, Volume= 0.199 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-yr Rainfall=6.50"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1: Patio/Park Runoff Area=10,823 sf 62.43% Impervious Runoff Depth=5.45"
Tc=5.0 min CN=91 Runoff=1.55 cfs 0.113 af

Subcatchment PR-2: Rear Parking - Lower Runoff Area=16,058 sf 78.19% Impervious Runoff Depth=5.79"
Tc=5.0 min CN=94 Runoff=2.37 cfs 0.178 af

Subcatchment PR-3: Rear Parking - Upper Runoff Area=26,139 sf 76.77% Impervious Runoff Depth=5.79"
Tc=5.0 min CN=94 Runoff=3.86 cfs 0.290 af

Subcatchment PR-4: Road/Retail Parking Runoff Area=63,913 sf 64.56% Impervious Runoff Depth=5.56"
Flow Length=945' Tc=14.3 min CN=92 Runoff=6.93 cfs 0.680 af

Subcatchment PR-5: Parking - Land Banked Runoff Area=9,252 sf 0.00% Impervious Runoff Depth=4.24"
Tc=5.0 min CN=80 Runoff=1.09 cfs 0.075 af

Subcatchment PR-6: Retail Parking Lot Runoff Area=8,228 sf 96.39% Impervious Runoff Depth=6.14"
Tc=5.0 min CN=97 Runoff=1.24 cfs 0.097 af

Subcatchment PR-7: Sidewalk- New Runoff Area=14,289 sf 60.96% Impervious Runoff Depth=5.45"
Tc=5.0 min CN=91 Runoff=2.04 cfs 0.149 af

Subcatchment PR-8: Building Runoff Area=30,229 sf 100.00% Impervious Runoff Depth=6.26"
Tc=5.0 min CN=98 Runoff=4.58 cfs 0.362 af

Pond 1P: Stormwater Infiltration Basin Peak Elev=14.34' Storage=0.145 af Inflow=8.44 cfs 0.652 af
Discarded=1.06 cfs 0.552 af Primary=2.40 cfs 0.099 af Outflow=3.45 cfs 0.652 af

Link DP-1: New Washington Inflow=11.57 cfs 1.145 af
Primary=11.57 cfs 1.145 af

Link DP-2: Washington Street Inflow=3.28 cfs 0.246 af
Primary=3.28 cfs 0.246 af

Total Runoff Area = 4.108 ac Runoff Volume = 1.943 af Average Runoff Depth = 5.68"
28.74% Pervious = 1.180 ac 71.26% Impervious = 2.927 ac

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Type III 24-hr 100-yr Rainfall=6.50"

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Summary for Subcatchment PR-1: Patio/Park

Runoff = 1.55 cfs @ 12.07 hrs, Volume= 0.113 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
4,066	80	>75% Grass cover, Good, HSG D
6,757	98	Paved parking, HSG D
10,823	91	Weighted Average
4,066		37.57% Pervious Area
6,757		62.43% Impervious Area

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

Summary for Subcatchment PR-2: Rear Parking - Lower

Runoff = 2.37 cfs @ 12.07 hrs, Volume= 0.178 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
3,502	80	>75% Grass cover, Good, HSG D
12,556	98	Paved parking, HSG D
16,058	94	Weighted Average
3,502		21.81% Pervious Area
12,556		78.19% Impervious Area

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

Summary for Subcatchment PR-3: Rear Parking - Upper

Runoff = 3.86 cfs @ 12.07 hrs, Volume= 0.290 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
6,072	80	>75% Grass cover, Good, HSG D
20,067	98	Paved parking, HSG D
26,139	94	Weighted Average
6,072		23.23% Pervious Area
20,067		76.77% Impervious Area

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Type III 24-hr 100-yr Rainfall=6.50"

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

Summary for Subcatchment PR-4: Road/Retail Parking Area

Runoff = 6.93 cfs @ 12.19 hrs, Volume= 0.680 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
22,649	80	>75% Grass cover, Good, HSG D
41,264	98	Paved parking, HSG D
63,913	92	Weighted Average
22,649		35.44% Pervious Area
41,264		64.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	132	0.0750	0.21		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.15"
1.3	173	0.0200	2.28		Shallow Concentrated Flow, Pavement Unpaved Kv= 16.1 fps
0.3	77	0.0100	4.54	3.56	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
2.1	563	0.0070	4.40	5.40	Pipe Channel, RCP_Round 15" 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
14.3	945	Total			

Summary for Subcatchment PR-5: Parking - Land Banked

Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.075 af, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
9,252	80	>75% Grass cover, Good, HSG D
9,252		100.00% Pervious Area

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

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Type III 24-hr 100-yr Rainfall=6.50"

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Summary for Subcatchment PR-6: Retail Parking Lot (Partial)

Runoff = 1.24 cfs @ 12.07 hrs, Volume= 0.097 af, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
297	80	>75% Grass cover, Good, HSG D
7,931	98	Paved parking, HSG D
8,228	97	Weighted Average
297		3.61% Pervious Area
7,931		96.39% Impervious Area

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

Summary for Subcatchment PR-7: Sidewalk- New Washington

Runoff = 2.04 cfs @ 12.07 hrs, Volume= 0.149 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
5,579	80	>75% Grass cover, Good, HSG D
8,710	98	Paved parking, HSG D
14,289	91	Weighted Average
5,579		39.04% Pervious Area
8,710		60.96% Impervious Area

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

Summary for Subcatchment PR-8: Building

Runoff = 4.58 cfs @ 12.07 hrs, Volume= 0.362 af, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
30,229	98	Roofs, HSG D
30,229		100.00% Impervious Area

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Type III 24-hr 100-yr Rainfall=6.50"

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

Summary for Pond 1P: Stormwater Infiltration Basin

Inflow Area = 1.294 ac, 89.23% Impervious, Inflow Depth = 6.04" for 100-yr event
Inflow = 8.44 cfs @ 12.07 hrs, Volume= 0.652 af
Outflow = 3.45 cfs @ 12.25 hrs, Volume= 0.652 af, Atten= 59%, Lag= 11.1 min
Discarded = 1.06 cfs @ 12.25 hrs, Volume= 0.552 af
Primary = 2.40 cfs @ 12.25 hrs, Volume= 0.099 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 14.34' @ 12.25 hrs Surf.Area= 0.087 ac Storage= 0.145 af

Plug-Flow detention time= 23.2 min calculated for 0.652 af (100% of inflow)
Center-of-Mass det. time= 23.2 min (776.3 - 753.0)

Volume	Invert	Avail.Storage	Storage Description
#1	12.00'	0.074 af	4.75'W x 7.12'L x 3.50'H Prisma toid x 112 0.304 af Overall - 0.119 af Embedded = 0.186 af x 40.0% Voids
#2	12.50'	0.119 af	StormTech SC-740 x 112 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 8 rows
		0.193 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	12.40'	12.0" Round RCP_Round 12" L= 210.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 12.40' / 9.30' S= 0.0148 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 0.79 sf
#2	Device 1	14.00'	3.0' long x 0.50' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)
#3	Device 1	12.90'	4.0" Vert. Orifice/Grate C= 0.600
#4	Discarded	12.00'	0.090 in/hr Exfiltration X 112.00 over Surface area Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=1.06 cfs @ 12.25 hrs HW=14.34' (Free Discharge)
↑**4=Exfiltration** (Controls 1.06 cfs)

Primary OutFlow Max=2.40 cfs @ 12.25 hrs HW=14.34' (Free Discharge)
↑**1=RCP_Round 12"** (Passes 2.40 cfs of 4.57 cfs potential flow)
↑**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.92 cfs @ 1.91 fps)
↑**3=Orifice/Grate** (Orifice Controls 0.47 cfs @ 5.44 fps)

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90 Washington Street, Somerville, MA

Type III 24-hr 100-yr Rainfall=6.50"

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Summary for Link DP-1: New Washington

Inflow Area = 3.591 ac, 70.88% Impervious, Inflow Depth = 3.83" for 100-yr event
Inflow = 11.57 cfs @ 12.19 hrs, Volume= 1.145 af
Primary = 11.57 cfs @ 12.19 hrs, Volume= 1.145 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Washington Street

Inflow Area = 0.517 ac, 73.90% Impervious, Inflow Depth = 5.70" for 100-yr event
Inflow = 3.28 cfs @ 12.07 hrs, Volume= 0.246 af
Primary = 3.28 cfs @ 12.07 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Project Name: **Cobble Hill Center Redevelopment**
 Project Location: **90 Washington Street, Somerville, MA**
 Project Number: **16120002**

Date: **10/4/2012**
 Calculated By: **JRS**
 Checked By: **BKF**

Total Impervious Area

Existing Conditions: 77,384.1 sq. ft.
1.78 acres

Proposed Conditions 127,513.4 sq. ft.
2.93 acres

Net New Impervious Area: **50,129.4 sq. ft.**
1.15 acres

Required Recharge Volume

Hydraulic Soil Group (HSG)	Area (sq. ft.)	Area (acres)	Recharge Depth (inches)	Volume (cu. ft.)
A		0.0	0.60	0.0
B	0.0	0.0	0.35	0.0
C	0.0	0.0	0.25	0.0
D	50,129.4	1.2	0.10	417.7
Total	50,129.4	1.15		417.7

Capture Area Adjustment

Impervious area draining to recharge facility: 1.2 acres (includes portions of the
 Total site impervious area: 2.9 acres pavement and the entire
 Impervious Ratio (Total Site Imp./Imp. to Facility): 2.5 building)

Adj. Minimum Required Recharge Volume: **1,063.4 cu. ft.**

Provided Recharge Volume

(StormTech SC -740)

Number of Chambers: 112

System Invert (Bot of Str.): 12.5 ft

Orifice Inv. Elevation: 12.9 ft

Depth of Storage: 0.4 ft

Storage per Chamber @ Depth: 10.9 cu. ft.

(Per Manufacturer's Specs -
See Attached Table 4)

Total Provided Recharge Volume: **1,220.8 cu. ft.**

72-hour Drawdown Calculation

Required Recharge Volume: 1,220.8 cu. ft.

Saturated Hydraulic Conductivity: 0.09 in/hr

(Rawls Rate was used)

Bottom Area: 2963.8 sq. ft.

Drawdown Time: **54.9 Hours**

Project Name: Cobble Hill Center Redevelopment
Project Location: 90 Washington Street, Somerville, MA
Project Number: 16120002

Date: 10/4/2012
Calculated By: JRS
Checked By: BKF

Structure Name: **WQS A-I**

Description: Stormceptor STC 450i

Subcatchment: **PR-1**

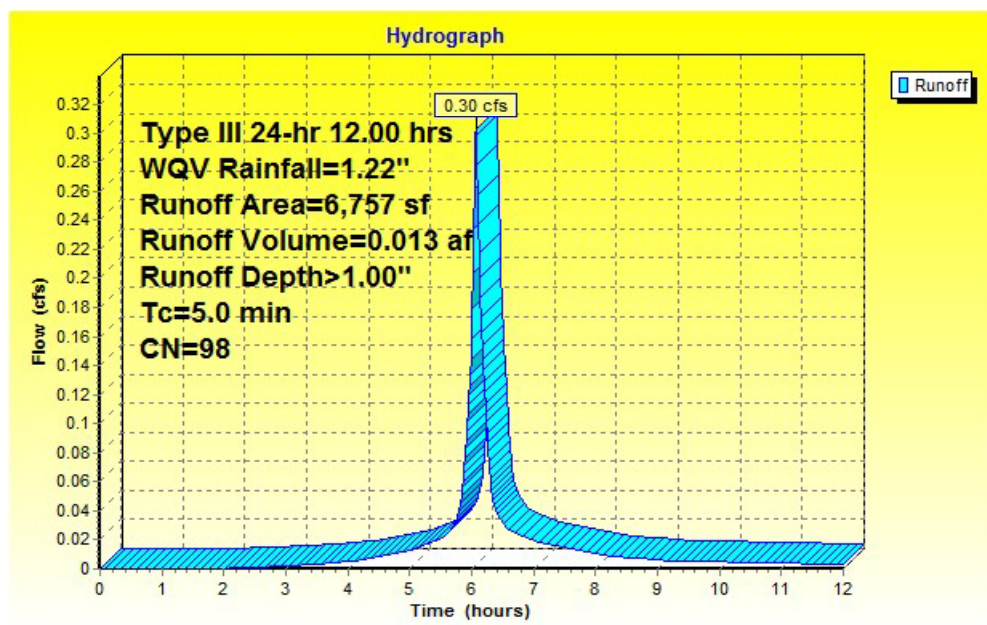
Total Drainage Area: 10,823 sq.ft.
0.25 ac

Total Intervius Area: 6,757 sq. ft.
0.16 acres

Runoff Depth to be Treated: 1.0 inches

Required Water Quality Volume:	563 cu. ft.
	0.01 ac.-ft.

Flowrate Conversion



Note: 12-hr Duration, Type III, 24-hour Storm producing
1.0 inches of runoff from impervious surfaces

Design Peak Flow Rate: **0.30** cfs (Based on HydroCAD Analysis)
Water Quality Runoff Volume: **0.013** ac-ft (Based on HydroCAD Analysis)

Stormceptor 450i will provide a treatment capacity of **0.3** cfs at **91%** TSS removal efficiency

(Based on Manufacturer's sizing. See attached calculation.)

Note: **While the 450i is sufficient to treat the WQV, the structure will be upsized to a Stormceptor STC 900 due to the configuration of pipe network.**



Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	10/1/2012
Project Name	Cobble Hill Redevelopment
Project Number	16120002
Location	Somerville, MA

Designer Information

Company	EBI Consulting
Contact	Jamie Sullivan

Notes

WQU A-1

Drainage Area

Total Area (ac)	0.25
Imperviousness (%)	62.4

The Stormceptor System model STC 450i achieves the water quality objective removing 91% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.3 cfs.

Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.3

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	91
STC 900	95
STC 1200	95
STC 1800	95
STC 2400	96
STC 3600	97
STC 4800	98
STC 6000	98
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size	Distribution	Specific Gravity	Settling Velocity		Particle Size	Distribution	Specific Gravity	Settling Velocity
μm	%		ft/s		μm	%		ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763
www.rinkerstormceptor.com

Project Name: **Cobble Hill Center Redevelopment**
 Project Location: **90 Washington Street, Somerville, MA**
 Project Number: **16120002**

Date: **10/4/2012**
 Calculated By: **JRS**
 Checked By: **BKF**

Structure Name: **WQS B-3**

Description: **Stormceptor STC 450i**

Subcatchment: **PR-2**

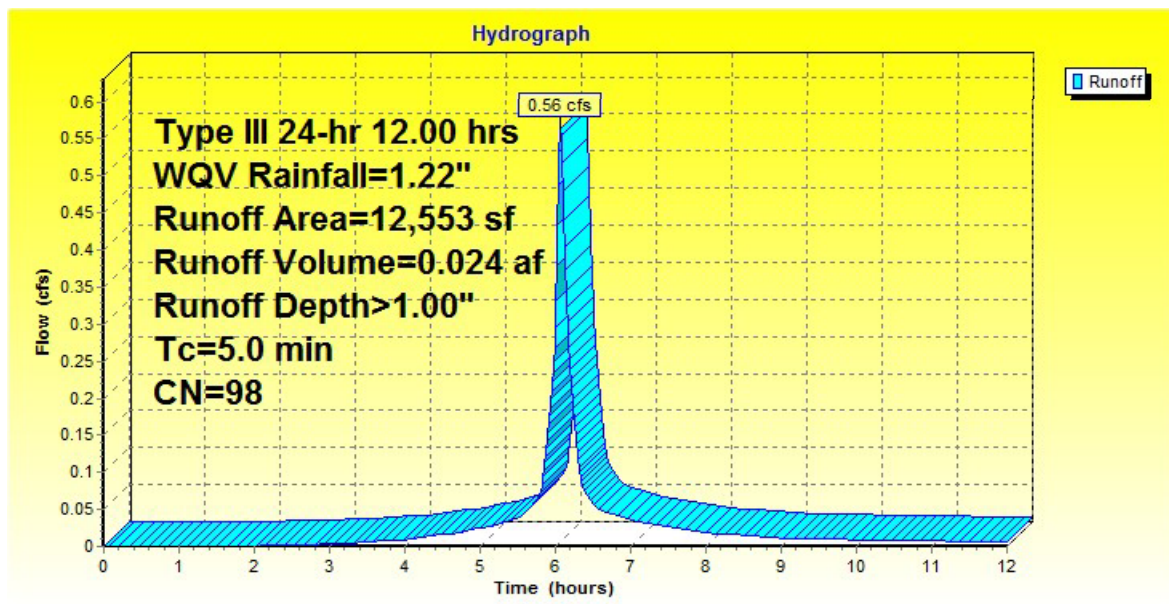
Total Drainage Area: **16,058 sq.ft.**
 0.37 ac

Total Impervious Area: **12,556 sq. ft.**
 0.29 acres

Runoff Depth to be Treated: **1.0 inches**

Required Water Quality Volume:
1,046 cu. ft.
0.02 ac-ft.

Flowrate Conversion



Note: 12-hr Duration, Type III, 24-hour Storm producing
 1.0 inches of runoff from impervious surfaces

Design Peak Flow Rate: **0.56 cfs** (Based on HydroCAD Analysis)
 Water Quality Runoff Volume: **0.024 ac-ft** (Based on HydroCAD Analysis)

Stormceptor 450i will provide a treatment capacity of
0.56 cfs at **88%** TSS removal efficiency

(Based on Manufacturer's sizing. See attached calculation.)



Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	10/1/2012
Project Name	Cobble Hill Redevelopment
Project Number	16120002
Location	Somerville, MA

Designer Information

Company	EBI Consulting
Contact	Jamie Sullivan

Notes

WQU B-3

Drainage Area

Total Area (ac)	0.37
Imperviousness (%)	78.2

The Stormceptor System model STC 450i achieves the water quality objective removing 88% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.56 cfs.

Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.56

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	88
STC 900	92
STC 1200	93
STC 1800	93
STC 2400	95
STC 3600	95
STC 4800	96
STC 6000	96
STC 7200	97
STC 11000	98
STC 13000	98
STC 16000	98



Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)							
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity Settling Velocity ft/s
20	20	1.3	0.0013				
60	20	1.8	0.0051				
150	20	2.2	0.0354				
400	20	2.65	0.2123				
2000	20	2.65	0.9417				

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763
www.rinkerstormceptor.com

Project Name: **Cobble Hill Center Redevelopment**
 Project Location: **90 Washington Street, Somerville, MA**
 Project Number: **16120002**

Date: **10/4/2012**
 Calculated By: **JRS**
 Checked By: **BKF**

Structure Name: **WQS C-3**

Description: **Stormceptor STC 900**

Subcatchment: **PR-3**

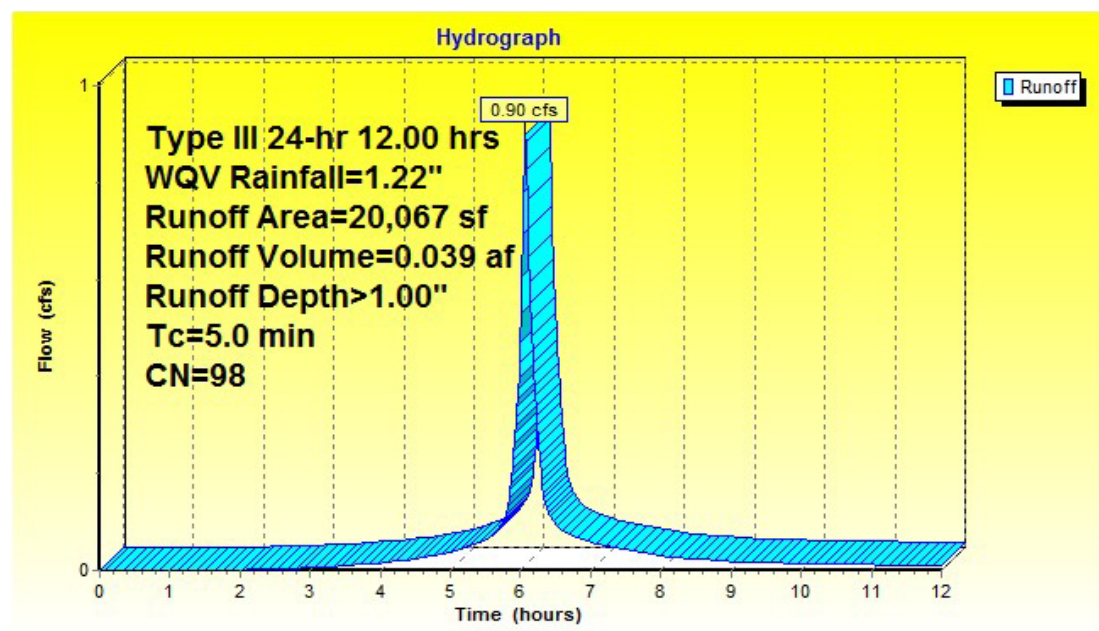
Total Drainage Area: **26,139** sq.ft.
0.60 ac

Total Impervious Area: **20,067** sq. ft.
0.46 acres

Runoff Depth to be Treated: **1.0** inches

Required Water Quality Volume: **1,672** cu. ft.
0.04 ac-ft.

Flowrate Conversion



Note: 12-hr Duration, Type III, 24-hour Storm producing
1.0 inches of runoff from impervious surfaces

Design Peak Flow Rate: **0.90** cfs (Based on HydroCAD Analysis)

Water Quality Runoff Volume: **0.039** ac-ft (Based on HydroCAD Analysis)

Stormceptor 450i will provide a treatment capacity of
0.90 cfs at **84%** TSS removal efficiency

(Based on Manufacturer's sizing. See attached calculation.)

Note: **While the 450i is sufficient to treat the WQV, the structure will be upsized to a Stormceptor STC 900 due to the configuration of pipe network.**



Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	10/1/2012
Project Name	Cobble Hill Redevelopment
Project Number	16120002
Location	Somerville, MA

Designer Information

Company	EBI Consulting
Contact	Jamie Sullivan

Notes

WQU C-3

Drainage Area

Total Area (ac)	0.6
Imperviousness (%)	76.8

The Stormceptor System model STC 450i achieves the water quality objective removing 84% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.9 cfs.

Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.9

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	84
STC 900	90
STC 1200	90
STC 1800	90
STC 2400	93
STC 3600	93
STC 4800	95
STC 6000	95
STC 7200	96
STC 11000	97
STC 13000	97
STC 16000	98

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size	Distribution	Specific Gravity	Settling Velocity		Particle Size	Distribution	Specific Gravity	Settling Velocity
μm	%		ft/s		μm	%		ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

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- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

Project Name: **Cobble Hill Center Redevelopment**
 Project Location: **90 Washington Street, Somerville, MA**
 Project Number: **16120002**

Date: **10/4/2012**
 Calculated By: **JRS**
 Checked By: **BKF**

Structure Name: **WQS D-1**

Description: **Stormceptor STC 900**

Subcatchment: **PR-4**

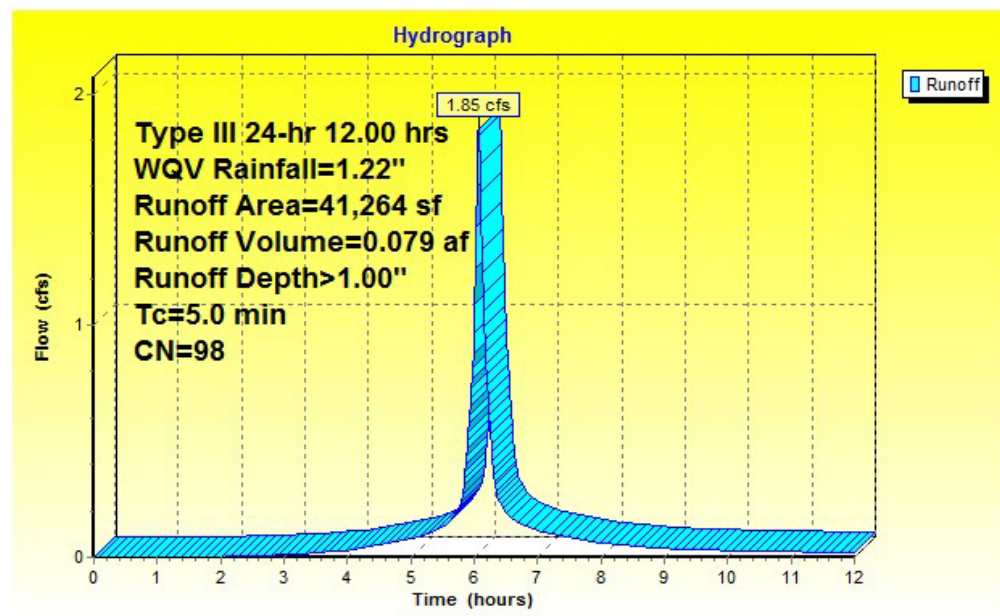
Total Drainage Area: **63,913 sq.ft.**
1.47 ac

Total Impervious Area: **41,264 sq. ft.**
0.95 acres

Runoff Depth to be Treated: **1.0 inches**

Required Water Quality Volume:
3,439 cu. ft.
0.08 ac-ft.

Flowrate Conversion



Note: 12-hr Duration, Type III, 24-hour Storm producing
1.0 inches of runoff from impervious surfaces

Design Peak Flow Rate: **1.85 cfs** (Based on HydroCAD Analysis)
 Water Quality Runoff Volume: **0.079 ac-ft** (Based on HydroCAD Analysis)

Stormceptor 450i will provide a treatment capacity of
1.85 cfs at **85%** TSS removal efficiency

(Based on Manufacturer's sizing. See attached calculation.)



Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	10/1/2012
Project Name	Cobble Hill Redevelopment
Project Number	16120002
Location	Somerville, MA

Designer Information

Company	EBI Consulting
Contact	Jamie Sullivan

Notes

WQU D-1

Drainage Area

Total Area (ac)	1.47
Imperviousness (%)	64.6

The Stormceptor System model STC 900 achieves the water quality objective removing 85% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 1.85 cfs.

Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	1.85

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	77
STC 900	85
STC 1200	85
STC 1800	85
STC 2400	89
STC 3600	89
STC 4800	91
STC 6000	92
STC 7200	93
STC 11000	95
STC 13000	95
STC 16000	96

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)							
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity Settling Velocity ft/s
20	20	1.3	0.0013				
60	20	1.8	0.0051				
150	20	2.2	0.0354				
400	20	2.65	0.2123				
2000	20	2.65	0.9417				

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
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www.rinkerstormceptor.com

Project Name: **Cobble Hill Center Redevelopment**
 Project Location: **90 Washington Street, Somerville, MA**
 Project Number: **16120002**

Date: **10/4/2012**
 Calculated By: **JRS**
 Checked By: **BKF**

Structure Name: **WQS E-2**

Description: **Stormceptor STC 900**

Subcatchment: **PR-6**

Total Drainage Area: **8,228 sq.ft.**
0.19 ac

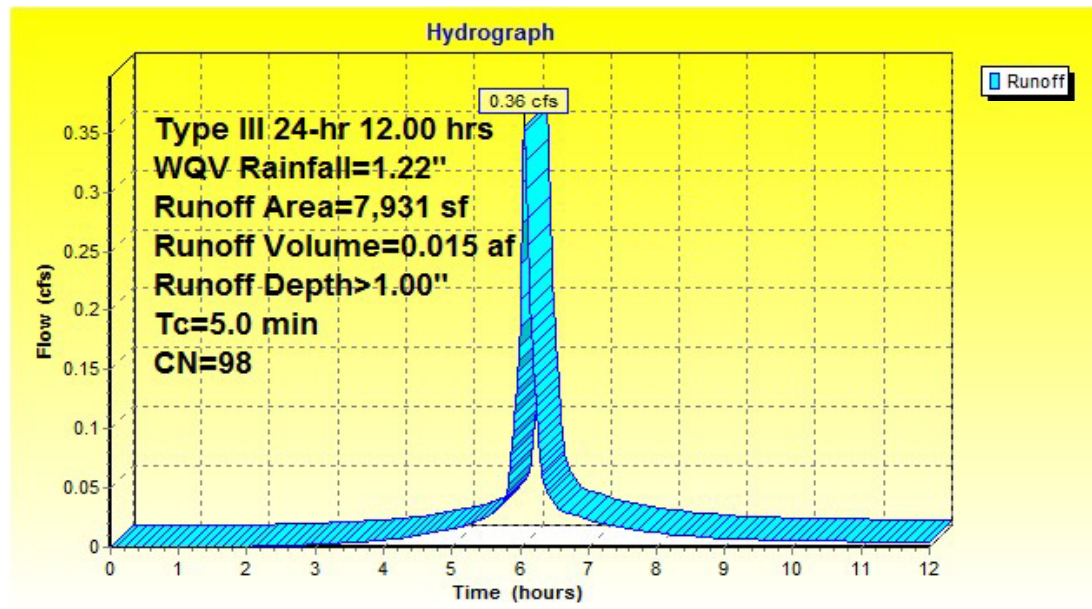
Total Impervious Area: **7,931 sq. ft.**
0.18 acres

Runoff Depth to be Treated: **1.0 inches**

Required Water Quality Volume:

661 cu. ft.
0.02 ac-ft.

Flowrate Conversion



Note: 12-hr Duration, Type III, 24-hour Storm producing
1.0 inches of runoff from impervious surfaces

Design Peak Flow Rate: **0.36 cfs** (Based on HydroCAD Analysis)

Water Quality Runoff Volume: **0.015 ac-ft** (Based on HydroCAD Analysis)

Stormceptor 450i will provide a treatment capacity of 0.36 cfs at 91% TSS removal efficiency
--

(Based on Manufacturer's sizing. See attached calculation.)

Note: **While the 450i is sufficient to treat the WQV, the structure will be upsized to a Stormceptor STC 900 due to the configuration of pipe network.**



Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	10/1/2012
Project Name	Cobble Hill Redevelopment
Project Number	16120002
Location	Somerville, MA

Designer Information

Company	EBI Consulting
Contact	Jamie Sullivan

Notes

WQU E-2

Drainage Area

Total Area (ac)	0.19
Imperviousness (%)	96.4

The Stormceptor System model STC 450i achieves the water quality objective removing 91% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.36 cfs.

Rainfall

Name	BOSTON WSFO AP
State	MA
ID	770
Years of Records	1948 to 2005
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.36

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	91
STC 900	94
STC 1200	95
STC 1800	95
STC 2400	96
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99



Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

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150	20	2.2	0.0354				
400	20	2.65	0.2123				
2000	20	2.65	0.9417				

Stormceptor Design Notes

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- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
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- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
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Blaisdell House, UMass
310 Hicks Way
Amherst, MA 01003

Massachusetts Stormwater
Evaluation Project

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MASTEP Technology Review

Technology Name: Stormceptor

Studies Reviewed: Final NJCAT Technology Verification Stormceptor STC900 September 2004, Coventry University Study, 1996; Technology Assessment, University of Massachusetts, 1997.

Date: November 23, 2007

Reviewer: Jerry Schoen

Rating: 2

Brief rationale for rating: This rating is primarily based on the 2005 NJCAT Technology Verification study. In general, this was a well-conducted test, which in large part followed NJDEP test guidelines for laboratory studies. MASTEP considers NJDEP laboratory test guidelines to be essentially the equivalent of TARP field protocols. Issues of concern: the study measured suspended sediment concentration (SSC) rather than total suspended solids (TSS). Although SSC is considered by many scientists to be the preferred method, it is at odds with Massachusetts stormwater regulations, which are based on TSS treatment. Comparing SSC and TSS results is considered an inexact science. The test was conducted with higher influent sediment concentrations than is preferred, but results were fairly consistent across all ranges studied. The particle size distribution also appears to be higher than the target test range. There are additional field studies that in general support the results obtained in this laboratory studies. These studies do not satisfy TARP protocols, but they do not contradict results obtained in the NJCAT study.

TARP Requirements Not Met*:

- Measurements in TSS.
- Influent sediment concentration is 100 – 300 mg/l: actual was 153-460.
- No documentation of a Quality Assurance Project Plan
- Third party studies are preferred. This was conducted by Stormceptor personnel, with sample analyses conducted by an external laboratory.

* Criteria also based on NJDEP laboratory testing guidelines.

TSS Removal Calculation Worksheet

Project Name: Proposed Residential Mixed Use Project
 Project Location: 90 Washington Street, Somerville, MA
 Project Number: 16120002
 Design Point: New Washington Street

Sheet Number: 1 of 2
 Computed by: JRS
 Date: 10/4/2012

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (B x C)	Remaining Load (C - D)
Deep Sump and Hooded Catch Basin	25%	1.00	0.25	0.75
Stormceptor ***	75%	0.75	0.56	0.19
Subsurface Infiltration Basin	80%	0.19	0.15	0.04

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1. Removal rates for proprietary devices are from approved methods for sizing the devices set forth by the MassDEP.

** Equals remaining load from previous BMP (E)

*** Stormceptor sizing calculation gives a TSS removal rate greater than 80%. To be conservative, a 75% removal rate was used for this calculation in accordance with the MASTEP performance evaluation for Stormceptor units.

**Treatment Train
TSS Removal =**

96%

TSS Removal Calculation Worksheet

Project Name: Proposed Residential Mixed Use Project
 Project Location: 90 Washington Street, Somerville, MA
 Project Number: 16120002
 Design Point: Washington Street

Sheet Number: 2 of 2
 Computed by: JRS
 Date: 10/4/2012

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (B x C)	Remaining Load (C - D)
Deep Sump and Hooded Catch Basin	25%	1.00	0.25	0.75
Stormceptor ***	75%	0.75	0.56	0.19

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1. Removal rates for proprietary devices are from approved methods for sizing the devices set forth by the MassDEP.

** Equals remaining load from previous BMP (E)

*** Stormceptor sizing calculation gives a TSS removal rate greater than 80%. To be conservative, a 75% removal rate was used for this calculation in accordance with the MASTEP performance evaluation for Stormceptor units.

**Treatment Train
TSS Removal =**

81%

Storm Drainage Computations

Name: Proposed Redevelopment
90 Washington Street, Boston, MA
Client: Corcoran Jennison

Proj. No.: 16120002
Date: 10/4/12
Computed by: JRS
Checked by: BKF

Design Parameters:
25 Year Storm
Boston
IDF Curve

k_e= 0.5

DESCRIPTION	LOCATION		AREA (AC.)	C	C x A	SUM C x A	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE				
	FROM	TO					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
	A-3	A-1	0.150	0.72	0.11	0.11	0.21	5.0	6.0	0.6	3.3	0.011	8	0.010	1.4	4.0	42	0.40	15.60	12.60	12.20
	A-2	A-1	0.040	0.35	0.01	0.01	0.64	5.0	6.0	0.1	1.4	0.011	8	0.006	1.1	3.1	53	0.30	16.50	12.50	12.20
	A-1	EX-A	---	---	---	0.12	0.45	5.6	5.8	0.7	2.2	0.011	12	0.003	2.4	3.1	61	0.20	16.90	12.10	11.90
	C-7	C-5	0.320	0.75	0.24	0.24	0.22	5.0	6.0	1.4	3.1	0.011	12	0.005	2.9	3.7	41	0.20	16.50	13.70	13.50
	C-6	C-5	0.130	0.82	0.11	0.11	0.06	5.0	6.0	0.6	3.2	0.011	8	0.009	1.4	3.9	11	0.10	16.80	13.60	13.50
	C-5	C-3	---	---	---	0.35	0.29	5.2	5.9	2.1	3.5	0.011	12	0.005	3.0	3.8	61	0.30	17.10	13.40	13.10
	C-4	C-3	0.130	0.82	0.11	0.11	0.02	5.0	6.0	0.6	4.3	0.011	8	0.020	2.0	5.7	5	0.10	17.00	13.20	13.10
	C-3	C-2	---	---	---	0.45	0.02	5.5	5.9	2.7	5.5	0.011	12	0.015	5.1	6.5	7	0.10	17.15	13.00	12.90
	ROOF	C-2	0.690	0.90	0.62	0.62	---	5.0	6.0	3.7	See MEP Plans						See MEP Plans				
	C-2	C-1	---	---	---	1.07	0.04	5.5	5.9	6.3	5.5	0.011	15	0.007	6.5	5.3	14	0.10	17.35	12.80	12.70
	C-1	IB-1	---	---	---	1.07	0.02	5.6	5.9	6.3	6.8	0.011	15	0.013	8.8	7.2	8	0.10	17.55	12.60	12.50
	IB-1 (B-4)	B-2	Discharge from Infil. Basin from HydroCAD Model (25-yr Design Storm)							0.8	3.6	0.011	12	0.011	4.4	5.6	28	0.30	17.30	12.40	12.10
	B-3	B-2	0.37	0.78	0.29	0.29	0.00	5.0	6.0	1.7	8.8	0.011	8	0.067	3.7	10.6	2	0.10	17.30	13.30	13.20
	B-2	B-1	---	---	---	---				2.6	4.7	0.011	12	0.010	4.2	5.3	71	0.70	17.50	12.00	11.30
	D-10	D-9	0.340	0.72	0.24	0.24	0.16	5.0	6.0	1.5	3.4	0.011	12	0.006	3.3	4.1	34	0.20	18.40	14.40	14.20
	D-9	D-7	---	---	---	0.24	0.41	5.2	6.0	1.5	4.3	0.011	12	0.011	4.3	5.5	104	1.10	18.30	14.20	13.10
	D-8	D-7	0.250	0.70	0.18	0.18	0.15	5.0	6.0	1.1	3.9	0.011	12	0.011	4.5	5.7	35	0.40	16.50	13.50	13.10
	D-7	D-5	---	---	---	0.42	0.25	5.6	5.9	2.5	4.6	0.011	15	0.010	7.4	6.1	68	0.65	16.65	13.00	12.35
	D-6	D-5	0.520	0.64	0.33	0.33	0.01	11.9	4.6	1.5	5.5	0.011	8	0.019	2.0	5.7	3	0.05	14.70	12.40	12.35
	D-5	D-3	---	---	---	0.75	0.10	11.9	4.6	3.5	4.3	0.011	15	0.006	5.9	4.8	25	0.15	14.80	12.25	12.10
	D-4	D-3	0.100	0.85	0.09	0.09	0.11	5.0	6.0	0.5	2.6	0.011	8	0.006	1.1	3.1	17	0.10	14.50	12.20	12.10
	D-3	D-1	---	---	---	0.84	0.11	12.0	4.6	3.9	4.5	0.011	15	0.006	6.2	5.0	31	0.20	15.00	12.00	11.80
	D-2	D-1	0.260	0.75	0.20	0.20	0.19	5.0	6.0	1.2	3.1	0.011	12	0.006	3.2	4.1	35	0.20	14.30	12.00	11.80
	D-1	EX- CB	---	---	---	1.03	0.02	12.1	4.6	4.7	6.2	0.011	15	0.014	8.9	7.2	7	0.10	15.05	11.70	11.60
	E-4	E-2	0.110	0.88	0.10	0.10	0.19	5.0	6.0	0.6	3.3	0.011	8	0.010	1.5	4.2	38	0.40	14.00	11.00	10.60
	E-3	E-2	0.080	0.83	0.07	0.07	0.01	5.0	6.0	0.4	5.3	0.011	8	0.065	3.6	10.4	5	0.30	13.90	10.90	10.60
	E-2	E-1	---	---	---	0.16	0.13	5.2	5.9	1.0	4.3	0.011	8	0.015	1.7	4.9	34	0.50	14.10	10.50	10.00

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

The following erosion and sedimentation controls are for use during the demolition, earthwork and construction phases of the redevelopment of 90 Washington Street in Somerville, Massachusetts. This Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan has been prepared in accordance with the Massachusetts DEP Stormwater Management Standards.

Erosion and Sedimentation Controls shall be installed and maintained as identified in the Site Plans – Cobble Hill Center Redevelopmentt (specifically: C-4 – Grading, Drainage and Erosion Control Plan).

Responsible Party for Plan Compliance:

CMJ Management Company

Emergency Contact Information:

EBI Consulting, Inc. (phone: 781.273.2500)

EROSION AND SEDIMENTATION CONTROLS

Erosion Control Barrier (Silt Sock/Straw Waddles/Silt Fence)

Erosion Control Barriers shall be placed at the perimeter of the work area, at the toe of slope and as shown in the plans to prevent sediment laden surface run-off from leaving the site. The barrier will be replaced as determined by periodic field inspections.

Catch Basin Protection

Newly constructed and existing catch basins will be protected with silt sacks (where appropriate) or hay bale barriers throughout construction.

Crushed-Stone Construction Entrance/Exit

A temporary crushed-stone construction entrance/exit will be constructed. A cross slope will be placed at the entrance to direct runoff to a protected catch basin inlet or settling area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the project site.

Vegetative Slope Stabilization

Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation. Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or flatter. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be established by hydro-seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer and water will be provided for effective establishment of these vegetative stabilization methods.

Mulch will also be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

Maintenance

- The site contractor will be responsible for implementing each control identified as part of this Construction Period Pollution Prevention and Erosion and Sedimentation Control plan.
- The site contractor will be responsible for inspecting all sediment and erosion controls periodically and after each rainfall event. Records of the inspections shall be prepared and maintained on-site by the contractor.
- Damaged or deteriorated items will be repaired immediately after identification or at the direction of the owner's engineer or the City Engineer.
- The site contractor shall comply with the General and Erosion Controls Notes as shown on the Site Plans.
- Silt shall be removed from behind barriers if greater than 6-inches deep or as needed.
- Sediment that is collected in structures shall be disposed of properly and covered if stored on-site.
- The stabilized construction entrances shall be inspected weekly. The entrances shall be maintained by adding additional clean, angular, durable stone to remove sediment from the tires of construction vehicles when exiting the site. Adjacent roadways shall be kept clean and swept as need to avoid deposition of sediment as a result of construction traffic exiting the site.
- Dust pollution shall be controlled using an on-site water source and/or an approved soil stabilization product.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be regraded and stabilized as necessary.

Proposed Mixed Use Redevelopment – 90 Washington Street, Somerville, MA

Long Term Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐ yes ☐ no (List Items)	Date of Cleaning/Repair	Performed by
Deep Sump and Hooded Catch Basins	Four times per year			Remove sediment when buildup exceeds two feet in depth.	☐ yes ☐ no		
Water Quality Structure	Twice per year or as required by manufacturer			Clean annually or when collected sediment exceeds manufacturer’s recommendations.	☐ yes ☐ no		
Roof Drain Leaders	Twice per year			Inspect for blockage and remove debris if required.	☐ yes ☐ no		
Street Sweeping	Twice per year				☐ yes ☐ no		
Subsurface Infiltration System	Once per year or as required by manufacturer			Inspect the system twice in the first year for proper function. Remove sediment once per year or when buildup exceeds three inches in depth.	☐ yes ☐ no		
					☐ yes ☐ no		
					☐ yes ☐ no		
					☐ yes ☐ no		
					☐ yes ☐ no		
					☐ yes ☐ no		
					☐ yes ☐ no		
					☐ yes ☐ no		

Stormwater Control Manager _____

Stormwater Operation and Maintenance Plan

The following Stormwater Operation and Maintenance (O&M) Plan is proposed to ensure the continued effectiveness of the stormwater management system. Attached to this plan is a Stormwater Best Management Practices Checklist for use during the long term operation and maintenance of the stormwater management system. This Stormwater Operation and Maintenance Plan has been prepared in accordance with the Massachusetts DEP Stormwater Management Standards.

DESCRIPTION OF STORMWATER MAINTENANCE MEASURES

Catch Basins

- All catch basins shall be inspected a minimum of at least two times per year.
- Sediment (if more than two feet deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Structural Water Quality Devices

- See the attached Manufacturer's instructions on operation & maintenance requirements and methodology.
- Inspect twice per year or as required by manufacturer.
- Clean annually or when collected sediment exceeds manufacturer's recommendations.

Roof Drain Leaders

- Perform routine roof inspections twice per year.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.

Subsurface Infiltration System

- The subsurface infiltration system will be inspected twice during for the first year and annually thereafter by removing the manhole/access port covers and determining the thickness of sediment that has accumulated.
- If sediment is more than two inches deep, it must be suspended via flushing with clean water and removed using a vactor truck.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.
- System will be observed after rainfall to see if it is properly draining.
- Manufacturer's specifications and instructions for cleaning the system are provided as an attachment to this section.

Inspection and Maintenance. Easy. Convenient.

When it rains, oils, sediment and other contaminants are captured and contained by over 20,000 Stormceptor units operating worldwide. While Stormceptor's patented scour prevention technology ensures captured pollutants remain in the unit during all rainfall events, the accumulated pollutants must eventually be removed as part of a regular maintenance program.

If neglected, oil and sediment gradually build up and diminish any BMP's efficiency, harming the environment and leaving owners and operators vulnerable to fines, surcharges and bad publicity.

Maintenance is a must

Ease, frequency and cost of maintenance are often overlooked by specifiers when considering the merits of a stormwater treatment system. In reality, maintenance is fundamental to the long-term performance of any stormwater quality treatment device.

While regular maintenance is crucial, it shouldn't be complicated. An ongoing maintenance program with Stormceptor is convenient and practically effortless. With virtually no disruptions, you can concentrate on your core business.

Quick inspections

Inspections are easily carried out above ground from any standard surface access cover through a visual inspection of the orifice and drop tee components. A sludge judge and oil dip-stick are all that are needed for sediment and oil depth measurements.

Easy unit access

Maintenance is typically conducted from the same surface access cover, eliminating the need for confined space entry into the unit. Your site remains undisturbed, saving you time and money.



No muss, no fuss and fast

Maintenance is performed quickly and inexpensively with a standard vacuum truck. Servicing usually takes less than two hours, with no disruption to your site.

A complete stormwater management plan for Stormceptor extends beyond installation and performance to regular maintenance. It's the smart, cost-effective way to ensure your unit continues to remove more pollutants than any other separator for decades to come.



Stormceptor maintenance recommendations

- Units should be inspected post-construction, prior to being put into service.
- Inspect every six months for the first year of operation to determine the oil and sediment accumulation rate.
- In subsequent years, inspections can be based on first-year observations or local requirements.
- Cleaning is required once the sediment depth reaches 15% of storage capacity, (generally taking one year or longer). Local regulations for maintenance frequency may vary.
- Inspect the unit immediately after an oil, fuel or chemical spill.
- A licensed waste management company should remove captured petroleum waste products from any oil, chemical or fuel spills and dispose responsibly.

With over 20,000 units operating worldwide, Stormceptor performs and protects every day, in every storm.



www.imbriumsystems.com

USA: (888) 279 8826
CANADA: (800) 565 4801

12.0 Inspection and Maintenance

12.1 ISOLATOR ROW INSPECTION

Regular inspection and maintenance are essential to assure a properly functioning stormwater system. Inspection is easily accomplished through the manhole or optional inspection ports of an Isolator Row. Please follow local and OSHA rules for a confined space entry.

Inspection ports can allow inspection to be accomplished completely from the surface without the need for a confined space entry. Inspection ports provide visual access to the system with the use of a flashlight. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding 3" (76 mm), cleanout is required.

A StormTech Isolator Row should initially be inspected immediately after completion of the site's construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter any stormwater system. Inspection and maintenance, if necessary, should be performed prior to passing responsibility over to the site's owner. Once in normal service, a StormTech Isolator Row should be inspected bi-annually until an understanding of the sites characteristics is developed. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

12.2 ISOLATOR ROW MAINTENANCE

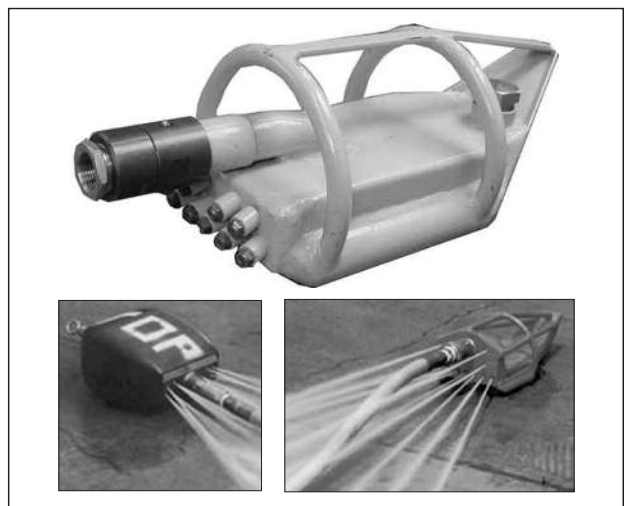
JetVac maintenance is recommended if sediment has been collected to an average depth of 3" (76 mm) inside the Isolator Row. More frequent maintenance may be required to maintain minimum flow rates through the Isolator Row. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, a wave of suspended sediments is flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/ JetVac combination vehicles. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" (1143 mm) are best. The JetVac process shall only be performed on StormTech Rows that have AASHTO class 1 woven geotextile over the foundation stone (ADS 315ST or equal).



Looking down the Isolator Row.



A typical JetVac truck. (This is not a StormTech product.)



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

12.0 Inspection & Maintenance

STORMTECH ISOLATOR™ ROW - STEP-BY-STEP MAINTENANCE PROCEDURES

Step 1) Inspect Isolator Row for sediment

- A) Inspection ports (if present)
 - i. Remove lid from floor box frame
 - ii. Remove cap from inspection riser
 - iii. Using a flashlight and stadia rod, measure depth of sediment
 - iv. If sediment is at, or above, 3" (76 mm) depth proceed to Step 2. If not proceed to Step 3.
- B) All Isolator Rows
 - i. Remove cover from manhole at upstream end of Isolator Row
 - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
 - 1. Follow OSHA regulations for confined space entry if entering manhole
 - 2. Mirrors on poles or cameras may be used to avoid a confined space entry
 - iii. If sediment is at or above the lower row of sidewall holes [approximately 3" (76 mm)] proceed to Step 2. If not proceed to Step 3.

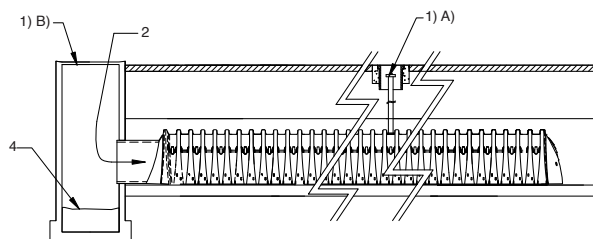
Step 2) Clean out Isolator Row using the JetVac process

- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45" (1143 mm) or more is preferable
- B) Apply multiple passes of JetVac until back-flush water is clean
- C) Vacuum manhole sump as required during jetting

Step 3) Replace all caps, lids and covers

Step 4) Inspect and clean catch basins and manholes upstream of the StormTech system following local guidelines.

Figure 20 – StormTech Isolator Row (not to scale)



12.3 ECCENTRIC PIPE HEADER INSPECTION

These guidelines do not supersede a pipe manufacturer's recommended I&M procedures. Consult with the manufacturer of the pipe header system for specific I&M procedures. Inspection of the header system should be carried out quarterly. On sites which generate higher levels of sediment more frequent inspections may be necessary. Headers may be accessed through risers, access ports or manholes. Measurement of sediment may be taken with a stadia rod or similar device. Clean-out of sediment should occur when the sediment volume has reduced the storage area by 25% or the depth of sediment has reached approximately 25% of the diameter of the structure.

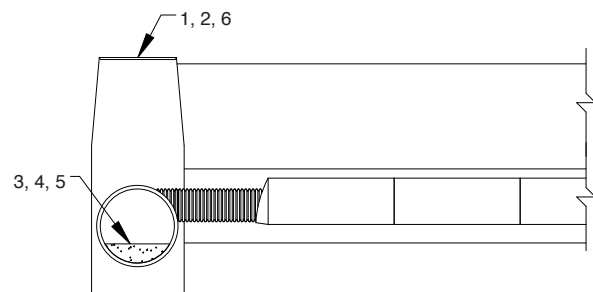
12.4 ECCENTRIC PIPE MANIFOLD MAINTENANCE

Cleanout of accumulated material should be accomplished by vacuum pumping the material from the header. Cleanout should be accomplished during dry weather. Care should be taken to avoid flushing sediments out through the outlet pipes and into the chamber rows.

Eccentric Header Step-by-Step Maintenance Procedures

1. Locate manholes connected to the manifold system
2. Remove grates or covers
3. Using a stadia rod, measure the depth of sediment
4. If sediment is at a depth of about 25% pipe volume or 25% pipe diameter proceed to step 5. If not proceed to step 6.
5. Vacuum pump the sediment. Do not flush sediment out inlet pipes.
6. Replace grates and covers
7. Record depth and date and schedule next inspection

Figure 21 – Eccentric Manifold Maintenance



Please contact StormTech's Technical Services Department at 888-892-2894 for a spreadsheet to estimate cleaning intervals.