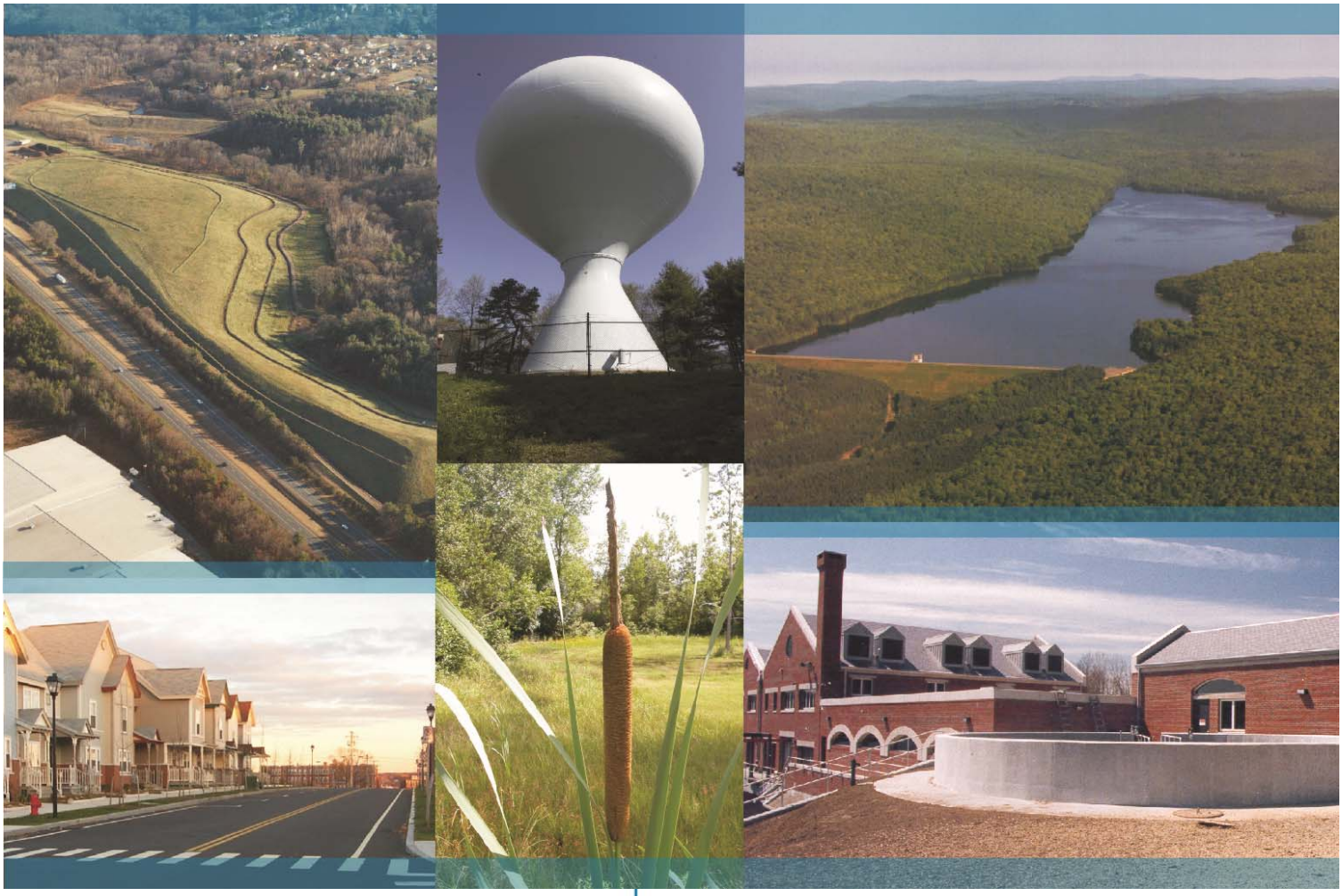

Tighe&Bond

Proposed Neighborhood Center
1342 Congress Street
Portland, ME

Drainage Study

Prepared For:

Jewish Community Alliance of Southern Maine

Last Revised June 23, 2015

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Section 1
Narrative

The proposed project consists on the construction of a one (1) story Neighborhood Center on a 2.16 acre lot in the R-5 Residential Zone There will also be associated site improvements that include surface parking lot, utilities, site lighting, landscaping, and stormwater management system.

The site is currently developed with a 14,960 SF Church that includes associated parking lot and driveways. The existing building and parking lot will be demolished as part of the proposed project. Currently, the runoff from the majority of the site including the parking lot and roof flows to the south of the property where it enters an existing drainage swale. Due to the lack of any stormwater treatment infrastructure, all runoff leaves the site untreated.

The proposed project includes substantial improvements to manage and treat runoff through the use of Stormtech Chambers and an underdrained soil filter bed. The proposed redevelopment will increase impervious area by approximately 12,500 SF. The proposed stormwater management system has been designed to mitigate additional impervious areas by decreasing peak runoff rates for the 2-year, 10-year, and 25-year design storms.

The proposed stormwater management system has been designed to meet the requirements and design principles outlined in the City of Portland Technical Manual and the Maine Stormwater Best Management Practices Manual.

1.1 On Site Soil Description

Section 7 of the City of Portland Technical Manual requires a Soil Survey be completed by a Maine Certified Soil Scientist for Level III Site Plan Submissions. We are requesting a waiver from this requirement as soil borings were completed as part of a Phase I/II Environmental Site Assessment at this site. Based on the soil information the runoff analyzed within this study area has been modeled assuming Class C soils. The boring logs have been included in the Appendix of this report. Due to the low infiltration rates associated with Class C soils, the drainage design has been completed assuming no exfiltration.

Section 2
Drainage Analysis

2.1 Calculation Methods

The design storms analyzed in this study are the 2-year, 10-year and 50-year 24-hour duration storm events. The stormwater modeling system, HydroCAD 10.0 was utilized to predict the peak runoff rates from these storm events. A Type III storm pattern was used in the model.

The time of concentration was computed using the TR-55 Method, which provides a means of determining the time for an entire watershed to contribute runoff to a specific location via sheet flows, shallow concentrated flow and channel flow. Runoff curve numbers were calculated by estimating the coverage areas and then summing the curve number for the coverage area as a percent of the entire watershed.

References:

1. HydroCAD Stormwater Modeling System, by HydroCAD Software Solutions LLC, Chocorua, New Hampshire.

2.2 Pre-Development Conditions

Pre-development conditions are considered, for this study, to be the conditions of the site prior to the start of the ongoing excavation operations. In order to analyze the pre-development condition, the site has been divided into three (3) contributing watershed areas modeled at three (3) points of analysis. These points of analysis and watersheds are depicted on the plan entitled “Pre-Development Watershed Plan”, Sheet WS-1.

Each of the points of analysis and their contributing watershed areas are described below:

Point of Analysis (PA-1)

Point of Analysis One (PA-1) is comprised of Pre-Development Watershed 1 (WS-1), which accounts for approximately 75% of the total watershed area. WS-1 consists of runoff generated from a portion of the roof of the existing building, parking lot, driveway, and grass/wooded areas at the south side of the parcel. Runoff travels in a southwestern direction via overland flow where it enters an existing drainage swale at PA-1.

Point of Analysis (PA-2)

Point of Analysis Two (PA-2) is comprised of Pre-Development Watershed 2 (WS-2). WS-2 consists primarily of runoff generated from the roof of the existing building, sidewalks, and grass areas. Runoff travels west via overland flow onto the adjacent parking lot of Westgate Plaza at PA-2.

Point of Analysis (PA-3)

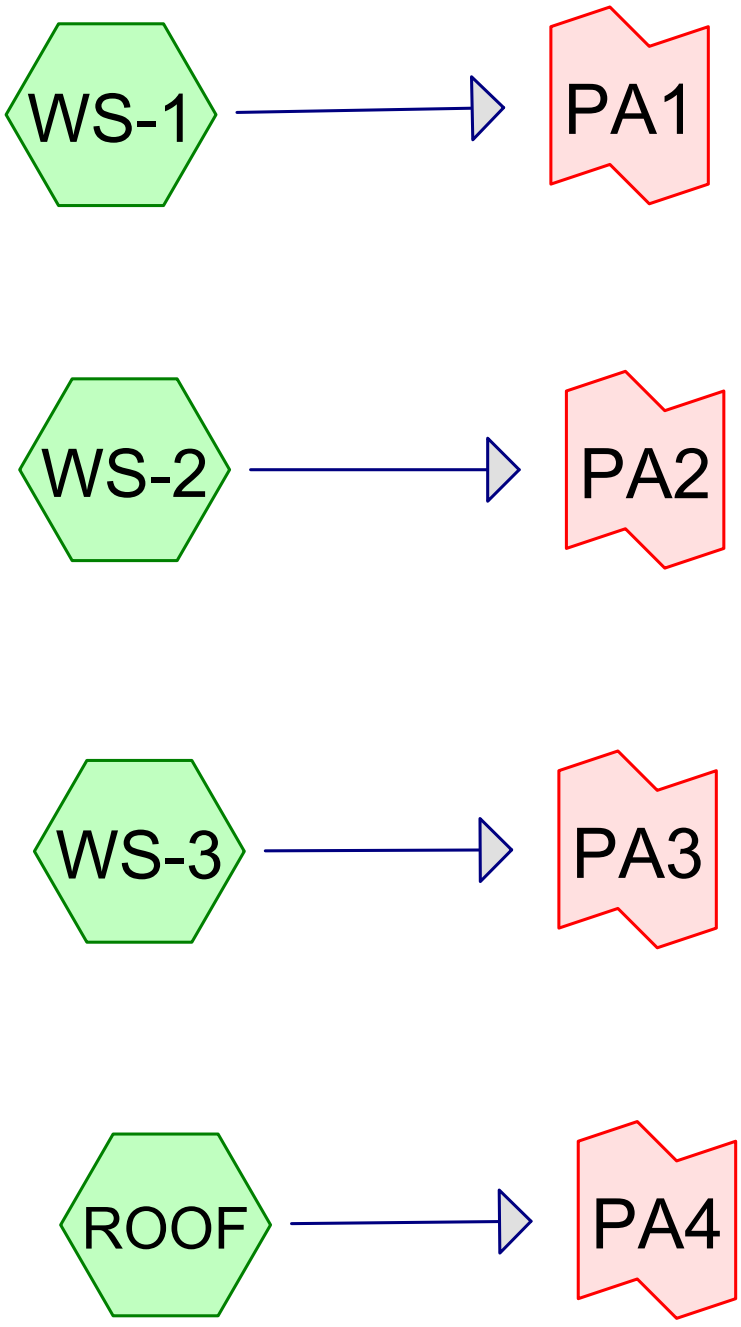
Point of Analysis Three (PA-3) is comprised of Pre-Development Watershed 3 (WS-3). WS-3 consists of runoff generated from the driveway and grass on the north side of the site. Runoff generated travels via overland flow north onto Congress Street and eventually into the City's closed drainage system.

Point of Analysis (PA-4)

Point of Analysis Four (PA-4) is comprised of the existing roof of the Chruch. The roof leaders are connected to the sanitary sewer on site for a combined sewer/stormwater system. The combined sewer/stormwater ultimately discharges into the sewer system in Congress Street. The configuration of the existing roof drainage system was verified in the field via camera inspection and dye flow testing. The City of Portland does not permit stormwater runoff to be conveyed into the City sewer system, so this connection will only be re-used for sanitary sewer for the proposed development.

2.2.1 Pre-Development Calculations

2.2.2 Pre-Development Watershed Plan, WS-1



Congress Street Sewer

Subcat Reach Pond Link

Routing Diagram for J0096-PRE
Prepared by Tighe & Bond, Printed 6/23/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.106	74	>75% Grass cover, Good, HSG C (WS-1, WS-2, WS-3)
0.490	98	Paved parking, HSG C (WS-1, WS-2, WS-3)
0.355	98	Roofs, HSG C (ROOF)
0.227	72	Woods/grass comb., Good, HSG C (WS-1)
2.179	**83**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.179	HSG C	ROOF, WS-1, WS-2, WS-3
0.000	HSG D	
0.000	Other	
2.179		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ROOF: Runoff Area=15,470 sf 100.00% Impervious Runoff Depth>2.77"
Flow Length=50' Slope=0.0400 '/' Tc=5.0 min CN=98 Runoff=1.07 cfs 0.082 af

Subcatchment WS-1: Runoff Area=64,314 sf 25.78% Impervious Runoff Depth>1.25"
Flow Length=451' Tc=7.6 min CN=80 Runoff=2.01 cfs 0.154 af

Subcatchment WS-2: Runoff Area=5,325 sf 25.60% Impervious Runoff Depth>1.25"
Flow Length=44' Slope=0.0150 '/' Tc=5.9 min CN=80 Runoff=0.18 cfs 0.013 af

Subcatchment WS-3: Runoff Area=9,792 sf 34.74% Impervious Runoff Depth>1.38"
Flow Length=87' Tc=5.0 min CN=82 Runoff=0.37 cfs 0.026 af

Link PA1: Inflow=2.01 cfs 0.154 af
Primary=2.01 cfs 0.154 af

Link PA2: Inflow=0.18 cfs 0.013 af
Primary=0.18 cfs 0.013 af

Link PA3: Inflow=0.37 cfs 0.026 af
Primary=0.37 cfs 0.026 af

Link PA4: Congress Street Sewer Inflow=1.07 cfs 0.082 af
Primary=1.07 cfs 0.082 af

Total Runoff Area = 2.179 ac Runoff Volume = 0.274 af Average Runoff Depth = 1.51"
61.20% Pervious = 1.333 ac 38.80% Impervious = 0.845 ac

Summary for Subcatchment ROOF:

Runoff = 1.07 cfs @ 12.07 hrs, Volume= 0.082 af, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
15,470	98	Roofs, HSG C
15,470		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
4.4	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-1:

Runoff = 2.01 cfs @ 12.11 hrs, Volume= 0.154 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
16,583	98	Paved parking, HSG C
37,846	74	>75% Grass cover, Good, HSG C
9,885	72	Woods/grass comb., Good, HSG C
64,314	80	Weighted Average
47,731		74.22% Pervious Area
16,583		25.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.4	90	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.8	311	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	451	Total			

Summary for Subcatchment WS-2:

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.013 af, Depth> 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
1,363	98	Paved parking, HSG C
3,962	74	>75% Grass cover, Good, HSG C
5,325	80	Weighted Average
3,962		74.40% Pervious Area
1,363		25.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	44	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"

Summary for Subcatchment WS-3:

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 0.026 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
3,402	98	Paved parking, HSG C
6,390	74	>75% Grass cover, Good, HSG C
9,792	82	Weighted Average
6,390		65.26% Pervious Area
3,402		34.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	30	0.0500	1.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.3	57	0.0350	2.81		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	87	Total, Increased to minimum Tc = 5.0 min			

Summary for Link PA1:

Inflow Area = 1.476 ac, 25.78% Impervious, Inflow Depth > 1.25" for 2-YR event
Inflow = 2.01 cfs @ 12.11 hrs, Volume= 0.154 af
Primary = 2.01 cfs @ 12.11 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA2:

Inflow Area = 0.122 ac, 25.60% Impervious, Inflow Depth > 1.25" for 2-YR event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 0.013 af
Primary = 0.18 cfs @ 12.09 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA3:

Inflow Area = 0.225 ac, 34.74% Impervious, Inflow Depth > 1.38" for 2-YR event
Inflow = 0.37 cfs @ 12.08 hrs, Volume= 0.026 af
Primary = 0.37 cfs @ 12.08 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA4: Congress Street Sewer

Inflow Area = 0.355 ac,100.00% Impervious, Inflow Depth > 2.77" for 2-YR event
Inflow = 1.07 cfs @ 12.07 hrs, Volume= 0.082 af
Primary = 1.07 cfs @ 12.07 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ROOF: Runoff Area=15,470 sf 100.00% Impervious Runoff Depth>4.46"
Flow Length=50' Slope=0.0400 '/' Tc=5.0 min CN=98 Runoff=1.69 cfs 0.132 af

Subcatchment WS-1: Runoff Area=64,314 sf 25.78% Impervious Runoff Depth>2.63"
Flow Length=451' Tc=7.6 min CN=80 Runoff=4.31 cfs 0.323 af

Subcatchment WS-2: Runoff Area=5,325 sf 25.60% Impervious Runoff Depth>2.63"
Flow Length=44' Slope=0.0150 '/' Tc=5.9 min CN=80 Runoff=0.38 cfs 0.027 af

Subcatchment WS-3: Runoff Area=9,792 sf 34.74% Impervious Runoff Depth>2.81"
Flow Length=87' Tc=5.0 min CN=82 Runoff=0.77 cfs 0.053 af

Link PA1: Inflow=4.31 cfs 0.323 af
Primary=4.31 cfs 0.323 af

Link PA2: Inflow=0.38 cfs 0.027 af
Primary=0.38 cfs 0.027 af

Link PA3: Inflow=0.77 cfs 0.053 af
Primary=0.77 cfs 0.053 af

Link PA4: Congress Street Sewer Inflow=1.69 cfs 0.132 af
Primary=1.69 cfs 0.132 af

Total Runoff Area = 2.179 ac Runoff Volume = 0.535 af Average Runoff Depth = 2.95"
61.20% Pervious = 1.333 ac 38.80% Impervious = 0.845 ac

Summary for Subcatchment ROOF:

Runoff = 1.69 cfs @ 12.07 hrs, Volume= 0.132 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
15,470	98	Roofs, HSG C
15,470		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
4.4	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-1:

Runoff = 4.31 cfs @ 12.11 hrs, Volume= 0.323 af, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
16,583	98	Paved parking, HSG C
37,846	74	>75% Grass cover, Good, HSG C
9,885	72	Woods/grass comb., Good, HSG C
64,314	80	Weighted Average
47,731		74.22% Pervious Area
16,583		25.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.4	90	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.8	311	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	451	Total			

Summary for Subcatchment WS-2:

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.027 af, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
1,363	98	Paved parking, HSG C
3,962	74	>75% Grass cover, Good, HSG C
5,325	80	Weighted Average
3,962		74.40% Pervious Area
1,363		25.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	44	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"

Summary for Subcatchment WS-3:

Runoff = 0.77 cfs @ 12.07 hrs, Volume= 0.053 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
3,402	98	Paved parking, HSG C
6,390	74	>75% Grass cover, Good, HSG C
9,792	82	Weighted Average
6,390		65.26% Pervious Area
3,402		34.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	30	0.0500	1.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.3	57	0.0350	2.81		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	87	Total, Increased to minimum Tc = 5.0 min			

Summary for Link PA1:

Inflow Area = 1.476 ac, 25.78% Impervious, Inflow Depth > 2.63" for 10-YR event
Inflow = 4.31 cfs @ 12.11 hrs, Volume= 0.323 af
Primary = 4.31 cfs @ 12.11 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA2:

Inflow Area = 0.122 ac, 25.60% Impervious, Inflow Depth > 2.63" for 10-YR event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.027 af
Primary = 0.38 cfs @ 12.09 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA3:

Inflow Area = 0.225 ac, 34.74% Impervious, Inflow Depth > 2.81" for 10-YR event
Inflow = 0.77 cfs @ 12.07 hrs, Volume= 0.053 af
Primary = 0.77 cfs @ 12.07 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA4: Congress Street Sewer

Inflow Area = 0.355 ac,100.00% Impervious, Inflow Depth > 4.46" for 10-YR event
Inflow = 1.69 cfs @ 12.07 hrs, Volume= 0.132 af
Primary = 1.69 cfs @ 12.07 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ROOF: Runoff Area=15,470 sf 100.00% Impervious Runoff Depth>5.26"
Flow Length=50' Slope=0.0400 '/' Tc=5.0 min CN=98 Runoff=1.98 cfs 0.156 af

Subcatchment WS-1: Runoff Area=64,314 sf 25.78% Impervious Runoff Depth>3.33"
Flow Length=451' Tc=7.6 min CN=80 Runoff=5.45 cfs 0.410 af

Subcatchment WS-2: Runoff Area=5,325 sf 25.60% Impervious Runoff Depth>3.33"
Flow Length=44' Slope=0.0150 '/' Tc=5.9 min CN=80 Runoff=0.48 cfs 0.034 af

Subcatchment WS-3: Runoff Area=9,792 sf 34.74% Impervious Runoff Depth>3.53"
Flow Length=87' Tc=5.0 min CN=82 Runoff=0.96 cfs 0.066 af

Link PA1: Inflow=5.45 cfs 0.410 af
Primary=5.45 cfs 0.410 af

Link PA2: Inflow=0.48 cfs 0.034 af
Primary=0.48 cfs 0.034 af

Link PA3: Inflow=0.96 cfs 0.066 af
Primary=0.96 cfs 0.066 af

Link PA4: Congress Street Sewer Inflow=1.98 cfs 0.156 af
Primary=1.98 cfs 0.156 af

Total Runoff Area = 2.179 ac Runoff Volume = 0.665 af Average Runoff Depth = 3.66"
61.20% Pervious = 1.333 ac 38.80% Impervious = 0.845 ac

Summary for Subcatchment ROOF:

Runoff = 1.98 cfs @ 12.07 hrs, Volume= 0.156 af, Depth> 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
15,470	98	Roofs, HSG C
15,470		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
4.4	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-1:

Runoff = 5.45 cfs @ 12.11 hrs, Volume= 0.410 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
16,583	98	Paved parking, HSG C
37,846	74	>75% Grass cover, Good, HSG C
9,885	72	Woods/grass comb., Good, HSG C
64,314	80	Weighted Average
47,731		74.22% Pervious Area
16,583		25.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.4	90	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.8	311	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.6	451	Total			

Summary for Subcatchment WS-2:

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
1,363	98	Paved parking, HSG C
3,962	74	>75% Grass cover, Good, HSG C
5,325	80	Weighted Average
3,962		74.40% Pervious Area
1,363		25.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	44	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"

Summary for Subcatchment WS-3:

Runoff = 0.96 cfs @ 12.07 hrs, Volume= 0.066 af, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
3,402	98	Paved parking, HSG C
6,390	74	>75% Grass cover, Good, HSG C
9,792	82	Weighted Average
6,390		65.26% Pervious Area
3,402		34.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	30	0.0500	1.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.3	57	0.0350	2.81		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.6	87	Total, Increased to minimum Tc = 5.0 min			

Summary for Link PA1:

Inflow Area = 1.476 ac, 25.78% Impervious, Inflow Depth > 3.33" for 25-YR event
Inflow = 5.45 cfs @ 12.11 hrs, Volume= 0.410 af
Primary = 5.45 cfs @ 12.11 hrs, Volume= 0.410 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA2:

Inflow Area = 0.122 ac, 25.60% Impervious, Inflow Depth > 3.33" for 25-YR event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af
Primary = 0.48 cfs @ 12.09 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA3:

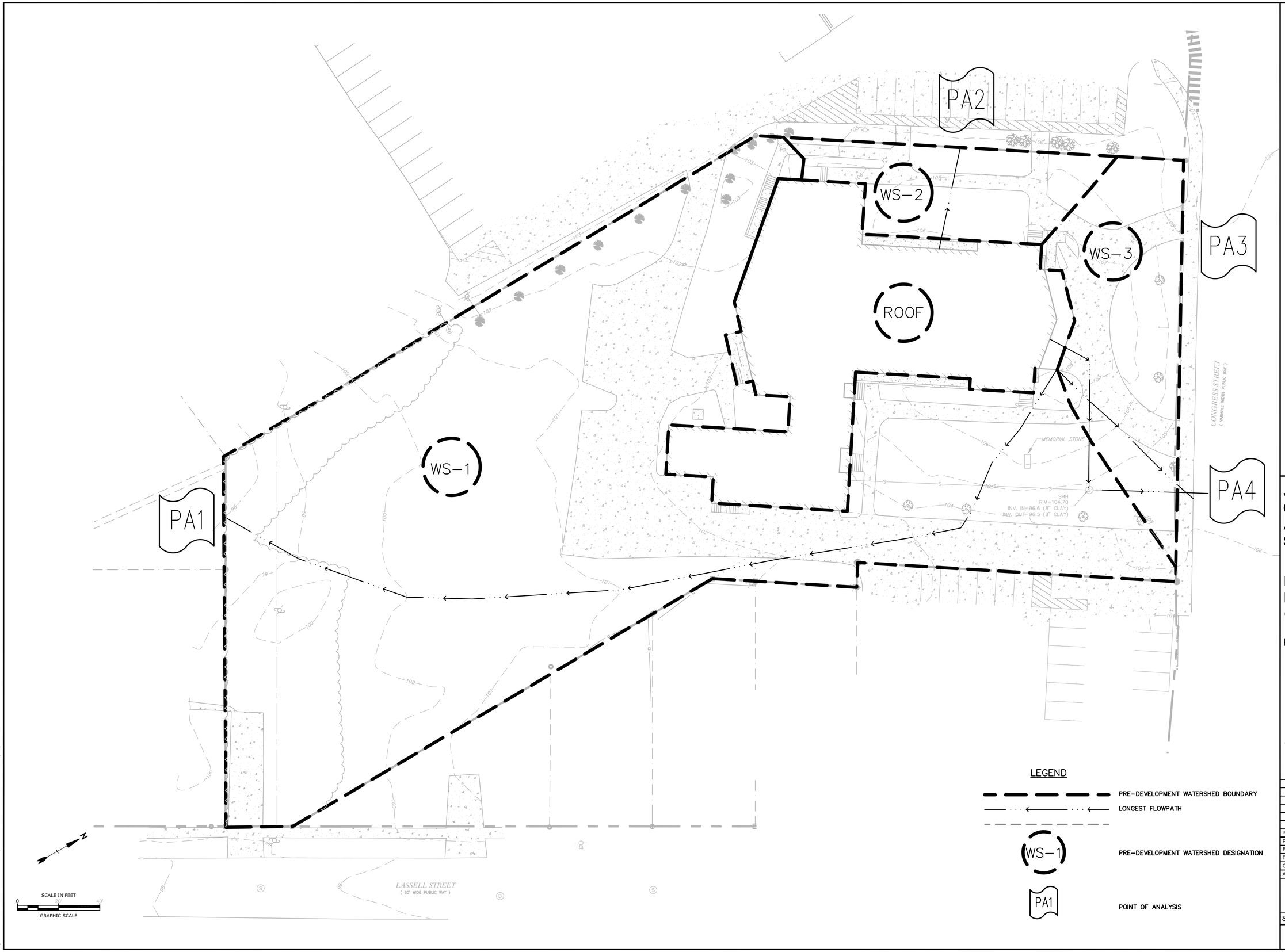
Inflow Area = 0.225 ac, 34.74% Impervious, Inflow Depth > 3.53" for 25-YR event
Inflow = 0.96 cfs @ 12.07 hrs, Volume= 0.066 af
Primary = 0.96 cfs @ 12.07 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA4: Congress Street Sewer

Inflow Area = 0.355 ac,100.00% Impervious, Inflow Depth > 5.26" for 25-YR event
Inflow = 1.98 cfs @ 12.07 hrs, Volume= 0.156 af
Primary = 1.98 cfs @ 12.07 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Tighe&Bond
Consulting Engineers
www.tighebond.com

Jewish Community Alliance of Southern Maine

Proposed Neighborhood Center

Portland, Maine

April 03, 2015

Mark	Date	Description
1.	8/23/15	REVISED FOR PB SUBMISSION

PROJECT NO:	J-0096
FILE:	J0094-SITE.dwg
DRAWN BY:	GWH
CHECKED:	BLM
APPROVED BY:	BLM

PRE-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

WS-1

Jun 23, 2015-8:08pm Plotted By: gwh
Tighe & Bond, Inc. -S:\J0096 Jewish Community Alliance\DWG-CAD\DESIGN\J0094-SITE.dwg Layout: PRE

2.3 Post-Development Conditions

The post-development drainage condition is also characterized by three (3) watershed areas modeled at the same three (3) points of analysis as the pre-development condition. These three (3) watershed areas are depicted on the Post-Development Watershed Plan, WS-2.

Point of Analysis (PA-1)

Point of Analysis One (PA-1) is comprised Post-Development Watershed 1A (WS-1A), Watershed 1B (WS-1B), and Watershed 1C (WS-1C). WS-1A consists of the proposed parking lot, sidewalks, and landscaped areas in the southwestern side of the site. Runoff from WS-1A travels via sheetflow into the underdrained soil filter bed to the rear of the parking lot.

WS-1B is a redeveloped area as the characteristics of this watershed remain largely unchanged from the pre-development condition. This watershed consists of the driveway that provides access to Congress Street, a small portion of sidewalk near the proposed building, and lawn at the south side of the site. Runoff generated travels via overland flow in the same pattern as the pre-development condition to PA-1.

WS-1C consists of the roof of the proposed building and the designated play area directly adjacent to the building. Runoff generated from the roof and play area is collected and conveyed to an underground detention area in the parking lot. Detained stormwater is conveyed via closed drainage to PA-1.

Point of Analysis (PA-2)

Point of Analysis Two (PA-2) is comprised of Post-Development Watershed 2 (WS-2A). WS-2 consists of runoff generated from the lawn and landscaping on the west side of the building. The runoff travels via overland flow in the same pattern as the pre-development condition.

Point of Analysis (PA-3)

Point of Analysis Three (PA-3) is comprised of Post Development Watershed 3 (WS-3). WS-3 is comprised of the sidewalk and landscaped areas along Congress Street. The runoff generated travels via overland flow in the same pattern as the pre-development condition.

2.3.1 Post-Development Calculations

2.3.2 Post-Development Watershed Plan, WS-2

2.4 Peak Rate Comparisons

The following table summarizes and compares the pre- and post-development peak runoff rates for the 2-year, 10-year, and 25-year storm events. The post-development peak rate of runoff for each discharge point has been determined to be less than the peak runoff rate generated during the pre-development condition.

Point of Analysis	Pre/**Post** 2-Year Storm (cfs)	Pre/**Post** 10-Year Storm (cfs)	Pre/**Post** 25-Year Storm (cfs)
PA1	2.01/**2.01**	4.31/**3.73**	5.45/**4.50**
PA2	0.18/**0.11**	0.38/**0.24**	0.48/**0.31**
PA3	0.37/**0.14**	0.77/**0.31**	0.96/**0.40**
PA4 (Roof)	1.07/**0.0**	1.69/**0.0**	1.98/**0.0**

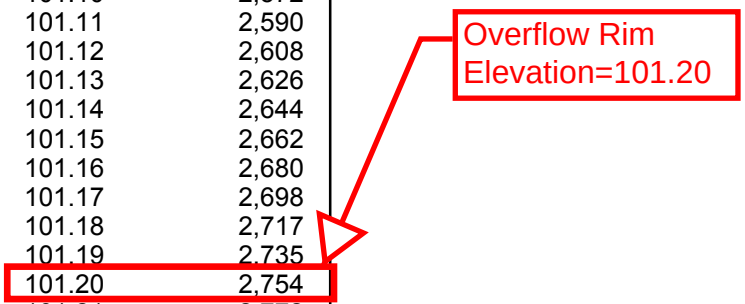
2.5 Stormwater Treatment Volume

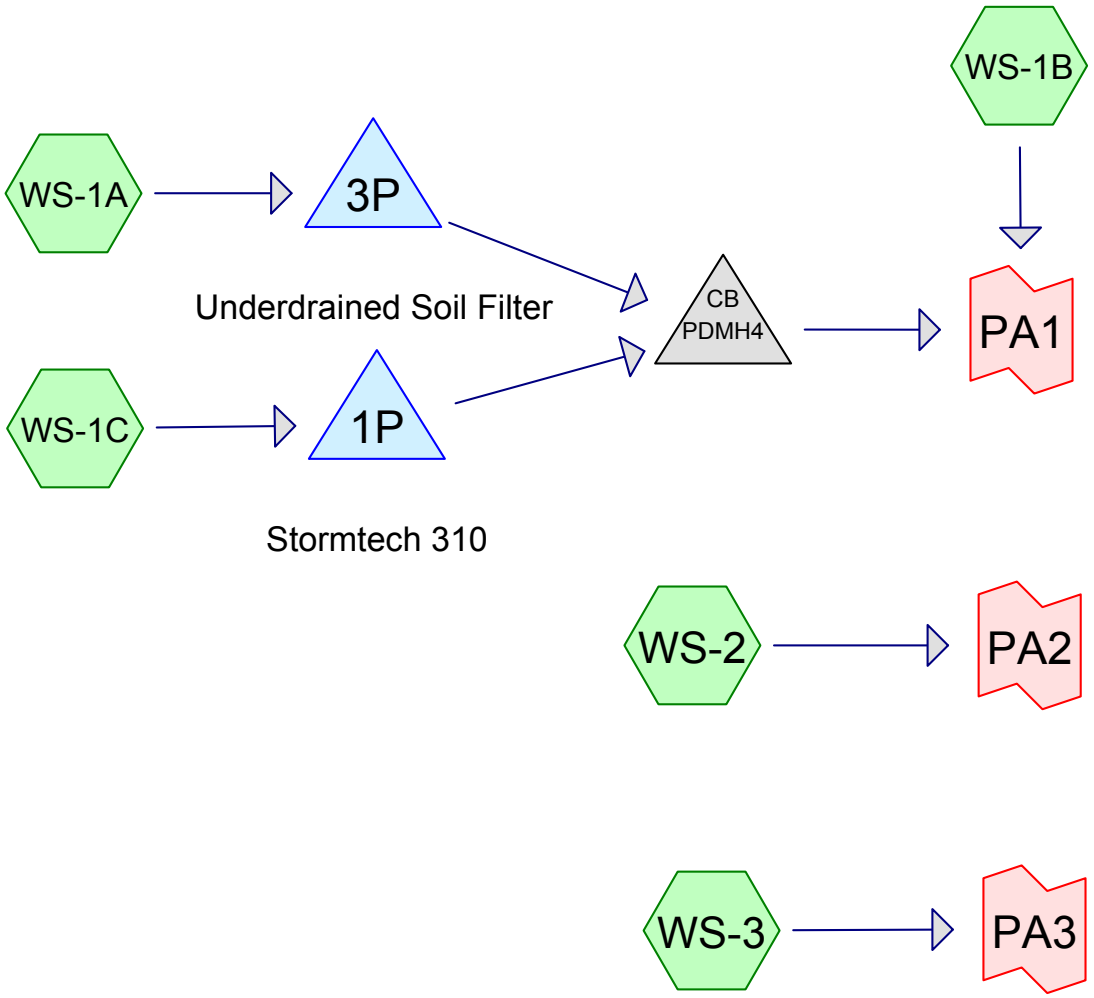
Table 6.1 - Underdrained Soil Filter Treatment Volume Calculations		
VARIABLE	DESCRIPTION	VALUE
Pi	1 Inch of Rainfall for Impervious Area	1 inch
Pv	0.4 Inch of Rainfall for Vegetated Area	0.4 inch
A	Total Area Draining to Design Structure	23,512 SF
Ai	Impervious Area Draining to Design Structure	14,558 SF
Av	Vegetated Area Draining to Design Structure	9,104 SF
ITV	**Impervious Area Treatment Volume = Pi*Ai**	**1,213 CF**
VTV	**Vegetated Area Treatment Volume = Pv*Av**	**304 CF**
	Total Treatment Volume Required	**1,517 CF**
Vs	**Total Treatment Volume Provided (see HydroCAD)**	**2,754 CF**

The Treatment Volume provided is greater than the Treatment Volume required. The total storage volume provided below the overflow rim elevation is 2,754 CF. The proposed Underdrained Soil Filter is treating a total of 14,558 SF of impervious area, which is equivalent to approximately 115% of the new impervious area and exceeds the requirements of the MaineDEP Chapter 500 General Standards.

Stage-Area-Storage for Pond 3P: Underdrained Soil Filter (continued)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
100.33	1,373	100.86	2,162	101.39	3,118
100.34	1,386	100.87	2,178	101.40	3,138
100.35	1,400	100.88	2,194	101.41	3,158
100.36	1,413	100.89	2,211	101.42	3,178
100.37	1,427	100.90	2,228	101.43	3,198
100.38	1,441	100.91	2,244	101.44	3,218
100.39	1,454	100.92	2,261	101.45	3,238
100.40	1,468	100.93	2,278	101.46	3,258
100.41	1,482	100.94	2,294	101.47	3,279
100.42	1,496	100.95	2,311	101.48	3,299
100.43	1,510	100.96	2,328	101.49	3,320
100.44	1,524	100.97	2,345	101.50	**3,340**
100.45	1,538	100.98	2,362		
100.46	1,552	100.99	2,379		
100.47	1,566	101.00	2,397		
100.48	1,580	101.01	2,414		
100.49	1,594	101.02	2,431		
100.50	1,609	101.03	2,448		
100.51	1,623	101.04	2,466		
100.52	1,637	101.05	2,483		
100.53	1,652	101.06	2,501		
100.54	1,666	101.07	2,518		
100.55	1,681	101.08	2,536		
100.56	1,696	101.09	2,554		
100.57	1,710	101.10	2,572		
100.58	1,725	101.11	2,590		
100.59	1,740	101.12	2,608		
100.60	1,755	101.13	2,626		
100.61	1,770	101.14	2,644		
100.62	1,785	101.15	2,662		
100.63	1,800	101.16	2,680		
100.64	1,815	101.17	2,698		
100.65	1,830	101.18	2,717		
100.66	1,845	101.19	2,735		
100.67	1,861	101.20	2,754		
100.68	1,876	101.21	2,772		
100.69	1,891	101.22	2,791		
100.70	1,907	101.23	2,810		
100.71	1,922	101.24	2,828		
100.72	1,938	101.25	2,847		
100.73	1,953	101.26	2,866		
100.74	1,969	101.27	2,885		
100.75	1,985	101.28	2,904		
100.76	2,001	101.29	2,923		
100.77	2,016	101.30	2,942		
100.78	2,032	101.31	2,962		
100.79	2,048	101.32	2,981		
100.80	2,064	101.33	3,000		
100.81	2,080	101.34	3,020		
100.82	2,097	101.35	3,039		
100.83	2,113	101.36	3,059		
100.84	2,129	101.37	3,078		
100.85	2,145	101.38	3,098		





Subcat Reach Pond Link

Routing Diagram for J0096-POST
Prepared by Tighe & Bond, Printed 6/23/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.047	74	>75% Grass cover, Good, HSG C (WS-1A, WS-1B, WS-1C, WS-2, WS-3)
0.689	98	Paved parking, HSG C (WS-1A, WS-1B, WS-1C, WS-2, WS-3)
0.443	98	Roofs, HSG C (WS-1C)
2.179	**86**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.179	HSG C	WS-1A, WS-1B, WS-1C, WS-2, WS-3
0.000	HSG D	
0.000	Other	
2.179		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment WS-1A: Runoff Area=23,662 sf 61.52% Impervious Runoff Depth>1.90"
Flow Length=130' Slope=0.0200 '/' Tc=5.0 min CN=89 Runoff=1.25 cfs 0.086 af

Subcatchment WS-1B: Runoff Area=34,411 sf 34.55% Impervious Runoff Depth>1.38"
Flow Length=495' Tc=5.5 min CN=82 Runoff=1.29 cfs 0.091 af

Subcatchment WS-1C: Runoff Area=28,650 sf 75.57% Impervious Runoff Depth>2.16"
Flow Length=240' Tc=5.0 min CN=92 Runoff=1.69 cfs 0.118 af

Subcatchment WS-2: Runoff Area=3,505 sf 17.12% Impervious Runoff Depth>1.13"
Flow Length=22' Slope=0.0150 '/' Tc=5.0 min CN=78 Runoff=0.11 cfs 0.008 af

Subcatchment WS-3: Runoff Area=4,685 sf 13.06% Impervious Runoff Depth>1.07"
Flow Length=30' Slope=0.0200 '/' Tc=5.0 min CN=77 Runoff=0.14 cfs 0.010 af

Pond 1P: Stormtech 310 Peak Elev=100.15' Storage=2,540 cf Inflow=1.69 cfs 0.118 af
Outflow=0.36 cfs 0.091 af

Pond 3P: Underdrained Soil Filter Peak Elev=99.84' Storage=916 cf Inflow=1.25 cfs 0.086 af
Outflow=0.56 cfs 0.080 af

Pond PDMH4: Peak Elev=98.06' Inflow=0.90 cfs 0.170 af
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.90 cfs 0.170 af

Link PA1: Inflow=2.01 cfs 0.261 af
Primary=2.01 cfs 0.261 af

Link PA2: Inflow=0.11 cfs 0.008 af
Primary=0.11 cfs 0.008 af

Link PA3: Inflow=0.14 cfs 0.010 af
Primary=0.14 cfs 0.010 af

Total Runoff Area = 2.179 ac Runoff Volume = 0.312 af Average Runoff Depth = 1.72"
48.05% Pervious = 1.047 ac 51.95% Impervious = 1.132 ac

Summary for Subcatchment WS-1A:

Runoff = 1.25 cfs @ 12.07 hrs, Volume= 0.086 af, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
14,558	98	Paved parking, HSG C
9,104	74	>75% Grass cover, Good, HSG C
23,662	89	Weighted Average
9,104		38.48% Pervious Area
14,558		61.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	130	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-1B:

Runoff = 1.29 cfs @ 12.08 hrs, Volume= 0.091 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
11,890	98	Paved parking, HSG C
22,521	74	>75% Grass cover, Good, HSG C
34,411	82	Weighted Average
22,521		65.45% Pervious Area
11,890		34.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0125	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	125	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.6	320	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
5.5	495	Total			

Summary for Subcatchment WS-1C:

Runoff = 1.69 cfs @ 12.07 hrs, Volume= 0.118 af, Depth> 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
19,300	98	Roofs, HSG C
2,350	98	Paved parking, HSG C
7,000	74	>75% Grass cover, Good, HSG C
28,650	92	Weighted Average
7,000		24.43% Pervious Area
21,650		75.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	75	0.0150	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	165	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.0	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-2:

Runoff = 0.11 cfs @ 12.08 hrs, Volume= 0.008 af, Depth> 1.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
2,905	74	>75% Grass cover, Good, HSG C
600	98	Paved parking, HSG C
3,505	78	Weighted Average
2,905		82.88% Pervious Area
600		17.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	22	0.0150	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
3.4	22	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-3:

Runoff = 0.14 cfs @ 12.08 hrs, Volume= 0.010 af, Depth> 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
612	98	Paved parking, HSG C
4,073	74	>75% Grass cover, Good, HSG C
4,685	77	Weighted Average
4,073		86.94% Pervious Area
612		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	30	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
3.9	30	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond 1P: Stormtech 310

Inflow Area = 0.658 ac, 75.57% Impervious, Inflow Depth > 2.16" for 2-YR event
Inflow = 1.69 cfs @ 12.07 hrs, Volume= 0.118 af
Outflow = 0.36 cfs @ 12.48 hrs, Volume= 0.091 af, Atten= 79%, Lag= 24.7 min
Primary = 0.36 cfs @ 12.48 hrs, Volume= 0.091 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 100.15' @ 12.48 hrs Surf.Area= 3,082 sf Storage= 2,540 cf
Flood Elev= 101.50' Surf.Area= 3,082 sf Storage= 4,570 cf

Plug-Flow detention time= 177.6 min calculated for 0.091 af (76% of inflow)
Center-of-Mass det. time= 95.4 min (894.0 - 798.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	98.60'	2,776 cf	**38.17'W x 80.76'L x 2.83'H Field A** 8,733 cf Overall - 1,794 cf Embedded = 6,939 cf x 40.0% Voids
#2A	99.60'	1,794 cf	**ADS_StormTech SC-310** x 121 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 2.07 sf x 11 rows
		4,570 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	99.50'	**12.0" Round Culvert** L= 135.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 99.50' / 97.60' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	99.50'	**4.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.36 cfs @ 12.48 hrs HW=100.15' TW=98.05' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.36 cfs of 1.47 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.36 cfs @ 3.26 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 3P: Underdrained Soil Filter

Inflow Area = 0.543 ac, 61.52% Impervious, Inflow Depth > 1.90" for 2-YR event
Inflow = 1.25 cfs @ 12.07 hrs, Volume= 0.086 af
Outflow = 0.56 cfs @ 12.24 hrs, Volume= 0.080 af, Atten= 55%, Lag= 9.9 min
Primary = 0.56 cfs @ 12.24 hrs, Volume= 0.080 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 99.84' @ 12.24 hrs Surf.Area= 1,945 sf Storage= 916 cf
Flood Elev= 101.50' Surf.Area= 4,001 sf Storage= 3,340 cf

Plug-Flow detention time= 65.5 min calculated for 0.080 af (93% of inflow)
Center-of-Mass det. time= 29.1 min (841.3 - 812.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	2,378 cf	**Pond Storage (Prismatic)**Listed below (Recalc)
#2	98.50'	439 cf	**Soil Filter (Prismatic)**Listed below (Recalc) 1,463 cf Overall x 30.0% Voids
#3	97.15'	524 cf	**Stone Resevoir (Prismatic)**Listed below (Recalc) 1,309 cf Overall x 40.0% Voids
		3,340 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	1,150	0	0
101.00	1,718	1,434	1,434
101.50	2,056	944	2,378

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	975	0	0
100.00	975	1,463	1,463

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.15	970	0	0
98.50	970	1,309	1,309

Device	Routing	Invert	Outlet Devices
#1	Primary	97.65'	**12.0" Round Culvert** L= 5.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.65' / 97.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	97.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.20'	**16.0" x 16.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.56 cfs @ 12.24 hrs HW=99.84' TW=98.06' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.56 cfs of 4.92 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.56 cfs @ 6.43 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond PDMH4:

Inflow Area = 1.201 ac, 69.22% Impervious, Inflow Depth > 1.70" for 2-YR event
Inflow = 0.90 cfs @ 12.32 hrs, Volume= 0.170 af
Outflow = 0.90 cfs @ 12.32 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.32 hrs, Volume= 0.170 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 98.06' @ 12.32 hrs
Flood Elev= 102.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	97.50'	**12.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.50' / 97.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.90 cfs @ 12.32 hrs HW=98.06' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.90 cfs @ 2.88 fps)

Summary for Link PA1:

Inflow Area = 1.991 ac, 55.46% Impervious, Inflow Depth > 1.57" for 2-YR event
Inflow = 2.01 cfs @ 12.10 hrs, Volume= 0.261 af
Primary = 2.01 cfs @ 12.10 hrs, Volume= 0.261 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA2:

Inflow Area = 0.080 ac, 17.12% Impervious, Inflow Depth > 1.13" for 2-YR event
Inflow = 0.11 cfs @ 12.08 hrs, Volume= 0.008 af
Primary = 0.11 cfs @ 12.08 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA3:

Inflow Area = 0.108 ac, 13.06% Impervious, Inflow Depth > 1.07" for 2-YR event
Inflow = 0.14 cfs @ 12.08 hrs, Volume= 0.010 af
Primary = 0.14 cfs @ 12.08 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment WS-1A: Runoff Area=23,662 sf 61.52% Impervious Runoff Depth>3.48"
Flow Length=130' Slope=0.0200 '/' Tc=5.0 min CN=89 Runoff=2.24 cfs 0.158 af

Subcatchment WS-1B: Runoff Area=34,411 sf 34.55% Impervious Runoff Depth>2.81"
Flow Length=495' Tc=5.5 min CN=82 Runoff=2.65 cfs 0.185 af

Subcatchment WS-1C: Runoff Area=28,650 sf 75.57% Impervious Runoff Depth>3.79"
Flow Length=240' Tc=5.0 min CN=92 Runoff=2.89 cfs 0.208 af

Subcatchment WS-2: Runoff Area=3,505 sf 17.12% Impervious Runoff Depth>2.46"
Flow Length=22' Slope=0.0150 '/' Tc=5.0 min CN=78 Runoff=0.24 cfs 0.016 af

Subcatchment WS-3: Runoff Area=4,685 sf 13.06% Impervious Runoff Depth>2.37"
Flow Length=30' Slope=0.0200 '/' Tc=5.0 min CN=77 Runoff=0.31 cfs 0.021 af

Pond 1P: Stormtech 310 Peak Elev=101.07' Storage=4,120 cf Inflow=2.89 cfs 0.208 af
Outflow=0.86 cfs 0.179 af

Pond 3P: Underdrained Soil Filter Peak Elev=100.66' Storage=1,850 cf Inflow=2.24 cfs 0.158 af
Outflow=0.66 cfs 0.151 af

Pond PDMH4: Peak Elev=98.26' Inflow=1.51 cfs 0.331 af
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=1.51 cfs 0.331 af

Link PA1: Inflow=3.73 cfs 0.515 af
Primary=3.73 cfs 0.515 af

Link PA2: Inflow=0.24 cfs 0.016 af
Primary=0.24 cfs 0.016 af

Link PA3: Inflow=0.31 cfs 0.021 af
Primary=0.31 cfs 0.021 af

Total Runoff Area = 2.179 ac Runoff Volume = 0.588 af Average Runoff Depth = 3.24"
48.05% Pervious = 1.047 ac 51.95% Impervious = 1.132 ac

Summary for Subcatchment WS-1A:

Runoff = 2.24 cfs @ 12.07 hrs, Volume= 0.158 af, Depth> 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
14,558	98	Paved parking, HSG C
9,104	74	>75% Grass cover, Good, HSG C
23,662	89	Weighted Average
9,104		38.48% Pervious Area
14,558		61.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	130	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-1B:

Runoff = 2.65 cfs @ 12.08 hrs, Volume= 0.185 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
11,890	98	Paved parking, HSG C
22,521	74	>75% Grass cover, Good, HSG C
34,411	82	Weighted Average
22,521		65.45% Pervious Area
11,890		34.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0125	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	125	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.6	320	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
5.5	495	Total			

Summary for Subcatchment WS-1C:

Runoff = 2.89 cfs @ 12.07 hrs, Volume= 0.208 af, Depth> 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
19,300	98	Roofs, HSG C
2,350	98	Paved parking, HSG C
7,000	74	>75% Grass cover, Good, HSG C
28,650	92	Weighted Average
7,000		24.43% Pervious Area
21,650		75.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	75	0.0150	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	165	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.0	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-2:

Runoff = 0.24 cfs @ 12.08 hrs, Volume= 0.016 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
2,905	74	>75% Grass cover, Good, HSG C
600	98	Paved parking, HSG C
3,505	78	Weighted Average
2,905		82.88% Pervious Area
600		17.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	22	0.0150	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
3.4	22	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-3:

Runoff = 0.31 cfs @ 12.08 hrs, Volume= 0.021 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
612	98	Paved parking, HSG C
4,073	74	>75% Grass cover, Good, HSG C
4,685	77	Weighted Average
4,073		86.94% Pervious Area
612		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	30	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
3.9	30	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond 1P: Stormtech 310

Inflow Area = 0.658 ac, 75.57% Impervious, Inflow Depth > 3.79" for 10-YR event
Inflow = 2.89 cfs @ 12.07 hrs, Volume= 0.208 af
Outflow = 0.86 cfs @ 12.38 hrs, Volume= 0.179 af, Atten= 70%, Lag= 18.7 min
Primary = 0.86 cfs @ 12.38 hrs, Volume= 0.179 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 101.07' @ 12.38 hrs Surf.Area= 3,082 sf Storage= 4,120 cf
Flood Elev= 101.50' Surf.Area= 3,082 sf Storage= 4,570 cf

Plug-Flow detention time= 152.2 min calculated for 0.179 af (86% of inflow)
Center-of-Mass det. time= 91.8 min (875.1 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	98.60'	2,776 cf	**38.17'W x 80.76'L x 2.83'H Field A** 8,733 cf Overall - 1,794 cf Embedded = 6,939 cf x 40.0% Voids
#2A	99.60'	1,794 cf	**ADS_StormTech SC-310** x 121 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 2.07 sf x 11 rows
		4,570 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	99.50'	**12.0" Round Culvert** L= 135.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 99.50' / 97.60' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	99.50'	**4.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.86 cfs @ 12.38 hrs HW=101.07' TW=98.26' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.86 cfs of 3.91 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.62 cfs @ 5.66 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.23 cfs @ 0.86 fps)

Summary for Pond 3P: Underdrained Soil Filter

Inflow Area = 0.543 ac, 61.52% Impervious, Inflow Depth > 3.48" for 10-YR event
Inflow = 2.24 cfs @ 12.07 hrs, Volume= 0.158 af
Outflow = 0.66 cfs @ 12.29 hrs, Volume= 0.151 af, Atten= 71%, Lag= 13.0 min
Primary = 0.66 cfs @ 12.29 hrs, Volume= 0.151 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 100.66' @ 12.40 hrs Surf.Area= 3,472 sf Storage= 1,850 cf
Flood Elev= 101.50' Surf.Area= 4,001 sf Storage= 3,340 cf

Plug-Flow detention time= 53.8 min calculated for 0.151 af (96% of inflow)
Center-of-Mass det. time= 31.3 min (826.5 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	2,378 cf	**Pond Storage (Prismatic)**Listed below (Recalc)
#2	98.50'	439 cf	**Soil Filter (Prismatic)**Listed below (Recalc) 1,463 cf Overall x 30.0% Voids
#3	97.15'	524 cf	**Stone Resevoir (Prismatic)**Listed below (Recalc) 1,309 cf Overall x 40.0% Voids
		3,340 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	1,150	0	0
101.00	1,718	1,434	1,434
101.50	2,056	944	2,378

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	975	0	0
100.00	975	1,463	1,463

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.15	970	0	0
98.50	970	1,309	1,309

Device	Routing	Invert	Outlet Devices
#1	Primary	97.65'	**12.0" Round Culvert** L= 5.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.65' / 97.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	97.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.20'	**16.0" x 16.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.66 cfs @ 12.29 hrs HW=100.64' TW=98.20' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.66 cfs of 5.91 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.66 cfs @ 7.52 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond PDMH4:

Inflow Area = 1.201 ac, 69.22% Impervious, Inflow Depth > 3.30" for 10-YR event
Inflow = 1.51 cfs @ 12.38 hrs, Volume= 0.331 af
Outflow = 1.51 cfs @ 12.38 hrs, Volume= 0.331 af, Atten= 0%, Lag= 0.0 min
Primary = 1.51 cfs @ 12.38 hrs, Volume= 0.331 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 98.26' @ 12.38 hrs
Flood Elev= 102.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	97.50'	**12.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.50' / 97.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.51 cfs @ 12.38 hrs HW=98.26' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.51 cfs @ 3.24 fps)

Summary for Link PA1:

Inflow Area = 1.991 ac, 55.46% Impervious, Inflow Depth > 3.11" for 10-YR event
Inflow = 3.73 cfs @ 12.09 hrs, Volume= 0.515 af
Primary = 3.73 cfs @ 12.09 hrs, Volume= 0.515 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA2:

Inflow Area = 0.080 ac, 17.12% Impervious, Inflow Depth > 2.46" for 10-YR event
Inflow = 0.24 cfs @ 12.08 hrs, Volume= 0.016 af
Primary = 0.24 cfs @ 12.08 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA3:

Inflow Area = 0.108 ac, 13.06% Impervious, Inflow Depth > 2.37" for 10-YR event
Inflow = 0.31 cfs @ 12.08 hrs, Volume= 0.021 af
Primary = 0.31 cfs @ 12.08 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment WS-1A: Runoff Area=23,662 sf 61.52% Impervious Runoff Depth>4.25"
Flow Length=130' Slope=0.0200 '/' Tc=5.0 min CN=89 Runoff=2.71 cfs 0.192 af

Subcatchment WS-1B: Runoff Area=34,411 sf 34.55% Impervious Runoff Depth>3.53"
Flow Length=495' Tc=5.5 min CN=82 Runoff=3.31 cfs 0.232 af

Subcatchment WS-1C: Runoff Area=28,650 sf 75.57% Impervious Runoff Depth>4.58"
Flow Length=240' Tc=5.0 min CN=92 Runoff=3.45 cfs 0.251 af

Subcatchment WS-2: Runoff Area=3,505 sf 17.12% Impervious Runoff Depth>3.14"
Flow Length=22' Slope=0.0150 '/' Tc=5.0 min CN=78 Runoff=0.31 cfs 0.021 af

Subcatchment WS-3: Runoff Area=4,685 sf 13.06% Impervious Runoff Depth>3.04"
Flow Length=30' Slope=0.0200 '/' Tc=5.0 min CN=77 Runoff=0.40 cfs 0.027 af

Pond 1P: Stormtech 310 Peak Elev=101.19' Storage=4,273 cf Inflow=3.45 cfs 0.251 af
Outflow=1.75 cfs 0.221 af

Pond 3P: Underdrained Soil Filter Peak Elev=101.00' Storage=2,398 cf Inflow=2.71 cfs 0.192 af
Outflow=0.69 cfs 0.186 af

Pond PDMH4: Peak Elev=98.54' Inflow=2.38 cfs 0.407 af
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=2.38 cfs 0.407 af

Link PA1: Inflow=4.50 cfs 0.640 af
Primary=4.50 cfs 0.640 af

Link PA2: Inflow=0.31 cfs 0.021 af
Primary=0.31 cfs 0.021 af

Link PA3: Inflow=0.40 cfs 0.027 af
Primary=0.40 cfs 0.027 af

Total Runoff Area = 2.179 ac Runoff Volume = 0.724 af Average Runoff Depth = 3.99"
48.05% Pervious = 1.047 ac 51.95% Impervious = 1.132 ac

Summary for Subcatchment WS-1A:

Runoff = 2.71 cfs @ 12.07 hrs, Volume= 0.192 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
14,558	98	Paved parking, HSG C
9,104	74	>75% Grass cover, Good, HSG C
23,662	89	Weighted Average
9,104		38.48% Pervious Area
14,558		61.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.16		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.5	80	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	130	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-1B:

Runoff = 3.31 cfs @ 12.08 hrs, Volume= 0.232 af, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
11,890	98	Paved parking, HSG C
22,521	74	>75% Grass cover, Good, HSG C
34,411	82	Weighted Average
22,521		65.45% Pervious Area
11,890		34.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0125	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
1.0	125	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.6	320	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
5.5	495	Total			

Summary for Subcatchment WS-1C:

Runoff = 3.45 cfs @ 12.07 hrs, Volume= 0.251 af, Depth> 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
19,300	98	Roofs, HSG C
2,350	98	Paved parking, HSG C
7,000	74	>75% Grass cover, Good, HSG C
28,650	92	Weighted Average
7,000		24.43% Pervious Area
21,650		75.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	75	0.0150	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.00"
0.9	165	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
2.0	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-2:

Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.021 af, Depth> 3.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
2,905	74	>75% Grass cover, Good, HSG C
600	98	Paved parking, HSG C
3,505	78	Weighted Average
2,905		82.88% Pervious Area
600		17.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	22	0.0150	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
3.4	22	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment WS-3:

Runoff = 0.40 cfs @ 12.07 hrs, Volume= 0.027 af, Depth> 3.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
612	98	Paved parking, HSG C
4,073	74	>75% Grass cover, Good, HSG C
4,685	77	Weighted Average
4,073		86.94% Pervious Area
612		13.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	30	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
3.9	30	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond 1P: Stormtech 310

Inflow Area = 0.658 ac, 75.57% Impervious, Inflow Depth > 4.58" for 25-YR event
Inflow = 3.45 cfs @ 12.07 hrs, Volume= 0.251 af
Outflow = 1.75 cfs @ 12.20 hrs, Volume= 0.221 af, Atten= 49%, Lag= 7.5 min
Primary = 1.75 cfs @ 12.20 hrs, Volume= 0.221 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 101.19' @ 12.20 hrs Surf.Area= 3,082 sf Storage= 4,273 cf
Flood Elev= 101.50' Surf.Area= 3,082 sf Storage= 4,570 cf

Plug-Flow detention time= 137.9 min calculated for 0.221 af (88% of inflow)
Center-of-Mass det. time= 83.9 min (862.3 - 778.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	98.60'	2,776 cf	**38.17'W x 80.76'L x 2.83'H Field A** 8,733 cf Overall - 1,794 cf Embedded = 6,939 cf x 40.0% Voids
#2A	99.60'	1,794 cf	**ADS_StormTech SC-310** x 121 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 2.07 sf x 11 rows
		4,570 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	99.50'	**12.0" Round Culvert** L= 135.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 99.50' / 97.60' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	99.50'	**4.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.74 cfs @ 12.20 hrs HW=101.19' TW=98.54' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.74 cfs of 4.13 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.65 cfs @ 5.91 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.09 cfs @ 1.43 fps)

Summary for Pond 3P: Underdrained Soil Filter

Inflow Area = 0.543 ac, 61.52% Impervious, Inflow Depth > 4.25" for 25-YR event
Inflow = 2.71 cfs @ 12.07 hrs, Volume= 0.192 af
Outflow = 0.69 cfs @ 12.57 hrs, Volume= 0.186 af, Atten= 74%, Lag= 29.9 min
Primary = 0.69 cfs @ 12.57 hrs, Volume= 0.186 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 101.00' @ 12.43 hrs Surf.Area= 3,664 sf Storage= 2,398 cf
Flood Elev= 101.50' Surf.Area= 4,001 sf Storage= 3,340 cf

Plug-Flow detention time= 53.2 min calculated for 0.186 af (97% of inflow)
Center-of-Mass det. time= 34.1 min (823.8 - 789.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	2,378 cf	**Pond Storage (Prismatic)**Listed below (Recalc)
#2	98.50'	439 cf	**Soil Filter (Prismatic)**Listed below (Recalc) 1,463 cf Overall x 30.0% Voids
#3	97.15'	524 cf	**Stone Resevoir (Prismatic)**Listed below (Recalc) 1,309 cf Overall x 40.0% Voids
		3,340 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	1,150	0	0
101.00	1,718	1,434	1,434
101.50	2,056	944	2,378

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	975	0	0
100.00	975	1,463	1,463

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.15	970	0	0
98.50	970	1,309	1,309

Device	Routing	Invert	Outlet Devices
#1	Primary	97.65'	**12.0" Round Culvert** L= 5.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.65' / 97.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	97.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.20'	**16.0" x 16.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.70 cfs @ 12.57 hrs HW=100.95' TW=98.22' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.70 cfs of 6.26 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.70 cfs @ 7.96 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond PDMH4:

Inflow Area = 1.201 ac, 69.22% Impervious, Inflow Depth > 4.07" for 25-YR event
Inflow = 2.38 cfs @ 12.20 hrs, Volume= 0.407 af
Outflow = 2.38 cfs @ 12.20 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 12.20 hrs, Volume= 0.407 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 98.54' @ 12.20 hrs
Flood Elev= 102.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	97.50'	**12.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.50' / 97.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.38 cfs @ 12.20 hrs HW=98.54' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.38 cfs @ 3.64 fps)

Summary for Link PA1:

Inflow Area = 1.991 ac, 55.46% Impervious, Inflow Depth > 3.86" for 25-YR event
Inflow = 4.50 cfs @ 12.08 hrs, Volume= 0.640 af
Primary = 4.50 cfs @ 12.08 hrs, Volume= 0.640 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA2:

Inflow Area = 0.080 ac, 17.12% Impervious, Inflow Depth > 3.14" for 25-YR event
Inflow = 0.31 cfs @ 12.07 hrs, Volume= 0.021 af
Primary = 0.31 cfs @ 12.07 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link PA3:

Inflow Area = 0.108 ac, 13.06% Impervious, Inflow Depth > 3.04" for 25-YR event
Inflow = 0.40 cfs @ 12.07 hrs, Volume= 0.027 af
Primary = 0.40 cfs @ 12.07 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: Stormtech 310

Inflow Area = 0.658 ac, 75.57% Impervious, Inflow Depth > 5.75" for 100-YR event
Inflow = 4.28 cfs @ 12.07 hrs, Volume= 0.315 af
Outflow = 3.42 cfs @ 12.13 hrs, Volume= 0.285 af, Atten= 20%, Lag= 3.4 min
Primary = 3.42 cfs @ 12.13 hrs, Volume= 0.285 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 101.36' @ 12.13 hrs Surf.Area= 3,082 sf Storage= 4,474 cf
Flood Elev= 101.50' Surf.Area= 3,082 sf Storage= 4,570 cf

Plug-Flow detention time= 122.6 min calculated for 0.285 af (90% of inflow)
Center-of-Mass det. time= 75.6 min (848.1 - 772.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	98.60'	2,776 cf	**38.17'W x 80.76'L x 2.83'H Field A** 8,733 cf Overall - 1,794 cf Embedded = 6,939 cf x 40.0% Voids
#2A	99.60'	1,794 cf	**ADS_StormTech SC-310** x 121 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 2.07 sf x 11 rows
		4,570 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	99.50'	**12.0" Round Culvert** L= 135.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 99.50' / 97.60' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	99.50'	**4.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.41 cfs @ 12.13 hrs HW=101.36' TW=99.13' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.41 cfs of 3.93 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.69 cfs @ 6.22 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.72 cfs @ 1.95 fps)

Summary for Pond 3P: Underdrained Soil Filter

Inflow Area = 0.543 ac, 61.52% Impervious, Inflow Depth > 5.41" for 100-YR event
Inflow = 3.41 cfs @ 12.07 hrs, Volume= 0.245 af
Outflow = 1.26 cfs @ 12.31 hrs, Volume= 0.239 af, Atten= 63%, Lag= 14.2 min
Primary = 1.26 cfs @ 12.31 hrs, Volume= 0.239 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 101.31' @ 12.30 hrs Surf.Area= 3,869 sf Storage= 2,952 cf
Flood Elev= 101.50' Surf.Area= 4,001 sf Storage= 3,340 cf

Plug-Flow detention time= 50.7 min calculated for 0.238 af (97% of inflow)
Center-of-Mass det. time= 35.0 min (818.2 - 783.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	2,378 cf	**Pond Storage (Prismatic)**Listed below (Recalc)
#2	98.50'	439 cf	**Soil Filter (Prismatic)**Listed below (Recalc) 1,463 cf Overall x 30.0% Voids
#3	97.15'	524 cf	**Stone Resevoir (Prismatic)**Listed below (Recalc) 1,309 cf Overall x 40.0% Voids
		3,340 cf	Total Available Storage

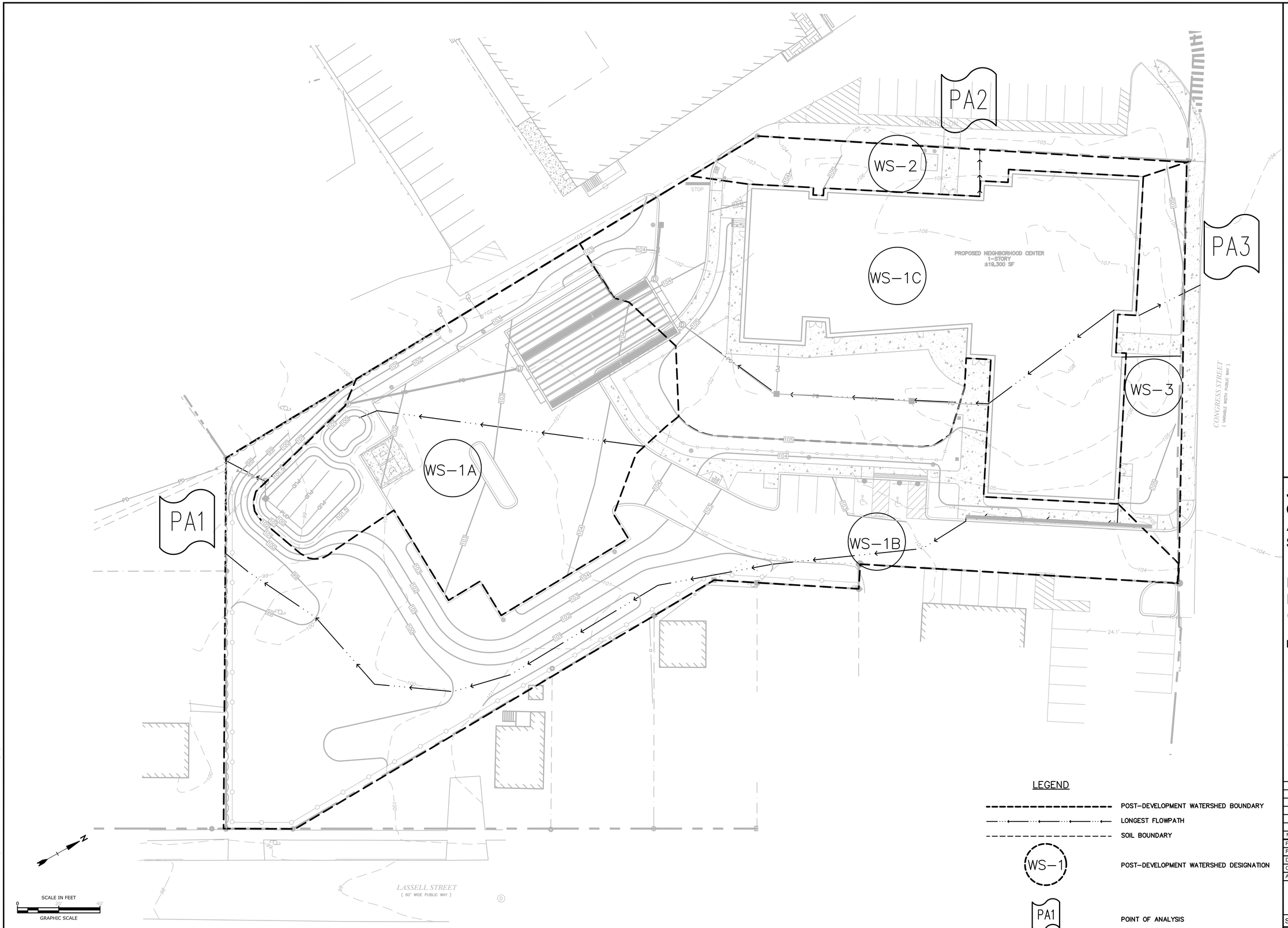
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	1,150	0	0
101.00	1,718	1,434	1,434
101.50	2,056	944	2,378

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
98.50	975	0	0
100.00	975	1,463	1,463

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.15	970	0	0
98.50	970	1,309	1,309

Device	Routing	Invert	Outlet Devices
#1	Primary	97.65'	**12.0" Round Culvert** L= 5.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 97.65' / 97.60' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	97.75'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	101.20'	**16.0" x 16.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.26 cfs @ 12.31 hrs HW=101.30' TW=98.76' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.26 cfs of 6.04 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.67 cfs @ 7.69 fps)
  └─**3=Orifice/Grate** (Weir Controls 0.59 cfs @ 1.06 fps)



LEGEND

- POST-DEVELOPMENT WATERSHED BOUNDARY
- LONGEST FLOWPATH
- SOIL BOUNDARY
- WS-1 — POST-DEVELOPMENT WATERSHED DESIGNATION
- PA1 — POINT OF ANALYSIS

Tighe&Bond
Consulting Engineers
www.tighebond.com

Jewish Community Alliance of Southern Maine

Proposed Neighborhood Center

Portland, Maine

April 03, 2015

Mark	Date	Description
1.	5/8/15	REVISED FOR PB WORKSHOP

PROJECT NO:	J-0096
FILE:	J0094-SITE.dwg
DRAWN BY:	GWH
CHECKED:	BLM
APPROVED BY:	BLM

POST-DEVELOPMENT WATERSHED PLAN

SCALE: AS SHOWN

WS-2

Jun 23, 2015-8:10pm Plotted By: gwh
Tighe & Bond, Inc. J:\J0096 Jewish Community Alliance\DWG-CAD\DESIGN\J0094-SITE.dwg Layout: POST

2.6 Mitigation Description and Best Management Practices

In order to mitigate the increase in impervious area required for the proposed project, a stormwater system has been designed for this project utilizing low impact development measures.

The intent of the stormwater management system design is for runoff to be collected, detained, and treated, where possible. An Underdrained Soil Filter has been provided to mitigate potential impacts from the increase in impervious area. The Underdrained Soil Filter has been designed to treat the entire runoff volume from the 2 and 10-year 24 hour storms. As shown in Section 2.5, the treatment volume provided is greater than the volume required by the stormwater regulations.

The underground detention basin, which consists of Stormtech SC-310 chambers, has been designed to detain and mitigate peak flows generated by the roof and grass play area. Runoff generated from the roof will not be treated as it is inherently clean. Deep sump catch basins with Casco traps will provide pre-treatment for stormwater that is collected within the play area adjacent to the building prior to discharge into the detention basin.

All soil erosion and sediment control measures shall be in accordance with regulations and principles as outlined in the Stormwater Management for Maine: Best Management Practices and Maine Erosion and Sediment Control Handbook for Construction. The intent of the outlined measures is to minimize erosion and sedimentation during construction, stabilize and protect the site from erosion after construction is complete and improve stormwater quality from the site. Best Management Practices for this project include:

- Temporary practices to be implemented during construction.
- Permanent practices to be implemented after construction.
- Stormwater treatment devices.

TEMPORARY PRACTICES

Sequencing:

1. Construct temporary and permanent sediment, erosion and detention control facilities. Erosion, sediment and detention measures shall be installed prior to any earth moving operations that will influence stormwater runoff such as:

    - New construction
    - Development of borrow pit areas
    - Disposal of sediment spoil, stump and other solid waste
    - Control of dust

2. All permanent ditches, swales, detention, retention and sedimentation basins to be stabilized using the vegetative and nonstructural BMPs prior to directing runoff to them.

3. Clear and dispose of debris.

4. Construct temporary culverts and diversion channels as required.

5. Begin permanent and temporary seeding and mulching. All cut and fill slopes shall be seeded and mulched immediately after their construction.

6. Daily, or as required, construct temporary berms, drains, ditches, silt fences, sediment traps etc., mulch and seed as required.

7. Finish pave all roadways and parking lots.

8. Inspect and maintain all erosion and sediment control measures.

9. Complete permanent seeding and landscaping.

10. Remove trapped sediment from collection devices as appropriate and then remove temporary erosion control measures.

Stabilization Practices:

1. Install stabilized construction entrance at the location shown on plans.

2. Loam stockpiles shall be mulched, seeded and contained by a silt fence barrier.

3. All erosion control devices, including silt fences and storm drain inlet filters, shall be inspected at least once per week and following any rainfall of 1/4 inch or greater. All necessary maintenance shall be completed within 48 hours. A Maintenance Inspection Report shall be kept on site and made available by the contractor at the city's request.

4. Inactivity: Area of the site which has been disturbed, where construction activity will not occur for more than twenty-one (21) days, shall be temporarily stabilized by mulching and seeding.

5. Waste Disposal/Spill Prevention: The Erosion Control Notes and Details Sheet of the Site Plans fully detail the waste disposal and spill prevention procedures. All waste from construction activities shall be collected and stored in receptacles. No construction materials shall be buried on site. The Spill Prevention Plan focuses on personnel training, housekeeping, storage and standard practices for use and disposal of materials.

PERMANENT PRACTICES

The objectives for developing permanent Best Management Practices for this site include the following:

- Develop a plan that provides the best hydrologic condition both on site and downstream.
- Provide a higher level of removal of pollutants from stormwater runoff.
- Minimize impact on the natural environment.
- Minimize future maintenance.

Section 3
Long Term Operation & Maintenance Plan

It is the intent of this Operation and Maintenance Plan to identify the areas of this site that need special attention and consideration, as well as implementing a plan to assure routine maintenance. By identifying the areas of concern as well as implementing a frequent and routine maintenance schedule the site will maintain a high quality of stormwater runoff.

Annual Reporting Requirements
The owner or operator of a BMP or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification to City of Portland Department of Public Services (DPS) in a form provided by DPS, certifying that the person has inspected the BMP(s) and that they are adequately maintained and functioning as intended by the approved post-construction stormwater management plan, or that they require maintenance or repair, including the record of the deficiency and corrective action(s) taken.

3.1 Contact/Responsible Party

Steve Brinn
Jewish Community Alliance of Southern Maine
57 Ashmont Street
Portland, Maine

(Note: The contact information for the Contact/Responsible Party shall be kept current. If ownership changes, the Operation and Maintenance Plan must be transferred to the new party.)

3.2 Maintenance Items

Maintenance of the following items shall be recorded:

- Litter/Debris Removal
- Landscaping
- Catch basin/Yard drain Cleaning
- Pavement Sweeping
- Stormtech Chamber Cleaning
- Underdrained Soil Filter Cleaning and Maintenance

The following maintenance items and schedule represent the minimum action required. Periodic site inspections shall be conducted and all measures must be maintained in effective operating condition. The following items shall be observed during site inspection and maintenance:

- Inspect vegetated areas, particularly slopes and embankments for areas of erosion. Replant and restore as necessary
- Inspect catch basins for sediment buildup
- Inspect site for trash and debris

3.3 Overall Site Operation & Maintenance Schedule

Overall Site Operation and Maintenance Schedule		
Maintenance Item	**Frequency of Maintenance**	**Operation**
Litter/Debris Removal	Weekly	Management Company
Pavement Sweeping - Sweep impervious areas to remove sand and litter.	2 - 4 times annually	Parking Lot Sweeper
Underdrain Soil Filter - Trash and debris to be removed. - Any required maintenance shall be addressed.	Two (2) times annually and after any rainfall event exceeding 2.5" in a 24-hr period	Management Company
Stormtech Chambers - Visual inspection and cleaning.	Twice Yearly	Management Company / Vacuum Truck
Rip Rap Aprons - Trash and debris to be removed. - Any required maintenance shall be addressed.	Annually	Management Company
Catch Basin (CB) / Yard Drain (YD) Cleaning - CBs/YDs to be cleaned of solids and oils.	Annually	Vacuum Truck
Landscaping - Landscaped islands to be maintained and mulched.	Maintained as required and mulched each Spring	Management Company

Underdrained Soil Filter Inspection/Maintenance Requirements		
Inspection/ Maintenance	**Frequency**	**Action**

Monitor to ensure that Rain Gardens function effectively after storms	Four (4) times annually (quarterly) and after any rainfall event exceeding 2.5" in a 24-hr period	- Trash and debris to be removed - Any required maintenance shall be addressed
Inspect Vegetation	Annually	- Inspect the condition of all Rain Garden vegetation - Prune back overgrowth - Replace dead vegetation - Remove any invasive species
Inspect Drawdown Time - The system shall drawdown within 48-hours following a rainfall event.	Annually	- Assess the condition of the facility to determine measures required to restore the filtration function, including but not limited to removal of accumulated sediments or reconstruction of the filter.

StormTech Inspection / Maintenance Requirements		
Inspection / Maintenance	**Frequency**	**Action**
Inspection with maintenance following as warranted	Twice Yearly	- Trash and debris to be removed - Any required maintenance shall be addressed.

Rip Rap Inspection / Maintenance Requirements		
Inspection / Maintenance	**Frequency**	**Action**
Visual Inspection	Annually	- Visually inspect for damage and deterioration - Repair damages immediately

3.3.1 Disposal Requirements

Disposal of debris, trash, sediment and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state and federal waste regulations.

3.3.2 Snow & Ice Management for Standard Asphalt and Walkways

Snow storage areas shall be located such that no direct untreated discharges are possible to receiving waters from the storage site (snow storage areas have been shown

on the Site Plan). Curb cuts shown on the plan shall remain free of snow and ice buildup. Salt storage areas shall be covered or located such that no direct untreated discharges are possible to receiving waters from the storage site.

3.3.3 Annual Updates and Log Requirements

The Owner and/or Contact/Responsible Party shall review this Operation and Maintenance Plan once per year for its effectiveness and adjust the plan and deed as necessary.

A log of all preventative and corrective measures for the stormwater system shall be kept on-site and be made available upon request by any public entity with administrative, health environmental or safety authority over the site.

Stormwater Management Report						
Project Name		**Proposed Neighborhood Center, 1342 Congress St, Portland, ME**				
BMP Description	**Date of Inspection**	**Inspector**	**BMP Installed and Operating Properly?**	**Cleaning / Corrective Action Needed**	**Date of Cleaning / Repair**	**Performed By**
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			

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Table 2-1
24 Hour Duration Rainfalls for Various Return Periods
Natural Resources Conservation Service County Rainfall Data

County	Storm Type	Return Interval or Frequency 1-Yr	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr	500-Yr	Annual	
Androscoggin		2.5	3.0	3.9	4.6	5.4	6.5	7.8	45.3	
Aroostook C		2.1	2.1	3.2	3.6	4.2	5.0	5.9	36.1	(Presque Isle Area)
Aroostook N	S	2.0	2.3	3.0	3.5	4.0	4.8	5.7	36.1	(Fort Kent Area)
Aroostook S	E	2.2	2.5	3.3	3.8	4.4	5.3	6.4	39.0	(Houlton Area)
Cumberland NW	E	2.8	3.3	4.3	5.0	5.8	6.9	8.3	43.4	(NW of St. Route 11)
Cumberland SE		2.5	3.0	4.0	4.7	5.5	6.7	8.1	44.4	(SE of St. Route 11)
Franklin	N	2.4	2.9	3.7	4.2	4.9	5.9	7.0	45.6	
Hancock	O	2.4	2.7	3.6	4.2	4.9	6.0	7.2	45.2	
Kennebec	T	2.4	3.0	3.8	4.4	5.1	6.1	7.2	41.7	
Knox-Lincoln	E	2.5	2.9	3.8	4.4	5.1	6.2	7.4	46.1	
Oxford E	S	2.5	3.0	4.0	4.6	5.3	6.4	7.6	43.0	(E of St. Route 26)
Oxford W		3.0	3.5	4.5	5.2	6.0	7.1	8.4	43.8	(W of St. Route 26)
Penobscot N	1	2.2	2.5	3.3	3.8	4.4	5.4	6.4	41.5	(N of Can. -Atl. Rwy)
Penobscot S		2.4	2.7	3.5	4.1	4.8	5.8	6.9	39.5	(S of Can. -Atl. Rwy)
Piscataquis N		2.2	2.5	3.3	3.8	4.4	5.3	6.3	38.5	(N of Can. - Atl. Rwy)
Piscataquis S	A	2.3	2.6	3.4	4.0	4.6	5.5	6.6	41.0	(S of Can. - Atl. Rwy)
Sagadahoc	N	2.5	3.0	3.9	4.6	5.4	6.5	7.8	45.3	
Somerset N	D	2.2	2.5	3.3	3.8	4.4	5.3	6.3	37.3	(N of Can. - Atl. Rwy)
Somerset S		2.4	2.7	3.5	4.1	4.7	5.7	6.8	39.5	(S of Can. - Atl. Rwy)
Waldo	2	2.5	2.8	3.7	4.3	4.9	6.0	7.1	47.2	
Washington		2.4	2.5	3.4	4.0	4.8	5.9	7.1	44.2	
York		2.5	3.0	4.0	4.6	5.4	6.6	7.8	46.7	

NOTES: REVISED 4/10/92 Lew P. Crosby
24-HR DURATION RAINFALL

SOURCES: 24-HR. DATA - TP 40
ANNUAL DATA - CDAN

Note 1: [1]Use ***Type II*** for Oxford County (with the exception of towns listed below) and Penobscot County (with the exception of towns listed below) and all Main counties not listed below)

Note 2: [2]Use ***Type III*** for York, Cumberland, Androscoggin, Sagadahoc, Kennebec, Waldo, Knox, Piscataquis, Somerset, Franklin, Aroostook, Lincoln, Hancock, Washington Counties; the following Oxford County Towns: Porter, Brownfield, Hiram, Denmark, Oxford, Hebron, Buckfield and Hartford; and the following Penobscot County Towns: Dixmont, Newburgh, Hampden, Bangor, Veazie, Orono, Bradley, Clifton, Eddington, Holden, Brewer, Orrington, Plymouth, Etna, Carmel, Hermon, Glenburn, Old Town, Milford and Greenfield.

March 18, 2013

Karen Johnson
Charter Realty & Development Corporation
800 Westchester Avenue, Suite S-632
Rye Brook, NY 10573

Re: Phase II Environmental Site Assessment
St. Patrick's Church
1342 and 1348 Congress Street
Portland, Maine
St.Germain Collins File No.: 3410.2

Dear Ms. Johnson:

St.Germain Collins is providing you with the results of a Phase II Environmental Site Assessment (ESA) conducted at St. Patrick's Church in Portland, Maine (Site) (see **Figure 1 – Site Location**). This work was in response to our identification of a 3,000-gallon #2 fuel oil underground storage tank (UST) formerly present on the Site. During completion of a Phase I ESA, St.Germain Collins determined that contaminated soil was observed during removal of this UST in 1991, and it therefore was considered a Recognized Environmental Condition (REC). The purpose of the Phase II ESA was to determine if the REC represented a threat to human health or the environment, and in turn could limit Site redevelopment.

Background and Site Description

The Site is located at 1342 and 1348 Congress Street in Portland, Maine in a mixed residential and light commercial neighborhood (see Figure 1). It encompasses approximately 2.2 acres and is occupied by a church and rectory, surrounded by paved driveways, parking, and vegetated areas (see **Figure 2 – Site Plan)**.

The church was built on the Site in 1964, and prior to its construction the Site was occupied by a farm and a small residence. The topography of the Site and surrounding area slopes gently to the south and west toward the Fore River. The Site and surrounding area are served by public water and sewer.

According to Maine Geological Survey maps, the Site is underlain by the Presumpscot Formation consisting of silt, clay and minor deposits of sand to unknown depth.

Phase II ESA Tasks

On March 4, 2013, St.Germain Collins supervised the advancement of four geoprobe soil borings in the area of the former UST located in a grassed area north of the Rectory (see Figure 2). All borings were continuously sampled and field screened with the Oil in Soil® shake test for petroleum hydrocarbons and a photoionization detector (PID) following Maine Department of Environmental Protection (MEDEP) Standard Operating Procedure TS-004 (Compendium of Field Testing of Soil Samples for Gasoline and Fuel Oil). One soil sample was collected for analysis of extractable petroleum hydrocarbons (EPH) by Analytics Environmental Laboratory (Analytics) in Portsmouth, New Hampshire. **Soil Boring Logs** are provided as **Attachment A** and the **Laboratory Report** is included as **Attachment B**.

Results

As shown on the boring logs in Attachment A, site geology consists of interbedded sand, silt, and clay. Boring SB-1 encountered refusal at a depth of 9.5 feet; the other borings did not reach refusal with the deepest boring SB-2 terminated at 24 feet. Groundwater was not encountered in any of the borings, though the low permeability clay may have limited groundwater flow into the borings.

No headspace readings exceeding the MEDEP notification limit of 40 parts per million (ppm) were recorded in the any of the borings; the highest PID reading was 6 ppm at 8 to 9 feet below grade in SB-1. One soil sample was collected from this interval for laboratory analysis of EPH. None of the samples showed the presence of free product based on the field tests.

The analyzed soil sample had detectable levels of three EPH constituents (C9-C18 Aliphatics, C19-C36 Aliphatics, and C11-C22 Aromatics. The detection of the aliphatic and aromatic hydrocarbons confirms that a petroleum release occurred. None of the detected constituents exceeded the 2009 MEDEP Petroleum Remediation Guidelines (PRGs), including the Residential PRG.

Dibenzo(a,h)anthracene was reported as non-detect, but had a practical quantization limit (PQL) above the Residential and Park User PRGs. This means that it is possible this compound is present about these two PRGs; the PQL is below the Construction/Excavation Worker and Outdoor Commercial Worker PRGs. With this soil being 8 to 9 feet below grade, it does not pose a risk under the Residential or Parker User PRGs unless brought to the surface.

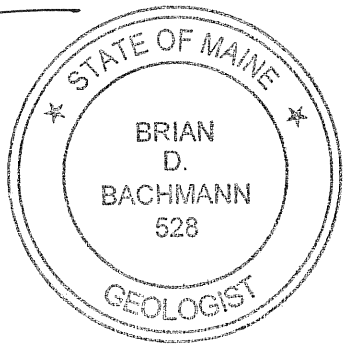
Although the impacted soil at SB-1 does not currently pose a risk, if this soil is brought to the surface it must be managed appropriately. The MEDEP typically allows such soil to be reused on-site, especially if the soil remains below the ground surface. Otherwise, the soil would need to be disposed of or recycled at a MEDEP-approved facility.

Closure

Based upon the March 2013 subsurface investigation and sample results, St.Germain Collins does not recommend any additional actions be taken at this time. If you have any questions, please do not hesitate to contact us at (207) 591-7000.

ST.GERMAIN COLLINS

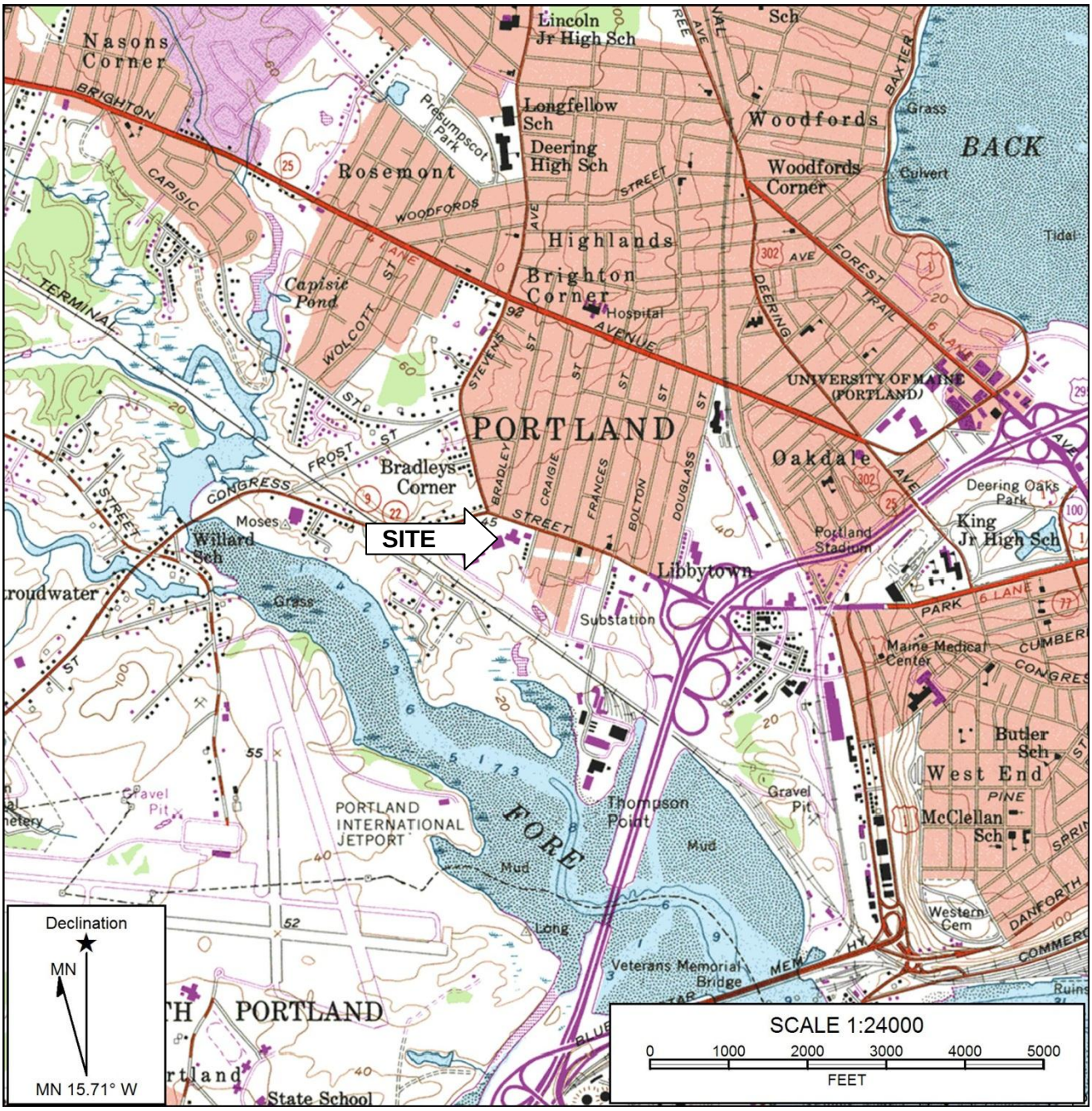
Brian Bachmann, C.G.
Geologist



Attachments

Figure 1 - Site Location
Figure 2 – Site Plan

Attachment A	Soil Boring Logs
Attachment B	Laboratory Report



REFERENCE:
USGS PORTLAND WEST, MAINE 7.5 MIN TOPGRAPHICAL MAP

SITE LOCATION MAP

ST. PATRICK'S CHURCH
1342 AND 1348 CONGRESS STREET
PORTLAND, MAINE

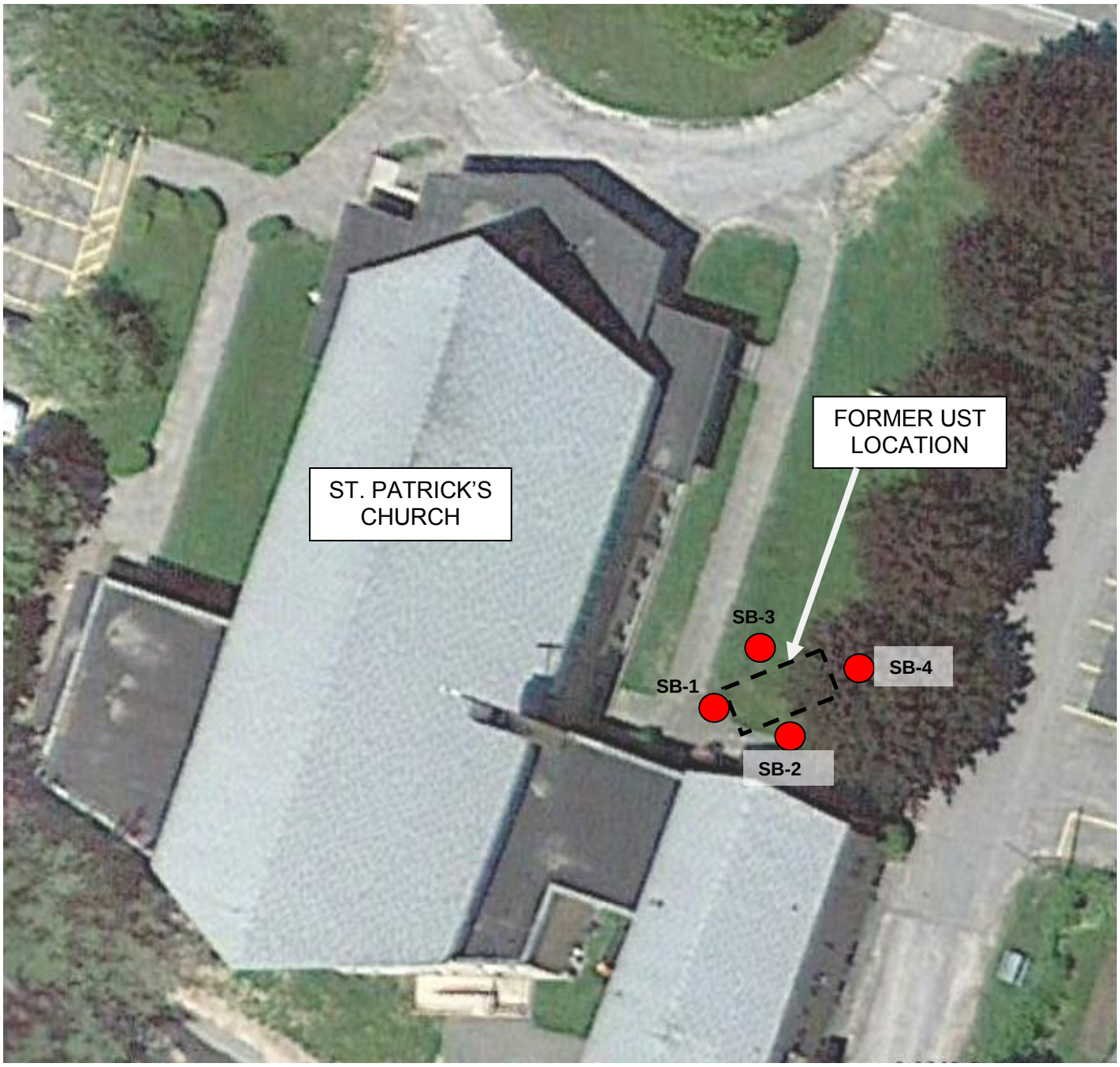
CHARTER REALTY & DEVELOPMENT CORP.
800 WESTCHESTER AVENUE
RYE BROOK, NY

ENVIRONMENTAL CONSULTING GROUP
St.Germain · Collins

FIGURE
1

DATE: FEBRUARY 4, 2013 | SCALE: SEE ABOVE | FILE: 3410.1

846 MAIN ST., SUITE 3 WESTBROOK, MAINE, 04092 TEL: 207-591-7000 WWW.STGERMAINCOLLINS.COM



REFERENCE: GOOGLE EARTH 2010

LEGEND

APPROXIMATE SOIL BORING LOCATIONS

FORMER UNDERGROUND STORAGE TANK (UST)

0 50 ft.

SCALE APPROXIMATE

N

SITE PLAN

ST.PATRICK'S CHURCH
1342 AND 1348 CONGRESS STREET
PORTLAND, MAINE

CHARTER REALTY & DEVELOPMENT CORP.
800 WESTCHESTER AVENUE
RYE BROOK. NY

ENVIRONMENTAL CONSULTING GROUP
St.Germain · Collins

FIGURE 2

DATE: MARCH 14, 2013 | SCALE: SEE ABOVE | FILE: 3410.2

846 MAIN ST., SUITE 3 WESTBROOK, MAINE, 04092 TEL: 207-591-7000 WWW.STGERMAINCOLLINS.COM

ATTACHMENT A

Soil Boring Logs

BORING AND MONITORING WELL LOG							BORING #:	SB-1
St.Germain Collins 846 Main Street Westbrook, Maine 04092 www.stgermaincollins.com					Project Number:	3410.2	Client/Location:	Charter Realty, St. Patricks Church
					Date of Installation:	3/4/13	Representative:	Brian Bachmann
					Total Depth of Boring:	9.5 feet	Drilling Company:	EPI
					Depth to Water:	NA	Drilling Technology:	Direct push
					Depth of Well:	NA	Sampler:	Dual Tube
					Well Screen Interval:	NA	Well Screen Type:	NA
					Well Riser Interval:	NA	Well Riser Type:	NA

Depth (ft)	Sample number	Sample Interval	Blows	Rec/Driven (in.)	Description	Stratum	Headspace Results (ppm)	Saturation Test Result	Depth (ft)	Well Construction
0	S-1	0-2	NA	31/48	organic **SILT** with sand, 2.5Y 3/3 dark olive brown, loose, slightly plastic, moist	SILT	0.4		0	No well installed at this location.
1									1	
2	S-2	2-4			**CLAY** with gravel, 2.5Y 4/2 dark grayish brown, medium stiff, plastic, dry	CLAY	1.7	Neg	2	
3									3	
4	S-3	4-6	NA	24/48	same as above		1.9		4	
5									5	
6	S-4	6-8			clayey **SAND**, 5Y 5/1 gray, very soft, very plastic, moist	SAND	4.2	Neg	6	
7									7	
8	S-5	8-10	NA	40/48	same as above (8.0 to 9.5 interval submitted for laboratory analysis of Extractable Petroleum Hydrocarbons)		6.0	Neg	8	
9									9	
					Refusal at 9.5 feet below ground surface.				12	

Notes:
NA = not applicable.
NS = not sampled.
ppm = parts per million.
Soil headspace screening completed with a MiniRae 3000 Photoionization Detector (PID).
Neg = negative result using Oil in Soil shaker test kit as prescribed by MEDEP SOP TS 004

BORING AND MONITORING WELL LOG						BORING #:	SB-2
St.Germain Collins 846 Main Street Westbrook, Maine 04092 www.stgermaincollins.com					Project Number:	3410.2	Client/Location:	Charter Realty, St. Patricks Church
					Date of Installation:	3/4/13	Representative:	Brian Bachmann
					Total Depth of Boring:	24.0	Drilling Company:	EPI
					Depth to Water:	NA	Drilling Technology:	Direct push
					Depth of Well:	NA	Sampler:	Dual Tube
					Well Screen Interval:	NA	Well Screen Type:	NA
					Well Riser Interval:	NA	Well Riser Type:	NA

Depth (ft)	Sample number	Sample Interval	Blows	Rec/Driven (in.)	Description	Stratum	Headspace Results (ppm)	Saturation Test Result	Depth (ft)	Well Construction
0	S-1	0-2	NA	48/48	organic SILT, 2.5Y 3/3 dark olive brown, medium dense, slightly plastic, dry	SILT	4.8		0	No well installed at this location.
1									1	
2	S-2	2-4			same as above		4.8	Neg	2	
3									3	
4	S-3	4-6	NA	48/48	clayey SAND, 2.5Y 5/3 light olive brown, stiff, plastic, dry	SAND	3.8		4	
5									5	
6	S-4	6-8			same as above		3.2	Neg	6	
7									7	
8	S-5	8-10	NA	48/48	CLAY,2.5Y 4/2 dark grayish brown, stiff, very plastic, dry	CLAY	1.8		8	
9									9	
10	S-6	10-12			same as above		2.3		10	
11									11	
12	S-7	12-14	NA	48/48	CLAY, 2.5Y 4/2 dark grayish brown, soft, very plastic, dry		NA	NA	12	
13									13	
14	S-8	14-16			CLAY, 2.5Y 5/0 gray, very soft, very plastic, moist				14	
15									15	
16	S-9	16-18	NA	48/48	same as above				16	
17									17	
18	S-10	18-20			same as above				18	
19									19	
20	S-11	20-22	NA	48/48	clayey SAND, 2.5Y 3/0 very dark gray, very soft, very plastic, moist	SAND			20	
21									21	
22	S-12	22-24							22	
23									23	
24					Terminated boring at 24.0 feet below ground surface				24	

Notes:
NA = not applicable.
NS = not sampled.
ppm = parts per million.
Soil headspace screening completed with a MiniRae 3000 Photoionization Detector (PID).
Neg = negative result using Oil in Soil shaker test kit as prescribed by MEDEP Standard Operating Procedure TS 004.

BORING AND MONITORING WELL LOG							BORING #:	SB-3
St.Germain Collins 846 Main Street Westbrook, Maine 04092 www.stgermaincollins.com					Project Number:	3410.2	Client/Location:	Charter Realty, St. Patricks Church
					Date of Installation:	3/4/13	Representative:	Brian Bachmann
					Total Depth of Boring:	12.0	Drilling Company:	EPI
					Depth to Water:	NA	Drilling Technology:	Direct push
					Depth of Well:	NA	Sampler:	Dual Tube
					Well Screen Interval:	NA	Well Screen Type:	NA
					Well Riser Interval:	NA	Well Riser Type:	NA

Depth (ft)	Sample number	Sample Interval	Blows	Rec/Driven (in.)	Description	Stratum	Headspace Results (ppm)	Saturation Test Result	Depth (ft)	Well Construction
0	S-1	0-2	NA	48/48	organic **SILT**, 2.5Y 3/3 dark olive brown, medium dense, slightly plastic, dry				0	
							1.7			
1									1	
2	S-2	2-4			same as above	**SILT**			2	
							1.8	Neg		
3									3	
4	S-3	4-6	NA	24/48	clayey **SAND**, 2.5Y 5/3 light olive brown, stiff, plastic, dry				4	
							1.5	Neg		
5									5	
										No well installed at this location.
6	S-4	6-8			same as above	**SAND**			6	
							2.9			
7									7	
8	S-5	8-10	NA	40/48	**CLAY**,2.5Y 4/2 dark grayish brown, stiff, very plastic, dry				8	
							3.6	Neg		
9									9	
10	S-6	10-12			same as above	**CLAY**			10	
							2.8			
11									11	
12					Terminated boring at 12.0 feet below ground surface				12	

Notes:
NA = not applicable.
NS = not sampled.
ppm = parts per million.
Soil headspace screening completed with a MiniRae 3000 Photoionization Detector (PID).
Neg = negative result using Oil in Soil shaker test kit as prescribed by MEDEP Standard Operating Procedure TS 004.

BORING AND MONITORING WELL LOG							BORING #:	SB-4
St.Germain Collins 846 Main Street Westbrook, Maine 04092 www.stgermaincollins.com					Project Number:	3410.2	Client/Location:	Charter Realty, St. Patricks Church
					Date of Installation:	3/4/13	Representative:	Brian Bachmann
					Total Depth of Boring:	12.0	Drilling Company:	EPI
					Depth to Water:	NA	Drilling Technology:	Direct push
					Depth of Well:	NA	Sampler:	Dual Tube
					Well Screen Interval:	NA	Well Screen Type:	NA
					Well Riser Interval:	NA	Well Riser Type:	NA

Depth (ft)	Sample number	Sample Interval	Blows	Rec/Driven (in.)	Description	Stratum	Headspace Results (ppm)	Saturation Test Result	Depth (ft)	Well Construction
0	S-1	0-2	NA	48/48	organic **SILT**, 2.5Y 3/3 dark olive brown, medium dense, slightly plastic, dry				0	
							1.1			
1									1	
2	S-2	2-4			same as above	**SILT**			2	
							1.5	Neg		
3									3	
4	S-3	4-6	NA	24/48	clayey **SAND**, 2.5Y 5/3 light olive brown, stiff, plastic, dry				4	
							1.0			
5									5	
										No well installed at this location.
6	S-4	6-8			same as above	**SAND**			6	
							2.4	Neg		
7									7	
8	S-5	8-10	NA	40/48	**CLAY**,2.5Y 4/2 dark grayish brown, stiff, very plastic, dry				8	
							0.9			
9									9	
10	S-6	10-12			same as above	**CLAY**			10	
							0.9	Neg		
11									11	
12					Terminated boring at 12.0 feet below ground surface				12	

Notes:
NA = not applicable.
NS = not sampled.
ppm = parts per million.
Soil headspace screening completed with a MiniRae 3000 Photoionization Detector (PID).
Neg = negative result using Oil in Soil shaker test kit as prescribed by MEDEP Standard Operating Procedure TS 004.