WALSH
ENGINEERING ASSOCIATES, INC.

Stormwater Management Report

for

Florida Avenue Extension
Florida Avenue
Portland, Maine

March 9, 2018

Applicants
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Introduction

Walsh Engineering Associates, Inc. (WEA) was retained by Robert and Christine Rodney and Kelsey Grover (Applicants) in the design and permitting of the Florida Avenue Extension project located along an existing gravel section of Florida Avenue in Portland, Maine. The project seeks to permit the construction to upgrade an existing gravel section of Florida Avenue to City of Portland road standards to allow development of two vacant adjacent lots owned by the applicants. The proposed road improvements will consist of replacement of base and subbase materials, placement of pavement, upgraded existing water line, installation of stormwater treatment facilities, and other minor utility work. The project will result in a net increase of 2,320 square feet of new impervious area.

This Stormwater Management Report assesses both pre-development and post-development peak runoff rates and stormwater treatment methods that will be used to manage stormwater. The analysis provided herein was completed in accordance with the City of Portland stormwater standards.

Methodology

The stormwater runoff analysis has been undertaken utilizing the HydroCAD Stormwater Modeling System software (Version 10) developed by the HydroCAD Software Solutions LLC of Chocorua, New Hampshire. The program is based upon the TR-20 computer program and the TR-55 tabular method, both of which are based upon techniques developed by the USDA Soil Conservation Service. The analysis was undertaken for the 2, 10, and 25-year frequencies (3.1, 4.6, and 5.8 inches, respectively) from Maine DEP Chapter 500, Appendix H for Cumberland SE. Consistent with Appendix H, twenty-four hour storms with a Type III distribution were used as the basis for the analysis.

Pre-Development Conditions

The proposed project is located at the southwestern end of Florida Avenue near the intersection of the paved portion Florida Avenue and Texas Street. The existing site consists of approximately 250 linear feet of gravel road extending from the intersection with Texas Street south to a dead end. There is approximately 5000 sf of existing gravel road. The road exists in a developed neighborhood with homes and mature lawns and gardens located on the both sides of the road and the two wooded undeveloped lots to the north which are looking to be developed by the clients in the future. The ROW for Florida Avenue extends south beyond the dead end, and is currently undeveloped and wooded with a swale extending along the western side to a wetland complex.

Stormwater runoff from the site generally flows southwest along the shoulders on each side of the street. The contributing area on the western side of the street extends north along the paved portion of Florida Avenue to a high point approximately 250 linear feet north of it's intersection with Texas Street. Apparent conditions seem to show the runoff running along the western shoulder line, then into a swale that flows through a driveway culvert and continues along the northwestern edge of the right of way. The southeastern side of Florida Ave has a smaller watershed that begins at the intersection of Texas street, with runoff running along the southeastern shoulder.

As taken from the USDA NRCS Web Soil Survey, soil type of the contributing area primarily consists of Lyman-Tunbridge complex (HrB), which is classified as hydrologic soil group (HSG) C. Additional areas along the south western boundary of the site consist of Scantic silt loam (Sn), also a C soil. A copy of the Web Soil Survey map is included in Appendix E.

Runoff from the site was analyzed at four locations where stormwater discharges from the site, described as analysis points AP1 and AP2. Pre-development HydroCAD calculations can be found in Appendix A. Pre-development peak flow rates at each of the analysis points are summarized in Table 1, for the 2, 10, and 25-year storm events.

Post-Development Conditions

The project includes the construction of road improvements along the gravel section of Florida Avenue to upgrade it to a paved road meeting City of Portland standards. The road will be increased from an approximately 18 foot wide gravel road to a 28 foot wide paved road resulting in 2,320 sf of new impervious area. Runoff from the project will continue to run southwest along the proposed road in a similar manner as existing conditions.

Very little change is proposed along the eastern shoulder line, and the proposed shoulder will generally be in the same location pre to post along the south eastern side.

For the northwestern side of the road, the shoulder will be expanded from its existing location. A soil filter is proposed to be located along the proposed western shoulder to capture run off from the proposed pavement and provide treatment and detention. A catch basin is proposed to be installed upgradient of the basin along the western shoulder of Florida Avenue to route upgradient runoff around the basin. To drain the catch basin and the soil filter, a Maine DOT type C underdrain pipe will be run along the shoulder. This will serve as the stormwater conveyance, and as an underdrain for the western shoulder. These will discharge through a solid drain pipe placed at the southwest end of the pavement, and will discharge onto the undeveloped portion of the ROW for Florida Avenue. The stormwater treatment calculations in Appendix C summarize the existing and proposed impervious and developed areas and associated treatment levels.

Post-development stormwater runoff from the site was analyzed by routing stormwater flows from the various developed subcatchments through proposed conveyance and treatment measures. Post-development HydroCAD calculations can be found in Appendix B and sheet D2.0 – Post Development Drainage Plan. Post-development peak flow rates at each of the analysis points are summarized in Table 1, for the 2, 10, and 25-year storm events.

Stormwater Quantity

The project is subject to the City of Portland stormwater standards which require that peak flow rates at each analysis point are not increased during the 2, 10, and 25-year storm events. In order to meet the City stormwater standards, WEA has analyzed the pre and post development flow rates at each analysis point for the respective storm events.

Stormwater detention is provided in the underdrained soil filter along the western side prior to discharge to analysis point AP1. Stormwater runoff reaches analysis point AP2 via overland flow.

The detention systems were sized and analyzed through an iterative process using HydroCAD in order to provide attenuation of post-development peak flow rates to remain at or below pre-development peak flow rates at the analysis point.

Table 1 – Comparison of Pre and Post -Development Runoff Rates
Runoff rates in cubic feet per second (c.f.s.)

Analysis Point	**Storm**		
AP1	**2 yr**	**10 yr**	**25 yr**
Pre Development	1.6	3.0	4.1
Post Development	1.4	2.9	4.0
AP2	**2 yr**	**10 yr**	**25 yr**
Pre Development	0.4	0.7	0.9
Post Development	0.4	0.7	0.9

As shown in Table 1, the peak runoff rates at all analysis points under the post-development conditions will remain at or below the peak pre-development runoff rates for the 2, 10, and 25-year storm events. Based on this analysis, we do not anticipate any adverse impact on downgradient drainage systems due to the proposed development.

Stormwater Quality

The proposed site improvements will result in a net increase of 2,320 square feet of new impervious area. Treatment for this increase in impervious area is proposed to be accomplished using an underdrained soil filter which has been designed to capture an area of 1,740 sf (75% of new impervious area). The basin has also been sized to hold a volume of 50% of the upgradient vegetated area that cannot be routed around the basin (per Maine DEP Chapter 500 standards). See Appendix C for treatment area calculations and BMP design calculations.

Erosion Control

BMPs such as silt fence and/or filter berms of erosion control mix, riprap pipe inlet and outlet protection, temporary catch basin inlet protection, mulch, and temporary seeding will be used to prevent erosion and downstream migration of sediment during construction. Permanent erosion control measures include asphalt pavement, permanent seeding, turf reinforcement matting, pipe inlet and outlet protection, and level spreaders. Detailed Erosion and sedimentation control notes and details can be found on Drawings C3.0.

Inspection & Maintenance

The Applicants will be responsible for maintaining the stormwater facilities for the project until the road is accepted by the City of Portland, after which, the City will be responsible. An Inspection and Maintenance Plan is included as Appendix D.

Conclusions

The stormwater management for this project includes a underdrained soil filter to control quantity and quality of stormwater runoff. The HydroCAD calculations show that the peak runoff rates at

the analysis points under post-development conditions are estimated to be equal to or less than the peak pre-development runoff rates for the 2, 10, and 25-year storm events. The proposed stormwater management BMPs are designed to meet the City of Portland stormwater standards to provide water quality enhancement. It is our opinion that the proposed stormwater management plan meets the requirements of the City of Portland regulations.

Christopher MacDonald, PE

Walsh Engineering Associates, Inc.

SUPPORTING DATA AND CALCULATIONS

The following material presents calculations and copies of source material used during the analysis for this study.

Appendix A: Pre-Development HydroCAD Calculations
Appendix B: Post-Development HydroCAD Calculations
Appendix C: Stormwater BMP Treatment Calculations
Appendix D: Inspection & Maintenance Plan
Appendix E: USDA NRCS Web Soil Survey
Appendix F: Drainage Plans
- D1.0: Pre Development Drainage Plan
- D2.0: Post Development Drainage Plan

Appendix A:

Pre-Development HydroCAD Calculations

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Western Side Florida Runoff Area=44,766 sf 36.51% Impervious Runoff Depth>1.35"
Flow Length=673' Tc=8.4 min CN=82 Runoff=1.58 cfs 0.116 af

Subcatchment 2S: Eastern Side Florida Ave Runoff Area=8,927 sf 36.55% Impervious Runoff Depth>1.42"
Flow Length=249' Tc=6.0 min CN=83 Runoff=0.36 cfs 0.024 af

Link AP 1: AP 1 Inflow=1.58 cfs 0.116 af
Primary=1.58 cfs 0.116 af

Link AP 2: AP 2 Inflow=0.36 cfs 0.024 af
Primary=0.36 cfs 0.024 af

Total Runoff Area = 1.233 ac Runoff Volume = 0.140 af Average Runoff Depth = 1.36"
63.49% Pervious = 0.783 ac 36.51% Impervious = 0.450 ac

Summary for Subcatchment 1S: Western Side Florida Ave

Runoff = 1.58 cfs @ 12.12 hrs, Volume= 0.116 af, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
16,342	98	Paved parking, HSG C
14,980	74	>75% Grass cover, Good, HSG C
13,444	70	Woods, Good, HSG C
44,766	82	Weighted Average
28,424		63.49% Pervious Area
16,342		36.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	49	0.0300	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
0.3	22	0.0300	1.18		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.10"
0.8	55	0.0300	1.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	328	0.0300	3.52		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.9	219	0.0100	3.96	47.53	**Channel Flow, E-F** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.040
8.4	673	Total			

Summary for Subcatchment 2S: Eastern Side Florida Ave

Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.024 af, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
3,263	98	Paved parking, HSG C
5,664	74	>75% Grass cover, Good, HSG C
8,927	83	Weighted Average
5,664		63.45% Pervious Area
3,263		36.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.85		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
1.8	155	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	54	0.0100	0.70		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
3.9	249	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP 1: AP 1

Inflow Area = 1.028 ac, 36.51% Impervious, Inflow Depth > 1.35" for 2-yr event
Inflow = 1.58 cfs @ 12.12 hrs, Volume= 0.116 af
Primary = 1.58 cfs @ 12.12 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link AP 2: AP 2

Inflow Area = 0.205 ac, 36.55% Impervious, Inflow Depth > 1.42" for 2-yr event
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 0.024 af
Primary = 0.36 cfs @ 12.09 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Western Side Florida Runoff Area=44,766 sf 36.51% Impervious Runoff Depth>2.54"
Flow Length=673' Tc=8.4 min CN=82 Runoff=2.98 cfs 0.218 af

Subcatchment 2S: Eastern Side Florida Ave Runoff Area=8,927 sf 36.55% Impervious Runoff Depth>2.64"
Flow Length=249' Tc=6.0 min CN=83 Runoff=0.66 cfs 0.045 af

Link AP 1: AP 1 Inflow=2.98 cfs 0.218 af
Primary=2.98 cfs 0.218 af

Link AP 2: AP 2 Inflow=0.66 cfs 0.045 af
Primary=0.66 cfs 0.045 af

Total Runoff Area = 1.233 ac Runoff Volume = 0.263 af Average Runoff Depth = 2.56"
63.49% Pervious = 0.783 ac 36.51% Impervious = 0.450 ac

Summary for Subcatchment 1S: Western Side Florida Ave

Runoff = 2.98 cfs @ 12.12 hrs, Volume= 0.218 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
16,342	98	Paved parking, HSG C
14,980	74	>75% Grass cover, Good, HSG C
13,444	70	Woods, Good, HSG C
44,766	82	Weighted Average
28,424		63.49% Pervious Area
16,342		36.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	49	0.0300	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
0.3	22	0.0300	1.18		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.10"
0.8	55	0.0300	1.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	328	0.0300	3.52		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.9	219	0.0100	3.96	47.53	**Channel Flow, E-F** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.040
8.4	673	Total			

Summary for Subcatchment 2S: Eastern Side Florida Ave

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.045 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
3,263	98	Paved parking, HSG C
5,664	74	>75% Grass cover, Good, HSG C
8,927	83	Weighted Average
5,664		63.45% Pervious Area
3,263		36.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.85		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
1.8	155	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	54	0.0100	0.70		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
3.9	249	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP 1: AP 1

Inflow Area = 1.028 ac, 36.51% Impervious, Inflow Depth > 2.54" for 10-yr event
Inflow = 2.98 cfs @ 12.12 hrs, Volume= 0.218 af
Primary = 2.98 cfs @ 12.12 hrs, Volume= 0.218 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link AP 2: AP 2

Inflow Area = 0.205 ac, 36.55% Impervious, Inflow Depth > 2.64" for 10-yr event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.045 af
Primary = 0.66 cfs @ 12.09 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Western Side Florida Runoff Area=44,766 sf 36.51% Impervious Runoff Depth>3.57"
Flow Length=673' Tc=8.4 min CN=82 Runoff=4.14 cfs 0.306 af

Subcatchment 2S: Eastern Side Florida Ave Runoff Area=8,927 sf 36.55% Impervious Runoff Depth>3.67"
Flow Length=249' Tc=6.0 min CN=83 Runoff=0.91 cfs 0.063 af

Link AP 1: AP 1 Inflow=4.14 cfs 0.306 af
Primary=4.14 cfs 0.306 af

Link AP 2: AP 2 Inflow=0.91 cfs 0.063 af
Primary=0.91 cfs 0.063 af

Total Runoff Area = 1.233 ac Runoff Volume = 0.368 af Average Runoff Depth = 3.59"
63.49% Pervious = 0.783 ac 36.51% Impervious = 0.450 ac

Summary for Subcatchment 1S: Western Side Florida Ave

Runoff = 4.14 cfs @ 12.12 hrs, Volume= 0.306 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
16,342	98	Paved parking, HSG C
14,980	74	>75% Grass cover, Good, HSG C
13,444	70	Woods, Good, HSG C
44,766	82	Weighted Average
28,424		63.49% Pervious Area
16,342		36.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	49	0.0300	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
0.3	22	0.0300	1.18		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.10"
0.8	55	0.0300	1.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.6	328	0.0300	3.52		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
0.9	219	0.0100	3.96	47.53	**Channel Flow, E-F** Area= 12.0 sf Perim= 10.9' r= 1.10' n= 0.040
8.4	673	Total			

Summary for Subcatchment 2S: Eastern Side Florida Ave

Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.063 af, Depth> 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
3,263	98	Paved parking, HSG C
5,664	74	>75% Grass cover, Good, HSG C
8,927	83	Weighted Average
5,664		63.45% Pervious Area
3,263		36.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.85		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
1.8	155	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	54	0.0100	0.70		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
3.9	249	Total, Increased to minimum Tc = 6.0 min			

Summary for Link AP 1: AP 1

Inflow Area = 1.028 ac, 36.51% Impervious, Inflow Depth > 3.57" for 25-yr event
Inflow = 4.14 cfs @ 12.12 hrs, Volume= 0.306 af
Primary = 4.14 cfs @ 12.12 hrs, Volume= 0.306 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link AP 2: AP 2

Inflow Area = 0.205 ac, 36.55% Impervious, Inflow Depth > 3.67" for 25-yr event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.063 af
Primary = 0.91 cfs @ 12.09 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Appendix B:

Post-Development HydroCAD Calculations

Summary for Subcatchment 1S: End of ROW

Runoff = 0.43 cfs @ 12.14 hrs, Volume= 0.032 af, Depth> 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
8,644	70	Woods, Good, HSG C
5,122	98	Paved parking, HSG C
13,766	80	Weighted Average
8,644		62.79% Pervious Area
5,122		37.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	51	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	70	0.0480	1.10		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.3	121	Total			

Summary for Subcatchment 2S: Florida Ave Treated Area

Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.018 af, Depth> 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
1,740	98	Paved parking, HSG C
3,978	74	>75% Grass cover, Good, HSG C
3,166	70	Woods, Good, HSG C
8,884	77	Weighted Average
7,144		80.41% Pervious Area
1,740		19.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	46	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	96	Total			

Summary for Subcatchment 3S: Florida Ave Upgradient

Runoff = 0.98 cfs @ 12.10 hrs, Volume= 0.068 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
10,450	98	Paved parking, HSG C
11,352	74	>75% Grass cover, Good, HSG C
21,802	86	Weighted Average
11,352		52.07% Pervious Area
10,450		47.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	49	0.0300	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
0.3	22	0.0300	1.18		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.10"
0.8	55	0.0300	1.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
6.9	346	Total			

Summary for Subcatchment 4S: Eastern Side Florida Ave

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.025 af, Depth> 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
3,604	98	Paved parking, HSG C
5,642	74	>75% Grass cover, Good, HSG C
9,246	83	Weighted Average
5,642		61.02% Pervious Area
3,604		38.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
1.8	155	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	54	0.0100	0.70		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
4.3	259	Total, Increased to minimum Tc = 6.0 min			

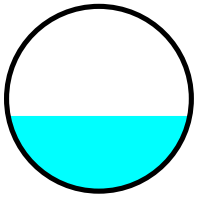
Summary for Reach 1R: Underdrain

Inflow Area = 0.704 ac, 39.72% Impervious, Inflow Depth > 1.40" for 2-yr event
Inflow = 0.99 cfs @ 12.10 hrs, Volume= 0.082 af
Outflow = 0.94 cfs @ 12.14 hrs, Volume= 0.082 af, Atten= 5%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.27 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 2.3 min

Peak Storage= 57 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.84 cfs

12.0" Round Pipe
n= 0.013
Length= 192.0' Slope= 0.0064 '/'
Inlet Invert= 77.14', Outlet Invert= 75.92'



Summary for Pond 1P: Treatment Filter

Inflow Area = 0.204 ac, 19.59% Impervious, Inflow Depth > 1.05" for 2-yr event
Inflow = 0.24 cfs @ 12.13 hrs, Volume= 0.018 af
Outflow = 0.11 cfs @ 12.41 hrs, Volume= 0.014 af, Atten= 52%, Lag= 17.1 min
Primary = 0.02 cfs @ 12.41 hrs, Volume= 0.011 af
Secondary = 0.10 cfs @ 12.41 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 79.26' @ 12.41 hrs Surf.Area= 940 sf Storage= 278 cf

Plug-Flow detention time= 141.4 min calculated for 0.014 af (81% of inflow)
Center-of-Mass det. time= 89.0 min (903.2 - 814.2)

Volume	Invert	Avail.Storage	Storage Description
#1	78.83'	521 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	77.83'	81 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 271 cf Overall x 30.0% Voids
#3	77.17'	54 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 179 cf Overall x 30.0% Voids
		656 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.83	271	0	0
80.00	619	521	521

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.83	271	0	0
78.83	271	271	271

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.17	271	0	0
77.83	271	179	179

Device	Routing	Invert	Outlet Devices
#1	Primary	77.17'	**0.750 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Secondary	79.23'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 12.41 hrs HW=79.26' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.09 cfs @ 12.41 hrs HW=79.26' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 0.09 cfs @ 0.52 fps)

Summary for Pond 2P: CB 1

Inflow Area = 0.501 ac, 47.93% Impervious, Inflow Depth > 1.63" for 2-yr event
Inflow = 0.98 cfs @ 12.10 hrs, Volume= 0.068 af
Outflow = 0.98 cfs @ 12.10 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.10 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.30' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	77.71'	**12.0" Round Culvert** L= 114.7' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 77.71' / 77.14' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.97 cfs @ 12.10 hrs HW=78.30' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.97 cfs @ 2.90 fps)

Summary for Link AP 1: AP 1

Inflow Area = 1.020 ac, 38.95% Impervious, Inflow Depth > 1.35" for 2-yr event
Inflow = 1.37 cfs @ 12.14 hrs, Volume= 0.114 af
Primary = 1.37 cfs @ 12.14 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link AP 2: AP 2

Inflow Area = 0.212 ac, 38.98% Impervious, Inflow Depth > 1.42" for 2-yr event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 0.025 af
Primary = 0.37 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: End of ROW

Runoff = 0.83 cfs @ 12.13 hrs, Volume= 0.062 af, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
8,644	70	Woods, Good, HSG C
5,122	98	Paved parking, HSG C
13,766	80	Weighted Average
8,644		62.79% Pervious Area
5,122		37.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	51	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	70	0.0480	1.10		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.3	121	Total			

Summary for Subcatchment 2S: Florida Ave Treated Area

Runoff = 0.50 cfs @ 12.12 hrs, Volume= 0.036 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
1,740	98	Paved parking, HSG C
3,978	74	>75% Grass cover, Good, HSG C
3,166	70	Woods, Good, HSG C
8,884	77	Weighted Average
7,144		80.41% Pervious Area
1,740		19.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	46	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	96	Total			

Summary for Subcatchment 3S: Florida Ave Upgradient

Runoff = 1.72 cfs @ 12.10 hrs, Volume= 0.121 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
10,450	98	Paved parking, HSG C
11,352	74	>75% Grass cover, Good, HSG C
21,802	86	Weighted Average
11,352		52.07% Pervious Area
10,450		47.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	49	0.0300	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
0.3	22	0.0300	1.18		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.10"
0.8	55	0.0300	1.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
6.9	346	Total			

Summary for Subcatchment 4S: Eastern Side Florida Ave

Runoff = 0.68 cfs @ 12.09 hrs, Volume= 0.047 af, Depth> 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
3,604	98	Paved parking, HSG C
5,642	74	>75% Grass cover, Good, HSG C
9,246	83	Weighted Average
5,642		61.02% Pervious Area
3,604		38.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
1.8	155	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	54	0.0100	0.70		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
4.3	259	Total, Increased to minimum Tc = 6.0 min			

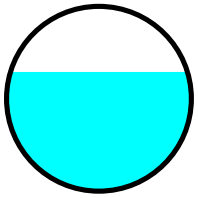
Summary for Reach 1R: Underdrain

Inflow Area = 0.704 ac, 39.72% Impervious, Inflow Depth > 2.59" for 10-yr event
Inflow = 2.20 cfs @ 12.11 hrs, Volume= 0.152 af
Outflow = 2.07 cfs @ 12.14 hrs, Volume= 0.152 af, Atten= 6%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.95 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 2.1 min

Peak Storage= 103 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.84 cfs

12.0" Round Pipe
n= 0.013
Length= 192.0' Slope= 0.0064 '/'
Inlet Invert= 77.14', Outlet Invert= 75.92'



Summary for Pond 1P: Treatment Filter

Inflow Area = 0.204 ac, 19.59% Impervious, Inflow Depth > 2.13" for 10-yr event
Inflow = 0.50 cfs @ 12.12 hrs, Volume= 0.036 af
Outflow = 0.48 cfs @ 12.14 hrs, Volume= 0.031 af, Atten= 3%, Lag= 1.1 min
Primary = 0.02 cfs @ 12.14 hrs, Volume= 0.012 af
Secondary = 0.47 cfs @ 12.14 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 79.31' @ 12.14 hrs Surf.Area= 956 sf Storage= 299 cf

Plug-Flow detention time= 74.1 min calculated for 0.031 af (85% of inflow)
Center-of-Mass det. time= 31.1 min (829.4 - 798.3)

Volume	Invert	Avail.Storage	Storage Description
#1	78.83'	521 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	77.83'	81 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 271 cf Overall x 30.0% Voids
#3	77.17'	54 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 179 cf Overall x 30.0% Voids
		656 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.83	271	0	0
80.00	619	521	521

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.83	271	0	0
78.83	271	271	271

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.17	271	0	0
77.83	271	179	179

Device	Routing	Invert	Outlet Devices
#1	Primary	77.17'	**0.750 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Secondary	79.23'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 12.14 hrs HW=79.31' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.45 cfs @ 12.14 hrs HW=79.31' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 0.45 cfs @ 0.92 fps)

Summary for Pond 2P: CB 1

Inflow Area = 0.501 ac, 47.93% Impervious, Inflow Depth > 2.91" for 10-yr event
Inflow = 1.72 cfs @ 12.10 hrs, Volume= 0.121 af
Outflow = 1.72 cfs @ 12.10 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.0 min
Primary = 1.72 cfs @ 12.10 hrs, Volume= 0.121 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.55' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	77.71'	**12.0" Round Culvert** L= 114.7' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 77.71' / 77.14' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.72 cfs @ 12.10 hrs HW=78.54' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.72 cfs @ 3.32 fps)

Summary for Link AP 1: AP 1

Inflow Area = 1.020 ac, 38.95% Impervious, Inflow Depth > 2.52" for 10-yr event
Inflow = 2.90 cfs @ 12.14 hrs, Volume= 0.214 af
Primary = 2.90 cfs @ 12.14 hrs, Volume= 0.214 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link AP 2: AP 2

Inflow Area = 0.212 ac, 38.98% Impervious, Inflow Depth > 2.64" for 10-yr event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 0.047 af
Primary = 0.68 cfs @ 12.09 hrs, Volume= 0.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1S: End of ROW

Runoff = 1.17 cfs @ 12.13 hrs, Volume= 0.089 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
8,644	70	Woods, Good, HSG C
5,122	98	Paved parking, HSG C
13,766	80	Weighted Average
8,644		62.79% Pervious Area
5,122		37.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	51	0.0600	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	70	0.0480	1.10		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.3	121	Total			

Summary for Subcatchment 2S: Florida Ave Treated Area

Runoff = 0.72 cfs @ 12.12 hrs, Volume= 0.052 af, Depth> 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
1,740	98	Paved parking, HSG C
3,978	74	>75% Grass cover, Good, HSG C
3,166	70	Woods, Good, HSG C
8,884	77	Weighted Average
7,144		80.41% Pervious Area
1,740		19.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	46	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.2	50	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	96	Total			

Summary for Subcatchment 3S: Florida Ave Upgradient

Runoff = 2.32 cfs @ 12.10 hrs, Volume= 0.166 af, Depth> 3.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
10,450	98	Paved parking, HSG C
11,352	74	>75% Grass cover, Good, HSG C
21,802	86	Weighted Average
11,352		52.07% Pervious Area
10,450		47.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	49	0.0300	0.17		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
0.3	22	0.0300	1.18		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.10"
0.8	55	0.0300	1.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
1.0	220	0.0300	3.52		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
6.9	346	Total			

Summary for Subcatchment 4S: Eastern Side Florida Ave

Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.065 af, Depth> 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.80"

Area (sf)	CN	Description
3,604	98	Paved parking, HSG C
5,642	74	>75% Grass cover, Good, HSG C
9,246	83	Weighted Average
5,642		61.02% Pervious Area
3,604		38.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.68		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
1.8	155	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
1.3	54	0.0100	0.70		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
4.3	259	Total, Increased to minimum Tc = 6.0 min			

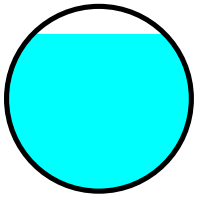
Summary for Reach 1R: Underdrain

Inflow Area = 0.704 ac, 39.72% Impervious, Inflow Depth > 3.62" for 25-yr event
Inflow = 2.99 cfs @ 12.11 hrs, Volume= 0.212 af
Outflow = 2.87 cfs @ 12.13 hrs, Volume= 0.212 af, Atten= 4%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.12 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 2.0 min

Peak Storage= 137 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.84 cfs

12.0" Round Pipe
n= 0.013
Length= 192.0' Slope= 0.0064 '/'
Inlet Invert= 77.14', Outlet Invert= 75.92'



Summary for Pond 1P: Treatment Filter

Inflow Area = 0.204 ac, 19.59% Impervious, Inflow Depth > 3.08" for 25-yr event
Inflow = 0.72 cfs @ 12.12 hrs, Volume= 0.052 af
Outflow = 0.70 cfs @ 12.13 hrs, Volume= 0.047 af, Atten= 3%, Lag= 0.8 min
Primary = 0.02 cfs @ 12.13 hrs, Volume= 0.013 af
Secondary = 0.68 cfs @ 12.13 hrs, Volume= 0.034 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 79.33' @ 12.13 hrs Surf.Area= 963 sf Storage= 309 cf

Plug-Flow detention time= 52.9 min calculated for 0.046 af (88% of inflow)
Center-of-Mass det. time= 18.1 min (808.0 - 789.9)

Volume	Invert	Avail.Storage	Storage Description
#1	78.83'	521 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	77.83'	81 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 271 cf Overall x 30.0% Voids
#3	77.17'	54 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 179 cf Overall x 30.0% Voids
		656 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.83	271	0	0
80.00	619	521	521

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.83	271	0	0
78.83	271	271	271

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.17	271	0	0
77.83	271	179	179

Device	Routing	Invert	Outlet Devices
#1	Primary	77.17'	**0.750 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Secondary	79.23'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 12.13 hrs HW=79.33' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.66 cfs @ 12.13 hrs HW=79.33' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 0.66 cfs @ 1.04 fps)

Summary for Pond 2P: CB 1

Inflow Area = 0.501 ac, 47.93% Impervious, Inflow Depth > 3.98" for 25-yr event
Inflow = 2.32 cfs @ 12.10 hrs, Volume= 0.166 af
Outflow = 2.32 cfs @ 12.10 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min
Primary = 2.32 cfs @ 12.10 hrs, Volume= 0.166 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 78.75' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	77.71'	**12.0" Round Culvert** L= 114.7' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 77.71' / 77.14' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.32 cfs @ 12.10 hrs HW=78.75' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.32 cfs @ 3.53 fps)

Summary for Link AP 1: AP 1

Inflow Area = 1.020 ac, 38.95% Impervious, Inflow Depth > 3.54" for 25-yr event
Inflow = 4.04 cfs @ 12.13 hrs, Volume= 0.301 af
Primary = 4.04 cfs @ 12.13 hrs, Volume= 0.301 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link AP 2: AP 2

Inflow Area = 0.212 ac, 38.98% Impervious, Inflow Depth > 3.67" for 25-yr event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 0.065 af
Primary = 0.94 cfs @ 12.09 hrs, Volume= 0.065 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Appendix C:

Stormwater BMP Treatment Calculations

WALSH
ENGINEERING ASSOCIATES, INC.

TABLE T-1
Impervious Area Analysis
Florida Avenue Extension
Florida Avenue, Portland, Maine
February 16, 2018

Material	Existing Conditions	Proposed Conditions	Net Change
Gravel (s.f.)	4,628	939	-3,689
Pavement (s.f.)	211	6,220	6,009
Total Impevious (s.f.)	4,839	7,159	**2,320**
Impervious Area Treated		**1,740**	75%

Stormwater BMP Sizing Calculations:

Grassed Underdrain Soil Filter
Net Impervious Area: 2320 sf
Upgradient Veg Area: 7142 sf

Required Treatment Vol: (2,320 sf)(75%)(.08333 ft) + (7142 sf)(50%)(.0333 ft) = 264 cf
Treatment Vol Provided: 267 cf; **OK**

Required Filter Area: (2,320 sf)(75%)(5%)+(7,142 sf)(50%)(2%) = 158 sf
Filter Area Provided: 271 sf; **OK**

Stage-Area-Storage for Pond 1P: Treatment Filter (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
78.23	542	86	78.76	542	129
78.24	542	87	78.77	542	130
78.25	542	88	78.78	542	131
78.26	542	89	78.79	542	132
78.27	542	89	78.80	542	133
78.28	542	90	78.81	542	133
78.29	542	91	78.82	542	134
78.30	542	92	78.83	813	135
78.31	542	93	78.84	816	138
78.32	542	93	78.85	819	140
78.33	542	94	78.86	822	143
78.34	542	95	78.87	825	146
78.35	542	96	78.88	828	149
78.36	542	97	78.89	831	152
78.37	542	98	78.90	834	155
78.38	542	98	78.91	837	158
78.39	542	99	78.92	840	161
78.40	542	100	78.93	843	164
78.41	542	101	78.94	846	167
78.42	542	102	78.95	849	170
78.43	542	102	78.96	852	173
78.44	542	103	78.97	855	176
78.45	542	104	78.98	858	179
78.46	542	105	78.99	861	182
78.47	542	106	79.00	864	185
78.48	542	107	79.01	867	189
78.49	542	107	79.02	870	192
78.50	542	108	79.03	872	195
78.51	542	109	79.04	875	198
78.52	542	110	79.05	878	202
78.53	542	111	79.06	881	205
78.54	542	111	79.07	884	209
78.55	542	112	79.08	887	212
78.56	542	113	79.09	890	215
78.57	542	114	79.10	893	219
78.58	542	115	79.11	896	222
78.59	542	115	79.12	899	226
78.60	542	116	79.13	902	230
78.61	542	117	79.14	905	233
78.62	542	118	79.15	908	237
78.63	542	119	79.16	911	241
78.64	542	120	79.17	914	244
78.65	542	120	79.18	917	248
78.66	542	121	79.19	920	252
78.67	542	122	79.20	923	256
78.68	542	123	79.21	926	259
78.69	542	124	79.22	929	263
78.70	542	124	79.23	932	267
78.71	542	125	79.24	935	271
78.72	542	126	79.25	938	275
78.73	542	127	79.26	941	279
78.74	542	128	79.27	944	283
78.75	542	128	79.28	947	287

Summary for Pond 1P: Treatment Filter

Inflow Area = 0.204 ac, 19.59% Impervious, Inflow Depth > 3.08" for 25-yr event
Inflow = 0.72 cfs @ 12.12 hrs, Volume= 0.052 af
Outflow = 0.71 cfs @ 12.17 hrs, Volume= 0.040 af, Atten= 1%, Lag= 3.0 min
Primary = 0.02 cfs @ 12.17 hrs, Volume= 0.015 af
Secondary = 0.69 cfs @ 12.17 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 79.94' @ 12.17 hrs Surf.Area= 1,142 sf Storage= 616 cf

Plug-Flow detention time= 94.5 min calculated for 0.040 af (77% of inflow)
Center-of-Mass det. time= 37.3 min (827.2 - 789.9)

Volume	Invert	Avail.Storage	Storage Description
#1	78.83'	521 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	77.83'	81 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 271 cf Overall x 30.0% Voids
#3	77.17'	54 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 179 cf Overall x 30.0% Voids
		656 cf	Total Available Storage

Bottom Area of Soil Filter

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.83	271	0	0
80.00	619	521	521

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.83	271	0	0
78.83	271	271	271

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.17	271	0	0
77.83	271	179	179

Device	Routing	Invert	Outlet Devices
#1	Primary	77.17'	**0.750 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Secondary	79.83'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.02 cfs @ 12.17 hrs HW=79.93' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.62 cfs @ 12.17 hrs HW=79.93' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 0.62 cfs @ 1.02 fps)

Appendix D:
Inspection and Maintenance Plan

Inspection and Maintenance Plan
For Stormwater Management Facilities

Florida Avenue Extension
Florida Avenue
Portland, Maine

March 2018

Stormwater management facilities include paved surfaces, an underdrained soil filter, and stormwater conveyance. The maintenance of all stormwater management facilities, the establishment of any contract services required to implement the program, and the keeping of records and maintenance log book will be the responsibility of Robert and Christine Rodney and Kelsey Grover (Applicants) until the road is accepted by the City of Portland, after which, it will be the City of Portland's responsibility.

At a minimum, the following maintenance activities for each stormwater management system shall be performed by a qualified post-construction stormwater inspector on a prescribed schedule.

City of Portland Yearly Reporting Requirements

- **Inspections:** The owner or operator of a BMP shall hire a qualified post-construction stormwater inspector to at least annually, inspect the BMPs, including but not limited to any parking areas, catch basins, drainage swales, detention basins and ponds, pipes and related structures, in accordance with all municipal and state inspection, cleaning and maintenance requirements of the approved post-construction stormwater management plan

- **Maintenance and Repair:** If the BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator of the BMP shall take corrective action(s) 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 action(s) to the department of public works ("DPW") in the annual report.

- **Annual Report:** 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 DPW in a form provided by DPW, 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.

- **Filing Fee:** Any persons required to file and annual certification under this section shall include with the annual certification a filing fee established by DPW to pay the administrative and technical costs of review of the annual certification.

- **Right of Entry:** In order to determine compliance with this article and with the post-construction stormwater management plan, DPW may enter upon property at reasonable ours with the consent of the owner, occupant or agent to inspect the BMPs.

General Inspection and Maintenance Activities

Paved Surfaces

Accumulations of winter sand along paved surfaces shall be cleared at least once a year, preferably in the spring, and periodically during the year on an as-needed basis, to minimize transportation of sediment during rainfall events. Accumulations on pavement may be removed by pavement sweeping or vacuuming. 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.

Ditches and Swales

Open swales and ditches shall be inspected twice per year (in spring and fall) to assure that debris and/or sediments do not reduce the effectiveness of the system. Debris and sediments shall be removed at that time. Any sign of erosion or blockage shall be immediately repaired to assure a vigorous growth of vegetation for the stability of the ditches and slopes proper function. Maintenance shall include, but not be limited to, mowing, trimming and removal of vegetation in the ditches and slopes as required in order to prevent vegetation from blocking or diverting storm flows, replacement of riprap channel lining to prevent scour of the channel invert, removing vegetation and debris from the culverts.

Vegetated ditches should be mowed at least monthly during the growing season. Larger brush or trees must not be allowed to become established in the channel. Any areas where the vegetation fails will be subject to erosion and should be reseeded and mulched immediately.

Underdrained Soil Filters

Mowing and removal of woody growth – underdrained soil filters are designed to grow water tolerant plantings and mowing is not required in the interior of the structure. However, the external and top slopes of earthen embankments will be mowed up to three times per growing season to control over growth.

Outlet inspection and cleaning – The soil filter outlet consists of a layer of planting loam and sand with a stone and perforated pipe underdrain. Influx of sediments will be limited by sumps on all upstream catch basin structures and vegetated swales. Outlet inspections shall include flushing of the underdrain through the cleanouts at the end of the pipes. Trash, sediment, and debris shall be removed from the vicinity of the outlet and disposed of at a

licensed off-site facility. The basin shall be inspected bi-annually for evidence of excessive retention or rapid release of flow.

If the filter fails to drain within 72 hours, the surface of the pond shall be rototilled to promote aeration of the filter media and vegetation shall be re-established. If aeration of the surface soil fails to promote filtration of impounded water within 72 hours, then the filter media shall be replaced as necessary. The stone underdrain shall also be replaced at this time, along with the perforated pipe.

If the filter drains too rapidly, (i.e. prior to 24 hours), then an adjustable orifice shall be installed on the underdrain outlet pipe. The orifice shall be adjusted such that the filter completely drains within 24 to 72 hours.

Underdrained soil filters shall not be used for snow storage area.

Vehicular equipment used to maintain or rehabilitate underdrained soil filters should work from the basin perimeter and not enter the basin area, as this will compact the soil surface and reduce the design infiltration rate.

Storm Drainage Pipes

Piped drainage systems shall be inspected on an annual basis to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the pipe inlet and outlet. Sediment should be removed when its level exceeds 20% of the pipe diameter. This may be accomplished by hydraulic flushing or any mechanical means; however, care should be taken to contain the sediment at the pipe outlet, and not flush the sediments into the stormwater filter or wetland areas.

Riprap aprons where stone is displaced should be replaced and chinked to assure stability. With time, additional riprap may be added. Vegetation growing through riprap should be removed on an annual basis.

Disposal

Any sediment or debris removed during maintenance of the stormwater system must be disposed of in accordance with the Maine Solid Waste Disposal Rules.

Recordkeeping

The Applicants will keep a written maintenance log that summarizes inspections, maintenance, and any corrective actions taken. The log shall include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediment or debris, the location where the sediment or debris was disposed after removal will be indicated. This log shall be made available to the City of Portland upon request.

Sample Inspection Report:

Florida Avenue Extension
Florida Avenue, Portland, Maine

STORMWATER FACILITIES INSPECTION REPORT

NAME: _____ SIGNATURE: _____

TITLE: _____ COMPANY: _____

DATE: _____ WEATHER: _____

OBSERVATIONS:

BMP	Defects	Location(s)	Repair/Action Needed	Date/Action taken
Ditches/ Swales	Yes/no			
Paved Areas	Yes/no			
Stormdrain Pipes	Yes/no			
Riprap Aprons	Yes/no			
Undrained Soil Filter	Yes/no			

DRAFT
STORMWATER DRAINAGE SYSTEM MAINTENANCE AGREEMENT AND RELEASE FROM LIABILITY

IN CONSIDERATION OF Level I Site Alteration Permit approval granted by the Planning Board of the City of Portland to a plan entitled Plan and Profile, Florida Avenue Extension, prepared for Robert & Christine Rodney & Kelsey Grover, by Walsh Engineering Associates Inc. dated _____ recorded in the Cumberland County Registry of Deeds in Plan Book _____, Page _____ (the "Plan") and pursuant to a condition thereof, Robert and Christine Rodney of 121 Walton Street, Portland, Maine and Kelsey Grover of 271 Bath Road, Wiscasset, Maine, the owners of the subject premises, does hereby agree, for itself, its successors and assigns (the "Owners"), as follows:

Maintenance Agreement

That it will, at its own cost and expense and at all times and in perpetuity, maintain in good repair and in proper working order the stormwater drainage system, as shown on said plan, including but not limited to the underdrained soil filter in strict compliance with the Maintenance of Facilities as described in Inspection and Maintenance Plan for Stormwater Management Facilities for Florida Avenue Extension, Florida Avenue, Portland, Maine dated _____ and Chapter 32 of the Portland City Code. Owner of the subject premises further agrees to keep a Stormwater Maintenance Log that will be made available for inspection by the City of Portland upon reasonable notice and request.

This Agreement is for the benefit of the said City of Portland and all persons in lawful possession of the property; further, that the said City of Portland may enforce this Agreement by an action at law or in equity in any court of competent jurisdiction; further, that after giving the Owner written notice as described in this Agreement, and a stated time to perform, that the said City of Portland, by its authorized agents or representatives, may, but is not obligated to (and in fact any and all maintenance shall be performed by the applicant and/or owner), enter upon the property in question to maintain, repair, or replace said stormwater drainage system, including but not limited to the underdrained soil filter thereon in the event of any failure or neglect thereof, the cost and expense thereof to be reimbursed in full to the said City of Portland by the Owner upon written demand. Any funds owed to the City under this paragraph shall be secured by a lien on the property.

This Agreement shall bind the undersigned only so long as it retains any interest in said premises, and shall run with the land and be binding upon the Owner's successors and assigns as their interests may from time to time appear. The Owner agrees to provide a copy of this Agreement to any successor or assign and to forward to the City an Addendum signed by any successor or assign in which the successor or assign states that the successor or assign has read the Agreement, agrees to all its terms and conditions.

For the purpose of this Agreement the real estate shown by chart, block and lot number in the records on file in the City Assessor's office shall constitute "the property" that may be entered by the City and liened if the City is not paid all of its costs and charges following the mailing of a written demand for payment to the Owner pursuant to the process and with the same force and effect as that established by 36 M.R.S.A. §§ 942 and 943 for real estate tax liens.

Any written notices or demands required by this Agreement shall be complete on the date the notice is mailed to the owner of record as shown on the tax roles on file in the City Assessor's Office. If the property has more than one owner on said tax rolls, service shall be complete by mailing it to only the first listed owner. The failure to receive any written notice required by this Agreement shall not prevent the City from entering the property and performing maintenance or repairs on the stormwater system, or any component thereof, or liening it or create a cause of action against the City.

Dated at Portland, Maine this _____ day of _____, 20___.

_____
By: _____
Its: _____

STATE OF MAINE
CUMBERLAND, ss. Date: _____

Personally appeared the above-named _____, and acknowledged the foregoing instrument to be his/his free act and deed in his/her said capacity, and the free act and deed of said _____.

Before me,

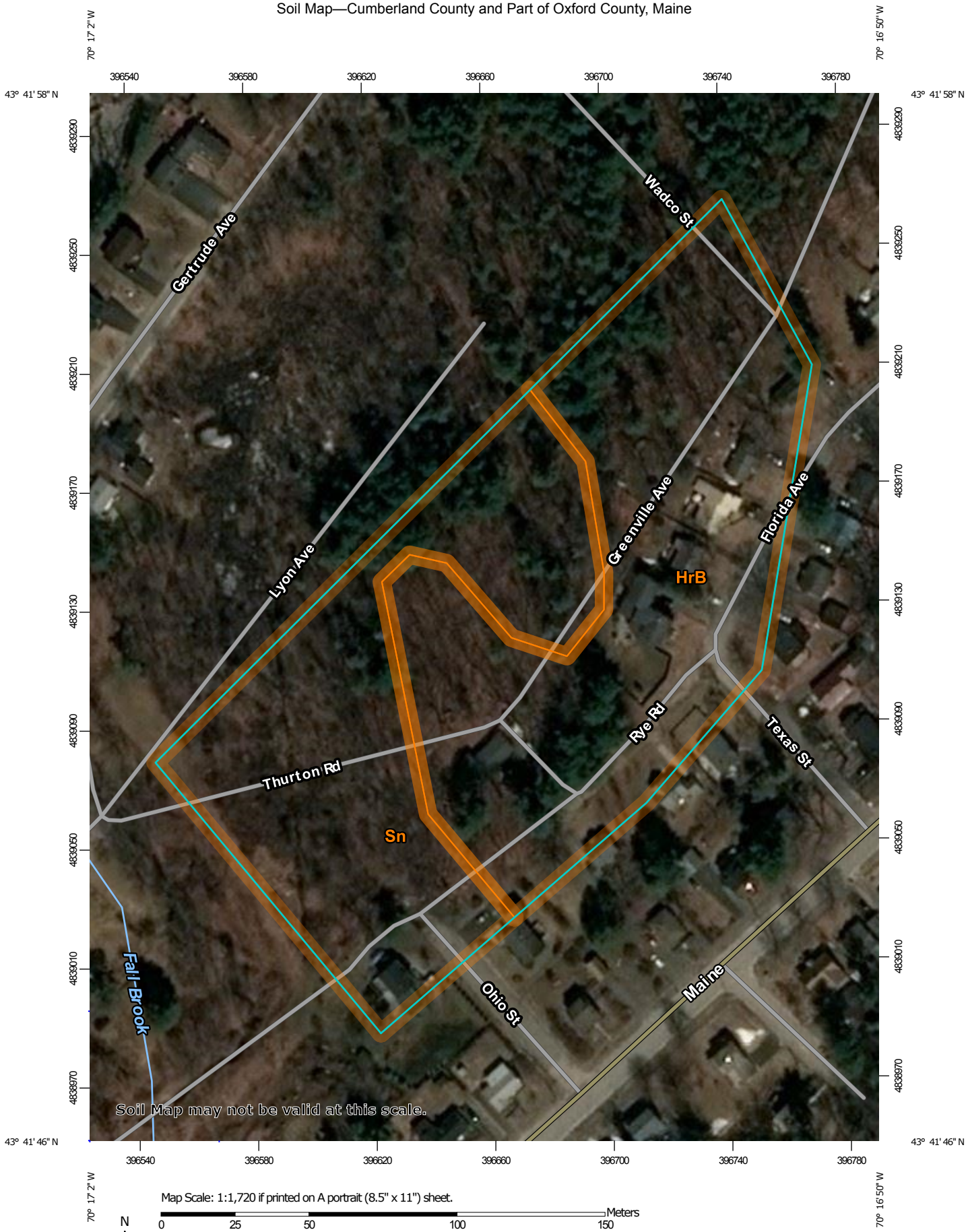
_____
Notary Public/Attorney at Law

Print name: _____

Appendix E:

USDA NRCS Web Soil Survey Map

Soil Map—Cumberland County and Part of Oxford County, Maine



Map Scale: 1:1,720 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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:
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 13, Sep 11, 2017

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

Date(s) aerial images were photographed: Data not available.

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HrB	Lyman-Tunbridge complex, 0 to 8 percent slopes, rocky	4.2	57.1%
Sn	Scantic silt loam, 0 to 3 percent slopes	3.1	42.9%
Totals for Area of Interest		**7.3**	**100.0%**

Appendix F:

Drainage Plans

D1.0: Pre Development Drainage Plan
D2.0: Post Development Drainage Plan