STORMWATER MANAGEMENT PLAN

1017 River Road
Windham, Maine

The following Stormwater Management Plan has been prepared for Meyer Development Solutions Inc. to evaluate stormwater runoff and erosion control for the 1017 River Road project.

Site Calculations

Total Property Area	0.54 Ac (+/-)
New Impervious Area	5,486 SF (0.13 Ac)
New Developed Area	11,879 SF (0.27 Ac)

Project Introduction

The 1017 River Road project is proposed to consist of one 2,840 SF building at 1017 River Road in Windham, Maine. The property is located on the east side of River Road, approximately 650' south of the intersection with Roosevelt Trail and is shown as lot #12A on the Town of Windham Tax Map #53 (see attached Aerial Map).

On-Site Hydrology

The project area is very flat and is internally drained since the site is lower than the surrounding roads & properties. The site is located on highly infiltrative soils. Test pits on a site directly east of this project were evaluated by Mark Cenci of Mark Cenci Geologic and excavated to a depth of 11'. No sign of groundwater was encountered. Mr. Cenci also found no evidence of freshwater wetlands.

The property is located within the Presumpscot River Watershed (See attached U.S.G.S. Quadrangle Map).

The development property is not located within a flood zone, as shown on Federal Insurance Rate Map 230189 0015 B (see attached soil map).

Onsite & Offsite Soils

The soils were delineated from the Cumberland County Medium Intensity Soil Survey as shown on the Soil Data Viewer on the NRCS website (See attached map). The soil survey reports that the watershed soils are as summarized below:

Soil Type Summary Table		
Soil Symbol	Soil Name	HSG
HlC	Hinkley	A

Modeling Assumptions

The onsite stormwater facilities were sized utilizing the USDA Soil Conservation Service (SCS) TR-20 Runoff Simulation Model, as contained in the HydroCAD computer software program (Version 9.0). Runoff curve numbers were determined for each direct watershed by measuring the area of each hydrologic soil group within each type of land cover. Weighted curve numbers were then calculated using curve numbers for various cover types and hydrologic soil groups, assuming "good" conditions as defined in U.S Soil Conservation Service (SCS) publications. Times of concentration and travel times were determined from site topographic maps in accordance with SCS procedures. A maximum length of 150 feet was used for sheet flow.

All of the watersheds' peak runoff rates were analyzed for the 2, 10 and 25-year frequency, 24-hour duration storm events. A Type III rainfall distribution was applied to these storms. The rainfall amounts for Cumberland County are as follows:

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

Water Quantity (Flooding Standard)

Site contains highly infiltrative soils. The dry well was sized to contain the 25-year storm event. The post development flow rate for the 2, 10 & 25 year storm events is assumed to be zero.

Water Quantity

The site contains highly infiltrative soils. The dry well was sized to contain the 25-year storm event. The post development flow rate for the 2, 10 & 25 year storm events is assumed to be zero.

Water Quality (BMP Standard)

The water quality requirements will be met by the construction of a dry well. The dry well will receive runoff from the new building and parking spaces. The associated watershed contains approximately 5,486 SF of impervious area and consists solely of the roof and parking spaces.

The impervious and developed treatment percentages are detailed below:

New Impervious Area: The project will result in the creation of approximately 5,486 SF of new impervious area in the form of roof and parking lot. The dry well will treat all of the new impervious area resulting in a treatment percentage of 100.%.

Percentage of Treatment of the New Impervious Area = 100.0% (95% req'd)

Project Developed Area: The project will result in the creation of approximately 11,879 SF of new developed area. The dry well will treat approximately 7,591 SF of the new developed area, and due to the highly infiltrative soils the remaining portion of new developed area will infiltrate into the ground onsite. This results in a treatment percentage of 100%.

Percentage of Treatment of the Developed Area = 100% (80% required)

BMP Sizing Calculations:

Dry Well

STAGE (FT)	AREA (SF)	VOID RATIO (%)	STORAGE (CF)
312	308	40	0
314	308	40	246
316	308	40	493
318	308	40	739
320	308	40	986

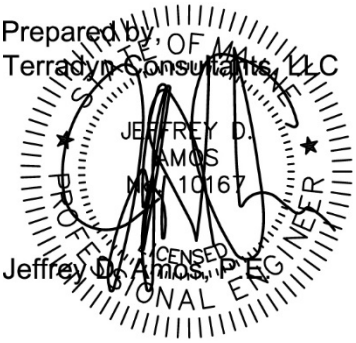
WATERSHED IMPERVIOUS AREA=	5,486	SF
WATERSHED LANDSCAPED AREA=	2,105	SF
REQUIRED WATER QUALITY VOLUME=	527	CF
PROVIDED WATER QUALITY VOLUME (40% Voids)=	986	CF

The required water quality volume was calculated by multiplying the impervious area by 1.0" and the landscaped area by 0.4". The provided water quality was calculated by multiplying the void space (40%) and the calculated storage area.

Summary

Based on the results of this evaluation, the proposed stormwater design is not expected to cause flooding, erosion or other significant adverse effects downstream of the site.

Prepared by,
Terradyn Consultants, LLC



Jeffrey D. Amos, P.E.

Attached:
Aerial Map
U.S.G.S. Quadrangle Map
FEMA Floodmap
NRCS Soil Map
Post Development Hydrocad Calculations
Maintenance & Inspection of Stormwater Facilities
Housekeeping Plan
Test Pit Logs

SHEET DESCRIPTION

U.S.G.S. QUADRANGLE MAP
1017 RIVER ROAD

PREPARED FOR

MEYER DEVELOPMENT SOLUTIONS INC.
P0 BOX 81
RAYMOND, MAINE 04071

TERRADYN
CONSULTANTS, LLC

P.O. Box 339
111 Elderberry Lane
New Gloucester, ME 04260
Office: (207) 926-5111
Fax: (207) 221-1317
www.terradynconsultants.com

Civil Engineering - Land Planning - Stormwater Design - Environmental Permitting

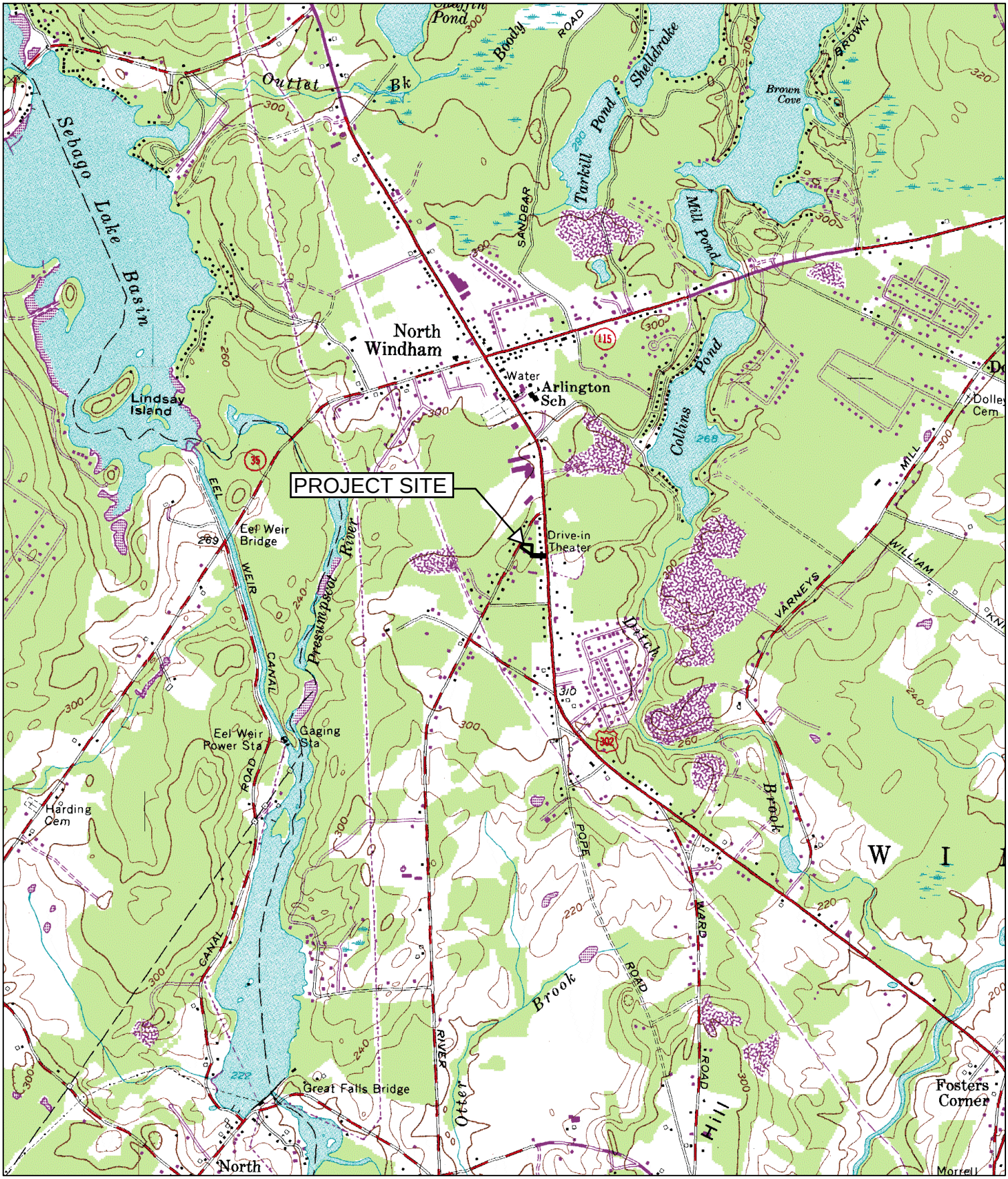
JOB NO. 1819

DATE 4/30/2018

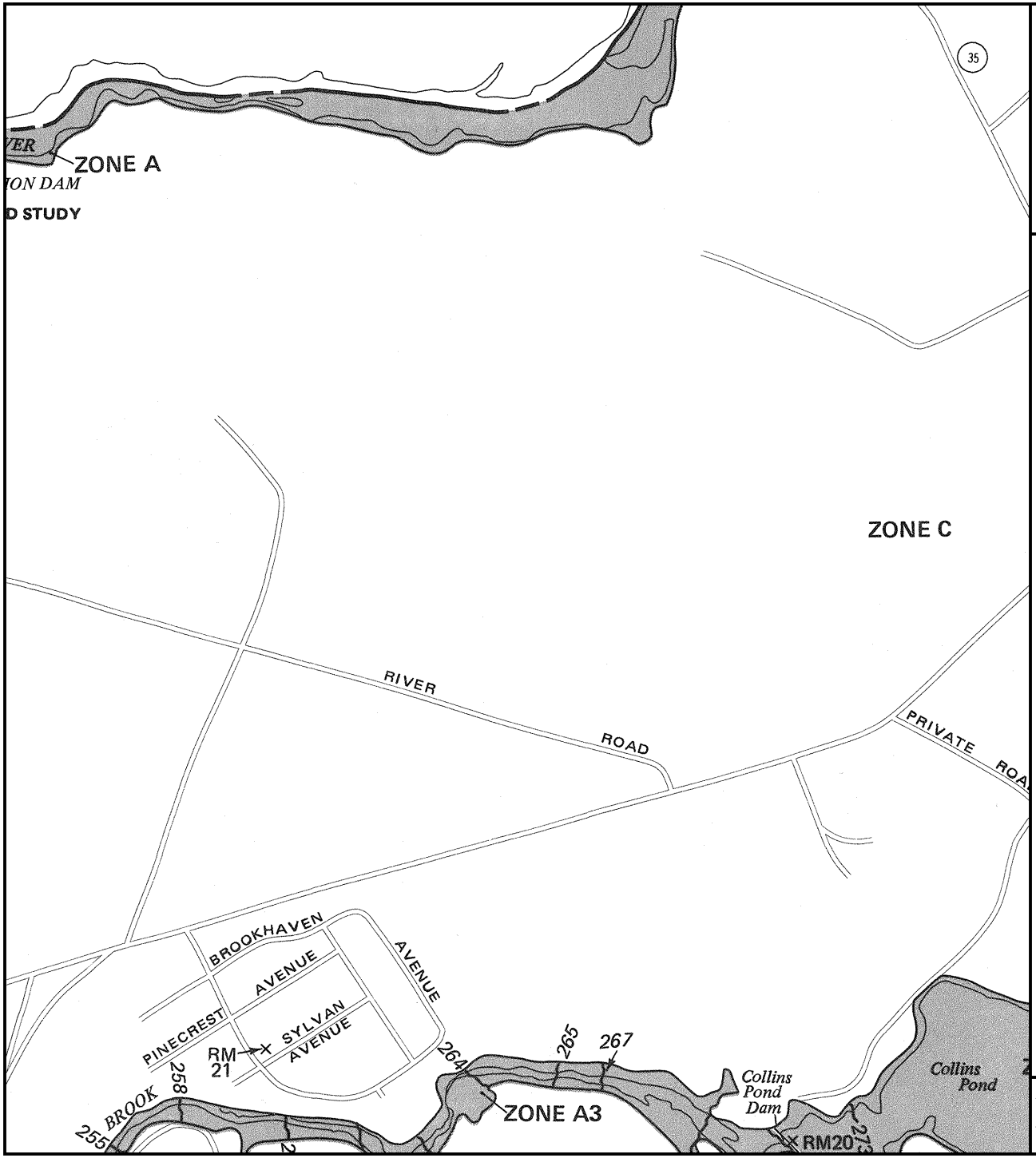
SCALE NTS

SHEET 1

OF 1



SHEET DESCRIPTION U.S.G.S. QUADRANGLE MAP 1017 RIVER ROAD	TERRADYN CONSULTANTS, LLC P.O. Box 339 111 Elderberry Lane New Gloucester, ME 04260 Office: (207) 926-5111 Fax: (207) 221-1317 www.terradynconsultants.com Civil Engineering - Land Planning - Stormwater Design - Environmental Permitting	JOB NO. 1819	SHEET 1
PREPARED FOR MEYER DEVELOPMENT SOLUTIONS INC. P0 BOX 81 RAYMOND, MAINE 04071		DATE 4/30/2018	OF 1
		SCALE 1"=2,000'	



APPROXIMATE SCALE

800 0 800 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

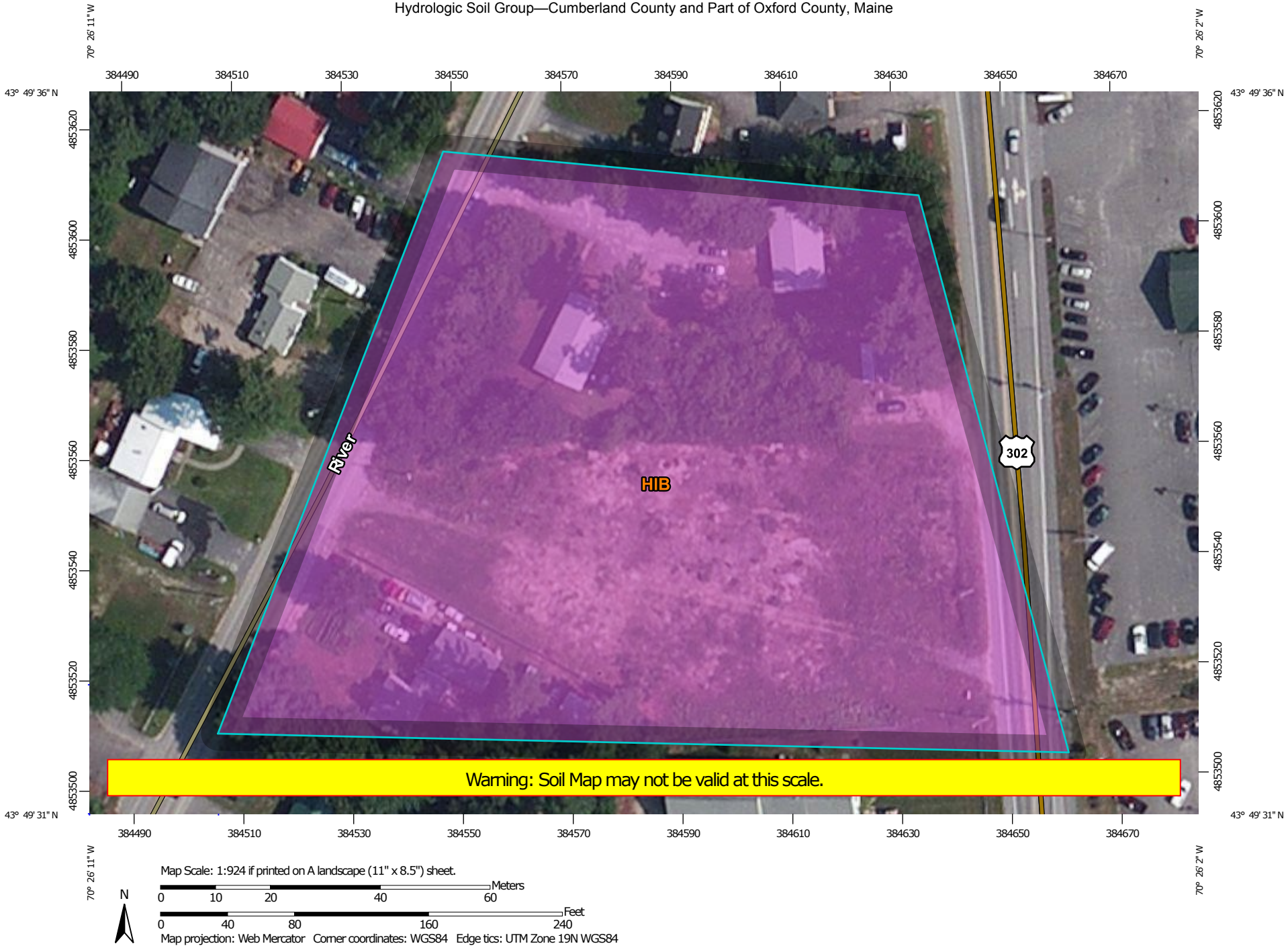
TOWN OF
WINDHAM, MAINE
CUMBERLAND COUNTY

PANEL 15 OF 35
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
230189 0015 B

EFFECTIVE DATE:
SEPTEMBER 2, 1981

federal emergency management agency
federal insurance administration



Map Scale: 1:924 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 11, Sep 17, 2015

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

Date(s) aerial images were photographed: Jun 20, 2010—Jul 18, 2010

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Cumberland County and Part of Oxford County, Maine (ME005)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HIB	Hinckley loamy sand, 3 to 8 percent slopes	A	3.1	100.0%
Totals for Area of Interest			**3.1**	**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.

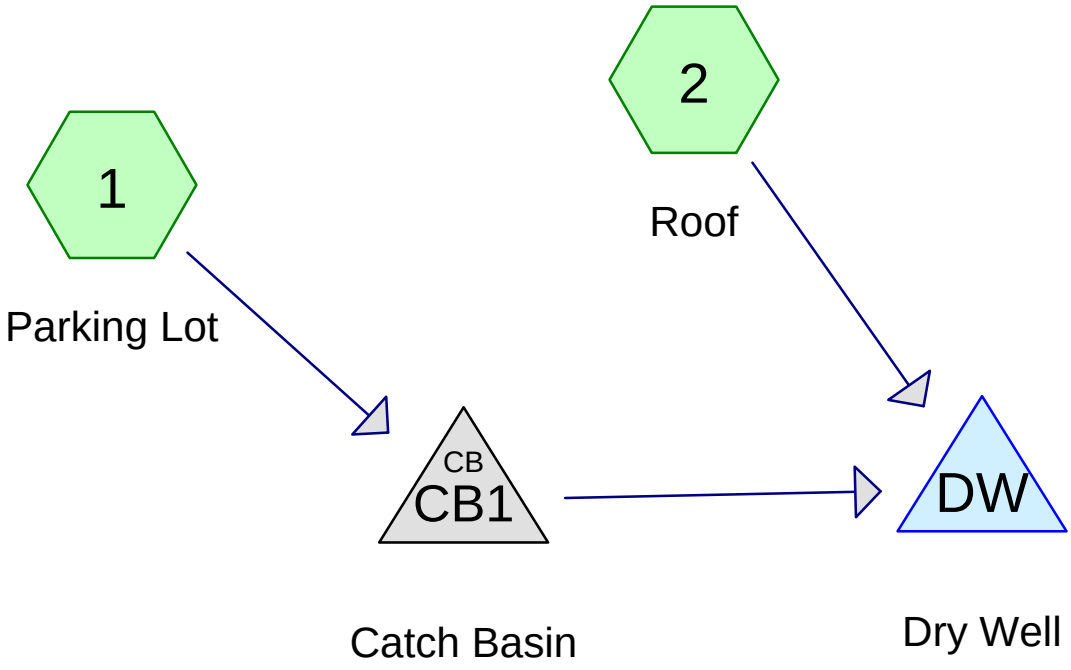
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



Subcat Reach Pond Link

Drainage Diagram for 1818 Post

Prepared by {enter your company name here}, Printed 5/1/2018

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.048	39	>75% Grass cover, Good, HSG A (1)
0.061	98	Impervious (1)
0.065	98	Roof (2)
0.174		**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.048	HSG A	1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.126	Other	1, 2
0.174		**TOTAL AREA**

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)
1	CB1	318.30	318.04	52.0	0.0050	0.013	15.0	0.0

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

Subcatchment 1: Parking Lot Runoff Area=4,751 sf 55.69% Impervious Runoff Depth>0.79"
Tc=2.0 min CN=72 Runoff=0.11 cfs 0.007 af

Subcatchment 2: Roof Runoff Area=2,840 sf 100.00% Impervious Runoff Depth>2.68"
Tc=2.0 min CN=98 Runoff=0.21 cfs 0.015 af

Pond CB1: Catch Basin Peak Elev=318.48' Inflow=0.11 cfs 0.007 af
15.0" Round Culvert n=0.013 L=52.0' S=0.0050 '/' Outflow=0.11 cfs 0.007 af

Pond DW: Dry Well Peak Elev=314.96' Storage=364 cf Inflow=0.32 cfs 0.022 af
Outflow=0.03 cfs 0.022 af

Total Runoff Area = 0.174 ac Runoff Volume = 0.022 af Average Runoff Depth = 1.50"
27.73% Pervious = 0.048 ac 72.27% Impervious = 0.126 ac

Summary for Subcatchment 1: Parking Lot

[49] Hint: Tc<2dt may require smaller dt

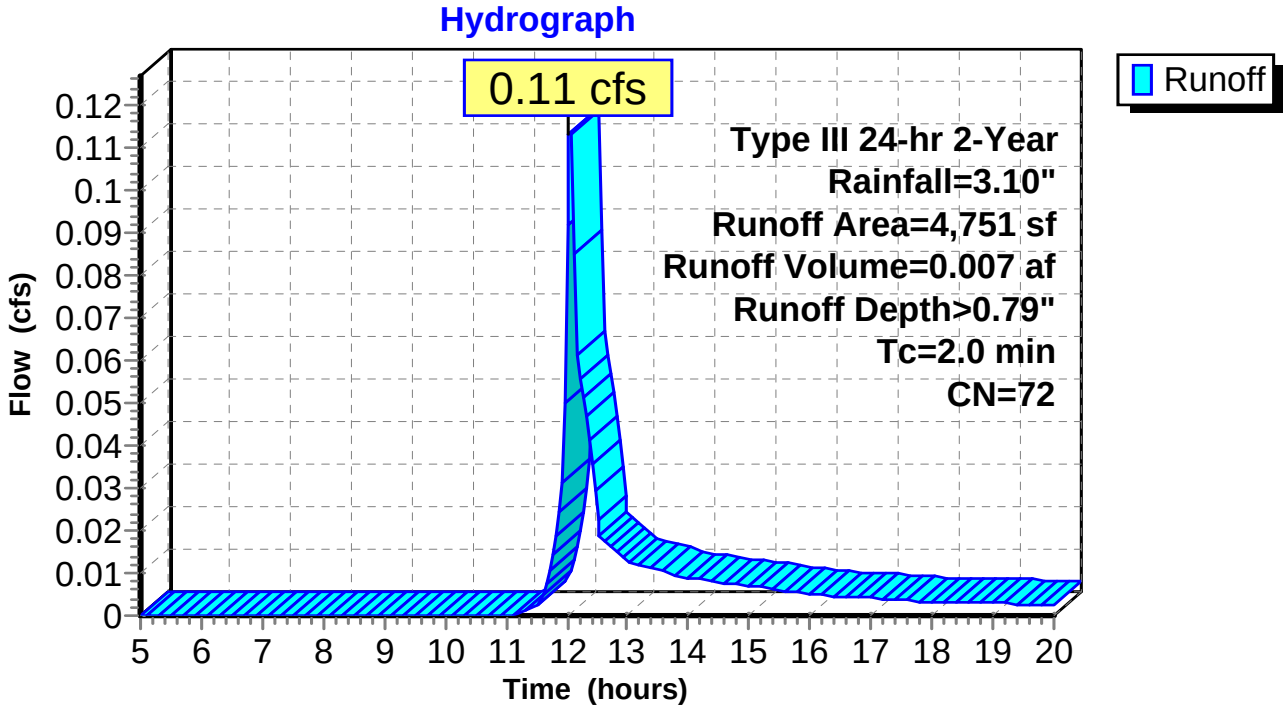
Runoff = 0.11 cfs @ 12.05 hrs, Volume= 0.007 af, Depth> 0.79"

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

	Area (sf)	CN	Description
*	2,646	98	Impervious
	2,105	39	>75% Grass cover, Good, HSG A
	4,751	72	Weighted Average
	2,105		44.31% Pervious Area
	2,646		55.69% Impervious Area

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

Subcatchment 1: Parking Lot



Summary for Subcatchment 2: Roof

[49] Hint: Tc<2dt may require smaller dt

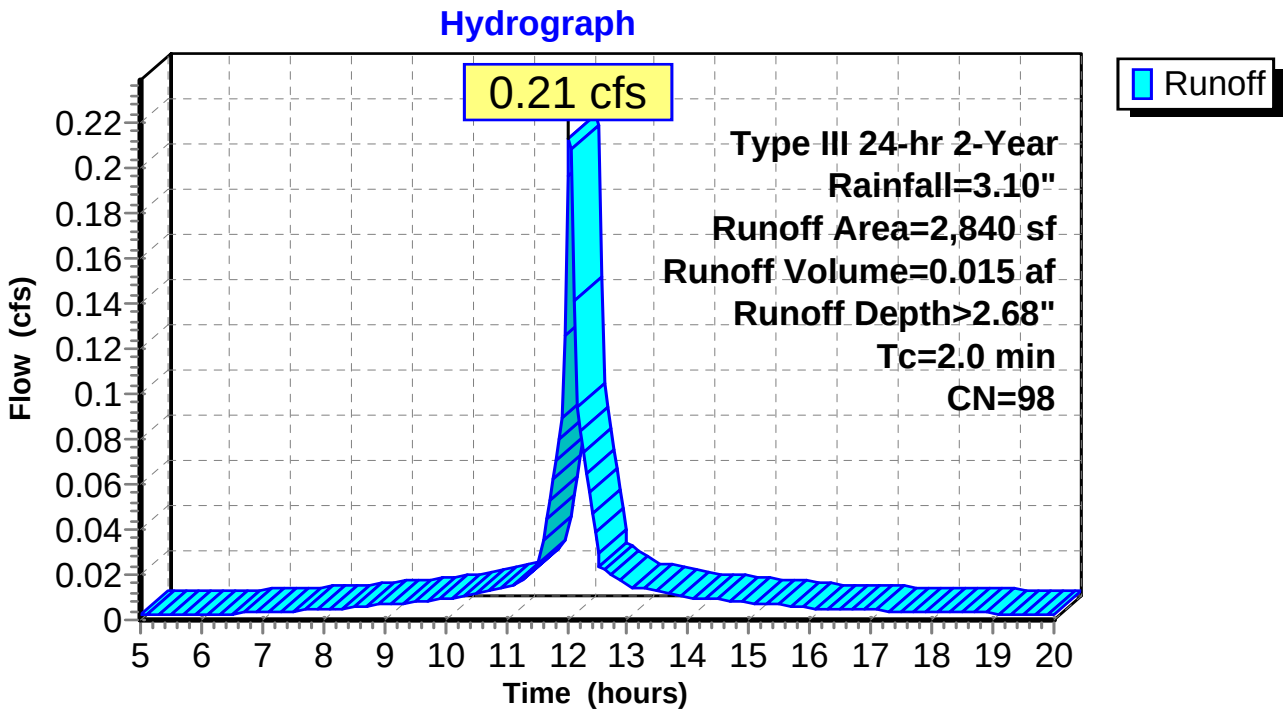
Runoff = 0.21 cfs @ 12.03 hrs, Volume= 0.015 af, Depth> 2.68"

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

	Area (sf)	CN	Description
*	2,840	98	Roof
	2,840		100.00% Impervious Area

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

Subcatchment 2: Roof



Summary for Pond CB1: Catch Basin

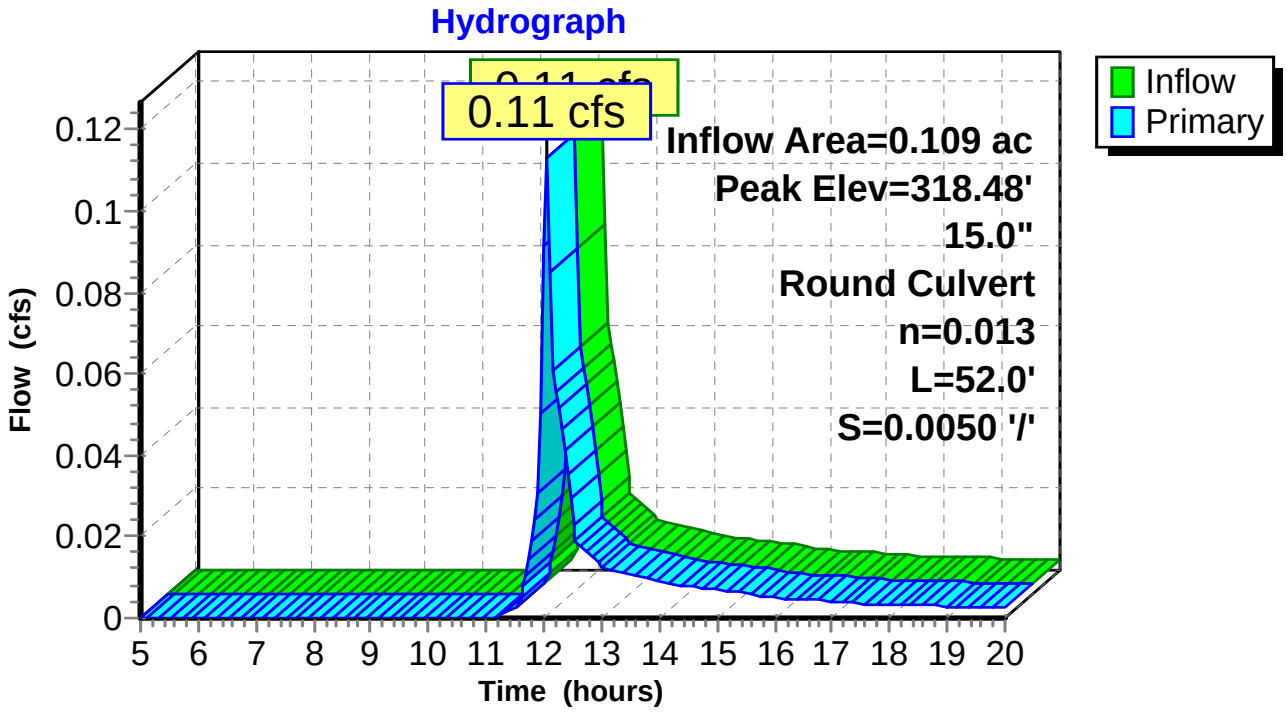
Inflow Area = 0.109 ac, 55.69% Impervious, Inflow Depth > 0.79" for 2-Year event
Inflow = 0.11 cfs @ 12.05 hrs, Volume= 0.007 af
Outflow = 0.11 cfs @ 12.05 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.05 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 318.48' @ 12.05 hrs
Flood Elev= 321.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	318.30'	**15.0" Round Culvert** L= 52.0' CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 318.04' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.11 cfs @ 12.05 hrs HW=318.48' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.11 cfs @ 1.52 fps)

Pond CB1: Catch Basin



Summary for Pond DW: Dry Well

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.174 ac, 72.27% Impervious, Inflow Depth > 1.50" for 2-Year event
Inflow = 0.32 cfs @ 12.04 hrs, Volume= 0.022 af
Outflow = 0.03 cfs @ 12.81 hrs, Volume= 0.022 af, Atten= 90%, Lag= 46.5 min
Discarded = 0.03 cfs @ 12.81 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 314.96' @ 12.81 hrs Surf.Area= 308 sf Storage= 364 cf
Flood Elev= 321.80' Surf.Area= 308 sf Storage= 1,207 cf

Plug-Flow detention time= 108.4 min calculated for 0.022 af (99% of inflow)
Center-of-Mass det. time= 105.1 min (869.3 - 764.2)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	1,207 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

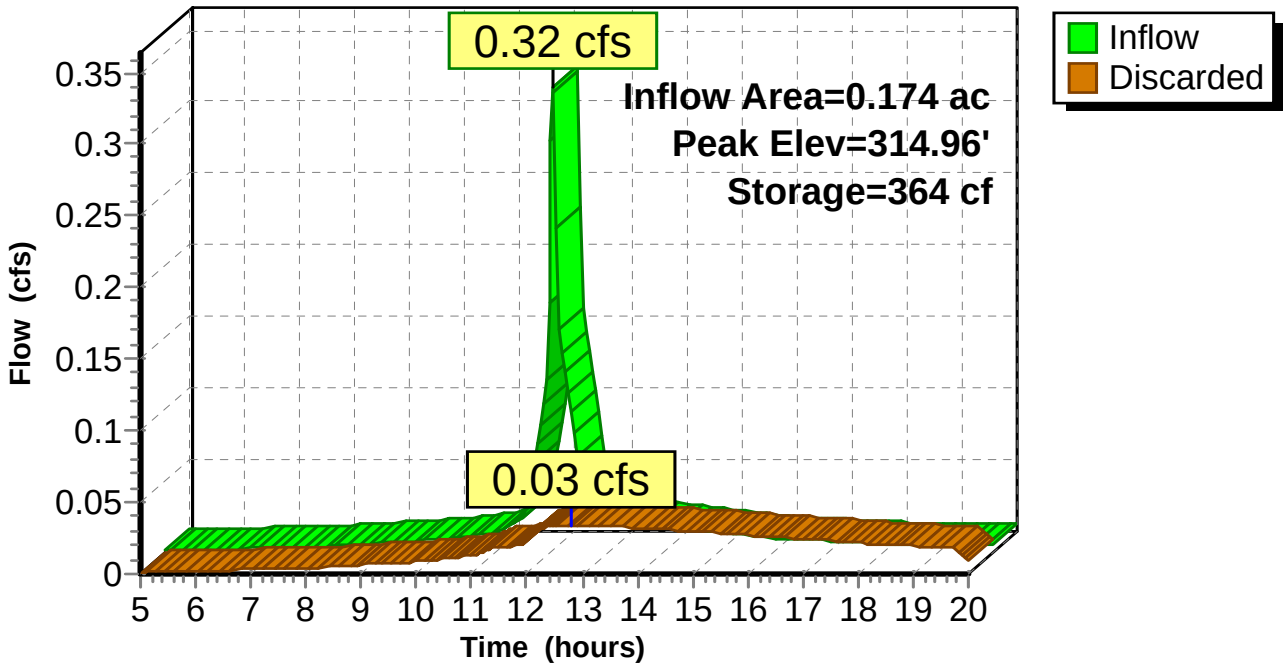
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	308	0.0	0	0
321.80	308	40.0	1,207	1,207

Device	Routing	Invert	Outlet Devices
#1	Discarded	312.00'	**2.400 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 309.00'

Discarded OutFlow Max=0.03 cfs @ 12.81 hrs HW=314.96' (Free Discharge)
1=Exfiltration (Controls 0.03 cfs)

Pond DW: Dry Well

Hydrograph



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

Subcatchment 1: Parking Lot Runoff Area=4,751 sf 55.69% Impervious Runoff Depth>1.75"
Tc=2.0 min CN=72 Runoff=0.26 cfs 0.016 af

Subcatchment 2: Roof Runoff Area=2,840 sf 100.00% Impervious Runoff Depth>4.05"
Tc=2.0 min CN=98 Runoff=0.32 cfs 0.022 af

Pond CB1: Catch Basin Peak Elev=318.58' Inflow=0.26 cfs 0.016 af
15.0" Round Culvert n=0.013 L=52.0' S=0.0050 '/' Outflow=0.26 cfs 0.016 af

Pond DW: Dry Well Peak Elev=317.94' Storage=732 cf Inflow=0.58 cfs 0.038 af
Outflow=0.05 cfs 0.033 af

Total Runoff Area = 0.174 ac Runoff Volume = 0.038 af Average Runoff Depth = 2.61"
27.73% Pervious = 0.048 ac 72.27% Impervious = 0.126 ac

Summary for Subcatchment 1: Parking Lot

[49] Hint: Tc<2dt may require smaller dt

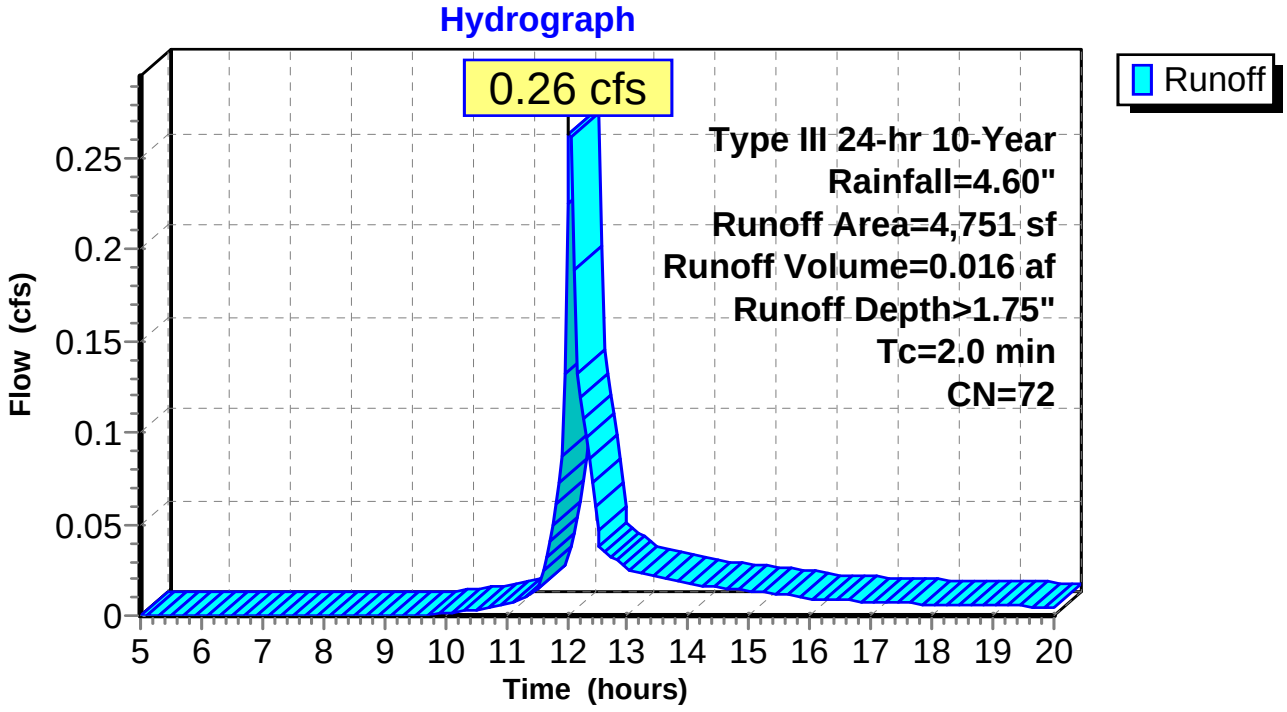
Runoff = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af, Depth> 1.75"

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

	Area (sf)	CN	Description
*	2,646	98	Impervious
	2,105	39	>75% Grass cover, Good, HSG A
	4,751	72	Weighted Average
	2,105		44.31% Pervious Area
	2,646		55.69% Impervious Area

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

Subcatchment 1: Parking Lot



Summary for Subcatchment 2: Roof

[49] Hint: Tc<2dt may require smaller dt

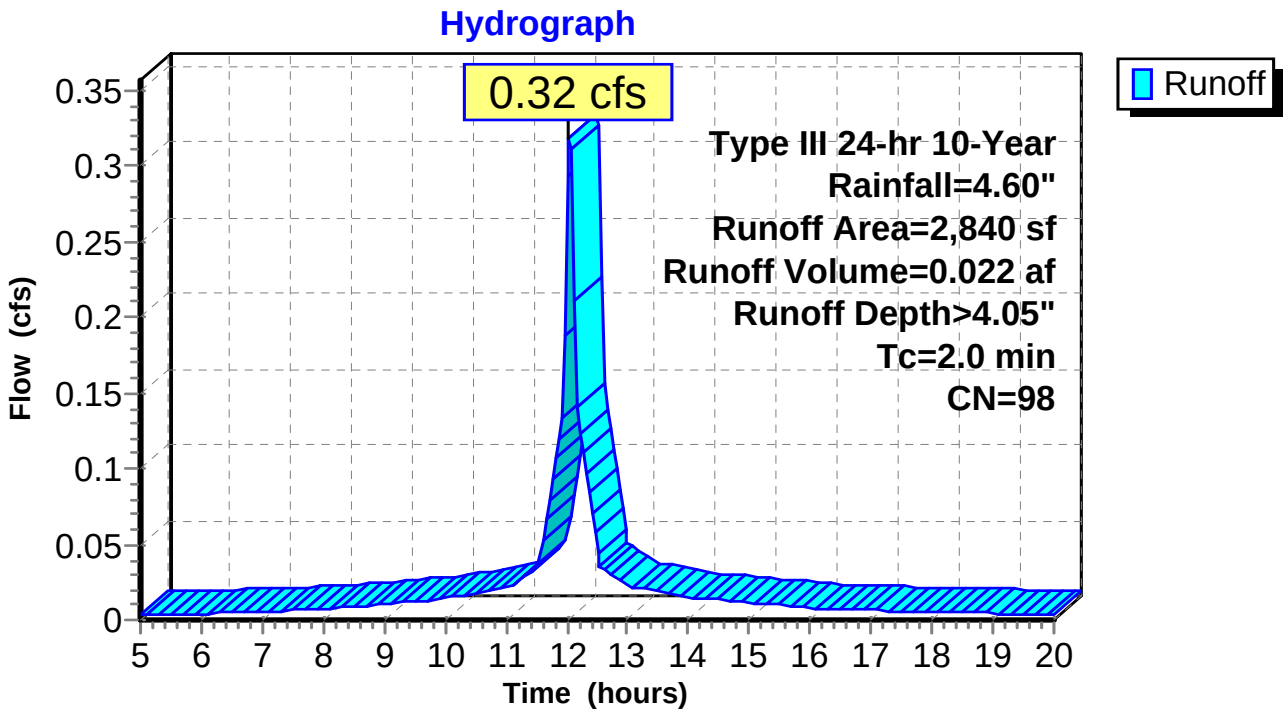
Runoff = 0.32 cfs @ 12.03 hrs, Volume= 0.022 af, Depth> 4.05"

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

	Area (sf)	CN	Description
*	2,840	98	Roof
	2,840		100.00% Impervious Area

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

Subcatchment 2: Roof



Summary for Pond CB1: Catch Basin

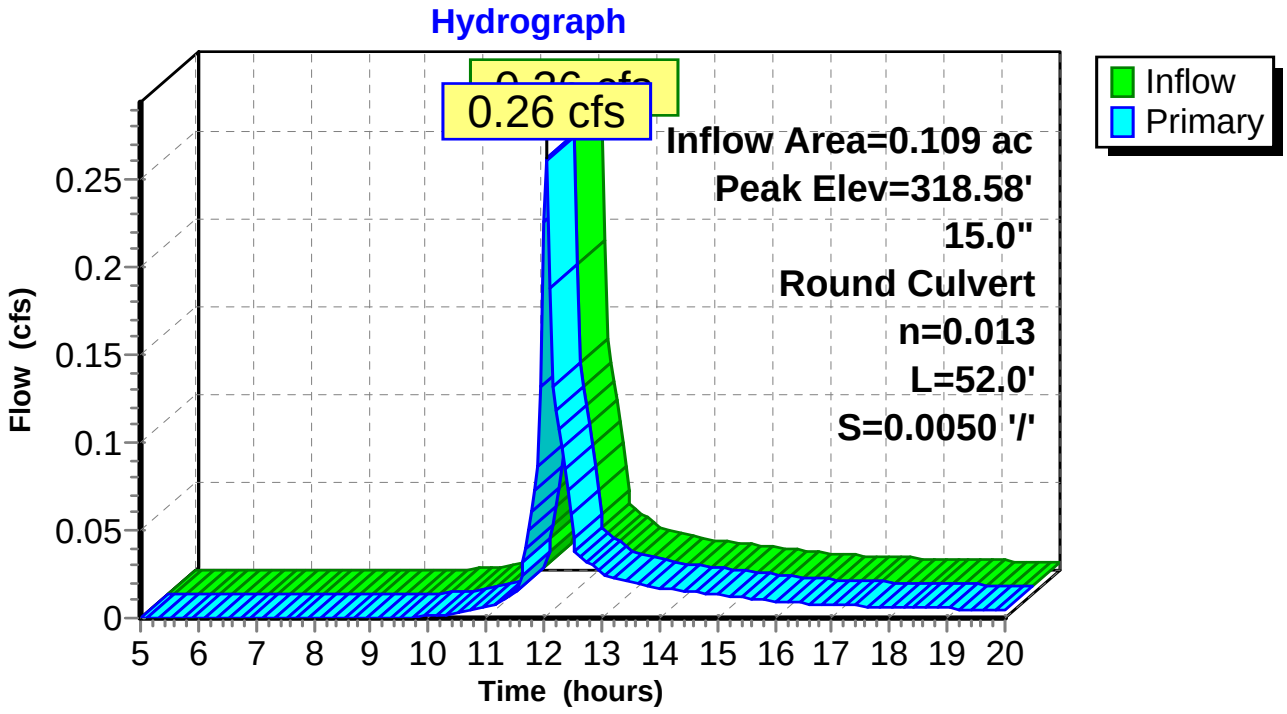
Inflow Area = 0.109 ac, 55.69% Impervious, Inflow Depth > 1.75" for 10-Year event
Inflow = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af
Outflow = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.04 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 318.58' @ 12.04 hrs
Flood Elev= 321.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	318.30'	**15.0" Round Culvert** L= 52.0' CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 318.04' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.25 cfs @ 12.04 hrs HW=318.58' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.25 cfs @ 1.90 fps)

Pond CB1: Catch Basin



Summary for Pond DW: Dry Well

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.174 ac, 72.27% Impervious, Inflow Depth > 2.61" for 10-Year event
Inflow = 0.58 cfs @ 12.04 hrs, Volume= 0.038 af
Outflow = 0.05 cfs @ 12.94 hrs, Volume= 0.033 af, Atten= 91%, Lag= 54.3 min
Discarded = 0.05 cfs @ 12.94 hrs, Volume= 0.033 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 317.94' @ 12.94 hrs Surf.Area= 308 sf Storage= 732 cf
Flood Elev= 321.80' Surf.Area= 308 sf Storage= 1,207 cf

Plug-Flow detention time= 152.2 min calculated for 0.033 af (87% of inflow)
Center-of-Mass det. time= 110.6 min (873.1 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	1,207 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

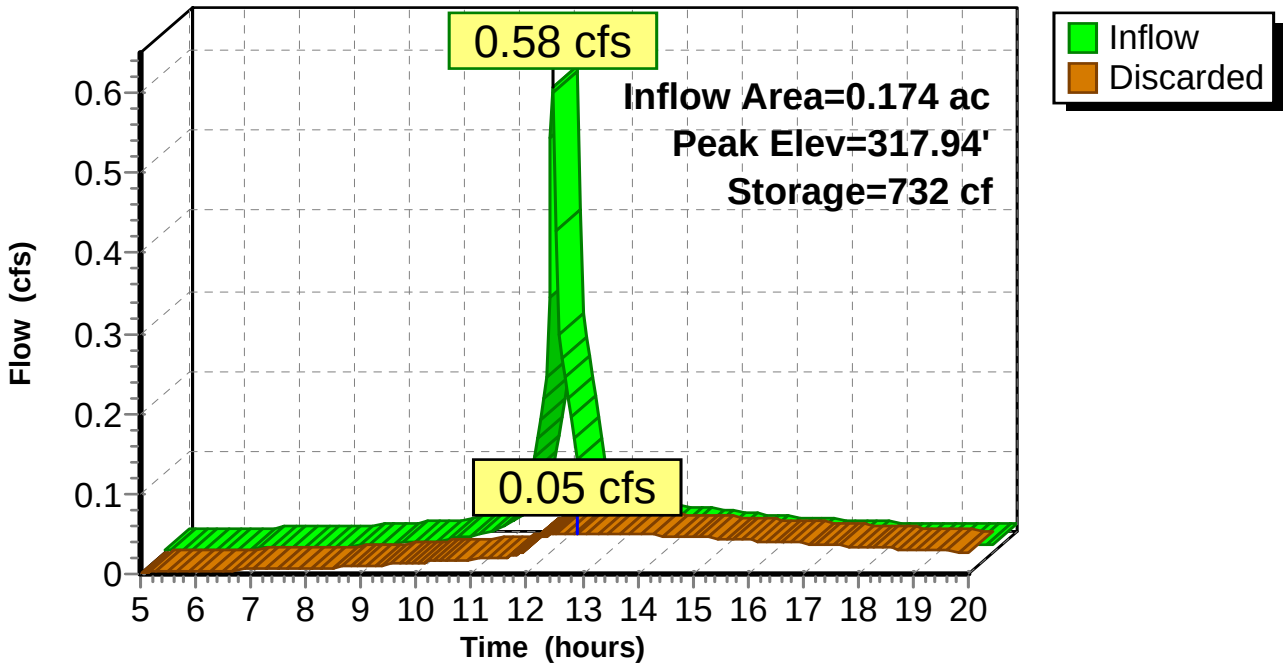
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	308	0.0	0	0
321.80	308	40.0	1,207	1,207

Device	Routing	Invert	Outlet Devices
#1	Discarded	312.00'	**2.400 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 309.00'

Discarded OutFlow Max=0.05 cfs @ 12.94 hrs HW=317.94' (Free Discharge)
1=Exfiltration (Controls 0.05 cfs)

Pond DW: Dry Well

Hydrograph



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

Subcatchment 1: Parking Lot Runoff Area=4,751 sf 55.69% Impervious Runoff Depth>2.63"
Tc=2.0 min CN=72 Runoff=0.40 cfs 0.024 af

Subcatchment 2: Roof Runoff Area=2,840 sf 100.00% Impervious Runoff Depth>5.15"
Tc=2.0 min CN=98 Runoff=0.40 cfs 0.028 af

Pond CB1: Catch Basin Peak Elev=318.65' Inflow=0.40 cfs 0.024 af
15.0" Round Culvert n=0.013 L=52.0' S=0.0050 '/' Outflow=0.40 cfs 0.024 af

Pond DW: Dry Well Peak Elev=320.66' Storage=1,067 cf Inflow=0.80 cfs 0.052 af
Outflow=0.07 cfs 0.043 af

Total Runoff Area = 0.174 ac Runoff Volume = 0.052 af Average Runoff Depth = 3.57"
27.73% Pervious = 0.048 ac 72.27% Impervious = 0.126 ac

Summary for Subcatchment 1: Parking Lot

[49] Hint: Tc<2dt may require smaller dt

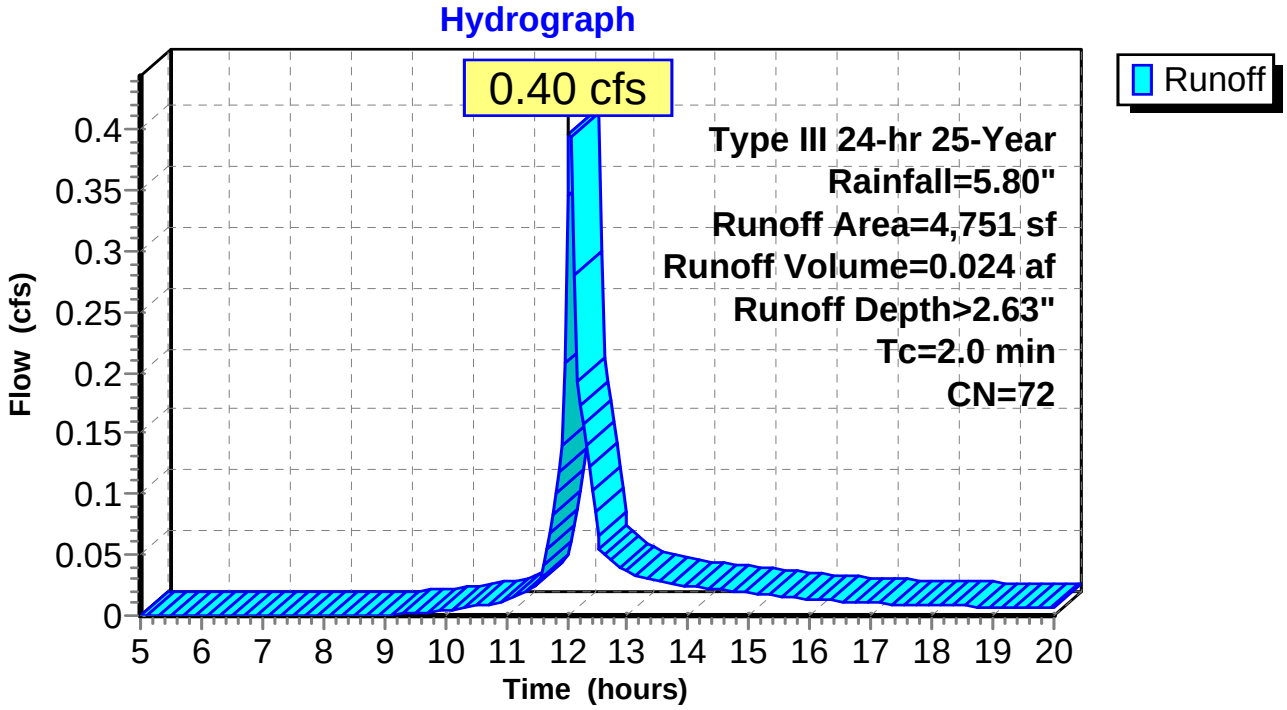
Runoff = 0.40 cfs @ 12.04 hrs, Volume= 0.024 af, Depth> 2.63"

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

	Area (sf)	CN	Description
*	2,646	98	Impervious
	2,105	39	>75% Grass cover, Good, HSG A
	4,751	72	Weighted Average
	2,105		44.31% Pervious Area
	2,646		55.69% Impervious Area

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

Subcatchment 1: Parking Lot



Summary for Subcatchment 2: Roof

[49] Hint: Tc<2dt may require smaller dt

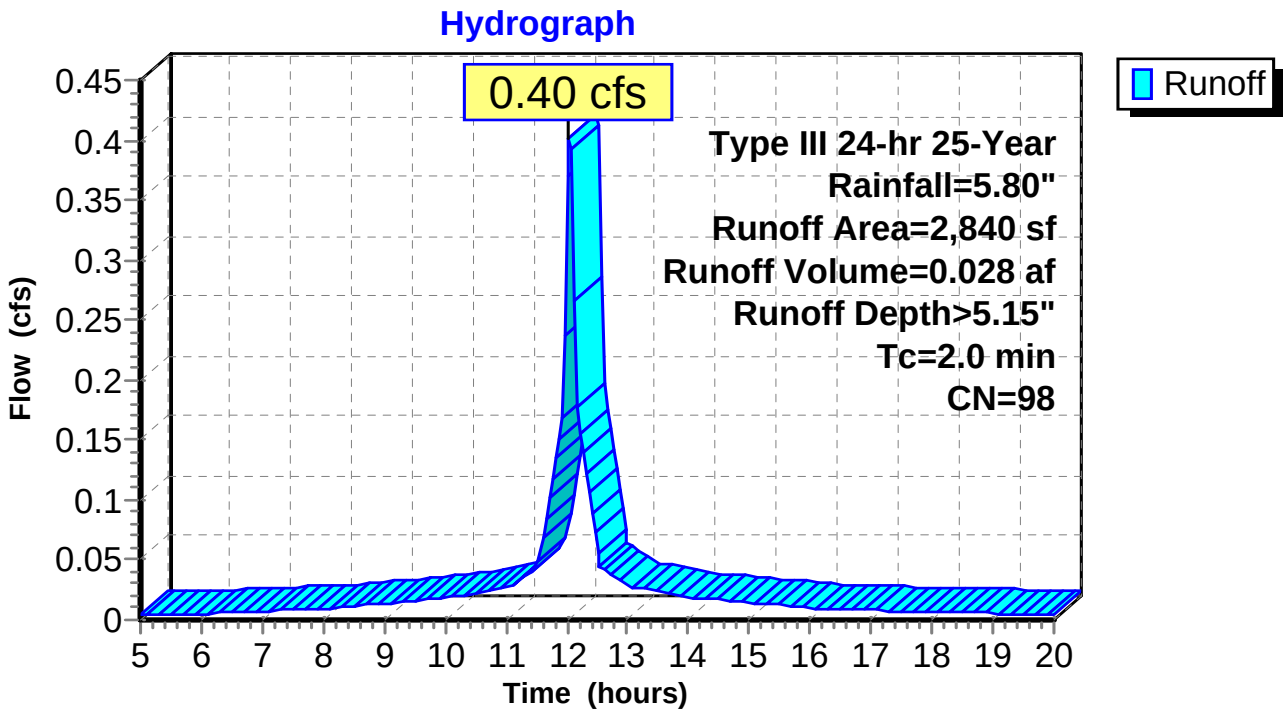
Runoff = 0.40 cfs @ 12.03 hrs, Volume= 0.028 af, Depth> 5.15"

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

	Area (sf)	CN	Description
*	2,840	98	Roof
	2,840		100.00% Impervious Area

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

Subcatchment 2: Roof



Summary for Pond CB1: Catch Basin

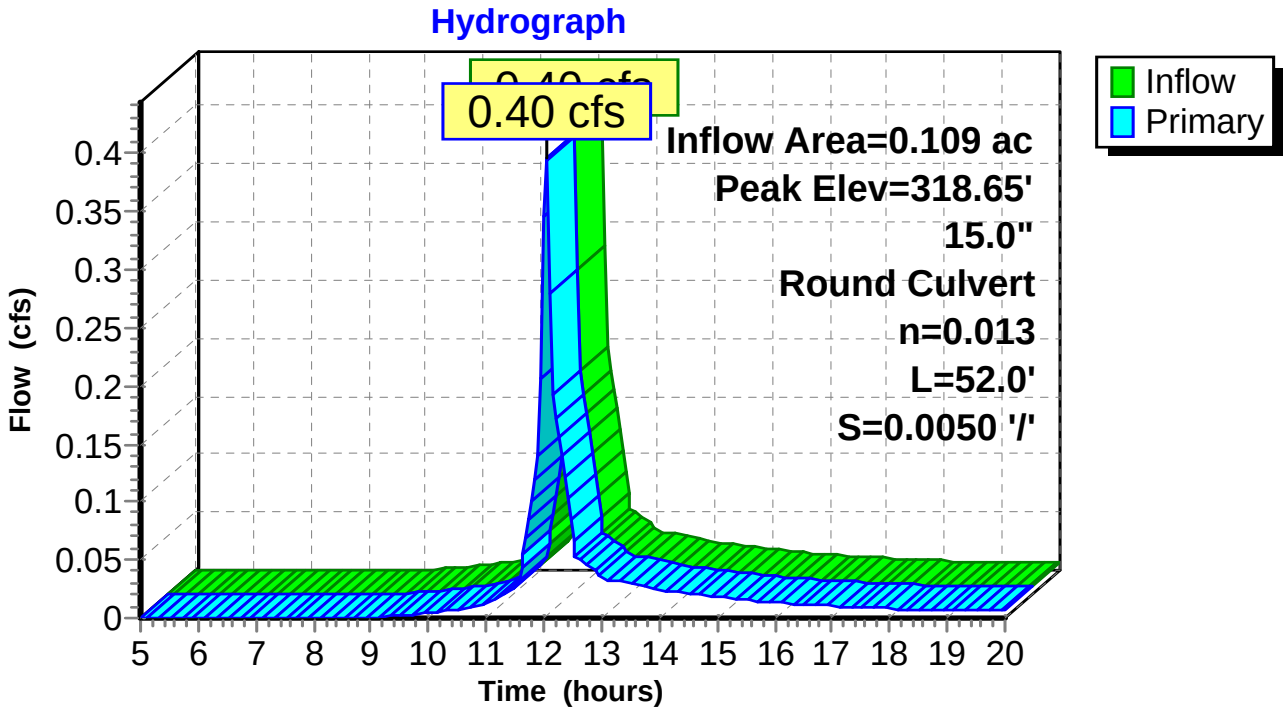
Inflow Area = 0.109 ac, 55.69% Impervious, Inflow Depth > 2.63" for 25-Year event
Inflow = 0.40 cfs @ 12.04 hrs, Volume= 0.024 af
Outflow = 0.40 cfs @ 12.04 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.04 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 318.65' @ 12.04 hrs
Flood Elev= 321.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	318.30'	**15.0" Round Culvert** L= 52.0' CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 318.04' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.38 cfs @ 12.04 hrs HW=318.64' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.38 cfs @ 2.11 fps)

Pond CB1: Catch Basin



Summary for Pond DW: Dry Well

[82] Warning: Early inflow requires earlier time span
[81] Warning: Exceeded Pond CB1 by 2.25' @ 13.00 hrs

Inflow Area = 0.174 ac, 72.27% Impervious, Inflow Depth > 3.57" for 25-Year event
Inflow = 0.80 cfs @ 12.04 hrs, Volume= 0.052 af
Outflow = 0.07 cfs @ 12.97 hrs, Volume= 0.043 af, Atten= 92%, Lag= 55.9 min
Discarded = 0.07 cfs @ 12.97 hrs, Volume= 0.043 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 320.66' @ 12.97 hrs Surf.Area= 308 sf Storage= 1,067 cf
Flood Elev= 321.80' Surf.Area= 308 sf Storage= 1,207 cf

Plug-Flow detention time= 166.1 min calculated for 0.043 af (82% of inflow)
Center-of-Mass det. time= 115.2 min (875.7 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1	312.00'	1,207 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

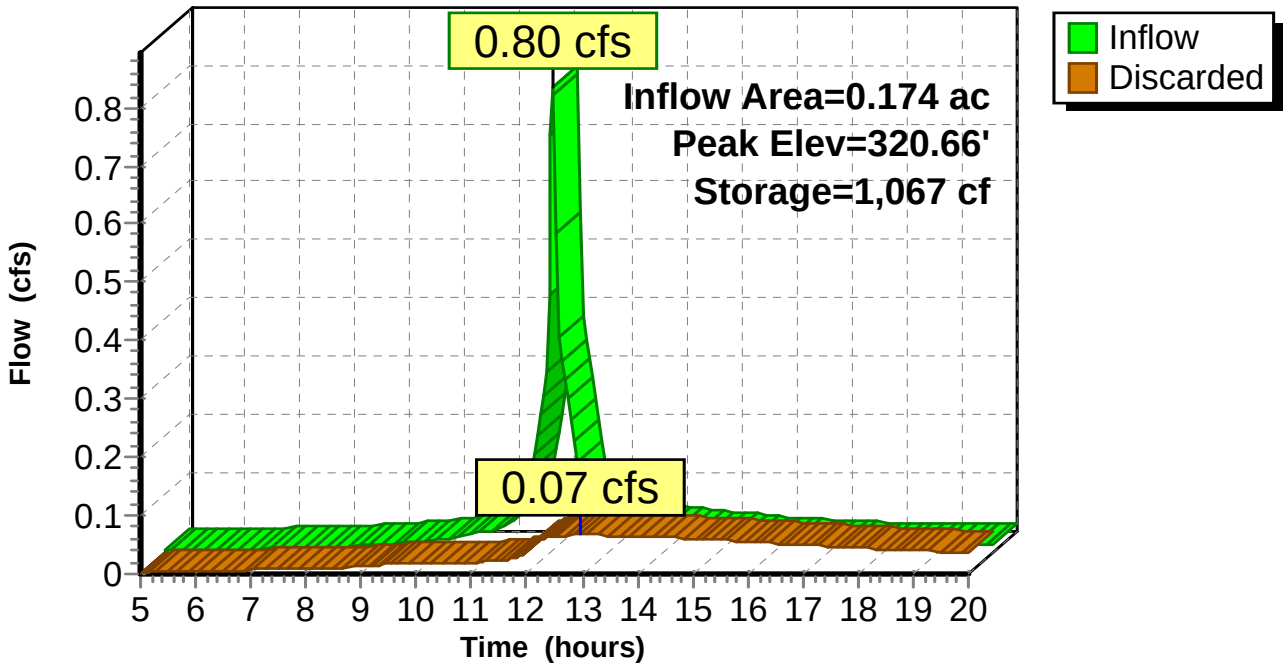
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
312.00	308	0.0	0	0
321.80	308	40.0	1,207	1,207

Device	Routing	Invert	Outlet Devices
#1	Discarded	312.00'	**2.400 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 309.00'

Discarded OutFlow Max=0.07 cfs @ 12.97 hrs HW=320.66' (Free Discharge)
↑**1=Exfiltration** (Controls 0.07 cfs)

Pond DW: Dry Well

Hydrograph



MAINTENANCE PLAN OF STORMWATER MANAGEMENT FACILITIES
FOR:
1017 RIVER ROAD
WINDHAM, MAINE

Project Developer: Meyer Development Solutions Inc.
PO Box 81
Raymond, ME 04071

Responsible Party: Meyer Development Solutions Inc.
PO Box 81
Raymond, ME 04071

List of Stormwater Measures:
Conveyance & Distribution System (Stormwater Channels & Culverts)
Roadways & Parking Surfaces
Dry Well

Introduction:
The owner or operator of the proposed project will be responsible for the maintenance of all stormwater management structures, the establishment of any contract services required to implement the program, and the keeping of records and maintenance log book. Records of all inspections and maintenance work accomplished must be kept on file and retained for a minimum 5 year time span. The maintenance log book will be made available to the DEP upon request. At a minimum, the appropriate and relevant activities for each of the stormwater management systems will be performed on the prescribed schedule.

Inspection & Maintenance Tasks:
Inspections should be performed by qualified erosion control professional. NOTE: The following instruction are excerpts from the Maine Department of Environmental Protection's *Stormwater Management for Maine, Volume III BMPs Technical Design Manual*, dated January 2006.

Conveyance & Distribution Systems: (Stormwater Channels & Culverts, etc.)

1. Inspection schedule:

a. Inspect ditches, swales and other open stormwater channels in the spring, in late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, to control vegetated growth that could obstruct flow, and to 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.

b. Inspect culverts in the spring, in 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.

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

2. Mowing: Grass should not be trimmed extremely short, as this will reduce the filtering effect of the swale (MPCA, 1989). The cut vegetation should be removed to prevent the decaying organic litter from adding pollutants to the discharge from the swale. The mowed height of the grass should be 2-4 inches taller than the maximum flow depth of the design water quality storm. A minimum mow height of 6 inches is generally recommended (Galli, 1993).

3. Erosion: It is important to install erosion and sediment control measures to stabilize this area as soon as possible and to retain any organic matter in the bottom of the trench.

4. Fertilization: Routine fertilization and/or use of pesticides is strongly discouraged. If complete re-seeding is necessary, half the original recommended rate of fertilizer should be applied with a full rate of seed.

5. Sediment Removal: The level of sediment deposition in the channel should be monitored regularly, and removed from grassed channels before permanent damage is done to the grassed vegetation, or if infiltration times are longer than 12 hours. Sediment should be removed from riprap channels when it reduces the capacity of the channel.

Roadways & Parking Surfaces:

Paved surfaces shall be swept or vacuumed at least twice annually in the Spring to remove all Winter sand, and periodically during the year on an as-needed basis to minimize transportation of sediment during rainfall events.

Maine Department of Environmental Protection Maintenance Criteria: General Maintenance for All Infiltration Measures.

1. Fertilization: Fertilization of the area over the infiltration bed should be avoided unless absolutely necessary to establish vegetation.

2. Snow Storage Prohibited: Snow removed from any on-site or off-site areas may not be stored over an infiltration area.

3. Monitoring and Inspections: Inspect the infiltration system several times in the first year of operation and at least annually thereafter. Conduct the inspections after large storms to check for surface ponding at the inlet that may indicate clogging. Water levels in the observation well should be recorded in the maintenance log over several days after the storm to ensure that the system drains within 24 to 48 hours after filling. The basin will need to be rehabilitated if it fails to drain before the next rain event or 72 hours.

4. Pollution-Control Devices: Pollution-control devices such as oil-water separators, skimmers, and booms must be inspected regularly to determine if they need to be cleaned or replaced.

5. Sediment Removal and Maintenance of System Performance: Sediment must be removed from the system at least annually to prevent deterioration of system performance. The pre-treatment inlets should be checked periodically and cleaned out when accumulated sediment occupies more than 10% of available capacity. This can be done manually or by a vacuum pump. Inlet and outlet pipes should be checked for clogging. Accumulated grease and oil from separator devices should be removed frequently and disposed of in accordance with applicable state and local regulations. The system must be rehabilitated or replaced if its performance is degraded to the point that applicable stormwater standards are not met.

6. Pretreatment Buffer Strips: If a grass buffer strip is used in conjunction with the infiltration BMP it should be inspected regularly. Growth should be vigorous and dense. Bare spots or eroded areas should be repaired and/or re-seeded or re-sodded. Watering and/or fertilization should be provided during the first few months after the strip is established, and may periodically be needed in times of drought. Grass filter strips should be mowed regularly to prevent the uncontrolled growth of briars and weeds. Filter strips in residential or commercial areas will need to be mowed more frequently, but filter strip performance will be impaired if the grass is cut too short. Lawn clippings should be removed to prevent them from clogging the BMP.

7. Observation Wells, Measure of Sediment Accumulation, and Points of Access for Sediment Removal: Observation wells to determine the system's performance and access points to allow for the removal of accumulated sediment must be included in the design of infiltration systems. Dry wells and infiltration basins must have staff gauges, marked rods, or similar instrumentation to measure the accumulation of sediment and determine how quickly the system drains after a storm. The maintenance plan must indicate the expected rate of drainage Chapter 6 Infiltration BMPs Volume III: BMPs Technical Design Manual Page 6-7 of the infiltration system and provide for removal of sediment from the infiltration system.

8. Groundwater Monitoring: Groundwater quality monitoring may be required as part of the system maintenance to demonstrate that pollutant removal practices are effective. Groundwater quality monitoring will generally be required for activities infiltrating water from areas of heavy turf-chemical use, such as golf courses and certain athletic fields, and large connected impervious areas, such as parking lots and runways. Groundwater quality monitoring will generally not be required for systems infiltrating water from lawn areas and other vegetated areas, residential developments, playing fields, and roofs of residential and commercial structures.

9. Groundwater Testing: Groundwater should be analyzed quarterly for indicator parameters such as pH, specific conductance, dissolved oxygen, and chloride. Zinc has been found to be a mobile heavy metal and should also be measured quarterly; it tends to appear anywhere from two to ten years after operation of large systems. Sampling for VPH and EPH, BTEX and MTBE, should be performed if draining large impervious areas of urbanized areas.

10. Deed: A commitment to regularly maintain privately-owned trenches will have to be legally conditioned in the property deed, development permit, or home-owner association agreement.

Maine Department of Environmental Protection Maintenance Criteria: Subsurface Sand Filter & Dry Well BMP

During the first year, the subsurface structure will be inspected semi-annually and following major storm events.

Maintenance Agreement: A legal maintenance agreement between the owner and an approved maintenance operator should be established with the specific descriptions of the responsibility of each for inspecting and maintaining any filter. The legal agreement establishing the entity should list specific maintenance activities (including timetables) and provide for the funding to cover long-- term inspection and maintenance.

Soil Filter Inspection: Inspection ports will need to be installed within the underdrain gravel layer. At least one port needs to be installed per 500 square feet of subsurface structure. The system should be inspected after every storm in the first few months to ensure proper function. Thereafter, the filter should be inspected after every major storm to ensure that it is draining within 48 hours. The observation well inspections must be recorded in the maintenance log.

If the infiltration bed is not draining completely within this period, it is not operating within the design criteria required by the rules and the infiltration capacity must be restored, unless a Maine Certified Engineer can demonstrate to the satisfaction of the Department that the system meets all requirements of the permit at the point of discharge to the offsite drainage system.

Pre-treatment device: Cleaning of the pretreatment device shall be done as needed and identified by the entity holding the maintenance agreement as mandated under contract. Debris and sediment buildup within the Isolator Row fabric shall be removed as needed utilizing a Jet-Vac system. A routine inspection schedule needs to be established for each individual site based on site specific variables such as land use (i.e. road, industrial, commercial, residential, etc.) anticipated pollutant load, percent imperviousness, etc. The filter should be inspected at least once every six months to ensure that it is draining within 24 hours to 36 hours; however the inspection can be adjusted based upon previous observations of sediment deposition. When the average depth of sediment throughout the length of the R-Tank Module Row exceeds 3 inches, clean-out must be performed.

Sample Maintenance Log Sheet:

Maintenance Log Sheet			
BMP's	**Date Inspected**	**Repairs Needed?**	**Date Repaired**
Example	8/17/2017	Y	8/27/2017
1. Conveyance & Distribution System			
2. Catch Basin Systems			
3. Roadways & Parking Surfaces			
4. Dry Well			
	See attached observation well log sheet		

Detailed Repair Notes:		
BMP Type	**Date**	**Description of Repair Made**
2	8/27/2017	Removed sediment from sump

HOUSEKEEPING PERFORMANCE STANDARDS

FOR:

1017 RIVER ROAD

WINDHAM, MAINE

Project Developer: Meyer Development Solutions Inc.
PO Box 81
Raymond, ME 04071

Responsible Party: Meyer Development Solutions Inc.
PO Box 81
Raymond, ME 04071

Introduction:

The contractor shall be responsible for maintaining proper housekeeping standards throughout the construction phase of the project. After the construction phase has been completed, the owner or operator of the project will be responsible.

Standards:

In accordance with the housekeeping performance standards required by MDEP chapter 500 stormwater regulations, the following standards shall be met:

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

   Operations during wet months that experience tracking of mud off the site onto public roads should provide for sweeping of road areas at least once a week and prior to significant storm events. Where chronic mud tracking occurs, a stabilized construction entrance should be provided. Operations during dry months, that experience fugitive dust problems, should wet down the access roads once a week or more frequently as needed.
4. **Debris and other materials.** Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

   To prevent these materials from becoming a source of pollutants, construction and post-construction activities related to a project may be required to comply with applicable

provision of rules related to solid, universal, and hazardous waste, including, but not limited to, the Maine solid waste and hazardous waste management rules; Maine hazardous waste management rules; Maine oil conveyance and storage rules; and Maine pesticide requirements.

5. **Trench or foundation de-watering.** Trench 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 must be removed from the ponded area, either through gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the department.

6. **Non-stormwater discharges.** Identify and prevent contamination by non-stormwater discharges.

Mark Cenci
Geologic, Inc.

CERTIFIED GEOLOGIST/LICENSED SITE EVALUATOR

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Cell: 207.329.3524 • mark@markcenci.com
www.markcenci.com

Soil Investigation for Storm Water Control Features, Auto Shine Car Wash, Roosevelt Trail, Windham

Date: November 5, 2016

To: Jeff Amos, PE
Terradyn Consultants, LLC
PO Box 339
New Gloucester, ME 04260

Date of Investigation: October 21, 2016.

Location, Purpose and Method of Investigation:

The property investigated is located approximately 600 feet south of the intersection of Roosevelt Trail and River Road, with frontage on both roads. The purpose of the investigation was to describe the soil at two sites in the areas proposed for storm water control features.

The Auto Shine Car Wash, Sketch Plan #1, by Terradyn Consultants, dated 7/16/2016 was used in the field to locate the areas for the test pits. The pits were dug by an excavator.

Results of the Investigation:

The site is mapped as an extensive deposit of Hinckley loamy sand on the *National Cooperative Soil Survey* (see attached photomaps and descriptions). Soil testing generally agrees with this mapping.

Soil logs are enclosed. The soil textures are sandy, from medium to pebbly and cobbley coarse sand textures, with no restrictive horizons. The test pits did not have a seasonally high water table to a depth of 11 feet.

The site is mapped as a Significant Sand and Gravel Aquifer on the Maine Geologic Survey Map of Craig D. Neil (Open –File Map 98-158).

The sites of the storm water control features are classified as Hydrologic Group A.

Mark Cenci
CG # 467

SOIL TEST PIT LOG FORMS

Project: AUTO SHINE CAR WASH Test Pit Logged By: MARK CENCI CG #467
Location: ROOSEVELT TRAIL, WINDHAM

Weather Conditions
Method of Excavation EXCAVATOR Date 10.21-16
Test Pit #1 Ground Surface Slope % Time

Depth (inches)	Texture	Consistence Or Density	Color	Mottles	Comments
6	LOAMY SAND	FRIABLE	DARK BROWN		
27	FINE SANDY LOAM	FRIABLE	YELLOW BROWN		
44	COBBLEY SAND	LOOSE	YELLOW BROWN		
78	PEBBLEY COARSE TO COBBLEY SAND	LOOSE	GRAY BROWN		
132	SAND MEDIUM TO PEBBLEY COARSE	LOOSE	GRAY BROWN	NONE TO 132"	
LIMIT OF	EXCAVATION	AT -132"			

Weather Conditions
Method of Excavation EXCAVATOR Date 10.21-16
Test Pit #2 Ground Surface Slope % Time

Depth (inches)	Texture	Consistence Or Density	Color	Mottles	Comments
18	SANDY LOAM	FRIABLE	DARK BROWN		
57	COBBLEY/PEBBLEY LOAMY SAND	LOOSE	YELLOW BROWN		
83	PEBBLEY COARSE SAND	LOOSE	GRAY BROWN		
132"	COARSE SAND	LOOSE	GRAY BROWN	NONE TO -132"	
	LIMIT OF	EXCAVATION	AT	-132"	