Stormwater Management Report
Acadia Lending Group Professional Office Building
Riverside Street
Portland, Maine 04103

General

On behalf of Acadia Lending Group, we have prepared this Stormwater Management Report to evaluate potential impacts associated with the modification in stormwater runoff characteristics upon development of a professional office building. The subject site is located on the easterly side of Riverside Street in Portland, approximately 0.5 miles north of the Riverside Street and Warren Avenue intersection. Stormwater management controls are designed to best suit the proposed office building project and to generally comply with applicable State and Local regulatory requirements for evaluation of pre- and post-development conditions.

Improvements will include a 5,133 building footprint, access drive aisles, a 31 space paved parking lot, sidewalks, stormwater infrastructure and associated utilities. New impervious surfaces comprise of building rooftop, pavement and concrete. The building will e divided into three units, with Acadia Lending occupying one of the units. Landscaped areas will mainly consist of vegetated sideslopes, planted gardens and Stormwater Best Management Practices (BMPs). Overall a total of 0.56 acres of impervious area and 0.94 acres of developed area (impervious and landscaped) will be created for the office building project.

Runoff from newly developed surfaces will be directed toward BMPs for stormwater treatment and detention. Specified BMPs are approved by Maine Department of Environmental Protection (DEP), including two (2) underdrained soil filters and a building drip edge at the perimeter of building. Stormwater associated with development areas will be managed in general conformance with Section 5 – Portland Stormwater Management and Maine DEP Ch. 500 of the City of Portland Technical Manual, latest revision. A Maine Department of Environmental Protection (DEP) permit application is not being submitted because the project will involve the creation of less than one acre of new impervious area in a watershed not most-at risk per Maine DEP Chapter 502. Runoff from the project site will have a negligible impact on downstream drainage ways.

Site Characteristics

Land areas to be developed are presently vacant, with ground cover consisting primarily of overgrown meadow with several pockets of tree canopy cover. The subject parcel appears to have been previously occupied by two residential structures. Little is known about the former development, although there is evidence of an abandoned leach field, a curb cut on Riverside Street and a ground survey identified two water shut off valves. The site is bounded by woodlands toward the east, a church development to the north and commercial businesses to the south and west along Riverside Street. Topography is generally flat throughout the project with land grades between 1% and 4%.

Front portions of the site are gently sloped to direct drainage west toward a closed storm drainage system within Riverside Street that outlets to a major drainage channel roughly 310 feet north of the

site. Runoff from the back portion of the site drains east toward offsite forested wetland depressions and drainage ways that ultimately discharge runoff south toward the major drainage channel. Flow in the major drainage channel drains east under Riverside Street via a culvert toward Presumpscot River. Two small freshwater, forested wetland depressions were identified when wetlands were delineated in March 2017. There are no known existing drainage issues onsite or immediately downstream.

Soils

A Class 'D' Medium Intensity Soil Survey for the site was obtained from the Soil Survey of Cumberland County Maine, published by the United States Department of Agriculture (USDA) and Natural Resources Conservation Service, latest revision. Soil data was obtained from the Web Soil Survey. The Hydrologic Soil Group (HSG) of the site soils are classified by Technical Release TR-55 of the Soil Conservation Service as follows:

Soil Type	Symbol	HSG	Drainage Class
Scantic Silt Loam	Sc	D	Poorly drained

Methodology

In order to evaluate drainage characteristics in pre and post-development conditions, a quantitative analysis was performed to determine peak rates of runoff for the 2, 10, and 25-year storm events. Runoff calculations were performed following the methodology outlined in the USDA Soil Conservation Service's "Urban Hydrology for Small Watersheds, Technical Release #55" and HydroCAD Stormwater Modeling System Software. A 24-hour, SCS Type III storm distribution for the 2, 10, and 25-year storm frequencies were used for analysis.

The 24-hour rainfall values in the hydrologic model for York County are as follows.

Table 1 - Storm Frequency Precipitation (in./24 hr)	
2-year	3.1
10-year	4.6
25-year	5.8

The HydroCAD model evaluates a single study point at a culvert crossing Riverside Street approximately 310 feet north of the subject site. The study point is identified as SP-1 in the drainage model. All runoff from the subject sites convenes at this single study point. A portion of the site drains east offsite and north through an abutting parcel to the culvert crossing. Runoff from other land areas drain west toward Riverside Street and into the existing closed drainage system that directs runoff north to the inlet end of the culvert crossing.

Stormwater Quality Standards

Filtration BMPs for stormwater treatment will be provided using two (1) underdrained soil filters and a building drip edge at the perimeter of building. The underdrained soil filter and roof drip edge will be

constructed in general conformance with Chapter 7.1 and 7.5 of the BMPs Technical Design Manual. Water quality volume depths vary depending on location and the amount of flow directed to the BMP. Soil filters provide a high level of contaminate removal and detention prior to discharge to downstream drainage ways. With wetlands identified onsite and in close proximity to the soil filters, impermeable liners are specified for protection against the anticipated seasonal high groundwater table. Due to the soil filter depths, a groundwater interceptor drain will be installed to alleviate potential buoyancy issues.

The stormwater management plan was designed to examine impervious areas across the entire developed site and provide treatment of runoff from at least 95% of the additional impervious area and a minimum 80% of total developed area. Through the use of a one wooded buffer and one wet pond, treatment of runoff will be provided for 95.21% of the impervious area and 80.18% of the developed area (landscaped and impervious areas). As proposed, the stormwater management design will exceed local and state standards for treatment requirements. Stormwater management design calculations for buffer and pond sizing, and for General Standard compliance, are enclosed as part of **Attachment A**.

Stormwater Quantity Standards

Existing drainage patterns are not anticipated to be significantly altered with the proposed stormwater management plan. Runoff from proposed imperious and landscaped surfaces will be conveyed to stormwater BMPs with channel protection volumes designed to provide flooding control before ultimate discharge to downstream closed drainage systems and natural swales. The HydroCAD model demonstrates negligible impact on the closed drainage system within Riverside Street.

Runoff from the developed site will continue to be directed toward the study point along Riverside Street. The following table summarizes the results of stormwater calculations for the design storm events for the project area. Calculations and computer modeling data sheets are provided with this report.

The HydroCAD model predicts slight decreases in peak flow rates during the 2-, 10- and 25-year storm events at the study point.

Stormwater Peak Discharge Summary Table

Study Point	2-Year Storm			10-Year Storm			25-Year Storm		
	Pre (cfs)	Post (cfs)	Diff. (cfs)	Pre (cfs)	Post (cfs)	Diff. (cfs)	Pre (cfs)	Post (cfs)	Diff. (cfs)
SP-1	1.13	1.13	0.00	2.34	1.72	-0.62	3.38	3.28	-0.10

Summary

An Erosion and Sedimentation Control Plan has been developed for the project site placing emphasis on the installation of sedimentation barriers and revegetation to minimize erosion potential from development activities during and after construction. The Erosion Control Plan is incorporated into the design plans and includes the locations of the erosion control provisions (i.e., silt fence, construction entrance) along with a narrative and construction details for reference by the contractor during construction. The Erosion Control and Sedimentation Plan calls for permanent or temporary measures

to be in place on any disturbed ground resulting from construction by use of riprap, seed, mulch, or other ground cover within one week from the time it was actively worked.

The Acadia Lending Group project will include a comprehensive grading and drainage plan responsive to site characteristics and topographical conditions. The proposed office development will include the construction of three types of stormwater BMPs which will provide treatment and detention of runoff from the majority of new impervious and developed surfaces. The level of water quality treatment provided will generally satisfy the General Standard. Runoff from the project site will continue to discharge directly to the same identified study point. Increases in post-development peak flow rates during the 2-, 10-, and 25-year storm events are anticipated to have negligible impact on flow characteristics of drainage ways immediately downstream of the site and further downstream to the Presumpscot River.

With incorporation of these measures, no significant impacts to off-site drainage ways are anticipated due to the development of the office building.

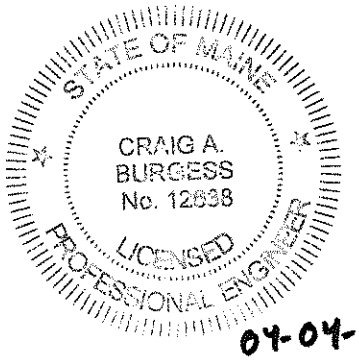
Prepared by:

SEBAGO TECHNICS, INC.

Craig Burgess

Craig Burgess, PE
Senior Project Engineer

CAB



04-04-17

Attachment A

Water Quality Calculations

Table 1: MDEP GENERAL STANDARD CALCULATIONS
Acadia Lending Group, Riverside Street, Portland, ME
Job #16078

AREA ID	WATERSHED SIZE (S.F.)	EXISTING IMPERVIOUS AREA (S.F.)	NEW IMPERVIOUS AREA (S.F.)	EXISTING LANDSCAPED AREA (S.F.)	NEW LANDSCAPED AREA (S.F.)	NEW DEVELOPED AREA (S.F.)	UNDEVELOPED AREAS (S.F.)	TREATMENT PROVIDED?	NEW IMPERVIOUS AREA TREATED* (S.F.)	NEW LANDSCAPED AREA TREATED* (S.F.)	NEW DEVELOPED AREA TREATED* (S.F.)	TREATMENT BMP
11	4,790	401	0	0	188	188	4,201	NO	0	0	0	NONE
12	6,928	5,603	210	0	480	690	6,238	NO	0	0	0	NONE
13	10,634	0	6,896	0	3,738	10,634	0	YES	6,896	3,738	10,634	UDSF 2
14	2,064	989	849	0	225	1,074	990	NO	0	0	0	NONE
21	5,099	0	70	0	4,094	4,164	935	YES	70	4,094	4,164	UDSF 1
22	5,901	0	5,193	0	708	5,901	0	YES	5,193	708	5,901	DRIP EDGE
23	2,668	0	1,769	0	899	2,668	0	YES	1,769	899	2,668	UDSF 1
24	11,970	0	9,528	0	2,016	11,544	426	YES	9,528	2,016	11,544	UDSF 1
25	3,635	0	0	0	2,968	2,968	667	NO	0	0	0	NONE
31	4,954	0	0	0	166	166	4,788	NO	0	0	0	NONE
L1	284	0	60	0	224	284	0	NO	0	0	0	NONE
L2	319	0	60	0	259	319	0	NO	0	0	0	NONE
L3	162	0	0	0	162	162	0	YES	0	162	162	UDSF 1
L4	148	0	0	0	148	148	0	YES	0	148	148	UDSF 1
SUM	**59,556.00**	**6,993.00**	**24,635.00**	**0.00**	**16,275.00**	**40,910.00**	**18,245.00**	-	**23,456.00**	**11,765.00**	**35,221.00**	-

TOTAL IMPERVIOUS AREA (S.F.)	**24,635.00**	**TOTAL DEVELOPED AREA (S.F.)**	**40,910.00**
TOTAL IMPERVIOUS AREA RECEIVING TREATMENT (S.F.)	**23,456.00**	**TOTAL DEV. AREA RECEIVING TREATMENT (S.F.)**	**35,221.00**
% OF IMPERVIOUS AREA RECEIVING TREATMENT	**95.21%**	**% OF DEV. AREA RECEIVING TREATMENT**	**86.09%**

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JOB	16078 - Acadia Lending		
SHEET NO.	1	OF	3
CALCULATED BY	MAM	DATE	4/4/2017
FILE NAME		PRNT DATE	4/4/2017

UNDERDRAINED SOIL FILTER 1

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Filter 1

Landscaped Area	7,319.0	SF						
Impervious Area	11,367.0	SF						

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	7,319.0	SF	Area	146.4	SF			
Total Impervious Area	11,367.0	SF	Area	568.4	SF			
Required Minimum Surface Area				714.7	SF			
Provided Surface Area				721.0	SF			

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

Landscaped Area	7,319.0	SF	Volume	244.0				
Impervious Area	11,367.0	SF	Volume	947.3				
CPV Required				1,191.2	CF	0.027	AF	
Provided CPV				1,241.0	CF	(Elevation 68.9 to 70.25)		

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 - "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load:	50 cubic feet per acre per year of sanded area							
Area to be sanded:	11,367.0	SF						
Sediment Volume	13.0	CF						
Provided	25.0	CF	12	Inch Deep Forebay		with area of	25.0	sf

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JOB	16078 - Acadia Lending		
SHEET NO.	3	OF	3
CALCULATED BY	MAM	DATE	4/4/2017
FILE NAME		PRNT DATE	4/4/2017

UNDERDRAINED SOIL FILTER 1

Task: Calculate water quality volume per MDEP chapter 500 regulations

References
1. Maine DEP Chapter 500, Section 4.B.(2)(b)
   a. "must detain a runoff volume equal to 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped area"
2. Maine DEP Best Management Practices Stormwater Manual, Section 7.1
   a. "surface should represent 5% of impervious area and 2% of landscaped area"

Tributary to Underdrained Soil Filter 2

Landscaped Area	3,738.0	SF		
Impervious Area	6,896.0	SF		

Minimum Surface Area

Required (2% X Landscaped + 5%" X Impervious)

Total Landscaped Area	3,738.0	SF	Area	74.8	SF
Total Impervious Area	6,896.0	SF	Area	344.8	SF
Required Minimum Surface Area				419.6	SF
Provided Surface Area				444.0	SF

Channel Protection Volume (CPV)

Required (0.4" X Landscaped + 1.0" X Impervious)

Landscaped Area	3,738.0	SF	Volume	124.6					
Impervious Area	6,896.0	SF	Volume	574.7					
CPV Required				650.0	CF	0.015	AF		
				must discharge in 24-48 hours					
Provided				650.0	CF				

Sediment Pre-Treatment

Per Reference 2, Chapter 7.13 - "Pretreatment devices shall be provided to minimize discharge of sediment to the soil filter"

Annual Sediment Load:	50 cubic feet per acre per year of sanded area						
Area to be sanded:	6896.0	SF					
Sediment Volume	7.9	CF					
Provided	14.5	CF	8	Inch Deep Forebay	with area of	22.0	sf

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JOB 16078 - Acadia Lending
SHEET NO. 2 OF 3
CALCULATED BY MAM DATE 3/2/2017
FILE NAME PRNT DATE 3/20/2017

ROOF DRIPLINE FILTER

References 2. Maine DEP Best Management Practices Stormwater Manual, Section 7.5

Note: Calculations based typical roof dripline filter provided along permiter of building.

WQV Calculation

(WQV = Water Quality Volume)

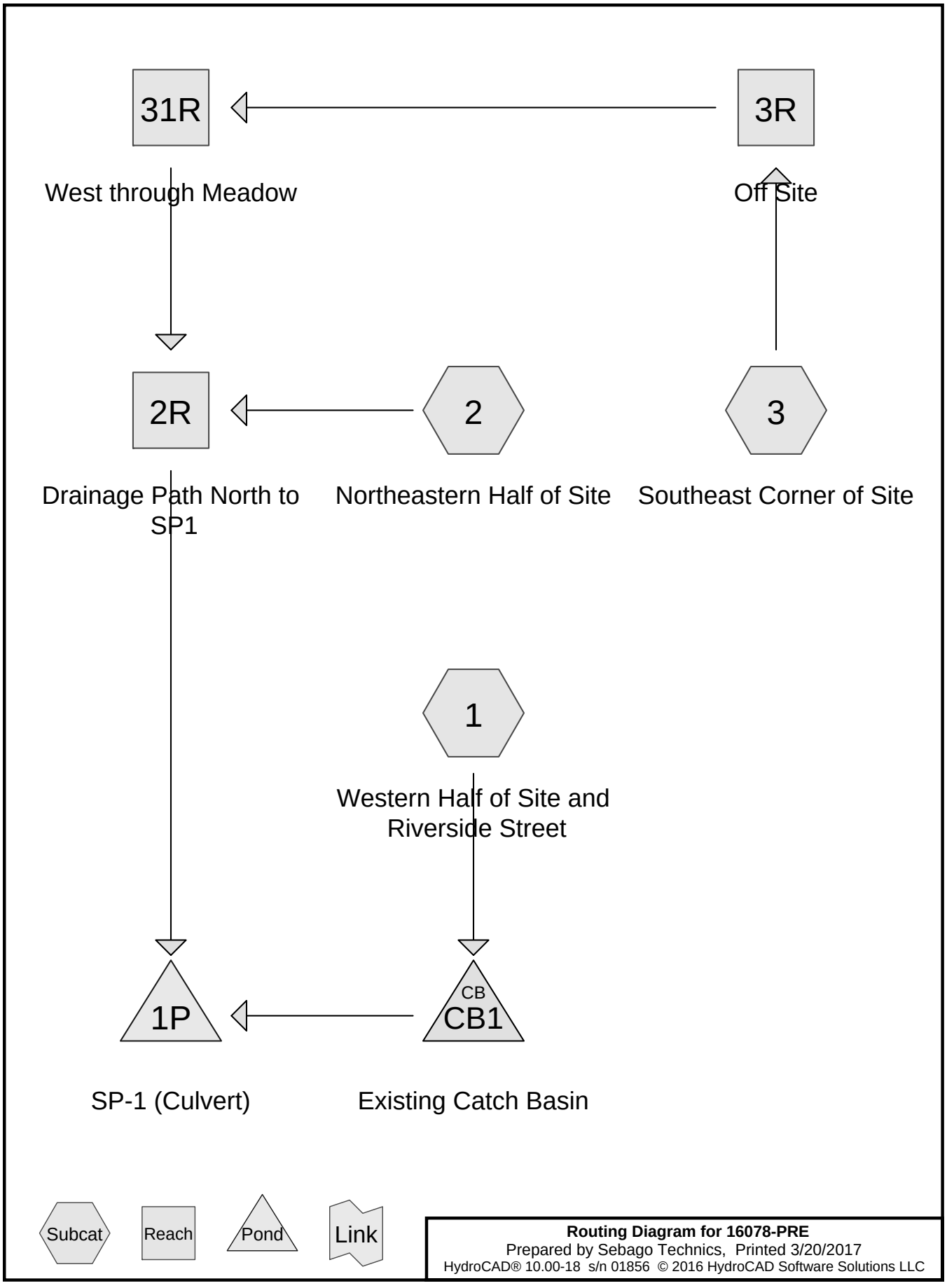
Total Impervious Area =	5,135.0	sf	*Building Area	
WQV (MDEP)= 1" x Impervious Area =		427.9	cf or	0.010 acre-ft
Length of Trench=		240.0	ft.	
Width of Crushed Stone Top=		3.0	ft.	
Depth of Stone		12.0	in.	40% porosity
Width of Choker Stone Layer=		2.0	ft.	
Depth of Stone		2.0	in.	40% porosity
Width of Crushed Stone Top=		2.0	ft.	
Depth of Sand Media=		12.0	in.	30% porosity

WQV Provided = Area of Trench * (Depth of stone*stone porosity + Depth of sand*sand porosity)

WQV Provided = Crushed Stone + Choker Stone + Sand Media **464.0** cf

Attachment B

Pre-Development Stormwater Modeling



Routing Diagram for 16078-PRE
Prepared by Sebago Technics, Printed 3/20/2017

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.902	78	Meadow, non-grazed, HSG D (1, 2, 3)
0.162	98	Paved roads w/curbs & sewers, HSG D (1)
0.304	77	Woods, Good, HSG D (2, 3)
1.368	**80**	**TOTAL AREA**

Summary for Subcatchment 1: Western Half of Site and Riverside Street

Runoff = 2.24 cfs @ 12.16 hrs, Volume= 0.193 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
18,762	78	Meadow, non-grazed, HSG D
7,036	98	Paved roads w/curbs & sewers, HSG D
25,798	83	Weighted Average
18,762		72.73% Pervious Area
7,036		27.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.1	45	0.0100	0.07		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
0.1	30	0.0500	3.60		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
1.1	130	0.0093	1.96		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
11.3	205	Total			

Summary for Subcatchment 2: Northeastern Half of Site

Runoff = 1.71 cfs @ 12.28 hrs, Volume= 0.182 af, Depth= 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
18,762	78	Meadow, non-grazed, HSG D
9,173	77	Woods, Good, HSG D
27,935	78	Weighted Average
27,935		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.3	65	0.0150	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.8	65	0.0150	0.61		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	60	0.0170	0.91		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
20.2	190	Total			

Summary for Subcatchment 3: Southeast Corner of Site

Runoff = 0.39 cfs @ 12.21 hrs, Volume= 0.037 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,750	78	Meadow, non-grazed, HSG D
4,086	77	Woods, Good, HSG D
5,836	77	Weighted Average
5,836		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	55	0.0100	0.08		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
2.9	90	0.0110	0.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
14.8	145	Total			

Summary for Reach 2R: Drainage Path North to SP1

Inflow Area = 0.775 ac, 0.00% Impervious, Inflow Depth = 3.39" for 25-YR event
Inflow = 1.99 cfs @ 12.30 hrs, Volume= 0.219 af
Outflow = 1.92 cfs @ 12.35 hrs, Volume= 0.219 af, Atten= 3%, Lag= 3.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.63 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 14.2 min

Peak Storage= 541 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 180.97 cfs

10.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 20.0 '/' Top Width= 50.00'
Length= 460.0' Slope= 0.0293 '/'
Inlet Invert= 71.50', Outlet Invert= 58.00'

‡

Summary for Reach 3R: Off Site

Inflow Area = 0.134 ac, 0.00% Impervious, Inflow Depth = 3.31" for 25-YR event
Inflow = 0.39 cfs @ 12.21 hrs, Volume= 0.037 af
Outflow = 0.37 cfs @ 12.27 hrs, Volume= 0.037 af, Atten= 7%, Lag= 3.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.60 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 14.5 min

Peak Storage= 121 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 94.97 cfs

10.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 50.00'
Length= 200.0' Slope= 0.0110 '/'
Inlet Invert= 74.00', Outlet Invert= 71.80'

‡

Summary for Reach 31R: West through Meadow

Inflow Area = 0.134 ac, 0.00% Impervious, Inflow Depth = 3.31" for 25-YR event
Inflow = 0.37 cfs @ 12.27 hrs, Volume= 0.037 af
Outflow = 0.31 cfs @ 12.39 hrs, Volume= 0.037 af, Atten= 15%, Lag= 7.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 10.5 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 29.1 min

Peak Storage= 196 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 40.64 cfs

8.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 200.0' Slope= 0.0010 '/'
Inlet Invert= 71.70', Outlet Invert= 71.50'

‡

Summary for Pond 1P: SP-1 (Culvert)

Inflow Area = 1.368 ac, 11.81% Impervious, Inflow Depth = 3.61" for 25-YR event
Inflow = 3.49 cfs @ 12.21 hrs, Volume= 0.412 af
Outflow = 3.38 cfs @ 12.29 hrs, Volume= 0.411 af, Atten= 3%, Lag= 4.6 min
Primary = 3.38 cfs @ 12.29 hrs, Volume= 0.411 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 58.77' @ 12.29 hrs Surf.Area= 1,639 sf Storage= 884 cf

Plug-Flow detention time= 8.9 min calculated for 0.411 af (100% of inflow)
Center-of-Mass det. time= 9.1 min (840.5 - 831.4)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	20,699 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	658	0	0
60.00	3,209	3,867	3,867
62.00	6,365	9,574	13,441
63.00	8,150	7,258	20,699

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**36.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.00' / 56.00' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=3.37 cfs @ 12.29 hrs HW=58.77' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.37 cfs @ 2.36 fps)

Summary for Pond CB1: Existing Catch Basin

Inflow Area = 0.592 ac, 27.27% Impervious, Inflow Depth = 3.91" for 25-YR event
Inflow = 2.24 cfs @ 12.16 hrs, Volume= 0.193 af
Outflow = 2.24 cfs @ 12.16 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min
Primary = 2.24 cfs @ 12.16 hrs, Volume= 0.193 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 65.90' @ 12.16 hrs
Flood Elev= 70.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.05'	**12.0" Round Stormdrain** L= 230.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.05' / 61.00' S= 0.0176 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.22 cfs @ 12.16 hrs HW=65.90' TW=58.69' (Dynamic Tailwater)
└**1=Stormdrain** (Inlet Controls 2.22 cfs @ 3.13 fps)

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

Subcatchment 1: Western Half of Site and Runoff Area=25,798 sf 27.27% Impervious Runoff Depth=1.53"
Flow Length=205' Tc=11.3 min CN=83 Runoff=0.88 cfs 0.075 af

Subcatchment 2: Northeastern Half of Site Runoff Area=27,935 sf 0.00% Impervious Runoff Depth=1.20"
Flow Length=190' Tc=20.2 min CN=78 Runoff=0.59 cfs 0.064 af

Subcatchment 3: Southeast Corner of Site Runoff Area=5,836 sf 0.00% Impervious Runoff Depth=1.14"
Flow Length=145' Tc=14.8 min CN=77 Runoff=0.13 cfs 0.013 af

Reach 2R: Drainage Path North to SP1 Avg. Flow Depth=0.05' Max Vel=1.09 fps Inflow=0.64 cfs 0.077 af
n=0.030 L=460.0' S=0.0293 '/' Capacity=180.97 cfs Outflow=0.60 cfs 0.077 af

Reach 3R: Off Site Avg. Flow Depth=0.03' Max Vel=0.39 fps Inflow=0.13 cfs 0.013 af
n=0.035 L=200.0' S=0.0110 '/' Capacity=94.97 cfs Outflow=0.11 cfs 0.013 af

Reach 31R: West through Meadow Avg. Flow Depth=0.05' Max Vel=0.19 fps Inflow=0.11 cfs 0.013 af
n=0.035 L=200.0' S=0.0010 '/' Capacity=40.64 cfs Outflow=0.08 cfs 0.013 af

Pond 1P: SP-1 (Culvert) Peak Elev=58.44' Storage=410 cf Inflow=1.19 cfs 0.152 af
36.0" Round Culvert n=0.025 L=100.0' S=0.0200 '/' Outflow=1.13 cfs 0.152 af

Pond CB1: Existing Catch Basin Peak Elev=65.53' Inflow=0.88 cfs 0.075 af
12.0" Round Culvert n=0.013 L=230.0' S=0.0176 '/' Outflow=0.88 cfs 0.075 af

Total Runoff Area = 1.368 ac Runoff Volume = 0.152 af Average Runoff Depth = 1.34"
88.19% Pervious = 1.206 ac 11.81% Impervious = 0.162 ac

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

Subcatchment 1: Western Half of Site and Runoff Area=25,798 sf 27.27% Impervious Runoff Depth=2.81"
Flow Length=205' Tc=11.3 min CN=83 Runoff=1.63 cfs 0.139 af

Subcatchment 2: Northeastern Half of Site Runoff Area=27,935 sf 0.00% Impervious Runoff Depth=2.38"
Flow Length=190' Tc=20.2 min CN=78 Runoff=1.19 cfs 0.127 af

Subcatchment 3: Southeast Corner of Site Runoff Area=5,836 sf 0.00% Impervious Runoff Depth=2.29"
Flow Length=145' Tc=14.8 min CN=77 Runoff=0.27 cfs 0.026 af

Reach 2R: Drainage Path North to SP1 Avg. Flow Depth=0.08' Max Vel=1.43 fps Inflow=1.36 cfs 0.153 af
n=0.030 L=460.0' S=0.0293 '/' Capacity=180.97 cfs Outflow=1.30 cfs 0.153 af

Reach 3R: Off Site Avg. Flow Depth=0.04' Max Vel=0.52 fps Inflow=0.27 cfs 0.026 af
n=0.035 L=200.0' S=0.0110 '/' Capacity=94.97 cfs Outflow=0.25 cfs 0.026 af

Reach 31R: West through Meadow Avg. Flow Depth=0.09' Max Vel=0.27 fps Inflow=0.25 cfs 0.026 af
n=0.035 L=200.0' S=0.0010 '/' Capacity=40.64 cfs Outflow=0.20 cfs 0.026 af

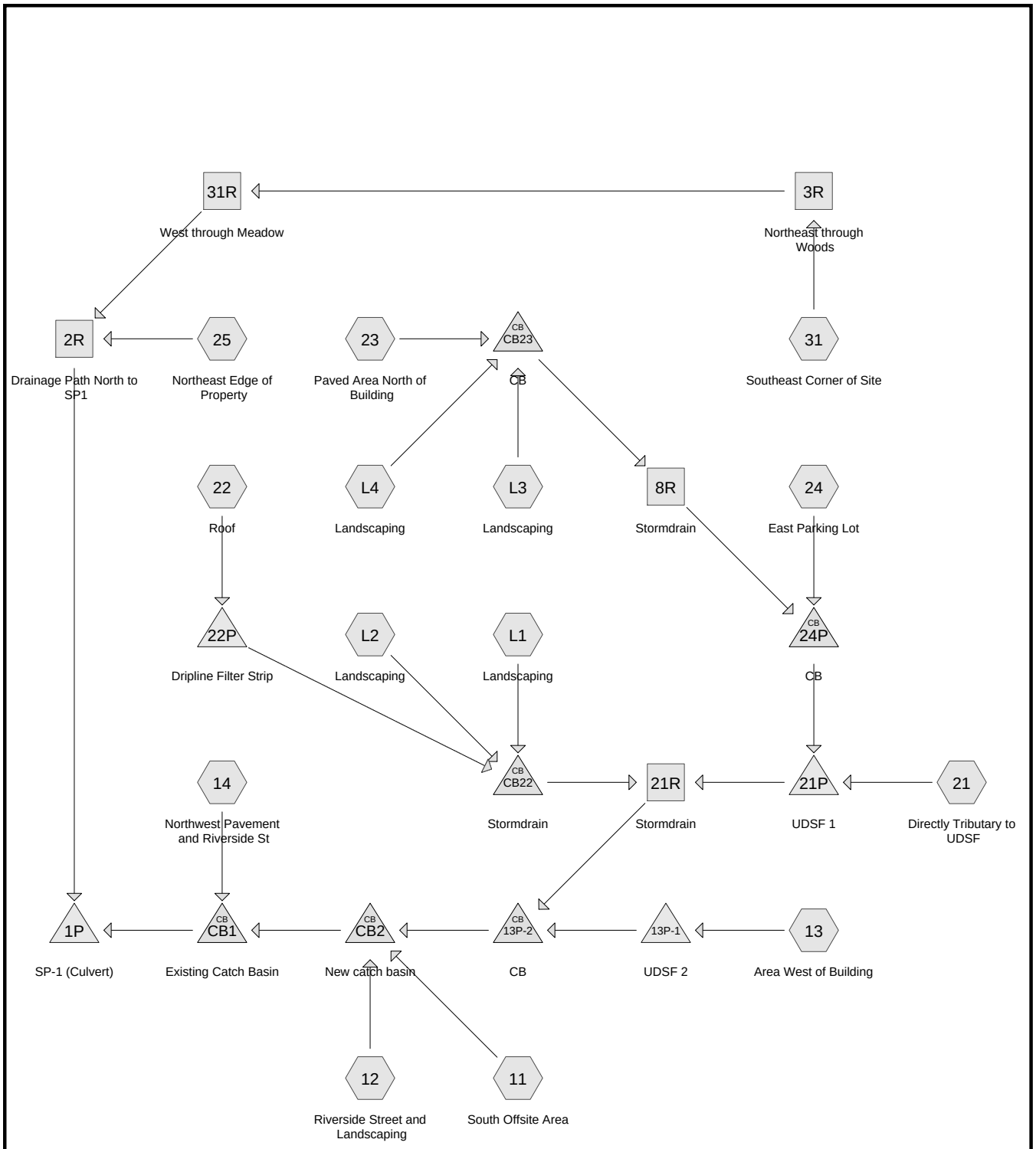
Pond 1P: SP-1 (Culvert) Peak Elev=58.64' Storage=675 cf Inflow=2.43 cfs 0.291 af
36.0" Round Culvert n=0.025 L=100.0' S=0.0200 '/' Outflow=2.34 cfs 0.291 af

Pond CB1: Existing Catch Basin Peak Elev=65.74' Inflow=1.63 cfs 0.139 af
12.0" Round Culvert n=0.013 L=230.0' S=0.0176 '/' Outflow=1.63 cfs 0.139 af

Total Runoff Area = 1.368 ac Runoff Volume = 0.291 af Average Runoff Depth = 2.56"
88.19% Pervious = 1.206 ac 11.81% Impervious = 0.162 ac

Attachment C

Post-Development Stormwater Modeling



Routing Diagram for 16078-POST
Prepared by Sebago Technics, Printed 4/4/2017

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.360	80	>75% Grass cover, Good, HSG D (11, 12, 13, 14, 21, 23, 24, 25, 31, L1, L2, L3, L4)
0.018	96	Crushed Stone (22)
0.168	78	Meadow, non-grazed, HSG D (11, 12, 21, 31)
0.468	98	Paved parking, HSG D (11, 13, 14, 21, 23, 24)
0.134	98	Paved roads w/curbs & sewers, HSG D (12)
0.122	98	Roofs, HSG D (13, 21, 22, L1, L2)
0.100	77	Woods, Good, HSG D (21, 24, 25, 31)
1.368	**89**	**TOTAL AREA**

Summary for Subcatchment 11: South Offsite Area

Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
401	98	Paved parking, HSG D
188	80	>75% Grass cover, Good, HSG D
4,201	78	Meadow, non-grazed, HSG D
4,790	80	Weighted Average
4,389		91.63% Pervious Area
401		8.37% Impervious Area

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

Summary for Subcatchment 12: Riverside Street and Landscaping

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 5.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
5,821	98	Paved roads w/curbs & sewers, HSG D
480	80	>75% Grass cover, Good, HSG D
627	78	Meadow, non-grazed, HSG D
6,928	95	Weighted Average
1,107		15.98% Pervious Area
5,821		84.02% Impervious Area

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

Summary for Subcatchment 13: Area West of Building

Runoff = 1.28 cfs @ 12.09 hrs, Volume= 0.099 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
6,866	98	Paved parking, HSG D
3,738	80	>75% Grass cover, Good, HSG D
30	98	Roofs, HSG D
10,634	92	Weighted Average
3,738		35.15% Pervious Area
6,896		64.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment 14: Northwest Pavement and Riverside St

Runoff = 0.26 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 5.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,839	98	Paved parking, HSG D
225	80	>75% Grass cover, Good, HSG D
2,064	96	Weighted Average
225		10.90% Pervious Area
1,839		89.10% Impervious Area

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

Summary for Subcatchment 21: Directly Tributary to UDSF

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 0.035 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
4,094	80	>75% Grass cover, Good, HSG D
40	98	Paved parking, HSG D
30	98	Roofs, HSG D
45	77	Woods, Good, HSG D
890	78	Meadow, non-grazed, HSG D
5,099	80	Weighted Average
5,029		98.63% Pervious Area
70		1.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment 22: Roof

Runoff = 0.75 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

	Area (sf)	CN	Description
	5,132	98	Roofs, HSG D
*	769	96	Crushed Stone
	5,901	98	Weighted Average
	769		13.03% Pervious Area
	5,132		86.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment 23: Paved Area North of Building

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,769	98	Paved parking, HSG D
900	80	>75% Grass cover, Good, HSG D
2,669	92	Weighted Average
900		33.72% Pervious Area
1,769		66.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment 24: East Parking Lot

Runoff = 1.48 cfs @ 12.09 hrs, Volume= 0.117 af, Depth= 5.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
2,117	80	>75% Grass cover, Good, HSG D
9,459	98	Paved parking, HSG D
438	77	Woods, Good, HSG D
12,014	94	Weighted Average
2,555		21.27% Pervious Area
9,459		78.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment 25: Northeast Edge of Property

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.024 af, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
2,968	80	>75% Grass cover, Good, HSG D
667	77	Woods, Good, HSG D
3,635	79	Weighted Average
3,635		100.00% Pervious Area

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

Summary for Subcatchment 31: Southeast Corner of Site

Runoff = 0.33 cfs @ 12.21 hrs, Volume= 0.031 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,581	78	Meadow, non-grazed, HSG D
3,207	77	Woods, Good, HSG D
166	80	>75% Grass cover, Good, HSG D
4,954	77	Weighted Average
4,954		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	55	0.0090	0.07		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.10"
2.9	90	0.0110	0.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.3	145	Total			

Summary for Subcatchment L1: Landscaping

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
60	98	Roofs, HSG D
224	80	>75% Grass cover, Good, HSG D
284	84	Weighted Average
224		78.87% Pervious Area
60		21.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment L2: Landscaping

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
60	98	Roofs, HSG D
259	80	>75% Grass cover, Good, HSG D
319	83	Weighted Average
259		81.19% Pervious Area
60		18.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment L3: Landscaping

Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.001 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
162	80	>75% Grass cover, Good, HSG D
162		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Subcatchment L4: Landscaping

Runoff = 0.01 cfs @ 12.09 hrs, Volume= 0.001 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
148	80	>75% Grass cover, Good, HSG D
148		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC Time < 6 mins**

Summary for Reach 2R: Drainage Path North to SP1

Inflow Area = 0.197 ac, 0.00% Impervious, Inflow Depth = 3.39" for 25-YR event
Inflow = 0.42 cfs @ 12.10 hrs, Volume= 0.056 af
Outflow = 0.37 cfs @ 12.40 hrs, Volume= 0.056 af, Atten= 11%, Lag= 17.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.92 fps, Min. Travel Time= 8.4 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 18.2 min

Peak Storage= 186 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 180.97 cfs

10.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 20.0 '/' Top Width= 50.00'
Length= 460.0' Slope= 0.0293 '/'
Inlet Invert= 71.50', Outlet Invert= 58.00'

‡

Summary for Reach 3R: Northeast through Woods

Inflow Area = 0.114 ac, 0.00% Impervious, Inflow Depth = 3.31" for 25-YR event
Inflow = 0.33 cfs @ 12.21 hrs, Volume= 0.031 af
Outflow = 0.30 cfs @ 12.28 hrs, Volume= 0.031 af, Atten= 8%, Lag= 4.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.56 fps, Min. Travel Time= 5.9 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 14.8 min

Peak Storage= 107 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 94.97 cfs

10.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 20.0 '/' Top Width= 50.00'
Length= 200.0' Slope= 0.0110 '/'
Inlet Invert= 74.00', Outlet Invert= 71.80'

‡

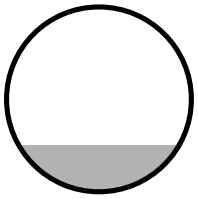
Summary for Reach 8R: Stormdrain

Inflow Area = 0.068 ac, 59.38% Impervious, Inflow Depth = 4.74" for 25-YR event
Inflow = 0.35 cfs @ 12.09 hrs, Volume= 0.027 af
Outflow = 0.35 cfs @ 12.10 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 2.27 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 1.9 min

Peak Storage= 13 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.53 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 85.0' Slope= 0.0051 '/'
Inlet Invert= 71.09', Outlet Invert= 70.66'



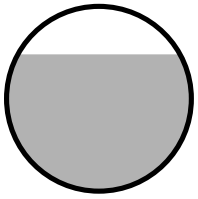
Summary for Reach 21R: Stormdrain

Inflow Area = 0.611 ac, 62.23% Impervious, Inflow Depth = 4.80" for 25-YR event
Inflow = 2.10 cfs @ 12.21 hrs, Volume= 0.244 af
Outflow = 2.04 cfs @ 12.22 hrs, Volume= 0.244 af, Atten= 3%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 3.24 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 1.2 min

Peak Storage= 45 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.26 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 72.0' Slope= 0.0040 '/'
Inlet Invert= 66.24', Outlet Invert= 65.95'



Summary for Reach 31R: West through Meadow

Inflow Area = 0.114 ac, 0.00% Impervious, Inflow Depth = 3.31" for 25-YR event
Inflow = 0.30 cfs @ 12.28 hrs, Volume= 0.031 af
Outflow = 0.26 cfs @ 12.41 hrs, Volume= 0.031 af, Atten= 15%, Lag= 7.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 0.30 fps, Min. Travel Time= 11.3 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 29.8 min

Peak Storage= 174 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 40.64 cfs

8.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 200.0' Slope= 0.0010 '/'
Inlet Invert= 71.70', Outlet Invert= 71.50'

‡

Summary for Pond 1P: SP-1 (Culvert)

Inflow Area = 1.368 ac, 52.86% Impervious, Inflow Depth = 4.58" for 25-YR event
Inflow = 3.62 cfs @ 12.22 hrs, Volume= 0.522 af
Outflow = 3.28 cfs @ 12.27 hrs, Volume= 0.522 af, Atten= 9%, Lag= 3.1 min
Primary = 3.28 cfs @ 12.27 hrs, Volume= 0.522 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 58.76' @ 12.27 hrs Surf.Area= 1,624 sf Storage= 864 cf

Plug-Flow detention time= 9.7 min calculated for 0.522 af (100% of inflow)
Center-of-Mass det. time= 9.1 min (833.8 - 824.7)

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	20,699 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	658	0	0
60.00	3,209	3,867	3,867
62.00	6,365	9,574	13,441
63.00	8,150	7,258	20,699

Device	Routing	Invert	Outlet Devices
#1	Primary	58.00'	**36.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 58.00' / 56.00' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=3.22 cfs @ 12.27 hrs HW=58.75' (Free Discharge)
1=Culvert (Inlet Controls 3.22 cfs @ 2.33 fps)

Summary for Pond 13P-1: UDSF 2

Inflow Area = 0.244 ac, 64.85% Impervious, Inflow Depth = 4.87" for 25-YR event
Inflow = 1.28 cfs @ 12.09 hrs, Volume= 0.099 af
Outflow = 0.63 cfs @ 12.27 hrs, Volume= 0.099 af, Atten= 51%, Lag= 11.0 min
Primary = 0.63 cfs @ 12.27 hrs, Volume= 0.099 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 72.07' @ 12.27 hrs Surf.Area= 1,118 sf Storage= 1,139 cf
Flood Elev= 72.50' Surf.Area= 1,228 sf Storage= 1,648 cf

Plug-Flow detention time= 39.6 min calculated for 0.099 af (100% of inflow)
Center-of-Mass det. time= 38.4 min (816.6 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1	68.82'	1,648 cf	**CPV (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.82	444	0.0	0	0
68.83	444	30.0	1	1
70.99	444	30.0	288	289
71.00	444	100.0	4	293
72.00	1,101	100.0	773	1,066
72.50	1,228	100.0	582	1,648

WQV= 1,066-293=773 CF

Device	Routing	Invert	Outlet Devices
#1	Primary	68.50'	**2.0" Vert. Orifice** C= 0.600
#2	Device 1	68.84'	**4.0" Round Underdrain** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.84' / 68.50' S= 0.0340 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#3	Primary	72.00'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.59 cfs @ 12.27 hrs HW=72.06' TW=67.17' (Dynamic Tailwater)
└─**1=Orifice** (Orifice Controls 0.20 cfs @ 8.98 fps)
└─**2=Underdrain** (Passes 0.20 cfs of 0.58 cfs potential flow)
└─**3=Grate** (Weir Controls 0.39 cfs @ 0.81 fps)

Summary for Pond 13P-2: CB

Inflow Area = 0.855 ac, 62.98% Impervious, Inflow Depth = 4.82" for 25-YR event
Inflow = 2.37 cfs @ 12.23 hrs, Volume= 0.343 af
Outflow = 2.37 cfs @ 12.23 hrs, Volume= 0.343 af, Atten= 0%, Lag= 0.0 min
Primary = 2.37 cfs @ 12.23 hrs, Volume= 0.343 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 67.30' @ 12.24 hrs
Flood Elev= 73.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.92'	**12.0" Round Stormdrain** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.92' / 65.75' S= 0.0068 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.13 cfs @ 12.23 hrs HW=67.23' TW=66.91' (Dynamic Tailwater)
└─**1=Stormdrain** (Inlet Controls 2.13 cfs @ 2.72 fps)

Summary for Pond 21P: UDSF 1

Inflow Area = 0.461 ac, 56.23% Impervious, Inflow Depth = 4.67" for 25-YR event
Inflow = 2.32 cfs @ 12.09 hrs, Volume= 0.179 af
Outflow = 1.58 cfs @ 12.21 hrs, Volume= 0.179 af, Atten= 32%, Lag= 7.1 min
Primary = 1.58 cfs @ 12.21 hrs, Volume= 0.179 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 70.38' @ 12.21 hrs Surf.Area= 1,275 sf Storage= 1,885 cf
Flood Elev= 71.00' Surf.Area= 1,494 sf Storage= 2,738 cf

Plug-Flow detention time= 40.7 min calculated for 0.179 af (100% of inflow)
Center-of-Mass det. time= 40.6 min (821.0 - 780.4)

Volume	Invert	Avail.Storage	Storage Description
#1	66.82'	6,512 cf	**CPV (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.82	721	0.0	0	0
66.83	721	30.0	2	2
68.99	721	30.0	467	469
69.00	746	100.0	7	477
70.00	1,143	100.0	945	1,421
70.25	1,228	100.0	296	1,718
71.00	1,494	100.0	1,021	2,738
72.00	1,878	100.0	1,686	4,424
73.00	2,297	100.0	2,088	6,512

WQV=1,718-477=1,241 CF

Device	Routing	Invert	Outlet Devices
#1	Primary	66.56'	**12.0" Round Stormdrain** L= 64.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.56' / 66.30' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	66.70'	**2.5" Vert. Orifice** C= 0.600
#3	Device 2	66.83'	**4.0" Round Underdrain** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 66.83' / 66.60' S= 0.0230 '/' Cc= 0.900 n= 0.013, Flow Area= 0.09 sf
#4	Device 1	70.25'	**2.0" x 2.0" Horiz. Grate X 6.00 columns** X 6 rows C= 0.600 in 24.0" x 24.0" Grate (25% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.51 cfs @ 12.21 hrs HW=70.38' TW=66.95' (Dynamic Tailwater)
└─**1=Stormdrain** (Passes 1.51 cfs of 5.90 cfs potential flow)
  ├─**2=Orifice** (Orifice Controls 0.30 cfs @ 8.91 fps)
  │ └─**3=Underdrain** (Passes 0.30 cfs of 0.61 cfs potential flow)
  └─**4=Grate** (Weir Controls 1.21 cfs @ 1.17 fps)

Summary for Pond 22P: Dripline Filter Strip

Inflow Area = 0.135 ac, 86.97% Impervious, Inflow Depth = 5.56" for 25-YR event
Inflow = 0.75 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.49 cfs @ 12.21 hrs, Volume= 0.060 af, Atten= 35%, Lag= 7.5 min
Primary = 0.04 cfs @ 10.65 hrs, Volume= 0.051 af
Secondary = 0.45 cfs @ 12.21 hrs, Volume= 0.010 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 76.01' @ 12.20 hrs Surf.Area= 700 sf Storage= 910 cf

Plug-Flow detention time= 190.8 min calculated for 0.060 af (96% of inflow)
Center-of-Mass det. time= 167.7 min (913.4 - 745.7)

Volume	Invert	Avail.Storage	Storage Description
#1	72.50'	910 cf	**Dripline Storage (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.50	700	0.0	0	0
73.50	700	30.0	210	210
74.50	700	40.0	280	490
76.00	700	40.0	420	910

Device	Routing	Invert	Outlet Devices
#1	Primary	73.00'	**4.0" Round Underdrain** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 73.00' / 72.34' S= 0.0330 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#2	Device 1	72.50'	**2.400 in/hr Filtration through Media over Surface area**
#3	Secondary	76.00'	**300.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.04 cfs @ 10.65 hrs HW=73.17' TW=72.10' (Dynamic Tailwater)
└─**1=Underdrain** (Passes 0.04 cfs of 0.06 cfs potential flow)
└─**2=Filtration through Media** (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=0.40 cfs @ 12.21 hrs HW=76.01' TW=72.36' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.40 cfs @ 0.19 fps)

Summary for Pond 24P: CB

Inflow Area = 0.344 ac, 74.89% Impervious, Inflow Depth = 5.03" for 25-YR event
Inflow = 1.83 cfs @ 12.09 hrs, Volume= 0.144 af
Outflow = 1.83 cfs @ 12.09 hrs, Volume= 0.144 af, Atten= 0%, Lag= 0.0 min
Primary = 1.83 cfs @ 12.09 hrs, Volume= 0.144 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 71.45' @ 12.09 hrs
Flood Elev= 73.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.56'	**12.0" Round Culvert** L= 65.0' Ke= 0.500 Inlet / Outlet Invert= 70.56' / 70.25' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.79 cfs @ 12.09 hrs HW=71.44' TW=70.05' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.79 cfs @ 3.27 fps)

Summary for Pond CB1: Existing Catch Basin

Inflow Area = 1.171 ac, 61.76% Impervious, Inflow Depth = 4.78" for 25-YR event
Inflow = 3.27 cfs @ 12.22 hrs, Volume= 0.466 af
Outflow = 3.27 cfs @ 12.22 hrs, Volume= 0.466 af, Atten= 0%, Lag= 0.0 min
Primary = 3.27 cfs @ 12.22 hrs, Volume= 0.466 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 66.29' @ 12.22 hrs
Flood Elev= 70.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.05'	**12.0" Round Stormdrain** L= 230.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.05' / 61.00' S= 0.0176 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.16 cfs @ 12.22 hrs HW=66.25' TW=58.72' (Dynamic Tailwater)
└**1=Stormdrain** (Inlet Controls 3.16 cfs @ 4.02 fps)

Summary for Pond CB2: New catch basin

Inflow Area = 1.124 ac, 60.61% Impervious, Inflow Depth = 4.76" for 25-YR event
Inflow = 3.14 cfs @ 12.22 hrs, Volume= 0.445 af
Outflow = 3.14 cfs @ 12.22 hrs, Volume= 0.445 af, Atten= 0%, Lag= 0.0 min
Primary = 3.14 cfs @ 12.22 hrs, Volume= 0.445 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 67.01' @ 12.21 hrs
Flood Elev= 71.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	65.61'	**12.0" Round Stormdrain** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 65.61' / 65.15' S= 0.0092 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.04 cfs @ 12.22 hrs HW=66.94' TW=66.25' (Dynamic Tailwater)
└**1=Stormdrain** (Outlet Controls 3.04 cfs @ 3.87 fps)

Summary for Pond CB22: Stormdrain

Inflow Area = 0.149 ac, 80.75% Impervious, Inflow Depth = 5.22" for 25-YR event
Inflow = 0.53 cfs @ 12.21 hrs, Volume= 0.065 af
Outflow = 0.53 cfs @ 12.21 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min
Primary = 0.53 cfs @ 12.21 hrs, Volume= 0.065 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 72.39' @ 12.21 hrs
Flood Elev= 75.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	72.00'	**10.0" Round Stormdrain** L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 72.00' / 66.65' S= 0.1783 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=0.47 cfs @ 12.21 hrs HW=72.37' TW=66.95' (Dynamic Tailwater)
↑—**1=Stormdrain** (Inlet Controls 0.47 cfs @ 2.06 fps)

Summary for Pond CB23: CB

Inflow Area = 0.068 ac, 59.38% Impervious, Inflow Depth = 4.74" for 25-YR event
Inflow = 0.35 cfs @ 12.09 hrs, Volume= 0.027 af
Outflow = 0.35 cfs @ 12.09 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.09 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 71.94' @ 12.09 hrs
Flood Elev= 74.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.60'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 71.60' / 71.19' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.09 hrs HW=71.94' TW=71.34' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.34 cfs @ 2.20 fps)

Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points x 2
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 11: South Offsite Area Runoff Area=4,790 sf 8.37% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=0.17 cfs 0.012 af

Subcatchment 12: Riverside Street and Runoff Area=6,928 sf 84.02% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=95 Runoff=0.44 cfs 0.034 af

Subcatchment 13: Area West of Building Runoff Area=10,634 sf 64.85% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=92 Runoff=0.62 cfs 0.046 af

Subcatchment 14: Northwest Pavement and Runoff Area=2,064 sf 89.10% Impervious Runoff Depth=2.65"
Tc=6.0 min CN=96 Runoff=0.13 cfs 0.010 af

Subcatchment 21: Directly Tributary to UDSF Runoff Area=5,099 sf 1.37% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=0.18 cfs 0.013 af

Subcatchment 22: Roof Runoff Area=5,901 sf 86.97% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=98 Runoff=0.40 cfs 0.032 af

Subcatchment 23: Paved Area North of Runoff Area=2,669 sf 66.28% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=92 Runoff=0.16 cfs 0.012 af

Subcatchment 24: East Parking Lot Runoff Area=12,014 sf 78.73% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=0.74 cfs 0.056 af

Subcatchment 25: Northeast Edge of Runoff Area=3,635 sf 0.00% Impervious Runoff Depth=1.26"
Tc=6.0 min CN=79 Runoff=0.12 cfs 0.009 af

Subcatchment 31: Southeast Corner of Site Runoff Area=4,954 sf 0.00% Impervious Runoff Depth=1.14"
Flow Length=145' Tc=15.3 min CN=77 Runoff=0.11 cfs 0.011 af

Subcatchment L1: Landscaping Runoff Area=284 sf 21.13% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=84 Runoff=0.01 cfs 0.001 af

Subcatchment L2: Landscaping Runoff Area=319 sf 18.81% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=83 Runoff=0.01 cfs 0.001 af

Subcatchment L3: Landscaping Runoff Area=162 sf 0.00% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=0.01 cfs 0.000 af

Subcatchment L4: Landscaping Runoff Area=148 sf 0.00% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=0.01 cfs 0.000 af

Reach 2R: Drainage Path North to SP1 Avg. Flow Depth=0.02' Max Vel=0.56 fps Inflow=0.13 cfs 0.020 af
n=0.030 L=460.0' S=0.0293 '/' Capacity=180.97 cfs Outflow=0.10 cfs 0.020 af

Reach 3R: Northeast through Woods Avg. Flow Depth=0.02' Max Vel=0.37 fps Inflow=0.11 cfs 0.011 af
n=0.035 L=200.0' S=0.0110 '/' Capacity=94.97 cfs Outflow=0.09 cfs 0.011 af

Reach 8R: Stormdrain Avg. Flow Depth=0.17' Max Vel=1.82 fps Inflow=0.17 cfs 0.012 af
12.0" Round Pipe n=0.013 L=85.0' S=0.0051 '/' Capacity=2.53 cfs Outflow=0.17 cfs 0.012 af

Reach 21R: Stormdrain Avg. Flow Depth=0.25' Max Vel=2.04 fps Inflow=0.32 cfs 0.113 af
12.0" Round Pipe n=0.013 L=72.0' S=0.0040 '/' Capacity=2.26 cfs Outflow=0.32 cfs 0.113 af

Reach 31R: West through Meadow Avg. Flow Depth=0.05' Max Vel=0.18 fps Inflow=0.09 cfs 0.011 af
n=0.035 L=200.0' S=0.0010 '/' Capacity=40.64 cfs Outflow=0.07 cfs 0.011 af

Pond 1P: SP-1 (Culvert) Peak Elev=58.44' Storage=409 cf Inflow=1.27 cfs 0.235 af
36.0" Round Culvert n=0.025 L=100.0' S=0.0200 '/' Outflow=1.13 cfs 0.235 af

Pond 13P-1: UDSF 2 Peak Elev=71.35' Storage=488 cf Inflow=0.62 cfs 0.046 af
Outflow=0.17 cfs 0.046 af

Pond 13P-2: CB Peak Elev=66.36' Inflow=0.49 cfs 0.159 af
12.0" Round Culvert n=0.013 L=25.0' S=0.0068 '/' Outflow=0.49 cfs 0.159 af

Pond 21P: UDSF 1 Peak Elev=69.56' Storage=955 cf Inflow=1.08 cfs 0.081 af
Outflow=0.27 cfs 0.081 af

Pond 22P: Dripline Filter Strip Peak Elev=74.92' Storage=607 cf Inflow=0.40 cfs 0.032 af
Primary=0.04 cfs 0.030 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.030 af

Pond 24P: CB Peak Elev=71.14' Inflow=0.91 cfs 0.069 af
12.0" Round Culvert n=0.013 L=65.0' S=0.0048 '/' Outflow=0.91 cfs 0.069 af

Pond CB1: Existing Catch Basin Peak Elev=65.63' Inflow=1.21 cfs 0.215 af
12.0" Round Culvert n=0.013 L=230.0' S=0.0176 '/' Outflow=1.21 cfs 0.215 af

Pond CB2: New catch basin Peak Elev=66.19' Inflow=1.08 cfs 0.205 af
12.0" Round Culvert n=0.013 L=50.0' S=0.0092 '/' Outflow=1.08 cfs 0.205 af

Pond CB22: Stormdrain Peak Elev=72.13' Inflow=0.06 cfs 0.032 af
10.0" Round Culvert n=0.013 L=30.0' S=0.1783 '/' Outflow=0.06 cfs 0.032 af

Pond CB23: CB Peak Elev=71.83' Inflow=0.17 cfs 0.012 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0051 '/' Outflow=0.17 cfs 0.012 af

Total Runoff Area = 1.368 ac Runoff Volume = 0.237 af Average Runoff Depth = 2.08"
47.14% Pervious = 0.645 ac 52.86% Impervious = 0.723 ac

Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points x 2
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 11: South Offsite Area Runoff Area=4,790 sf 8.37% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=80 Runoff=0.32 cfs 0.023 af

Subcatchment 12: Riverside Street and Runoff Area=6,928 sf 84.02% Impervious Runoff Depth=4.02"
Tc=6.0 min CN=95 Runoff=0.68 cfs 0.053 af

Subcatchment 13: Area West of Building Runoff Area=10,634 sf 64.85% Impervious Runoff Depth=3.70"
Tc=6.0 min CN=92 Runoff=0.99 cfs 0.075 af

Subcatchment 14: Northwest Pavement and Runoff Area=2,064 sf 89.10% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=96 Runoff=0.20 cfs 0.016 af

Subcatchment 21: Directly Tributary to UDSF Runoff Area=5,099 sf 1.37% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=80 Runoff=0.34 cfs 0.025 af

Subcatchment 22: Roof Runoff Area=5,901 sf 86.97% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=98 Runoff=0.59 cfs 0.049 af

Subcatchment 23: Paved Area North of Runoff Area=2,669 sf 66.28% Impervious Runoff Depth=3.70"
Tc=6.0 min CN=92 Runoff=0.25 cfs 0.019 af

Subcatchment 24: East Parking Lot Runoff Area=12,014 sf 78.73% Impervious Runoff Depth=3.91"
Tc=6.0 min CN=94 Runoff=1.16 cfs 0.090 af

Subcatchment 25: Northeast Edge of Runoff Area=3,635 sf 0.00% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=79 Runoff=0.24 cfs 0.017 af

Subcatchment 31: Southeast Corner of Site Runoff Area=4,954 sf 0.00% Impervious Runoff Depth=2.29"
Flow Length=145' Tc=15.3 min CN=77 Runoff=0.23 cfs 0.022 af

Subcatchment L1: Landscaping Runoff Area=284 sf 21.13% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=84 Runoff=0.02 cfs 0.002 af

Subcatchment L2: Landscaping Runoff Area=319 sf 18.81% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=83 Runoff=0.02 cfs 0.002 af

Subcatchment L3: Landscaping Runoff Area=162 sf 0.00% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=80 Runoff=0.01 cfs 0.001 af

Subcatchment L4: Landscaping Runoff Area=148 sf 0.00% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=80 Runoff=0.01 cfs 0.001 af

Reach 2R: Drainage Path North to SP1 Avg. Flow Depth=0.03' Max Vel=0.78 fps Inflow=0.28 cfs 0.039 af
n=0.030 L=460.0' S=0.0293 '/' Capacity=180.97 cfs Outflow=0.24 cfs 0.039 af

Reach 3R: Northeast through Woods Avg. Flow Depth=0.04' Max Vel=0.49 fps Inflow=0.23 cfs 0.022 af
n=0.035 L=200.0' S=0.0110 '/' Capacity=94.97 cfs Outflow=0.21 cfs 0.022 af

Reach 8R: Stormdrain Avg. Flow Depth=0.22' Max Vel=2.10 fps Inflow=0.27 cfs 0.020 af
12.0" Round Pipe n=0.013 L=85.0' S=0.0051 '/' Capacity=2.53 cfs Outflow=0.27 cfs 0.020 af

Reach 21R: Stormdrain Avg. Flow Depth=0.36' Max Vel=2.44 fps Inflow=0.62 cfs 0.185 af
12.0" Round Pipe n=0.013 L=72.0' S=0.0040 '/' Capacity=2.26 cfs Outflow=0.62 cfs 0.185 af

Reach 31R: West through Meadow Avg. Flow Depth=0.08' Max Vel=0.25 fps Inflow=0.21 cfs 0.022 af
n=0.035 L=200.0' S=0.0010 '/' Capacity=40.64 cfs Outflow=0.17 cfs 0.022 af

Pond 1P: SP-1 (Culvert) Peak Elev=58.54' Storage=543 cf Inflow=1.90 cfs 0.392 af
36.0" Round Culvert n=0.025 L=100.0' S=0.0200 '/' Outflow=1.72 cfs 0.392 af

Pond 13P-1: UDSF 2 Peak Elev=71.92' Storage=977 cf Inflow=0.99 cfs 0.075 af
Outflow=0.19 cfs 0.075 af

Pond 13P-2: CB Peak Elev=66.47' Inflow=0.81 cfs 0.260 af
12.0" Round Culvert n=0.013 L=25.0' S=0.0068 '/' Outflow=0.81 cfs 0.260 af

Pond 21P: UDSF 1 Peak Elev=70.30' Storage=1,775 cf Inflow=1.77 cfs 0.135 af
Outflow=0.57 cfs 0.135 af

Pond 22P: Dripline Filter Strip Peak Elev=76.00' Storage=910 cf Inflow=0.59 cfs 0.049 af
Primary=0.04 cfs 0.045 af Secondary=0.08 cfs 0.002 af Outflow=0.12 cfs 0.047 af

Pond 24P: CB Peak Elev=71.32' Inflow=1.42 cfs 0.110 af
12.0" Round Culvert n=0.013 L=65.0' S=0.0048 '/' Outflow=1.42 cfs 0.110 af

Pond CB1: Existing Catch Basin Peak Elev=65.77' Inflow=1.74 cfs 0.353 af
12.0" Round Culvert n=0.013 L=230.0' S=0.0176 '/' Outflow=1.74 cfs 0.353 af

Pond CB2: New catch basin Peak Elev=66.34' Inflow=1.53 cfs 0.337 af
12.0" Round Culvert n=0.013 L=50.0' S=0.0092 '/' Outflow=1.53 cfs 0.337 af

Pond CB22: Stormdrain Peak Elev=72.19' Inflow=0.13 cfs 0.050 af
10.0" Round Culvert n=0.013 L=30.0' S=0.1783 '/' Outflow=0.13 cfs 0.050 af

Pond CB23: CB Peak Elev=71.90' Inflow=0.27 cfs 0.020 af
12.0" Round Culvert n=0.013 L=80.0' S=0.0051 '/' Outflow=0.27 cfs 0.020 af

Total Runoff Area = 1.368 ac Runoff Volume = 0.395 af Average Runoff Depth = 3.46"
47.14% Pervious = 0.645 ac 52.86% Impervious = 0.723 ac

Attachment D

Inspection, Maintenance, and Housekeeping Plan

Inspection, Maintenance, and Housekeeping Plan
Acadia Lending Group Professional Office Building
Riverside Street
Portland, Maine 04103

Introduction

Upon completion of the proposed office development, Acadia Lending Group will be the responsible party for maintaining the stormwater management system. Acadia Lending Group, or other another responsible party shall schedule maintenance of all stormwater management structures, the establishment of any contract services required to implement the program, and the keeping of records and maintenance logbook.

Records of all inspections and maintenance work accomplished must be kept on file and retained for a minimum 5-year time span. The maintenance logbook will be made available to the City of Portland upon request. At a minimum, the appropriate and relevant activities for each of the stormwater management systems will be performed on the prescribed schedule.

The following plan outlines the anticipated inspection, maintenance, and housekeeping procedures for the erosion and sedimentation controls as well as stormwater management devices for the project site. Also, this plan outlines several housekeeping requirements that shall be followed during and after construction. These procedures should be followed in order to ensure the intended function of the designed measures and to prevent unreasonable adverse impacts to the surrounding environment.

The procedures outlined in the Inspection, Maintenance, and Housekeeping Plan are provided as an overview of the anticipated practices to be used on this site. In some instances, additional measures may be required due to unexpected conditions. For additional details on any of the erosion and sedimentation control measures or stormwater management devices to be utilized on this project, refer to the most recently revised edition of the "Maine Erosion and Sedimentation Control BMP" manual and/or the "Stormwater Management for Maine: Best Management Practices" manual as published by the MDEP.

During Construction

1. **Inspection:** During the construction process, it is the Contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. These responsibilities include inspecting disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as before and after a storm event, and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in any applicable permits, shall conduct the inspections.

2. **Maintenance:** All measures shall be maintained in an effective operating condition until areas are permanently stabilized. If Best Management Practices (BMPs) need to be maintained or modified, additional BMPs are necessary, or other corrective action is needed, implementation must be completed within seven (7) calendar days and prior to any storm event (rainfall).

3. **Documentation:** A log summarizing the inspections and any corrective action taken must be maintained on-site. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of erosion and sedimentation controls, material storage areas, and vehicle access points to the site. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken.

   The log must be made accessible to the appropriate regulatory agency upon request. The permittee shall retain a copy of the log for a period of at least three (3) years from the completion of permanent stabilization.

4. **Specific Inspection and Maintenance Tasks:** The following is a list of erosion control and stormwater management measures and the specific inspection and maintenance tasks to be performed during construction.

   A. Sediment Barriers:

   - Hay bale barriers, silt fences, and filter berms shall be inspected immediately after each rainfall and at least daily during prolonged rainfall.
   - If the fabric on silt fence or filter barrier should decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, it shall be replaced.
   - Sediment deposits should be removed after each storm event. They must be removed before deposits reach approximately one-half the height of the barrier.
   - Filter berms shall be reshaped as needed.
   - Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required should be dressed to conform to the existing grade, prepared, and seeded.

   B. Riprap Materials:

   - Once a riprap installation has been completed, it should require very little maintenance. It shall, however, be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone.

   C. Erosion Control Blankets:

   - Inspect these reinforced areas semi-annually and after significant rainfall events for slumping, sliding, seepage, and scour. Pay close attention to unreinforced areas adjacent to the erosion control blankets, which may experience accelerated erosion.
   - Review all applicable inspection and maintenance procedures recommended by the specific blanket manufacturer. These tasks shall be included in addition to this plan.

   D. Temporary Storm Drain Inlet Protection:

   - The inlet protection structure shall be inspected before each rain event and repaired as necessary.

- Sediment shall be removed and the storm drain sediment barrier restored to its original dimensions when the sediment has accumulated to half of the design depth of the trap.
- Structures shall be removed upon permanent stabilization of the tributary area.
- Upon removal of the structure, all accumulated sediments downstream of the structure shall be cleaned from the storm drain system.

E. Stabilized Construction Entrances/Exits:

- The exit shall be maintained in a condition that will prevent tracking of sediment onto public rights-of-way.
- When the control pad becomes ineffective, the stone shall be removed along with the collected soil material. The entrance should then be reconstructed.
- Areas that have received mud-tracking or sediment deposits shall be swept or washed. Washing shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device (not into storm drains, ditches, or waterways).

F. Temporary Seed and Mulch:

- Mulched areas should be inspected after rain events to check for rill erosion.
- If less than 90% of the soil surface is covered by mulch, additional mulch shall be applied in bare areas.
- In applications where seeding and mulch have been applied in conjunction with erosion control blankets, the blankets must be inspected after rain events for dislocation or undercutting.
- Mulch shall continue to be reapplied until 95% of the soil surface has established temporary vegetative cover.

G. Stabilized Drainage Swales:

- Sediment accumulation in the swale shall be removed once the cross section of the swale is reduced by 25%.
- The swales shall be inspected after rainfall events. Any evidence of sloughing of the side slopes or channel erosion shall be repaired and corrective action should be taken to prevent reoccurrence of the problem.
- In addition to the stabilized lining of the channel (i.e. erosion control blankets), stone check dams may be needed to further reduce channel velocity.

5. **Housekeeping:** The following general performance standards apply to the proposed project.

A. Spill Prevention: Controls must be used to prevent pollutants from being discharged from materials on-site, including storage practices to minimize exposure of the materials to stormwater, and appropriate spill prevention, containment, and response planning and implementation.

B. Groundwater Protection: During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a

result of soils, topography and other relevant factors, accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

C. Fugitive Sediment and Dust: Actions must be taken to insure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control.

D. Debris and Other Materials: Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

E. Trench or Foundation Dewatering: Trench dewatering is the removal of water from trenches, foundations, cofferdams, ponds, and other areas within the construction area that retain water after excavation. In most cases, the collected water is heavily silted and hinders correct and safe construction practices. The collected water must be removed from the ponded area, either through gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved.

After Construction

1. **Inspection:** After construction, the owner or operator shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan.

2. **Maintenance, and repair:** If a BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator shall take corrective actions to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective actions to the Maine Department of Environmental Protection (MDEP) or City upon request. The following is a list of permanent erosion control and stormwater management measures and the inspection, maintenance, and housekeeping tasks to be performed after construction.

   A. Vegetated Areas:
      - Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems.
      - Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. Ditches, Swales and Other Open Channels:
      - Inspect ditches, swales, and other open stormwater channels in the spring, in the late fall, and after heavy rains to remove any obstructions to the flow. Remove accumulated sediments and debris, remove woody vegetative growth that could obstruct flow and repair any erosion of the ditch lining.

- Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity.
- Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable.
- Replace riprap in areas where any underlying filter fabric or underlying gravel is showing through the stone or where stones have dislodged.

C. Winter Sanding:
- Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring.
- Accumulations on pavement may be removed by pavement sweeping.
- Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader or other acceptable method.

D. Underdrained Soil Filter:
- During the first year, the basin shall be inspected semi-annually and following major storm events.
- Debris and sediment buildup shall be removed from the forebay and basin as needed. Mowing of a grassed basin can occur semiannually to a height no less than 6 inches. Any bare area or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. Maintaining good grass cover will minimize clogging with fine sediments and if ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity.
- The soil filter should be inspected after every major storm in the first year to be sure it is functioning properly. Thereafter, the filter should be inspected at least once every six months to ensure that it is draining within 48 hours following a one inch storm or greater. Following storms that fill the system and overflow is observed, the soil filter should drain in no less than 36 to 60 hours. If the system drains too fast, an orifice may need to be added on the underdrain outlet or, if already present, may need to be modified.
- Soil Filter Replacement: The top several inches of the filter shall be replaced with fresh material when water ponds on the surface of the bed for more than 72 hours. Removed sediments should be disposed of in an acceptable manner.
- Sediment Removal: Sediment and plant debris should be removed from the pretreatment structure at least annually.
- Mowing: If mowing is desired, only handheld string trimmers or push-mowers are allowed on the filter (no tractor) and the grass bed should be mowed no more than 2 times per growing season to maintain grass heights of no less than 6 inches.
- Fertilization: Fertilization of the underdrained filter area should be avoided unless absolutely necessary to establish vegetation.
- Harvesting and Weeding: Harvesting and pruning of excessive growth will need to be done occasionally. Weeding to control unwanted or invasive plants may also be necessary.

E. Catch Basins:
- Inspect and, if required, clean-out catch basins at least once a year, preferably in early spring.
- Clean out must include the removal and legal disposal of accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes

between basins.

F. Culverts and Stormdrains:
- Inspect culverts and stormdrains in the spring, in the late fall, and after heavy rains to remove any obstructions to flow.
- Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit.
- Inspect and repair any erosion damage at the culvert's inlet and outlet.
- Inspect embankment for erosion, settling, and structural failure.

3. **Documentation:**

A. 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 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 required maintenance or repair, including the record of the deficiency and corrective action(s) taken.

B. A log summarizing the inspections and any corrective action taken must be maintained. The log must include the name(s) and qualifications of the person making the inspections, the date(s) of the inspections, and major observations about the operation and maintenance of controls. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and locations where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to the appropriate regulatory agency upon request. A sample "Stormwater Inspection and Maintenance Form" has been included as Attachment 1 of this Inspection, Maintenance, and Housekeeping Plan.

4. **Duration of Maintenance:** Perform maintenance as described and required for any associated permits unless and until the system is formally accepted by a municipality or quasi-municipal district, or is placed under the jurisdiction of a legally created association that will be responsible for the maintenance of the system.

Attachments
Attachment 1 – Sample Stormwater Inspection and Maintenance Form

Sample Stormwater Inspection and Maintenance Form
Acadia Lending Group Professional Office Building
Riverside Street
Portland, Maine 04103

Attachment 1

This log is intended to accompany the stormwater Inspection, Maintenance and Housekeeping Plan for the office development at 473/ 483 Riverside Street. The following items shall be checked, cleaned and maintained on a regular basis as specified in the Maintenance Plan and as described in the table below. This log shall be kept on file for a minimum of five (5) years and shall be available for review. Qualified personnel familiar with drainage systems and soils shall perform all inspections. Attached is a copy of the construction and post-construction maintenance logs.

`	INSPECTOR NAME	DATE PERFORMED	SUGGESTED INTERVAL
Vegetated Areas			
Inspect all slopes and embankments			Annually
Replant bare areas or areas with sparse growth			Annually
Paved Surfaces			
Clear accumulated winter sand			Annually
Remove sediment along edges and in pockets			Annually
Ditches & Swales			
Remove any obstructions and accumulated sediments and debris			Monthly
Repair any erosion of ditch lining			Annually
Mow vegetated ditches			Annually
Remove woody vegetation growing through riprap			Annually
Repair any slumping side slopes			Annually
Replace riprap where stones have dislodged			Annually
Catch Basins			
Remove accumulated sediments and debris in the sump and at grate			Annually
Culverts			
Remove accumulated sediments and debris at the inlet, outlet, within conduit			Annually
Repair any erosion at inlet and outlet			Annually
Sump Depth			Annually

Underdrained Soil Filter				
	Remove sediment & debris			Monthly
	Remove weeds			Monthly (during growing season)
	Erosion (side slopes, embankment)			Monthly
	Inspection after major storm to verify proper function			Bi-Annually