NHDES ALTERATION OF TERRAIN PERMIT APPLICATION

COLBY-SAWYER COLLEGE
FINE & PERFORMING ARTS CENTER
New London, New Hampshire

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APPLICATION FOR
NHDES ALTERATION OF TERRAIN PERMIT
FOR
COLBY-SAWYER COLLEGE

FINE & PERFORMING ARTS CENTER
NEW LONDON, NH

FEBRUARY 2016

PROJECT NUMBER 15853

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* Information that is not applicable to this project is noted by N/A and is omitted from this report

****Some items have not been included for the New London Site Plan Review submission. These items are noted with a strikethrough in the table of contents below.**

LIST OF TABLES

2.6 Project Narrative

2.6.1 Project Summary

Colby-Sawyer College is applying for an Alteration of Terrain (AoT) permit from the New Hampshire Department of Environmental Services (NHDES) for the construction of a Fine & Performing Arts Center building, sidewalks, landscaping, and drainage features. The project is located in the town of New London, NH, on Tax Map 85, Lot 33. The disturbance area for the proposed project, when combined with other projects completed on campus within the last 10 years, is greater than 100,000 square feet. Therefore the applicant has prepared an AoT permit application for this project.

Excavation and fill for building foundation and site work will be required to complete the improvements. New impervious surfaces will include building roof and walkways. The total disturbance for this work is 78,500 square feet. The total proposed post-project impervious area within the disturbed area is 20,932 square feet. Stormwater from impervious surfaces will be directed to stone drip edges or a micro-extended detention pond.

The following table shows the 2, 10 and 50 year peak flow rate comparison at the discharge points.

Table 2.0 – 2, 10 and 50 Year Comparison

Watershed Area Discharge Point	Pre 2 Yr Flow Rate (cfs)	Post 2 Yr Flow Rate (cfs)	Pre 10 Yr Flow Rate (cfs)	Post 10 Yr Flow Rate (cfs)	Pre 50 Yr Flow Rate (cfs)	Post 50 Yr Flow Rate (cfs)
Dp4	1.43	0.53	3.02	2.88	5.60	5.50

Impacts to watershed water quality from grading within the watersheds are likely from uncontrolled discharge of site runoff during construction activities and stabilized post-project surfaces. To minimize the impacts to the watersheds, the site has been designed to cause no increase in runoff and erosion control methods have been sized in accordance with the Env-Wq 1500 and the *New Hampshire Stormwater Management Manual* (December, 2008).

2.6.2 Existing Site Conditions

The site is located on the Colby-Sawyer College campus between the Windy Hill School and the Curtis L. Ivey Science Center on the site of the Colby Farm building. The site surfaces include a mix of grass, gravel, building roof, and pavement. The site was reviewed for wetlands and there are no wetlands within the proposed disturbance area. No wetland impacts are proposed as part of this project. The project site slopes to the east towards an open meadow and eventually to a wetland stream on campus.

2.6.3 Proposed Site Conditions & Disturbances

Approximately 78,500 square feet of earth disturbance will be required to construct the proposed project. An area of disturbance breakdown has been shown in **Table 2.1**.

Table 2.1 – Proposed Disturbance Area Breakdown

Construction/Disturbance Activity	Area (square feet)	% EIC*	% UDC*
Total Connected Impervious Area	20,932	26.6%	-
Total Disconnected Impervious Area	0	0.0%	-
Grading and Site Disturbance	57,568	-	-
Total Disturbance	78,500		

** EIC = Effective Impervious Cover*
** UDC = Undisturbed Cover*

The total connected impervious area listed with EIC of 26.6% is the EIC within the proposed disturbance area.

The impacts to water quality during site development will be minimized using erosion control measures. Frequent site inspections during construction are required during or directly following rainfall events to ensure erosion control devices are working properly. A copy of the Stormwater Inspection and Maintenance Manual can be found in **Section 3.8** of this report.

2.6.4 Rainfall Data

Using SCS TR-20, run under HydroCAD Version 10.0 with Type II-24 hour rainfall events, pre- and post-development cover types and drainage paths were modeled to generate peak discharge rates. Rainfall events modeled have intensities described by data provided by the Northeast Regional Climate Center for the geographic location of the project. These data are provided in full in section 2.13 of this report, and are summarized below in **Table 2.2**.

Table 2.2 - Type II, 24 Hour Rainfall Depths for Project Site (43.411^{o}N, 71.974^{o}W)

Rainfall Event	Depth*
1-Year	2.25”
2-Year	2.99”
10-Year	3.85”
50-Year	5.61”

** Rainfall depths from the Northeast Regional Climate Center Extreme Precipitation Tables, http://precip.eas.cornell.edu, accessed 10 December 2015, See section 2.13*

2.6.5 Peak Runoff Control Requirement

Due to the post-project grading of the site and changes in land cover, stormwater devices were used to attenuate flow in order to meet the Peak Runoff Control requirements of Env-Wq 1507.06. **Table 2.3** summarizes the stormwater runoff peak flow rate for the 10 and 50 year storm events.

Table 2.3 – 10 and 50 Year Comparison

Watershed Area Discharge Point	Pre 10 Yr Flow Rate (cfs)	Post 10 Yr Flow Rate (cfs)	Pre 50 Yr Flow Rate (cfs)	Post 50 Yr Flow Rate (cfs)
Dp4	3.02	2.88	5.60	5.50

2.6.6 Channel Protection Requirement

NHDES requires that the receiving waters and downstream wetland channels be protected from erosion and sedimentation resulting from the project development. In order to show no impact to offsite channels, analysis of the proposed drainage system must meet one of the conditions in Env-Wq 1507.05. **Table 2.4** summarizes the flow data with respect to Channel Protection. The final discharge point off-site, Dp4, meets Env-Wq 1507.05 (b) (1) (b).

Table 2.4 – Channel Protection Comparison Outlet Points

Outlet point	Pre 2 Yr Flow Rate (cfs)	Post 2 Yr Flow Rate (cfs)	Pre 2yr Vol. acre-feet (af)	Post 2yr Vol. acre-feet (af)
Dp4	1.40	0.53	0.12	0.11

2.6.7 Groundwater Recharge Volume

Under Env-Wq 1507.04, NHDES requires a portion of the stormwater runoff be infiltrated to protect groundwater resources by reducing the amount of water diverted off-site by the proposed disturbance. The amount of groundwater recharge required per soil group is summarized in **Table 2.5**. An infiltration practice has been included in the proposed design. The stone drip edge infiltration practice provides 288 cubic feet of groundwater recharge through infiltration.

Table 2.5 – Groundwater Recharge Volume Comparison

HSG	Required Groundwater Recharge Depth (in)	Net Proposed Effective Impervious Area (Acres)	GRV Required by NHDES (cubic feet)	GRV Provided (cubic feet)
A	0.40	0.00	0	
B	0.25	0.29	105	288
C	0.10	0.00	0	
D	0.00	0.00	0	
	Total	0.23	105	288

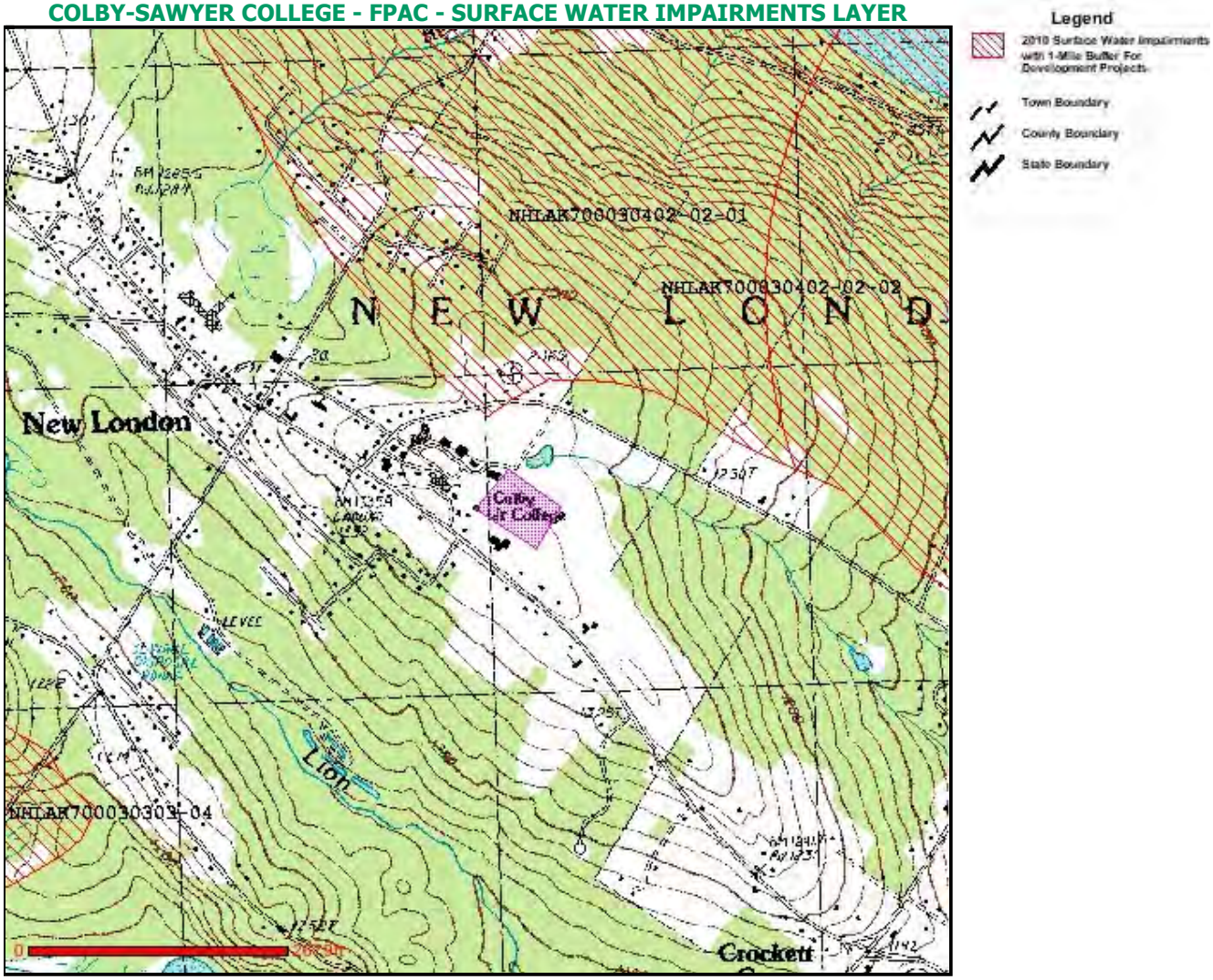
2.7 Surface Water Impairments

2010 Surface Water Impairments with 1-Mile Buffer for Development Projects
(Features returned: **0**)

New Hampshire Department of Environmental Services

OneStop Program GIS

COLBY-SAWYER COLLEGE - FPAC - SURFACE WATER IMPAIRMENTS LAYER



Map Scale = 1 : 23155 (1" = 1930 feet or 0.4 miles)

The information contained in the OneStop Program GIS is the best available according to the procedures and standards of each of the contributing programs and of the GIS. The different programs are regularly maintaining the information in their databases. As a result, the GIS may not always provide access to all existing information, and it may occasionally contain unintentional inaccuracies. The Department can not be responsible for the misuse or misinterpretation of the information presented by this system.

Map prepared 2/5/2016 12:58:51 PM

GRANIT Complex Systems Research Center

Developed in cooperation with NH GRANIT

2.8 AOT Screening Layers

Wellhead Protection Area
(Features returned: **0**)

GAA Groundwater Classification Area
(Features returned: **0**)

GA1 Groundwater Classification Area
(Features returned: **0**)

Public Water Supply Sources
(Features returned: **0**)

Aquifer Transmissity
(Features returned: **0**)

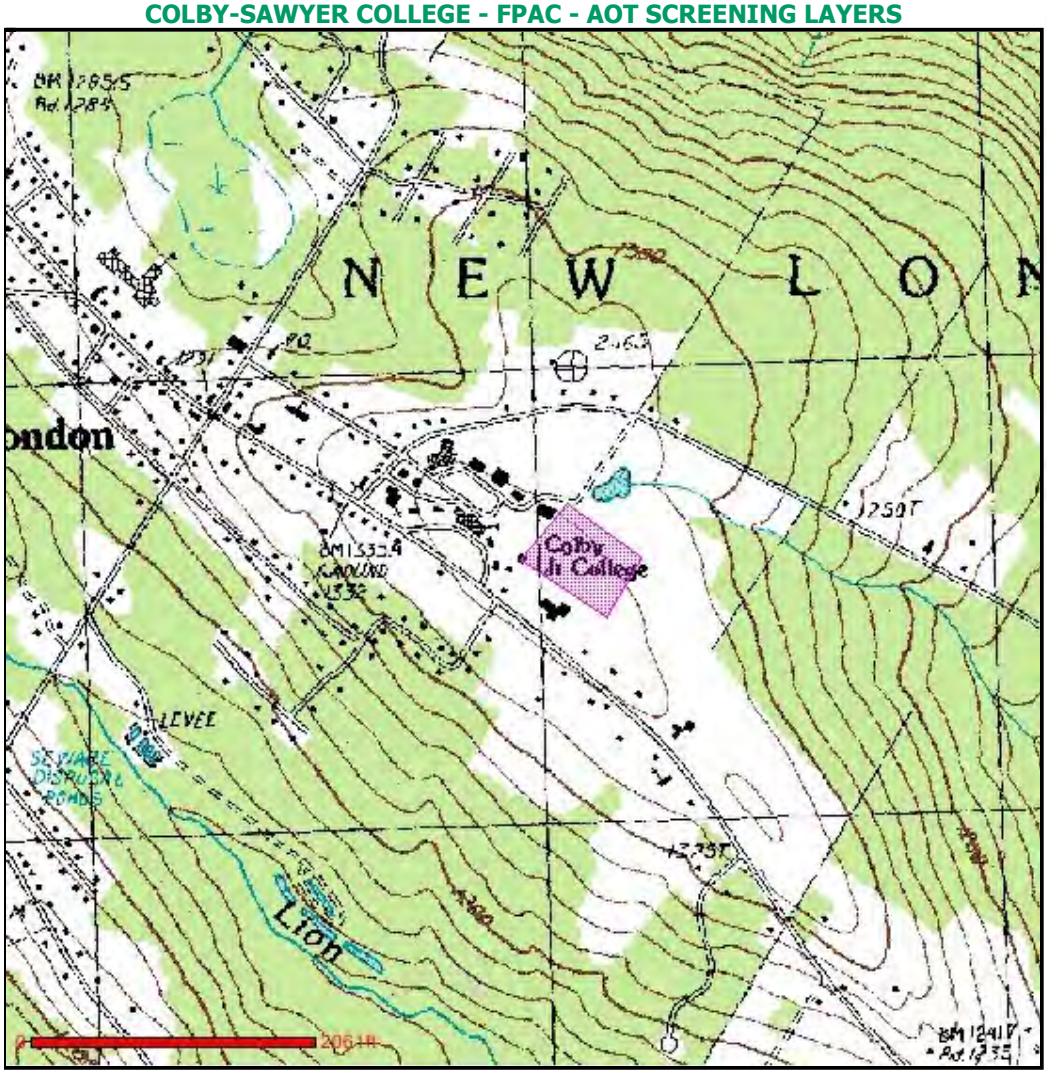
Aquifer Saturated Thickness Contours (feet)
(Features returned: **0**)

Water Supply Intake 1/4-Mile Radii
(Features returned: **0**)

New Hampshire Department of Environmental Services

OneStop Program GIS

COLBY-SAWYER COLLEGE - FPAC - AOT SCREENING LAYERS



Map Scale = 1 : 17814 (1" = 1485 feet or 0.3 miles)

The information contained in the OneStop Program GIS is the best available according to the procedures and standards of each of the contributing programs and of the GIS. The different programs are regularly maintaining the information in their databases. As a result, the GIS may not always provide access to all existing information, and it may occasionally contain unintentional inaccuracies. The Department can not be responsible for the misuse or misinterpretation of the information presented by this system.

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GRANIT Complex Systems Research Center

Developed in cooperation with NH GRANIT

2.9 NHB Letter/Response

New Hampshire Natural Heritage Bureau

To: Will Davis
PO Box 1825
New London, NH 03257

Date: 1/29/2016

From: NH Natural Heritage Bureau

Re: Review by NH Natural Heritage Bureau of request dated 1/29/2016

NHB File ID: NHB16-0299

Applicant: Will Davis

Location: Tax Map(s)/Lot(s): Tax Map 85 Lot 33
New London

Project Description: Remove exisitng building and construct a new building with associated walks, utility services, landscaping, and drainage features.

The NH Natural Heritage database has been checked for records of rare species and exemplary natural communities near the area mapped below. The species considered include those listed as Threatened or Endangered by either the state of New Hampshire or the federal government. We currently have no recorded occurrences for sensitive species near this project area.

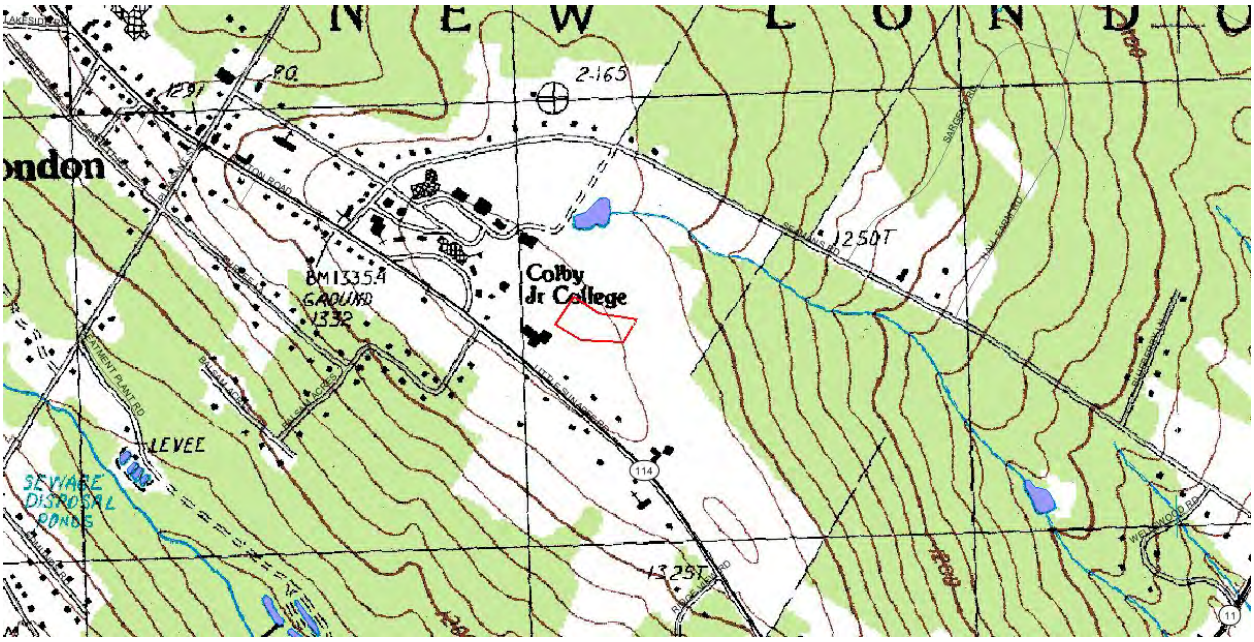
A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

This report is valid through 1/28/2017.

Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DRED/NHB
172 Pembroke Road
Concord NH 03301

MAP OF PROJECT BOUNDARIES FOR NHB FILE ID: NHB16-0299



Department of Resources and Economic Development
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DRED/NHB
172 Pembroke Road
Concord NH 03301

2.10 NRCS Soils Information
(Web Soils Survey Map)

2.11 Aerial Photograph

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Merrimack and Belknap Counties, New Hampshire

Colby-Sawyer College - F&PAC

February 2, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

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: 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: Merrimack and Belknap Counties, New Hampshire
Survey Area Data: Version 20, Sep 22, 2015

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

Date(s) aerial images were photographed: Apr 8, 2011—May 1, 2011

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

Merrimack and Belknap Counties, New Hampshire (NH609)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
378B	Peru fine sandy loam, 3 to 8 percent slopes	5.0	59.5%
378C	Peru fine sandy loam, 8 to 15 percent slopes	3.4	39.8%
379C	Peru fine sandy loam, 8 to 15 percent slopes, very stony	0.1	0.7%
Totals for Area of Interest		**8.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments

on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Merrimack and Belknap Counties, New Hampshire

378B—Peru fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2ty5y
Elevation: 230 to 1,770 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Peru and similar soils: 84 percent
Minor components: 16 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peru

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy lodgment till derived from granite and/or loamy lodgment till derived from mica schist and/or loamy lodgment till derived from phyllite

Typical profile

Ap - 0 to 6 inches: fine sandy loam
Bhs - 6 to 8 inches: fine sandy loam
Bs1 - 8 to 12 inches: fine sandy loam
Bs2 - 12 to 18 inches: fine sandy loam
Bs3 - 18 to 21 inches: fine sandy loam
BC - 21 to 24 inches: fine sandy loam
Cd - 24 to 65 inches: sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 16 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D

Minor Components

Marlow

Percent of map unit: 6 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, interfluve
Microfeatures of landform position: Rises, rises
Down-slope shape: Convex
Across-slope shape: Convex

Colonel

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase, interfluve
Microfeatures of landform position: Closed depressions, closed depressions
Down-slope shape: Linear, concave
Across-slope shape: Concave

Cabot

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase, interfluve
Microfeatures of landform position: Closed depressions, closed depressions
Down-slope shape: Concave
Across-slope shape: Concave

Lyman

Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Mountainbase, interfluve
Microfeatures of landform position: Rises, rises
Down-slope shape: Convex
Across-slope shape: Convex

378C—Peru fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2ty60
Elevation: 330 to 1,870 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Peru and similar soils: 83 percent

Minor components: 17 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peru

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy lodgment till derived from granite and/or loamy lodgment till derived from mica schist and/or loamy lodgment till derived from phyllite

Typical profile

Ap - 0 to 6 inches: fine sandy loam
Bhs - 6 to 8 inches: fine sandy loam
Bs1 - 8 to 12 inches: fine sandy loam
Bs2 - 12 to 18 inches: fine sandy loam
Bs3 - 18 to 21 inches: fine sandy loam
BC - 21 to 24 inches: fine sandy loam
Cd - 24 to 65 inches: sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 16 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D

Minor Components

Colonel

Percent of map unit: 7 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase, mountainflank, nose slope, interfluve, side slope
Microfeatures of landform position: Open depressions, open depressions, closed depressions, closed depressions
Down-slope shape: Linear, concave
Across-slope shape: Concave

Marlow

Percent of map unit: 4 percent
Landform: Hills, mountains

Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Microfeatures of landform position: Rises, rises
Down-slope shape: Convex
Across-slope shape: Convex

Cabot

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase, mountainflank, side slope, interfluve, nose slope
Microfeatures of landform position: Open depressions, open depressions, closed depressions, closed depressions
Down-slope shape: Concave
Across-slope shape: Concave

Tunbridge

Percent of map unit: 2 percent
Landform: Hills, mountains
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, nose slope, side slope
Microfeatures of landform position: Rises, rises
Down-slope shape: Convex
Across-slope shape: Convex

379C—Peru fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2ty65
Elevation: 360 to 2,160 feet
Mean annual precipitation: 31 to 95 inches
Mean annual air temperature: 27 to 52 degrees F
Frost-free period: 90 to 160 days
Farmland classification: Farmland of local importance

Map Unit Composition

Peru, very stony, and similar soils: 84 percent
Minor components: 16 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peru, Very Stony

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, side slope, nose slope

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy lodgment till derived from granite and/or loamy lodgment till derived from mica schist and/or loamy lodgment till derived from phyllite

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 5 inches: fine sandy loam
E - 5 to 6 inches: fine sandy loam
Bs1 - 6 to 7 inches: fine sandy loam
Bs2 - 7 to 13 inches: fine sandy loam
Bs3 - 13 to 18 inches: fine sandy loam
BC - 18 to 21 inches: fine sandy loam
Cd1 - 21 to 37 inches: fine sandy loam
Cd2 - 37 to 65 inches: fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 1.1 percent
Depth to restrictive feature: 21 to 43 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.42 in/hr)
Depth to water table: About 17 to 34 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Minor Components

Marlow, very stony

Percent of map unit: 6 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, side slope, nose slope
Microfeatures of landform position: Rises, rises
Down-slope shape: Convex
Across-slope shape: Convex

Cabot, very stony

Percent of map unit: 4 percent
Landform: Hills, mountains
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, side slope, nose slope
Microfeatures of landform position: Open depressions, open depressions, closed depressions, closed depressions
Down-slope shape: Concave
Across-slope shape: Concave

Lyman, very stony

Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (two-dimensional): Shoulder, summit, backslope
Landform position (three-dimensional): Mountainflank, mountainbase, interfluve, side slope, nose slope
Microfeatures of landform position: Rises, rises
Down-slope shape: Convex
Across-slope shape: Convex

Colonel, very stony

Percent of map unit: 3 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase, mountainflank, interfluve, side slope, nose slope
Microfeatures of landform position: Open depressions, open depressions, closed depressions, closed depressions
Down-slope shape: Linear, concave
Across-slope shape: Concave

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2.12 Site Photographs

COLBY-SAWYER COLLEGE – FINE & PERFORMING ARTS CENTER

PHOTO 1 – Front Building Elevation (12/8/2015)

PHOTO 2 – Site looking northeast (12/8/2015)

PHOTO 3 – Site looking north (12/8/2015)

PHOTO 4 – Rear Building Elevation (12/8/2015)

PHOTO 5 – Site looking east (12/8/2015)

PHOTO 6 – Building Elevation – Windy Hill School Side (12/8/2015)

PHOTO 7 – Site looking east toward Micro-Extended Detention Pond location (12/17/2015)

PHOTO 8 – Site looking south towards NLSWP Pump Station (11/5/2015)

2.13 Extreme Precipitation Tables
(Northeast Regional Climate Center)

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	71.974 degrees West
Latitude	43.411 degrees North
Elevation	0 feet
Date/Time	Thu, 10 Dec 2015 15:56:03 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.02	**1yr**	0.70	0.95	1.17	1.46	1.81	2.25	2.55	**1yr**	1.99	2.45	2.84	3.50	4.05	**1yr**
2yr	0.31	0.48	0.60	0.79	0.99	1.24	**2yr**	0.85	1.13	1.42	1.75	2.16	2.64	2.99	**2yr**	2.34	2.88	3.35	4.00	4.59	**2yr**
5yr	0.37	0.58	0.72	0.97	1.24	1.56	**5yr**	1.07	1.42	1.79	2.21	2.69	3.27	3.75	**5yr**	2.90	3.61	4.18	4.93	5.59	**5yr**
10yr	0.42	0.66	0.83	1.13	1.47	1.86	**10yr**	1.27	1.70	2.15	2.64	3.20	3.85	4.45	**10yr**	3.40	4.28	4.96	5.77	6.50	**10yr**
25yr	0.50	0.79	1.01	1.39	1.84	2.35	**25yr**	1.59	2.15	2.71	3.32	4.00	4.77	5.59	**25yr**	4.22	5.37	6.21	7.13	7.93	**25yr**
50yr	0.57	0.91	1.17	1.63	2.19	2.81	**50yr**	1.89	2.58	3.24	3.96	4.74	5.61	6.64	**50yr**	4.96	6.38	7.37	8.36	9.22	**50yr**
100yr	0.64	1.04	1.35	1.91	2.60	3.35	**100yr**	2.25	3.08	3.87	4.72	5.62	6.60	7.89	**100yr**	5.85	7.58	8.74	9.82	10.73	**100yr**
200yr	0.74	1.21	1.57	2.25	3.09	4.00	**200yr**	2.67	3.69	4.62	5.61	6.66	7.78	9.38	**200yr**	6.88	9.02	10.38	11.53	12.49	**200yr**
500yr	0.89	1.47	1.92	2.78	3.89	5.05	**500yr**	3.36	4.69	5.83	7.06	8.33	9.66	11.79	**500yr**	8.55	11.34	13.03	14.27	15.27	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.21	0.32	0.40	0.53	0.66	0.82	**1yr**	0.57	0.80	0.95	1.28	1.64	1.95	2.30	**1yr**	1.73	2.21	2.57	2.99	3.28	**1yr**
2yr	0.30	0.46	0.57	0.77	0.95	1.12	**2yr**	0.82	1.10	1.29	1.68	2.16	2.56	2.87	**2yr**	2.26	2.76	3.21	3.86	4.43	**2yr**
5yr	0.34	0.52	0.65	0.89	1.14	1.33	**5yr**	0.98	1.30	1.52	1.97	2.49	2.99	3.37	**5yr**	2.65	3.24	3.76	4.48	5.12	**5yr**
10yr	0.37	0.57	0.71	0.99	1.28	1.49	**10yr**	1.11	1.46	1.71	2.20	2.76	3.37	3.80	**10yr**	2.98	3.65	4.22	5.01	5.72	**10yr**
25yr	0.41	0.63	0.78	1.12	1.47	1.70	**25yr**	1.27	1.66	2.01	2.53	3.18	3.93	4.44	**25yr**	3.48	4.27	4.89	5.80	6.59	**25yr**
50yr	0.44	0.67	0.83	1.19	1.61	1.86	**50yr**	1.39	1.82	2.26	2.81	3.51	4.43	4.99	**50yr**	3.92	4.80	5.47	6.44	7.35	**50yr**
100yr	0.46	0.69	0.87	1.25	1.72	2.03	**100yr**	1.48	1.98	2.54	3.24	3.91	4.99	5.60	**100yr**	4.41	5.38	6.09	7.14	8.16	**100yr**
200yr	0.47	0.71	0.90	1.31	1.83	2.20	**200yr**	1.58	2.15	2.86	3.64	4.36	5.63	6.26	**200yr**	4.98	6.02	6.77	7.92	9.07	**200yr**
500yr	0.50	0.74	0.96	1.39	1.98	2.41	**500yr**	1.71	2.35	3.34	4.24	5.01	6.62	7.25	**500yr**	5.86	6.97	7.75	9.04	10.42	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.55	0.74	0.91	1.09	**1yr**	0.79	1.06	1.21	1.58	1.95	2.51	2.90	**1yr**	2.23	2.78	3.21	3.86	4.46	**1yr**
2yr	0.34	0.53	0.65	0.88	1.08	1.24	**2yr**	0.93	1.21	1.40	1.81	2.30	2.76	3.14	**2yr**	2.44	3.02	3.52	4.18	4.77	**2yr**
5yr	0.41	0.63	0.78	1.07	1.36	1.59	**5yr**	1.17	1.56	1.81	2.29	2.90	3.57	4.17	**5yr**	3.16	4.01	4.65	5.37	6.07	**5yr**
10yr	0.49	0.75	0.93	1.30	1.67	1.97	**10yr**	1.44	1.93	2.23	2.73	3.44	4.33	5.20	**10yr**	3.83	5.00	5.74	6.52	7.32	**10yr**
25yr	0.63	0.95	1.18	1.69	2.22	2.63	**25yr**	1.92	2.57	2.95	3.51	4.38	5.58	6.95	**25yr**	4.94	6.68	7.65	8.46	9.38	**25yr**
50yr	0.75	1.15	1.43	2.05	2.77	3.28	**50yr**	2.39	3.21	3.64	4.25	5.27	6.79	8.66	**50yr**	6.01	8.33	9.51	10.32	11.32	**50yr**
100yr	0.92	1.39	1.75	2.52	3.46	4.11	**100yr**	2.98	4.02	4.50	5.32	6.34	8.26	10.81	**100yr**	7.31	10.40	11.81	12.61	13.67	**100yr**
200yr	1.12	1.69	2.14	3.10	4.32	5.16	**200yr**	3.73	5.05	5.57	6.46	8.06	10.06	13.51	**200yr**	8.90	12.99	14.67	15.44	16.51	**200yr**
500yr	1.47	2.18	2.81	4.08	5.80	6.99	**500yr**	5.01	6.83	7.40	8.37	10.39	13.05	18.18	**500yr**	11.55	17.48	19.61	20.19	21.22	**500yr**

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SECTION 3.0 - DRAINAGE CALCULATIONS, ANALYSIS & DESIGN

3.1 Groundwater Recharge Volume (GRV) Calculations

Groundwater Recharge Volume (GRV) Calculation

	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
0.29	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.10	inches	Rd = weighted groundwater recharge depth	
0.029	ac-in	GRV = AI * Rd	
105	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12")	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

Stone Drip Edges provide GRV.

3.2 BMP Worksheets for all Treatment Systems

STORMWATER POND DESIGN CRITERIA (Env-Wq 1508.03)

Type/Node Name: **2P - Micro-Extended Detention Pond**

Enter the type of stormwater pond (e.g., Wet Pond) and the node name in the drainage analysis, if applicable

1.36	ac	A = Area draining to the practice	
0.42	ac	A_I = Impervious area draining to the practice	
0.31	decimal	I = percent impervious area draining to the practice, in decimal form	
0.33	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.45	ac-in	WQV= 1" x Rv x A	
1,619	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
162	cf	10% x WQV (check calc for sediment forebay and micropool volume)	
809	cf	50% x WQV (check calc for extended detention volume)	
162	cf	V_{SED} = sediment forebay volume	← **≥ 10%WQV**
270	cf	V_{PP} = permanent pool volume (volume below the lowest invert of the outlet structure)	
1,349	cf	V_{ED} = WQV - V_{PP} = extended detention volume	← **≤ X%[1] WQV**
1,335.28		E_{ED} = elevation of V_{ED} (attach stage-storage table)	
0.03	cfs	$2Q_{avg}$ = 2* V_{ED} / 24 hrs * (1hr / 3600 sec) (used to check against Q_{EDmax} below)	
0.02	cfs	Q_{EDmax} = discharge at the E_{ED} (attach stage-discharge table)	← **<$2Q_{avg}$**
37.47	hours	T_{ED} = drawdown time of extended detention = $2V_{ED}/Q_{EDmax}$	← **≥ 24-hrs**
3.00	:1	Pond side slopes	← **≥3:1**
4.00	ft	Average permanent pool depth	← **3 - 6 ft**
4.00	ft	Maximum depth of permanent pool	← **≤ 8 ft**
65.00	ft	Length of the flow path between the inlet and outlet at mid-depth	
20.00	ft	Average Width ([average of the top width + average bottom width]/2)	
3.25	:1	Length to Average Width ratio	← **≥ 3:1**
Yes	Yes/No	The perimeter should be curvilinear.	
Yes	Yes/No	The inlet and outlet should be located as far apart as possible.	
Yes	Yes/No	Is there a manually-controlled drain provided to dewater the pond over a 24hr period?	
If no state why:			
Screen on		What mechanism is proposed to prevent the outlet structure from clogging (applicable for orifices/weirs with a dimension of ≤6")?	
End Section			
1,336.00	ft	Peak elevation of the 50-year storm event	
1,337.00	ft	Berm elevation of the pond	
YES		50 peak elevation ≤ the berm elevation?	← **yes**

Qualified professional that developed the planting plan:

Name, Profession: Will Davis, PE

1. "X" varies depending on type of stormwater pond design. See NH Stormwater Manual, Vol.2, Ch.4-3, Section 1, for the design permanent pool volumes and extended detention volumes.

Designer's Notes:

INFILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.05)

Type/Node Name: **1P - Roof Stone Drip Edge**

Enter the type of infiltration practice (e.g., trench) and the node name in the drainage analysis, if applicable

Yes		Have you reviewed Env-Wq 1508.05(a) to ensure that infiltration is allowed?	
0.05	ac	A = Area draining to the practice	
0.05	ac	A_I = Impervious area draining to the practice	
1.00	decimal	I = percent impervious area draining to the practice, in decimal form	
0.95	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.05	ac-in	WQV= 1" x Rv x A	
171	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
43	cf	25% x WQV (check calc for sediment forebay volume)	
Roof Runoff		Method of pretreatment? (not required for clean or roof runoff)	
N/A	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
226	cf	V = volume[1] (attach a stage-storage table)	← ≥ WQV
285	sf	A_{SA} = surface area of the bottom of the pond	
3.00	iph	I_{DESIGN} = design infiltration rate[2]	
3.2	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
1,361.00	feet	E_{BTM} = elevation of the bottom of the practice	
	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1,361.00	feet	D_{SHWT} = separation from SHWT[3]	← ≥ *[3]
1,361.0	feet	D_{ROCK} = separation from bedrock[3]	← ≥ *[3]
2.00	ft	D_T = depth of trench, if trench proposed	← 4 - 10 ft
N/A	Yes/No	If a trench or underground system is proposed, observation well provided	
stone		If a trench is proposed, material in trench	
N/A		If a basin is proposed, basin floor material	
N/A	Yes/No	If a basin is proposed, the perimeter should be curvilinear.	
N/A	:1	If a basin is proposed, pond side slopes	← ≥3:1
1,362.84	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
1,362.91	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
1,363.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. See NH Stormwater Manual, Vol.2, Ch.2-4, for guidance on determining the infiltration rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.

Designer's Notes:

INFILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.05)

Type/Node Name: **3P - Roof Stone Drip Edge**

Enter the type of infiltration practice (e.g., trench) and the node name in the drainage analysis, if applicable

Yes		Have you reviewed Env-Wq 1508.05(a) to ensure that infiltration is allowed?	
0.01	ac	A = Area draining to the practice	
0.01	ac	A_I = Impervious area draining to the practice	
1.00	decimal	I = percent impervious area draining to the practice, in decimal form	
0.95	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.01	ac-in	WQV= 1" x Rv x A	
45	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
11	cf	25% x WQV (check calc for sediment forebay volume)	
Roof Runoff		Method of pretreatment? (not required for clean or roof runoff)	
N/A	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
60	cf	V = volume[1] (attach a stage-storage table)	← ≥ WQV
75	sf	A_{SA} = surface area of the bottom of the pond	
3.00	iph	I_{DESIGN} = design infiltration rate[2]	
3.2	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
1,361.00	feet	E_{BTM} = elevation of the bottom of the practice	
	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1,361.00	feet	D_{SHWT} = separation from SHWT[3]	← ≥ *[3]
1,361.0	feet	D_{ROCK} = separation from bedrock[3]	← ≥ *[3]
2.00	ft	D_T = depth of trench, if trench proposed	← 4 - 10 ft
N/A	Yes/No	If a trench or underground system is proposed, observation well provided	
stone		If a trench is proposed, material in trench	
N/A		If a basin is proposed, basin floor material	
N/A	Yes/No	If a basin is proposed, the perimeter should be curvilinear.	
N/A	:1	If a basin is proposed, pond side slopes	← ≥3:1
1,362.85	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
1,362.90	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
1,363.00	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. See NH Stormwater Manual, Vol.2, Ch.2-4, for guidance on determining the infiltration rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.

Designer's Notes:

Stage-Discharge for Pond 2P: Micro-Extended Detention Pond

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
1,332.00	0.00	0.00	0.00
1,332.05	0.00	0.00	0.00
1,332.10	0.00	0.00	0.00
1,332.15	0.00	0.00	0.00
1,332.20	0.00	0.00	0.00
1,332.25	0.00	0.00	0.00
1,332.30	0.00	0.00	0.00
1,332.35	0.00	0.00	0.00
1,332.40	0.00	0.00	0.00
1,332.45	0.00	0.00	0.00
1,332.50	0.00	0.00	0.00
1,332.55	0.00	0.00	0.00
1,332.60	0.00	0.00	0.00
1,332.65	0.00	0.00	0.00
1,332.70	0.01	0.01	0.00
1,332.75	0.01	0.01	0.00
1,332.80	0.01	0.01	0.00
1,332.85	0.01	0.01	0.00
1,332.90	0.01	0.01	0.00
1,332.95	0.01	0.01	0.00
1,333.00	0.01	0.01	0.00
1,333.05	0.01	0.01	0.00
1,333.10	0.01	0.01	0.00
1,333.15	0.01	0.01	0.00
1,333.20	0.01	0.01	0.00
1,333.25	0.01	0.01	0.00
1,333.30	0.01	0.01	0.00
1,333.35	0.01	0.01	0.00
1,333.40	0.01	0.01	0.00
1,333.45	0.01	0.01	0.00
1,333.50	0.01	0.01	0.00
1,333.55	0.01	0.01	0.00
1,333.60	0.01	0.01	0.00
1,333.65	0.01	0.01	0.00
1,333.70	0.01	0.01	0.00
1,333.75	0.01	0.01	0.00
1,333.80	0.01	0.01	0.00
1,333.85	0.01	0.01	0.00
1,333.90	0.02	0.02	0.00
1,333.95	0.02	0.02	0.00
1,334.00	0.02	0.02	0.00
1,334.05	0.02	0.02	0.00
1,334.10	0.02	0.02	0.00
1,334.15	0.02	0.02	0.00
1,334.20	0.02	0.02	0.00
1,334.25	0.02	0.02	0.00
1,334.30	0.02	0.02	0.00
1,334.35	0.02	0.02	0.00
1,334.40	0.02	0.02	0.00
1,334.45	0.02	0.02	0.00
1,334.50	0.02	0.02	0.00
1,334.55	0.02	0.02	0.00
1,334.60	0.02	0.02	0.00
1,334.65	0.02	0.02	0.00
1,334.70	0.02	0.02	0.00
1,334.75	0.02	0.02	0.00
1,334.80	0.02	0.02	0.00
1,334.85	0.02	0.02	0.00
1,334.90	0.02	0.02	0.00
1,334.95	0.02	0.02	0.00
1,335.00	0.02	0.02	0.00
1,335.05	0.02	0.02	0.00
1,335.10	0.02	0.02	0.00
1,335.15	0.02	0.02	0.00
1,335.20	0.02	0.02	0.00
1,335.25	0.02	0.02	0.00
1,335.30	0.02	0.02	0.00
1,335.35	0.02	0.02	0.00
1,335.40	0.02	0.02	0.00
1,335.45	0.02	0.02	0.00
1,335.50	0.02	0.02	0.00
1,335.55	0.02	0.02	0.00
1,335.60	0.02	0.02	0.00
1,335.65	0.02	0.02	0.00
1,335.70	0.02	0.02	0.00
1,335.75	0.30	0.02	0.27
1,335.80	0.79	0.02	0.77
1,335.85	1.44	0.02	1.42
1,335.90	2.21	0.02	2.18
1,335.95	3.12	0.02	3.09
1,336.00	4.15	0.02	4.12
1,336.05	5.29	0.02	5.27
1,336.10	6.55	0.02	6.53
1,336.15	7.89	0.02	7.86
1,336.20	9.32	0.02	9.30
1,336.25	10.85	0.02	10.83
1,336.30	12.48	0.02	12.46
1,336.35	14.06	0.03	14.03
1,336.40	15.69	0.03	15.67
1,336.45	17.38	0.03	17.36
1,336.50	19.13	0.03	19.10
1,336.55	20.91	0.03	20.88
1,336.60	22.74	0.03	22.71
1,336.65	24.61	0.03	24.58
1,336.70	26.53	0.03	26.50
1,336.75	28.51	0.03	28.49
1,336.80	30.54	0.03	30.52
1,336.85	32.62	0.03	32.59
1,336.90	34.73	0.03	34.70
1,336.95	36.92	0.03	36.90
1,337.00	**39.16**	**0.03**	**39.13**

Stage-Area-Storage for Pond 2P: Micro-Extended Detention Pond

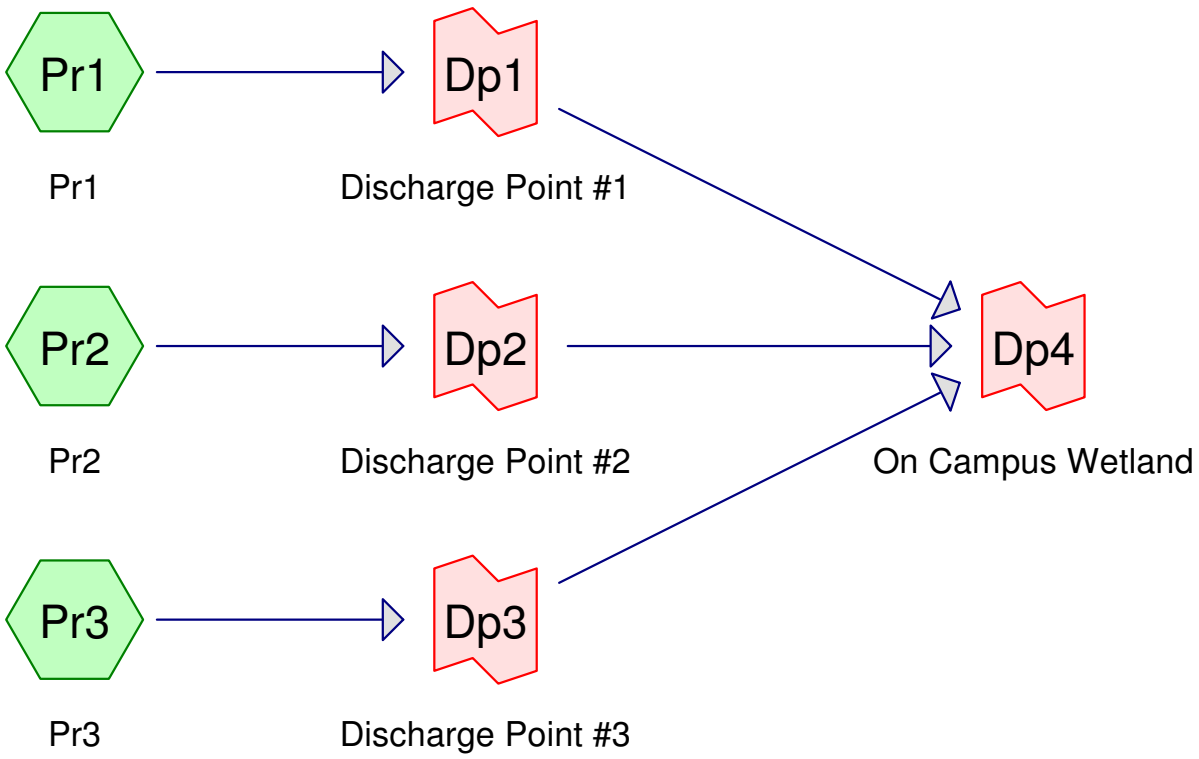
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
1,332.00	0	1,334.60	963
1,332.05	0	1,334.65	999
1,332.10	1	1,334.70	1,038
1,332.15	1	1,334.75	1,079
1,332.20	2	1,334.80	1,122
1,332.25	2	1,334.85	1,167
1,332.30	3	1,334.90	1,215
1,332.35	3	1,334.95	1,265
1,332.40	4	1,335.00	1,318
1,332.45	5	1,335.05	1,372
1,332.50	6	1,335.10	1,427
1,332.55	15	1,335.15	1,483
1,332.60	25	1,335.20	1,541
1,332.65	35	1,335.25	1,600
1,332.70	45	1,335.30	1,660
1,332.75	57	1,335.35	1,721
1,332.80	68	1,335.40	1,783
1,332.85	80	1,335.45	1,847
1,332.90	93	1,335.50	1,911
1,332.95	106	1,335.55	1,977
1,333.00	120	1,335.60	2,044
1,333.05	134	1,335.65	2,112
1,333.10	149	1,335.70	2,181
1,333.15	165	1,335.75	2,252
1,333.20	182	1,335.80	2,323
1,333.25	199	1,335.85	2,396
1,333.30	218	1,335.90	2,470
1,333.35	237	1,335.95	2,545
1,333.40	256	1,336.00	2,622
1,333.45	277	1,336.05	2,699
1,333.50	298	1,336.10	2,778
1,333.55	320	1,336.15	2,858
1,333.60	343	1,336.20	2,939
1,333.65	367	1,336.25	3,022
1,333.70	391	1,336.30	3,106
1,333.75	416	1,336.35	3,191
1,333.80	442	1,336.40	3,278
1,333.85	469	1,336.45	3,366
1,333.90	497	1,336.50	3,455
1,333.95	525	1,336.55	3,546
1,334.00	554	1,336.60	3,638
1,334.05	584	1,336.65	3,731
1,334.10	615	1,336.70	3,826
1,334.15	647	1,336.75	3,921
1,334.20	680	1,336.80	4,018
1,334.25	714	1,336.85	4,117
1,334.30	749	1,336.90	4,217
1,334.35	784	1,336.95	4,318
1,334.40	821	1,337.00	**4,420**
1,334.45	859		
1,334.50	898		
1,334.55	930		

3.3 Pre-Development Analysis

3.3 Pre-development Analysis

The pre-development analysis included three subcatchment areas labeled Pr1 through Pr3 throughout this report, on the watershed plans, and in the HydroCAD report. Pr1 includes a portion of the Colby Farm roof, gravel/concrete driveway, patios, and lawn areas around the building. The discharge point for Pr1 is an existing stone detention area on campus, Dp1. Pr2 encompasses the remainder of the Colby Farm roof, patio, and lawn area that discharges into a section of open meadow on campus, Dp2. Pr3 is a small strip along the south side of the watershed area that includes gravel access road and a grassed swale that discharges into a section of open meadow on campus, Dp3. Dp1 through Dp3 are all conveyed on campus to Susan's Swamp and an on-campus wetland prior to discharge off-site, Dp4.

A site specific soils survey within the work area was completed by Jonathan Sisson, Certified Wetland Scientist, Certified Soil Scientist of Beavertracks, LLC, in accordance with Env-Wq 1504.09 (b) (2) in January of 2016. This information can be found in **Section 3.6** of this report. The watershed areas and drainage paths can be found in **Section 4.**



Subcat Reach Pond Link

Routing Diagram for 15853 Pre 01
Prepared by Microsoft, Printed 2/5/2016

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
70,130	74	>75% Grass cover, Good, HSG C (Pr1, Pr2, Pr3)
7,063	96	Gravel surface, HSG C (Pr1, Pr3)
1,353	98	Paved parking, HSG C (Pr1)
5,037	98	Roofs, HSG C (Pr1, Pr2)
83,583	**78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
83,583	HSG C	Pr1, Pr2, Pr3
0	HSG D	
0	Other	
83,583		**TOTAL AREA**

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 Pr1: Pr1 Runoff Area=28,517 sf 19.15% Impervious Runoff Depth>1.02"
Flow Length=196' Slope=0.0300 '/' Tc=6.4 min CN=82 Runoff=0.81 cfs 2,414 cf

Subcatchment Pr2: Pr2 Runoff Area=44,941 sf 2.07% Impervious Runoff Depth>0.62"
Flow Length=448' Tc=13.9 min CN=74 Runoff=0.57 cfs 2,320 cf

Subcatchment Pr3: Pr3 Runoff Area=10,125 sf 0.00% Impervious Runoff Depth>0.85"
Flow Length=260' Tc=8.8 min CN=79 Runoff=0.22 cfs 719 cf

Link Dp1: Discharge Point #1 Inflow=0.81 cfs 2,414 cf
Primary=0.81 cfs 2,414 cf

Link Dp2: Discharge Point #2 Inflow=0.57 cfs 2,320 cf
Primary=0.57 cfs 2,320 cf

Link Dp3: Discharge Point #3 Inflow=0.22 cfs 719 cf
Primary=0.22 cfs 719 cf

Link Dp4: On Campus Wetland Inflow=1.43 cfs 5,453 cf
Primary=1.43 cfs 5,453 cf

Total Runoff Area = 83,583 sf Runoff Volume = 5,453 cf Average Runoff Depth = 0.78"
92.35% Pervious = 77,193 sf 7.65% Impervious = 6,390 sf

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 Pr1: Pr1 Runoff Area=28,517 sf 19.15% Impervious Runoff Depth>1.93"
Flow Length=196' Slope=0.0300 '/' Tc=6.4 min CN=82 Runoff=1.55 cfs 4,593 cf

Subcatchment Pr2: Pr2 Runoff Area=44,941 sf 2.07% Impervious Runoff Depth>1.36"
Flow Length=448' Tc=13.9 min CN=74 Runoff=1.35 cfs 5,101 cf

Subcatchment Pr3: Pr3 Runoff Area=10,125 sf 0.00% Impervious Runoff Depth>1.71"
Flow Length=260' Tc=8.8 min CN=79 Runoff=0.44 cfs 1,440 cf

Link Dp1: Discharge Point #1 Inflow=1.55 cfs 4,593 cf
Primary=1.55 cfs 4,593 cf

Link Dp2: Discharge Point #2 Inflow=1.35 cfs 5,101 cf
Primary=1.35 cfs 5,101 cf

Link Dp3: Discharge Point #3 Inflow=0.44 cfs 1,440 cf
Primary=0.44 cfs 1,440 cf

Link Dp4: On Campus Wetland Inflow=3.02 cfs 11,134 cf
Primary=3.02 cfs 11,134 cf

Total Runoff Area = 83,583 sf Runoff Volume = 11,134 cf Average Runoff Depth = 1.60"
92.35% Pervious = 77,193 sf 7.65% Impervious = 6,390 sf

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 Pr1: Pr1 Runoff Area=28,517 sf 19.15% Impervious Runoff Depth>3.41"
Flow Length=196' Slope=0.0300 '/' Tc=6.4 min CN=82 Runoff=2.68 cfs 8,094 cf

Subcatchment Pr2: Pr2 Runoff Area=44,941 sf 2.07% Impervious Runoff Depth>2.65"
Flow Length=448' Tc=13.9 min CN=74 Runoff=2.67 cfs 9,926 cf

Subcatchment Pr3: Pr3 Runoff Area=10,125 sf 0.00% Impervious Runoff Depth>3.11"
Flow Length=260' Tc=8.8 min CN=79 Runoff=0.81 cfs 2,628 cf

Link Dp1: Discharge Point #1 Inflow=2.68 cfs 8,094 cf
Primary=2.68 cfs 8,094 cf

Link Dp2: Discharge Point #2 Inflow=2.67 cfs 9,926 cf
Primary=2.67 cfs 9,926 cf

Link Dp3: Discharge Point #3 Inflow=0.81 cfs 2,628 cf
Primary=0.81 cfs 2,628 cf

Link Dp4: On Campus Wetland Inflow=5.60 cfs 20,648 cf
Primary=5.60 cfs 20,648 cf

Total Runoff Area = 83,583 sf Runoff Volume = 20,648 cf Average Runoff Depth = 2.96"
92.35% Pervious = 77,193 sf 7.65% Impervious = 6,390 sf

Summary for Subcatchment Pr1: Pr1

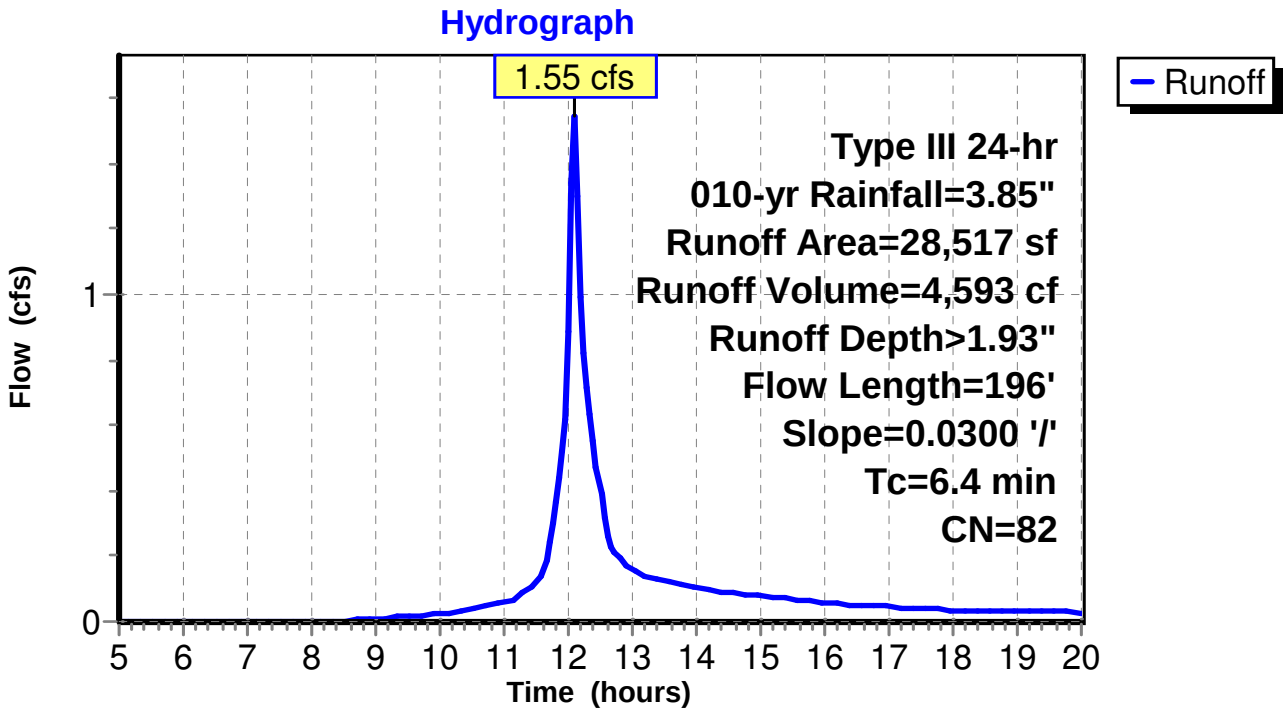
Runoff = 1.55 cfs @ 12.10 hrs, Volume= 4,593 cf, Depth> 1.93"

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 010-yr Rainfall=3.85"

Area (sf)	CN	Description
4,107	98	Roofs, HSG C
4,827	96	Gravel surface, HSG C
1,353	98	Paved parking, HSG C
18,230	74	>75% Grass cover, Good, HSG C
28,517	82	Weighted Average
23,057		80.85% Pervious Area
5,460		19.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	30	0.0300	0.14		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
0.7	50	0.0300	1.28		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.64"
1.5	10	0.0300	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
0.7	106	0.0300	2.50	2.50	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=0.50' Z= 4.0 '/' Top.W=4.00' n= 0.040
6.4	196	Total			

Subcatchment Pr1: Pr1



Summary for Subcatchment Pr2: Pr2

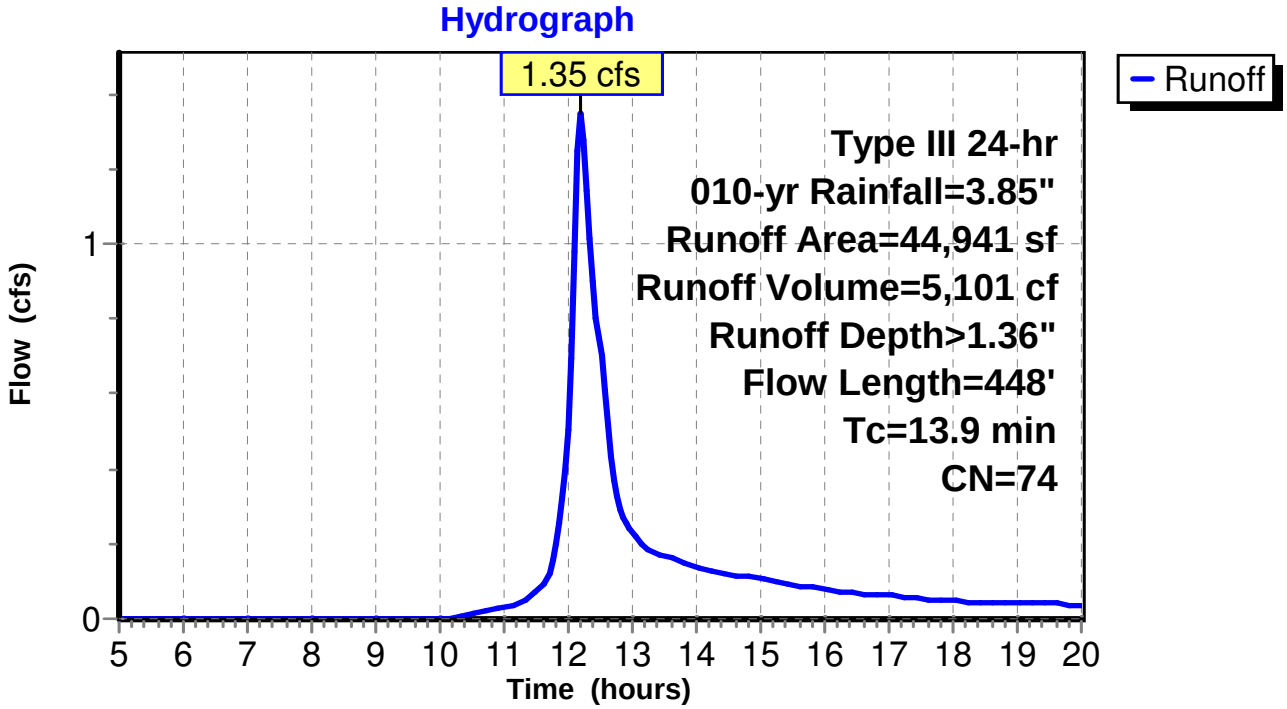
Runoff = 1.35 cfs @ 12.20 hrs, Volume= 5,101 cf, Depth> 1.36"

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 010-yr Rainfall=3.85"

Area (sf)	CN	Description
930	98	Roofs, HSG C
44,011	74	>75% Grass cover, Good, HSG C
44,941	74	Weighted Average
44,011		97.93% Pervious Area
930		2.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
3.1	348	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.9	448	Total			

Subcatchment Pr2: Pr2



Summary for Subcatchment Pr3: Pr3

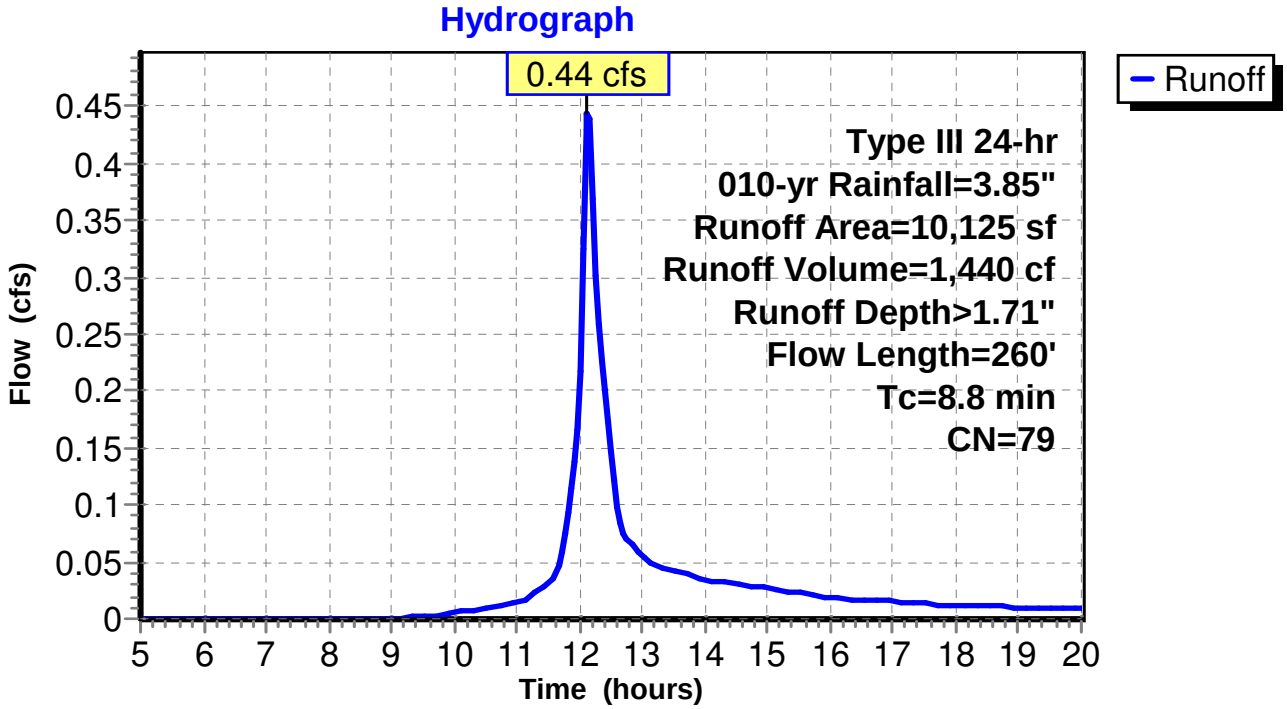
Runoff = 0.44 cfs @ 12.13 hrs, Volume= 1,440 cf, Depth> 1.71"

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 010-yr Rainfall=3.85"

Area (sf)	CN	Description
2,236	96	Gravel surface, HSG C
7,889	74	>75% Grass cover, Good, HSG C
10,125	79	Weighted Average
10,125		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0400	0.20		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
0.6	160	0.0600	4.72	4.72	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=0.50' Z= 4.0 '/' Top.W=4.00' n= 0.030 Earth, grassed & winding
8.8	260	Total			

Subcatchment Pr3: Pr3

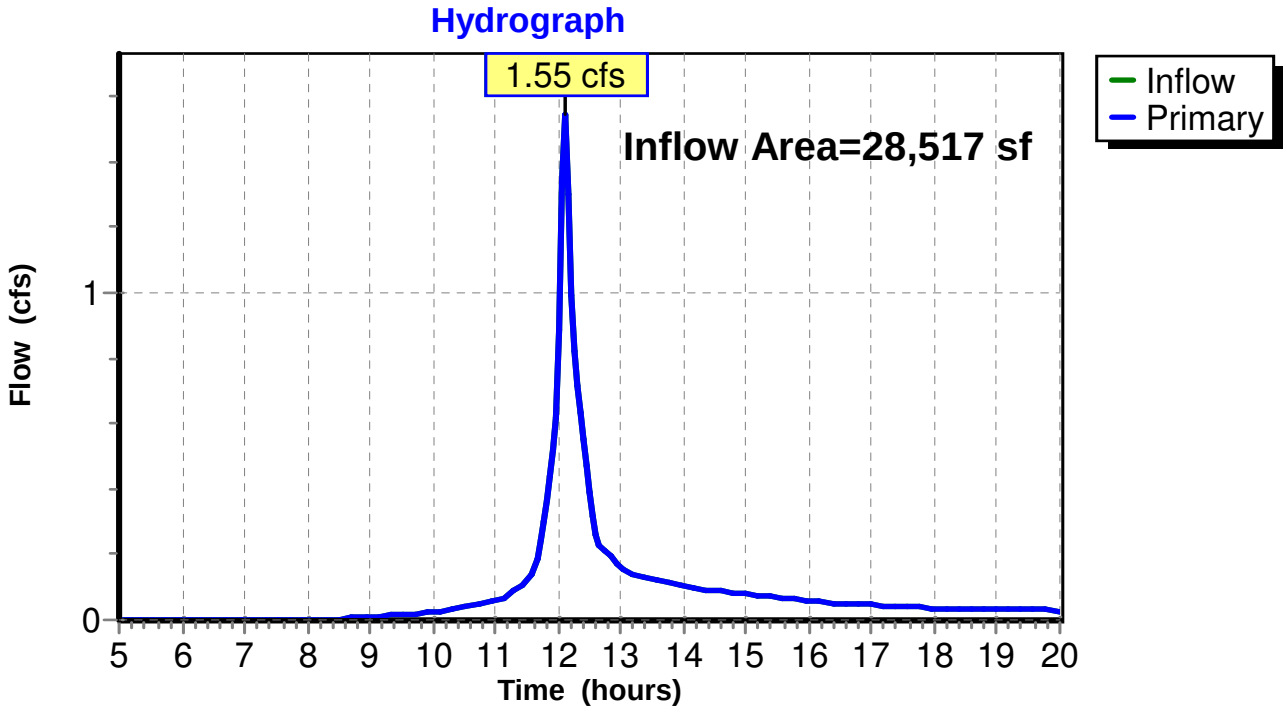


Summary for Link Dp1: Discharge Point #1

Inflow Area = 28,517 sf, 19.15% Impervious, Inflow Depth > 1.93" for 010-yr event
Inflow = 1.55 cfs @ 12.10 hrs, Volume= 4,593 cf
Primary = 1.55 cfs @ 12.10 hrs, Volume= 4,593 cf, Atten= 0%, Lag= 0.0 min

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

Link Dp1: Discharge Point #1

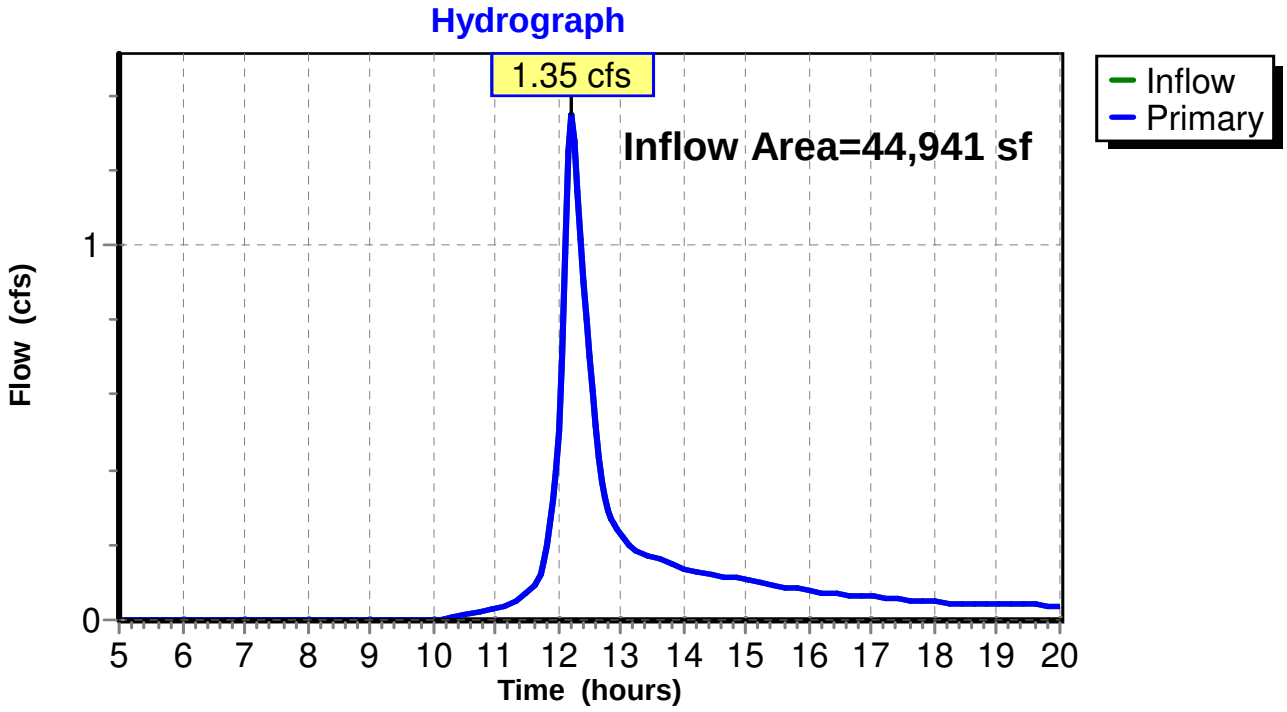


Summary for Link Dp2: Discharge Point #2

Inflow Area = 44,941 sf, 2.07% Impervious, Inflow Depth > 1.36" for 010-yr event
Inflow = 1.35 cfs @ 12.20 hrs, Volume= 5,101 cf
Primary = 1.35 cfs @ 12.20 hrs, Volume= 5,101 cf, Atten= 0%, Lag= 0.0 min

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

Link Dp2: Discharge Point #2

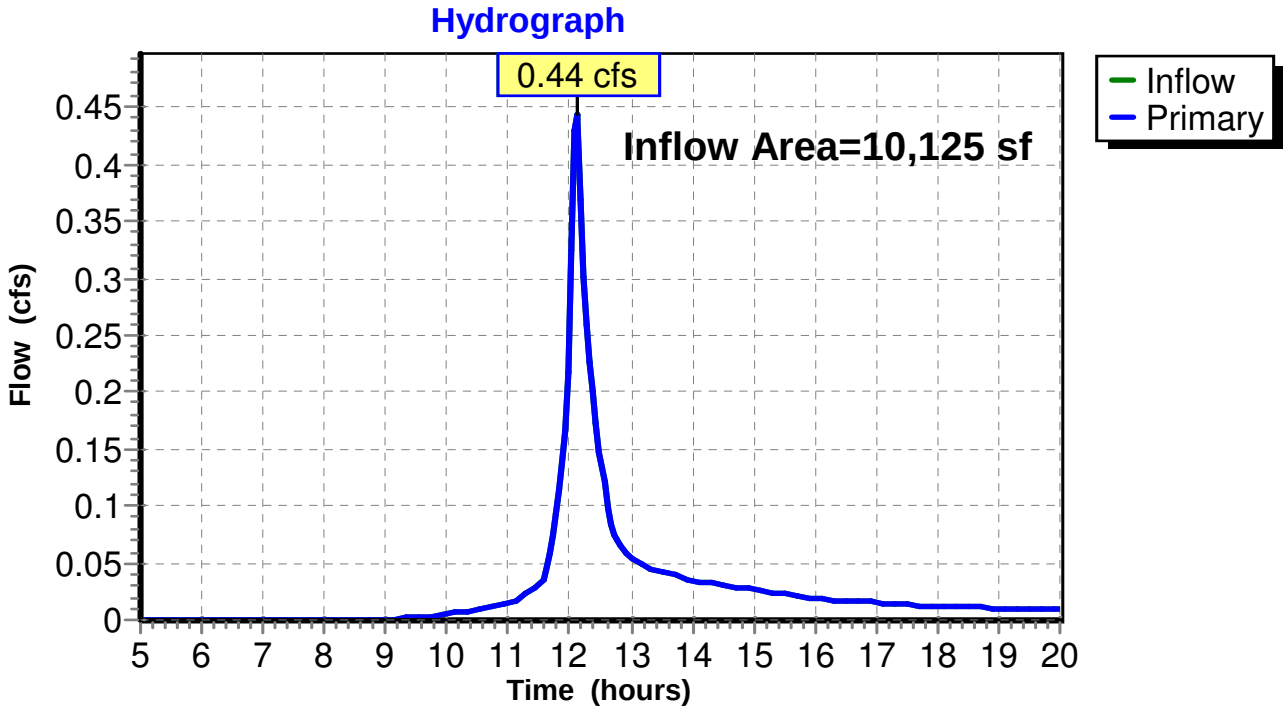


Summary for Link Dp3: Discharge Point #3

Inflow Area = 10,125 sf, 0.00% Impervious, Inflow Depth > 1.71" for 010-yr event
Inflow = 0.44 cfs @ 12.13 hrs, Volume= 1,440 cf
Primary = 0.44 cfs @ 12.13 hrs, Volume= 1,440 cf, Atten= 0%, Lag= 0.0 min

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

Link Dp3: Discharge Point #3

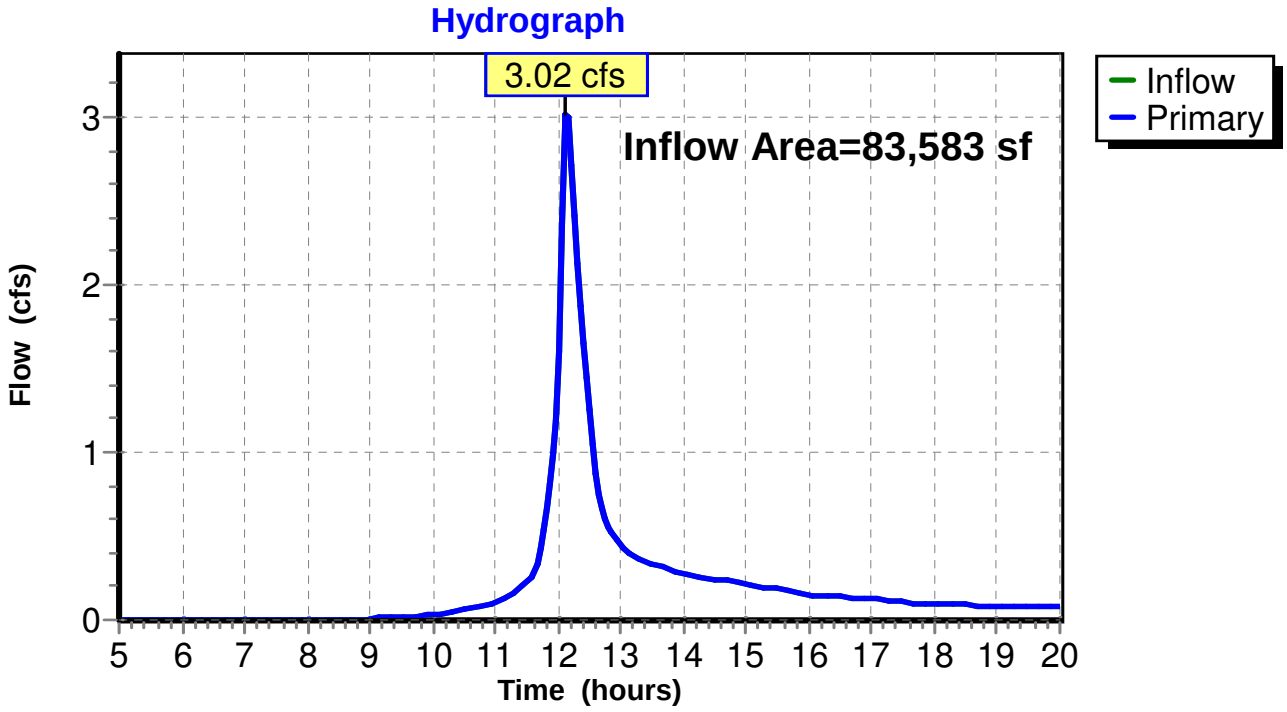


Summary for Link Dp4: On Campus Wetland

Inflow Area = 83,583 sf, 7.65% Impervious, Inflow Depth > 1.60" for 010-yr event
Inflow = 3.02 cfs @ 12.13 hrs, Volume= 11,134 cf
Primary = 3.02 cfs @ 12.13 hrs, Volume= 11,134 cf, Atten= 0%, Lag= 0.0 min

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

Link Dp4: On Campus Wetland



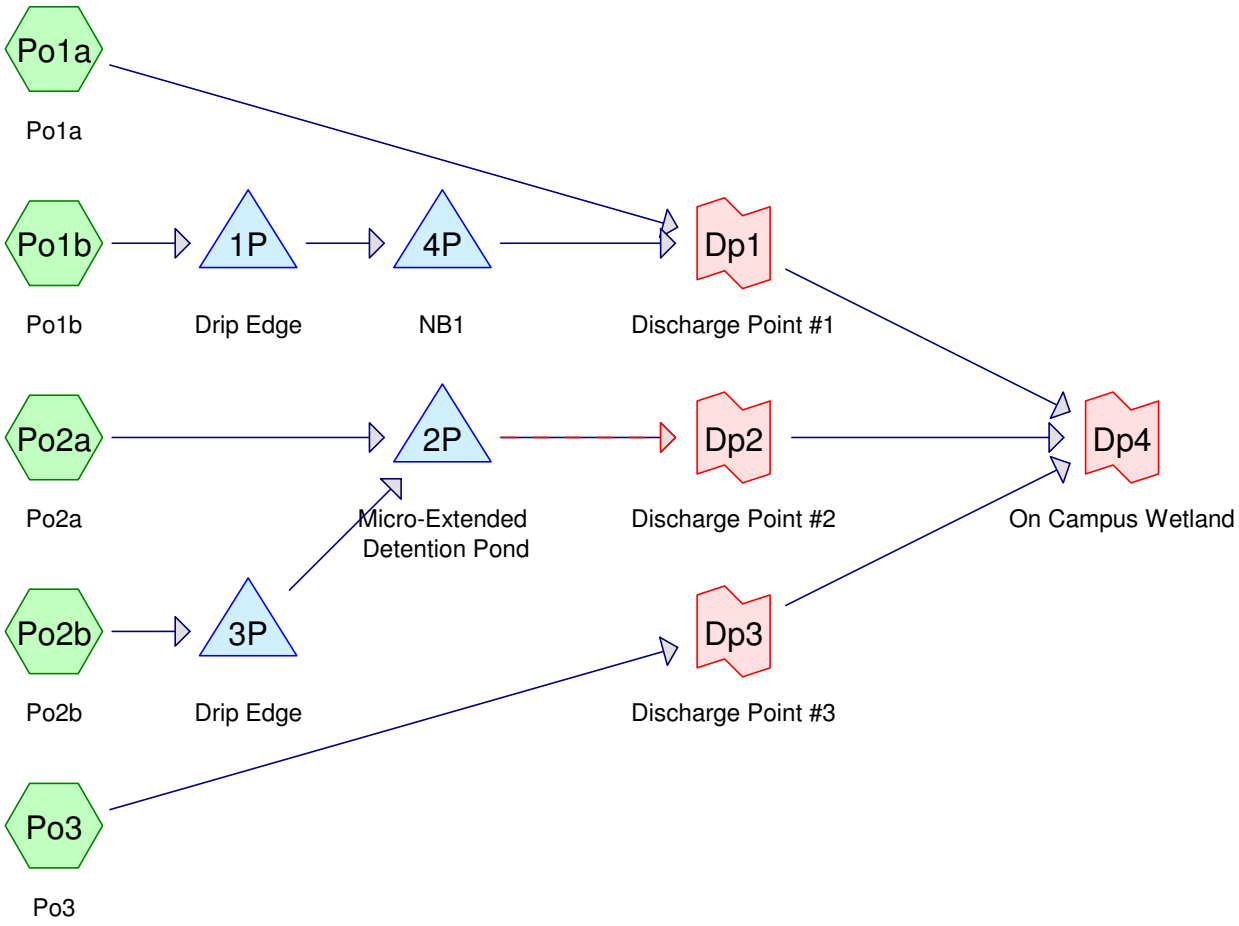
3.4 Post-Development Analysis

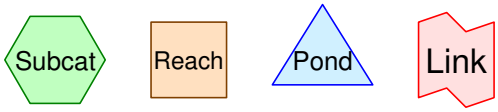
3.4 Post-Development Analysis

The post-development analysis includes subcatchment areas numbered Po1a, Po1b, Po2a, Po2b, and Po3. Subcatchment Po1a includes walkways and proposed lawn area. Stormwater is routed using curb and a small catch basin system to an existing stone trench with a perforated pipe that flows to an existing detention area on campus, Dp1. A portion of the adjacent parking lot will be conveyed to the same stone trench as it is in the pre-development condition. Po1b and Po2b each include a portion of the sloped roof which is directed to an infiltrating stone drip edge (1P and 3P). The drip edges have been designed to hold and infiltrate greater than the WQV and GRV in the stone voids. Po2a includes all of the low-sloped roof and canopy roof for the building. These sections of roof will be collected using roof drains and will be conveyed inside the building to a single drainage pipe. The drainage pipe will discharge into a grass lined swale and then to Micro-Extended Detention Pond (2P). Po2a also includes the majority of the proposed lawn area for the site and the rear patio which will be conveyed by sheet flow and grass lined swale to Micro-Extended Detention Pond (2P). Micro-Extended Detention Pond (2P) discharges to Dp2. Po3 is a small strip along the south side of the watershed area that includes gravel access road, a small section of proposed walkway, and a grassed swale that discharges into a section of open meadow on campus, Dp3. Dp1 through Dp3 are all conveyed on campus to Susan's Swamp and an on-campus wetland prior to discharge off-site, Dp4.

For more detailed information on the post-developed area, see attached drainage plans found in **Section 4** and the HydroCAD area listing found in **Section 3.4.1**. A pre- versus post- development comparison flow rate table for the 2, 10, and 50 year storm events can be found in **Table 2.0** in **Section 2.6.1**.

3.4.1 Post-Development 2, 10, and 50 - Year Storm





Routing Diagram for 15853 Post 01
Prepared by Microsoft, Printed 2/5/2016

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
57,490	74	>75% Grass cover, Good, HSG C (Po1a, Po2a, Po3)
17,415	98	Roofs, HSG C (Po1b, Po2a, Po2b)
8,678	98	Walkways, HSG C (Po1a, Po2a, Po3)
83,583	**81**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
83,583	HSG C	Po1a, Po1b, Po2a, Po2b, Po3
0	HSG D	
0	Other	
83,583		**TOTAL AREA**

Time span=0.50-30.00 hrs, dt=0.04 hrs, 739 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 Po1a: Po1a Runoff Area=11,375 sf 24.38% Impervious Runoff Depth=0.99"
Flow Length=100' Slope=0.0800 '/' Tc=6.2 min CN=80 Runoff=0.29 cfs 936 cf

Subcatchment Po1b: Po1b Runoff Area=2,162 sf 100.00% Impervious Runoff Depth=2.41"
Tc=5.0 min CN=98 Runoff=0.13 cfs 434 cf

Subcatchment Po2a: Po2a Runoff Area=59,349 sf 30.51% Impervious Runoff Depth=1.04"
Flow Length=541' Tc=15.5 min CN=81 Runoff=1.21 cfs 5,160 cf

Subcatchment Po2b: Po2b Runoff Area=572 sf 100.00% Impervious Runoff Depth=2.41"
Tc=5.0 min CN=98 Runoff=0.03 cfs 115 cf

Subcatchment Po3: Po3 Runoff Area=10,125 sf 24.46% Impervious Runoff Depth=0.99"
Flow Length=260' Tc=9.2 min CN=80 Runoff=0.23 cfs 833 cf

Pond 1P: Drip Edge Peak Elev=1,361.86' Storage=0.002 af Inflow=0.13 cfs 434 cf
Discarded=0.03 cfs 434 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 434 cf

Pond 2P: Micro-Extended Detention Pond Peak Elev=1,335.76' Storage=2,265 cf Inflow=1.21 cfs 5,160 cf
Primary=0.02 cfs 1,505 cf Secondary=0.36 cfs 1,939 cf Outflow=0.39 cfs 3,444 cf

Pond 3P: Drip Edge Peak Elev=1,361.87' Storage=0.001 af Inflow=0.03 cfs 115 cf
Discarded=0.01 cfs 115 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 115 cf

Pond 4P: NB1 Peak Elev=1,357.60' Storage=0 cf Inflow=0.00 cfs 0 cf
6.0" Round Culvert n=0.010 L=45.0' S=0.0200 '/' Outflow=0.00 cfs 0 cf

Link Dp1: Discharge Point #1 Inflow=0.29 cfs 936 cf
Primary=0.29 cfs 936 cf

Link Dp2: Discharge Point #2 Inflow=0.39 cfs 3,444 cf
Primary=0.39 cfs 3,444 cf

Link Dp3: Discharge Point #3 Inflow=0.23 cfs 833 cf
Primary=0.23 cfs 833 cf

Link Dp4: On Campus Wetland Inflow=0.53 cfs 5,212 cf
Primary=0.53 cfs 5,212 cf

Total Runoff Area = 83,583 sf Runoff Volume = 7,478 cf Average Runoff Depth = 1.07"
68.78% Pervious = 57,490 sf 31.22% Impervious = 26,093 sf

Time span=0.50-30.00 hrs, dt=0.04 hrs, 739 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 Po1a: Po1a Runoff Area=11,375 sf 24.38% Impervious Runoff Depth=1.92"
Flow Length=100' Slope=0.0800 '/' Tc=6.2 min CN=80 Runoff=0.58 cfs 1,818 cf

Subcatchment Po1b: Po1b Runoff Area=2,162 sf 100.00% Impervious Runoff Depth=3.62"
Tc=5.0 min CN=98 Runoff=0.19 cfs 651 cf

Subcatchment Po2a: Po2a Runoff Area=59,349 sf 30.51% Impervious Runoff Depth=2.00"
Flow Length=541' Tc=15.5 min CN=81 Runoff=2.37 cfs 9,872 cf

Subcatchment Po2b: Po2b Runoff Area=572 sf 100.00% Impervious Runoff Depth=3.62"
Tc=5.0 min CN=98 Runoff=0.05 cfs 172 cf

Subcatchment Po3: Po3 Runoff Area=10,125 sf 24.46% Impervious Runoff Depth=1.92"
Flow Length=260' Tc=9.2 min CN=80 Runoff=0.46 cfs 1,619 cf

Pond 1P: Drip Edge Peak Elev=1,362.61' Storage=0.004 af Inflow=0.19 cfs 651 cf
Discarded=0.03 cfs 651 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 651 cf

Pond 2P: Micro-Extended Detention Pond Peak Elev=1,335.91' Storage=2,478 cf Inflow=2.37 cfs 9,872 cf
Primary=0.02 cfs 1,582 cf Secondary=2.27 cfs 6,567 cf Outflow=2.29 cfs 8,149 cf

Pond 3P: Drip Edge Peak Elev=1,362.63' Storage=0.001 af Inflow=0.05 cfs 172 cf
Discarded=0.01 cfs 172 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 172 cf

Pond 4P: NB1 Peak Elev=1,357.60' Storage=0 cf Inflow=0.00 cfs 0 cf
6.0" Round Culvert n=0.010 L=45.0' S=0.0200 '/' Outflow=0.00 cfs 0 cf

Link Dp1: Discharge Point #1 Inflow=0.58 cfs 1,818 cf
Primary=0.58 cfs 1,818 cf

Link Dp2: Discharge Point #2 Inflow=2.29 cfs 8,149 cf
Primary=2.29 cfs 8,149 cf

Link Dp3: Discharge Point #3 Inflow=0.46 cfs 1,619 cf
Primary=0.46 cfs 1,619 cf

Link Dp4: On Campus Wetland Inflow=2.87 cfs 11,586 cf
Primary=2.87 cfs 11,586 cf

Total Runoff Area = 83,583 sf Runoff Volume = 14,133 cf Average Runoff Depth = 2.03"
68.78% Pervious = 57,490 sf 31.22% Impervious = 26,093 sf

Time span=0.50-30.00 hrs, dt=0.04 hrs, 739 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 Po1a: Po1a Runoff Area=11,375 sf 24.38% Impervious Runoff Depth=3.43"
Flow Length=100' Slope=0.0800 '/' Tc=6.2 min CN=80 Runoff=1.03 cfs 3,253 cf

Subcatchment Po1b: Po1b Runoff Area=2,162 sf 100.00% Impervious Runoff Depth=5.37"
Tc=5.0 min CN=98 Runoff=0.28 cfs 968 cf

Subcatchment Po2a: Po2a Runoff Area=59,349 sf 30.51% Impervious Runoff Depth=3.53"
Flow Length=541' Tc=15.5 min CN=81 Runoff=4.19 cfs 17,459 cf

Subcatchment Po2b: Po2b Runoff Area=572 sf 100.00% Impervious Runoff Depth=5.37"
Tc=5.0 min CN=98 Runoff=0.07 cfs 256 cf

Subcatchment Po3: Po3 Runoff Area=10,125 sf 24.46% Impervious Runoff Depth=3.43"
Flow Length=260' Tc=9.2 min CN=80 Runoff=0.83 cfs 2,895 cf

Pond 1P: Drip Edge Peak Elev=1,362.90' Storage=0.005 af Inflow=0.28 cfs 968 cf
Discarded=0.03 cfs 865 cf Primary=0.14 cfs 97 cf Outflow=0.16 cfs 962 cf

Pond 2P: Micro-Extended Detention Pond Peak Elev=1,336.00' Storage=2,623 cf Inflow=4.21 cfs 17,471 cf
Primary=0.02 cfs 1,688 cf Secondary=4.15 cfs 14,056 cf Outflow=4.17 cfs 15,744 cf

Pond 3P: Drip Edge Peak Elev=1,362.90' Storage=0.001 af Inflow=0.07 cfs 256 cf
Discarded=0.01 cfs 228 cf Primary=0.02 cfs 12 cf Outflow=0.03 cfs 240 cf

Pond 4P: NB1 Peak Elev=1,357.83' Storage=0 cf Inflow=0.14 cfs 97 cf
6.0" Round Culvert n=0.010 L=45.0' S=0.0200 '/' Outflow=0.13 cfs 97 cf

Link Dp1: Discharge Point #1 Inflow=1.03 cfs 3,350 cf
Primary=1.03 cfs 3,350 cf

Link Dp2: Discharge Point #2 Inflow=4.17 cfs 15,744 cf
Primary=4.17 cfs 15,744 cf

Link Dp3: Discharge Point #3 Inflow=0.83 cfs 2,895 cf
Primary=0.83 cfs 2,895 cf

Link Dp4: On Campus Wetland Inflow=5.50 cfs 21,989 cf
Primary=5.50 cfs 21,989 cf

Total Runoff Area = 83,583 sf Runoff Volume = 24,831 cf Average Runoff Depth = 3.56"
68.78% Pervious = 57,490 sf 31.22% Impervious = 26,093 sf

3.4.2 Post-Development Full Summary Diagram
10 - Year Storm Event

Summary for Subcatchment Po1a: Po1a

Runoff = 0.58 cfs @ 12.10 hrs, Volume= 1,818 cf, Depth= 1.92"

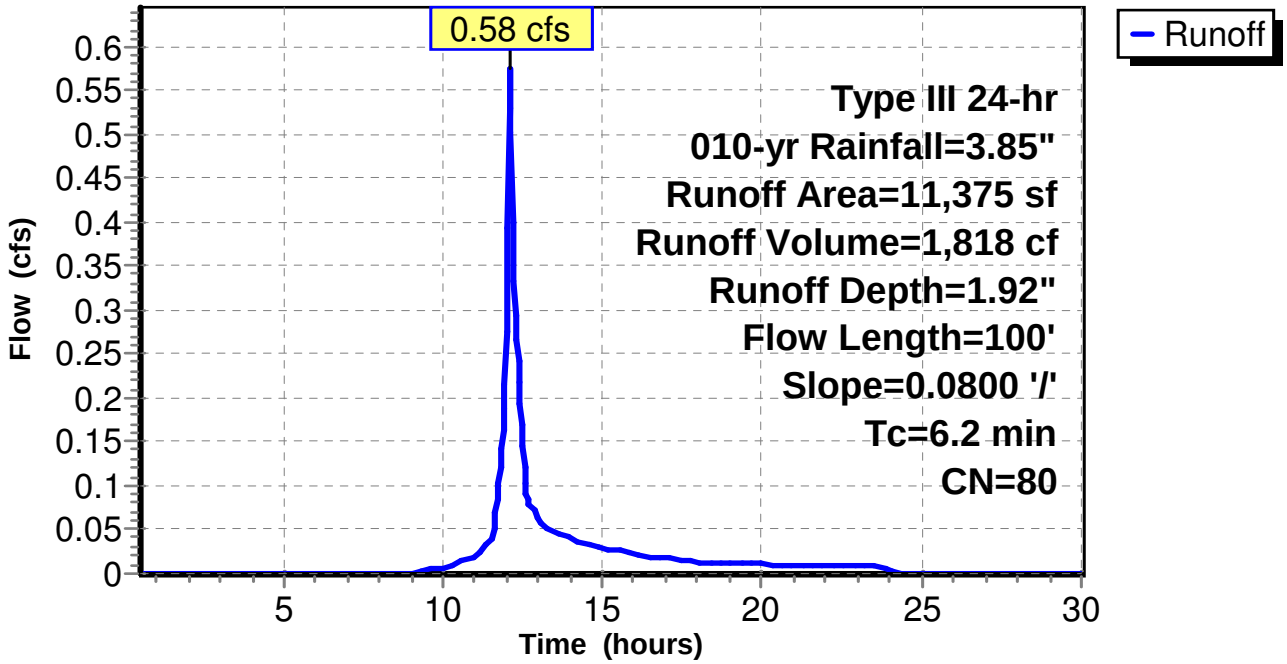
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Type III 24-hr 010-yr Rainfall=3.85"

	Area (sf)	CN	Description
*	2,773	98	Walkways, HSG C
	8,602	74	>75% Grass cover, Good, HSG C
	11,375	80	Weighted Average
	8,602		75.62% Pervious Area
	2,773		24.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	100	0.0800	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"

Subcatchment Po1a: Po1a

Hydrograph



Summary for Subcatchment Po1b: Po1b

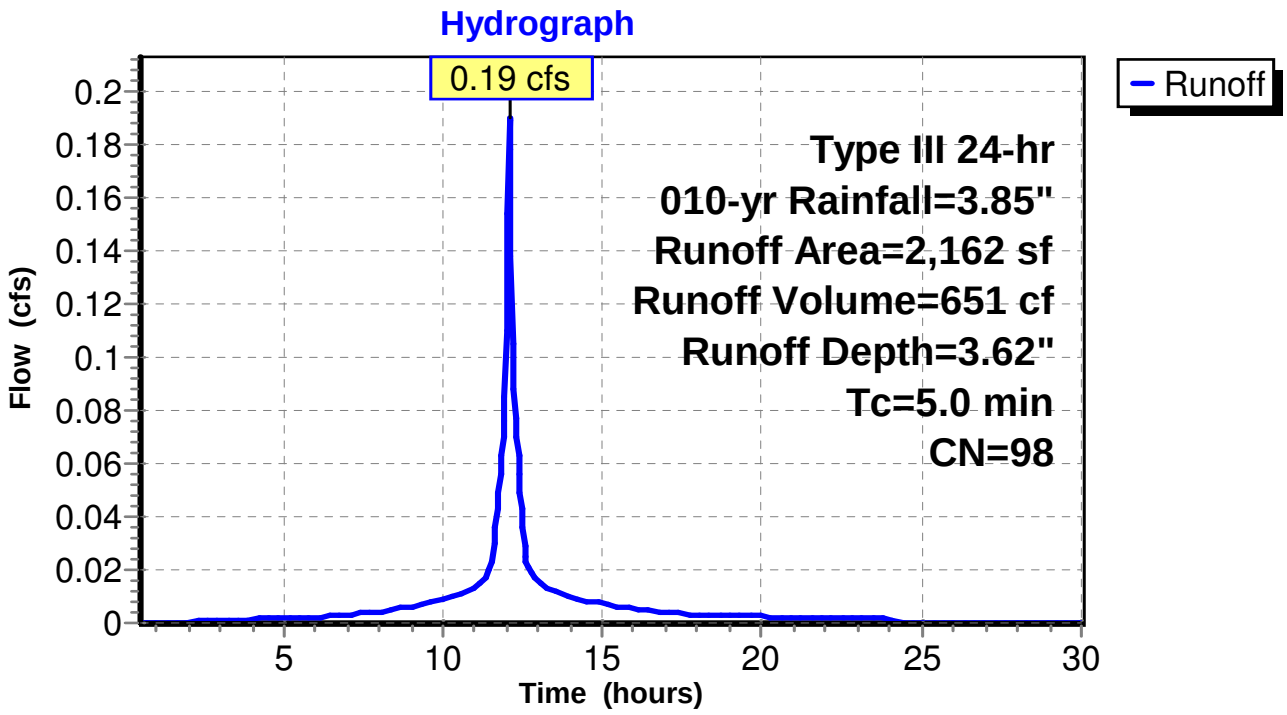
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 651 cf, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Type III 24-hr 010-yr Rainfall=3.85"

Area (sf)	CN	Description
2,162	98	Roofs, HSG C
2,162		100.00% Impervious Area

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

Subcatchment Po1b: Po1b



Summary for Subcatchment Po2a: Po2a

Runoff = 2.37 cfs @ 12.22 hrs, Volume= 9,872 cf, Depth= 2.00"

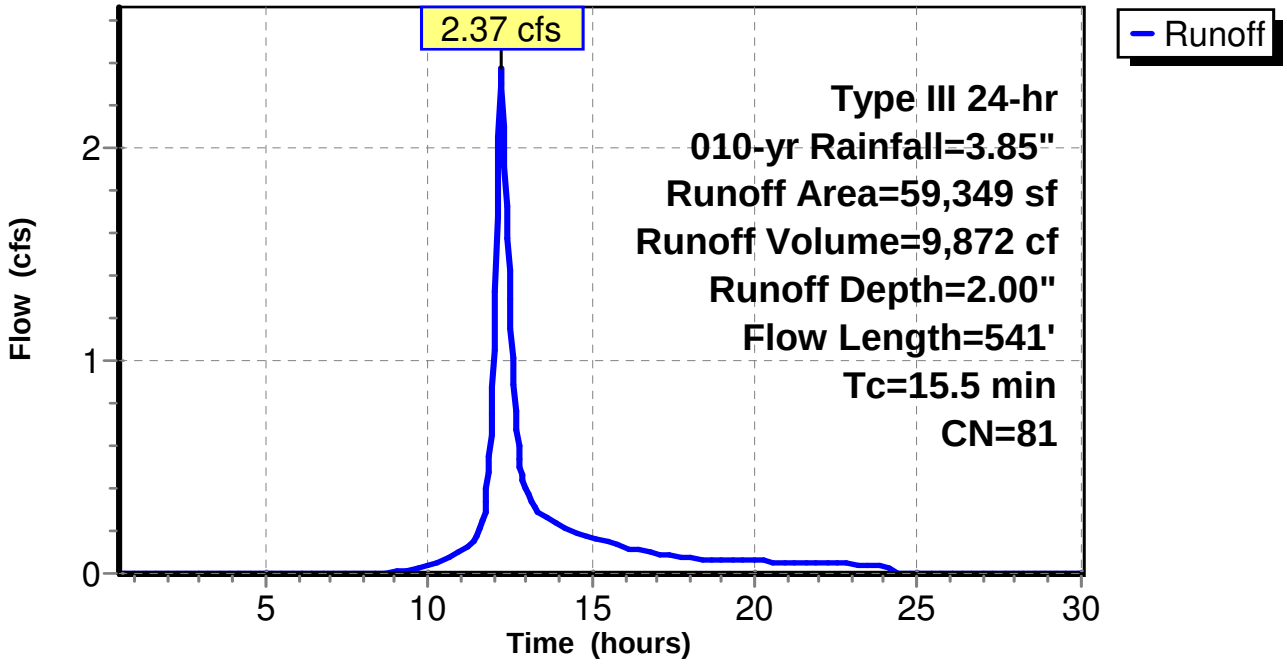
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Type III 24-hr 010-yr Rainfall=3.85"

	Area (sf)	CN	Description
	14,681	98	Roofs, HSG C
*	3,428	98	Walkways, HSG C
	41,240	74	>75% Grass cover, Good, HSG C
	59,349	81	Weighted Average
	41,240		69.49% Pervious Area
	18,109		30.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
1.0	210	0.0500	3.35		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
0.3	231	0.0700	13.94	167.22	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Earth, grassed & winding
15.5	541	Total			

Subcatchment Po2a: Po2a

Hydrograph



Summary for Subcatchment Po2b: Po2b

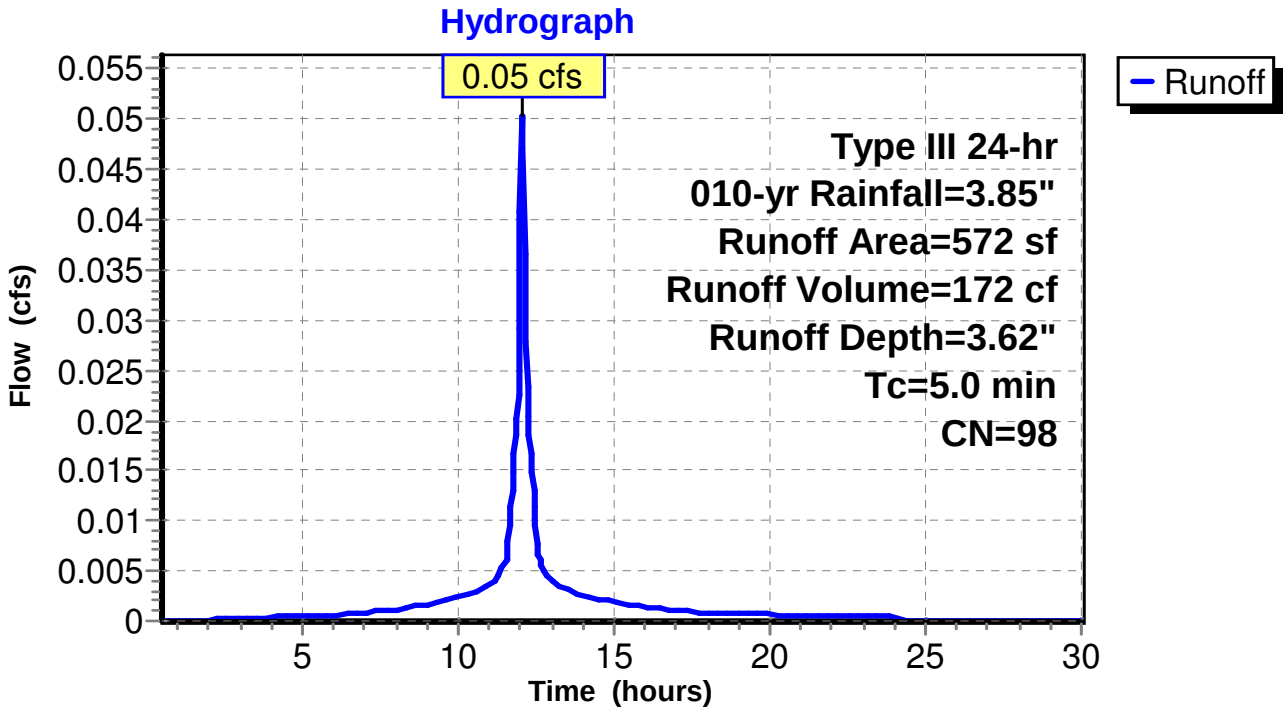
Runoff = 0.05 cfs @ 12.07 hrs, Volume= 172 cf, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Type III 24-hr 010-yr Rainfall=3.85"

Area (sf)	CN	Description
572	98	Roofs, HSG C
572		100.00% Impervious Area

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

Subcatchment Po2b: Po2b



Summary for Subcatchment Po3: Po3

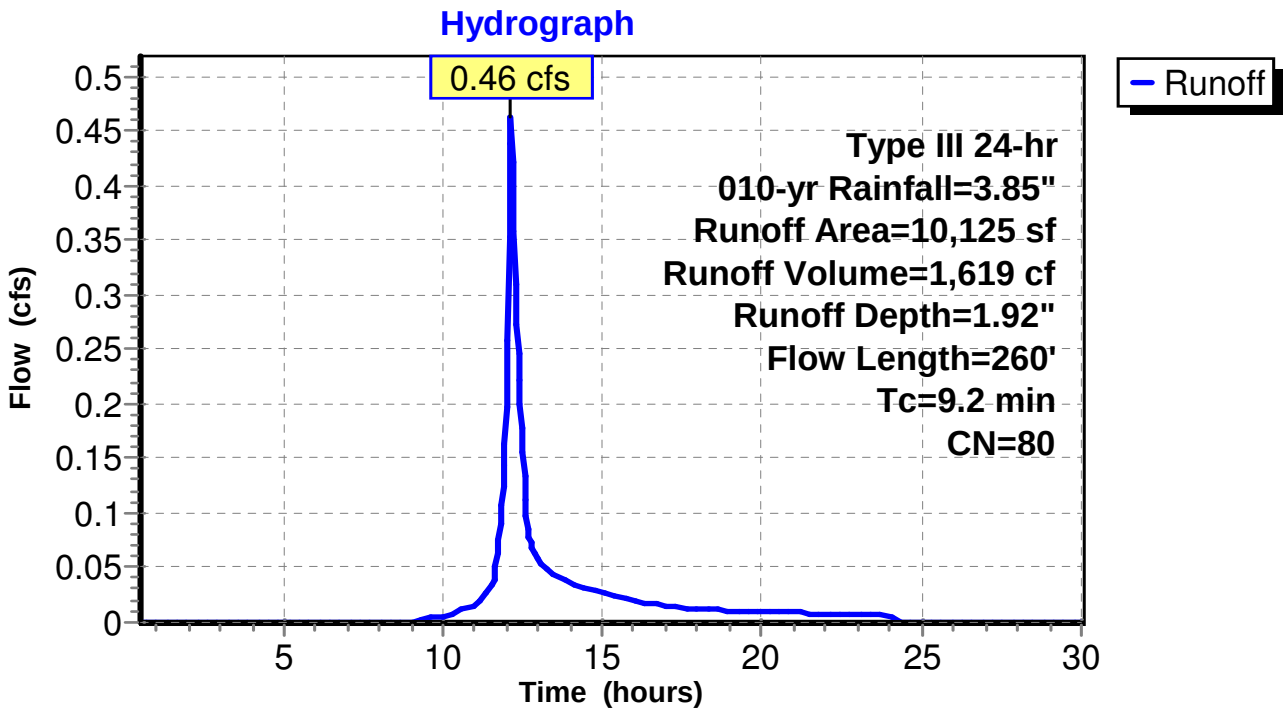
Runoff = 0.46 cfs @ 12.13 hrs, Volume= 1,619 cf, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Type III 24-hr 010-yr Rainfall=3.85"

	Area (sf)	CN	Description
*	2,477	98	Walkways, HSG C
	7,648	74	>75% Grass cover, Good, HSG C
	10,125	80	Weighted Average
	7,648		75.54% Pervious Area
	2,477		24.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.0400	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
0.2	10	0.0400	1.04		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.64"
6.1	70	0.0400	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.64"
0.6	160	0.0600	4.72	4.72	**Trap/Vee/Rect Channel Flow,** Bot.W=0.00' D=0.50' Z= 4.0 '/' Top.W=4.00' n= 0.030 Earth, grassed & winding
9.2	260	Total			

Subcatchment Po3: Po3



Summary for Pond 1P: Drip Edge

Inflow Area = 2,162 sf,100.00% Impervious, Inflow Depth = 3.62" for 010-yr event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 651 cf
Outflow = 0.03 cfs @ 11.62 hrs, Volume= 651 cf, Atten= 86%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.62 hrs, Volume= 651 cf
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs / 2
Peak Elev= 1,362.61' @ 12.57 hrs Surf.Area= 0.007 ac Storage= 0.004 af

Plug-Flow detention time= 40.3 min calculated for 651 cf (100% of inflow)
Center-of-Mass det. time= 40.2 min (791.9 - 751.8)

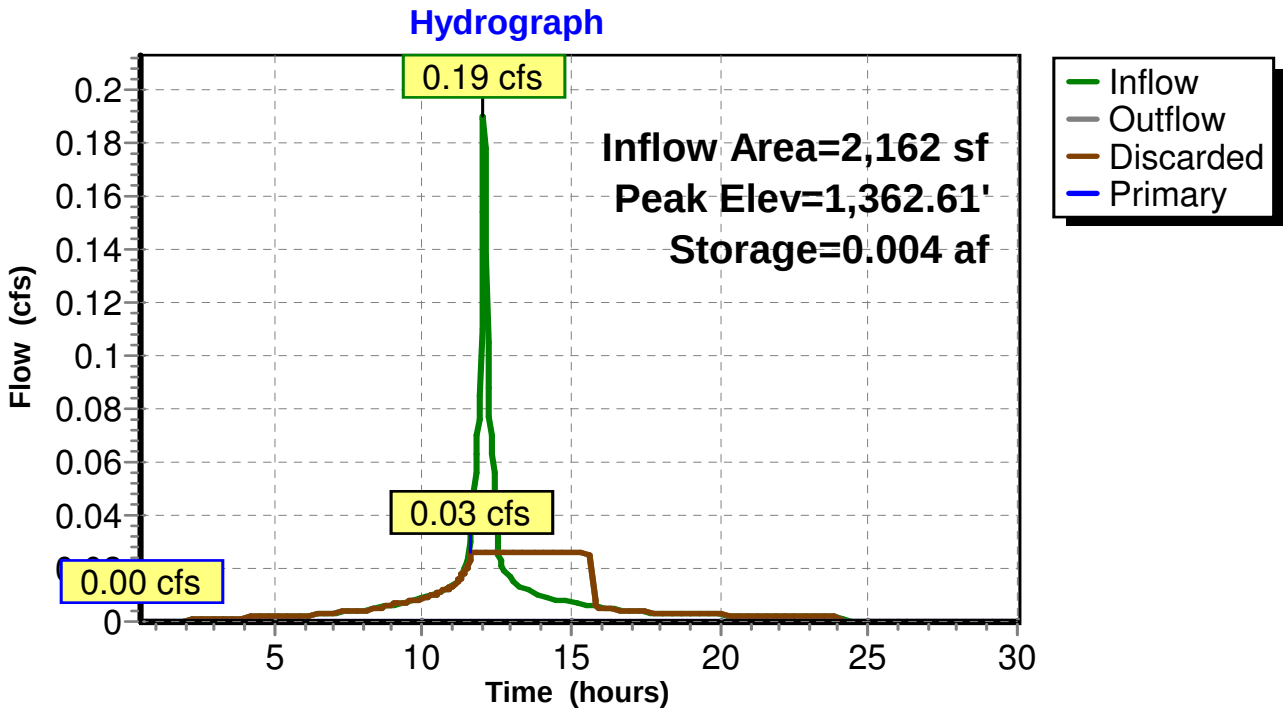
Volume	Invert	Avail.Storage	Storage Description
#1	1,361.00'	0.005 af	**3.00'W x 95.00'L x 2.00'H Prismatoid** 0.013 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	1,362.90'	**95.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	1,361.00'	**4.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.62 hrs HW=1,361.02' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=1,361.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: Drip Edge



Summary for Pond 2P: Micro-Extended Detention Pond

Inflow Area = 59,921 sf, 31.18% Impervious, Inflow Depth = 1.98" for 010-yr event
Inflow = 2.37 cfs @ 12.22 hrs, Volume= 9,872 cf
Outflow = 2.29 cfs @ 12.28 hrs, Volume= 8,149 cf, Atten= 3%, Lag= 3.5 min
Primary = 0.02 cfs @ 12.28 hrs, Volume= 1,582 cf
Secondary = 2.27 cfs @ 12.28 hrs, Volume= 6,567 cf

Routing by Stor-Ind method, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Peak Elev= 1,335.91' @ 12.28 hrs Surf.Area= 1,673 sf Storage= 2,478 cf

Plug-Flow detention time= 155.2 min calculated for 8,138 cf (82% of inflow)
Center-of-Mass det. time= 84.1 min (923.6 - 839.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,332.00'	162 cf	**FOREBAY (Prismatic)** Listed below (Recalc)
#2	1,332.50'	4,258 cf	**MAIN POND (Prismatic)** Listed below (Recalc)
		4,420 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,332.00	6	0	0
1,333.00	28	17	17
1,334.00	115	72	89
1,334.50	180	74	162

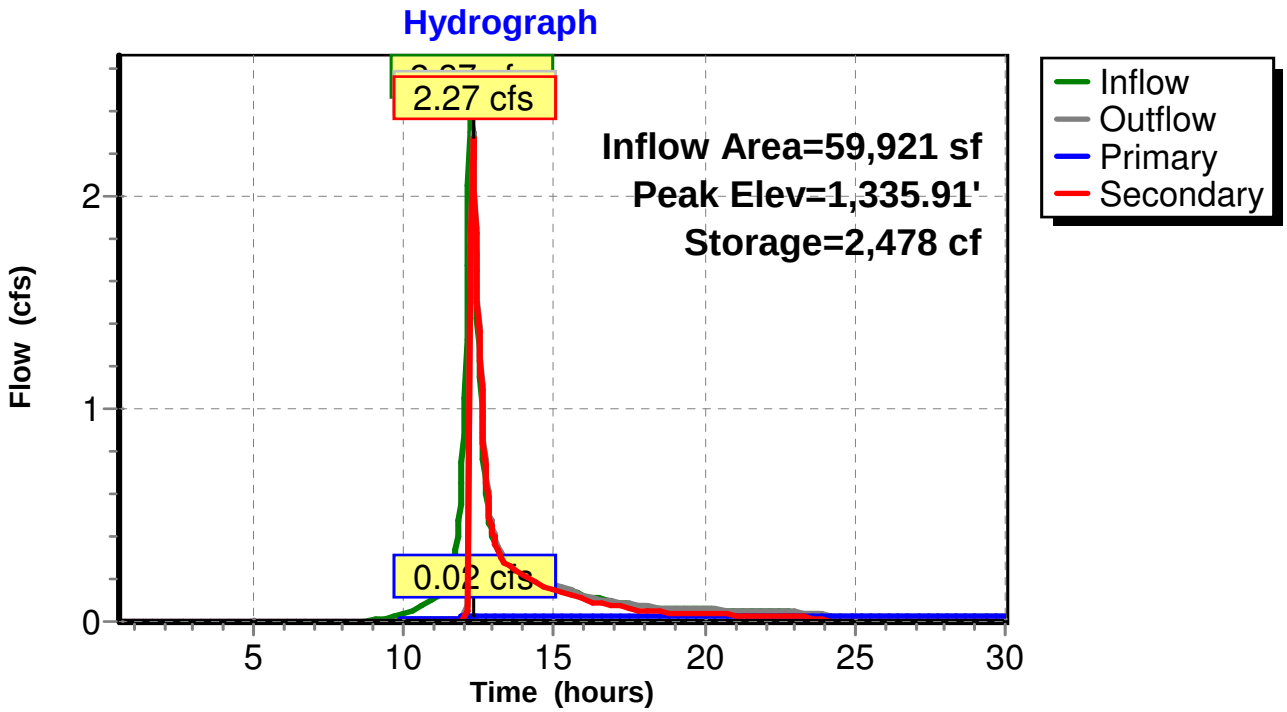
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,332.50	161	0	0
1,333.00	251	103	103
1,334.00	474	363	466
1,334.50	607	270	736
1,335.00	1,071	420	1,155
1,336.00	1,537	1,304	2,459
1,337.00	2,060	1,799	4,258

Device	Routing	Invert	Outlet Devices
#1	Secondary	1,335.70'	**10.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Primary	1,332.50'	**0.7" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.02 cfs @ 12.28 hrs HW=1,335.90' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 8.84 fps)

Secondary OutFlow Max=2.20 cfs @ 12.28 hrs HW=1,335.90' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 2.20 cfs @ 1.09 fps)

Pond 2P: Micro-Extended Detention Pond



Summary for Pond 3P: Drip Edge

Inflow Area = 572 sf,100.00% Impervious, Inflow Depth = 3.62" for 010-yr event
Inflow = 0.05 cfs @ 12.07 hrs, Volume= 172 cf
Outflow = 0.01 cfs @ 11.62 hrs, Volume= 172 cf, Atten= 86%, Lag= 0.0 min
Discarded = 0.01 cfs @ 11.62 hrs, Volume= 172 cf
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs / 2
Peak Elev= 1,362.63' @ 12.57 hrs Surf.Area= 0.002 ac Storage= 0.001 af

Plug-Flow detention time= 40.8 min calculated for 172 cf (100% of inflow)
Center-of-Mass det. time= 40.6 min (792.3 - 751.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,361.00'	0.001 af	**3.00'W x 25.00'L x 2.00'H Prismatoid** 0.003 af Overall x 40.0% Voids

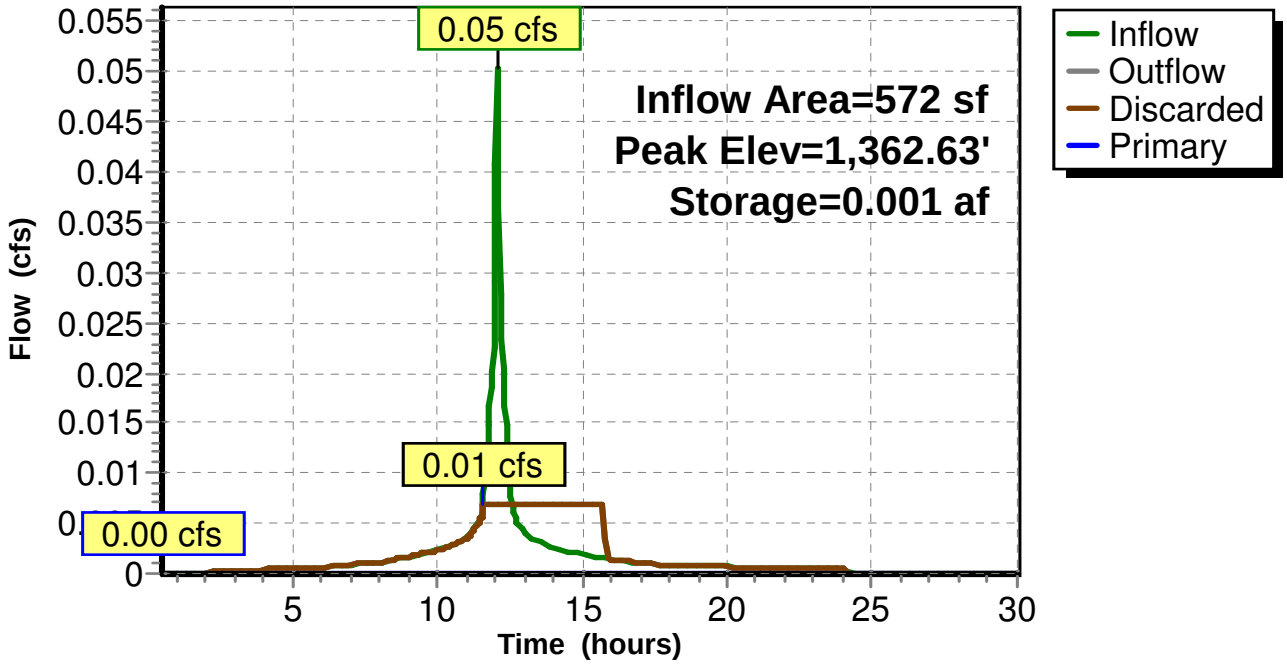
Device	Routing	Invert	Outlet Devices
#1	Primary	1,362.90'	**95.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Discarded	1,361.00'	**4.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 11.62 hrs HW=1,361.02' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=1,361.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Drip Edge

Hydrograph



Summary for Pond 4P: NB1

Inflow Area = 2,162 sf,100.00% Impervious, Inflow Depth = 0.00" for 010-yr event
Inflow = 0.00 cfs @ 0.50 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.50 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs
Peak Elev= 1,357.60' @ 0.50 hrs Surf.Area= 2 sf Storage= 0 cf
Flood Elev= 1,361.00' Surf.Area= 540 sf Storage= 247 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	1,357.60'	4 cf	**1.50'D x 2.50'H Vertical Cone/Cylinder**
#2	1,360.10'	243 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		247 cf	Total Available Storage

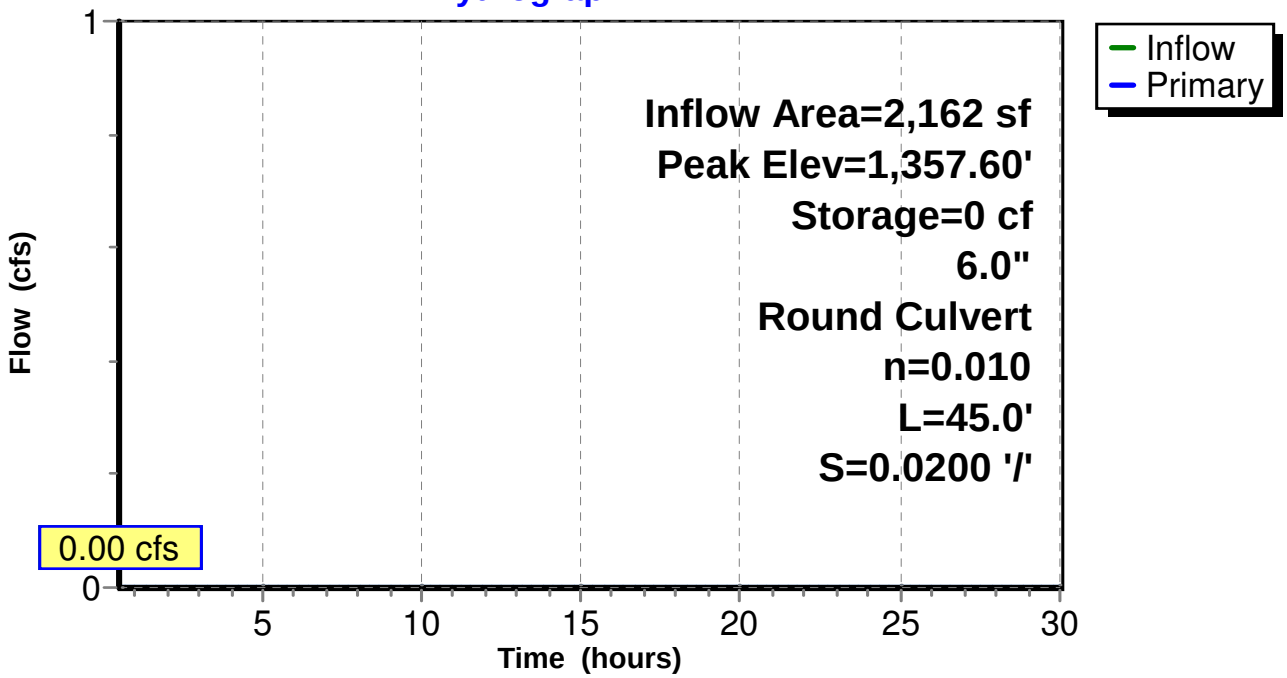
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,360.10	2	0	0
1,361.00	538	243	243

Device	Routing	Invert	Outlet Devices
#1	Primary	1,357.60'	**6.0" Round Culvert** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 1,357.60' / 1,356.70' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=1,357.60' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Pond 4P: NB1

Hydrograph

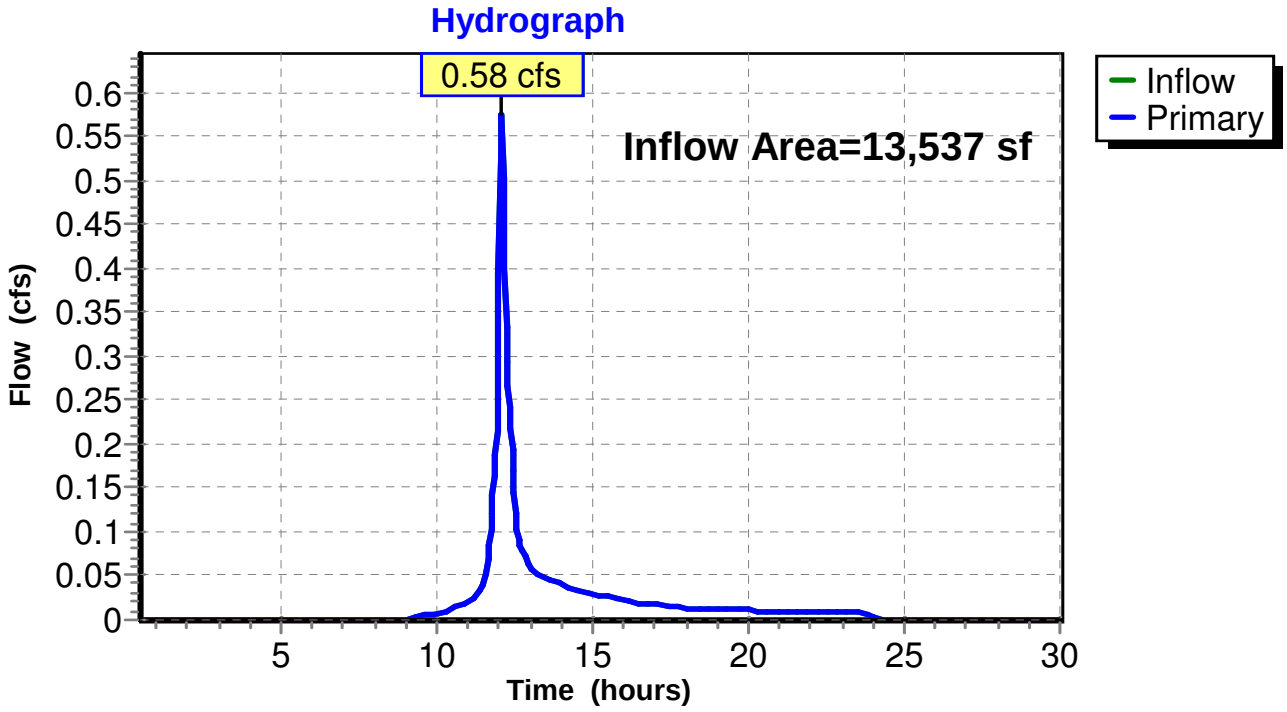


Summary for Link Dp1: Discharge Point #1

Inflow Area = 13,537 sf, 36.46% Impervious, Inflow Depth = 1.61" for 010-yr event
Inflow = 0.58 cfs @ 12.10 hrs, Volume= 1,818 cf
Primary = 0.58 cfs @ 12.10 hrs, Volume= 1,818 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs

Link Dp1: Discharge Point #1

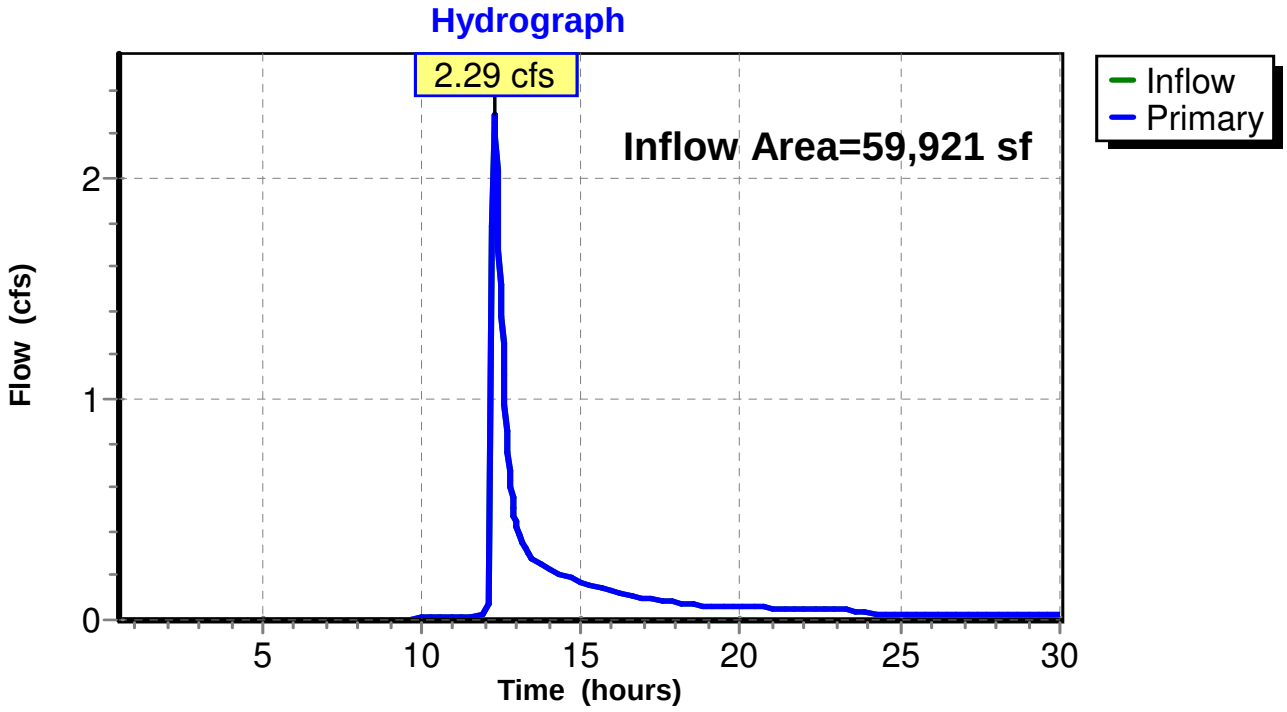


Summary for Link Dp2: Discharge Point #2

Inflow Area = 59,921 sf, 31.18% Impervious, Inflow Depth > 1.63" for 010-yr event
Inflow = 2.29 cfs @ 12.28 hrs, Volume= 8,149 cf
Primary = 2.29 cfs @ 12.28 hrs, Volume= 8,149 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs

Link Dp2: Discharge Point #2

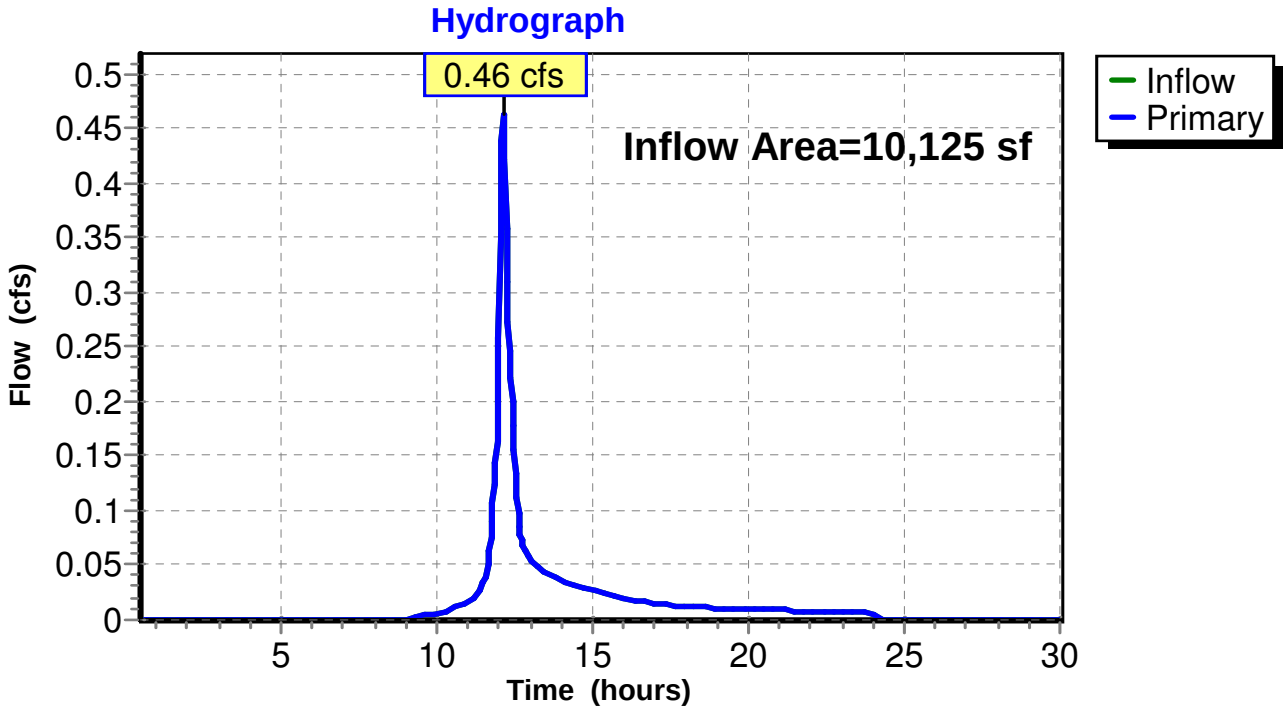


Summary for Link Dp3: Discharge Point #3

Inflow Area = 10,125 sf, 24.46% Impervious, Inflow Depth = 1.92" for 010-yr event
Inflow = 0.46 cfs @ 12.13 hrs, Volume= 1,619 cf
Primary = 0.46 cfs @ 12.13 hrs, Volume= 1,619 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs

Link Dp3: Discharge Point #3

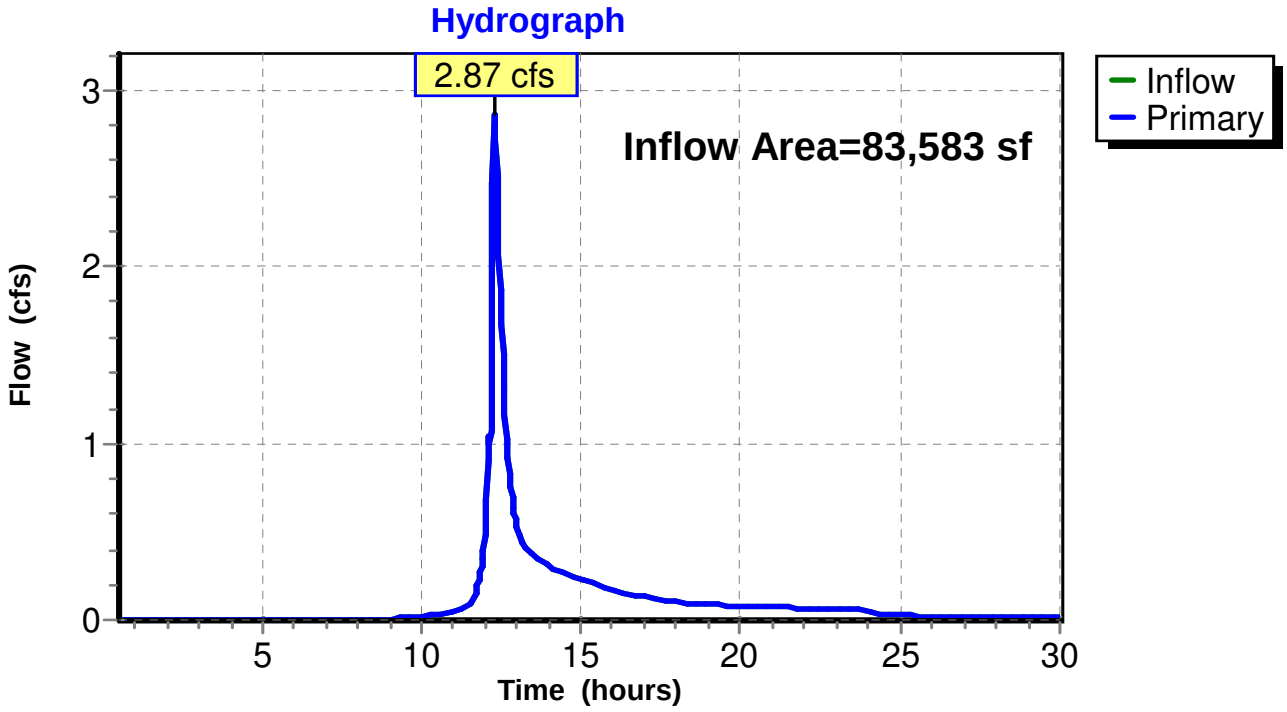


Summary for Link Dp4: On Campus Wetland

Inflow Area = 83,583 sf, 31.22% Impervious, Inflow Depth > 1.66" for 010-yr event
Inflow = 2.87 cfs @ 12.27 hrs, Volume= 11,586 cf
Primary = 2.87 cfs @ 12.27 hrs, Volume= 11,586 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-30.02 hrs, dt= 0.04 hrs

Link Dp4: On Campus Wetland



3.5 Stone Riprap Calculations
(Energy Dissipation – Stability Calculations)

Stone Fill Sizing - Outlet Protection
Calculations 25 year storm

Project:	F&PAC Roof Drain Pipe
Performed By:	WTD
Checked By:	
Date:	2/2/2016

Apron Length

When Tail water depth at pipe outlet is **less (<)** than 1/2 the dia. pipe

use **Eq 1**: $La = \frac{1.8 \times Q}{D^{3/2}} + 7 \times D$

When Tail water depth at pipe outlet is **greater (>)** than 1/2 the dia. pipe

use **Eq 2**: $La = \frac{3 \times Q}{D^{3/2}} + 7 \times D$

Apron Width at Outlet = 3 x D **Eq3** or channel bottom width, when there is a well defined channel

Downstream Apron Width when there is **NO** well defined channel at pipe outlet

and the Tailwater Depth is less (<) than the elevation of the center of the pipe use **Eq 4**

W=3D+La

or if the Tailwater Depth is greater (>) than the elevation of the center of the pipe use **Eq 5**

W=3D+0.4xLa

Where D= pipe Diameter La= apron length W= apron width

Q=Discharge from pipe CFS Tw=Tailwater

8" Diameter HDPE (smooth interior)

		CFS		Feet		Feet	Channel (Y or N)
Data:	Q=	3	D=	0.67	Tw=	0.66	y

1) Apron Width at Outlet

Use Channel Bottom Width for Feet

2) Apron Length

Use Eq 2 21 Feet

3) Downstream Apron Width

Use Channel Bottom Width for Feet

4) Stone Size

$$d50 = \frac{0.02 \times Q^{4/3}}{Tw \times D}$$

0.20 Feet

Use NHDOT Class C Stone Fill

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Tuesday, Feb 2 2016

8-Inch Diameter Roof Drain Pipe

Invert Elev Dn (ft)	=	1351.00
Pipe Length (ft)	=	150.00
Slope (%)	=	4.67
Invert Elev Up (ft)	=	1358.00
Rise (in)	=	8.0
Shape	=	Cir
Span (in)	=	8.0
No. Barrels	=	1
n-Value	=	0.012
Inlet Edge	=	Projecting
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.5

Embankment

Top Elevation (ft)	=	1363.00
Top Width (ft)	=	100.00
Crest Width (ft)	=	100.00

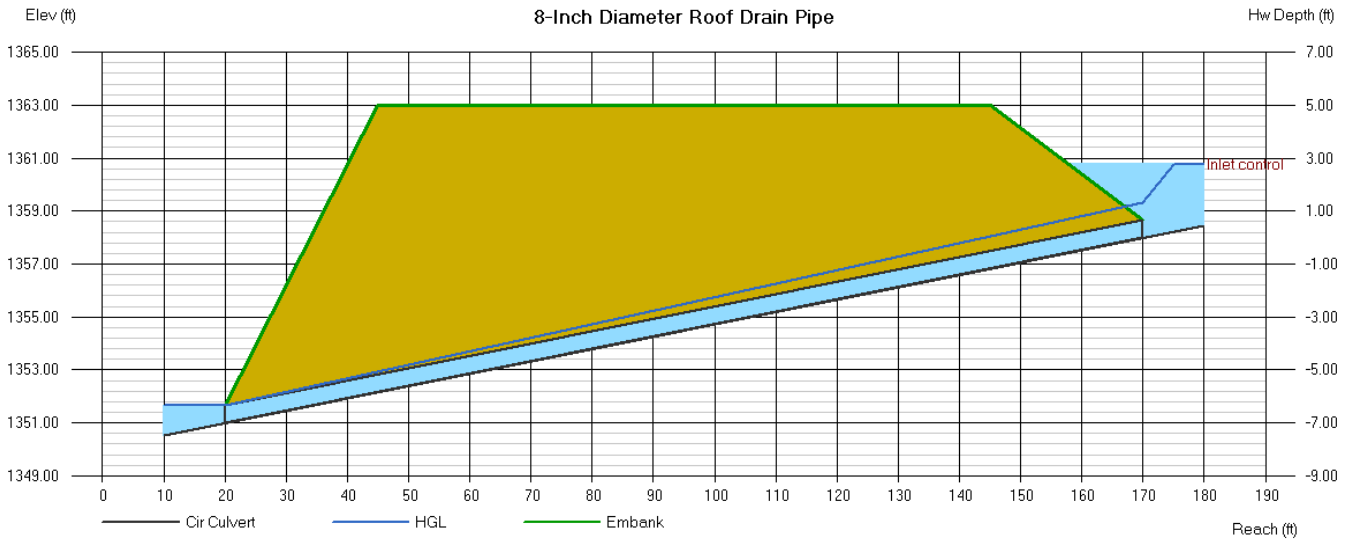
Calculations

Qmin (cfs)	=	1.00
Qmax (cfs)	=	4.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	3.00
Qpipe (cfs)	=	3.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.60
Veloc Up (ft/s)	=	8.59
HGL Dn (ft)	=	1351.66
HGL Up (ft)	=	1359.30
Hw Elev (ft)	=	1360.79
Hw/D (ft)	=	4.18
Flow Regime	=	Inlet Control

Tw = 1351.66-1351.00 = 0.66



Stone Fill Sizing - Weir Outlet
Calculations 25 year storm

Performed By:	WTD
Checked By:	DEB
Date:	2/2/2016

Detention Pond Broad-Crested Weir Spillway Stone Sizing

$Tc = Sw * S * d$

Where Tc = Critical Shear Stress Sw = Specific Weight of Water (lb/cf)

d = Depth of Flow (Feet) S = Channel Slope (ft/ft)

Weir-1 Outlet Protection

		lb/ft³		Feet		Feet/Feet
Data:	Sw =	62.4	d =	0.21	S=	0.333333

T= 0.4 LB/FT² »»» 25.0 mm from attached chart
0.984 in

Use NHDOT Class C Stone Fill

Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Tuesday, Feb 2 2016

Micro-Extended Detention Pond (2P) Weir Outlet

Trapezoidal Weir

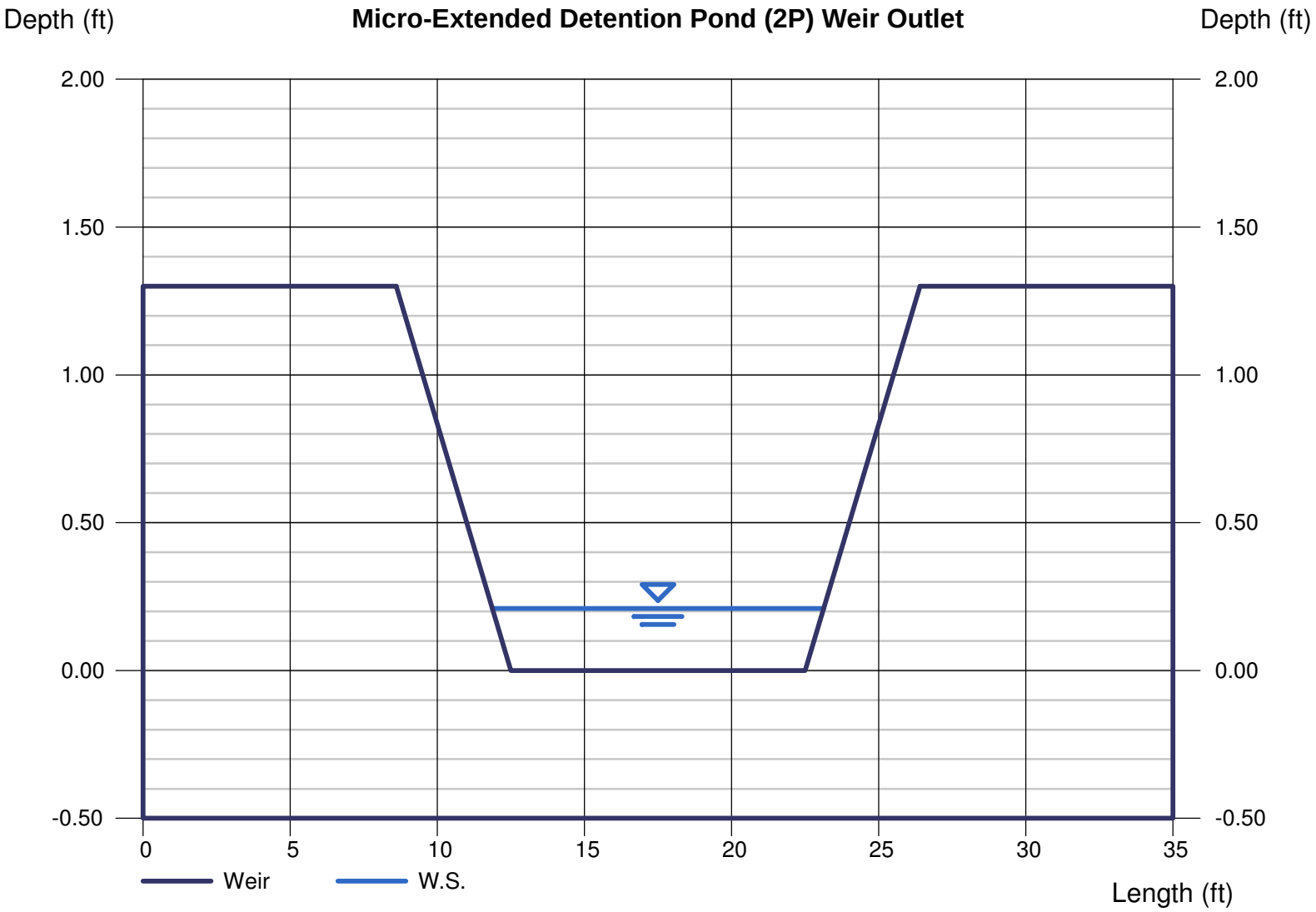
Crest	=	Sharp
Bottom Length (ft)	=	10.00
Total Depth (ft)	=	1.30
Side Slope (z:1)	=	3.00

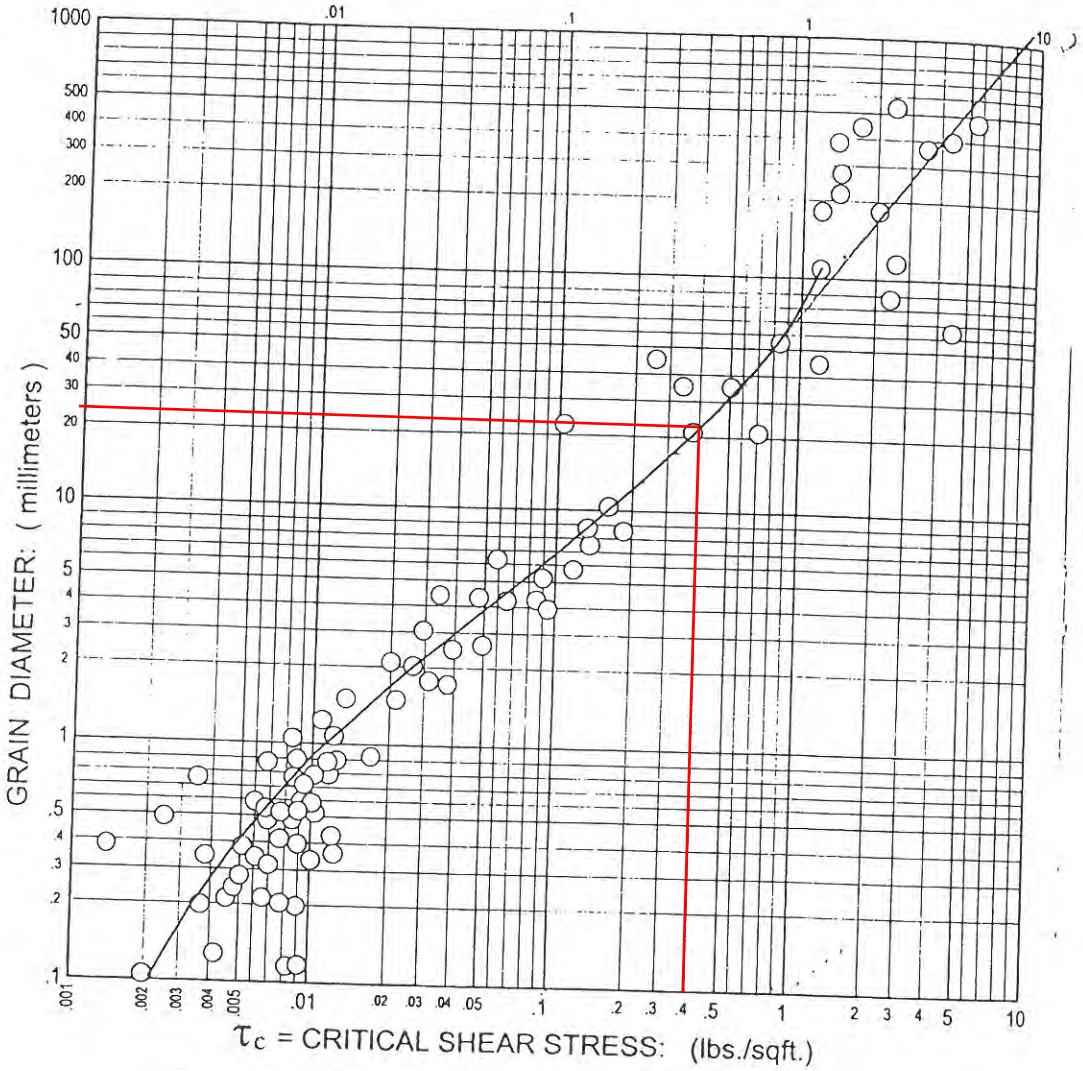
Calculations

Weir Coeff. Cw	=	3.10
Compute by:		Known Q
Known Q (cfs)	=	3.00

Highlighted

Depth (ft)	=	0.21
Q (cfs)	=	3.000
Area (sqft)	=	2.23
Velocity (ft/s)	=	1.34
Top Width (ft)	=	11.26





Laboratory and field data on critical shear stress required to initiate movement of grains (Leopold, Wolman, & Miller 1964). The solid line is the Shields curve of the *threshold of motion*; transposed from the θ versus R_g form into the present form, in which critical shear stress is plotted as a function of grain diameter.

Data Points are drawn from the following sources:

U.S.W.E.S.	Chitty Ho
Chang	Krey
Nat'l. Bur. of Standards	Prussian Exper. Institute
Kramer	Engels
Indri	Fahnestock

$\tau = \gamma s d$

3.6 Site Specific Soil Survey

SITE-SPECIFIC SOIL MAP REPORT

Colby Sawyer College
New London, NH 03257

prepared for

Horizons Engineering, Inc
PO Box 1825
New London, NH 03257

January 31, 2016

Beaver Tracks, LLC
21 Hale Hill Road
Swanzey, NH 03446

Introduction

This report accompanies a site-specific soil survey map produced by Jonathan A Sisson III, NH Certified Soil Scientist. The site-specific soil map was completed on January 26, 2016. The site is approximately 4.0 acres of land to the east side of the Colby Farm building on the Colby Sawyer College campus. The soil map is for the construction of a detention pond and new building. This soil map is required for an alteration of terrain permit in New Hampshire.

Methodology

The soil map was produced according to the guidelines provided in "Site-Specific Soil Mapping Standards For New Hampshire and Vermont", version 3.0, December 2006, SSSNNE Special Publication No. 3. Soil samples were taken using a long handled shovel and a soil auger. Soil series name of each sample was determined from the NRCS Merrimack County Soil Catena table by the parent material, the drainage classification, and presence or lack of a dense layer. Test holes (points) were located with a Thales ProMark 3 GPS unit. Point data was post processed with data from a second Thales ProMark 3 GPS unit located on the property. The corrected data was then imported into Carlson Civil (CAD based program). In Carlson Civil, the final soil lines and text were digitally drawn on the topographic plan provided by Horizons Engineering.

Comments

The soils in the mapping area is slightly disturbed. Top soil has been pushed around for the construction of the farm house, town water facility, roads and the tennis courts. All areas have a fine sandy loam dense layer. Six test pits were dug by hand and four dug by a small excavator. Only one of the test pits had redox. This one test pit was in a man-made drainage area. The soil series for the area that with redox is Peru. The soil series for the rest of the area (with no redox to 40") is Marlow. The third soil series on the soil map is areas that are filled for roads (gravel and concrete) and buildings. This filled area has an impervious surface over fine sandy loam with a dense layer.

Soil Map Unit Descriptions

Unit Symbol	Unit Name	Drainage Class	Hydrologic Group	Parent Material
76A,B,C,D,E	Marlow	Well	C	Glacial Till
78D	Peru	Moderately Well	C	Glacial Till

Soil Map Unit Descriptions

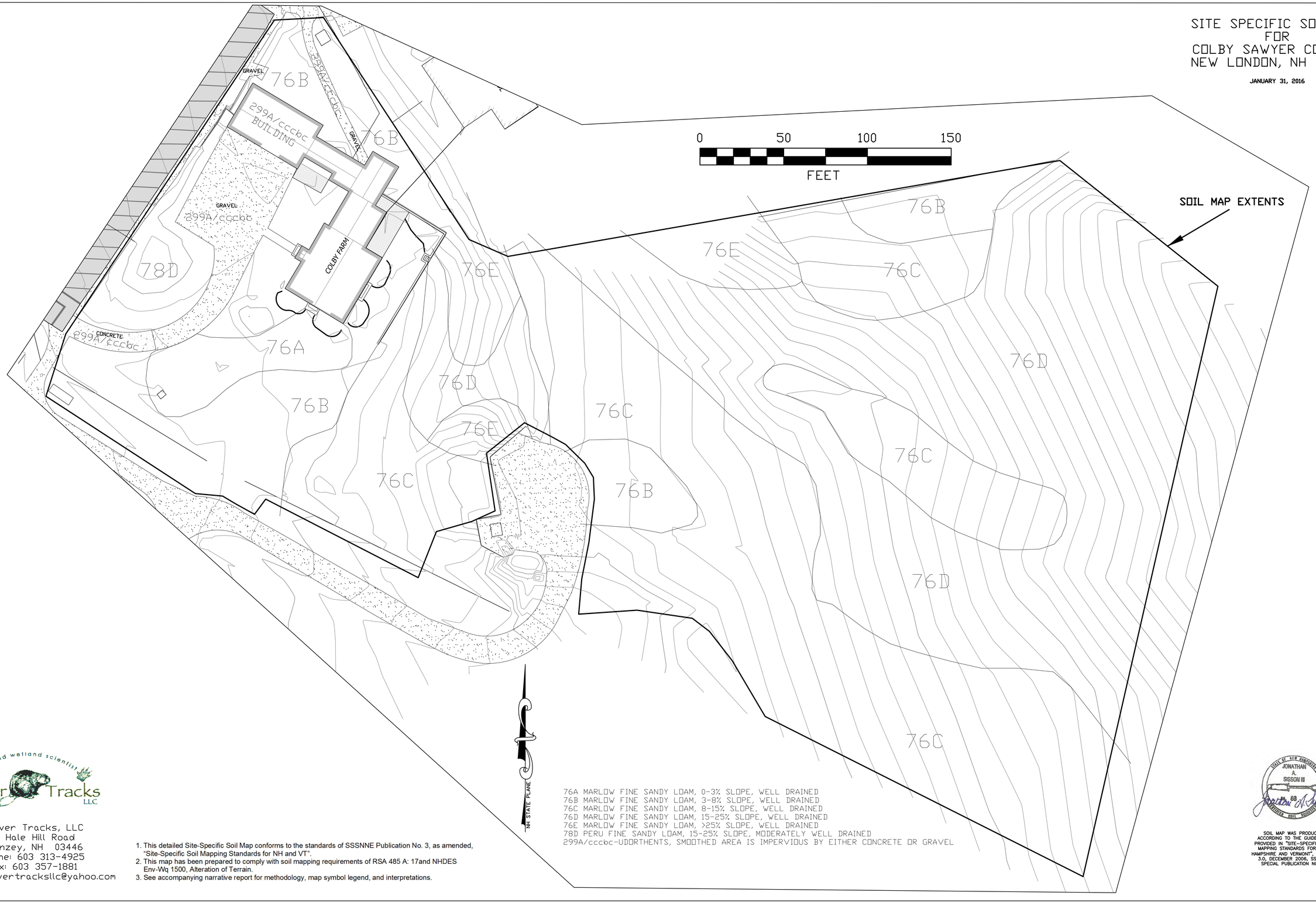
	Components of the Disturbed Soil[2]				
Unit Symbol[1]	**Drainage Class**	**Parent Material**	**Restrictive Layer**	**Ksat**	**Hydrologic Group**
299A/cccbc	c=well	c= glacial till	c= Less than 40”	b=moderate	c

[1] Unit Symbol taken from Catena Key for Disturbed, Filled Land and Bottom Land table on page 22 in *NH State-Wide Numerical Soil Legend*, Issue #10, January 2011

[2] Components of the Disturbed Soil obtained from NH Supplement, Feb 2011 of the *Site-Specific Soil Mapping Standards For New Hampshire and Vermont*, version 3.0, December 2006, SSSNNE Special Publication No. 3

SITE SPECIFIC SOIL MAP
FOR
COLBY SAWYER COLLEGE
NEW LONDON, NH 03257

JANUARY 31, 2016



76A MARLOW FINE SANDY LOAM, 0-3% SLOPE, WELL DRAINED
76B MARLOW FINE SANDY LOAM, 3-8% SLOPE, WELL DRAINED
76C MARLOW FINE SANDY LOAM, 8-15% SLOPE, WELL DRAINED
76D MARLOW FINE SANDY LOAM, 15-25% SLOPE, WELL DRAINED
76E MARLOW FINE SANDY LOAM, >25% SLOPE, WELL DRAINED
78D PERU FINE SANDY LOAM, 15-25% SLOPE, MODERATELY WELL DRAINED
299A/ccc-bc-UDORTHENTS, SMOOTHED AREA IS IMPERVIOUS BY EITHER CONCRETE OR GRAVEL

soil and wetland scientists
Beaver Tracks LLC

Beaver Tracks, LLC
21 Hale Hill Road
Swanzey, NH 03446
Phone: 603 313-4925
Fax: 603 357-1881
email: beavertracksllc@yahoo.com

1. This detailed Site-Specific Soil Map conforms to the standards of SSSNNE Publication No. 3, as amended, "Site-Specific Soil Mapping Standards for NH and VT".
2. This map has been prepared to comply with soil mapping requirements of RSA 485 A: 17and NHDES Env-Wq 1500, Alteration of Terrain.
3. See accompanying narrative report for methodology, map symbol legend, and interpretations.

STATE OF NEW HAMPSHIRE
JONATHAN A. SISSON III
68
CERTIFIED SOIL SCIENTIST

SOIL MAP WAS PRODUCED ACCORDING TO THE GUIDELINES PROVIDED IN "SITE-SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT", VERSION 3.0, DECEMBER 2006, SSSNNE SPECIAL PUBLICATION NO. 3

3.7 Infiltration Feasibility Report

INFILTRATION FEASIBILITY REPORT
COLBY-SAWYER FINE & PERFORMING ARTS BUILDING
NEW LONDON, NEW HAMPSHIRE

FEBRUARY 2016

TABLE OF CONTENTS

PROJECT NO. 15853

I. LOCATION OF THE PRACTICES

The proposed Fine & Performing Arts Building is located on the Colby-Sawyer College campus where the Colby Farm House is currently sited. Two (2) infiltration practices are planned; one westerly of the proposed building and one east of the proposed building and south of the tennis courts.

II. EXISTING TOPOGRAPHY AT THE PRACTICE LOCATIONS

The area where test pits 1 and 2 were excavated is generally level. Test pit 1 was on the bank of a small stormwater pond. This area will be regraded as part of the project. The area around test pit 3 slopes to the east at a gradient of approximately 10%. The gradient near test pit 4 appears to be shallower. This area has been filled to level the southeast corner of the adjacent tennis courts. The field at test pits 3 and 4 is obviously mowed on a regular basis.

III. TEST PIT LOCATIONS

Four test pits were excavated on January 28, 2016. Two are located in each of the proposed practice areas. The locations of test pits 1 and 2 were significantly dictated by subsurface utilities. Utilities were not a problem at test pits 3 and 4. The pits were excavated to determine soil types, the depth to estimated seasonal high water table (ESHWT), and depth to bedrock or other restrictive layer. The test pits were excavated by Andrews Construction, Inc. and logged by Bruce H. Cox, P.E. of Horizons Engineering, Inc.

IV. SUBSURFACE SYSTEM PLAN AND DETAILS (SEE ATTACHED)

V. SEASONAL HIGH WATER AND BEDROCK ELEVATION

TP-1
Ground elevation at the test pit ≅ 1360
Pit bottom at 7.5+' ≅ elev 1352.5
No bedrock observed to 7.5'+
ESHWT: 23"

TP-2
Ground elevation at the test pit ≅ 1362
Pit bottom at 7'+ ≅ elev <1355
No bedrock observed to 7'
ESHWT: 23"

TP-3
Ground elevation at the test pit ≅ 1334
Pit bottom at 7'+ ≅ elev <1327
No bedrock observed to 7'+
ESHWT: 23"

TP-4
Ground elevation at the test pit ≅ 1328
Pit bottom at 6'+ ≅ elev <1322
No bedrock observed to 6'+
ESHWT: 24"

VI. TEST PIT LOGS

Detailed test pit logs were prepared for each excavation as described in Env-Wq 1504.13 (d). The test pit logs are attached.

VII. DESIGN INFILTRATION RATE

The infiltration rate was determined from Borehole Infiltration tests as described in Env-Wq 1504.14 (e) (4). The tests were completed on January 28, 2016 by Horizons personnel. The test sheets are attached.

<u>BIT-1 (TP-2)</u>
Depth of test: 23"
Rates: >11.5"/hr, 9.9"/hr, 9.0"/hr, 8.0"/hr.

Calculated rate = 8.0"/hr

<u>BIT-2 (TP-3)</u>
Depth of test: 22"
Rates: 5.0"/hr, 4.4"/hr, 4.9"/hr, 4.8"/hr.

Calculated rate = 4.8"/hr

Summary: Given these rates, the existing soils are judged to meet the AoT infiltration requirements without amendment or modification.

Horizons Engineering, Inc.
176 Newport Road, P.O. Box 1825
New London, New Hampshire 03257

Project: Fine Arts Building

Project No.: 15853

Client: Colby – Sawyer College

Subcontractor: Andrews Construction

Test Pit Log No.: 1

Operator:

Date: 1/28/2016

Inspector: B. Cox

Site Conditions

Partly sunny, teens – 30's

Equipment

Hitachi ZX75US

Test Pit Location

Edge of existing stormwater pond

Depth	Sketch	Description	Digging Effort (Easy, Moderate, Difficult)	Other
4"±		Dark brown (10YR/3/3) Topsoil (FINE SANDY LOAM). Friable, very fine – fine grained, well sorted sand. 10%+ non- plastic fines. Fine roots.	D (frozen)	
8"		Olive brown (2.5Y/4/3) FINE SANDY LOAM. Fine – medium grained, moderately poorly sorted sand. Friable. 10% - 20% non-plastic fines. Trace of stones to 2".	D (frozen)	
23"		Very dark grayish brown (10YR/3/2) FINE SANDY LOAM. Friable – firm at bottom. Very fine – fine grained, moderately well sorted sand. 20%+ non-plastic fines. Dry.	E	
7.5'+		Olive brown (2.5Y/4/3) FINE SANDY LOAM (TILL). Dense, platy, very fine – fine grained, moderately well sorted sand. 20%± non-plastic fines. 10% stones 3" – rarely 12". Mottles at 23". Slightly moist.	E - M	
		Summary: No refusal to depth. No seepage observed. Depth to estimated seasonal high water: 23"		

Horizons Engineering, Inc.
176 Newport Road, P.O. Box 1825
New London, New Hampshire 03257

Project: Fine Arts Building

Project No.: 15853

Client: Colby – Sawyer College

Subcontractor: Andrews Construction

Test Pit Log No.: 2

Operator:

Date: 1/28/2016

Inspector: B. Cox

Site Conditions

Partly sunny, teens – 30's

Equipment

Hitachi ZX75US

Test Pit Location

Near existing stormwater pond

Depth	Sketch	Description	Digging Effort (Easy, Moderate, Difficult)	Other
4"±		Dark brown (10YR/3/3) Topsoil (FINE SANDY LOAM). Friable, very fine – fine grained, well sorted sand. 10%+ non- plastic fines. Fine roots.	D (frozen)	
8"		Olive brown (2.5Y/4/3) FINE SANDY LOAM. Fine – medium grained, moderately poorly sorted sand. Friable. 10% - 20% non-plastic fines. Trace of stones to 2".	D (frozen)	
23"		Very dark grayish brown (10YR/3/2) FINE SANDY LOAM. Friable – firm at bottom. Very fine – fine grained, moderately well sorted sand. 20%+ non-plastic fines. Roots to 21". Dry.	E	
7'+		Olive brown (2.5Y/4/3) FINE SANDY LOAM (TILL). Dense, platy, very fine – fine grained, moderately well sorted sand. 20%± non-plastic fines. 10% stones 3" – rarely 12". Mottles at 23". Slightly moist.	E - M	
		Summary: No refusal to depth. No seepage observed. Depth to estimated seasonal high water: 23"		

Horizons Engineering, Inc.
176 Newport Road, P.O. Box 1825
New London, New Hampshire 03257

Project: Fine Arts Building

Project No.: 15853

Client: Colby – Sawyer College

Subcontractor: Andrews Construction

Test Pit Log No.: 3

Operator:

Date: 1/28/2016

Inspector: B. Cox

Site Conditions

Partly sunny, teens – 30's

Equipment

Hitachi ZX75US

Test Pit Location

South of the tennis courts

Depth	Sketch	Description	Digging Effort (Easy, Moderate, Difficult)	Other
10"		Dark brown (10YR/3/3) Topsoil (FINE SANDY LOAM). Friable, very fine – fine grained, well sorted sand. 10%+ non- plastic fines. Fine roots.	E	
26"		Very dark grayish brown (10YR/3/2) FINE SANDY LOAM. Friable – firm at bottom. Very fine – fine grained, moderately well sorted sand. 20%+ non-plastic fines. Mottles at 23". Dry.	E	
7'+		Very dark grayish brown (2.5Y/3/2) FINE SANDY LOAM (TILL). Dense, platy, very fine – fine grained, moderately well sorted sand. 20%± non-plastic fines. 10% stones 3" – rarely 12". Mottles at 23". Slightly moist.	E - M	
		Summary: No refusal to depth. No seepage observed. Depth to estimated seasonal high water: 23"		

Horizons Engineering, Inc.
176 Newport Road, P.O. Box 1825
New London, New Hampshire 03257

Project: Fine Arts Building

Project No.: 15853

Client: Colby – Sawyer College

Subcontractor: Andrews Construction

Test Pit Log No.: 4

Operator:

Date: 1/28/2016

Inspector: B. Cox

Site Conditions

Partly sunny, teens – 30's

Equipment

Hitachi ZX75US

Test Pit Location

South of the tennis courts

Depth	Sketch	Description	Digging Effort (Easy, Moderate, Difficult)	Other
6"		Dark brown (10YR/3/3) Topsoil (FINE SANDY LOAM). Friable, very fine – fine grained, well sorted sand. 10%+ non- plastic fines. Occasional light – medium gray silty inclusions. Fine roots.	E	
18"		Very dark grayish brown (10YR/3/2) FINE SANDY LOAM. Friable – firm at bottom. Very fine – fine grained, moderately well sorted sand. 20%+ non-plastic fines.	E	
6'+		Very dark grayish brown (2.5Y/3/2) FINE SANDY LOAM (TILL). Dense, platy, very fine – fine grained, moderately well sorted sand. 20%± non-plastic fines. 10% stones 3" – rarely 12". Mottles at 24". Slightly moist.	E - M	
		Summary: No refusal to depth. No seepage observed. Depth to estimated seasonal high water: 24"		

BOREHOLE INFILTRATION TEST

CLIENT: COLBY - SAWYER COLLEGE
PROJECT: FINE ARTS BUILDING
ADDRESS: COLBY - SAWYER COLLEGE

INFILTRATION TEST NO.: BIT-1
ASSOCIATED TEST PIT(S): TP-2
CONDUCTED BY: B. COX
DATE: 1/28/2016

DEPTH OF TEST: 23" CASING DIA.: 4"
SATURATION PERIOD: START: 12:00 NOON END: 1:00 PM

START TIME	START DISTANCE	END TIME	END DISTANCE	RATE (IN/HR)
1:00 PM	18 1/2"	2:00 PM	30"	>11.5
2:00 PM	18 5/8"	3:00 PM	29 1/2"	9.9
3:00 PM	19 1/2"	4:00 PM	28 1/2"	9.0
4:00 PM	20 1/8"	5:00 PM	28 1/8"	8.0

FINAL RATE: 8.0 IN/HR

INFILTRATION TEST NO.: BIT-2
ASSOCIATED TEST PIT(S): TP-3
CONDUCTED BY: B. COX
DATE: 1/28/2016

DEPTH OF TEST: 22" CASING DIA.: 4"
SATURATION PERIOD: START: 12:05 PM END: 1:05 PM

START TIME	START DISTANCE	END TIME	END DISTANCE	RATE (IN/HR)
1:05 PM	14 3/4"	2:05 PM	19 3/4"	5.0
2:05 PM	15"	3:05 PM	19 3/8"	4.4
3:05 PM	14 1/2"	4:05 PM	19 3/8"	4.9
4:05 PM	14 3/4"	5:05 PM	19 1/2"	4.8

FINAL RATE: 4.8 IN/HR

Infiltration Feasibility Report; Colby-Sawyer Fine Arts Building
Site Photographs – January 28, 2016
New London, New Hampshire

Photo 1: Test pit 1 (foreground) and test pit 2 (background) looking southeast.

Photo 2: Test pit 1 looking northeast.

Photo 3: Test pits 2 looking southeast.

Photo 4: Test pit 3 looking east.

Photo 5: Test pit 3 looking north.

Photo 6: Test pit 4 looking northeast.

3.8 Inspection and Maintenance Manual

Inspection and Maintenance Plan

Colby-Sawyer College - Fine & Performing Arts Center
New London, NH

Introduction

This document is intended to provide a unified procedure for the party (ies) responsible for inspecting and maintaining the stormwater management device(s) that are located within the site development (see Design Plan for the device locations).

Responsible Parties

The ultimate responsibility for complying with this plan rests with the owners of the Property.

Owner's Name: Colby-Sawyer College

Prior to transfer of ownership to another entity the existing owner shall notify DES in writing of such transfer.

Parties assigned to complete inspection and maintenance tasks are presented in the following table:

DEVICE	TASK	PARTY RESPONSIBLE
Structural Stormwater Devices		
Micro-Extended Detention Pond	Inspection	OWNER
	Maintenance	OWNER
	Reporting	OWNER
Catch Basins and Culverts	Inspection	OWNER
	Maintenance	OWNER
	Reporting	OWNER
Stone Infiltration Drip Edge	Inspection	OWNER
	Maintenance	OWNER
	Reporting	OWNER

Frequency of Activities

The best time to perform inspections is during the onset of rain. To the extent practicable inspections should be timed to coincide with moderate storms that do not have the potential for severe (thunderstorms, etc.) precipitation. The frequency of inspection and maintenance will vary by intensity of use; however the following shall serve as the minimum inspection frequency:

- Structural Devices: Spring and fall
- Infiltration Drip Edges: Once annually, the system should be inspected for a drawdown time of 72 hours. The system has been designed with inspection ports for access for inspection and maintenance.
- Pretreatment measures should be inspected and cleaned at least twice annually.
- Ponds should be inspected at least twice annually.

Maintenance frequencies will be determined based upon the results of the inspections and if specific maintenance thresholds are observed to have been crossed during inspections.

All inspection activities shall be recorded on the appropriate attached Inspection Form. One form shall be used for each stormwater device.

Records

A record of inspection and maintenance activities shall be recorded on the Inspection and Maintenance Log presented following. Records of Inspection Forms and Inspection and Maintenance Logs shall be made available upon request.

____
Year

Stormwater BMP
Inspection and Maintenance Log

Colby-Sawyer College - Fine & Performing Arts Center – New London, NH

DEVICE/ LOCATION	INSPECTION		FOLLOW UP ACTIVITY	
	Date	Insp. Name	Date	Action Taken

_____ BMP Name

Micro-Extended Detention Pond

Inspection Form

Colby-Sawyer College – Fine & Performing Arts Center
New London, NH

Date of today's inspection__/__/__ Inspector Name_____
Date of last inspection (of this BMP) __/__/__

Recent Weather history

Storm date(s)	Storm duration	Rainfall amount	Did runoff occur?

Today's Weather_____

INSPECTION AREAS	LOOK FOR	CIRCLE ONE		IF YES
Outlet(s) from BMP				
	Turbid Discharge?	Y	N	Follow turbidity upgradient to source and stabilize
	Scour?	Y	N	Replace scour apron to original plan dimensions, may need to increase D_{50} stone size
	Clogged pipe/weir	Y	N	Remove clog and debris in vicinity of outlet
	Seepage	Y	N	If Dam, consult O&M plan otherwise attempt to find source with dye and plug with bentonite
Banks				
	Erosion?	Y	N	Reshape, seed and apply erosion control matting
	Large areas of sparse growth above waterline?	Y	N	Take soil sample and apply slow release amendments(N, K) per results
	Large areas below waterline are slumping?	Y	N	Either establish appropriate wetland vegetation or apply stone
	Settling?	Y	N	Consult Dam O&M plan if

				applicable, otherwise fill void with specified material, compact, and vegetate
	Woody growth on dam faces?	Y	N	Remove per Dam O&M
Floor				
	Trash or debris accumulations?	Y	N	Remove all trash at every inspection
	Filter Media failure?	Y	N	Replace per manufacturer's specifications
	Does system drain in 72 hours?	Y	N	Seek a qualified professional to assess the condition to determine measures required to restore filtration function, including but not limited to removal of accumulated sediments or reconstruction of the filter.
	Is grass covering the 1" gravel debris screen?	Y	N	Replace per manufacturer's specifications
Inlet(s) to BMP				
	Scour?	Y	N	Replace scour apron to original plan dimensions, may need to increase D_{50} stone size and/ or add check dam
	Sediment accumulation?	Y	N	Look at pretreatment device and clean once sediment occupies 50% of volume, then clean out inlet pipe to main device
Culverts				
	Sediment or debris at Culvert inlet or outlets?	Y	N	Remove sediment. Inspect culvert and clean if necessary

_____ BMP Name

Catch Basins and Culverts

Inspection Form

Colby-Sawyer College - Fine & Performing Arts Center
New London, NH

Date of today's inspection__/__/__ Inspector Name_____
Date of last inspection (of this BMP) __/__/__

Recent Weather history

Storm date(s)	Storm duration	Rainfall amount	Did runoff occur?

Today's Weather_____

INSPECTION AREAS	LOOK FOR	CIRCLE ONE		IF YES
Catchbasin				
	Sump full of sediment?	Y	N	Remove sediment. Inspect culvert and clean if necessary
Culverts				
	Sediment or debris at Culvert inlet or outlets?	Y	N	Remove sediment. Inspect culvert and clean if necessary

3.10 References
Preparer's Certification

REFERENCES

Mays, Larry. *Stormwater Collection Systems Design Handbook*. McGraw-Hill. New York, NY. 2001

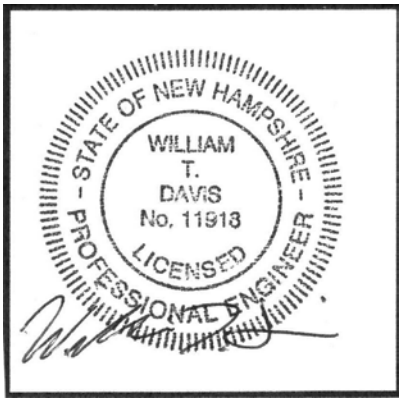
McCarthy, David. *Essentials of Soil Mechanics and Foundations: Sixth Edition*. Prentice Hall. Columbus, Ohio. 2002.

NHDES. *New Hampshire Stormwater Manual*. New Hampshire Department of Environmental Services. 2008.

NHDES. *New Hampshire Homeowner's Guide to Stormwater Management*. New Hampshire Department of Environmental Services. 2012

The UNH Stormwater Center, *The LID Stormwater Management Systems Demonstrate LID Stormwater Management Systems Demonstrate Superior Cold Climate Performance than Superior Cold Climate Performance than Conventional Stormwater Management Systems, UNH Stormwater Center, NEIWPCC 2007 NPS Conference, Newport, RI, May 2007*

PREPARER'S CERTIFICATION



Prepared by William T. Davis, PE

SECTION 4.0 – PLANS

4.1 Design Plans

(Unbound)

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(Plans Bound Separately)

4.4 Pre- & Post-Development Drainage Area Plans

WILKINS WAY

CHARGERS ROAD

PETERSON PATH

CHARGERS ROAD

Dp1

Dp2

Dp3

Dp4

Pr1

Pr2

Pr3

LEGEND

- EXISTING CONTOUR, MAJOR (960)
- EXISTING CONTOUR, MINOR (962)
- PROPOSED CONTOUR, MAJOR (960)
- PROPOSED CONTOUR, MINOR (962)
- SUBCATCHMENT BOUNDARY
- Po1b — WATERSHED LABEL
- SUBCATCHMENT FLOW PATH

0 25 50 100 200

SCALE IN FEET

DATE OF PRINT
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FINE & PERFORMING ARTS CENTER

NEW LONDON, NEW HAMPSHIRE

PRE-DEVELOPMENT DRAINAGE PLAN

NO.	DATE	REVISION DESCRIPTION	ENG	DWG

DATE: FEB 2016	PROJECT #: 15853
ENGIN'D BY: WTD	DRAWN BY: WTD
CHECK'D BY: SHJ	ARCHIVE #: H-5263

4.4A

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WILKINS WAY

CHARGERS ROAD

PETERSON PATH

CHARGERS ROAD

Dp1

Dp2

Dp3

Dp4

Po1a

Po1b

Po2a

Po2b

Po3

D

D

LEGEND

960	EXISTING CONTOUR, MAJOR
962	EXISTING CONTOUR, MINOR
960	PROPOSED CONTOUR, MAJOR
962	PROPOSED CONTOUR, MINOR
	SUBCATCHMENT BOUNDARY
Po1b	WATERSHED LABEL
	SUBCATCHMENT FLOW PATH

0 25 50 100 200

SCALE IN FEET

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NEW LONDON, NEW HAMPSHIRE

POST-DEVELOPMENT DRAINAGE PLAN

NO.	DATE	REVISION DESCRIPTION	ENG	DWG

DATE: FEB 2016	PROJECT #: 15853
ENGIN'D BY: WTD	DRAWN BY: WTD
CHECK'D BY: SHJ	ARCHIVE #: H-5263

4.4B

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