STORMWATER MANAGEMENT REPORT

ROOSEVELT TRAIL SELF-STORAGE
WINDHAM, MAINE

A. Narrative

Keith Harnum is proposing to develop a 1.4-acre parcel off Roosevelt Trail in Windham. The proposed project intends to construct three (3) buildings totaling 18,000 square feet of building footprint, as well as associated paved driveway and access, utilities and stormwater management facilities. The property is located within the Commercial-3 Zoning District and abuts the Dollar General retail store to the north of the project site. Access to the property will be from the existing driveway that runs along the southeast property line, which is located within an existing 50-foot private right-of-way.

As mentioned above, the development will consist of three (3) structures, access and driveways totaling 25,231 square feet of pavement, utilities and stormwater infrastructure. The project includes a filter basin to provide water quality treatment and stormwater management. The facility is not proposed to include an office so a septic system will not be needed. We have conducted preliminary soils investigations to show that the soils in the southeast corner can accommodate a septic system in the future, if necessary.

The existing property consists of existing lawn area and, in general, the project site and its entire tributary watershed drains in an east to west direction. The westerly sub-basin watershed drains to an existing drainage swale along the west side of Roosevelt Trail, while the easterly sub-basin watershed drains to an existing drain culvert located on the Dollar General project site which then outlets into the existing drainage swale along the west side of Roosevelt Trail. Once stormwater reaches the existing drainage channel, stormwater is then conveyed to the north in the drainage channel to an existing culvert that discharges on the west side of Roosevelt Trail, where it is then conveyed in the Black Brook then into the Presumpscot River.

B. Alterations to Land Cover

The property was previously developed but that development has been removed, and the site exists as lawn. The proposed project will result in new paved surfaces equal to 25,231 square feet in area, as well as 18,000 square feet of building footprint. The project will all consider the site work within the developed area as new landscaped area, and consists of 22,499 square feet.

The site is fairly uniform in slope. Areas of the site are relatively flat (1-5%) with the flatter slopes in the vicinity of the project's Roosevelt Trail frontage. The steepest portion of the site, 4-5% slopes are located at the southeasterly property corner.

The onsite soils as identified on the Medium Intensity Soil Maps for Cumberland County, Maine published by the Natural Resources Conservation Service are listed in Table 1, on the following page, and included as on the enclosed Soils Map identified as Attachment 1 of this report.

Table 1 – Onsite Soils		
Map Unit Symbol	Soil Name	Hydrologic Soils Group
BgB	Belgrade Very Fine Sandy Loam	B
PbB	Paxton Fine Sandy Loam	C
PbC	Paxton Fine Sandy Loam	C
Sn	Scantic Silt Loam	D

C. Methodology and Modeling Assumptions

The proposed stormwater management system has been designed utilizing Best Management Practices (BMPs) to maintain existing drainage patterns while providing stormwater quality improvement measures. The goal of the storm drainage design is to remove potential pollutants while promoting infiltration and filtration of runoff generated by the development. The method utilized to predict the surface water runoff rates in this analysis is a computer program entitled HydroCAD, which is based on the same methods that were originally developed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, and utilized in the TR-20 modeling program. Peak rates of runoff are forecasted based upon land use, hydrologic soil conditions, vegetative cover, contributing watershed area, time of concentration, rainfall data, storage volumes of detention basins and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains and constructed stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2-, 10- and 25 years was obtained from Appendix H of the MDEP, Chapter 500 Stormwater Management, last revised in 2015. The National Weather Service developed four synthetic storm types to simulate rainfall patterns around the country. For analysis in Cumberland County, Maine, the type III rainfall pattern with a 24-hour duration is appropriate.

D. Basic Standards

The project is required by the Town and the Maine Department of Environmental Protection (MDEP) to provide permanent and temporary Erosion Control Best Management Practices. These methods are outlined in detail in the plan set.

E. General Standard

Since the proposed roadway will generate less than 1 acre of new impervious surface and less than 5 acres of total developed area, a Chapter 500 Stormwater Permit from the Maine Department of Environmental Protection (MDEP) will not be required. Although the State of Maine doesn't require stormwater treatment under the Stormwater Permit, the Windham Land Use Ordinance still requires that projects requiring Subdivision Review shall comply with Section 4B-General Standards of the MDEP Chapter 500 Stormwater Management. This document outlines the requirement of the project to provide stormwater quality treatment for no less than 95% of the new impervious surface and 80% of the total new developed area associated with the project.

The water quality requirements will be met with the utilization of one (1) underdrain filter basin. The underdrain filter basin (FB-1) will capture and treat of the majority of the proposed project site, as well as a significant portion of offsite developed (lawn) area. As a result of the proposed stormwater infrastructure, the project provides water quality treatment for 97% of the site's new impervious surfaces and 96% of the new developed areas. Calculations can be found on the Treatment Plan and included as Attachment 2 of this report.

F. Flooding Standards

The Windham Land Use Ordinance requires that projects requiring Subdivision Review shall comply with Section 4E-Flooding Standards of the MDEP Chapter 500 Stormwater Management. The Town of Windham Land Use Ordinance requires the project to detain, retain or result in the infiltration of stormwater from the 24-hour storms of the 2-year, 10-year and 25-year frequencies such that the peak flows of stormwater from the project site do not exceed the peak flows of stormwater prior to undertaking the project. To maintain these rates, one (1) underdrained filter basin has been proposed as part of the stormwater infrastructure.

The proposed project design has been modeled to evaluate and analyze the stormwater runoff characteristics of the site prior to construction of the project and upon completion of all proposed construction activities. The first study point (SP-1) is located along the northerly watershed (and property limit) of watershed 1 in the pre-developed condition and watershed 10 in the developed condition at the inlet to an existing culvert located on the Dollar General, abutter to the north of the project site, and conveys captured stormwater to the drainage basin located on the Dollar General site, which discharges to the drainage channel in Roosevelt Trail.

Study point 2 (SP-2) is located along the westerly property limits at the drainage channel for Roosevelt Trail. The sub-basin watershed tributary to SP-2 consists of the area associated with proposed project site. Prior to discharging from the site, stormwater runoff will be collected and treated in underdrained filter basin (FB-1). Stormwater runoff tributary to SP-2 is conveyed via the outlet control structure's culvert and into the existing drainage channel in Roosevelt Trail.

Stormwater runoff tributary to SP-1 and SP-1, after being discharged into the existing drainage channel in Roosevelt Trail, is conveyed in the channel to the north to a culvert crossing under Roosevelt Trail. Discharge from the culvert is then tributary to the Black Brook and conveyed ultimately into the Presumpscot River.

The following table summarizes the analysis prepared for this stormwater management report:

Table 1 – Peak Rates of Stormwater Runoff

Study Point	2-Year (cfs)		10-Year (cfs)		25-Year (cfs)	
	Pre	Post	Pre	Post	Pre	Post
SP-1	1.25	1.09	2.88	2.25	4.37	3.27
SP-2	1.15	1.00	2.24	1.59	3.16	2.98

As illustrated by the table above, the proposed BMP's as incorporated in the project's storm water design, effectively reduces the peak at all study points.

The watershed maps showing pre-development and post-development drainage patterns are included in the plan set and the computations performed with the HydroCAD software program are included as Attachment 3 of this report.

G. Maintenance of common facilities or property

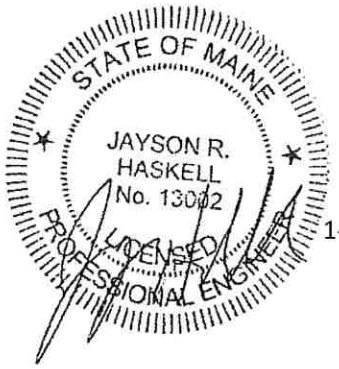
The homeowner's association will be responsible for the maintenance of the stormwater facilities. Enclosed is an Inspection, Maintenance and Housekeeping Plan for the project.

Prepared by:

DM ROMA CONSULTING ENGINEERS

Jason R. Haskell

Jayson R. Haskell, P.E.
Southern Maine Regional Manager



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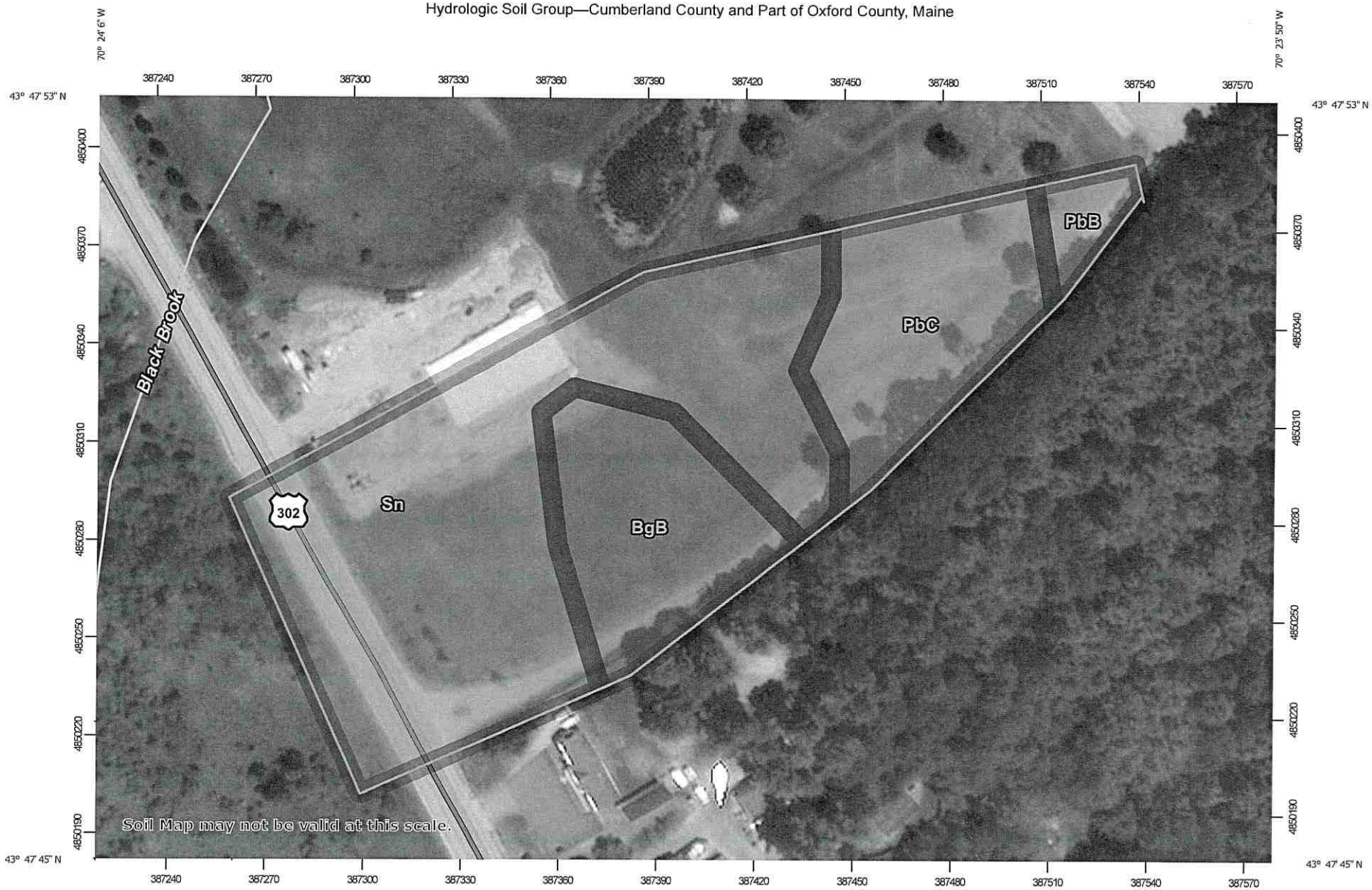
ATTACHMENT 1

SOILS MAP



Map Scale: 1:1,650 if printed on A landscape (11" x 8.5") sheet.

N

0 20 40 80 120 Meters

0 50 100 200 300 Feet

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 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:
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 15, Sep 6, 2018

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

Date(s) aerial images were photographed: Sep 5, 2013—Oct 22, 2017

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BgB	Belgrade very fine sandy loam, 0 to 8 percent slopes	B	1.1	18.0%
PbB	Paxton fine sandy loam, 3 to 8 percent slopes	C	0.2	3.3%
PbC	Paxton fine sandy loam, 8 to 15 percent slopes	C	1.1	19.1%
Sn	Scantic silt loam, 0 to 3 percent slopes	D	3.5	59.6%
Totals for Area of Interest			**5.8**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 2

STORMWATER TREATMENT CALCULATIONS

Stormwater Treatment Table

Self-Storage Facility

	Total Watershed Area (SF)	New Driveway and Road Impervious Area (SF)	New Building Area (SF)	New Landscaped Area (SF)	Existing/Offsite Impervious Area (SF)**	Existing/Offsite Landscaped Area (SF)**	Existing Undeveloped Area (SF)	Treatment Provided	New Impervious Area Treated In Treatment Device (SF)	New Landscaped Area Treated In Treatment Device (SF)	Treatment Device
WS-10	57,743	1,222	0	1,706	0	54,815	0	No	0	0	None
WS-11	62,802	24,009	18,000	20,793	0	0	0	YES	42,009	20,793	FB-1
Total		**25,231**	**18,000**	**22,499**					**42,009**	**20,793**	

** The project is not taking credit for the Existing or Offsite impervious and landscaped areas, but are included in the BMP sizing calculations for each treatment device.

New Impervious Area = 43,231 sf
Impervious Area Requiring Treatment (95%) = 41,069 sf
Impervious Area Treatment Provided = 42,009 sf
97% New Impervious Area Treated

New Developed Area = 65,730 sf
Developed Area Requiring Treatment (80%) = 52,584 sf
Developed Area Treatment Provided = 62,802 sf
96% New Developed Area Treated

Filter Basin FB-1

Tributary Impervious Area=	42,009 sf	(WS-11 Impervious Area)
Tributary Landscaped Area=	20,793 sf	(WS-11 Landscaped Area)

Water Quality Volume (WQV) Calculation

WQV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

WQV (Required) = 4,194 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
231	2,837	0
233	6,405	9,838

Outlet Elevation = 232.07

Storage Volume Provided = 4,203 cf > Required

Filter Bottom Calculation

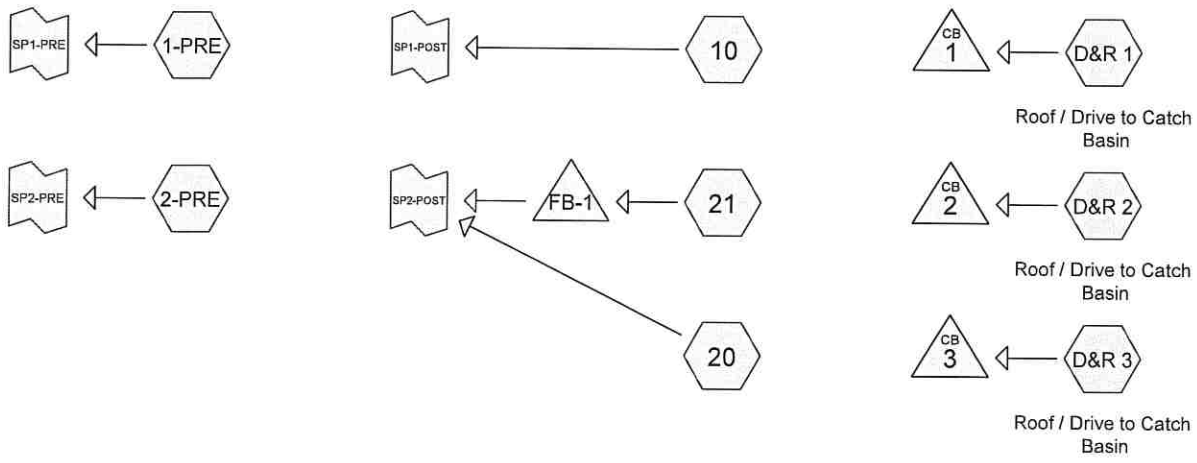
Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 2,516 sf

Filter Area Provided = 2,837 sf > Required

ATTACHMENT 3

HYDROCAD OUTPUT



Subcat Reach Pond Link

Routing Diagram for 18050-PRE&POST
Prepared by DM Roma Consulting Engineers, Printed 1/22/2019

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

Subcatchment1-PRE: Runoff Area=80,526 sf 0.00% Impervious Runoff Depth=0.88"
Flow Length=551' Tc=16.0 min CN=WQ Runoff=1.25 cfs 5,922 cf

Subcatchment2-PRE: Runoff Area=49,149 sf 7.38% Impervious Runoff Depth=1.31"
Flow Length=407' Tc=18.4 min CN=WQ Runoff=1.15 cfs 5,381 cf

Subcatchment10: Runoff Area=52,065 sf 2.35% Impervious Runoff Depth=1.13"
Flow Length=644' Tc=16.4 min CN=WQ Runoff=1.09 cfs 4,895 cf

Subcatchment20: Runoff Area=16,031 sf 30.26% Impervious Runoff Depth=1.78"
Flow Length=354' Tc=6.0 min CN=WQ Runoff=0.71 cfs 2,377 cf

Subcatchment21: Runoff Area=62,802 sf 66.89% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=WQ Runoff=3.42 cfs 11,980 cf

SubcatchmentD&R 1: Roof / Drive to Runoff Area=8,100 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=WQ Runoff=0.55 cfs 1,936 cf

SubcatchmentD&R 2: Roof / Drive to Runoff Area=9,900 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=WQ Runoff=0.67 cfs 2,366 cf

SubcatchmentD&R 3: Roof / Drive to Runoff Area=9,000 sf 100.00% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=WQ Runoff=0.61 cfs 2,151 cf

Total Runoff Area = 287,573 sf Runoff Volume = 37,008 cf Average Runoff Depth = 1.54"
72.63% Pervious = 208,862 sf 27.37% Impervious = 78,711 sf

Summary for Subcatchment 1-PRE:

Runoff = 1.25 cfs @ 12.25 hrs, Volume= 5,922 cf, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
30,023	61	>75% Grass cover, Good, HSG B
22,647	74	>75% Grass cover, Good, HSG C
27,856	80	>75% Grass cover, Good, HSG D
80,526		Weighted Average
80,526		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	150	0.0502	0.18		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.7	205	0.1051	5.22		**Shallow Concentrated Flow, Seg B to C** Unpaved Kv= 16.1 fps
0.9	160	0.0313	2.85		**Shallow Concentrated Flow, Seg C to D** Unpaved Kv= 16.1 fps
0.5	36	0.0053	1.17		**Shallow Concentrated Flow, Seg D to E** Unpaved Kv= 16.1 fps
16.0	551	Total			

Summary for Subcatchment 2-PRE:

Runoff = 1.15 cfs @ 12.26 hrs, Volume= 5,381 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	6,700	61	>75% Grass cover, Good, HSG B
	33,318	80	>75% Grass cover, Good, HSG D
	5,502	80	>75% Grass cover, Good, HSG D
*	3,629	98	Paved roads
	49,149		Weighted Average
	45,520		92.62% Pervious Area
	3,629		7.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.9	150	0.0307	0.15		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
1.1	130	0.0159	2.03		**Shallow Concentrated Flow, Seg B to C** Unpaved Kv= 16.1 fps
0.4	127	0.0142	4.96	79.33	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=2.00' Z= 4.0 '/' Top.W=16.00' n= 0.035 Earth, dense weeds

18.4	407	Total

Summary for Subcatchment 10:

Runoff = 1.09 cfs @ 12.24 hrs, Volume= 4,895 cf, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
4,508	61	>75% Grass cover, Good, HSG B
22,647	74	>75% Grass cover, Good, HSG C
23,688	80	>75% Grass cover, Good, HSG D
1,222	98	Unconnected pavement, HSG B
52,065		Weighted Average
50,843		97.65% Pervious Area
1,222		2.35% Impervious Area
1,222		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	150	0.0502	0.18		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
0.7	205	0.1051	5.22		**Shallow Concentrated Flow, Seg B to C** Unpaved Kv= 16.1 fps
0.8	132	0.0314	2.85		**Shallow Concentrated Flow, Seg C to D** Unpaved Kv= 16.1 fps
1.0	157	0.0053	2.69	18.83	**Trap/Vee/Rect Channel Flow, Seg D to E** Bot.W=0.00' D=1.00' Z= 12.0 & 2.0 '/' Top.W=14.00' n= 0.025 Earth, clean & winding
16.4	644	Total			

Summary for Subcatchment 20:

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 2,377 cf, Depth= 1.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	228	61	>75% Grass cover, Good, HSG B
	5,450	80	>75% Grass cover, Good, HSG D
	5,502	80	>75% Grass cover, Good, HSG D
	1,222	98	Unconnected pavement, HSG B
*	3,629	98	Paved roads
	16,031		Weighted Average
	11,180		69.74% Pervious Area
	4,851		30.26% Impervious Area
	1,222		25.19% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	18	0.0733	0.14		**Sheet Flow, Seg A to B** Grass: Dense n= 0.240 P2= 3.10"
1.0	167	0.0198	2.73	4.78	**Trap/Vee/Rect Channel Flow, Seg B to C** Bot.W=0.00' D=0.50' Z= 12.0 & 2.0 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
0.6	169	0.0139	4.91	78.49	**Trap/Vee/Rect Channel Flow, Seg C to D** Bot.W=0.00' D=2.00' Z= 4.0 '/' Top.W=16.00' n= 0.035 Earth, dense weeds
3.8	354	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 21:

Runoff = 3.42 cfs @ 12.09 hrs, Volume= 11,980 cf, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
	3	61	>75% Grass cover, Good, HSG B
	12,095	74	>75% Grass cover, Good, HSG C
	8,695	80	>75% Grass cover, Good, HSG D
*	24,009	98	Paved parking,
*	18,000	98	Roofs,
	62,802		Weighted Average
	20,793		33.11% Pervious Area
	42,009		66.89% Impervious Area

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

Summary for Subcatchment D&R 1: Roof / Drive to Catch Basin

Runoff = 0.55 cfs @ 12.09 hrs, Volume= 1,936 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
3,600	98	Paved parking, HSG A
4,500	98	Roofs, HSG A
8,100		Weighted Average
8,100		100.00% Impervious Area

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

Summary for Subcatchment D&R 2: Roof / Drive to Catch Basin

Runoff = 0.67 cfs @ 12.09 hrs, Volume= 2,366 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
3,600	98	Paved parking, HSG A
6,300	98	Roofs, HSG A
9,900		Weighted Average
9,900		100.00% Impervious Area

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

Summary for Subcatchment D&R 3: Roof / Drive to Catch Basin

Runoff = 0.61 cfs @ 12.09 hrs, Volume= 2,151 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
3,600	98	Paved parking, HSG A
5,400	98	Roofs, HSG A
9,000		Weighted Average
9,000		100.00% Impervious Area

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

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

Subcatchment1-PRE: Runoff Area=80,526 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=551' Tc=16.0 min CN=WQ Runoff=2.88 cfs 12,621 cf

Subcatchment2-PRE: Runoff Area=49,149 sf 7.38% Impervious Runoff Depth=2.49"
Flow Length=407' Tc=18.4 min CN=WQ Runoff=2.24 cfs 10,193 cf

Subcatchment10: Runoff Area=52,065 sf 2.35% Impervious Runoff Depth=2.25"
Flow Length=644' Tc=16.4 min CN=WQ Runoff=2.25 cfs 9,767 cf

Subcatchment20: Runoff Area=16,031 sf 30.26% Impervious Runoff Depth=3.08"
Flow Length=354' Tc=6.0 min CN=WQ Runoff=1.23 cfs 4,110 cf

Subcatchment21: Runoff Area=62,802 sf 66.89% Impervious Runoff Depth=3.67"
Tc=6.0 min CN=WQ Runoff=5.46 cfs 19,188 cf

SubcatchmentD&R 1: Roof / Drive to Runoff Area=8,100 sf 100.00% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=WQ Runoff=0.82 cfs 2,946 cf

SubcatchmentD&R 2: Roof / Drive to Runoff Area=9,900 sf 100.00% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=WQ Runoff=1.00 cfs 3,600 cf

SubcatchmentD&R 3: Roof / Drive to Runoff Area=9,000 sf 100.00% Impervious Runoff Depth=4.36"
Tc=6.0 min CN=WQ Runoff=0.91 cfs 3,273 cf

Total Runoff Area = 287,573 sf Runoff Volume = 65,698 cf Average Runoff Depth = 2.74"
72.63% Pervious = 208,862 sf 27.37% Impervious = 78,711 sf

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

Subcatchment1-PRE: Runoff Area=80,526 sf 0.00% Impervious Runoff Depth=2.79"
Flow Length=551' Tc=16.0 min CN=WQ Runoff=4.37 cfs 18,740 cf

Subcatchment2-PRE: Runoff Area=49,149 sf 7.38% Impervious Runoff Depth=3.51"
Flow Length=407' Tc=18.4 min CN=WQ Runoff=3.16 cfs 14,378 cf

Subcatchment10: Runoff Area=52,065 sf 2.35% Impervious Runoff Depth=3.24"
Flow Length=644' Tc=16.4 min CN=WQ Runoff=3.27 cfs 14,074 cf

Subcatchment20: Runoff Area=16,031 sf 30.26% Impervious Runoff Depth=4.17"
Flow Length=354' Tc=6.0 min CN=WQ Runoff=1.66 cfs 5,571 cf

Subcatchment21: Runoff Area=62,802 sf 66.89% Impervious Runoff Depth=4.80"
Tc=6.0 min CN=WQ Runoff=7.13 cfs 25,123 cf

SubcatchmentD&R 1: Roof / Drive to Runoff Area=8,100 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=WQ Runoff=1.03 cfs 3,754 cf

SubcatchmentD&R 2: Roof / Drive to Runoff Area=9,900 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=WQ Runoff=1.26 cfs 4,589 cf

SubcatchmentD&R 3: Roof / Drive to Runoff Area=9,000 sf 100.00% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=WQ Runoff=1.15 cfs 4,172 cf

Total Runoff Area = 287,573 sf Runoff Volume = 90,400 cf Average Runoff Depth = 3.77"
72.63% Pervious = 208,862 sf 27.37% Impervious = 78,711 sf

ATTACHMENT 4

INSPECTION, MAINTENANCE & HOUSEKEEPING PLAN

DM ROMA
CONSULTING ENGINEERS

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

ROOSEVELT TRAIL SELF-STORAGE
ROOSEVELT TRAIL
WINDHAM, MAINE

Responsible Party

Owner: Keith Harnum
83 Beech Hill Road
Exeter, New Hampshire 03833

The owners are responsible for the maintenance of all stormwater management structures and related site components and the keeping of a maintenance log book with service records until such time that a homeowner's association is created. Records of all inspections and maintenance work performed must be kept on file with the owner and retained for a minimum of five years. The maintenance log will be made available to the Town and Maine Department of Environmental Protection (MDEP) upon request. At a minimum, the maintenance of stormwater management systems will be performed on the prescribed schedule.

The procedures outlined in this plan are provided as a general overview of the anticipated practices to be utilized on this site. In some instances, additional measures may be required due to unexpected conditions. *The Maine Erosion and Sedimentation Control BMP* and *Stormwater Management for Maine: Best Management Practices* Manuals published by the MDEP should be referenced for additional information.

During Construction

1. **Inspection and Corrective Action:** It is the contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. Inspection shall occur on all disturbed and impervious areas, erosion control measures, material storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as 24 hours before and after a storm event and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections.

2. **Maintenance:** Erosion controls shall be maintained in effective operating condition until areas are permanently stabilized. If best management practices (BMPs) need to be repaired, the repair work should be initiated upon discovery of the problem but no later than the end of the next workday. If BMPs need to be maintained or modified, additional

BMPs are necessary, or other corrective action is needed, implementation must be completed within seven calendar days and prior to any rainfall event.

3. **Construction vehicles and equipment:** Construction vehicles and equipment shall not be driven or stored within the infiltration basins. To ensure the infiltration basins function as designed perpetually, prohibiting vehicles and equipment from the infiltration areas will limit the risk of inhibiting the function of the infiltration basins due to compaction.

4. **Snow Storage:** The proposed underdrained filter basin (FB-1) shall not be utilized for snow storage. Snow storage areas shall be located away from the basins, and in areas that will direct snow melt runoff into one of the basins on site.

5. **Documentation:** A report summarizing the inspections and any corrective action taken must be maintained on site. The log must include the name(s) and qualifications of the person making the inspections; the date(s) of the inspections; and the major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicle access points to the parcel. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to MDEP staff, and a copy must be provided upon request. The owner shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

Housekeeping

1. **Spill prevention:** Controls must be used to prevent pollutants from construction and waste materials on site to enter stormwater, which includes storage practices to minimize exposure of the materials to stormwater. The site contractor or operator must develop, and implement as necessary, appropriate spill prevention, containment, and response planning measures.

2. **Groundwater protection:** During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials. Any project proposing infiltration of stormwater must provide adequate pre-treatment of stormwater prior to discharge of stormwater to the infiltration area, or provide for treatment within the infiltration area, in order to prevent the accumulation of fines, reduction in infiltration rate, and consequent flooding and destabilization.

3. **Fugitive sediment and dust:** Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control, but other water additives may be considered as needed. A stabilized construction entrance (SCE) should be included to minimize tracking of mud and sediment. If off-site tracking occurs, public roads should be swept immediately and no less than once a week and prior to significant storm events. Operations during dry months, that experience fugitive dust problems, should wet down unpaved access roads once a week or more frequently as needed with a water additive to suppress fugitive sediment and dust.

4. **Debris and other materials:** Minimize the exposure of construction debris, building and landscaping materials, trash, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials to precipitation and stormwater runoff. These materials must be prevented from becoming a pollutant source.

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

6. **Authorized Non-stormwater discharges:** Identify and prevent contamination by non-stormwater discharges. Where allowed non-stormwater discharges exist, they must be identified and steps should be taken to ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge. Authorized non-stormwater discharges are:
   (a) Discharges from firefighting activity;
   (b) Fire hydrant flushings;
   (c) Vehicle washwater if detergents are not used and washing is limited to the exterior of vehicles (engine, undercarriage and transmission washing is prohibited);
   (d) Dust control runoff in accordance with permit conditions and Appendix (C)(3);
   (e) Routine external building washdown, not including surface paint removal, that does not involve detergents;
   (f) Pavement washwater (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material had been removed) if detergents are not used;
   (g) Uncontaminated air conditioning or compressor condensate;
   (h) Uncontaminated groundwater or spring water;
   (i) Foundation or footer drain-water where flows are not contaminated;

(j) Uncontaminated excavation dewatering (see requirements in Appendix C(5));
(k) Potable water sources including waterline flushings; and
(l) Landscape irrigation.

7. **Unauthorized non-stormwater discharges:** Approval from the MDEP does not authorize a discharge that is mixed with a source of non-stormwater, other than those discharges in compliance with Section 6 above. Specifically, the MDEP's approval does not authorize discharges of the following:
(a) Wastewater from the washout or cleanout of concrete, stucco, paint, form release oils, curing compounds or other construction materials;
(b) Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance;
(c) Soaps, solvents, or detergents used in vehicle and equipment washing; and
(d) Toxic or hazardous substances from a spill or other release.

Post construction

1. **Inspection and Corrective Action:** All measures must be maintained by the owner in effective operating condition. A qualified third-party inspector hired by the owner shall at least annually inspect the stormwater management facilities. This person should have knowledge of erosion and stormwater control including the standards and conditions of the site's approvals. The inspector shall be certified through the MDEP to inspect the stormwater infrastructure. The following areas, facilities, and measures must be inspected, and identified deficiencies must be corrected. Areas, facilities, and measures other than those listed below may also require inspection on a specific site.

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

   B. **Ditches, Swales, and Open Channels:** Inspect ditches, swales, and other open channels in the spring, late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, control vegetative growth that could obstruct flow, and repair any erosion of the ditch lining. Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. The channel must receive adequate routine maintenance to maintain capacity and prevent or correct any erosion of the channel's bottom or side slopes.

C. **Culverts:** Inspect culverts in the spring, late fall, and after heavy rains to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the culvert's inlet and outlet.

D. **Underdrained Filter Basins:** Underdrained filter basins are not intended to function as snow storage areas, and winter plowing operations shall ensure that snow is not plowed or dumped into the basins. The basins should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The basin should drain within 48 hours following a one-inch storm and if a larger storm fills the system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity. If water ponds on the surface of the bed for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up in the forebay and basin and remove as needed. Mowing of the basin can only occur semi-annually to a height of no less than 6 inches utilizing a hand-held string trimmer or push-mower. Any bare areas or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. The basin should also be inspected annually for destabilization of side slopes, embankment settling and other signs of structural failure.

E. **Regular Maintenance:** Clear accumulations of winter sand along roadway once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along pavement shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

F. **Documentation:** Keep a log (report) summarizing inspections, maintenance, and any corrective actions taken. The log must 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 sediments or debris, indicate where the sediment and debris was disposed after removal. The log must be made accessible to Town staff upon request. The permittee shall retain a copy of the log for a period of at least five years from the completion of permanent stabilization. Attached is a sample log.

Re-certification

Submit a certification of the following to the MDEP within three months of the expiration of each five-year interval from the date of issuance of the permit.

(a) **Identification and repair of erosion problems**. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

(b) **Inspection and repair of stormwater control system**. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

(c) **Maintenance**. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the Department, and the maintenance log is being maintained.

Municipalities with separate storm sewer systems regulated under the Maine Pollutant Discharge Elimination System (MPDES) Program may report on all regulated systems under their control as part of their required annual reporting in lieu of separate certification of each system. Municipalities not regulated by the MPDES Program, but that are responsible for maintenance of permitted stormwater systems, may report on multiple stormwater systems in one report.

Duration of Maintenance

Perform maintenance as described.

MAINTENANCE LOG

ROOSEVELT TRAIL SELF-STORAGE
WINDHAM, MAINE

The following stormwater management and erosion control items shall be inspected and maintained as prescribed in the Maintenance Plan with recommended frequencies as identified below. The owner is responsible for keeping this maintenance log on file for a minimum of five years and shall provide a copy to the Town and MDEP upon request. Inspections are to be performed by a qualified third-party inspector and all corrective actions shall be performed by personnel familiar with stormwater management systems and erosion controls.

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Vegetated Areas	Inspect slopes and embankments early in Spring.			
Ditches, swales, and other open channels	Inspect after major rainfall event producing 1" of rain in two hours.			
	Inspect for erosion or slumping & repair			
	Mowed at least annually.			
Culverts	Inspect semiannually and after major rainfall.			
	Repair erosion at inlet or outlet of pipe.			
	Repair displaced riprap.			
	Clean accumulated sediment in culverts when >20% full.			
Underdrained Filter Basins	Check after each rainfall event to ensure that pond drains within 24-48 hours.			
	Replace top several inches of filter if pond does not drain within 72 hours.			
	Mow grass no more than twice a year to no less than 6 inches in height.			
	Inspect semi-annually for erosion or sediment accumulation and repair as necessary.			
Regular Maintenance	Clear accumulation of winter sand in paved areas annually.			