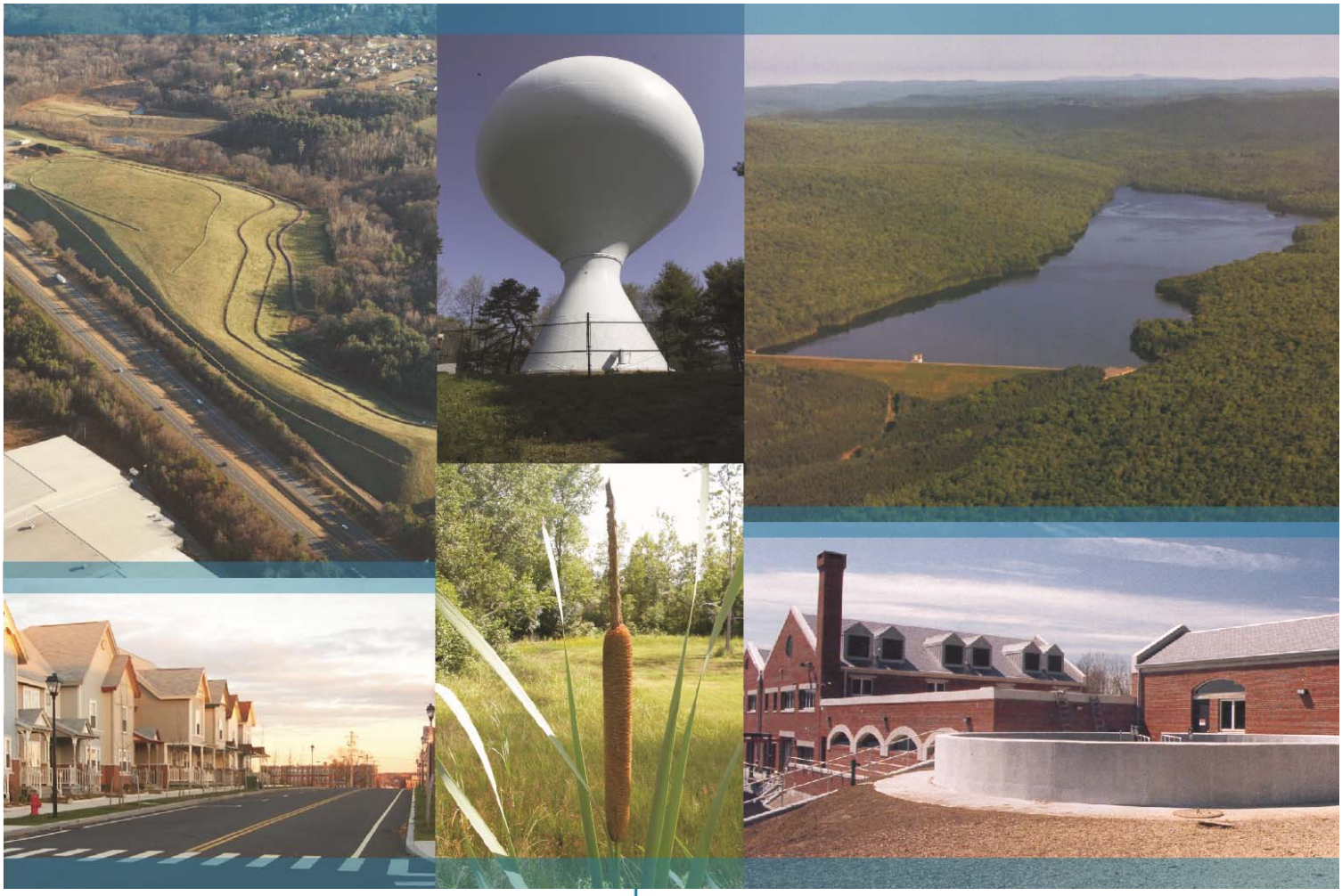

Tighe&Bond

72 Munjoy Street Condos
72 Munjoy Street
Portland, ME

Drainage Study

Prepared For:

Peninsula Property Development

July 20, 2015

Section 1 Narrative

Section 2 Drainage Analysis

Section 3 Long Term Operations & Maintenance Plan

Section 4 Appendices

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Section 1
Narrative

The proposed project consists of the construction of a four (4) story condominium building on a 0.13 acre lot in the R-6 Residential Zone. The proposed building will be connected to an existing two (2) story home. There will also be associated site improvements that include stormwater management with porous concrete and new utility service connections in Munjoy Street.

The site is currently developed with a two (2) story 1,334 SF footprint house that includes an existing paved driveway. The existing building will remain, but the paved driveway will be demolished as part of the proposed project. Currently, the runoff from the majority of the site including the driveway and roof flows to the northeast of the property where it ultimately reaches the closed drainage system in Munjoy Street.

The proposed development will increase impervious area by approximately 2,500 SF. The proposed stormwater management system, which consists of porous concrete, has been designed to mitigate additional impervious areas by decreasing post-development 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. On-site soil information used for this drainage analysis was taken from the National Resources Conservation Service (NRCS) Web Soil Survey (WSS). The WSS indicates that soils in this area consist of Hinckley gravelly sandy loam, which is in Group A of the Hydrologic Soil classification. Soils in this group have high infiltration rates when thoroughly wet, which makes them suitable for infiltration.

The proposed porous concrete pavement section has been modeled assuming a conservative infiltration rate of 1in/hr. The saturated hydraulic conductivity rating for this soil is approximately 8.2in/hr, which was based on data from the NRCS WSS. The NRCS WSS soil data has been included in this report.

Section 2
Drainage Analysis

2.1 Calculation Methods

The design storms analyzed in this study are the 2-year, 10-year and 25-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.

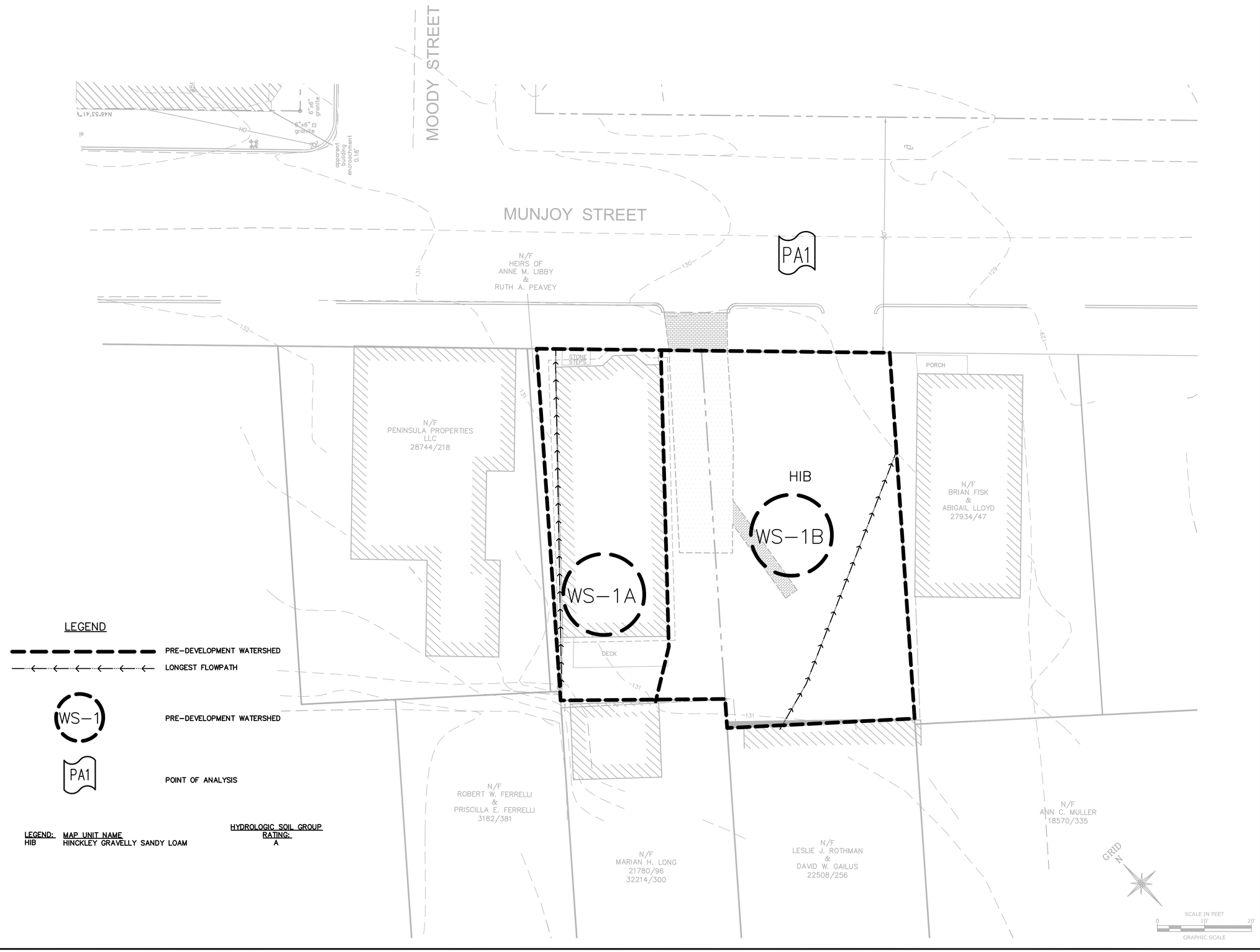
2.2 Pre-Development Conditions

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 two (2) contributing watershed areas modeled at one (1) point of analysis. Th points of analysis and watersheds are depicted on the plan entitled “Pre-Development Watershed Plan”, Sheet WS-1.

Point of Analysis (PA-1)

Point of Analysis One (PA-1) is comprised of Pre-Development Watershed (WS-1A) and (WS-1B). Pre-Development Watershed (WS-1A) consists of runoff generated by the existing ±1,334 SF (2) story building roof. Runoff generated from this area is collected by roof leaders and is discharged above ground where it ultimately flows into Munjoy Street. Pre-Development Watershed (WS-1B) consists of runoff generated by the existing paved driveway and lawn area. Runoff generated from this area travels via sheet flow into Munjoy Street.

2.2.1 Pre-Development Watershed Plan



LEGEND

PRE-DEVELOPMENT WATERSHED

LONGEST FLOWPATH

WS-1 PRE-DEVELOPMENT WATERSHED

PA1 POINT OF ANALYSIS

LEGEND:	MAP UNIT NAME	HYDROLOGIC SOIL GROUP RATING:
HIB	HINCKLEY GRAVELLY SANDY LOAM	A

Last Saved: 7/20/2015
Plotted: Jul 20, 2015 - 5:09pm By: rwh
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72 Munjoy Street Condos

Peninsula Property Development

Portland, Maine

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION
-	-	-

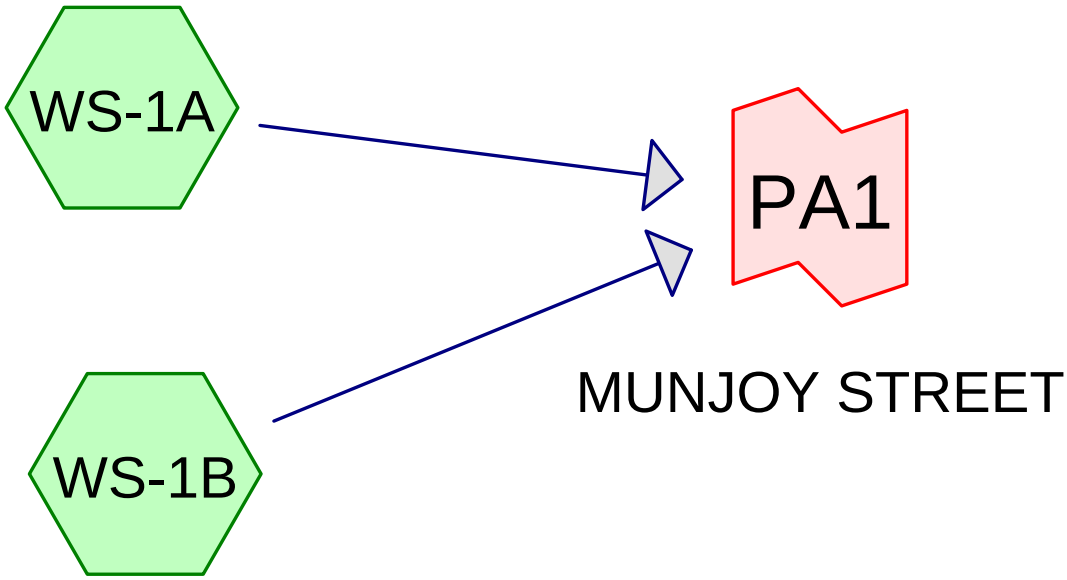
PROJECT NO:	P-0765
DATE:	2015/06/16
FILE:	P0765-SITE.dwg
DRAWN BY:	GWH
CHECKED:	WJD
APPROVED:	GMM

PRE-DEVEOPMENT WATERSHED PLAN

SCALE: 1" = 10'

WS-1

2.2.2 Pre-Development Calculations



Subcat Reach Pond Link

Routing Diagram for P0765-PRE
Prepared by Tighe & Bond, Printed 7/20/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.088	39	>75% Grass cover, Good, HSG A (WS-1A, WS-1B)
0.013	98	Paved parking, HSG A (WS-1B)
0.031	98	Roofs, HSG A (WS-1A)
0.132	**59**	**TOTAL AREA**

Soil Listing (all nodes)

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

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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=1,749 sf 76.27% Impervious Runoff Depth>1.51"
Flow Length=75' Tc=6.8 min CN=84 Runoff=0.07 cfs 0.005 af

Subcatchment WS-1B: Runoff Area=4,008 sf 14.60% Impervious Runoff Depth>0.06"
Flow Length=75' Tc=6.8 min CN=48 Runoff=0.00 cfs 0.000 af

Link PA1: MUNJOY STREET Inflow=0.07 cfs 0.006 af
Primary=0.07 cfs 0.006 af

Total Runoff Area = 0.132 ac Runoff Volume = 0.006 af Average Runoff Depth = 0.50"
66.67% Pervious = 0.088 ac 33.33% Impervious = 0.044 ac

Summary for Subcatchment WS-1A:

Runoff = 0.07 cfs @ 12.10 hrs, Volume= 0.005 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
1,334	98	Roofs, HSG A
415	39	>75% Grass cover, Good, HSG A
1,749	84	Weighted Average
415		23.73% Pervious Area
1,334		76.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	75	Total			

Summary for Subcatchment WS-1B:

Runoff = 0.00 cfs @ 14.96 hrs, Volume= 0.000 af, Depth> 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
585	98	Paved parking, HSG A
3,423	39	>75% Grass cover, Good, HSG A
4,008	48	Weighted Average
3,423		85.40% Pervious Area
585		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	75	Total			

Summary for Link PA1: MUNJOY STREET

Inflow Area = 0.132 ac, 33.33% Impervious, Inflow Depth > 0.50" for 2-YR event
Inflow = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af
Primary = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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=1,749 sf 76.27% Impervious Runoff Depth>2.99"
Flow Length=75' Tc=6.8 min CN=84 Runoff=0.13 cfs 0.010 af

Subcatchment WS-1B: Runoff Area=4,008 sf 14.60% Impervious Runoff Depth>0.48"
Flow Length=75' Tc=6.8 min CN=48 Runoff=0.02 cfs 0.004 af

Link PA1: MUNJOY STREET Inflow=0.15 cfs 0.014 af
Primary=0.15 cfs 0.014 af

Total Runoff Area = 0.132 ac Runoff Volume = 0.014 af Average Runoff Depth = 1.24"
66.67% Pervious = 0.088 ac 33.33% Impervious = 0.044 ac

Summary for Subcatchment WS-1A:

Runoff = 0.13 cfs @ 12.10 hrs, Volume= 0.010 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
1,334	98	Roofs, HSG A
415	39	>75% Grass cover, Good, HSG A
1,749	84	Weighted Average
415		23.73% Pervious Area
1,334		76.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	75	Total			

Summary for Subcatchment WS-1B:

Runoff = 0.02 cfs @ 12.20 hrs, Volume= 0.004 af, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
585	98	Paved parking, HSG A
3,423	39	>75% Grass cover, Good, HSG A
4,008	48	Weighted Average
3,423		85.40% Pervious Area
585		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	75	Total			

Summary for Link PA1: MUNJOY STREET

Inflow Area = 0.132 ac, 33.33% Impervious, Inflow Depth > 1.24" for 10-YR event
Inflow = 0.15 cfs @ 12.11 hrs, Volume= 0.014 af
Primary = 0.15 cfs @ 12.11 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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=1,749 sf 76.27% Impervious Runoff Depth>3.73"
Flow Length=75' Tc=6.8 min CN=84 Runoff=0.17 cfs 0.012 af

Subcatchment WS-1B: Runoff Area=4,008 sf 14.60% Impervious Runoff Depth>0.78"
Flow Length=75' Tc=6.8 min CN=48 Runoff=0.05 cfs 0.006 af

Link PA1: MUNJOY STREET Inflow=0.22 cfs 0.018 af
Primary=0.22 cfs 0.018 af

Total Runoff Area = 0.132 ac Runoff Volume = 0.018 af Average Runoff Depth = 1.68"
66.67% Pervious = 0.088 ac 33.33% Impervious = 0.044 ac

Summary for Subcatchment WS-1A:

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 0.012 af, Depth> 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
1,334	98	Roofs, HSG A
415	39	>75% Grass cover, Good, HSG A
1,749	84	Weighted Average
415		23.73% Pervious Area
1,334		76.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	75	Total			

Summary for Subcatchment WS-1B:

Runoff = 0.05 cfs @ 12.14 hrs, Volume= 0.006 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
585	98	Paved parking, HSG A
3,423	39	>75% Grass cover, Good, HSG A
4,008	48	Weighted Average
3,423		85.40% Pervious Area
585		14.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
6.8	75	Total			

Summary for Link PA1: MUNJOY STREET

Inflow Area = 0.132 ac, 33.33% Impervious, Inflow Depth > 1.68" for 25-YR event
Inflow = 0.22 cfs @ 12.11 hrs, Volume= 0.018 af
Primary = 0.22 cfs @ 12.11 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

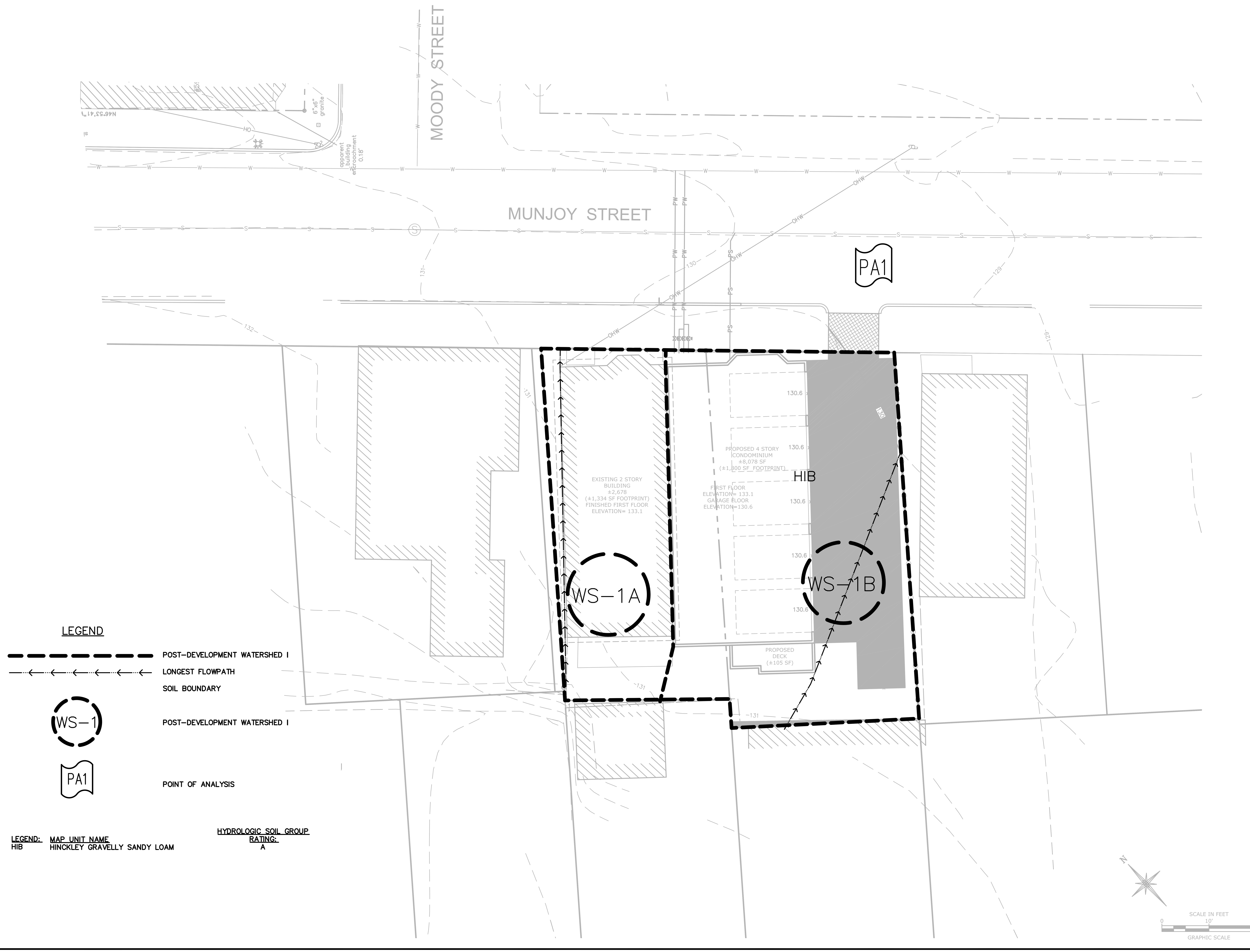
2.3 Post-Development Conditions

The Post-Development drainage area is also characterized by two (2) contributing watershed areas modeled at one (1) point of analysis. The points of analysis and watersheds are depicted on the plan entitled “Post-Development Watershed Plan”, Sheet WS-2.

Point of Analysis (PA-1)

Point of Analysis One (PA-1) is comprised of Post-Development Watershed (WS-1A) and (WS-1B). Post-Development Watershed (WS-1A) remains largely unchanged from the pre-development condition. Post-Development Watershed (WS-1B) consists of runoff generated by the proposed building roof, porous concrete driveway, and lawn area. Runoff generated from the proposed roof is collected by roof leaders and discharged into the reservoir course of the porous concrete. The remaining runoff generated in this watershed enters the porous concrete through the surface and is detained and infiltrated in the subsurface soils.

2.3.1 Post-Development Watershed Plan



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72 Munjoy Street Condos

Peninsula Property Development

Portland, Maine

VERIFY SCALE
BAR IS 1 INCH ON ORIGINAL DRAWING
0 ▬ 1 INCH
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

MARK	DATE	DESCRIPTION
-	-	-

PROJECT NO: P-0765
DATE: 2015/06/16
FILE: P0765-SITE.dwg
DRAWN BY: GWH
CHECKED: WJD
APPROVED: GMM

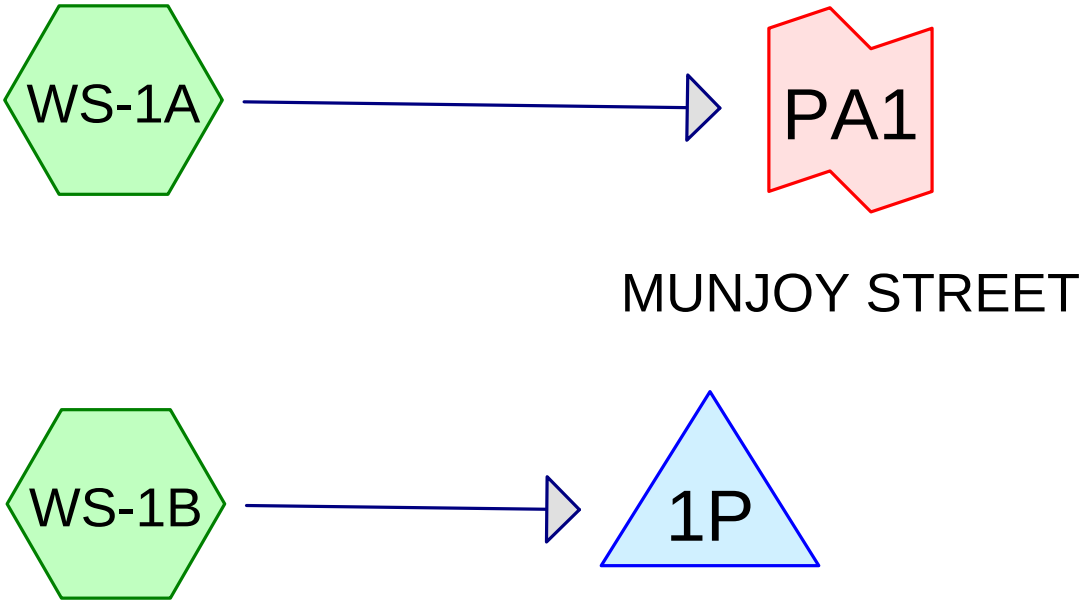
POST-DEVEOPMENT WATERSHED PLAN

SCALE: 1" = 10'

WS-2

Last Saved: 7/20/2015
Plotted On:Jul 20, 2015-2:59pm By: gwh
Tighe & Bond, Inc. J:\P\P0765 Peninsula Property Development\DWG-CAD\DESIGN\P0765-SITE.dwg

2.3.2 Post-Development Calculations



Subcat Reach Pond Link

Routing Diagram for P0765-POST
Prepared by Tighe & Bond, Printed 7/20/2015

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.032	39	>75% Grass cover, Good, HSG A (WS-1A, WS-1B)
0.028	98	Paved parking, HSG A (WS-1B)
0.074	98	Roofs, HSG A (WS-1A, WS-1B)
0.135	**84**	**TOTAL AREA**

Soil Listing (all nodes)

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

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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=1,749 sf 76.27% Impervious Runoff Depth>1.51"
Flow Length=75' Slope=0.0110 '/' Tc=7.7 min CN=84 Runoff=0.07 cfs 0.005 af

Subcatchment WS-1B: Runoff Area=4,112 sf 76.24% Impervious Runoff Depth>1.52"
Tc=5.0 min CN=84 Runoff=0.17 cfs 0.012 af

Pond 1P: POROUS CONCRETE Peak Elev=127.64' Storage=144 cf Inflow=0.17 cfs 0.012 af
Outflow=0.03 cfs 0.012 af

Link PA1: MUNJOY STREET Inflow=0.07 cfs 0.005 af
Primary=0.07 cfs 0.005 af

Total Runoff Area = 0.135 ac Runoff Volume = 0.017 af Average Runoff Depth = 1.51"
23.75% Pervious = 0.032 ac 76.25% Impervious = 0.103 ac

Summary for Subcatchment WS-1A:

Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.005 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
1,334	98	Roofs, HSG A
415	39	>75% Grass cover, Good, HSG A
1,749	84	Weighted Average
415		23.73% Pervious Area
1,334		76.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0110	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0110	1.57		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.7	75	Total			

Summary for Subcatchment WS-1B:

Runoff = 0.17 cfs @ 12.08 hrs, Volume= 0.012 af, Depth> 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.00"

Area (sf)	CN	Description
1,230	98	Paved parking, HSG A
1,905	98	Roofs, HSG A
977	39	>75% Grass cover, Good, HSG A
4,112	84	Weighted Average
977		23.76% Pervious Area
3,135		76.24% Impervious Area

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

Summary for Pond 1P: POROUS CONCRETE

Inflow Area = 0.094 ac, 76.24% Impervious, Inflow Depth > 1.52" for 2-YR event
Inflow = 0.17 cfs @ 12.08 hrs, Volume= 0.012 af
Outflow = 0.03 cfs @ 11.95 hrs, Volume= 0.012 af, Atten= 83%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.95 hrs, Volume= 0.012 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 127.64' @ 12.57 hrs Surf.Area= 1,230 sf Storage= 144 cf
Flood Elev= 129.75' Surf.Area= 1,230 sf Storage= 1,107 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 32.3 min (863.5 - 831.2)

Volume	Invert	Avail.Storage	Storage Description
#1	127.35'	1,107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 2,768 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
127.35	1,230	0	0
129.60	1,230	2,768	2,768

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.35'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.95 hrs HW=127.38' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Summary for Link PA1: MUNJOY STREET

Inflow Area = 0.040 ac, 76.27% Impervious, Inflow Depth > 1.51" for 2-YR event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 0.005 af
Primary = 0.07 cfs @ 12.11 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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=1,749 sf 76.27% Impervious Runoff Depth>2.99"
Flow Length=75' Slope=0.0110 '/' Tc=7.7 min CN=84 Runoff=0.13 cfs 0.010 af

Subcatchment WS-1B: Runoff Area=4,112 sf 76.24% Impervious Runoff Depth>3.00"
Tc=5.0 min CN=84 Runoff=0.33 cfs 0.024 af

Pond 1P: POROUS CONCRETE Peak Elev=128.15' Storage=396 cf Inflow=0.33 cfs 0.024 af
Outflow=0.03 cfs 0.024 af

Link PA1: MUNJOY STREET Inflow=0.13 cfs 0.010 af
Primary=0.13 cfs 0.010 af

Total Runoff Area = 0.135 ac Runoff Volume = 0.034 af Average Runoff Depth = 2.99"
23.75% Pervious = 0.032 ac 76.25% Impervious = 0.103 ac

Summary for Subcatchment WS-1A:

Runoff = 0.13 cfs @ 12.11 hrs, Volume= 0.010 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
1,334	98	Roofs, HSG A
415	39	>75% Grass cover, Good, HSG A
1,749	84	Weighted Average
415		23.73% Pervious Area
1,334		76.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0110	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0110	1.57		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.7	75	Total			

Summary for Subcatchment WS-1B:

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 0.024 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
1,230	98	Paved parking, HSG A
1,905	98	Roofs, HSG A
977	39	>75% Grass cover, Good, HSG A
4,112	84	Weighted Average
977		23.76% Pervious Area
3,135		76.24% Impervious Area

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

Summary for Pond 1P: POROUS CONCRETE

Inflow Area = 0.094 ac, 76.24% Impervious, Inflow Depth > 3.00" for 10-YR event
Inflow = 0.33 cfs @ 12.08 hrs, Volume= 0.024 af
Outflow = 0.03 cfs @ 11.75 hrs, Volume= 0.024 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.75 hrs, Volume= 0.024 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 128.15' @ 13.08 hrs Surf.Area= 1,230 sf Storage= 396 cf
Flood Elev= 129.75' Surf.Area= 1,230 sf Storage= 1,107 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 115.0 min (926.6 - 811.7)

Volume	Invert	Avail.Storage	Storage Description
#1	127.35'	1,107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 2,768 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
127.35	1,230	0	0
129.60	1,230	2,768	2,768

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.35'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.75 hrs HW=127.38' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Summary for Link PA1: MUNJOY STREET

Inflow Area = 0.040 ac, 76.27% Impervious, Inflow Depth > 2.99" for 10-YR event
Inflow = 0.13 cfs @ 12.11 hrs, Volume= 0.010 af
Primary = 0.13 cfs @ 12.11 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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=1,749 sf 76.27% Impervious Runoff Depth>3.73"
Flow Length=75' Slope=0.0110 '/' Tc=7.7 min CN=84 Runoff=0.16 cfs 0.012 af

Subcatchment WS-1B: Runoff Area=4,112 sf 76.24% Impervious Runoff Depth>3.73"
Tc=5.0 min CN=84 Runoff=0.41 cfs 0.029 af

Pond 1P: POROUS CONCRETE Peak Elev=128.44' Storage=536 cf Inflow=0.41 cfs 0.029 af
Outflow=0.03 cfs 0.029 af

Link PA1: MUNJOY STREET Inflow=0.16 cfs 0.012 af
Primary=0.16 cfs 0.012 af

Total Runoff Area = 0.135 ac Runoff Volume = 0.042 af Average Runoff Depth = 3.73"
23.75% Pervious = 0.032 ac 76.25% Impervious = 0.103 ac

Summary for Subcatchment WS-1A:

Runoff = 0.16 cfs @ 12.11 hrs, Volume= 0.012 af, Depth> 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
1,334	98	Roofs, HSG A
415	39	>75% Grass cover, Good, HSG A
1,749	84	Weighted Average
415		23.73% Pervious Area
1,334		76.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0110	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.00"
0.3	25	0.0110	1.57		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
7.7	75	Total			

Summary for Subcatchment WS-1B:

Runoff = 0.41 cfs @ 12.07 hrs, Volume= 0.029 af, Depth> 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.50"

Area (sf)	CN	Description
1,230	98	Paved parking, HSG A
1,905	98	Roofs, HSG A
977	39	>75% Grass cover, Good, HSG A
4,112	84	Weighted Average
977		23.76% Pervious Area
3,135		76.24% Impervious Area

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

Summary for Pond 1P: POROUS CONCRETE

Inflow Area = 0.094 ac, 76.24% Impervious, Inflow Depth > 3.73" for 25-YR event
Inflow = 0.41 cfs @ 12.07 hrs, Volume= 0.029 af
Outflow = 0.03 cfs @ 11.65 hrs, Volume= 0.029 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.65 hrs, Volume= 0.029 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 128.44' @ 13.58 hrs Surf.Area= 1,230 sf Storage= 536 cf
Flood Elev= 129.75' Surf.Area= 1,230 sf Storage= 1,107 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 163.7 min (969.2 - 805.5)

Volume	Invert	Avail.Storage	Storage Description
#1	127.35'	1,107 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 2,768 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
127.35	1,230	0	0
129.60	1,230	2,768	2,768

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.35'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.65 hrs HW=127.38' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Summary for Link PA1: MUNJOY STREET

Inflow Area = 0.040 ac, 76.27% Impervious, Inflow Depth > 3.73" for 25-YR event
Inflow = 0.16 cfs @ 12.11 hrs, Volume= 0.012 af
Primary = 0.16 cfs @ 12.11 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: POROUS CONCRETE

Inflow Area = 0.094 ac, 76.24% Impervious, Inflow Depth > 4.85" for 100-YR event
Inflow = 0.53 cfs @ 12.07 hrs, Volume= 0.038 af
Outflow = 0.03 cfs @ 11.45 hrs, Volume= 0.035 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.45 hrs, Volume= 0.035 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 128.92' @ 14.15 hrs Surf.Area= 1,230 sf Storage= 771 cf
Flood Elev= 129.75' Surf.Area= 1,230 sf Storage= 1,107 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 198.6 min (996.7 - 798.1)

Volume	Invert	Avail.Storage	Storage Description
#1	127.35'	1,107 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 2,768 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
127.35	1,230	0	0
129.60	1,230	2,768	2,768

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.35'	**1.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.45 hrs HW=127.38' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

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 equal to or 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	0.07/**0.07**	0.15/**0.13**	0.22/**0.16**

2.5 Stormwater Treatment

The Applicant requests a waiver from pre-treatment and treatment requirements in the City of Portland Technical Manual for stormwater runoff generated by the additional impervious area (±2,500 SF) that will result from the proposed development. The new impervious area consists of roof runoff, which does not typically require treatment as it is inherently clean, and the porous concrete driveway. The porous concrete driveway will not generate any runoff as water that falls onto the pavement will infiltrate into the reservoir course below the concrete. A small portion grass will contribute runoff into the driveway, but the grass provides sufficient treatment prior to discharge into the porous pavement.

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 infiltrated, where possible. Porous concrete pavement has been provided to mitigate potential impacts from the increase in impervious area.

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 Operations & 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

Robert LeBlanc
Peninsula Property Development
59 Moody Street
Portland, Maine 04101

(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
- Porous Pavement Vacuuming and Sweeping

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.

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
Catch Basin (CB) / 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

Porous Concrete Inspection/Maintenance Requirements		
Inspection/ Maintenance	Frequency	Action
Inspect for Signs of Deterioration and Spalling	Annually	- Repair as required
Monitor for proper Infiltration	Periodically	- Inspect the area for infiltration rate. - If required: hire qualified professional to 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.
Clean Porous Asphalt	2 - 4 times annually	- Vacuum Sweeper to clean entire porous concrete area (Note: power washing may be required on heavily soiled areas to dislodge particles prior to sweeping/vacuuming).

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 Walkways and Pavement

Snow storage areas shall be located such that no direct untreated discharges are possible to receiving waters from the storage. Salt storage areas shall be covered or located such that no direct untreated discharges are possible to receiving waters from the storage site. Salt and sand shall be used to the minimum extent practical.

3.3.3 Snow & Ice Management for Porous Concrete

- Maintenance personnel shall be properly trained as to the locations of porous concrete pavement and operations and maintenance requirements for the porous concrete pavement.
- The porous concrete areas shall be plowed after every storm in accordance with standard plowing operations for standard pavement and as required to maintain safe conditions. Special plow blades may be used to prevent scarring but are not necessary (raised blade plowing is not recommended).
- The UNHSC has documented up to a 75% net salt reduction for de-icing measures over the course of a winter season. However, salt reduction is site dependent due to pavement shading, hours of operation, storm intensities, temperatures, etc. Salt/de-icing chemicals shall be applied as needed to maintain a safe and accessible site at all times. The following recommendations for salt/de-icing chemical application may be applicable:
    - Additional salt/de-icing chemical application may be needed during challenging storm events, particularly mixed precipitation events.
    - Salt/de-icing chemical application prior to storm events may be required to maintain a safe and accessible site during the first part of a storm.
    - Salt/de-icing chemical application during and after storm events may be required to control compact snow and ice not removed by plowing.
    - Salt/de-icing chemical reduction may be realized between storm events depending on black ice formation.
- Sand application is not recommended for porous concrete areas or areas that drain to porous concrete areas due to an increased maintenance burden.

3.3.4 Annual Updates & 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.

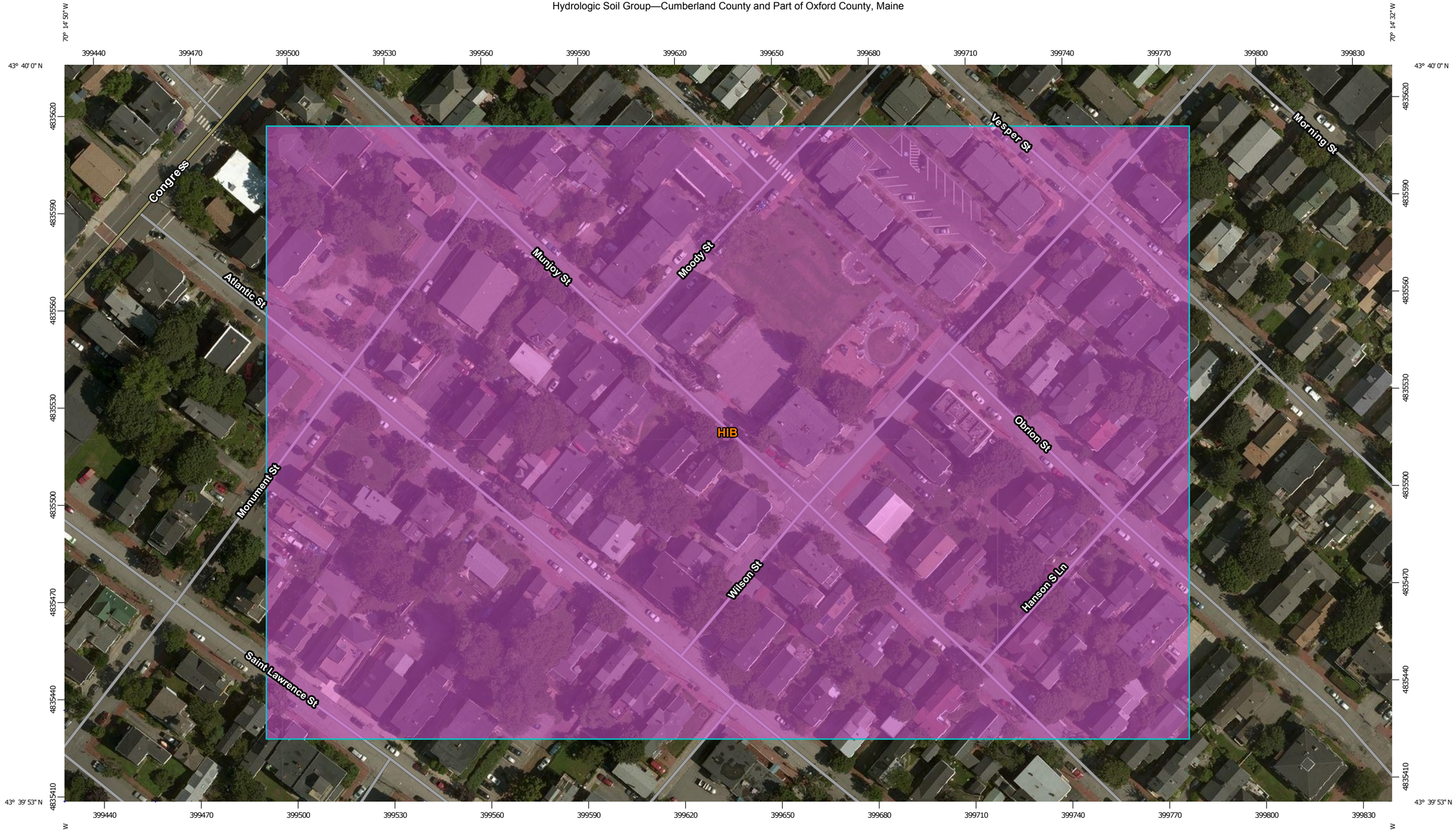
Stormwater Management Report						
Project Name		**72 Munjoy Street Condos, Portland, ME**				
BMP Description	**Date of Inspection**	**Inspector**	**BMP Installed and Operating Properly?**	**Cleaning / Corrective Action Needed**	**Date of Cleaning / Repair**	**Performed By**
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			
			❑Yes ❑No			

Section 4
Appendices

4.1 Site Plans - Bound Separately

4.2 Soil Maps

Hydrologic Soil Group—Cumberland County and Part of Oxford County, Maine



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 9, Sep 13, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 31, 2013—Aug 11, 2013

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Cumberland County and Part of Oxford County, Maine (ME005)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HIB	Hinckley gravelly sandy loam, 3 to 8 percent slopes	A	13.4	100.0%
Totals for Area of Interest			**13.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Saturated Hydraulic Conductivity (Ksat)—Cumberland County and Part of Oxford County, Maine

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 57.9133

Not rated or not available

Soil Rating Lines

= 57.9133

Not rated or not available

Soil Rating Points

= 57.9133

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

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

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 9, Sep 13, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 31, 2013—Aug 11, 2013

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

Saturated Hydraulic Conductivity (Ksat)

Saturated Hydraulic Conductivity (Ksat)— Summary by Map Unit — Cumberland County and Part of Oxford County, Maine (ME005)				
Map unit symbol	**Map unit name**	**Rating (micrometers per second)**	**Acres in AOI**	**Percent of AOI**
HIB	Hinckley gravelly sandy loam, 3 to 8 percent slopes	57.9133	13.4	100.0%
Totals for Area of Interest			**13.4**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: *None Specified*

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 1

Bottom Depth: 4

Units of Measure: Centimeters

4.3 Precipitation Table

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.