STORMWATER MANAGEMENT REPORT
(BASIC, GENERAL, FLOODING AND URBAN IMPAIRED STREAM STANDARDS)

CONVENIENCE STORE AND FUEL STATION
PORTLAND, ME

PREPARED FOR:

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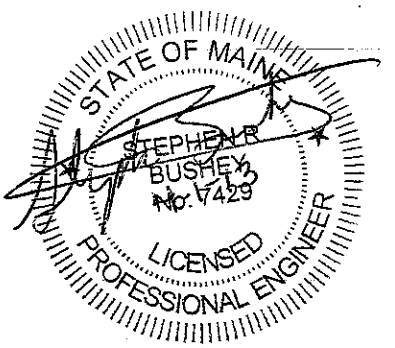

April 2013

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STORMWATER MANAGEMENT REPORT

1.0 Introduction

DeLuca-Hoffman Associates, Inc. has been retained by CJ Developers, Inc. for the preparation of site design and site permitting for a proposed convenience store/fuel station at 2282 Congress Street in Portland, Maine. The development will include a convenience store, drive-thru ATM and fueling facilities.

The project's 3.24-acre site is a cleared undeveloped wooded lot which was partially clear cut within the last ten years in preparation for a previously approved, but not constructed, project. The overall site is rectangular shaped with a small notched portion extending northerly to provide 60 feet of frontage on Congress Street. A narrow parcel of Maine Turnpike Authority (MTA) property that houses a Natural Gas Regulator Station separates the rest of the northerly property line and Congress Street. The westerly property line abuts the Merrimack River Medical Services building and property and the remaining two sides are bounded by MTA Highway I-95 and Skyway Dr. The site's Congress Street entrance drive will be constructed on a 0.12 acre permanent access easement across the MTA property.

This proposed project will create a total of 2.25 ac of developed area of which 1.57 ac will be new structure area (building and other impervious surfaces) within the 3.36 acre project boundary (3.24 acre parcel plus 0.12 acre Access Easement). This project meets the thresholds which require a MeDEP Stormwater Law permit which will be reviewed by the City of Portland under their delegated review authority. The stormwater management design presented herein will show that it meets the criterion of the City of Portland Stormwater Requirements and the adopted MeDEP Chapter 500 Regulations.

The site flows easterly to a 24" RCP Culvert adjacent to the I-95 Interstate which flows southerly under Skyway Dr. and ultimately drains to the North Branch of Long Creek. Because the site is within the Long Creek Watershed the applicant will be required to apply for a Maine Waste Discharge Permit with the MeDEP and it must meet the urban impaired stream requirements described in MeDEP Chapter 500 Regulations.

Runoff from the proposed site will drain to a new inlet and conveyance system and it will be discharged to a stormwater storage facility. Stormwater storage will be comprised of an open detention basin and separate subsurface arch chamber storage tank. The stormwater detention basin will provide channel protection storage meeting the MeDEP General Standards Requirements. The subsurface chamber system will meet the flooding standards and manage the release of the 2, 10 and 25-year storm event to below predevelopment conditions as required by the City of Portland Stormwater Regulations. A series of StormTreat™ tanks will be utilized to meet the stormwater quality standards required under the general standards as outlined in the adopted MeDEP Chapter 500 Stormwater Management Technical Manual. The StormTreat™ system will provide water quality treatment for approximately 89% of the proposed development.

USGS, aerial photographs, and related maps are appended to this report in Appendix A.

On behalf of the applicant, DeLuca-Hoffman Associates, Inc. has prepared this report to show the proposed Stormwater Management Plan meets the City's General Stormwater Standards, as well as standards applicable to project's in the Long Creek Watershed.

2.0 Existing Site Conditions

The site is 3.24 acres and is currently undeveloped with the following land cover:

TABLE 1 – LAND COVER	
Current Land Cover	**Area (acre)**
Woods (Emerging)	3.04
Meadow (Natural Gas Easement)	0.20
Total	**3.24**

Topography slopes from west to east with slopes ranging from 3% to 14%. The site elevations range from 73 to 102 based on NGVD29. Existing topography sheet flows across the southerly and easterly property lines and drainage is towards a 24" RCP culvert adjacent to the abutting I-95 interstate highway (SB lanes).

The soils on the site are shown on the USDA medium intensity soils map to be primarily Hollis fine sandy loam and Scantic silt loam. Geotechnical explorations by SW Cole in March 2013 show that the soils are predominantly silty sand overlying sandy silt with gravel overlying relatively shallow bedrock.

The site is in the IM Industrial Zone and has been approved by the City of Portland as a permitted use through a Conditional Zone Agreement.

The existing conditions are shown on Drawing C-1.3 and supplemented by photographs appended to the end of this narrative in Appendix B.

The site is not located in a mapped 100-year floodplain and is denoted as Zone X based upon the Dec. 8, 1998 FEMA mapping and depicted on Figure 7 provided by MGIS Firm Panel # 230051 Panel #12-C.

The drainage is divided into two areas; the majority of the site is tributary to the North Branch of the Long Creek Subwatershed C as identified in the Long Creek Watershed Management Plan. A small portion of the Northwest corner of the site flows westerly along Congress Street and is tributary to the Stroudwater River.

Figures 8, 9, and 10 appended to the report provide the USDA medium intensity soils, sand and gravel aquifers maps, and surficial geology map for the site.

3.0 Proposed Project

The proposed project is generally described below and is shown on Drawing C-2.0. The project will develop 2.25 acres of the 3.24 acre wooded site.

The proposed project will include construction of a 3,850 s.f. convenience store and fuel station with 12 pumps and a canopy. The development will also include a separate 2 dispenser diesel fueling area with canopy, drive-thru ATM machine, and provisions for a future Compressed Natural Gas fueling station.

The proposed land use for the site after development will be as follows:

TABLE 2 – LAND USE (ONSITE ONLY)		
Proposed Land Cover	**Area (acre)**	**Change from Current (acre)**
Woods	0.99	(2.05)
Meadow (Natural Gas Easement)	0.20	0
Meadow (Vegetated Fill Slopes)	0.42	+0.42
Lawn/Landscaped Planting Areas	0.01	+0.01
Pavement	1.48	+1.48
Roof	0.09	+0.09
Rip Rap Slope	0.05	+0.05
Total	**3.24**	**0**

The Erosion Control Plan contained in Appendix J of this section outlines the erosion control measures which will be required for the project (Basic Stormwater Standards).

4.0 Watershed Delineation Method

The following resources were used for watershed delineation:

- USGS Topographic Mapping
- Field Reconnaissance

  Bo Kennedy P.E., Project Engineer, DeLuca-Hoffman Associates, Inc.
  Reviewed by Stephen Bushey, P.E., DeLuca-Hoffman Associates, Inc.

- Site Topographic Survey

  Titcomb Associates, Inc., dated March, 2013.

- Hydrologic Soil Group Information

  USDA SCS Medium Intensity Mapping with interpretation of wetland delineation by Albert Frick Associates.

5.0 References

- Urban Hydrology for Small Watersheds from the USDA SCC *Technical Release SS, dated 1986*
- Erosion and Sediment *Maine Erosion and Sediment Control BMPs", published by the MeDEP in 2003 http://www.maine.gov/dep/blwg/docstand/escbmps/index.htm*
- City of Portland – Code of Ordinances, Section 32 Rev. 9-17-09
- Portland Stormwater Management – Section 5 Adopted 7-19-10.
- Stormwater Management for Maine Volume III – BMP Technical Design Manual
- Chapter 500 DEP Rules, revision October 2010.

6.0 Modeling Software

- HydroCAD Stormwater Modeling System, version 8.5, Applied Microcomputer Systems – used for modeling underground storage facilities.

- Microsoft Excel 2007, Microsoft Corporation – used for spreadsheet computations.

7.0 Design Storms

TABLE 3 – RAINFALL	
Rainfall Amount (inches)	
2-Year Storm	3.0
10-Year Storm	4.7
25-Year Storm	5.5

Hydrologic Parameters: Cumberland County SE Type III Distribution: Antecedent Moisture Condition 2, SCS 24 Hour Distribution as per MeDEP Stormwater Best Management Practices (page 25).

8.0 Presentation of Analysis

The stormwater analysis has been performed for the project to determine the requirements of the City of Portland, Section 5 and adopted MeDEP Chapter 500 Stormwater Rules and to show a plan which will generally meet the requirements with the exceptions noted herein. The analysis is documented with supporting HydroCAD models appended to this narrative.

9.0 Modeling Assumptions

- Inlets modeled as ponds with cylindrical storage based on invert to rim depth and structure diameter. It is assumed that all stormwater can enter at inlets.
- Analysis was run with pipe lengths (modeled as culvert outlets). Pipe sizes were generated using the HydroCAD modeling flow computations.
- The Tc flow paths were assumed to be a min. of 6 minutes as recommended in the TR-55 technical manual. In instances where flow paths were computed to be less then 6 minutes a direct entry command was used.

10.0 Predevelopment Analysis

Runoff from the site flows from the northwest corner in a southeasterly direction and generally passes over the property line as sheet flow. Flow begins to concentrate beyond the property line in road side ditches along Skyway Dr. to the south and I-95 to the east. Runoff discharges through a 24" RCP culvert crossing under Skyway Dr. flowing southerly through a channel to Long Creek's North Branch. The site is considered part of Long Creek Subwatershed C as defined in the Long Creek Watershed Management Plan. Long Creek is considered an Urban Impaired Stream as classified by the MeDEP.

For the purpose of this analysis, the offsite area downstream of the property boundaries tributary to the 24" culvert have been omitted for clarity and is not considered relevant to

this particular project. This peripheral area is small and does not produce a significant amount of runoff. The predevelopment analysis considers the sheet flow across the southerly and easterly property boundaries to the 24" culvert as the Point of Interest (POI) 1. The postdevelopment analysis analyzes the same POI and assumes that any concentrated flows will be redistributed to match predevelopment sheet flows as discussed in the following Postdevelopment Analysis section. The Predevelopment Watershed Map C-14.0 is enclosed as part of the plan set.

Peak flows at POI 1 are as follows:

TABLE 4
PREDEVELOPMENT FLOWS (PEAK DISCHARGE RATES) AT POI 1

POI #	2 Yr Storm Event (CFS)	10 Yr Storm Event (CFS)	25 Yr Storm Event (CFS)
1	2.86	7.18	9.42

Runoff from a small portion of the site in the northwestern corner flows westerly along Congress Street and ultimately enters the City of Portland storm drainage system tributary to the Stroudwater River. This area of the site is by in large excluded from the development area and therefore the analysis. A small piece of this area, which is development, is captured, redirected, treated and discharged to the Long Creek Watershed.

11.0 Postdevelopment Analysis

The postdevelopment analysis breaks up the site into two categories; the first category includes proposed vegetated fill slopes around the southeast perimeter of the development and undeveloped area downstream of the development. This area is identified as Subcatchment 101 in the postdevelopment analysis and shown on the Postdevelopment Watershed Map C-14.1 enclosed in the plan set. Subcatchment 101 is best described as the remaining portion of the predevelopment subcatchment directly tributary to POI 1 and it characteristics have changed as shown in Table 5.

TABLE 5
PREDEVELOPMENT VS. POSTDEVELOPMENT
COMPARISON OF SUBCATCHMENT 1

Subcatchment ID	Peak Flows (CFS)			CN	Area (Ac.)	Hydrologic Time of Concentration (min.)
	2 Yr Storm Event	10 Yr Storm Event	25 Yr Storm Event			
1	2.86	7.18	9.42	74	4.16	18.3
101	1.99	4.73	6.13	76	2.33	14.9

The second category includes the area of the project development which drains to a new inlet and conveyance system. This area is released in three discharge locations as shown on the Grading and Drainage Plan C-3.0 and is described below:

TABLE 6 SUMMARY OF POSTDEVELOPMENT DISCHARGES	
Discharge Location ID	**Description**
1	Channel Protection discharge from StormTreat Treatment tanks with riprap apron directly to the southerly property line.
2	Discharge from subsurface detention zone with riprap apron and level lip spreader.
3	Culvert discharge from Subcatchment C1 (access drive) with riprap apron.

The development is broken into six (6) subcatchments which enter a series of catch basin inlets, flow to a central stormwater management area and are tributary to discharge locations 1 and 2. A seventh subcatchment identified as C1, located in the access drive, that is discharged at location 3 and bypasses the stormwater management facility. Each subcatchment has been modeled and routed to a catch basin inlet modeled as a pond. The inlets are routed together such that HydroCad can combine all of the hydrographs and compute the peak flow rates entering the stormwater detention basins. The model assumes each subcatchment has a minimum Time of Concentration (Tc) of 6.0 min.

Discharge from the development enters the open detention basin (DET O) that is equipped with a pretreatment sediment forebay. Runoff is distributed into either a series of 6 StormTreat™ treatment tanks or an overflow subsurface detention basin. Runoff in excess of 1" or equivalent to the water quality volume will exceed the storage capacity of the StormTreat™ tanks and open detention basin and it will overflow into the subsurface detention basin which is constructed of 42 large arched chambers (StormTech® Model MC-4500) with 12" of stone below and above the chambers.

Flows entering the stormwater management basins are summarized in the table below:

TABLE 7 POSTDEVELOPMENT FLOWS INTO DETENTION POND (DET O)	
Storm Event Interval	**Peak Flows (CFS)**
2-Year	4.45
10-Year	7.62
25-Year	9.12

Peak flows from the basins are routed to POI 1 using overland flow reaches with a high manning's coefficient typically seen in a wooded sheet flow application and combined with flows from Subcatchment 101. Postdevelopment flows tributary to POI 1 without any attenuation of flow are compared to Predevelopment in the following table and computations are attached in Appendix C:

TABLE 8 PEAK FLOW RATES AT POI 1 (WITHOUT DETENTION STORAGE)			
	2 Yr Storm Event (CFS)	**10 Yr Storm Event (CFS)**	**25 Yr Storm Event (CFS)**
Predevelopment	2.86	7.18	9.42
Postdevelopment	5.54	10.90	13.55
Net	+2.68	+3.72	+4.13

As evident from the table above, it is necessary to attenuate flow in the proposed subsurface detention area to meet the MeDEP Flooding standard objective as noted below.

12.0 Stormwater Management Objectives

The goal of the Stormwater Management Plan is to design, operate, and maintain the development to avoid downstream erosion or significant water quality impairment.

This goal will be achieved by:

- Designing the project to meet the Portland Stormwater Management Standards adopted 7/19/10 and Basic Standards, General Standards, and Flooding Standards of MeDEP (revised October 2010).
- Designing water quality measures to provide long-term removal of non-point contaminants.
- Implementing a plan to control erosion, sedimentation, or fugitive dust emissions during construction.
- Maintenance of the Stormwater Management System in accordance with the Stormwater O&M Manual (provided as a separate document).

The plan has been designed in accordance with the City of Portland Stormwater Rules.

13.0 Stormwater Management Quantity Summary

To meet the Flooding Standards of the MeDEP Chapter 500 Stormwater Rules the project has been designed to store runoff in a subsurface detention area located on the easterly end of the development. The subsurface detention area will be constructed of large arched chambers manufactured by StormTech® and backfilled with crushed stone having approximately 40% porosity. Design plans require the entering row of chambers be constructed as an isolator row with inspection ports and terminus maintenance manhole.

Flow from the detention area will be restricted through a 7.5 inch orifice located in a outlet control manhole (D1). Flows and storage characteristics of the system are as follows:

TABLE 9 SUMMARY OF SUBSURFACE DETENTION SYSTEM (DET 2)				
Storm Event Interval	**Peak Flows In (CFS)**	**Peak Flows Out (CFS)**	**Storage (CF)**	**Peak Elevation (FT)**
2-Year	1.85	1.36	699	87.46
10-Year	6.56	2.67	4,185	89.87
25-Year	7.53	3.09	5,587	90.97

Detaining flows results in the following comparison of peak flows at POI 1:

TABLE 10 PEAK FLOW RATES AT POI 1 (WITH DETENTION STORAGE)			
	2 Yr Storm Event (CFS)	**10 Yr Storm Event (CFS)**	**25 Yr Storm Event (CFS)**
Predevelopment	2.86	7.18	9.42
Postdevelopment	2.51	7.06	9.17
Net	-0.35	-0.12	-0.25

The postdevelompent flows are lower then those in predevelopment conditions at point of interest 1 and therefore the Flooding Standard Goal has been met. Postdevelopment computations are contained in Appendices D & E.

14.0 Stormwater Management Quality Summary

Approach

To meet the General Standards, our office has reviewed the implementation of the 4 approved treatment strategies listed below. Our findings are as follows:

- **Wetpond** – Wetponds were considered for part of the project's stormwater management strategy; however, due to physical and natural resource site constraints and the required limits of proposed development, there is insufficient space to utilize this method of water quality treatment without eliminating proposed development area or filling wetlands. Generally speaking, the approximately 2.25 acres of treated development area would require a wet pond of approximately 0.30 acres in size or 3 times the size of basin currently designed; thus this option is not feasible.
- **Filter** – Filters cover a broad range of techniques including pre-approved proprietary stormwater treatment devices. The preliminary stormwater management strategy presented herein focuses on filters to meet the General Standard requirements.
- **Infiltration** – Our office has reviewed the Geotechnical Report about the site and the USDA medium intensity soil survey. The medium intensity soil survey maps the site as predominantly Hollis fine sandy loam and Scantic Silt loam. These soils are

commonly found to be somewhat excessively drained to poorly drained. The limiting factor to effective infiltration is the restrictive layer (i.e. bedrock, depth to groundwater, and infiltration rates of receiving soils). Despite the favorable drainage category as classified by the USDA soils mapping, the presence of a restrictive layer (high groundwater table and bedrock) will make infiltration very difficult to incorporate into this site. Geotechnical explorations show that bedrock is present around 1.5 ft to 5 ft below existing grade and seasonally high groundwater table approximately 2 ft below existing grade. Due to the proximity to the groundwater table and bedrock, our office is proposing the use of an impermeable liner around all of the stormwater storage areas.

- **Buffers** – Buffers were not considered as part of the site's stormwater management due to insufficient space. As an example, a minimum forested or meadow buffer width needs to be 75 ft, 100 ft or 150 ft with a slope of 0% - 8%, none of which is attainable on the site. Additionally, buffers are required to be encumbered by a conservation easement and deed restrictions.

Implementation

Our office has laid out a plan which utilizes proprietary water quality treatment filters as described in Chapter 7.0 Filtration BMPs of the MeDEP Volume III BMPs Technical Design Manual to meet the minimum treatment standards as required by the General Standards. The plan shown on Sheet C-3.0 incorporates six (6) parallel StormTreat™ Proprietary tanks to best utilize the site conditions. The plan sheets detailing this system is enclosed in the full plan set.

A water quality summary chart of the project is appended with this application in Appendix G. The basis of design of the StormTreat™ treatment method is as follows:

- **StormTreat™ Treatment Units:**

  The StormTreat™ treatment units have been designed to treat at least 95% of the new structure area and 80 % of the developed area.

  To meet Chapter 500, the Channel Protection Volume provided must be equal to or greater than the following:

  1"/12 x impervious area (1.57 ac) plus 0.4"/12 x landscaped area (0.68 ac) = Water Quality Volume (6,252 cubic feet)

  It is noted that the proposed impervious area includes impervious area (894 sq. ft.) associated with a compressed natural gas compressor building which will not be constructed as part of this development until a future date. The construction of this building is incorporated into this design so that future modifications to the stormwater management system will not be necessary.

  Computations of the water quality volume are appended in Appendix G.

  The water quality volume provided is equal to 6,451 cubic feet in an open detention basin at an elevation of 91.00 which exceeds the required 6,252 CF. The pond stage storage calculations are appended in Appendix F.

Based on the revisions made to Chapter 7 of the MeDEP Best Stormwater Practices in October 2010 the StormTreat™ treatment units shall be sized to treat the entire water quality volume in 24 to 72 hours at a discharge rate of approximately 2 gpm per tank. The system must have at least one StormTreat™ tank per 1,155 cubic feet of water quality volume.

The discharge must pass through the StormTreat™ tanks at a rate less than 2.0 gallons per minute per tank. The discharge from the 6 tanks are piped to a common 12" header and controlled with an orifice plate sized to meet the cumulative 12 gpm flow rate. The orifice drawdown computations are appended in Appendix H.

Discharge from larger storm events overflow over a broad crested weir housed in a precast concrete outlet control structure set at elevation 91.00 (i.e. the basin stage when water quality volume has been reached). The overflow piping network is sized to handle runoff from a 25-year storm event. A rain event exceeding the storm drainage network capacity would flood the channel protection basin and detention basin and discharge over the reinforced turf overflow spillway at the northeast corner of the basin.

Pretreatment for flow entering from all inlet pipes to the storage area will be provided via the installation a riprap lined sediment forebay.

Therefore, water quality goals for the StormTreat™ Proprietary System meet the General Stormwater Standards of the November 2005 Chapter 500 Rules of MeDEP (rev. October 2010).

15.0 Chapter 500 Treatment Percent Compliance

The proposed redevelopment project creates 1.57 acres of newly constructed impervious area and 0.68 acres of pervious area for a total disturbed area of about 2.25 acres.

Of the 1.57 acres of impervious area the proposed Stormwater Management Plan provides treatment for 1.53 acres or 97.42 percent. The disturbed area as part of this redevelopment is approximately 2.25 acres. Of the 2.25 acres the proposed Stormwater Management Plan provides treatment for 2.01 acres or 89.32 percent. Hence, the strategies proposed herein meets the minimum requirements stated in the General Standards.

16.0 Erosion Control

An Erosion Control Narrative, Plan, and Details have been prepared for the project and accompanies this submission in Appendix J.

17.0 Operations and Maintenance

An Operations & Maintenance Manual has been prepared and accompanies this application in Appendix K.

18.0 Permit Requirements

City of Portland review and permitting of the Stormwater Management Plan is required and will be completed with the review of the Site Plan Application submitted to the City of Portland Planning Authority. This review will also meet the requirements of the MeDEP Stormwater Management Regulations and permit. A separate but concurrent review with the Long Creek Watershed District will be performed.

19.0 Drainage Network Pipe Sizing

The drainage network has been sized using the flows computed using HydroCad modeling software. The pipe sizes are noted on the drawings.

20.0 Appendices

A – Figures
B – Existing Conditions Photographs
C – Predvelopment Computations (2, 10 and 25-year Storm Event HydroCAD Computations)
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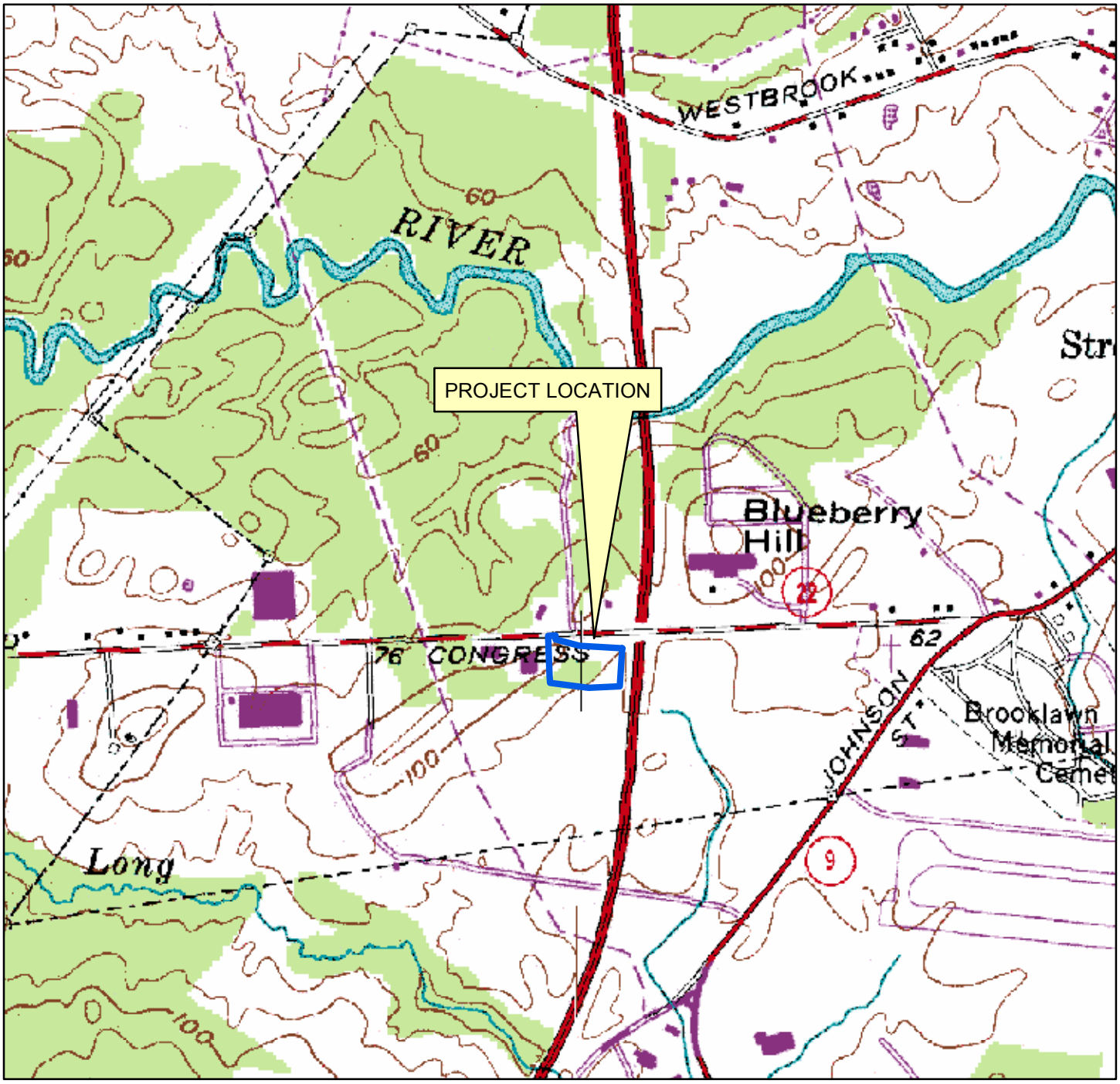
APPENDIX A

Figures



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USGS LOCATION MAP
MULTI-USE DEVELOPMENT
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS - MAPS

DeLuca-Hoffman Associates, Inc.
778 MAIN STREET, SUITE 8
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207-775-1121
www.delucahoffman.com

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DATE:	SEPT 2012
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SCALE:	1 inch = 1,000 feet

FIGURE

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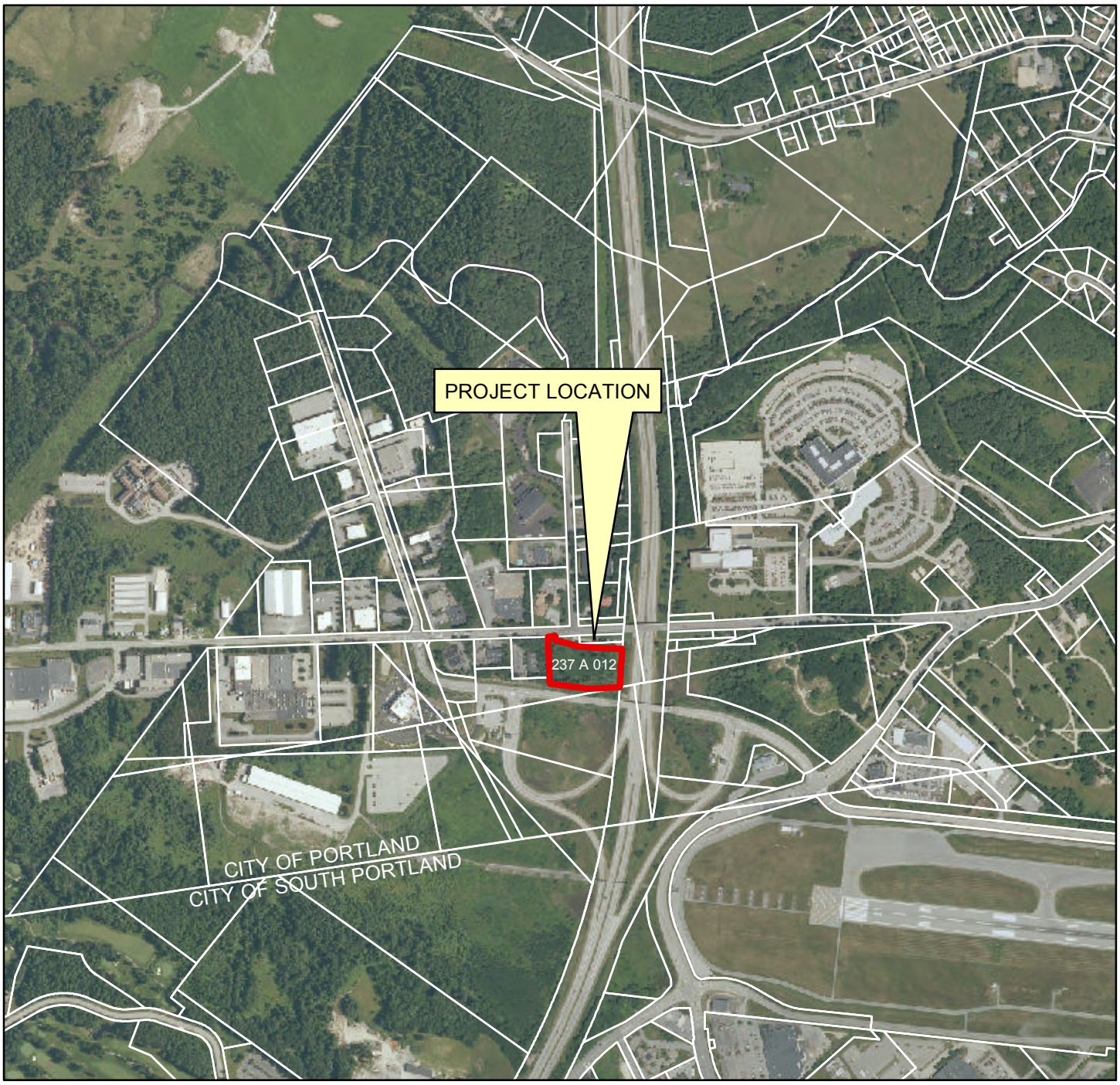

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TAX MAP
CONVENIENCE STORE
PORTLAND, MAINE

SOURCE: CITY OF PORTLAND

DeLuca-Hoffman Associates, Inc.
778 MAIN STREET, SUITE 8
SOUTH PORTLAND, ME 04106
207-775-1121
www.delucahoffman.com

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DATE:	SEPT 2012
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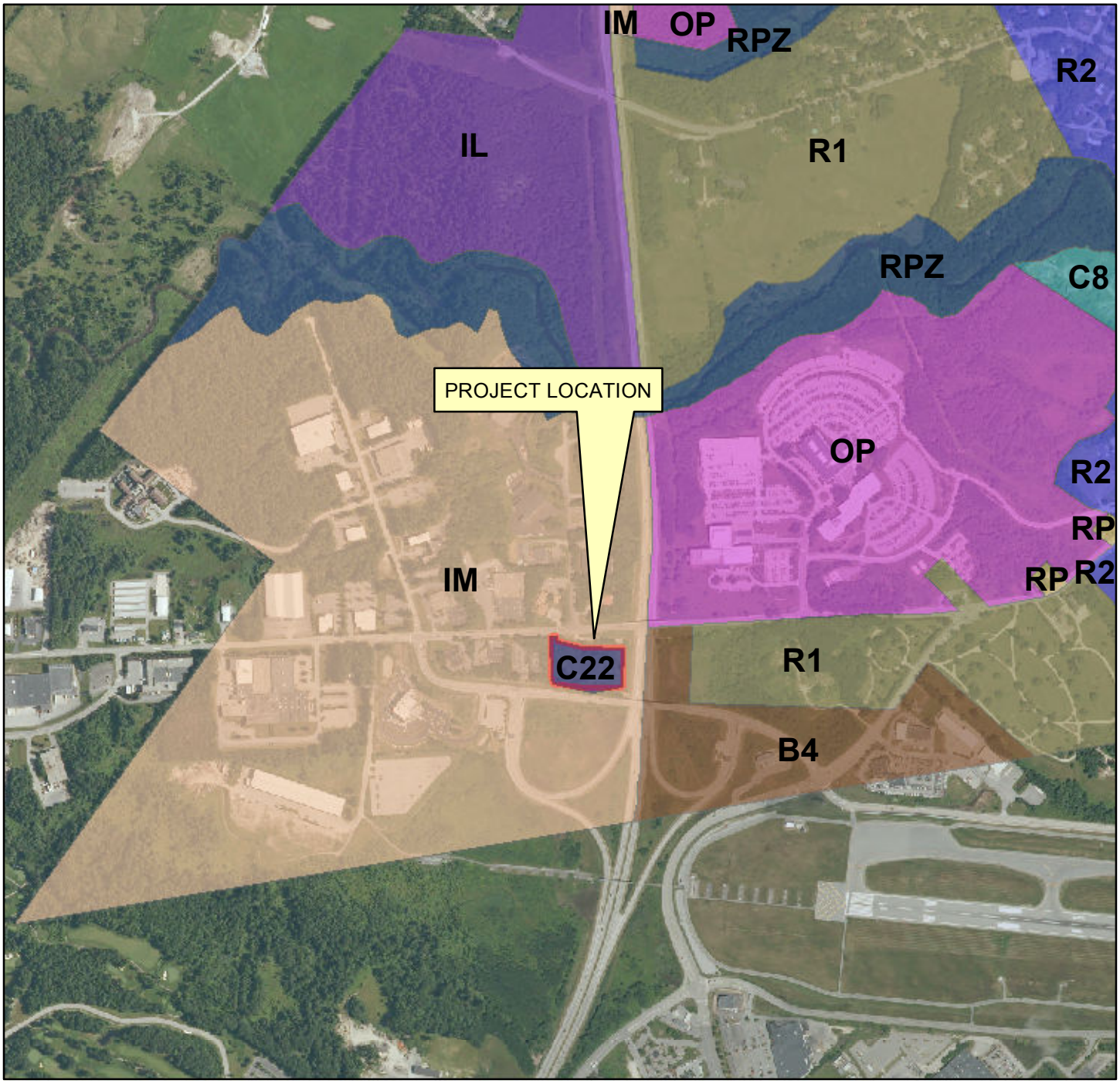
FIGURE

3



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ZONING MAP
CONVENIENCE STORE
PORTLAND, MAINE

SOURCE: CITY OF PORTLAND

DeLuca-Hoffman Associates, Inc.
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FIGURE

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AERIAL PHOTOGRAPH
CONVENIENCE STORE
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS - MAPS

DeLuca-Hoffman Associates, Inc.
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DATE:	SEPT 2012
FILENAME:	3118-AERIAL
SCALE:	1 inch = 1,000 feet

FIGURE

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FLOOD MAP
MULTI-USE DEVELOPMENT
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS - FIRM LAYER

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FIGURE

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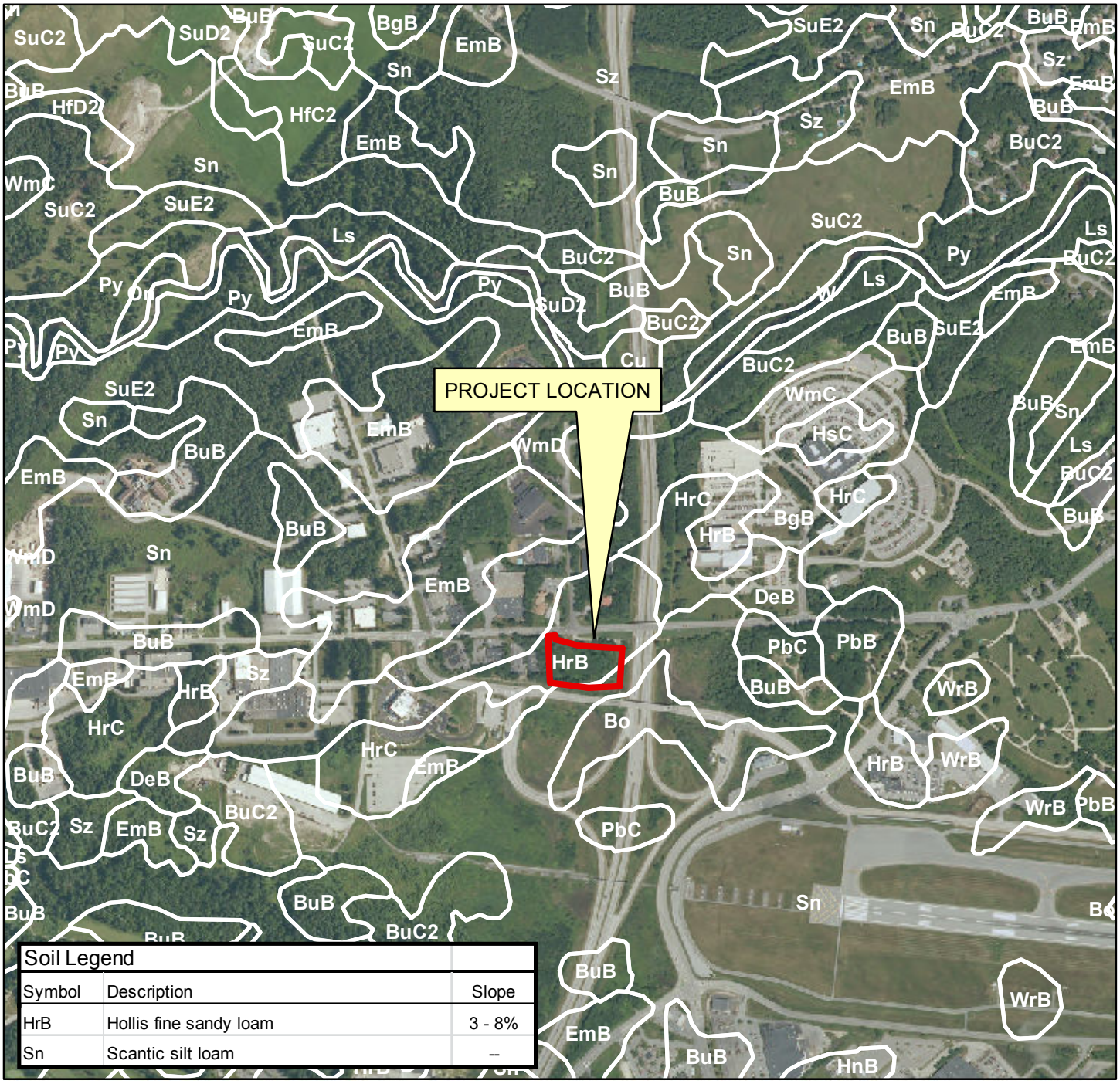

Soil Legend		
Symbol	Description	Slope
HrB	Hollis fine sandy loam	3 - 8%
Sn	Scantic silt loam	--

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SOILS MAP
MULTI-USE DEVELOPMENT
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS

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FILENAME:	3118-SOILS
SCALE:	1 inch = 1,000 feet

FIGURE

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SAND AND GRAVEL AQUIFER MAP
MULTI-USE DEVELOPMENT
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS

DeLuca-Hoffman Associates, Inc.
778 MAIN STREET, SUITE 8
SOUTH PORTLAND, ME 04106
207-775-1121
www.delucahoffman.com

DRAWN:	DED
CHECKED:	SRB
DATE:	SEPT 2012
FILENAME:	3118-AQUIFER
SCALE:	1 inch = 1,000 feet

FIGURE

9

N
W E
S

SURFICIAL GEOLOGY MAP
MULTI-USE DEVELOPMENT
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS - SURF LAYER

DeLuca-Hoffman Associates, Inc.
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SOUTH PORTLAND, ME 04106
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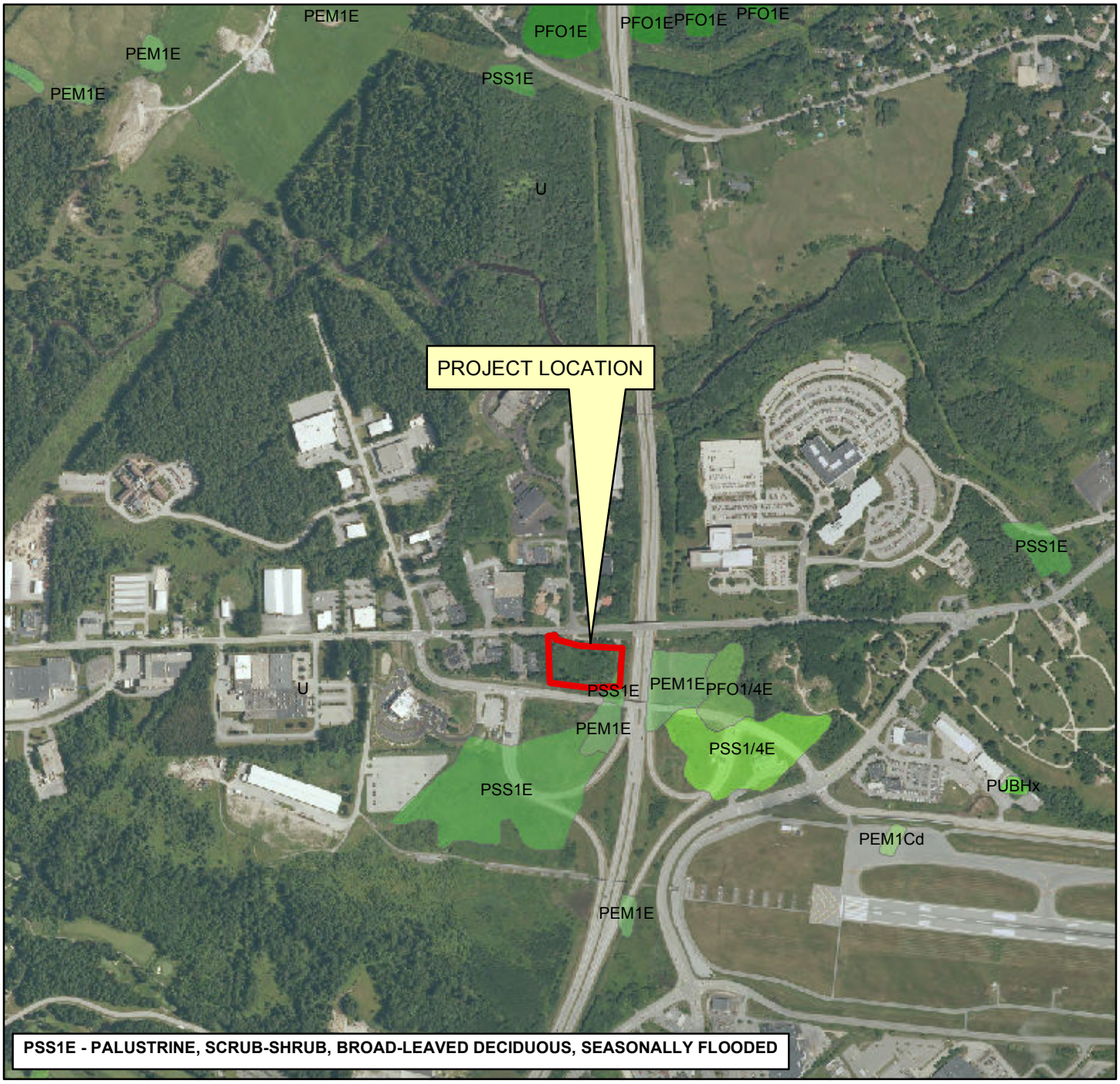
DRAWN:	DED
CHECKED:	SRB
DATE:	SEPT 2012
FILENAME:	3118-GEOLOGY
SCALE:	1 inch = 1,000 feet

FIGURE

10



N
W E
S

NWI MAP
MULTI-USE DEVELOPMENT
PORTLAND, MAINE

SOURCE: MAINE OFFICE OF GIS - NWI LAYER

DeLuca-Hoffman Associates, Inc.
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DRAWN:	DED
CHECKED:	SRB
DATE:	SEPT 2012
FILENAME:	3118-NWI
SCALE:	1 inch = 1,000 feet

FIGURE

11

APPENDIX B

Existing Conditions Photographs

PHOTO 1 – Skyway Drive – West

PHOTO 2 – Unitil Gas Regulator off Congress Street

DeLUCA-HOFFMAN ASSOCIATES, INC.
CONSULTING ENGINEERS
778 MAIN STREET, SUITE 8
SOUTH PORTLAND, MAINE 04106
TEL. 207-775-1121
FAX: 207-879-0896
E-MAIL: dhai@delucahoffman.com

Existing Site Photographs
2282 Congress Street – Portland, Maine
Photos Taken 04-01-13 by Steve Bushey, P.E.

PHOTO 3 – View from Skyway Drive

PHOTO 4 – View from Skyway Drive

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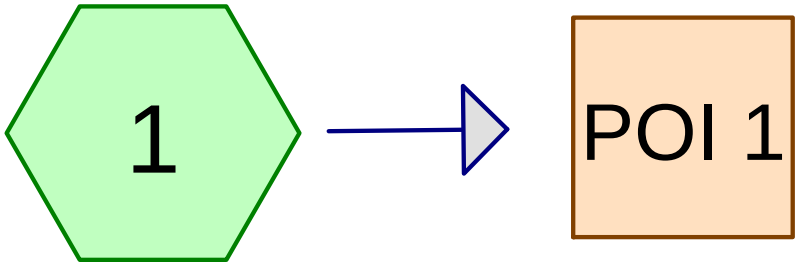
Existing Site Photographs
2282 Congress Street – Portland, Maine
Photos Taken 04-01-13 by Steve Bushey, P.E.

APPENDIX C

Predevelopment Computations



1 POI 1

Subcat Reach Pond Link

Drainage Diagram for 2013.03.21 PREDEVELOPMENT
Prepared by {enter your company name here}, Printed 3/27/2013

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.279	70	Woods, Good, HSG C (1)
0.515	71	Meadow, non-grazed, HSG C (1)
0.773	77	Woods, Good, HSG D (1)
0.210	78	Meadow, non-grazed, HSG D (1)
0.137	89	Gravel roads, HSG C (1)
0.244	98	Paved roads w/curbs & sewers (1)
4.157		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.930	HSG C	1
0.984	HSG D	1
0.244	Other	1
4.157		**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: 1 Runoff Area=181,089 sf 5.86% Impervious Runoff Depth=0.91"
Flow Length=503' Tc=18.3 min CN=74 Runoff=2.86 cfs 0.315 af

Reach POI 1: POI 1 Inflow=2.86 cfs 0.315 af
Outflow=2.86 cfs 0.315 af

Total Runoff Area = 4.157 ac Runoff Volume = 0.315 af Average Runoff Depth = 0.91"
94.14% Pervious = 3.914 ac 5.86% Impervious = 0.244 ac

Summary for Subcatchment 1: 1

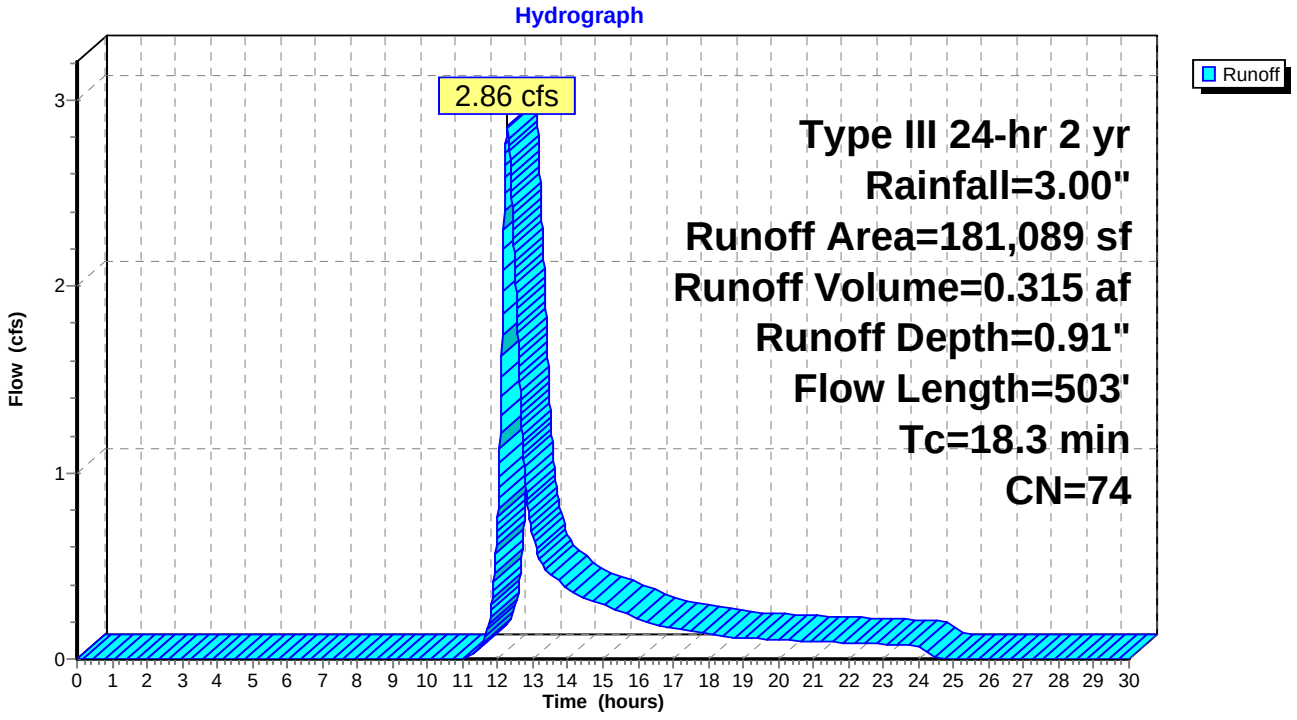
Runoff = 2.86 cfs @ 12.27 hrs, Volume= 0.315 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.00"

Area (sf)	CN	Description
10,611	98	Paved roads w/curbs & sewers
5,953	89	Gravel roads, HSG C
99,263	70	Woods, Good, HSG C
22,420	71	Meadow, non-grazed, HSG C
9,165	78	Meadow, non-grazed, HSG D
33,677	77	Woods, Good, HSG D
181,089	74	Weighted Average
170,478		Pervious Area
10,611		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	81	0.0190	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.00"
5.6	422	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.3	503	Total			

Subcatchment 1: 1



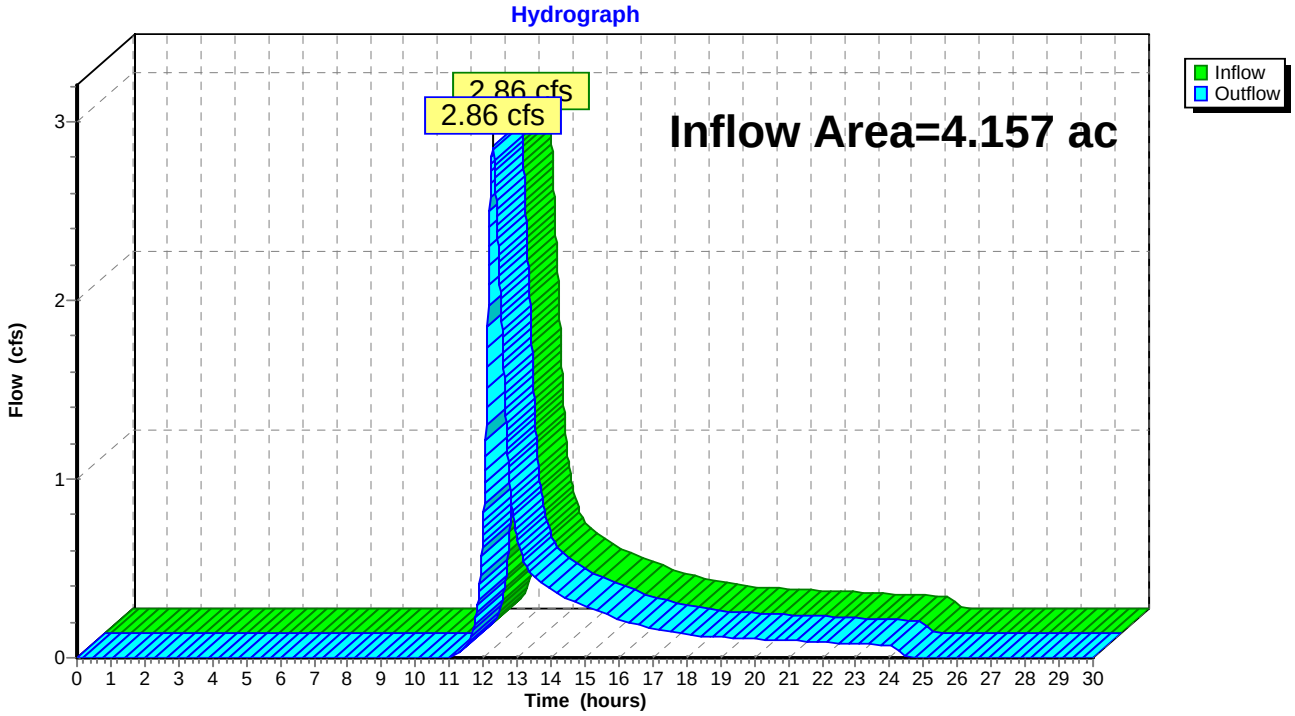
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.157 ac, 5.86% Impervious, Inflow Depth = 0.91" for 2 yr event
Inflow = 2.86 cfs @ 12.27 hrs, Volume= 0.315 af
Outflow = 2.86 cfs @ 12.27 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: 1 Runoff Area=181,089 sf 5.86% Impervious Runoff Depth=2.13"
Flow Length=503' Tc=18.3 min CN=74 Runoff=7.18 cfs 0.737 af

Reach POI 1: POI 1 Inflow=7.18 cfs 0.737 af
Outflow=7.18 cfs 0.737 af

Total Runoff Area = 4.157 ac Runoff Volume = 0.737 af Average Runoff Depth = 2.13"
94.14% Pervious = 3.914 ac 5.86% Impervious = 0.244 ac

Summary for Subcatchment 1: 1

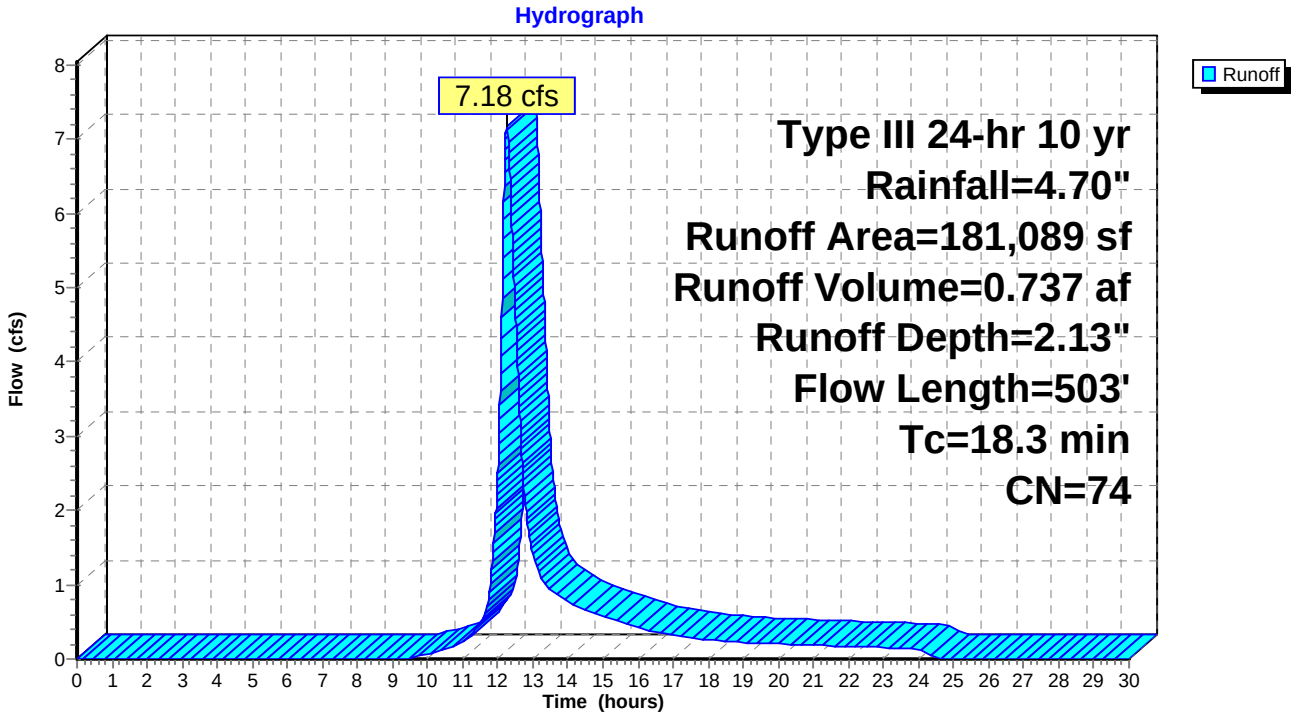
Runoff = 7.18 cfs @ 12.26 hrs, Volume= 0.737 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.70"

Area (sf)	CN	Description
10,611	98	Paved roads w/curbs & sewers
5,953	89	Gravel roads, HSG C
99,263	70	Woods, Good, HSG C
22,420	71	Meadow, non-grazed, HSG C
9,165	78	Meadow, non-grazed, HSG D
33,677	77	Woods, Good, HSG D
181,089	74	Weighted Average
170,478		Pervious Area
10,611		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	81	0.0190	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.00"
5.6	422	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.3	503	Total			

Subcatchment 1: 1



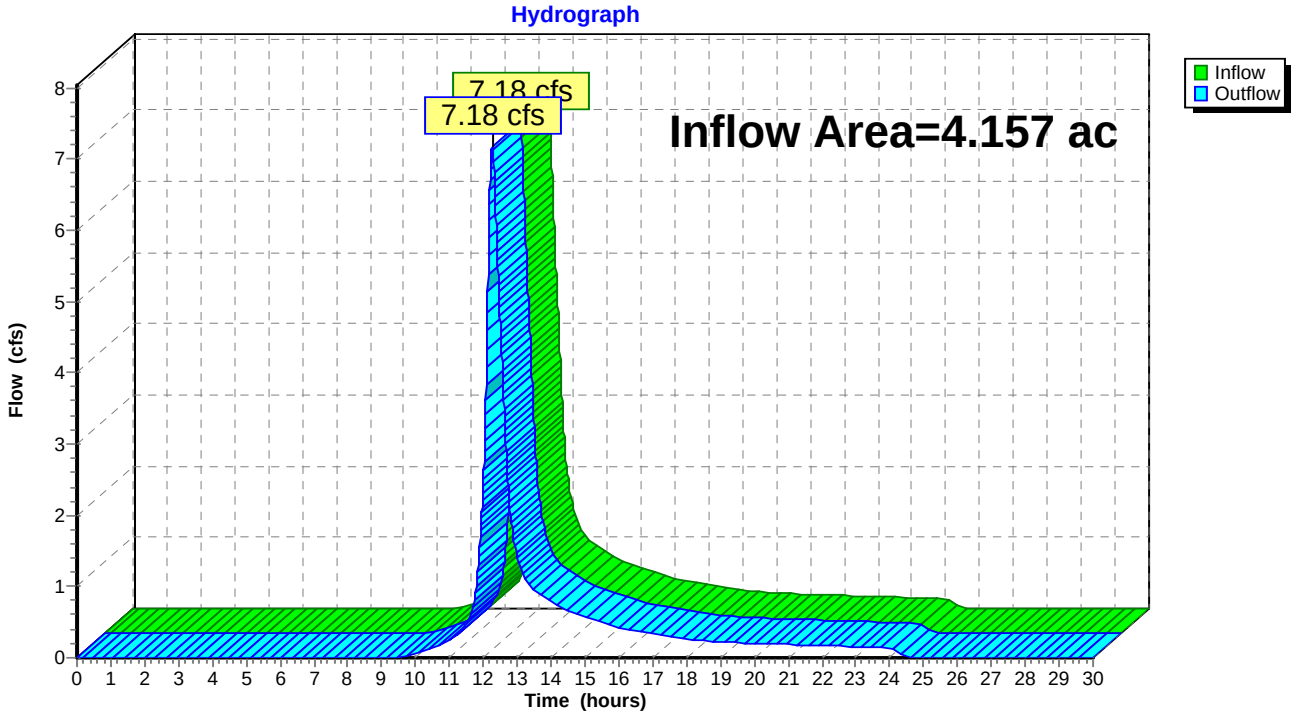
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.157 ac, 5.86% Impervious, Inflow Depth = 2.13" for 10 yr event
Inflow = 7.18 cfs @ 12.26 hrs, Volume= 0.737 af
Outflow = 7.18 cfs @ 12.26 hrs, Volume= 0.737 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: 1 Runoff Area=181,089 sf 5.86% Impervious Runoff Depth=2.77"
Flow Length=503' Tc=18.3 min CN=74 Runoff=9.42 cfs 0.959 af

Reach POI 1: POI 1 Inflow=9.42 cfs 0.959 af
Outflow=9.42 cfs 0.959 af

Total Runoff Area = 4.157 ac Runoff Volume = 0.959 af Average Runoff Depth = 2.77"
94.14% Pervious = 3.914 ac 5.86% Impervious = 0.244 ac

Summary for Subcatchment 1: 1

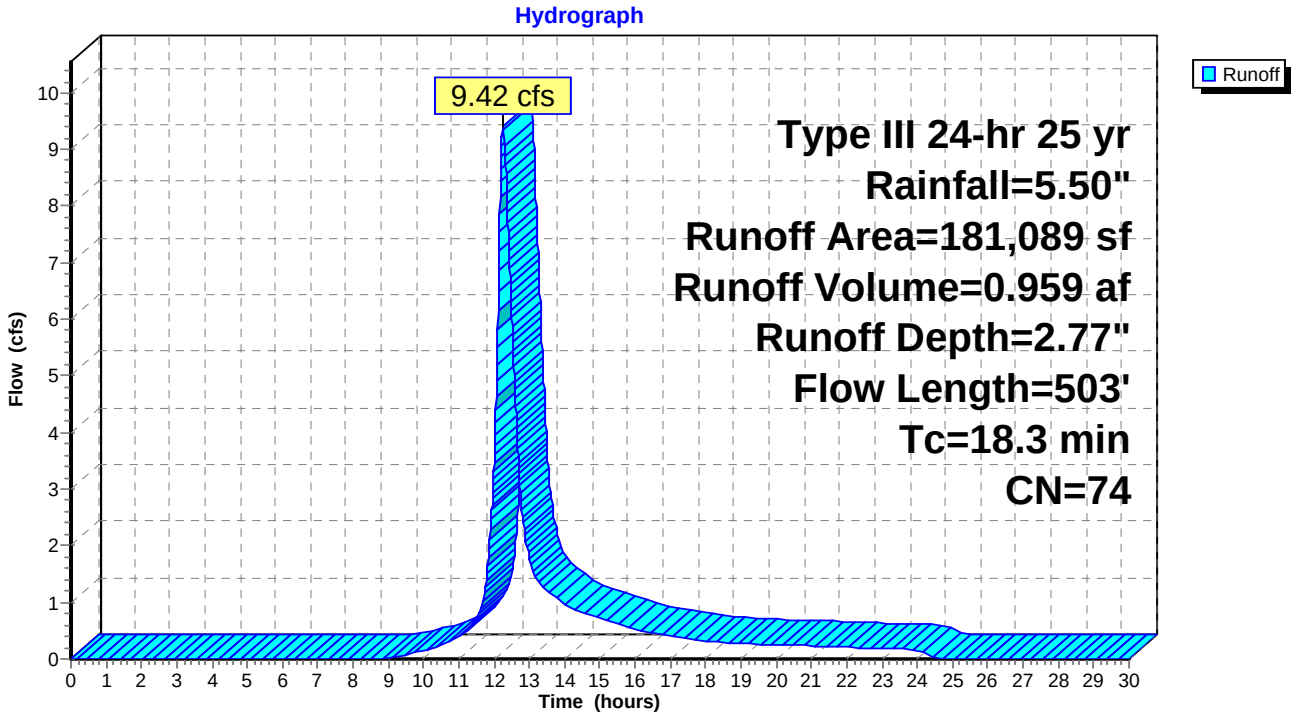
Runoff = 9.42 cfs @ 12.26 hrs, Volume= 0.959 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.50"

Area (sf)	CN	Description
10,611	98	Paved roads w/curbs & sewers
5,953	89	Gravel roads, HSG C
99,263	70	Woods, Good, HSG C
22,420	71	Meadow, non-grazed, HSG C
9,165	78	Meadow, non-grazed, HSG D
33,677	77	Woods, Good, HSG D
181,089	74	Weighted Average
170,478		Pervious Area
10,611		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	81	0.0190	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.00"
5.6	422	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.3	503	Total			

Subcatchment 1: 1



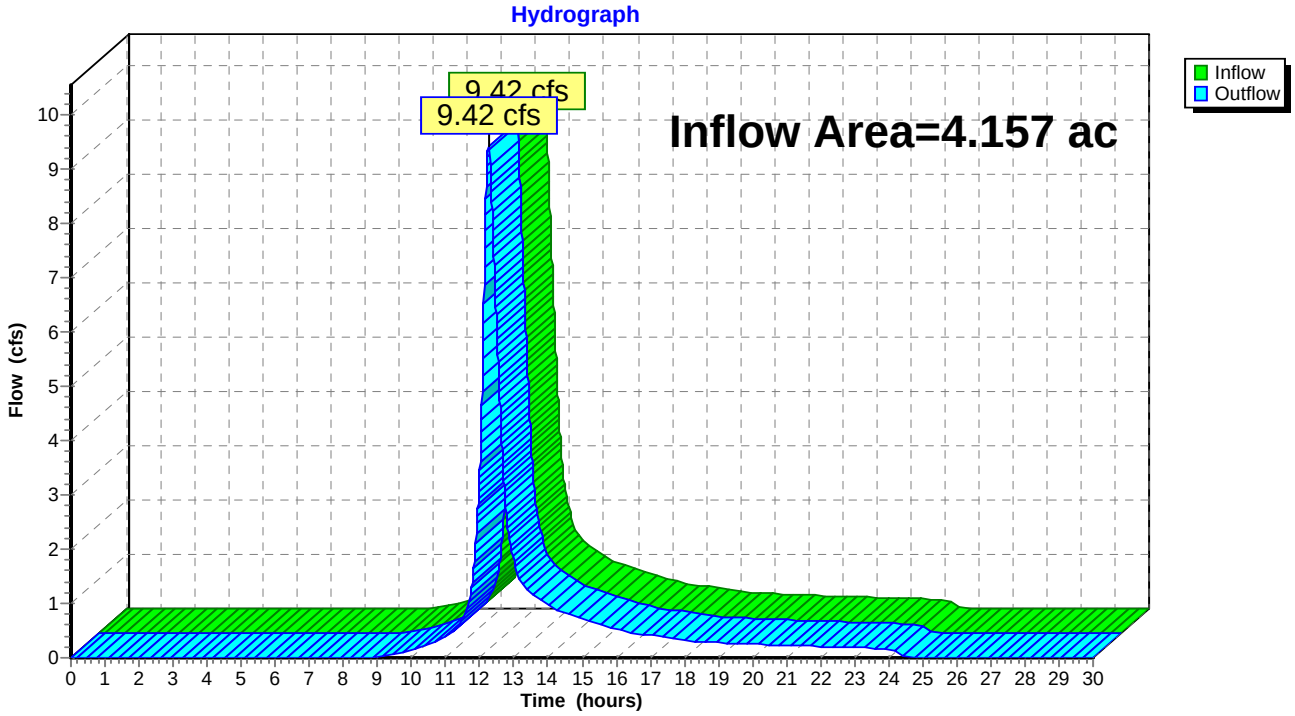
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.157 ac, 5.86% Impervious, Inflow Depth = 2.77" for 25 yr event
Inflow = 9.42 cfs @ 12.26 hrs, Volume= 0.959 af
Outflow = 9.42 cfs @ 12.26 hrs, Volume= 0.959 af, Atten= 0%, Lag= 0.0 min

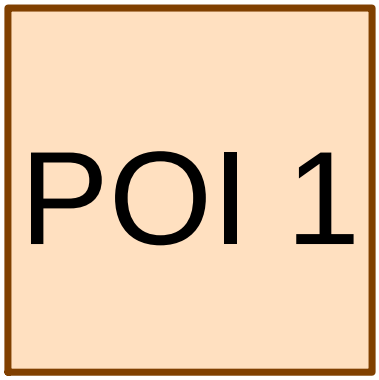
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



APPENDIX D

Postdevelopment Computations Without Detention



POI 1

Subcat Reach Pond Link

Drainage Diagram for 2013.03.21 POSTDEVELOPMENT W-O DET
Prepared by {enter your company name here}, Printed 3/31/2013

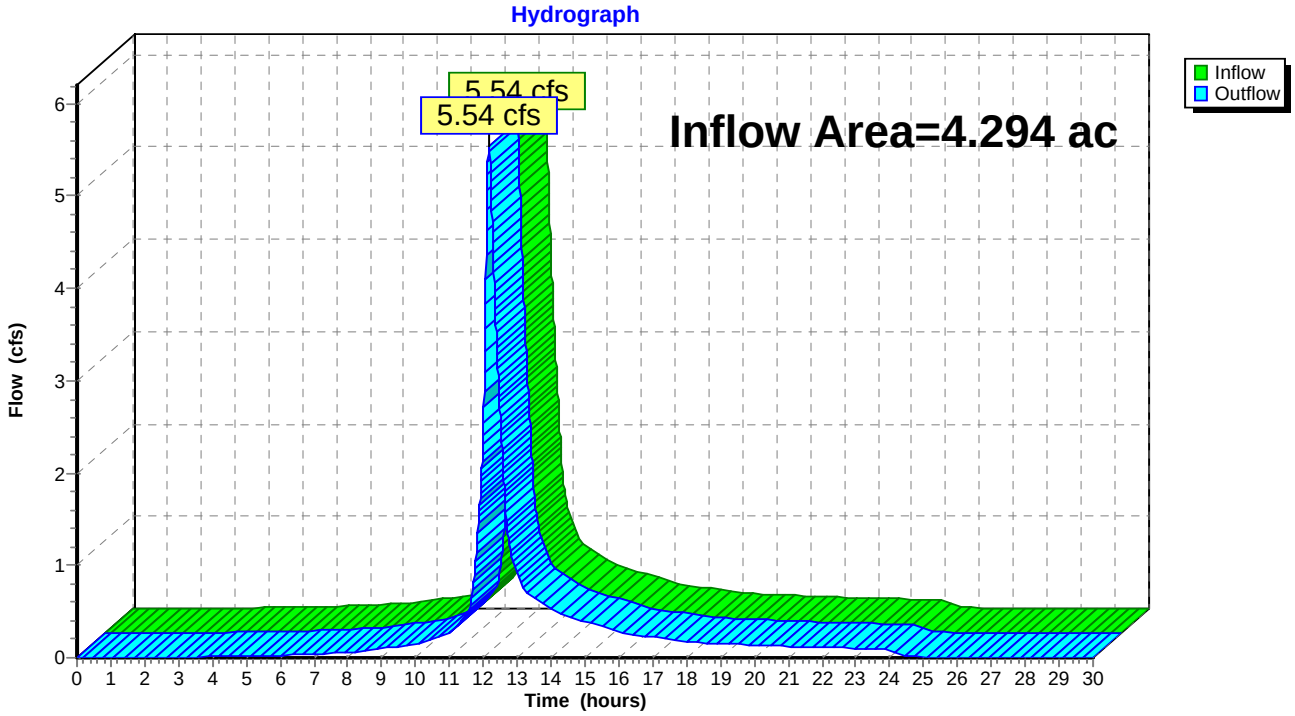
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.294 ac, 38.96% Impervious, Inflow Depth = 1.56" for 2 YR event
Inflow = 5.54 cfs @ 12.16 hrs, Volume= 0.557 af
Outflow = 5.54 cfs @ 12.16 hrs, Volume= 0.557 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



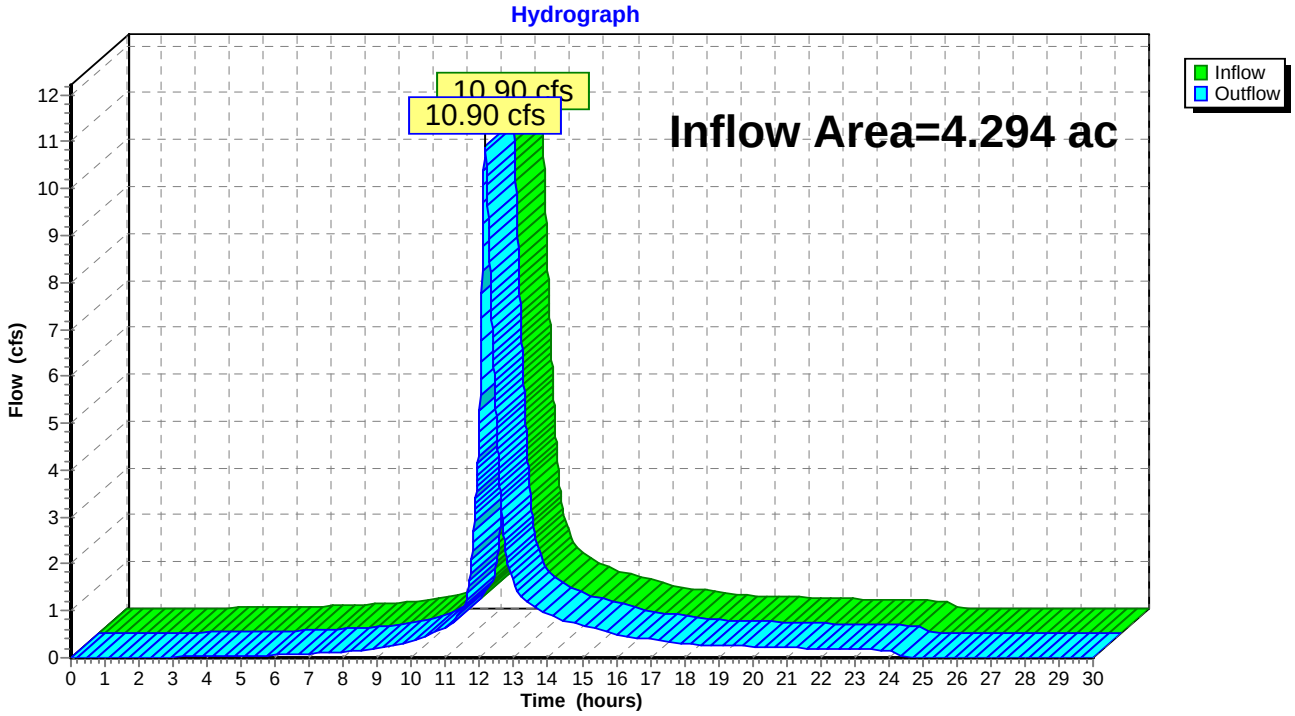
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.294 ac, 38.96% Impervious, Inflow Depth = 2.98" for 10 YR event
Inflow = 10.90 cfs @ 12.16 hrs, Volume= 1.067 af
Outflow = 10.90 cfs @ 12.16 hrs, Volume= 1.067 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



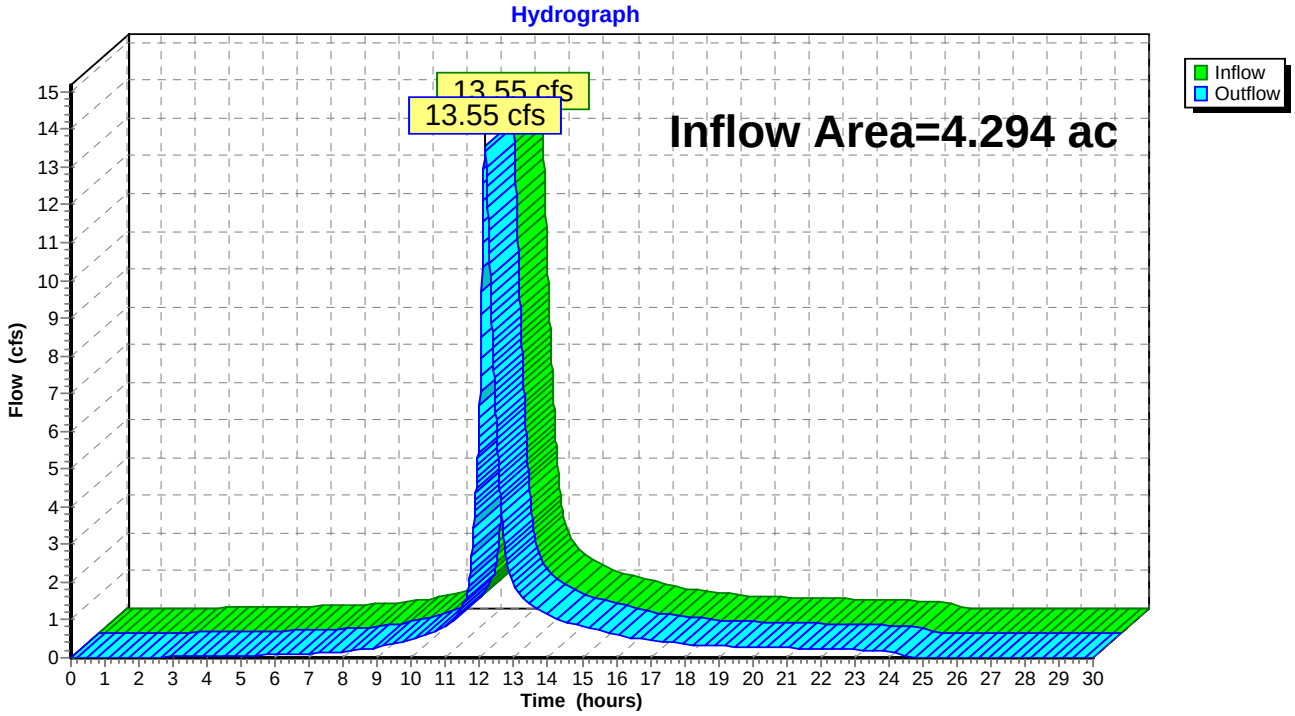
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.294 ac, 38.96% Impervious, Inflow Depth = 3.69" for 25 YR event
Inflow = 13.55 cfs @ 12.16 hrs, Volume= 1.322 af
Outflow = 13.55 cfs @ 12.16 hrs, Volume= 1.322 af, Atten= 0%, Lag= 0.0 min

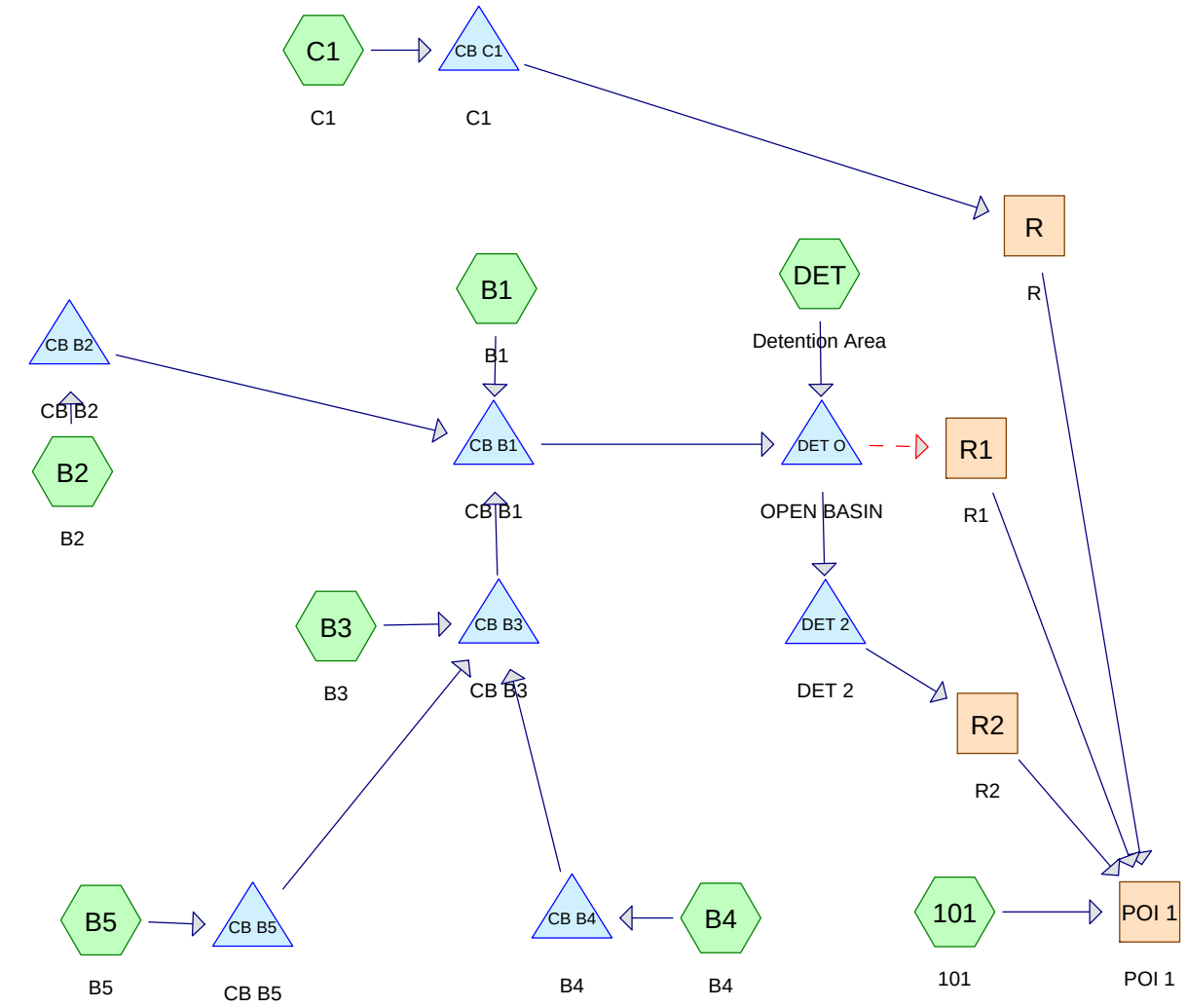
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



APPENDIX E

Postdevelopment Computations



Subcat Reach Pond Link

Drainage Diagram for 2013.03.21 POSTDEVELOPMENT
Prepared by {enter your company name here}, Printed 3/31/2013

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.480	70	Woods, Good, HSG C (101,B2,B5)
0.876	71	Meadow, non-grazed, HSG C (101,B2,B5)
0.201	74	>75% Grass cover, Good, HSG C (B2,B3,B4,B5,DET)
0.755	77	Woods, Good, HSG D (101)
0.210	78	Meadow, non-grazed, HSG D (101)
0.099	89	Gravel roads, HSG C (101)
1.673	98	Paved roads w/curbs & sewers (101,B1,B2,B3,B4,B5,C1)
4.294		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.656	HSG C	101, B2, B3, B4, B5, DET
0.965	HSG D	101
1.673	Other	101, B1, B2, B3, B4, B5, C1
4.294		**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 101: 101 Runoff Area=101,537 sf 8.08% Impervious Runoff Depth=1.02"
Flow Length=93' Tc=14.9 min CN=76 Runoff=1.99 cfs 0.197 af

Subcatchment B1: B1 Runoff Area=4,719 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.31 cfs 0.025 af

Subcatchment B2: B2 Runoff Area=21,844 sf 56.52% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=86 Runoff=0.98 cfs 0.069 af

Subcatchment B3: B3 Runoff Area=15,427 sf 99.04% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=1.03 cfs 0.082 af

Subcatchment B4: B4 Runoff Area=16,903 sf 96.61% Impervious Runoff Depth=2.66"
Tc=6.0 min CN=97 Runoff=1.11 cfs 0.086 af

Subcatchment B5: B5 Runoff Area=15,109 sf 76.73% Impervious Runoff Depth=2.16"
Tc=6.0 min CN=92 Runoff=0.86 cfs 0.062 af

Subcatchment C1: C1 Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.023 af

Subcatchment DET: Detention Area Runoff Area=7,116 sf 0.00% Impervious Runoff Depth=0.91"
Tc=6.0 min CN=74 Runoff=0.16 cfs 0.012 af

Reach POI 1: POI 1 Inflow=2.51 cfs 0.410 af
Outflow=2.51 cfs 0.410 af

Reach R: R Avg. Depth=0.04' Max Vel=0.19 fps Inflow=0.29 cfs 0.023 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.14 cfs 0.023 af

Reach R1: R1 Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.00 cfs 0.000 af

Reach R2: R2 Avg. Depth=0.13' Max Vel=0.32 fps Inflow=1.36 cfs 0.189 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=1.28 cfs 0.189 af

Pond CB B1: CB B1 Inflow=4.29 cfs 0.325 af
Primary=4.29 cfs 0.325 af

Pond CB B2: CB B2 Inflow=0.98 cfs 0.069 af
Primary=0.98 cfs 0.069 af

Pond CB B3: CB B3 Inflow=3.00 cfs 0.230 af
Primary=3.00 cfs 0.230 af

Pond CB B4: B4 Inflow=1.11 cfs 0.086 af
Primary=1.11 cfs 0.086 af

Pond CB B5: CB B5 Inflow=0.86 cfs 0.062 af
Primary=0.86 cfs 0.062 af

Pond CB C1: C1 Inflow=0.29 cfs 0.023 af
Primary=0.29 cfs 0.023 af

Pond DET 2: DET 2 Peak Elev=87.46' Storage=699 cf Inflow=1.85 cfs 0.189 af
Outflow=1.36 cfs 0.189 af

Pond DET O: OPEN BASIN Peak Elev=91.23' Storage=7,214 cf Inflow=4.45 cfs 0.337 af
Primary=1.85 cfs 0.189 af Secondary=0.00 cfs 0.000 af Outflow=1.85 cfs 0.189 af

Total Runoff Area = 4.294 ac Runoff Volume = 0.557 af Average Runoff Depth = 1.56"
61.04% Pervious = 2.621 ac 38.96% Impervious = 1.673 ac

Summary for Subcatchment 101: 101

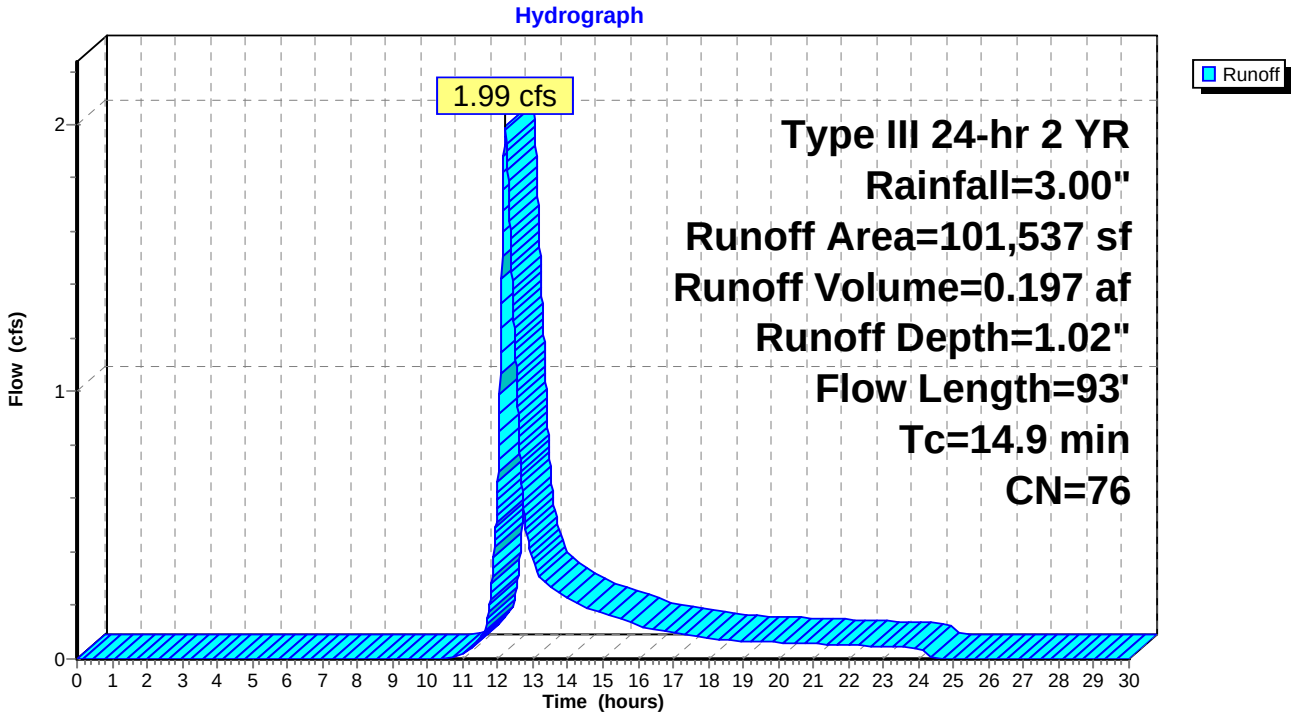
Runoff = 1.99 cfs @ 12.22 hrs, Volume= 0.197 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
8,201	98	Paved roads w/curbs & sewers
4,313	89	Gravel roads, HSG C
15,498	70	Woods, Good, HSG C
31,475	71	Meadow, non-grazed, HSG C
9,165	78	Meadow, non-grazed, HSG D
32,885	77	Woods, Good, HSG D
101,537	76	Weighted Average
93,336		Pervious Area
8,201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	81	0.0370	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
0.2	12	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.9	93	Total			

Subcatchment 101: 101



Summary for Subcatchment B1: B1

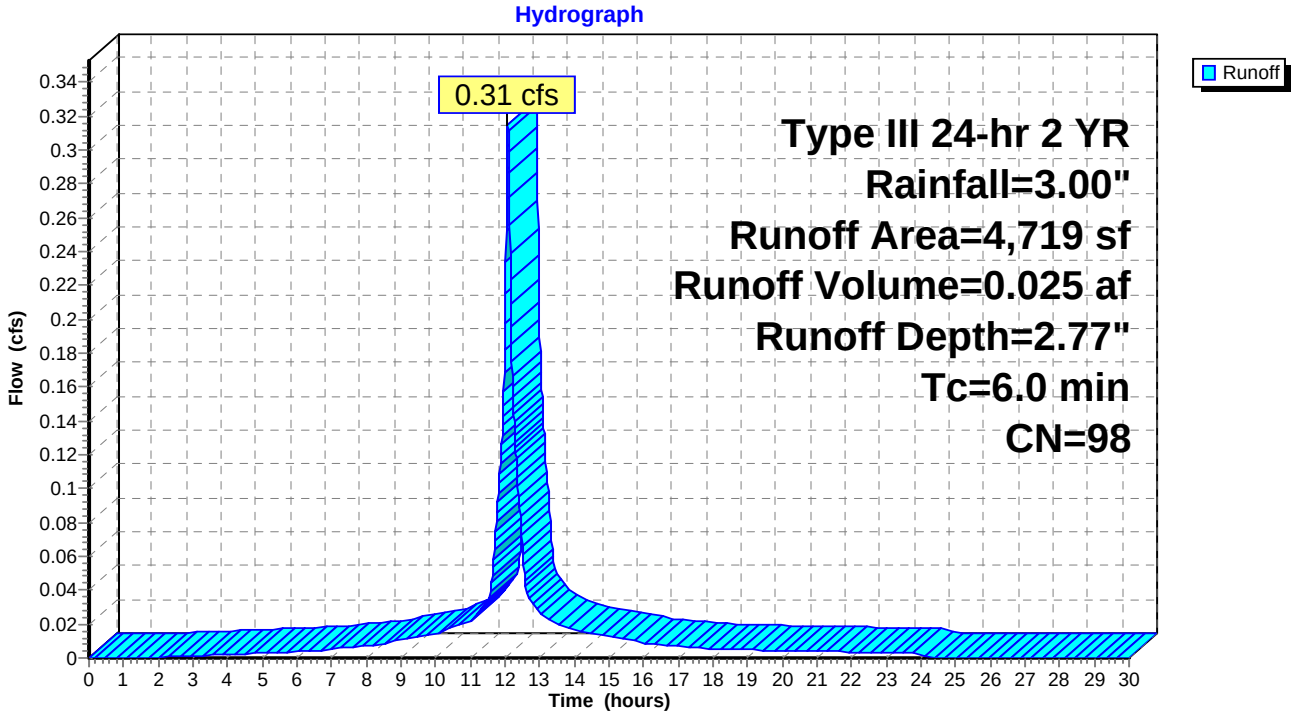
Runoff = 0.31 cfs @ 12.08 hrs, Volume= 0.025 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
4,719	98	Paved roads w/curbs & sewers
4,719		Impervious Area

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

Subcatchment B1: B1



Summary for Subcatchment B2: B2

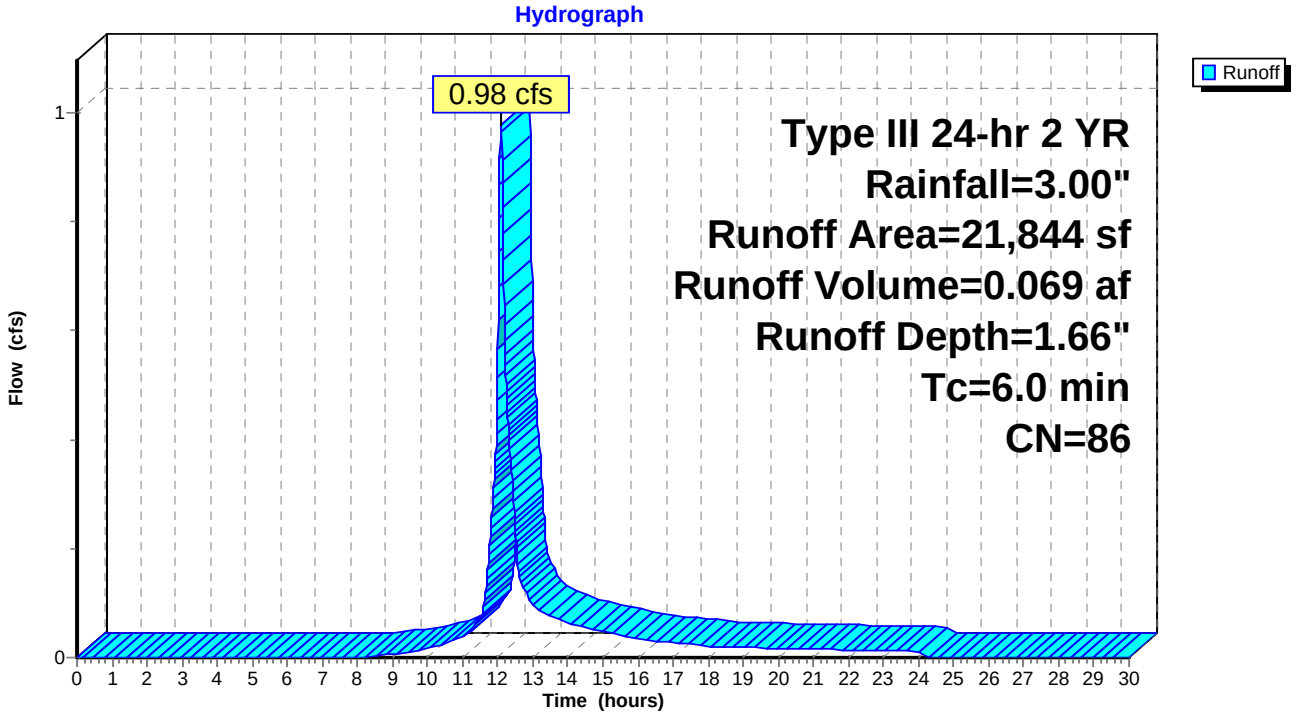
Runoff = 0.98 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
12,346	98	Paved roads w/curbs & sewers
3,238	70	Woods, Good, HSG C
5,811	71	Meadow, non-grazed, HSG C
449	74	>75% Grass cover, Good, HSG C
21,844	86	Weighted Average
9,498		Pervious Area
12,346		Impervious Area

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

Subcatchment B2: B2



Summary for Subcatchment B3: B3

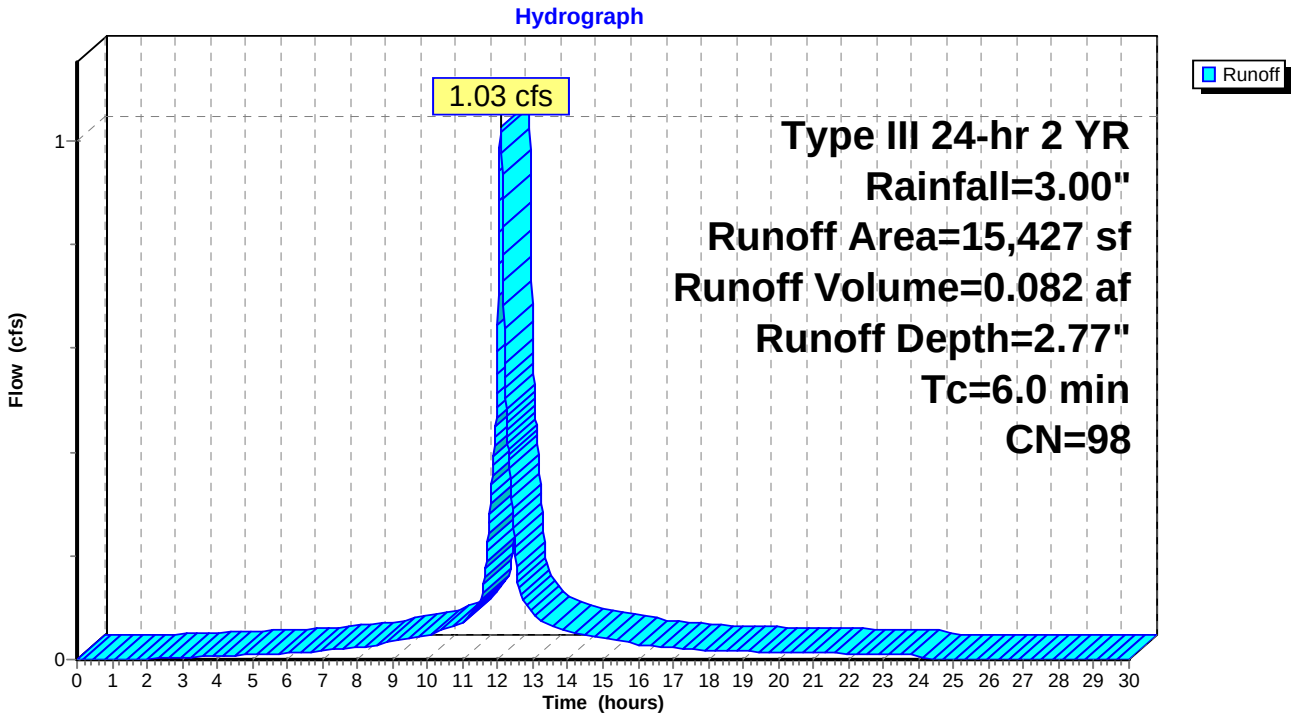
Runoff = 1.03 cfs @ 12.08 hrs, Volume= 0.082 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
15,279	98	Paved roads w/curbs & sewers
148	74	>75% Grass cover, Good, HSG C
15,427	98	Weighted Average
148		Pervious Area
15,279		Impervious Area

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

Subcatchment B3: B3



Summary for Subcatchment B4: B4

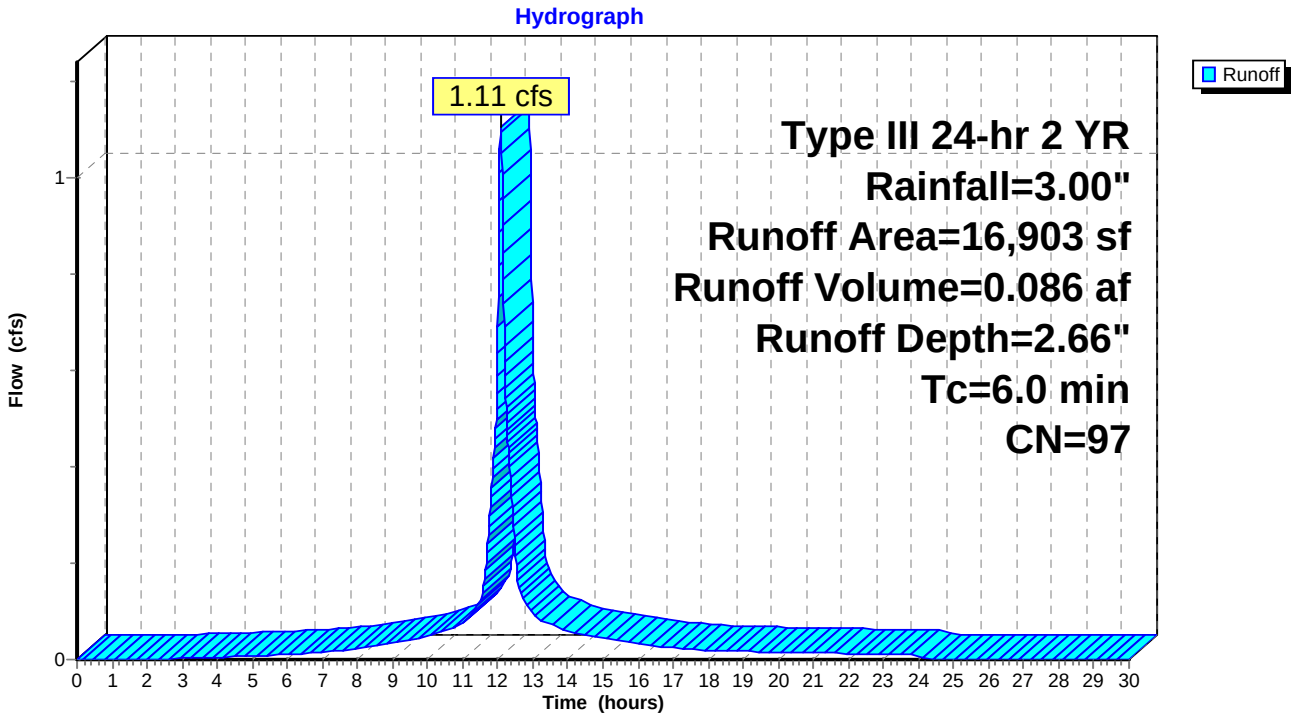
Runoff = 1.11 cfs @ 12.08 hrs, Volume= 0.086 af, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
16,330	98	Paved roads w/curbs & sewers
573	74	>75% Grass cover, Good, HSG C
16,903	97	Weighted Average
573		Pervious Area
16,330		Impervious Area

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

Subcatchment B4: B4



Summary for Subcatchment B5: B5

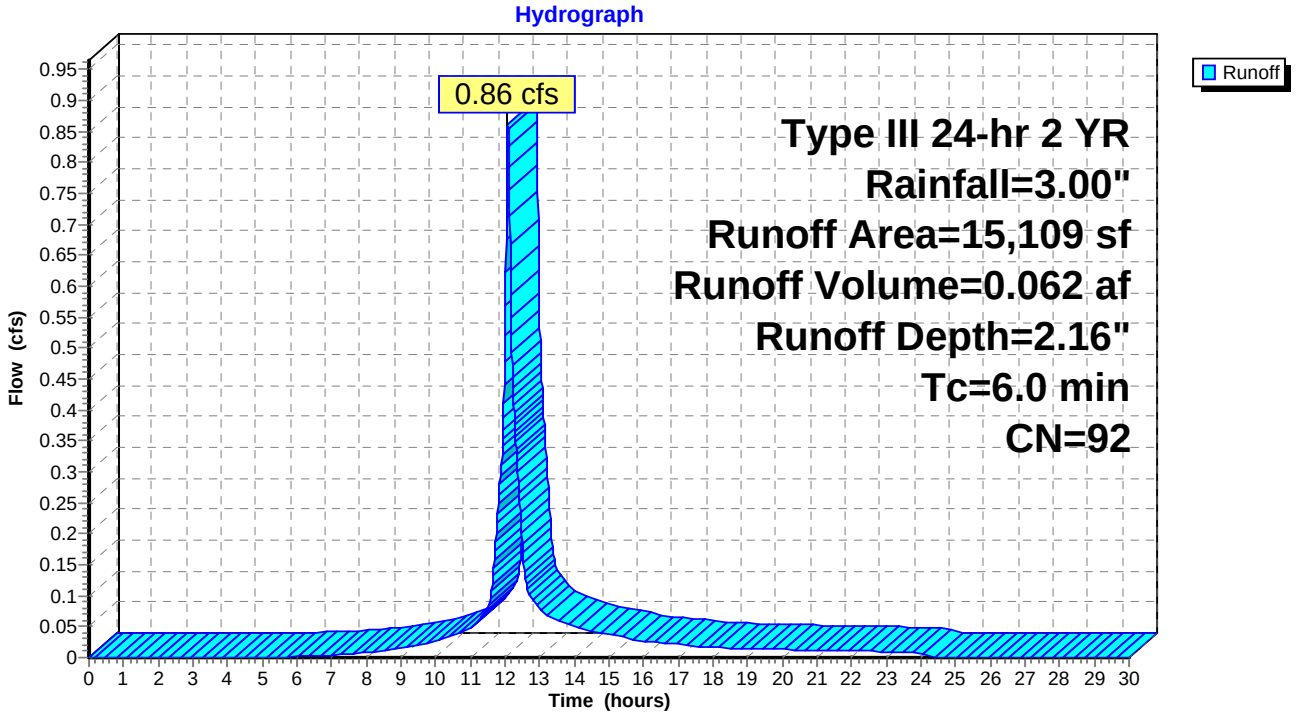
Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.062 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
11,593	98	Paved roads w/curbs & sewers
2,175	70	Woods, Good, HSG C
868	71	Meadow, non-grazed, HSG C
473	74	>75% Grass cover, Good, HSG C
15,109	92	Weighted Average
3,516		Pervious Area
11,593		Impervious Area

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

Subcatchment B5: B5



Summary for Subcatchment C1: C1

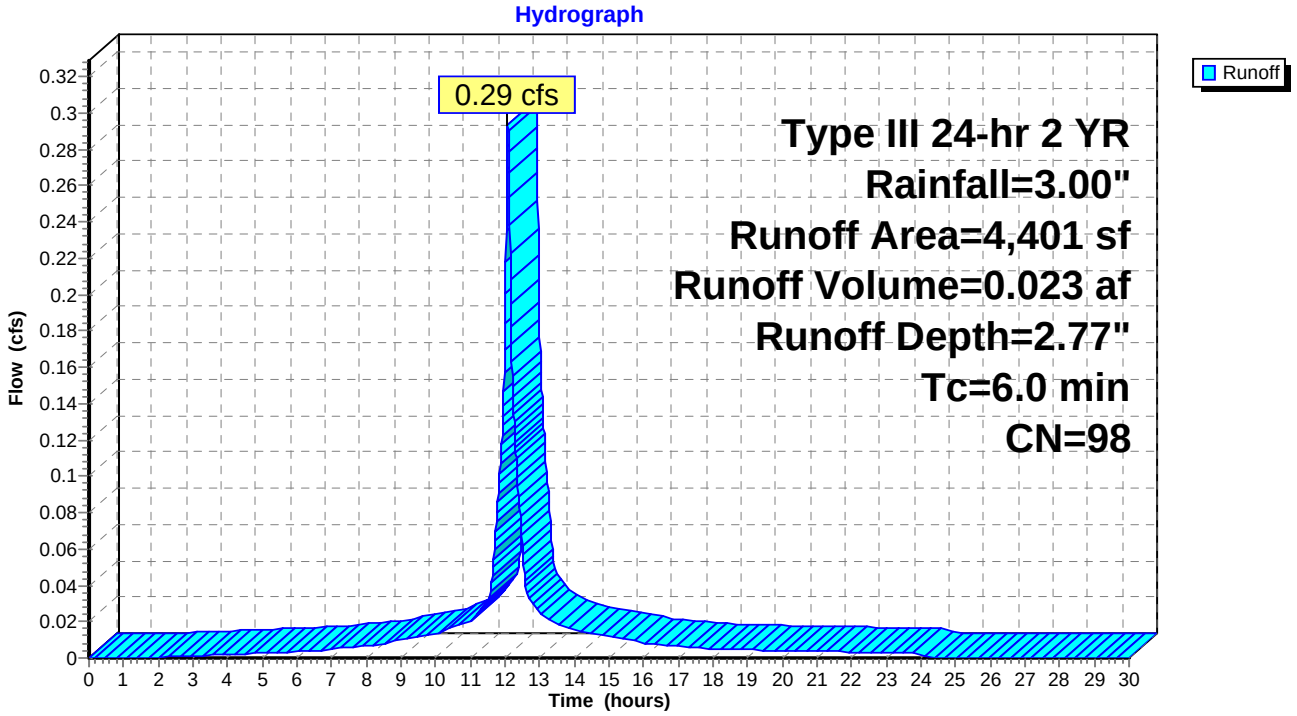
Runoff = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
4,401	98	Paved roads w/curbs & sewers
4,401		Impervious Area

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

Subcatchment C1: C1



Summary for Subcatchment DET: Detention Area

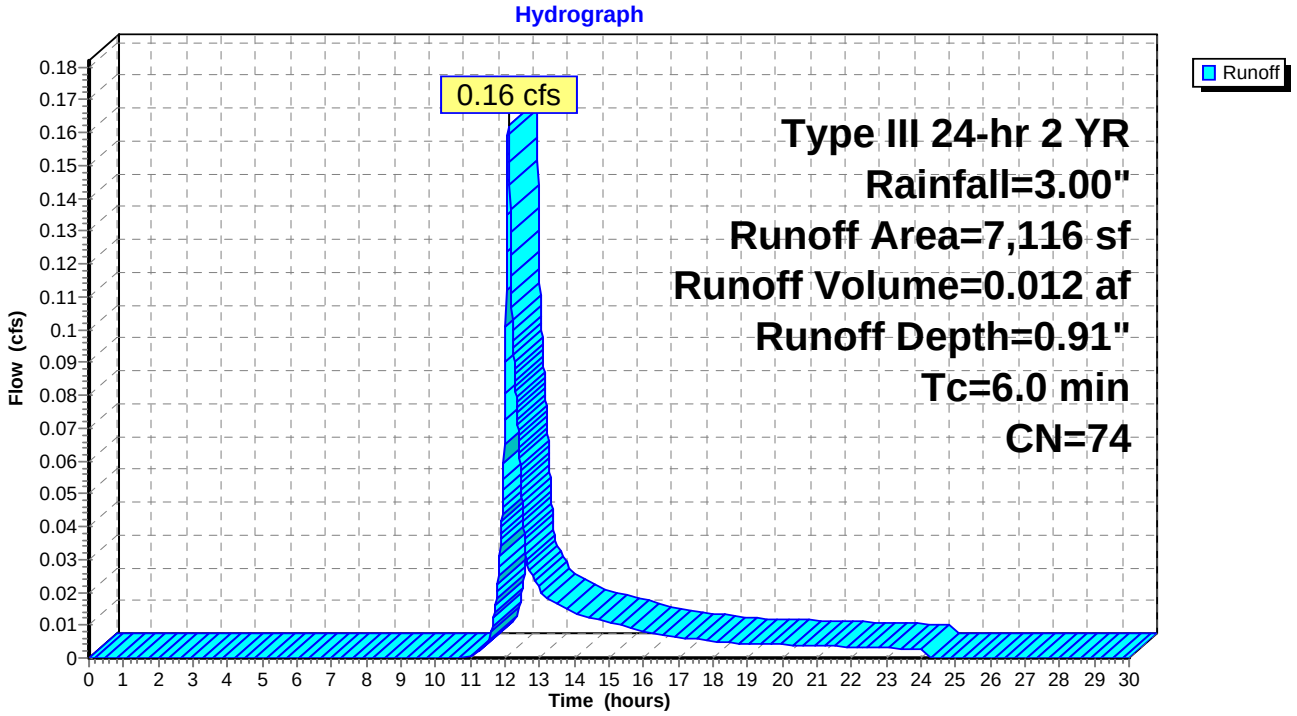
Runoff = 0.16 cfs @ 12.10 hrs, Volume= 0.012 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 YR Rainfall=3.00"

Area (sf)	CN	Description
7,116	74	>75% Grass cover, Good, HSG C
7,116		Pervious Area

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

Subcatchment DET: Detention Area



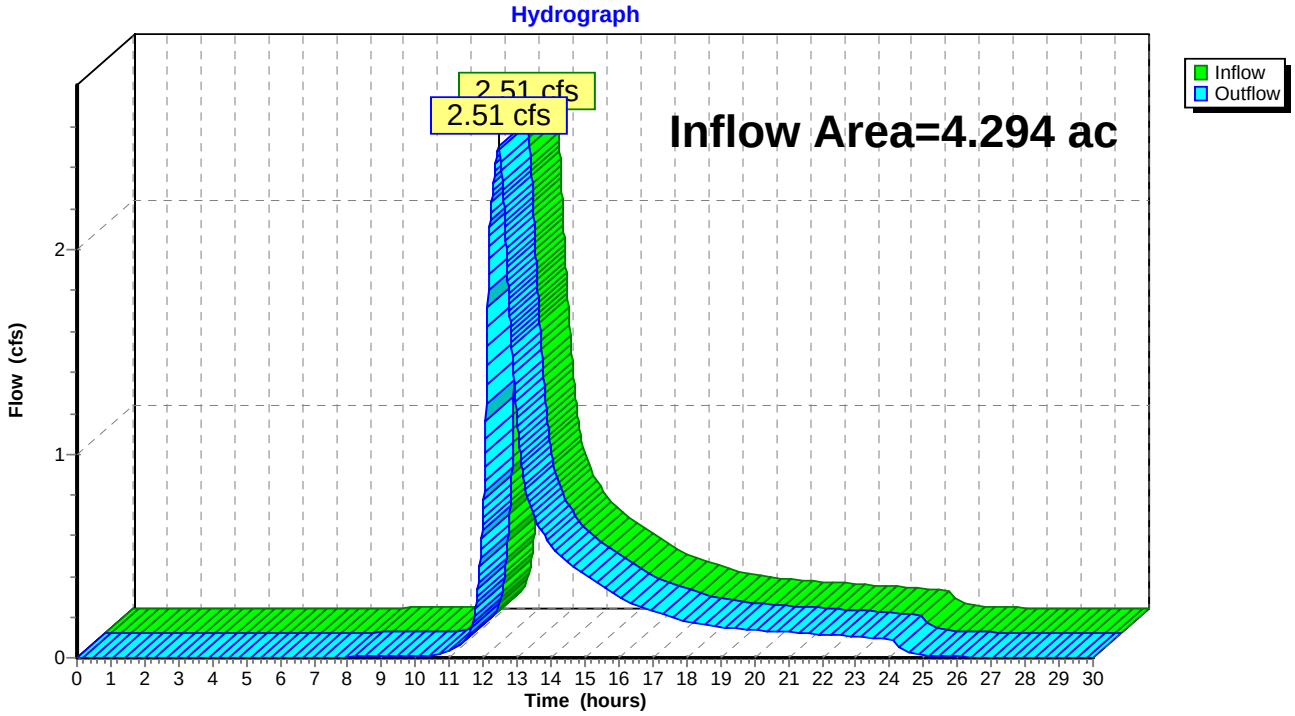
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.294 ac, 38.96% Impervious, Inflow Depth = 1.14" for 2 YR event
Inflow = 2.51 cfs @ 12.44 hrs, Volume= 0.410 af
Outflow = 2.51 cfs @ 12.44 hrs, Volume= 0.410 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



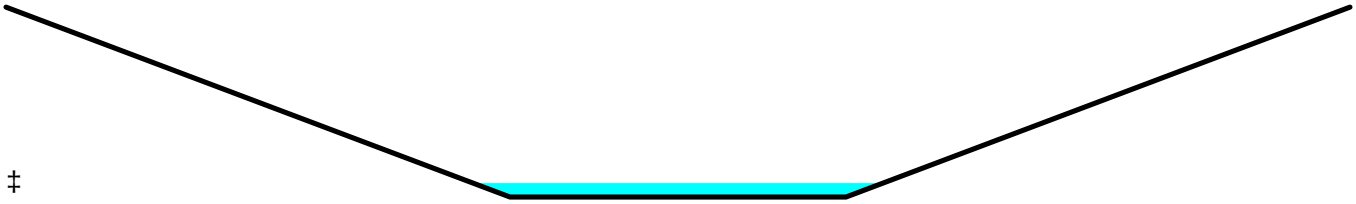
Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 2.77" for 2 YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Outflow = 0.14 cfs @ 12.24 hrs, Volume= 0.023 af, Atten= 53%, Lag= 9.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.19 fps, Min. Travel Time= 31.3 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 90.2 min

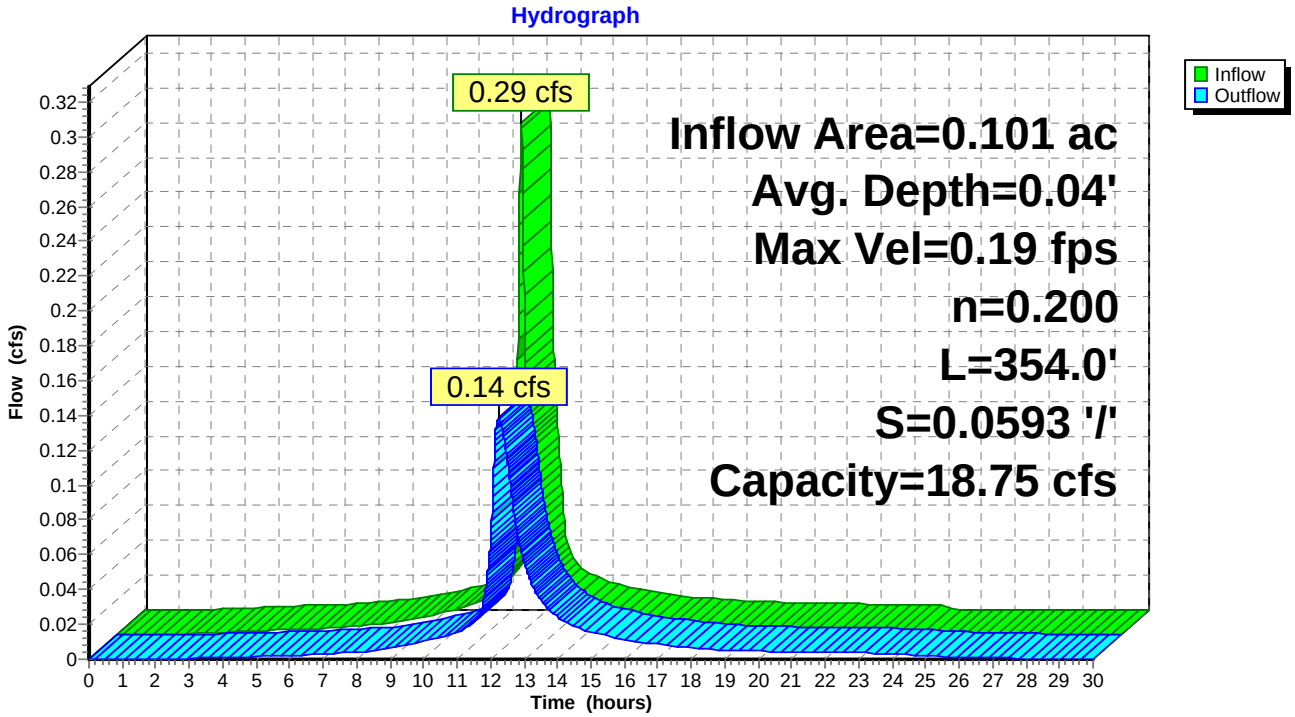
Peak Storage= 261 cf @ 12.24 hrs, Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'



‡

Reach R: R



Summary for Reach R1: R1

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

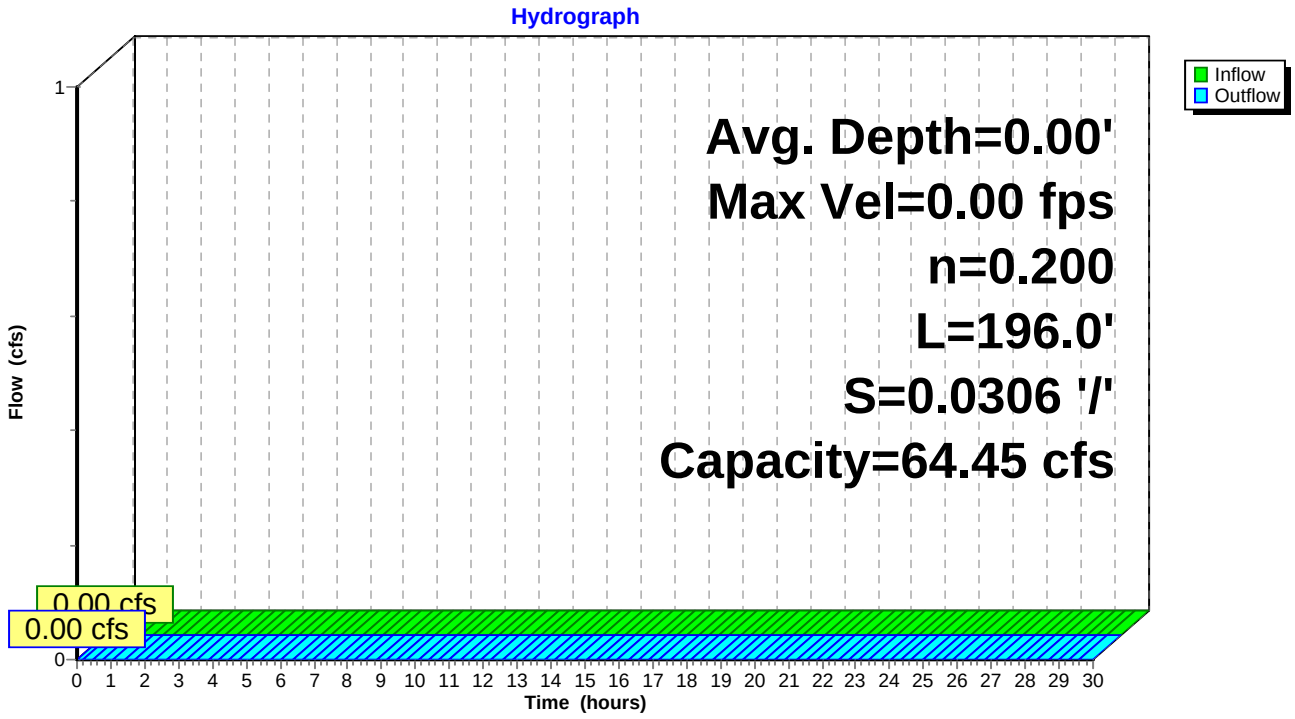
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

Reach R1: R1



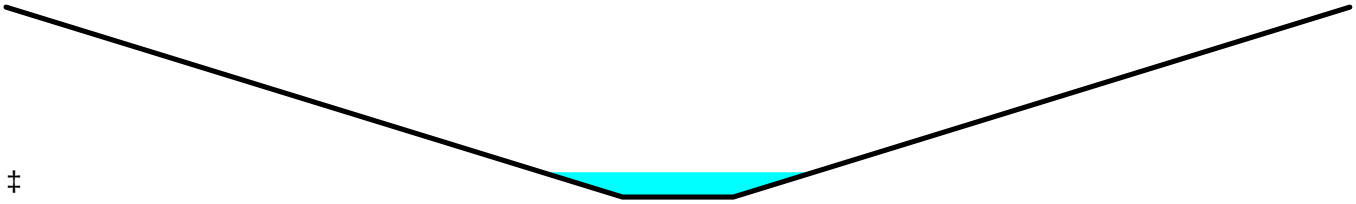
Summary for Reach R2: R2

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 1.22" for 2 YR event
Inflow = 1.36 cfs @ 12.48 hrs, Volume= 0.189 af
Outflow = 1.28 cfs @ 12.59 hrs, Volume= 0.189 af, Atten= 6%, Lag= 6.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 7.3 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 17.6 min

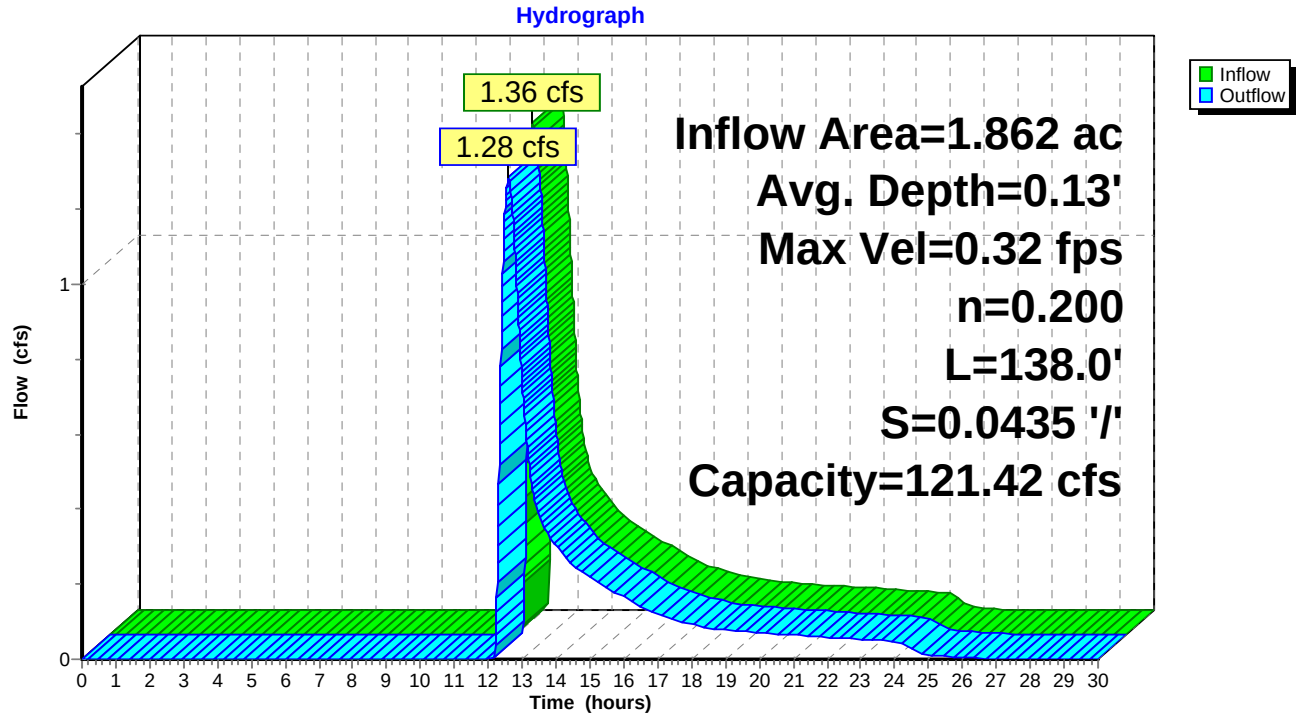
Peak Storage= 561 cf @ 12.59 hrs, Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

Reach R2: R2



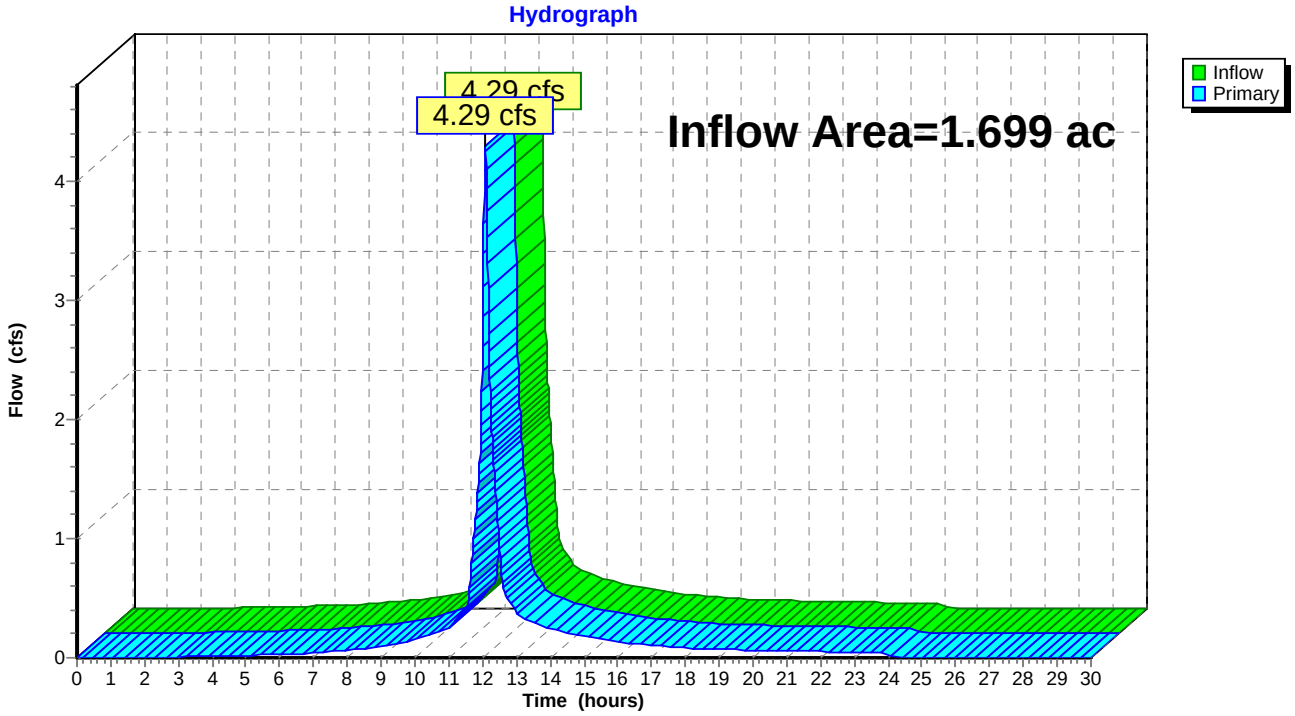
Summary for Pond CB B1: CB B1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.699 ac, 81.44% Impervious, Inflow Depth = 2.29" for 2 YR event
Inflow = 4.29 cfs @ 12.09 hrs, Volume= 0.325 af
Primary = 4.29 cfs @ 12.09 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B1: CB B1



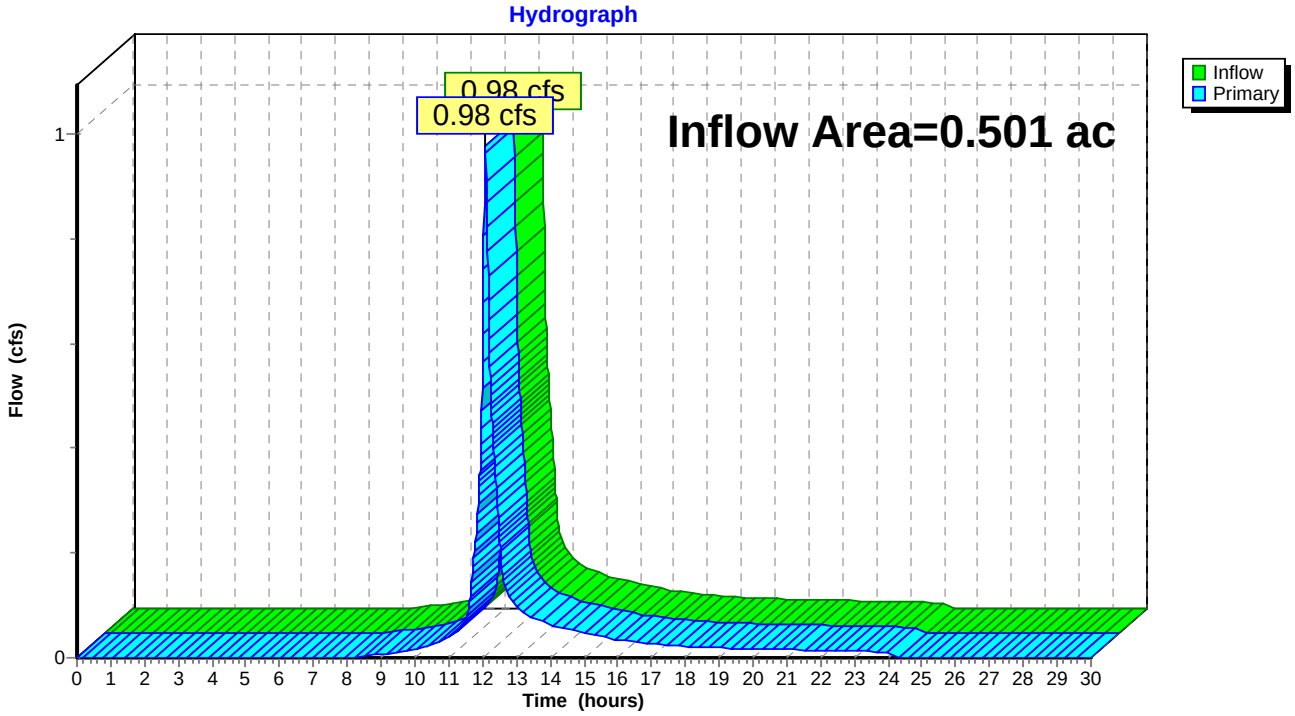
Summary for Pond CB B2: CB B2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.501 ac, 56.52% Impervious, Inflow Depth = 1.66" for 2 YR event
Inflow = 0.98 cfs @ 12.09 hrs, Volume= 0.069 af
Primary = 0.98 cfs @ 12.09 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B2: CB B2



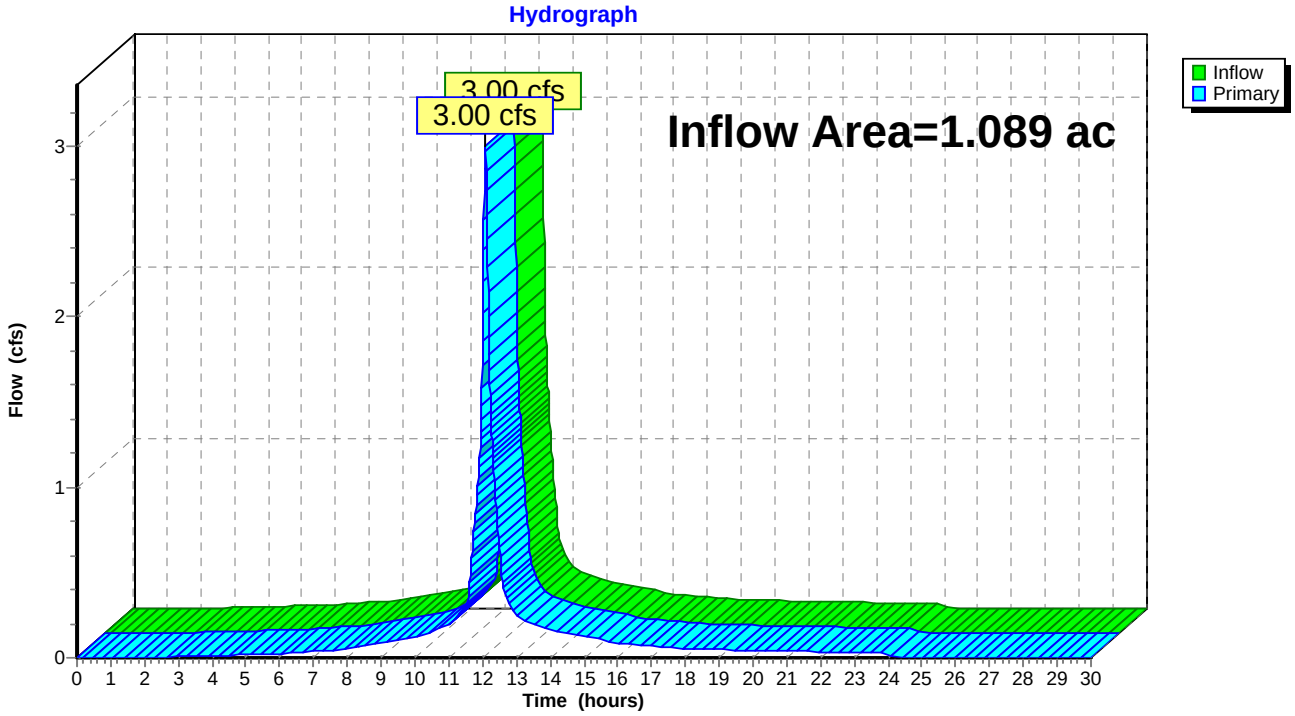
Summary for Pond CB B3: CB B3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.089 ac, 91.07% Impervious, Inflow Depth = 2.54" for 2 YR event
Inflow = 3.00 cfs @ 12.08 hrs, Volume= 0.230 af
Primary = 3.00 cfs @ 12.08 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B3: CB B3



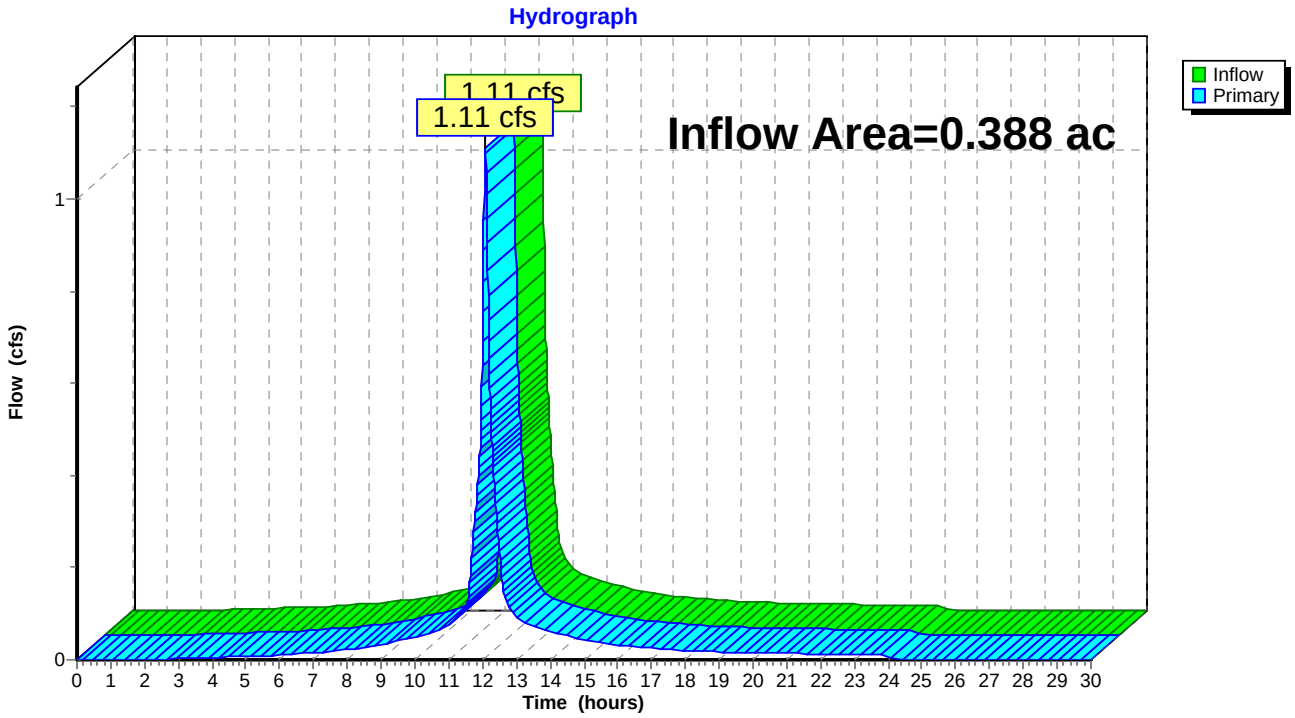
Summary for Pond CB B4: B4

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.388 ac, 96.61% Impervious, Inflow Depth = 2.66" for 2 YR event
Inflow = 1.11 cfs @ 12.08 hrs, Volume= 0.086 af
Primary = 1.11 cfs @ 12.08 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B4: B4



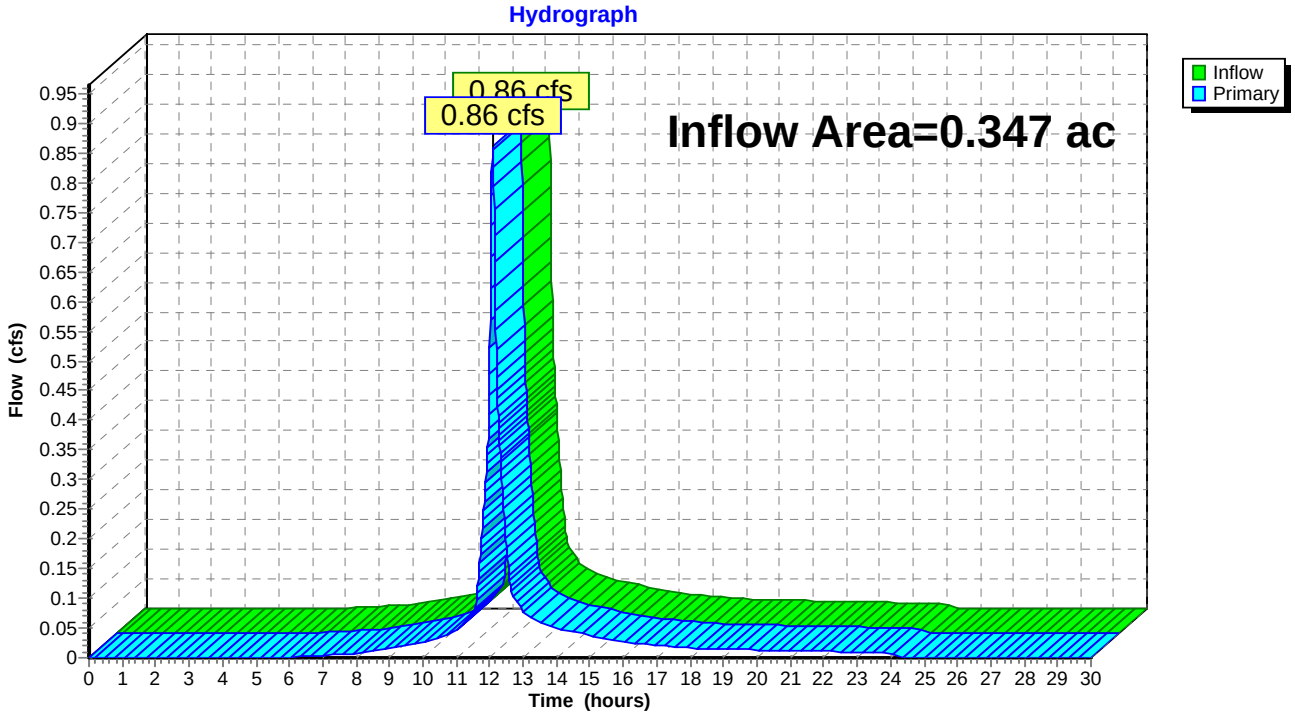
Summary for Pond CB B5: CB B5

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.347 ac, 76.73% Impervious, Inflow Depth = 2.16" for 2 YR event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.062 af
Primary = 0.86 cfs @ 12.09 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B5: CB B5



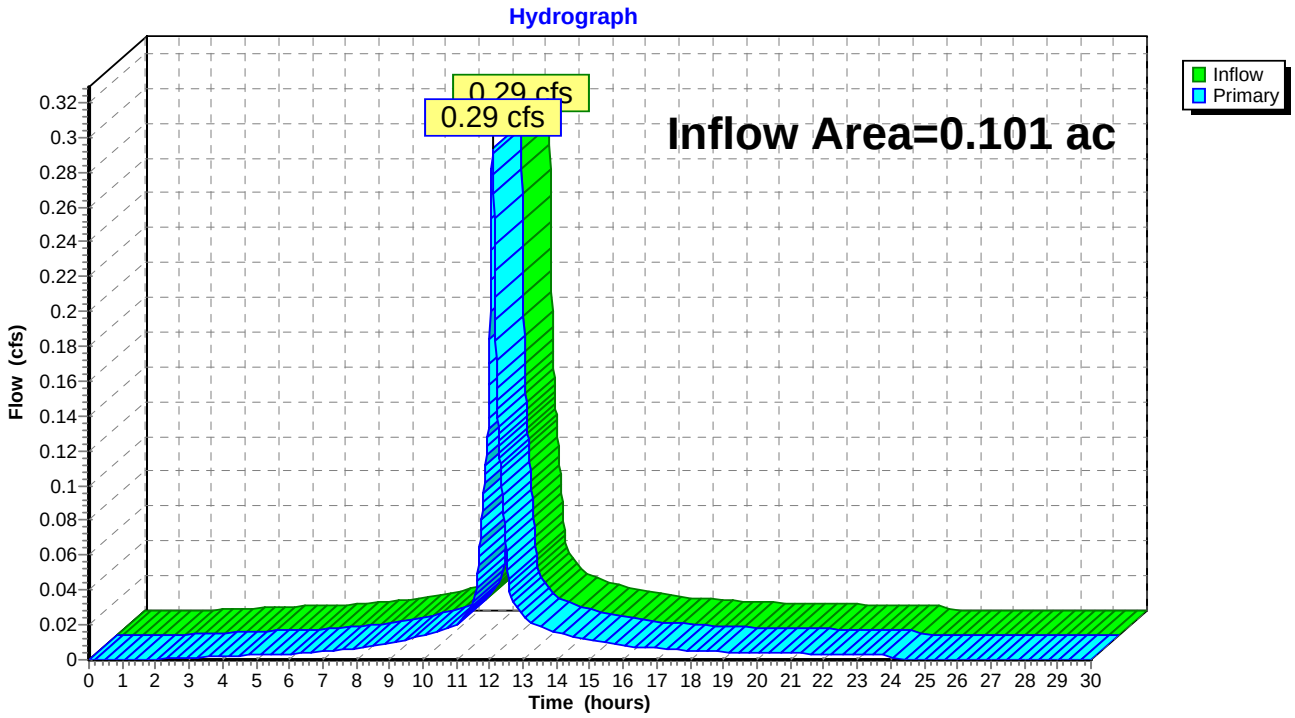
Summary for Pond CB C1: C1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 2.77" for 2 YR event
Inflow = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af
Primary = 0.29 cfs @ 12.08 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB C1: C1



Summary for Pond DET 2: DET 2

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 1.22" for 2 YR event
Inflow = 1.85 cfs @ 12.30 hrs, Volume= 0.189 af
Outflow = 1.36 cfs @ 12.48 hrs, Volume= 0.189 af, Atten= 26%, Lag= 11.0 min
Primary = 1.36 cfs @ 12.48 hrs, Volume= 0.189 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 87.46' @ 12.48 hrs Surf.Area= 1,811 sf Storage= 699 cf

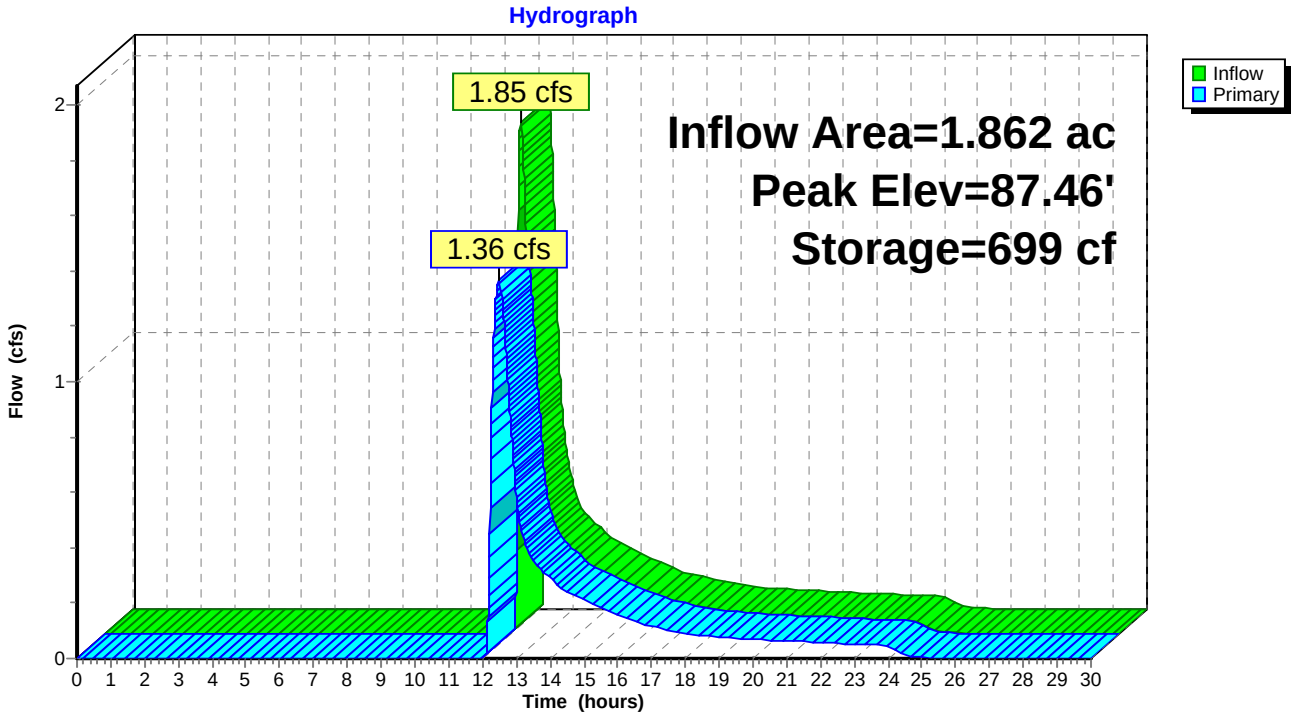
Plug-Flow detention time= 4.3 min calculated for 0.189 af (100% of inflow)
Center-of-Mass det. time= 4.2 min (904.6 - 900.3)

Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	3,190 cf	**28.50'W x 63.54'L x 7.00'H Prismatoid**
			12,676 cf Overall - 4,702 cf Embedded = 7,975 cf x 40.0% Voids
#2	87.50'	4,702 cf	**100.0"W x 60.0"H x 4.03'L Parabolic Arch** x 42 Inside #1
		7,891 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	86.30'	**12.0" x 52.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900
			Outlet Invert= 81.00' S= 0.1019 '/' Cc= 0.900 n= 0.012
#2	Device 1	86.30'	**7.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.36 cfs @ 12.48 hrs HW=87.46' TW=80.12' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.36 cfs of 2.43 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.36 cfs @ 4.44 fps)

Pond DET 2: DET 2



Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 2.17" for 2 YR event
Inflow = 4.45 cfs @ 12.09 hrs, Volume= 0.337 af
Outflow = 1.85 cfs @ 12.30 hrs, Volume= 0.189 af, Atten= 59%, Lag= 12.8 min
Primary = 1.85 cfs @ 12.30 hrs, Volume= 0.189 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 91.23' @ 12.30 hrs Surf.Area= 0 sf Storage= 7,214 cf

Plug-Flow detention time= 226.6 min calculated for 0.189 af (56% of inflow)
Center-of-Mass det. time= 114.3 min (900.3 - 786.1)

Volume	Invert	Avail.Storage	Storage Description
#1	88.42'	9,834 cf	**Custom Stage Data** Listed below

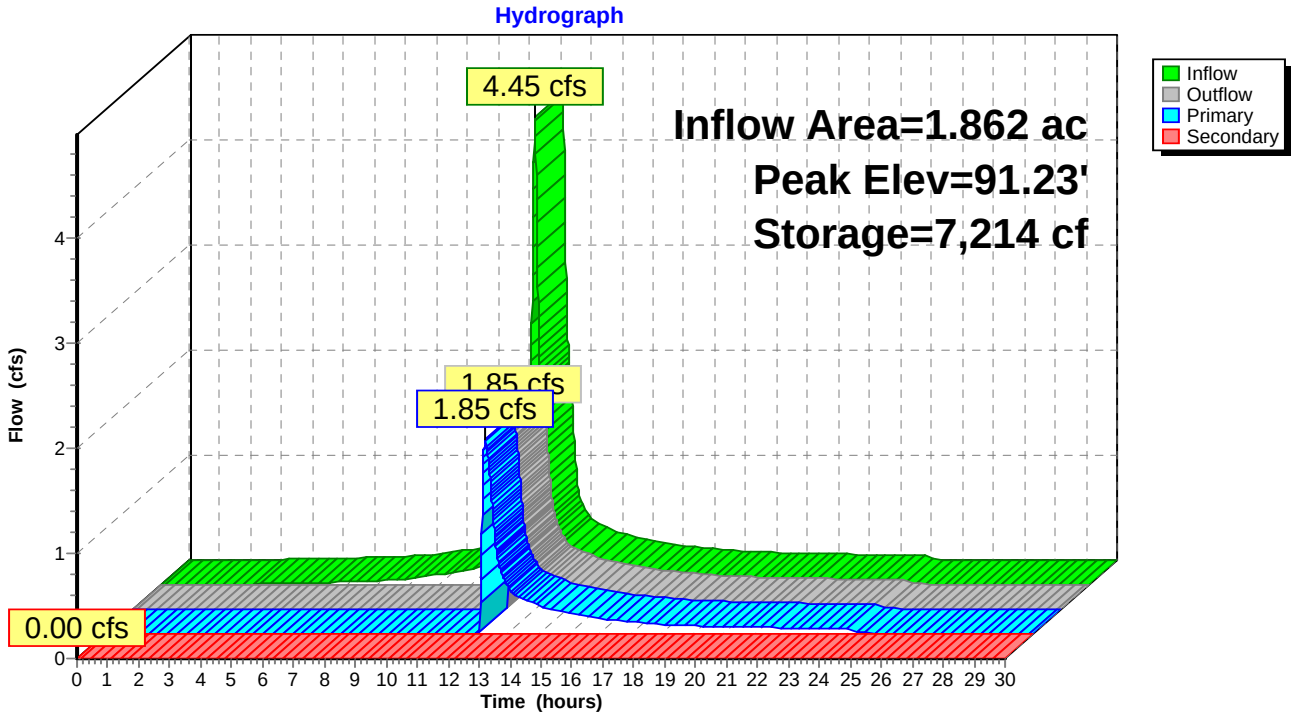
Elevation (feet)	Cum.Store (cubic-feet)
88.42	0
89.00	1,177
90.00	3,560
91.00	6,438
92.00	9,834

Device	Routing	Invert	Outlet Devices
#1	Primary	88.00'	**24.0" x 20.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 86.50' S= 0.0750 '/' Cc= 0.900 n= 0.012
#2	Device 1	91.00'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	91.45'	**13.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=1.85 cfs @ 12.30 hrs HW=91.23' TW=87.11' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.85 cfs of 17.83 cfs potential flow)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.85 cfs @ 1.35 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=88.42' TW=80.00' (Dynamic Tailwater)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond DET O: OPEN BASIN



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 101: 101 Runoff Area=101,537 sf 8.08% Impervious Runoff Depth=2.29"
Flow Length=93' Tc=14.9 min CN=76 Runoff=4.73 cfs 0.445 af

Subcatchment B1: B1 Runoff Area=4,719 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.50 cfs 0.040 af

Subcatchment B2: B2 Runoff Area=21,844 sf 56.52% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=86 Runoff=1.85 cfs 0.133 af

Subcatchment B3: B3 Runoff Area=15,427 sf 99.04% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=1.63 cfs 0.132 af

Subcatchment B4: B4 Runoff Area=16,903 sf 96.61% Impervious Runoff Depth=4.35"
Tc=6.0 min CN=97 Runoff=1.77 cfs 0.141 af

Subcatchment B5: B5 Runoff Area=15,109 sf 76.73% Impervious Runoff Depth=3.80"
Tc=6.0 min CN=92 Runoff=1.47 cfs 0.110 af

Subcatchment C1: C1 Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.46 cfs 0.038 af

Subcatchment DET: Detention Area Runoff Area=7,116 sf 0.00% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=74 Runoff=0.40 cfs 0.029 af

Reach POI 1: POI 1 Inflow=7.06 cfs 0.919 af
Outflow=7.06 cfs 0.919 af

Reach R: R Avg. Depth=0.05' Max Vel=0.23 fps Inflow=0.46 cfs 0.038 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.24 cfs 0.038 af

Reach R1: R1 Avg. Depth=0.03' Max Vel=0.12 fps Inflow=0.50 cfs 0.003 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.07 cfs 0.003 af

Reach R2: R2 Avg. Depth=0.19' Max Vel=0.38 fps Inflow=2.67 cfs 0.434 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=2.64 cfs 0.434 af

Pond CB B1: CB B1 Inflow=7.22 cfs 0.556 af
Primary=7.22 cfs 0.556 af

Pond CB B2: CB B2 Inflow=1.85 cfs 0.133 af
Primary=1.85 cfs 0.133 af

Pond CB B3: CB B3 Inflow=4.87 cfs 0.382 af
Primary=4.87 cfs 0.382 af

Pond CB B4: B4 Inflow=1.77 cfs 0.141 af
Primary=1.77 cfs 0.141 af

Pond CB B5: CB B5 Inflow=1.47 cfs 0.110 af
Primary=1.47 cfs 0.110 af

Pond CB C1: C1 Inflow=0.46 cfs 0.038 af
Primary=0.46 cfs 0.038 af

Pond DET 2: DET 2 Peak Elev=89.87' Storage=4,185 cf Inflow=6.56 cfs 0.434 af
Outflow=2.67 cfs 0.434 af

Pond DET O: OPEN BASIN Peak Elev=91.51' Storage=8,167 cf Inflow=7.62 cfs 0.585 af
Primary=6.56 cfs 0.434 af Secondary=0.50 cfs 0.003 af Outflow=7.05 cfs 0.437 af

Total Runoff Area = 4.294 ac Runoff Volume = 1.067 af Average Runoff Depth = 2.98"
61.04% Pervious = 2.621 ac 38.96% Impervious = 1.673 ac

Summary for Subcatchment 101: 101

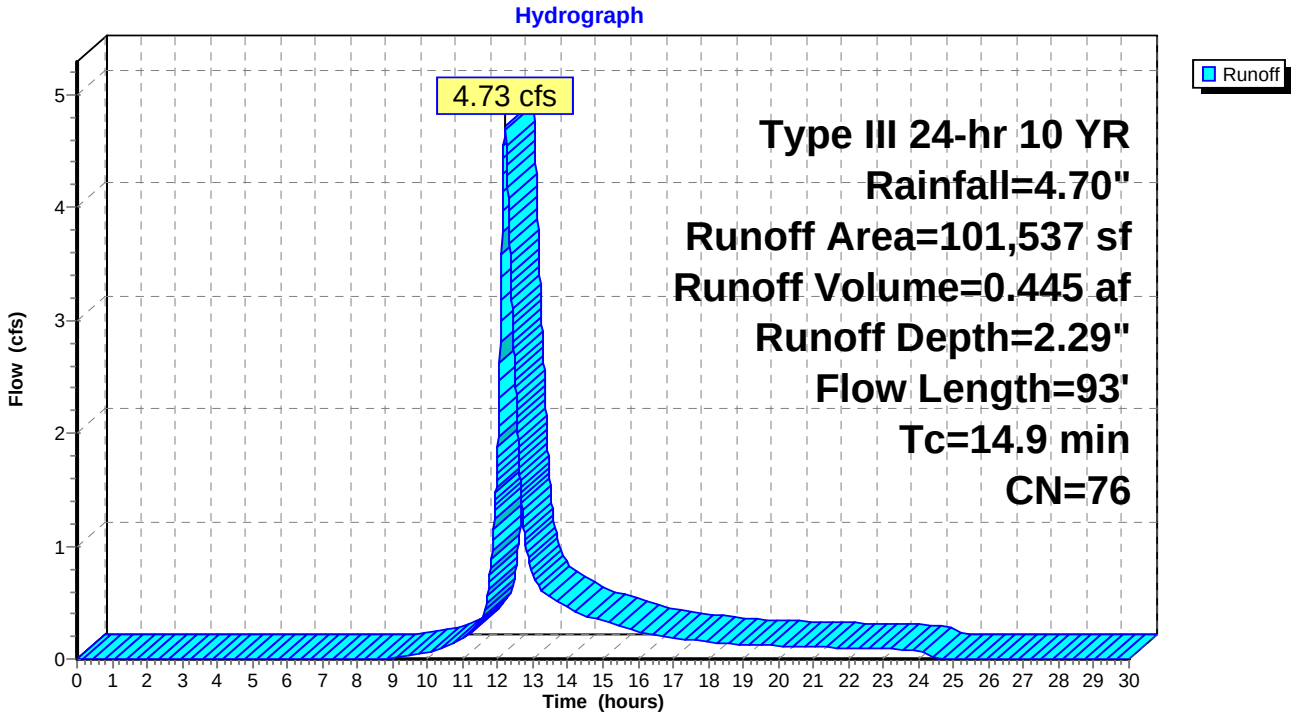
Runoff = 4.73 cfs @ 12.20 hrs, Volume= 0.445 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
8,201	98	Paved roads w/curbs & sewers
4,313	89	Gravel roads, HSG C
15,498	70	Woods, Good, HSG C
31,475	71	Meadow, non-grazed, HSG C
9,165	78	Meadow, non-grazed, HSG D
32,885	77	Woods, Good, HSG D
101,537	76	Weighted Average
93,336		Pervious Area
8,201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	81	0.0370	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
0.2	12	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.9	93	Total			

Subcatchment 101: 101



Summary for Subcatchment B1: B1

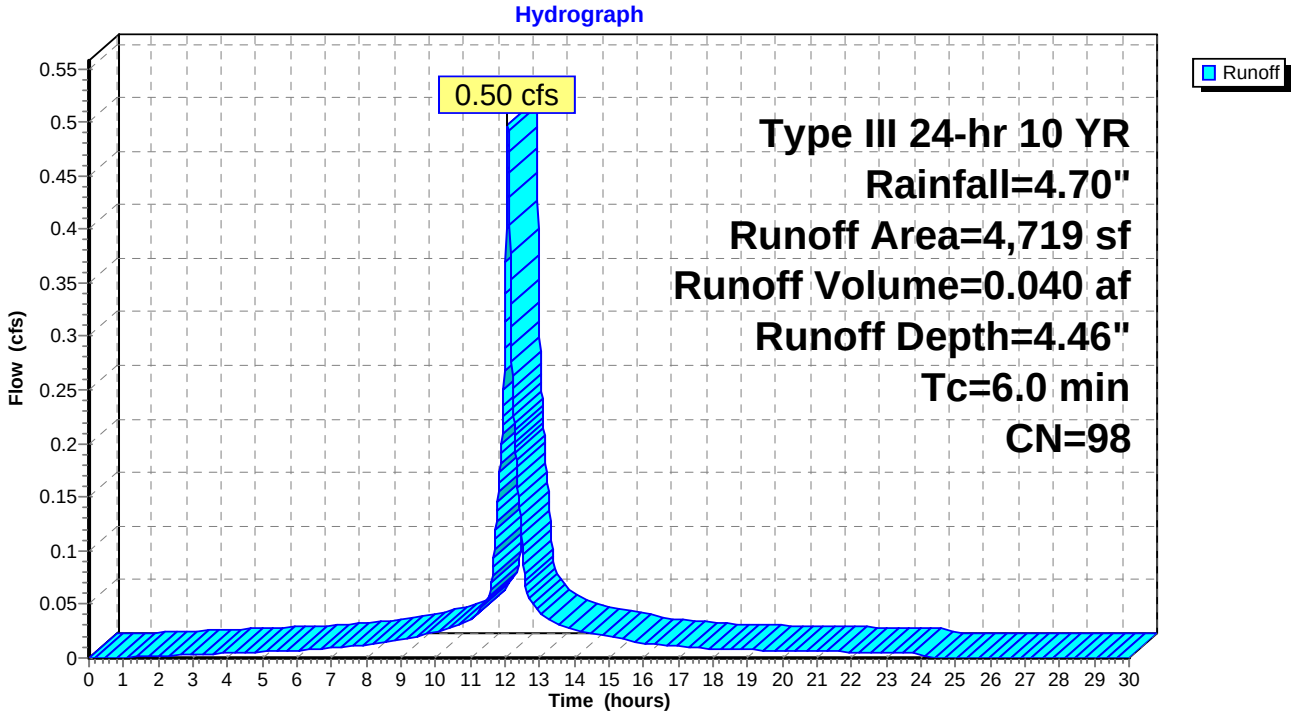
Runoff = 0.50 cfs @ 12.08 hrs, Volume= 0.040 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
4,719	98	Paved roads w/curbs & sewers
4,719		Impervious Area

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

Subcatchment B1: B1



Summary for Subcatchment B2: B2

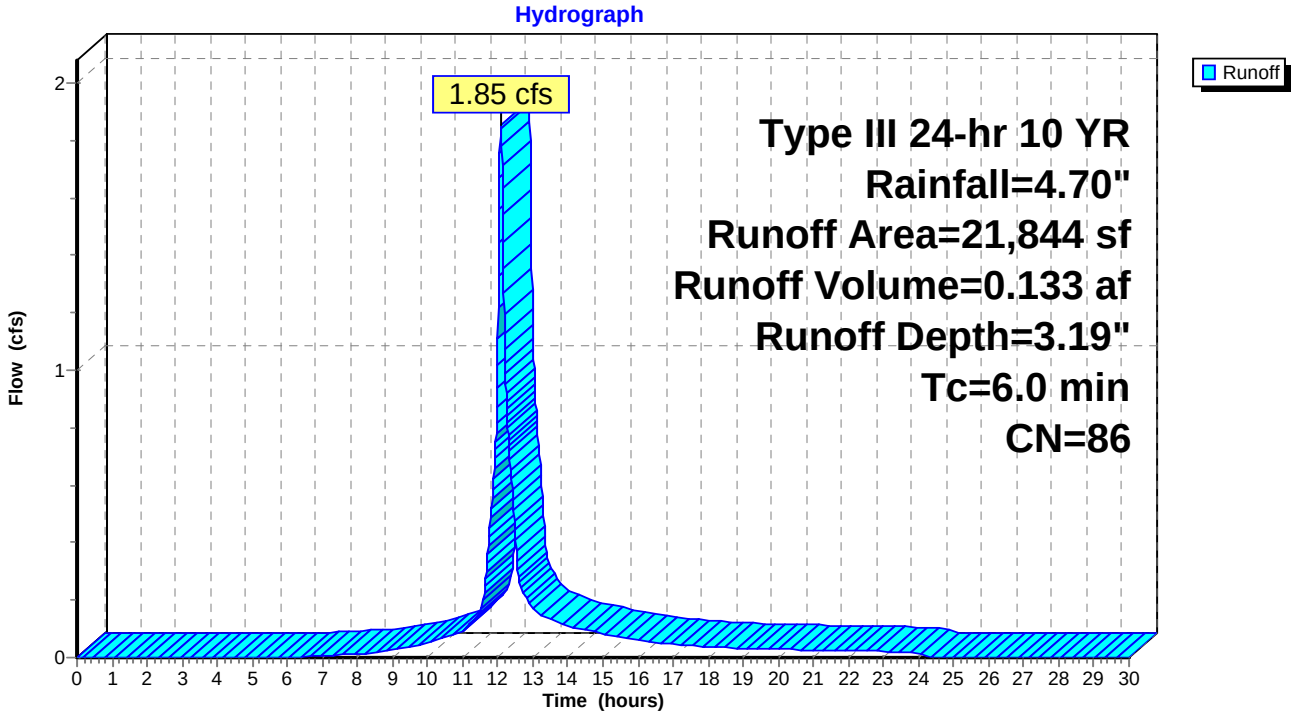
Runoff = 1.85 cfs @ 12.09 hrs, Volume= 0.133 af, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
12,346	98	Paved roads w/curbs & sewers
3,238	70	Woods, Good, HSG C
5,811	71	Meadow, non-grazed, HSG C
449	74	>75% Grass cover, Good, HSG C
21,844	86	Weighted Average
9,498		Pervious Area
12,346		Impervious Area

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

Subcatchment B2: B2



Summary for Subcatchment B3: B3

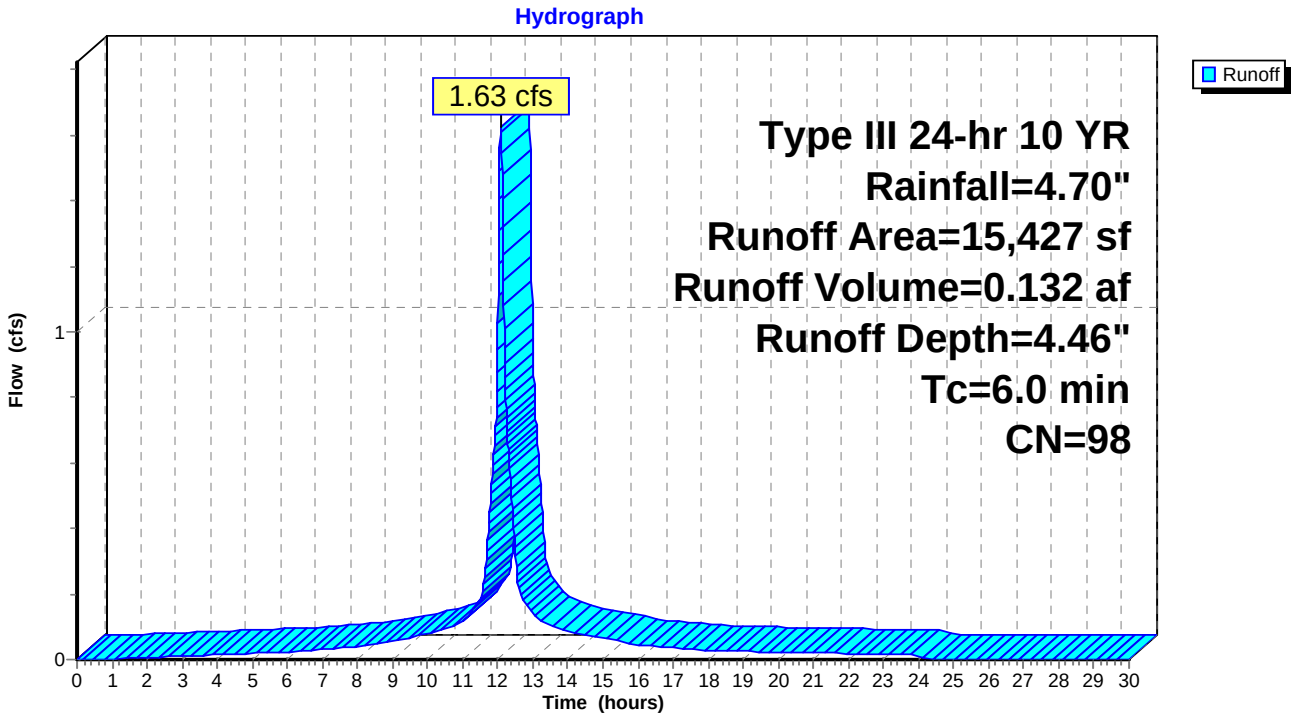
Runoff = 1.63 cfs @ 12.08 hrs, Volume= 0.132 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
15,279	98	Paved roads w/curbs & sewers
148	74	>75% Grass cover, Good, HSG C
15,427	98	Weighted Average
148		Pervious Area
15,279		Impervious Area

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

Subcatchment B3: B3



Summary for Subcatchment B4: B4

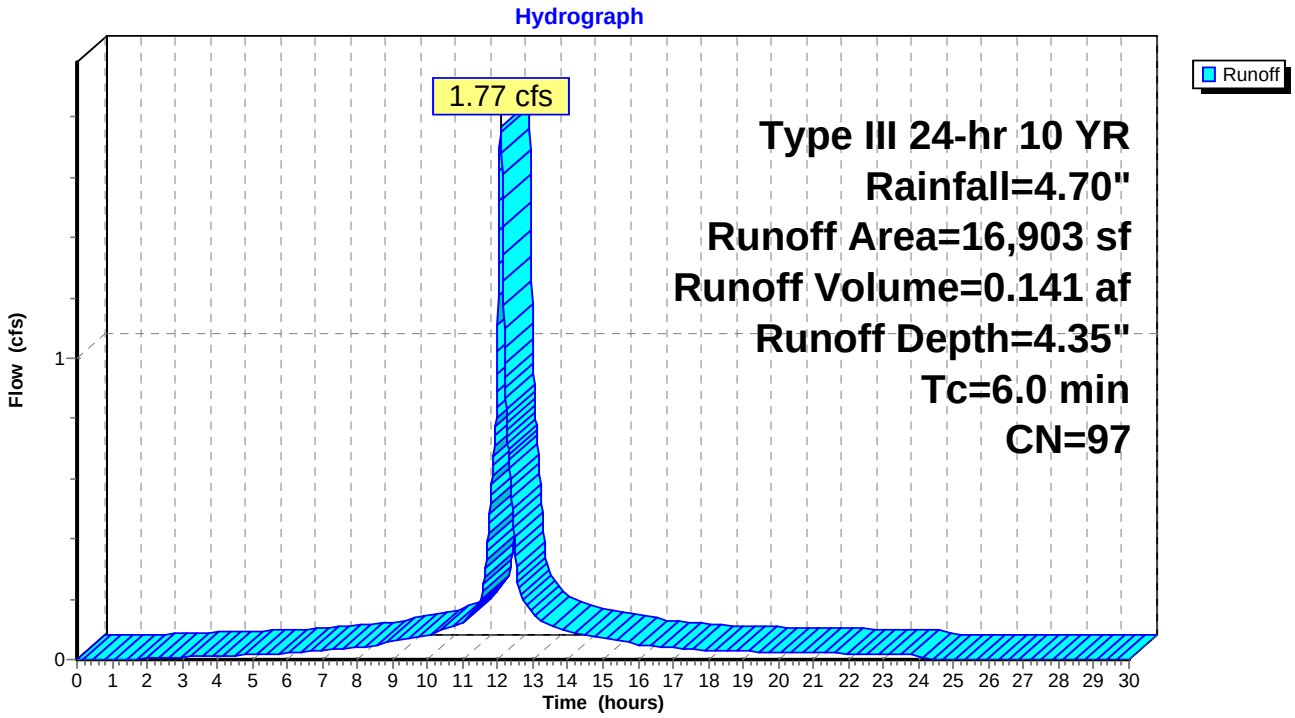
Runoff = 1.77 cfs @ 12.08 hrs, Volume= 0.141 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
16,330	98	Paved roads w/curbs & sewers
573	74	>75% Grass cover, Good, HSG C
16,903	97	Weighted Average
573		Pervious Area
16,330		Impervious Area

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

Subcatchment B4: B4



Summary for Subcatchment B5: B5

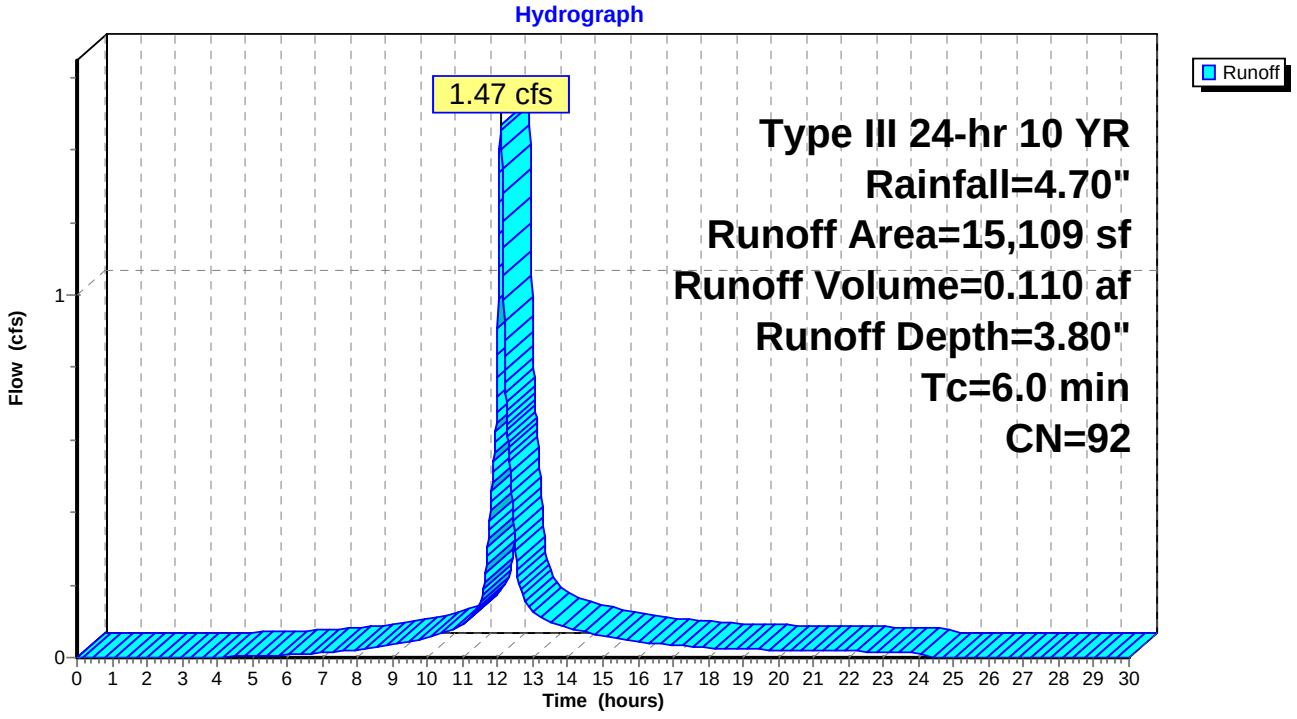
Runoff = 1.47 cfs @ 12.08 hrs, Volume= 0.110 af, Depth= 3.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
11,593	98	Paved roads w/curbs & sewers
2,175	70	Woods, Good, HSG C
868	71	Meadow, non-grazed, HSG C
473	74	>75% Grass cover, Good, HSG C
15,109	92	Weighted Average
3,516		Pervious Area
11,593		Impervious Area

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

Subcatchment B5: B5



Summary for Subcatchment C1: C1

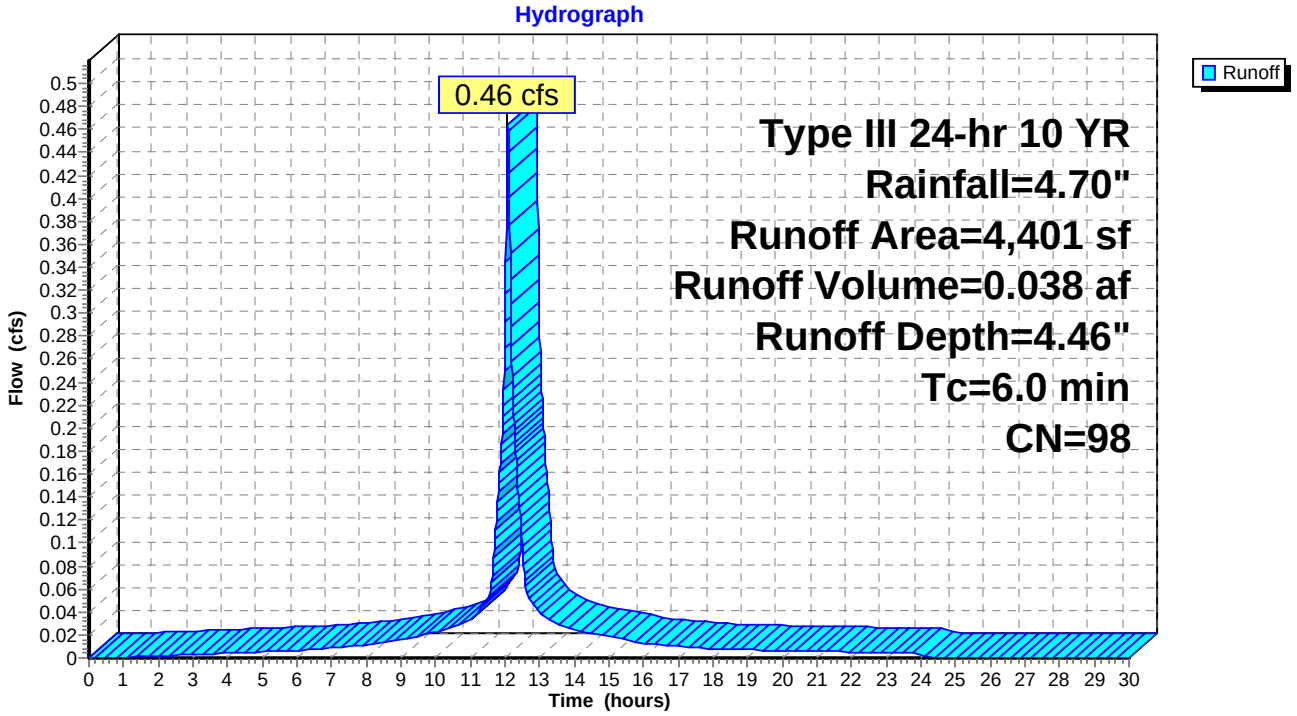
Runoff = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
4,401	98	Paved roads w/curbs & sewers
4,401		Impervious Area

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

Subcatchment C1: C1



Summary for Subcatchment DET: Detention Area

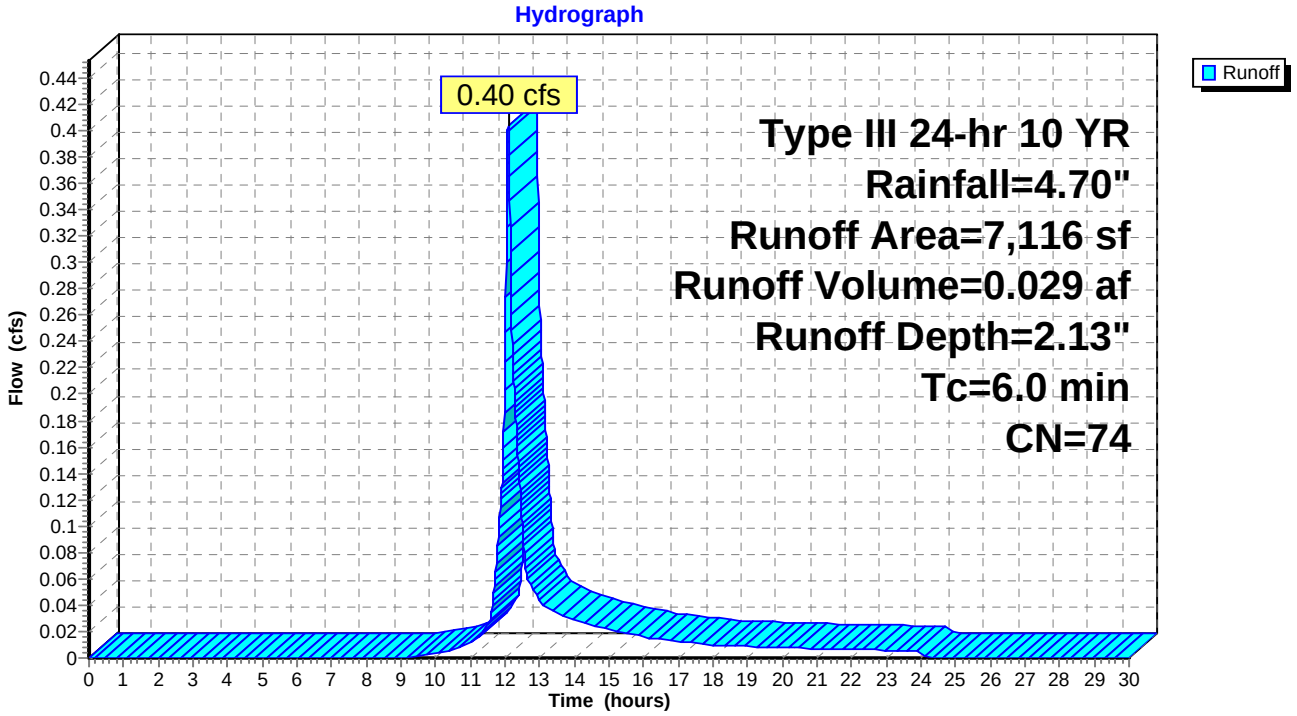
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 YR Rainfall=4.70"

Area (sf)	CN	Description
7,116	74	>75% Grass cover, Good, HSG C
7,116		Pervious Area

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

Subcatchment DET: Detention Area



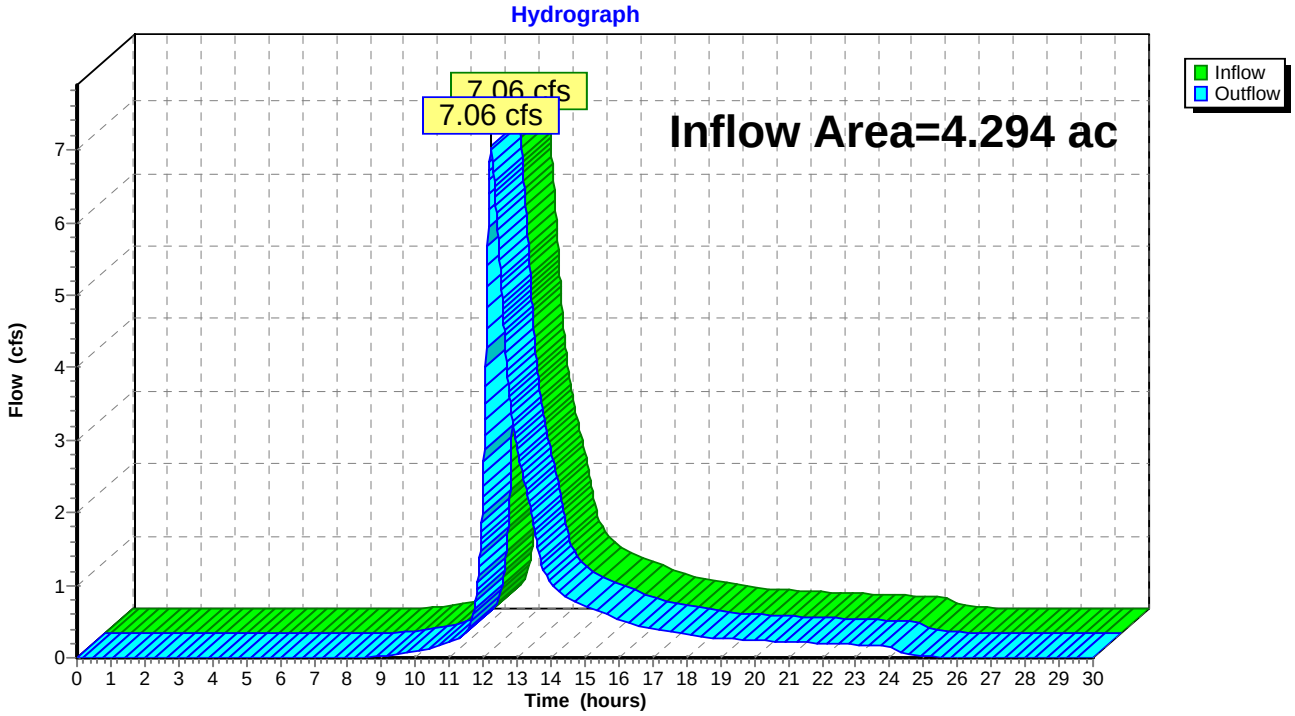
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.294 ac, 38.96% Impervious, Inflow Depth = 2.57" for 10 YR event
Inflow = 7.06 cfs @ 12.23 hrs, Volume= 0.919 af
Outflow = 7.06 cfs @ 12.23 hrs, Volume= 0.919 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 YR event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af
Outflow = 0.24 cfs @ 12.22 hrs, Volume= 0.038 af, Atten= 48%, Lag= 7.9 min

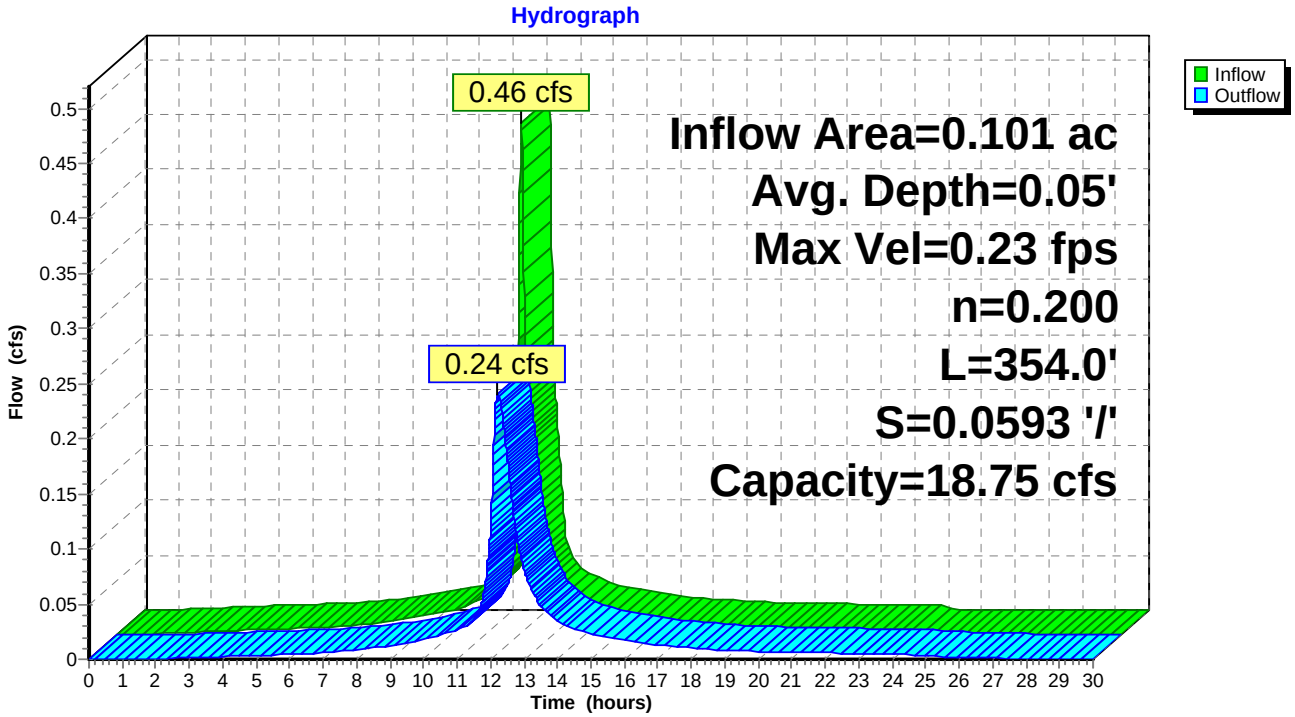
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.23 fps, Min. Travel Time= 25.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 80.8 min

Peak Storage= 372 cf @ 12.22 hrs, Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

Reach R: R



Summary for Reach R1: R1

Inflow = 0.50 cfs @ 12.12 hrs, Volume= 0.003 af
Outflow = 0.07 cfs @ 12.18 hrs, Volume= 0.003 af, Atten= 85%, Lag= 3.8 min

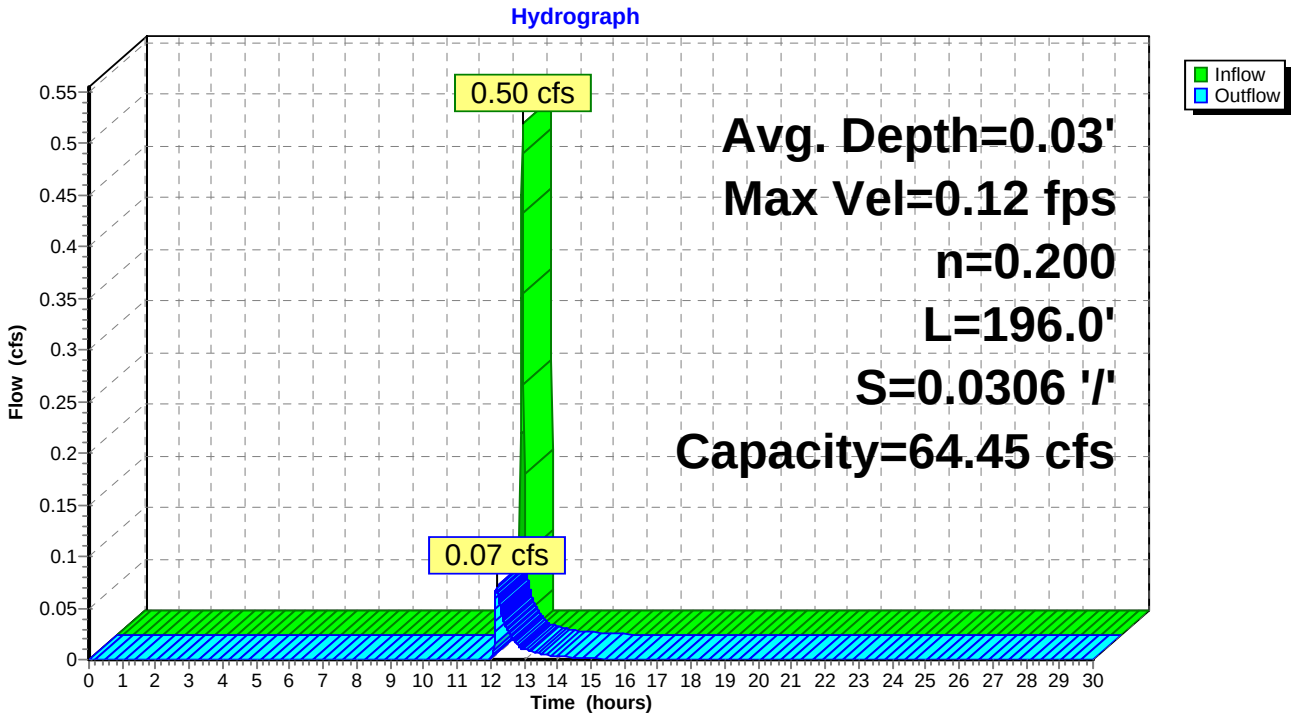
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.12 fps, Min. Travel Time= 27.2 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 52.5 min

Peak Storage= 117 cf @ 12.18 hrs, Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

Reach R1: R1



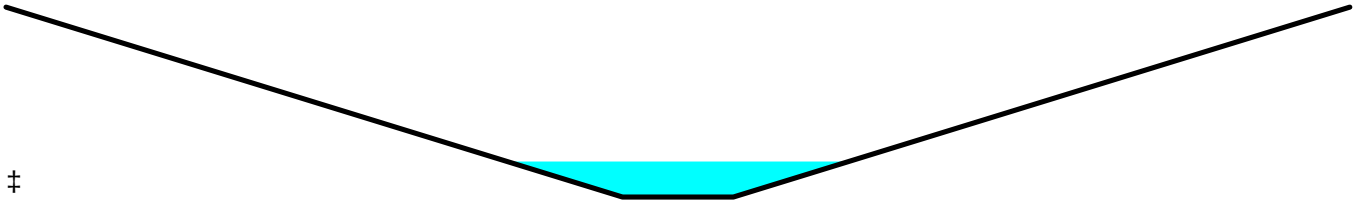
Summary for Reach R2: R2

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 2.79" for 10 YR event
Inflow = 2.67 cfs @ 12.42 hrs, Volume= 0.434 af
Outflow = 2.64 cfs @ 12.51 hrs, Volume= 0.434 af, Atten= 1%, Lag= 5.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.38 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 14.8 min

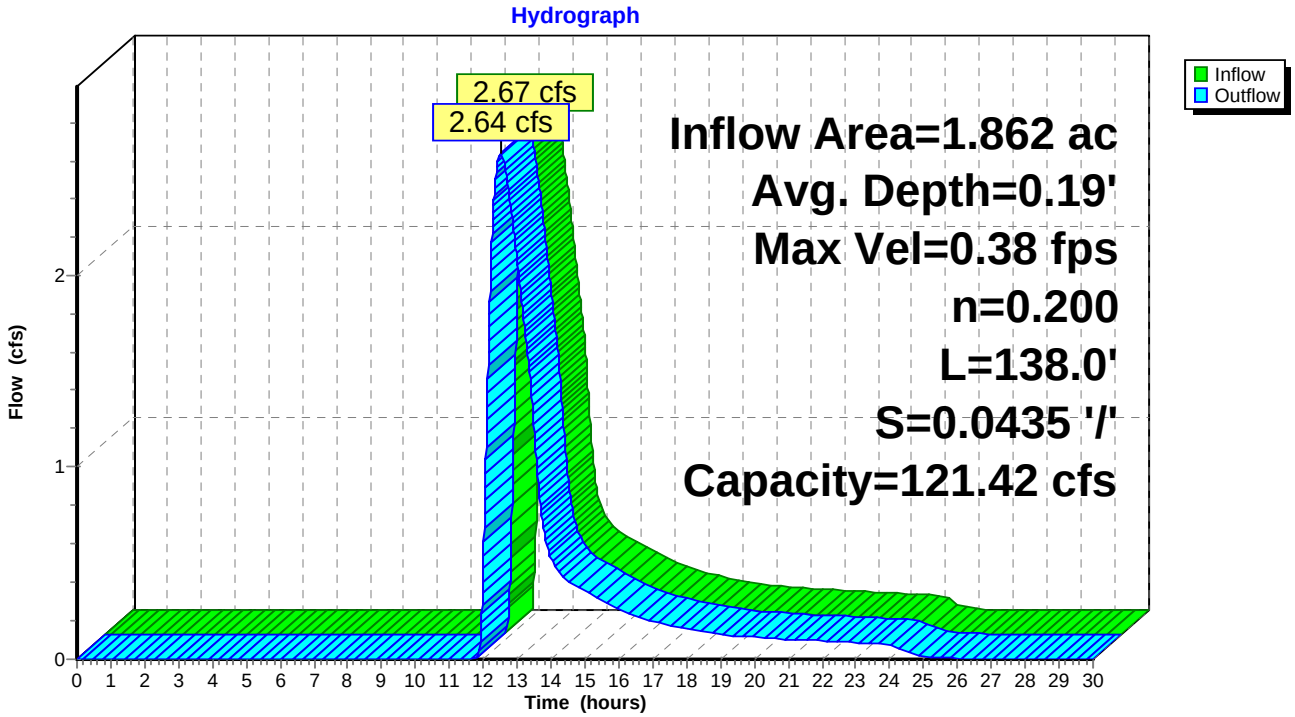
Peak Storage= 945 cf @ 12.51 hrs, Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

Reach R2: R2



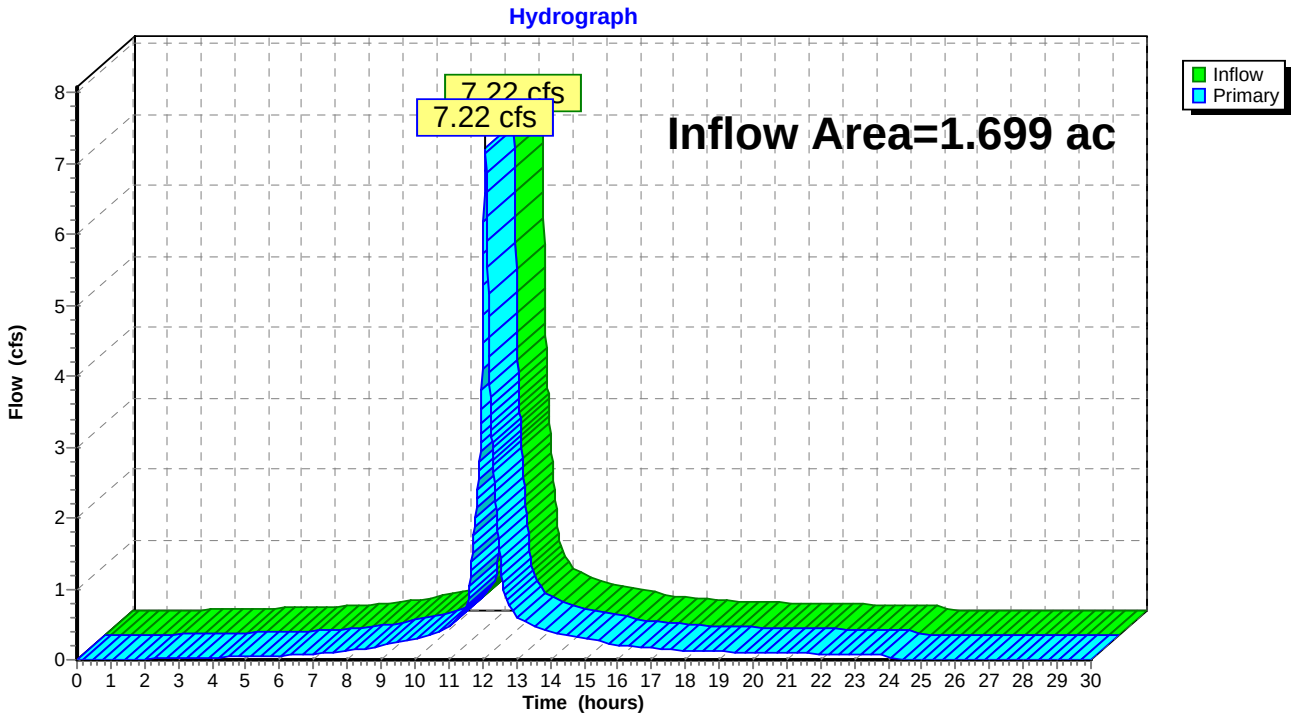
Summary for Pond CB B1: CB B1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.699 ac, 81.44% Impervious, Inflow Depth = 3.92" for 10 YR event
Inflow = 7.22 cfs @ 12.08 hrs, Volume= 0.556 af
Primary = 7.22 cfs @ 12.08 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B1: CB B1



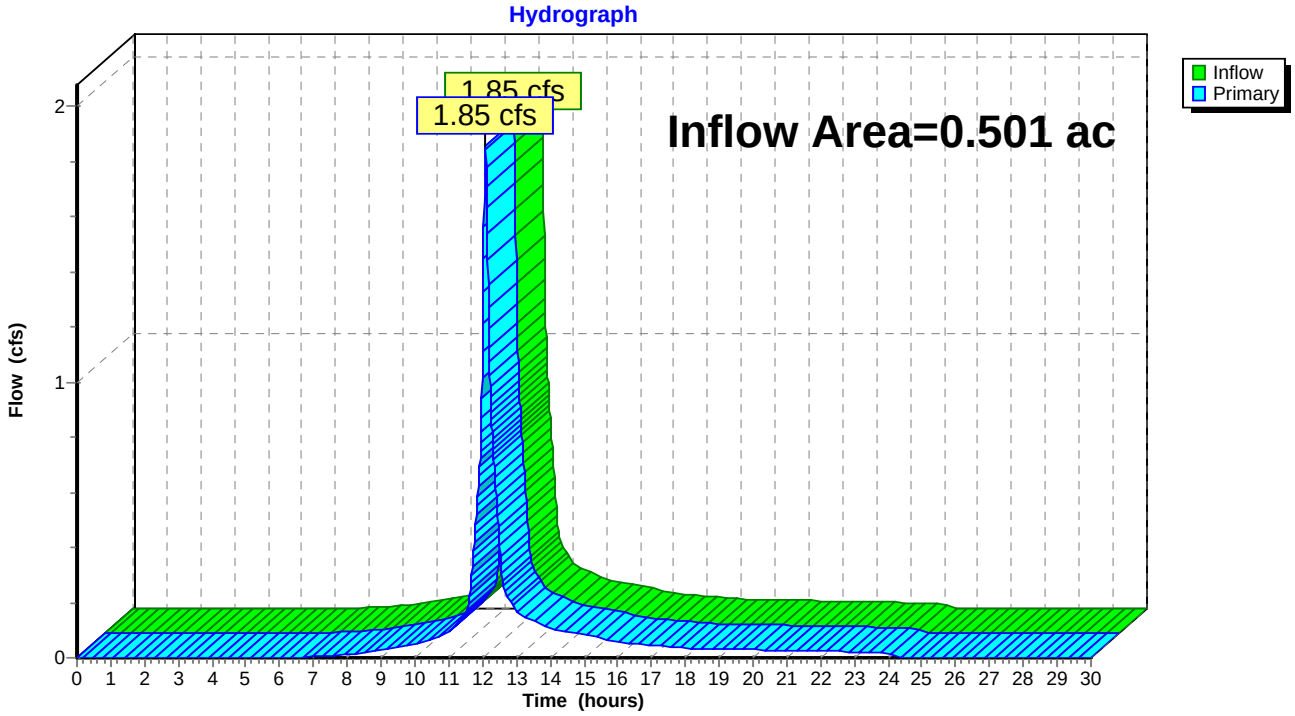
Summary for Pond CB B2: CB B2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.501 ac, 56.52% Impervious, Inflow Depth = 3.19" for 10 YR event
Inflow = 1.85 cfs @ 12.09 hrs, Volume= 0.133 af
Primary = 1.85 cfs @ 12.09 hrs, Volume= 0.133 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B2: CB B2



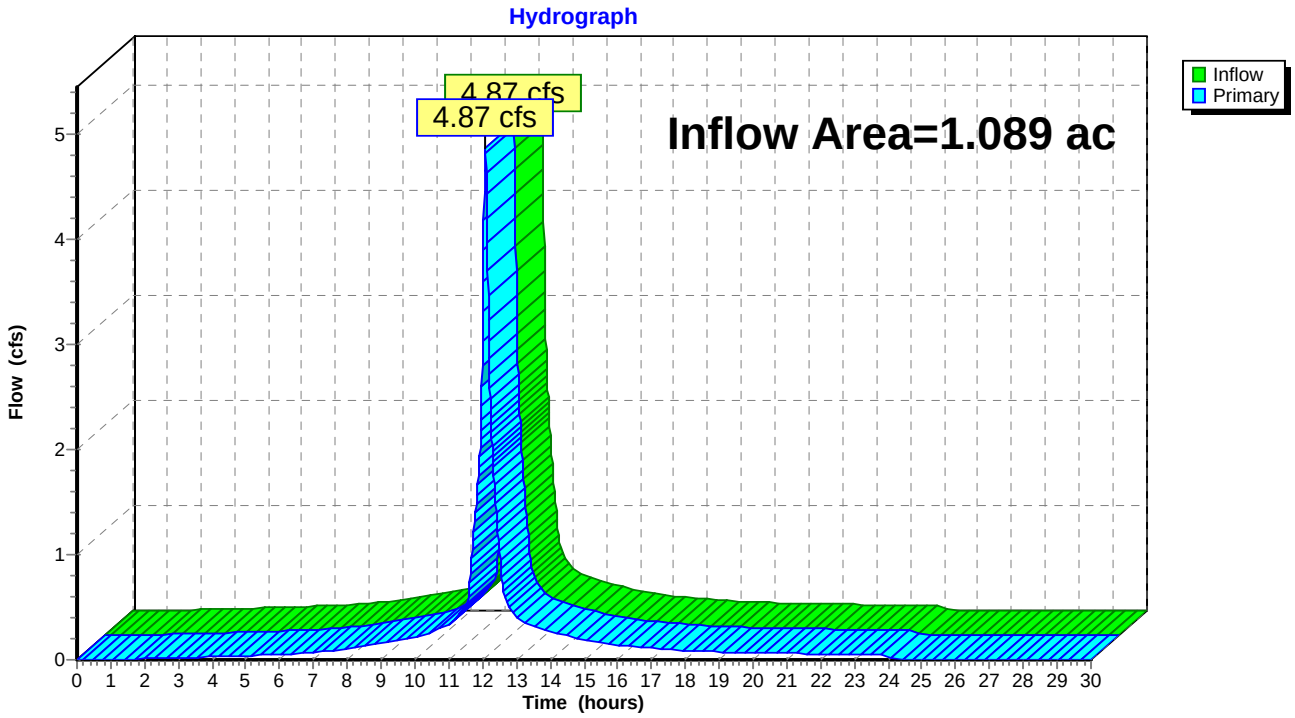
Summary for Pond CB B3: CB B3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.089 ac, 91.07% Impervious, Inflow Depth = 4.21" for 10 YR event
Inflow = 4.87 cfs @ 12.08 hrs, Volume= 0.382 af
Primary = 4.87 cfs @ 12.08 hrs, Volume= 0.382 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B3: CB B3



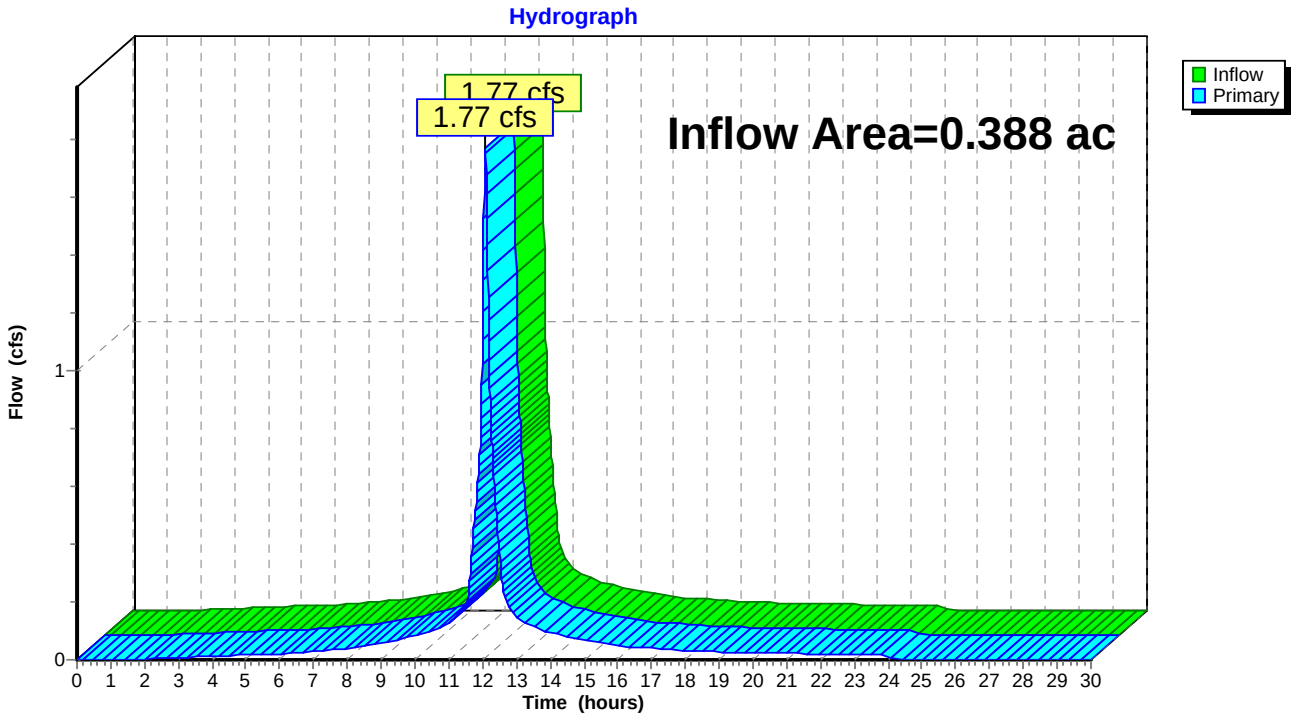
Summary for Pond CB B4: B4

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.388 ac, 96.61% Impervious, Inflow Depth = 4.35" for 10 YR event
Inflow = 1.77 cfs @ 12.08 hrs, Volume= 0.141 af
Primary = 1.77 cfs @ 12.08 hrs, Volume= 0.141 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B4: B4



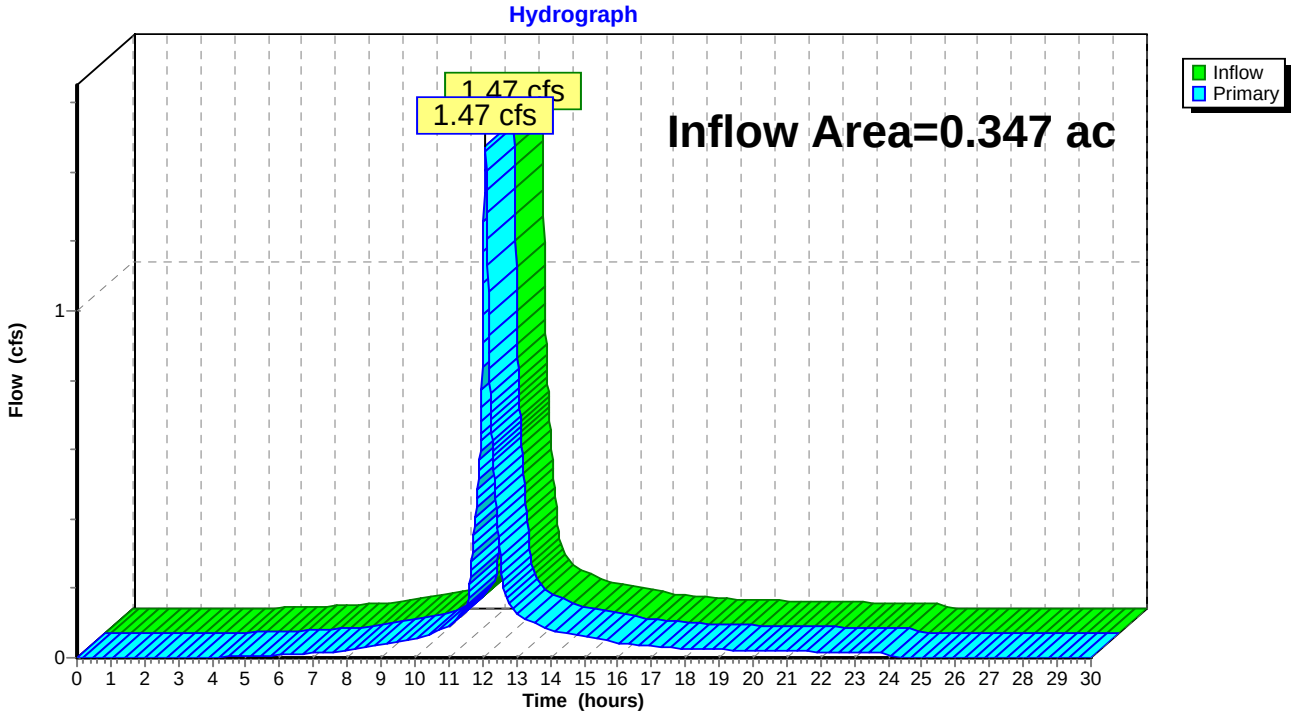
Summary for Pond CB B5: CB B5

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.347 ac, 76.73% Impervious, Inflow Depth = 3.80" for 10 YR event
Inflow = 1.47 cfs @ 12.08 hrs, Volume= 0.110 af
Primary = 1.47 cfs @ 12.08 hrs, Volume= 0.110 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B5: CB B5



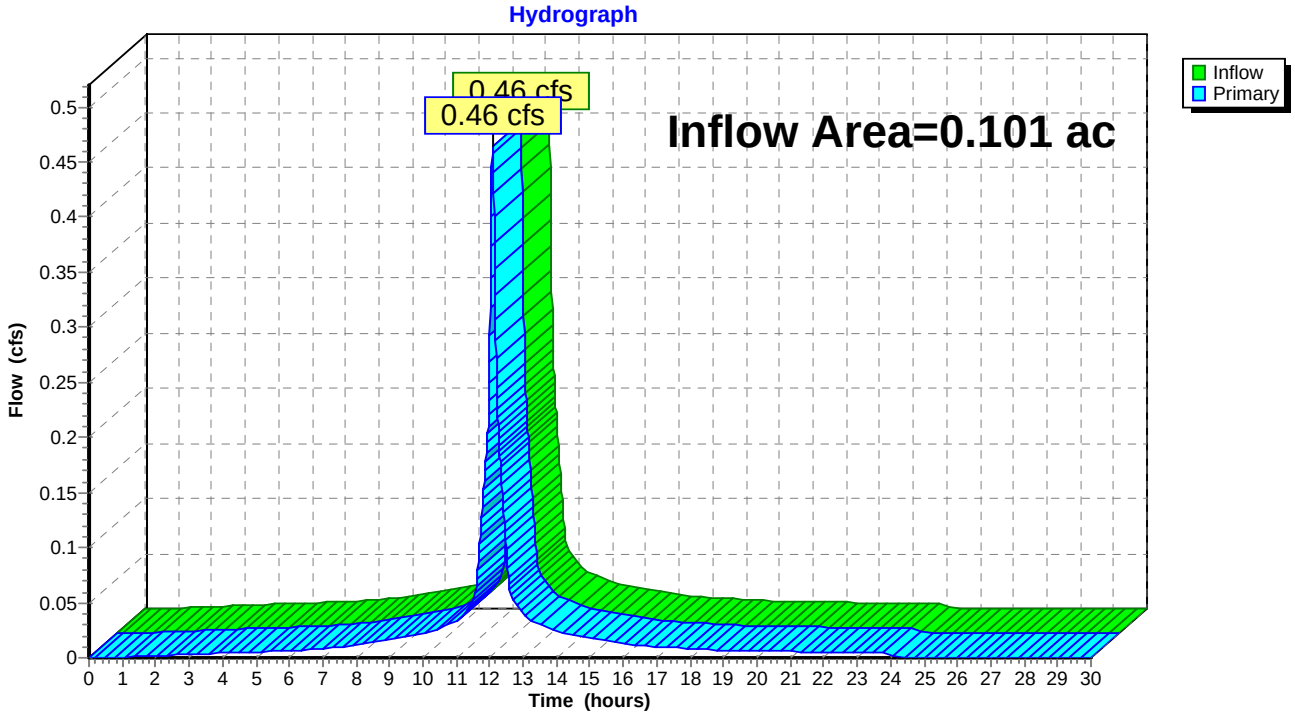
Summary for Pond CB C1: C1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 YR event
Inflow = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af
Primary = 0.46 cfs @ 12.08 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB C1: C1



Summary for Pond DET 2: DET 2

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 2.79" for 10 YR event
Inflow = 6.56 cfs @ 12.12 hrs, Volume= 0.434 af
Outflow = 2.67 cfs @ 12.42 hrs, Volume= 0.434 af, Atten= 59%, Lag= 18.3 min
Primary = 2.67 cfs @ 12.42 hrs, Volume= 0.434 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 89.87' @ 12.42 hrs Surf.Area= 1,811 sf Storage= 4,185 cf

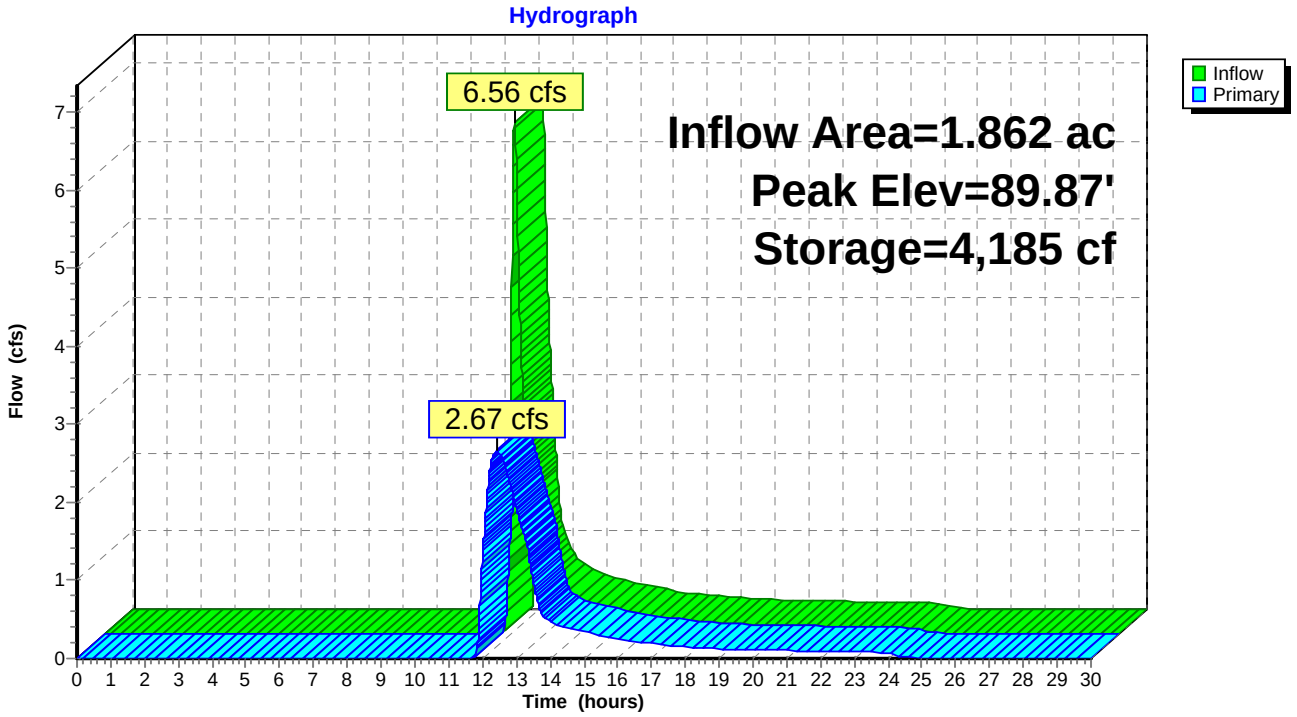
Plug-Flow detention time= 13.1 min calculated for 0.434 af (100% of inflow)
Center-of-Mass det. time= 13.1 min (862.2 - 849.1)

Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	3,190 cf	**28.50'W x 63.54'L x 7.00'H Prismatoid** 12,676 cf Overall - 4,702 cf Embedded = 7,975 cf x 40.0% Voids
#2	87.50'	4,702 cf	**100.0"W x 60.0"H x 4.03'L Parabolic Arch** x 42 Inside #1
		7,891 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	86.30'	**12.0" x 52.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 81.00' S= 0.1019 '/' Cc= 0.900 n= 0.012
#2	Device 1	86.30'	**7.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.67 cfs @ 12.42 hrs HW=89.87' TW=80.19' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.67 cfs of 5.23 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 2.67 cfs @ 8.69 fps)

Pond DET 2: DET 2



Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 3.77" for 10 YR event
Inflow = 7.62 cfs @ 12.08 hrs, Volume= 0.585 af
Outflow = 7.05 cfs @ 12.12 hrs, Volume= 0.437 af, Atten= 7%, Lag= 2.0 min
Primary = 6.56 cfs @ 12.12 hrs, Volume= 0.434 af
Secondary = 0.50 cfs @ 12.12 hrs, Volume= 0.003 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 91.51' @ 12.12 hrs Surf.Area= 0 sf Storage= 8,167 cf

Plug-Flow detention time= 159.8 min calculated for 0.437 af (75% of inflow)
Center-of-Mass det. time= 72.9 min (848.3 - 775.4)

Volume	Invert	Avail.Storage	Storage Description
#1	88.42'	9,834 cf	**Custom Stage Data** Listed below

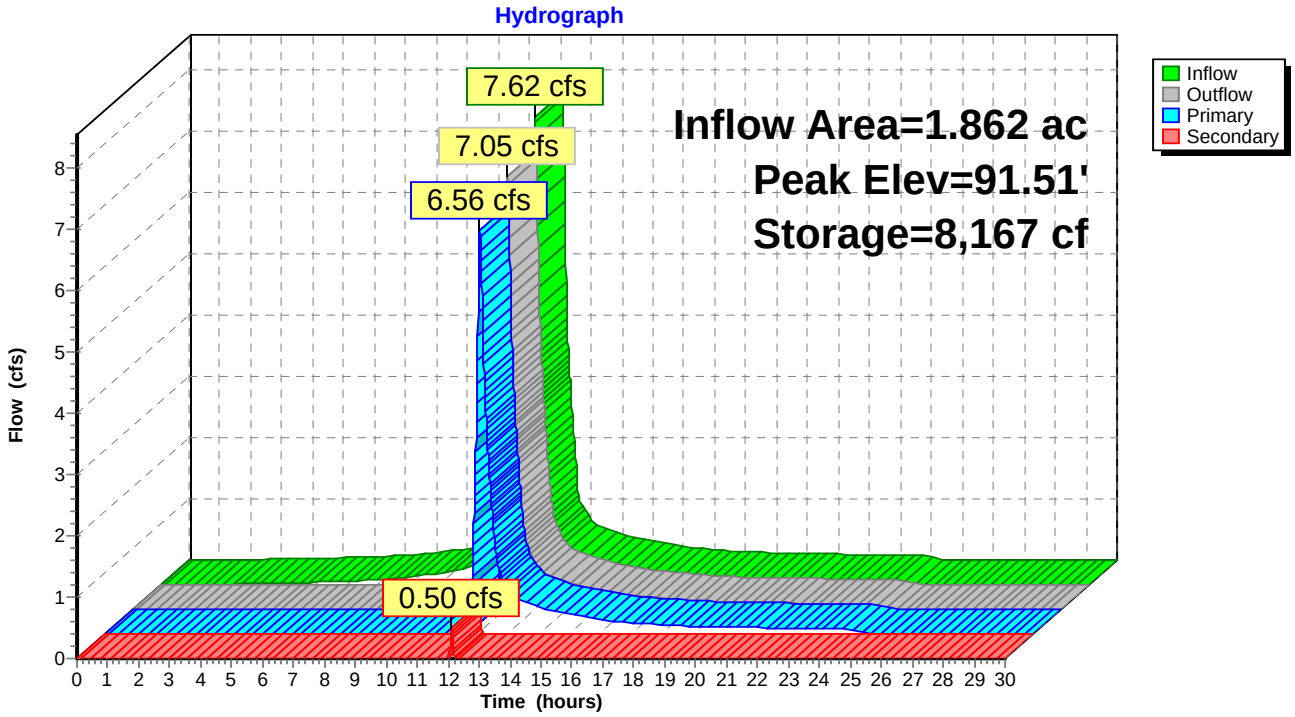
Elevation (feet)	Cum.Store (cubic-feet)
88.42	0
89.00	1,177
90.00	3,560
91.00	6,438
92.00	9,834

Device	Routing	Invert	Outlet Devices
#1	Primary	88.00'	**24.0" x 20.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 86.50' S= 0.0750 '/' Cc= 0.900 n= 0.012
#2	Device 1	91.00'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	91.45'	**13.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=6.55 cfs @ 12.12 hrs HW=91.51' TW=88.42' (Dynamic Tailwater)
└**1=Culvert** (Passes 6.55 cfs of 18.92 cfs potential flow)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 6.55 cfs @ 2.15 fps)

Secondary OutFlow Max=0.49 cfs @ 12.12 hrs HW=91.51' TW=80.02' (Dynamic Tailwater)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.49 cfs @ 0.64 fps)

Pond DET O: OPEN BASIN



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 101: 101 Runoff Area=101,537 sf 8.08% Impervious Runoff Depth=2.95"
Flow Length=93' Tc=14.9 min CN=76 Runoff=6.13 cfs 0.574 af

Subcatchment B1: B1 Runoff Area=4,719 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.58 cfs 0.048 af

Subcatchment B2: B2 Runoff Area=21,844 sf 56.52% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=86 Runoff=2.27 cfs 0.164 af

Subcatchment B3: B3 Runoff Area=15,427 sf 99.04% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=1.91 cfs 0.155 af

Subcatchment B4: B4 Runoff Area=16,903 sf 96.61% Impervious Runoff Depth=5.15"
Tc=6.0 min CN=97 Runoff=2.08 cfs 0.166 af

Subcatchment B5: B5 Runoff Area=15,109 sf 76.73% Impervious Runoff Depth=4.58"
Tc=6.0 min CN=92 Runoff=1.76 cfs 0.132 af

Subcatchment C1: C1 Runoff Area=4,401 sf 100.00% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=98 Runoff=0.54 cfs 0.044 af

Subcatchment DET: Detention Area Runoff Area=7,116 sf 0.00% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=74 Runoff=0.53 cfs 0.038 af

Reach POI 1: POI 1 Inflow=9.17 cfs 1.174 af
Outflow=9.17 cfs 1.174 af

Reach R: R Avg. Depth=0.06' Max Vel=0.24 fps Inflow=0.54 cfs 0.044 af
n=0.200 L=354.0' S=0.0593 '/' Capacity=18.75 cfs Outflow=0.29 cfs 0.044 af

Reach R1: R1 Avg. Depth=0.07' Max Vel=0.21 fps Inflow=1.15 cfs 0.010 af
n=0.200 L=196.0' S=0.0306 '/' Capacity=64.45 cfs Outflow=0.34 cfs 0.010 af

Reach R2: R2 Avg. Depth=0.20' Max Vel=0.40 fps Inflow=3.09 cfs 0.546 af
n=0.200 L=138.0' S=0.0435 '/' Capacity=121.42 cfs Outflow=3.06 cfs 0.546 af

Pond CB B1: CB B1 Inflow=8.59 cfs 0.666 af
Primary=8.59 cfs 0.666 af

Pond CB B2: CB B2 Inflow=2.27 cfs 0.164 af
Primary=2.27 cfs 0.164 af

Pond CB B3: CB B3 Inflow=5.74 cfs 0.454 af
Primary=5.74 cfs 0.454 af

Pond CB B4: B4 Inflow=2.08 cfs 0.166 af
Primary=2.08 cfs 0.166 af

Pond CB B5: CB B5 Inflow=1.76 cfs 0.132 af
Primary=1.76 cfs 0.132 af

Pond CB C1: C1 Inflow=0.54 cfs 0.044 af
Primary=0.54 cfs 0.044 af

Pond DET 2: DET 2 Peak Elev=90.97' Storage=5,587 cf Inflow=7.53 cfs 0.546 af
Outflow=3.09 cfs 0.546 af

Pond DET O: OPEN BASIN Peak Elev=91.55' Storage=8,319 cf Inflow=9.12 cfs 0.704 af
Primary=7.53 cfs 0.546 af Secondary=1.15 cfs 0.010 af Outflow=8.68 cfs 0.556 af

Total Runoff Area = 4.294 ac Runoff Volume = 1.322 af Average Runoff Depth = 3.69"
61.04% Pervious = 2.621 ac 38.96% Impervious = 1.673 ac

Summary for Subcatchment 101: 101

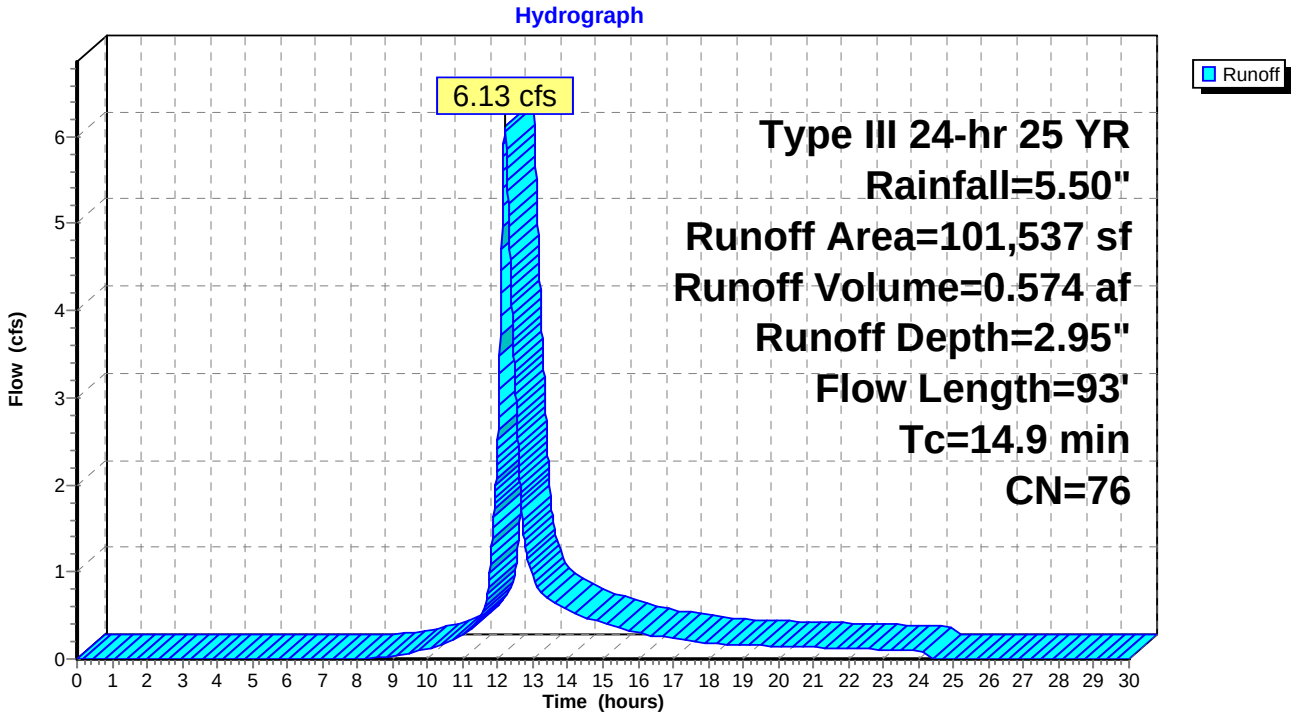
Runoff = 6.13 cfs @ 12.20 hrs, Volume= 0.574 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
8,201	98	Paved roads w/curbs & sewers
4,313	89	Gravel roads, HSG C
15,498	70	Woods, Good, HSG C
31,475	71	Meadow, non-grazed, HSG C
9,165	78	Meadow, non-grazed, HSG D
32,885	77	Woods, Good, HSG D
101,537	76	Weighted Average
93,336		Pervious Area
8,201		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	81	0.0370	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.00"
0.2	12	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.9	93	Total			

Subcatchment 101: 101



Summary for Subcatchment B1: B1

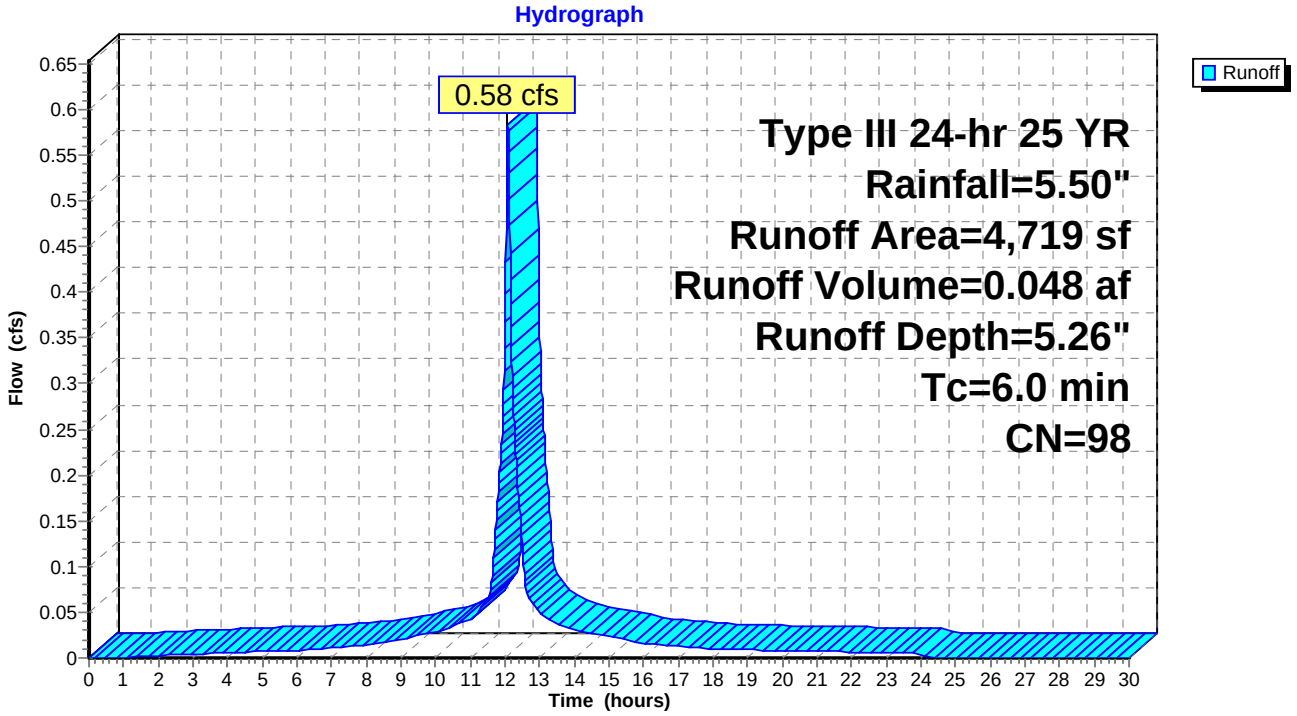
Runoff = 0.58 cfs @ 12.08 hrs, Volume= 0.048 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
4,719	98	Paved roads w/curbs & sewers
4,719		Impervious Area

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

Subcatchment B1: B1



Summary for Subcatchment B2: B2

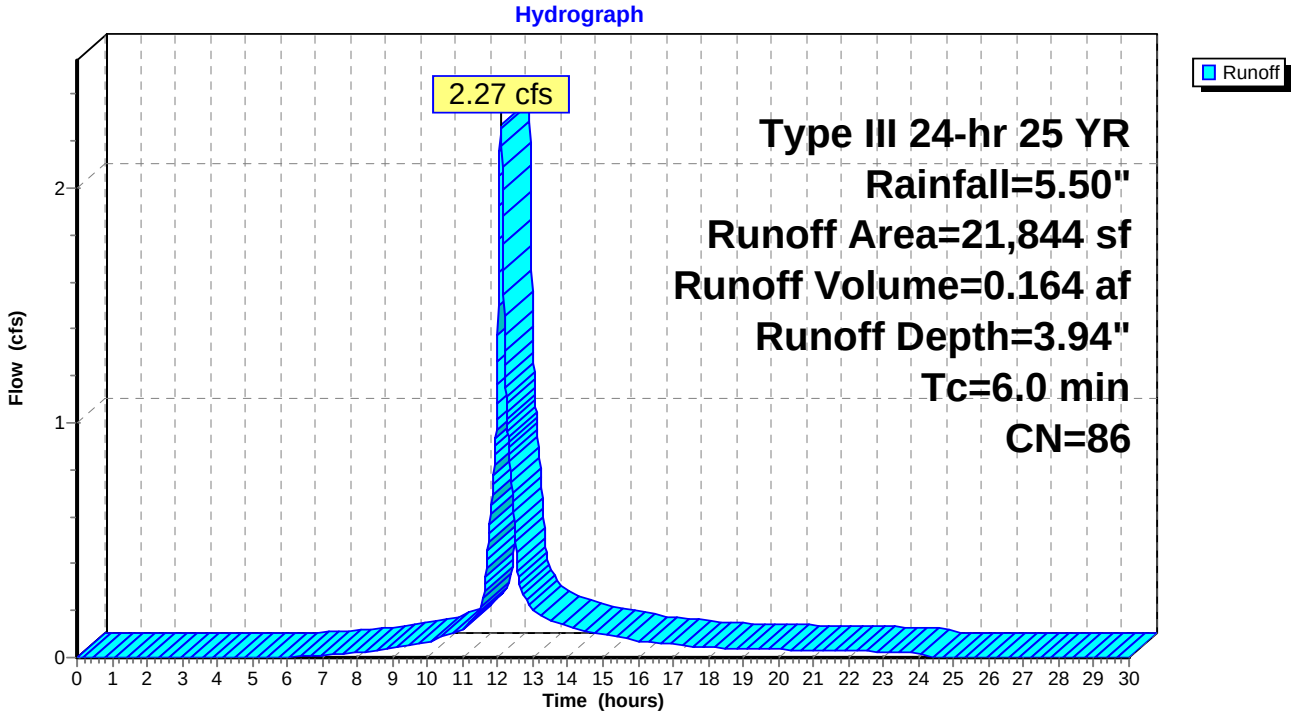
Runoff = 2.27 cfs @ 12.09 hrs, Volume= 0.164 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
12,346	98	Paved roads w/curbs & sewers
3,238	70	Woods, Good, HSG C
5,811	71	Meadow, non-grazed, HSG C
449	74	>75% Grass cover, Good, HSG C
21,844	86	Weighted Average
9,498		Pervious Area
12,346		Impervious Area

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

Subcatchment B2: B2



Summary for Subcatchment B3: B3

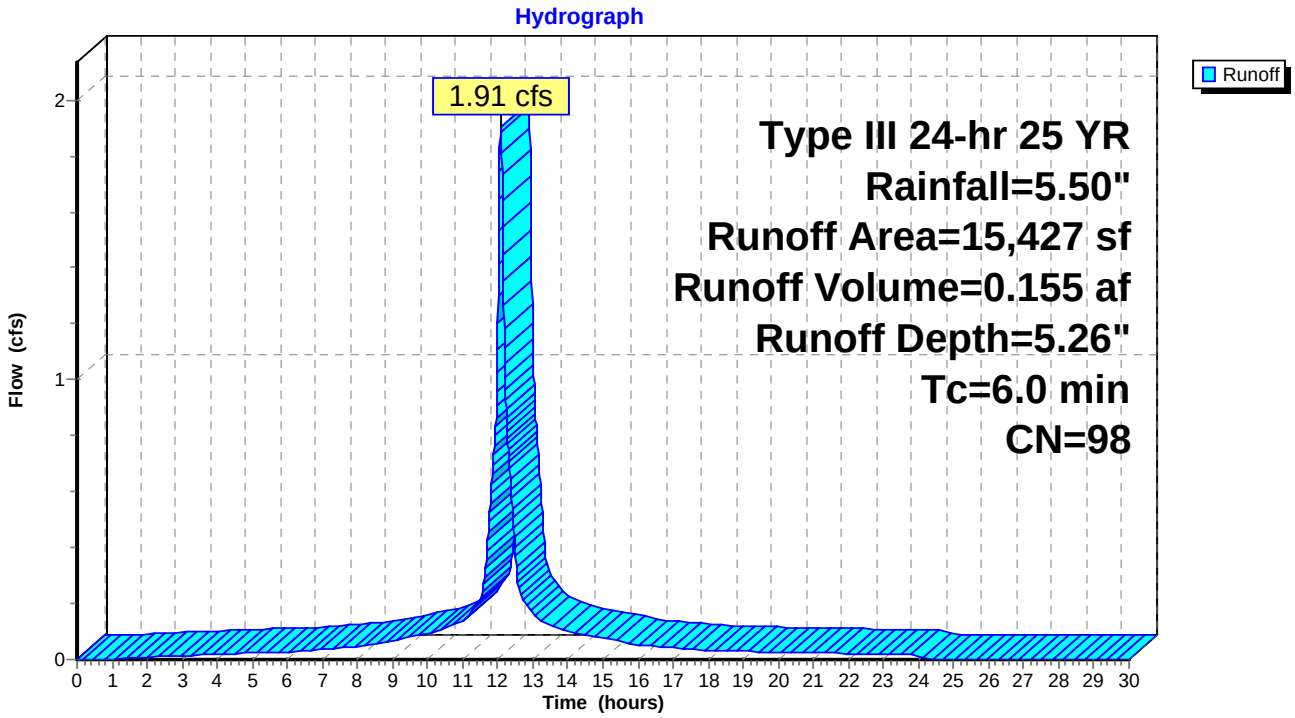
Runoff = 1.91 cfs @ 12.08 hrs, Volume= 0.155 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
15,279	98	Paved roads w/curbs & sewers
148	74	>75% Grass cover, Good, HSG C
15,427	98	Weighted Average
148		Pervious Area
15,279		Impervious Area

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

Subcatchment B3: B3



Summary for Subcatchment B4: B4

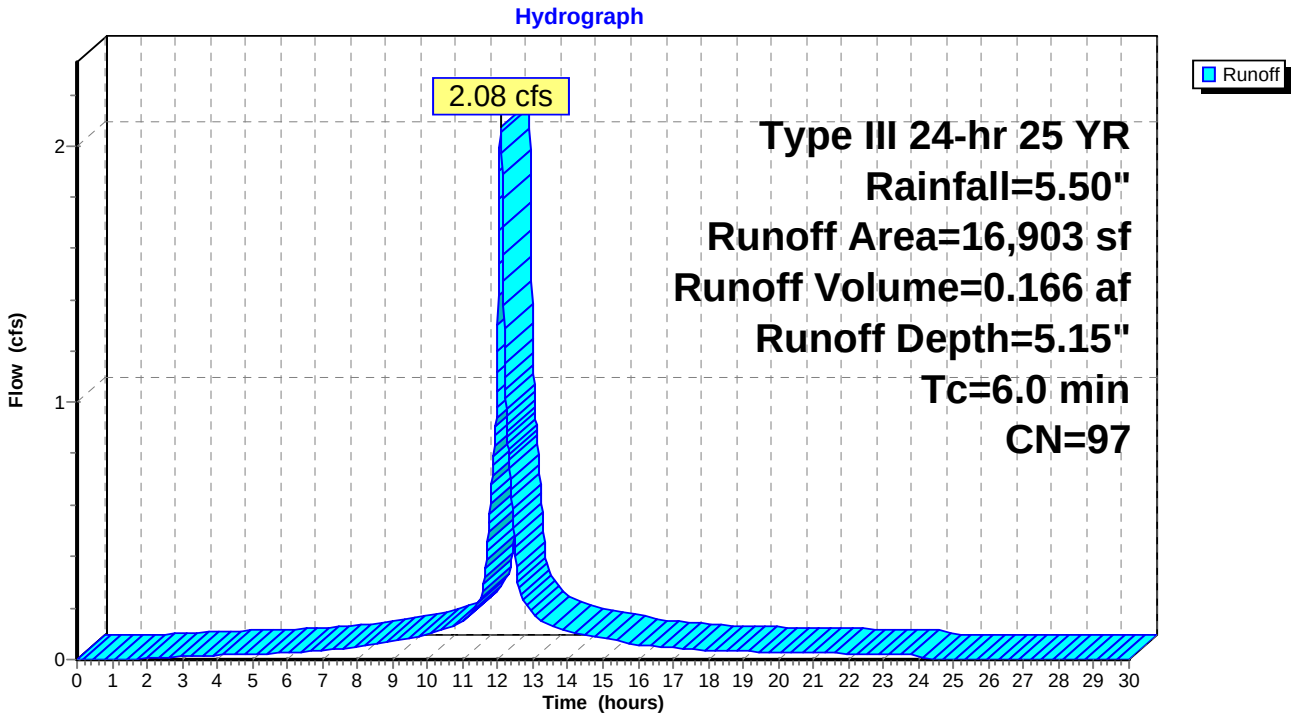
Runoff = 2.08 cfs @ 12.08 hrs, Volume= 0.166 af, Depth= 5.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
16,330	98	Paved roads w/curbs & sewers
573	74	>75% Grass cover, Good, HSG C
16,903	97	Weighted Average
573		Pervious Area
16,330		Impervious Area

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

Subcatchment B4: B4



Summary for Subcatchment B5: B5

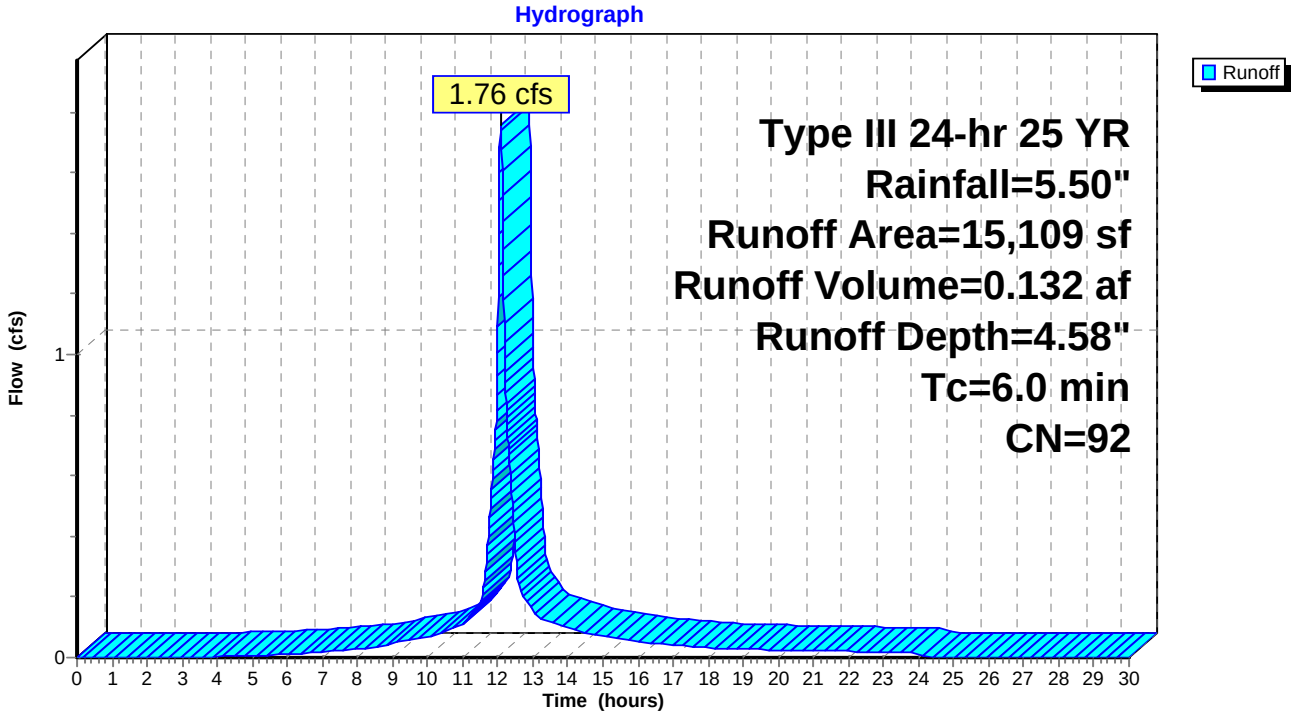
Runoff = 1.76 cfs @ 12.08 hrs, Volume= 0.132 af, Depth= 4.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
11,593	98	Paved roads w/curbs & sewers
2,175	70	Woods, Good, HSG C
868	71	Meadow, non-grazed, HSG C
473	74	>75% Grass cover, Good, HSG C
15,109	92	Weighted Average
3,516		Pervious Area
11,593		Impervious Area

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

Subcatchment B5: B5



Summary for Subcatchment C1: C1

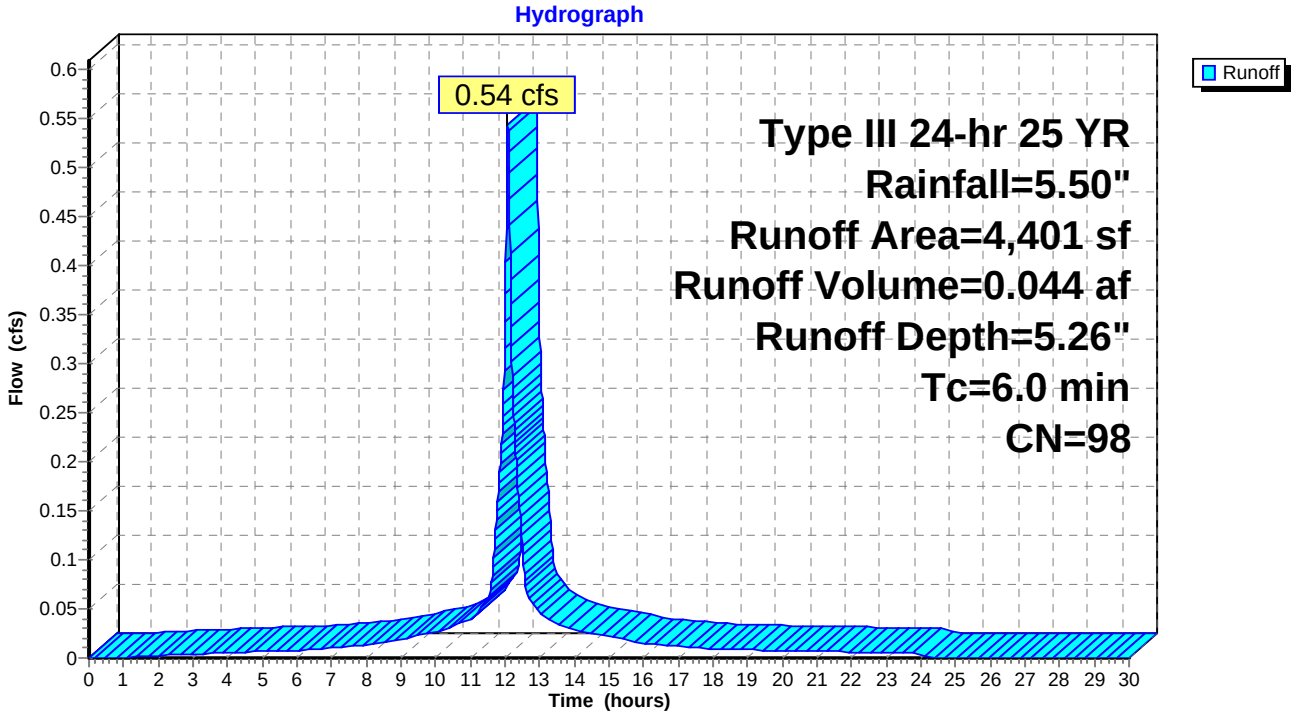
Runoff = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
4,401	98	Paved roads w/curbs & sewers
4,401		Impervious Area

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

Subcatchment C1: C1



Summary for Subcatchment DET: Detention Area

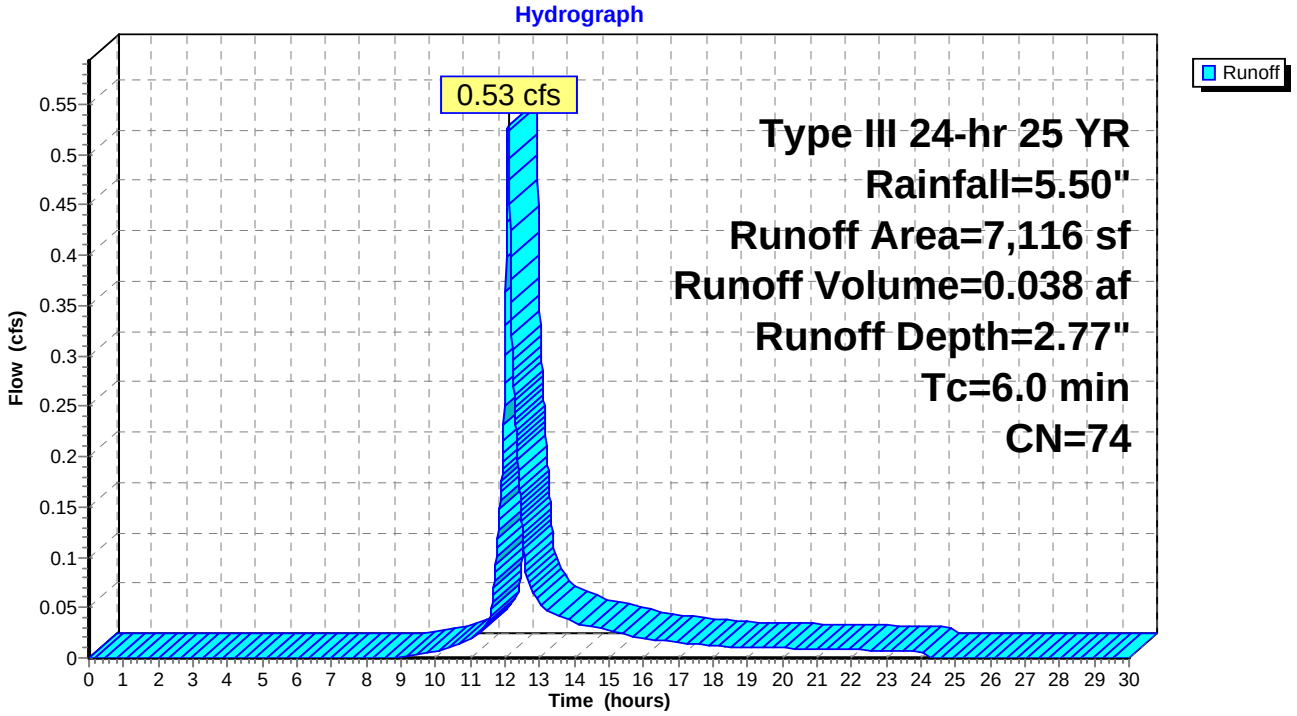
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 YR Rainfall=5.50"

Area (sf)	CN	Description
7,116	74	>75% Grass cover, Good, HSG C
7,116		Pervious Area

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

Subcatchment DET: Detention Area



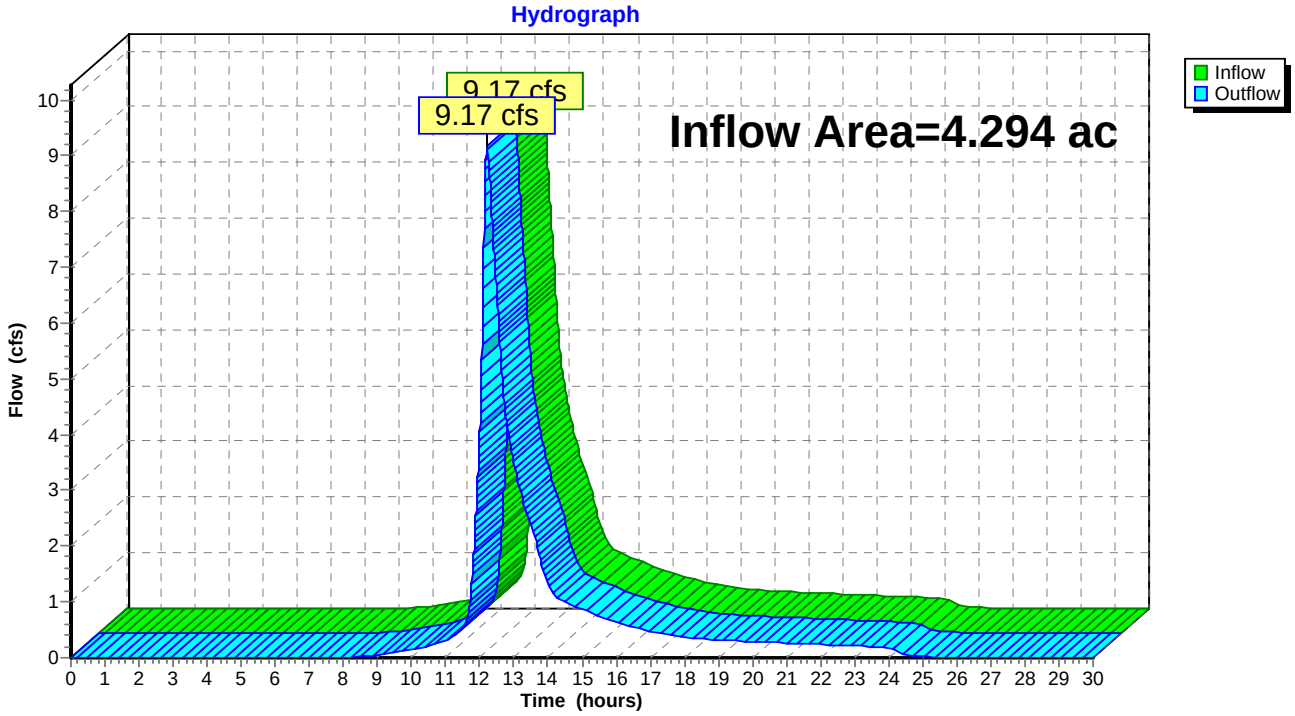
Summary for Reach POI 1: POI 1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.294 ac, 38.96% Impervious, Inflow Depth = 3.28" for 25 YR event
Inflow = 9.17 cfs @ 12.22 hrs, Volume= 1.174 af
Outflow = 9.17 cfs @ 12.22 hrs, Volume= 1.174 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach POI 1: POI 1



Summary for Reach R: R

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 5.26" for 25 YR event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af
Outflow = 0.29 cfs @ 12.21 hrs, Volume= 0.044 af, Atten= 47%, Lag= 7.6 min

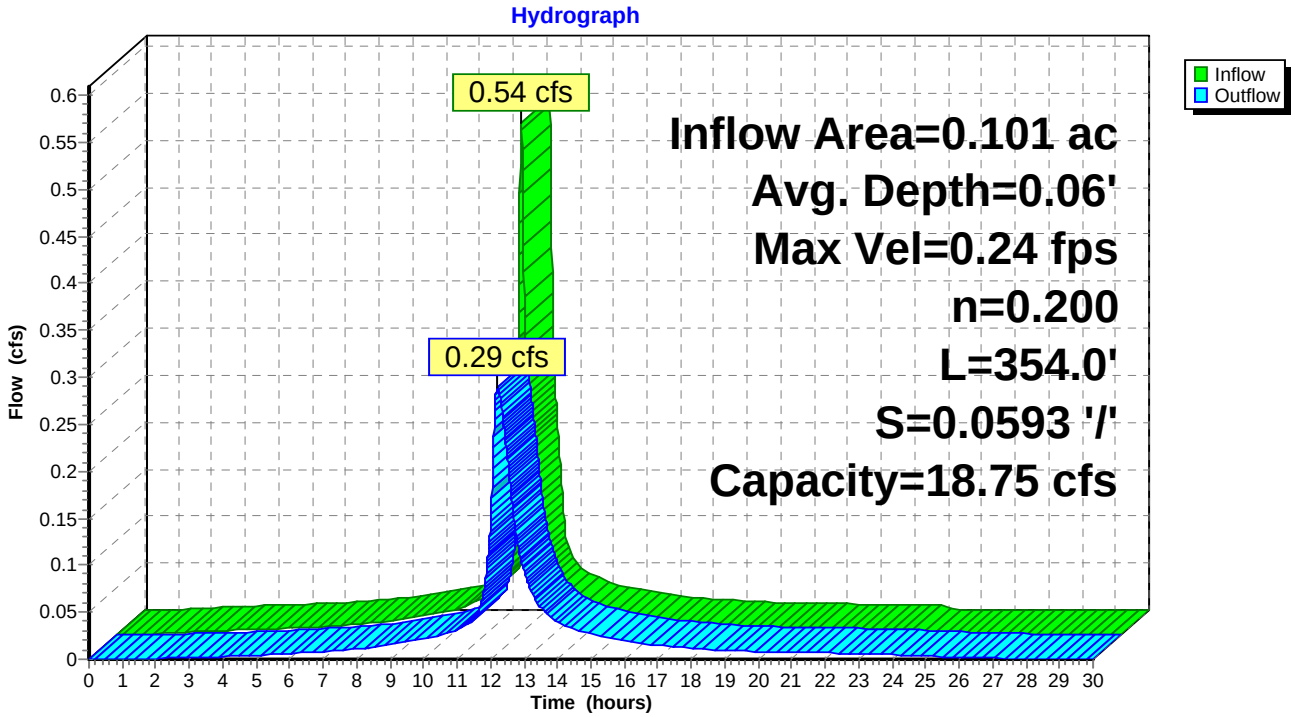
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.24 fps, Min. Travel Time= 24.2 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 77.1 min

Peak Storage= 421 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 18.75 cfs

18.00' x 0.50' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 72.00'
Length= 354.0' Slope= 0.0593 '/'
Inlet Invert= 95.00', Outlet Invert= 74.00'

‡

Reach R: R



Summary for Reach R1: R1

Inflow = 1.15 cfs @ 12.11 hrs, Volume= 0.010 af
Outflow = 0.34 cfs @ 12.19 hrs, Volume= 0.010 af, Atten= 71%, Lag= 4.5 min

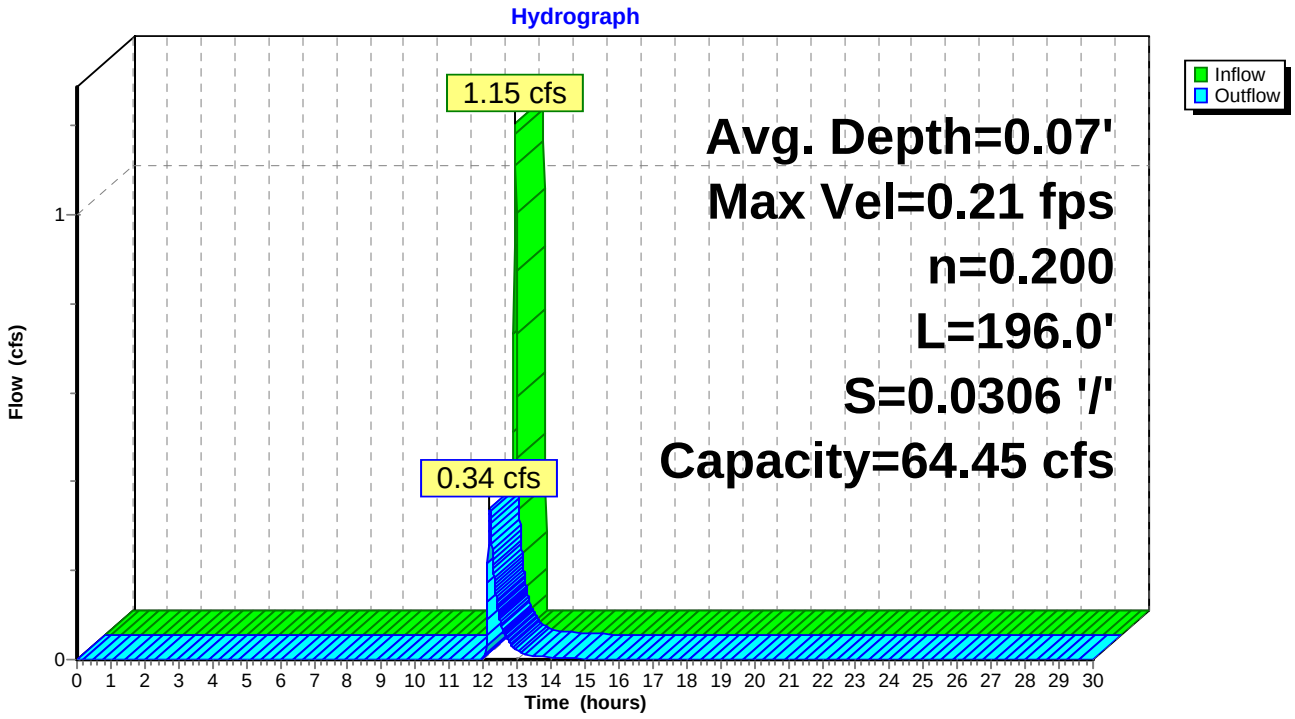
Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.21 fps, Min. Travel Time= 15.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 48.4 min

Peak Storage= 321 cf @ 12.19 hrs, Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.45 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 54.0 '/' Top Width= 126.00'
Length= 196.0' Slope= 0.0306 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'

‡

Reach R1: R1



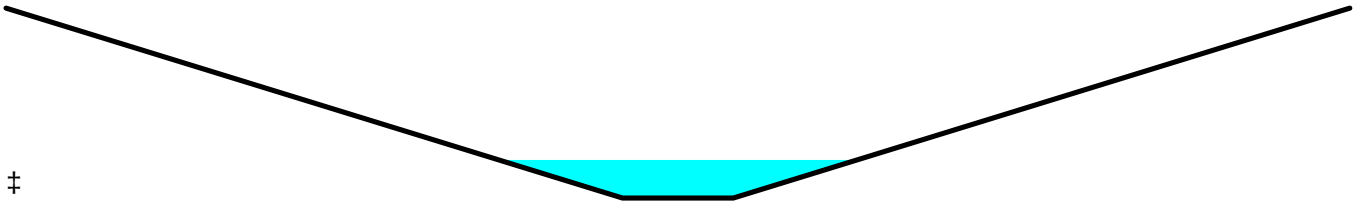
Summary for Reach R2: R2

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 3.52" for 25 YR event
Inflow = 3.09 cfs @ 12.43 hrs, Volume= 0.546 af
Outflow = 3.06 cfs @ 12.51 hrs, Volume= 0.546 af, Atten= 1%, Lag= 4.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.40 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 14.0 min

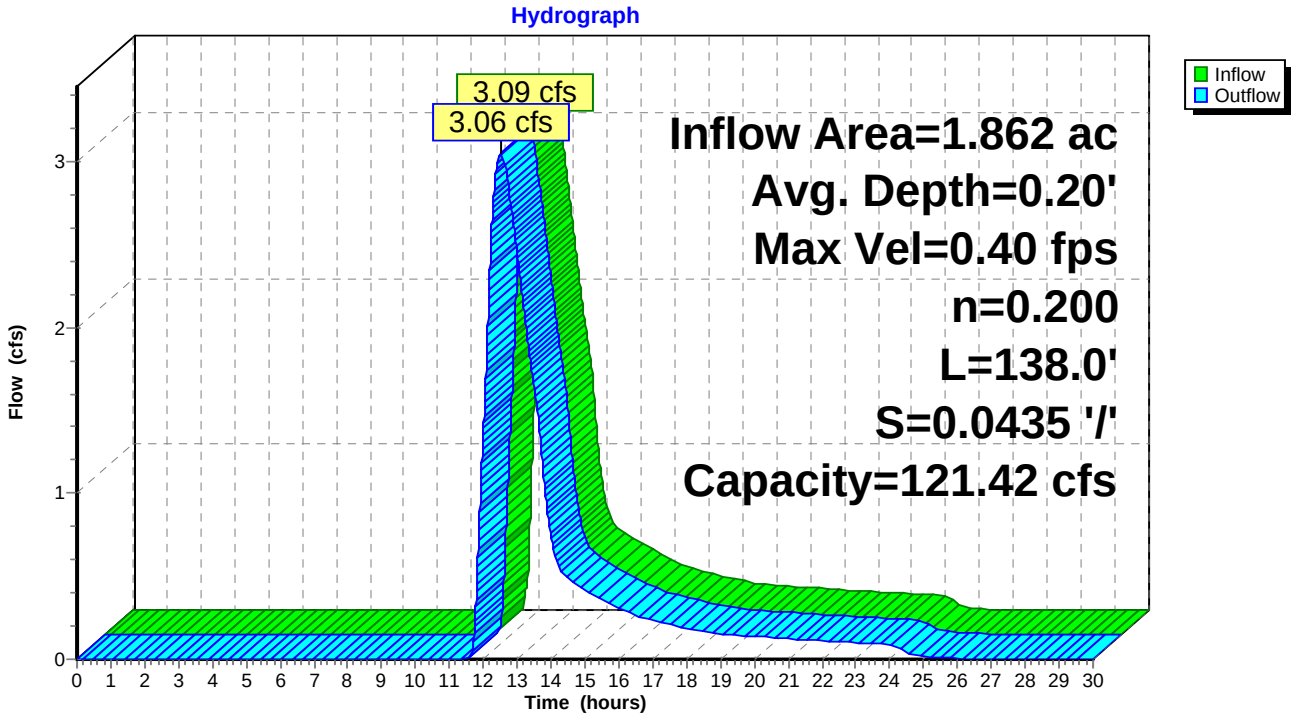
Peak Storage= 1,054 cf @ 12.51 hrs, Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 121.42 cfs

18.00' x 1.00' deep channel, n= 0.200 Sheet flow: Woods+light brush
Side Slope Z-value= 100.0 '/' Top Width= 218.00'
Length= 138.0' Slope= 0.0435 '/'
Inlet Invert= 80.00', Outlet Invert= 74.00'



‡

Reach R2: R2



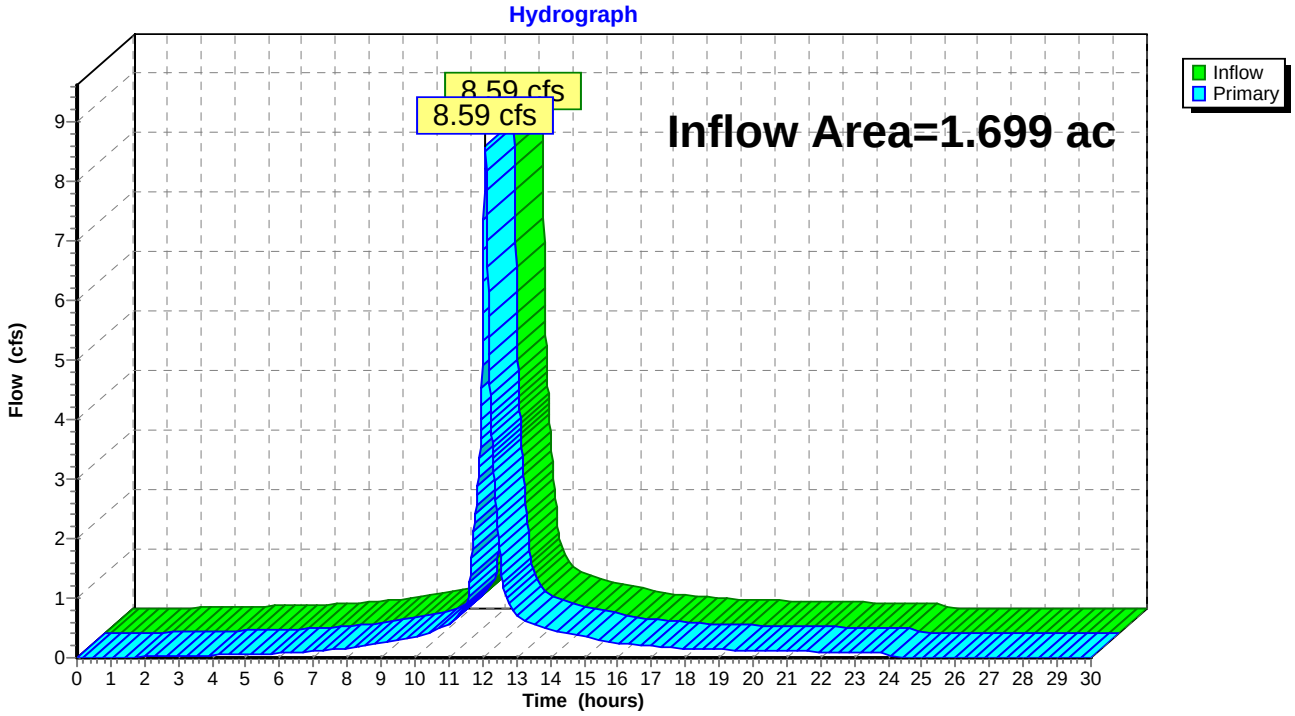
Summary for Pond CB B1: CB B1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.699 ac, 81.44% Impervious, Inflow Depth = 4.70" for 25 YR event
Inflow = 8.59 cfs @ 12.08 hrs, Volume= 0.666 af
Primary = 8.59 cfs @ 12.08 hrs, Volume= 0.666 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B1: CB B1



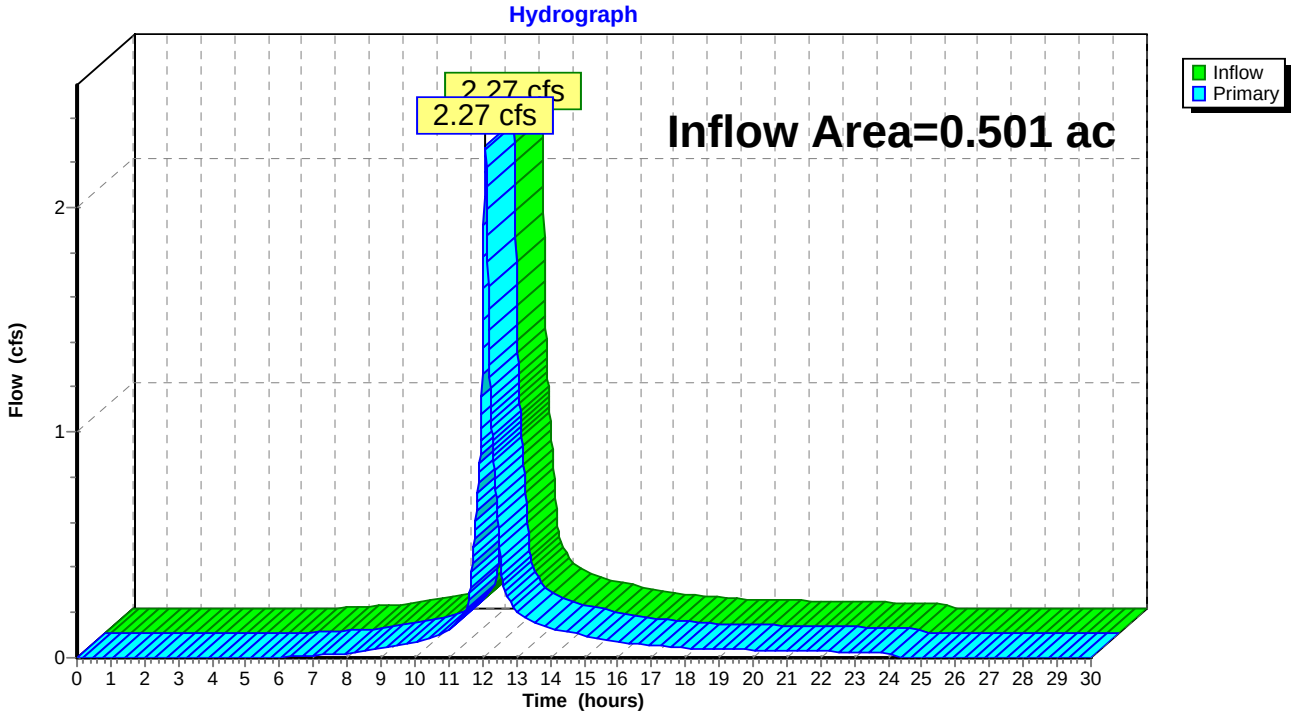
Summary for Pond CB B2: CB B2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.501 ac, 56.52% Impervious, Inflow Depth = 3.94" for 25 YR event
Inflow = 2.27 cfs @ 12.09 hrs, Volume= 0.164 af
Primary = 2.27 cfs @ 12.09 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B2: CB B2



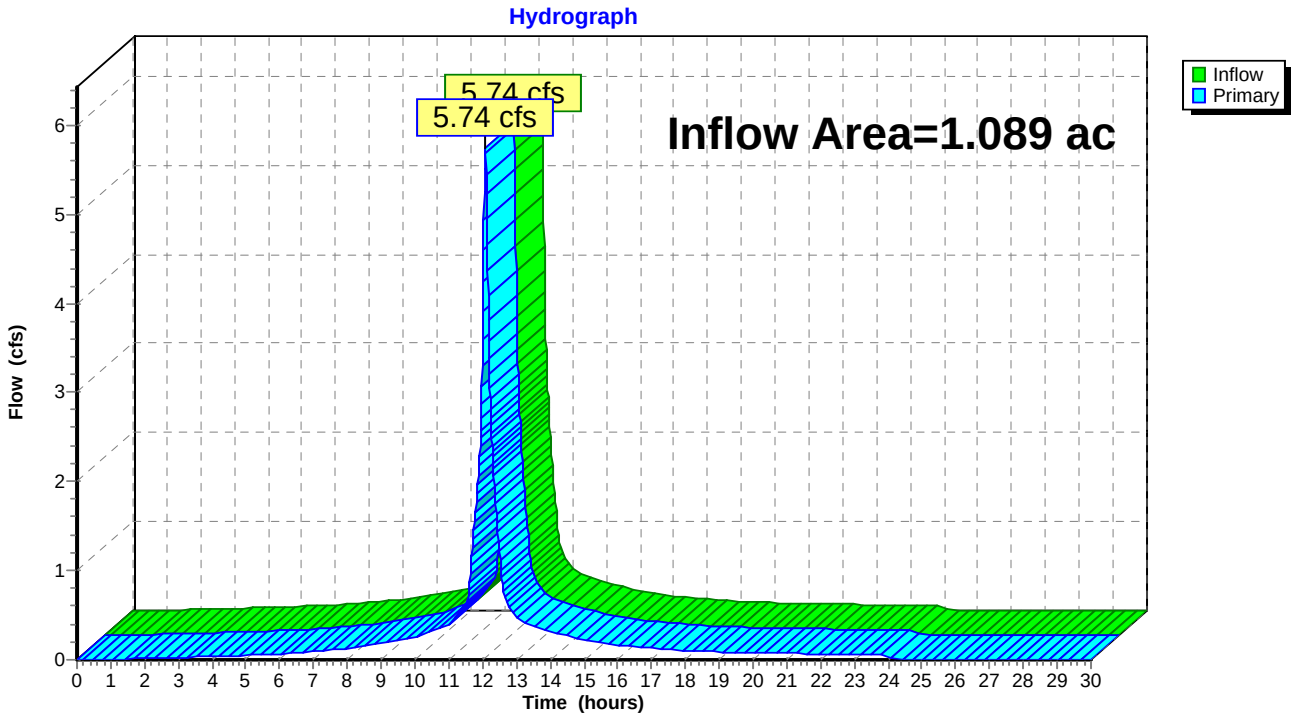
Summary for Pond CB B3: CB B3

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.089 ac, 91.07% Impervious, Inflow Depth = 5.00" for 25 YR event
Inflow = 5.74 cfs @ 12.08 hrs, Volume= 0.454 af
Primary = 5.74 cfs @ 12.08 hrs, Volume= 0.454 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B3: CB B3



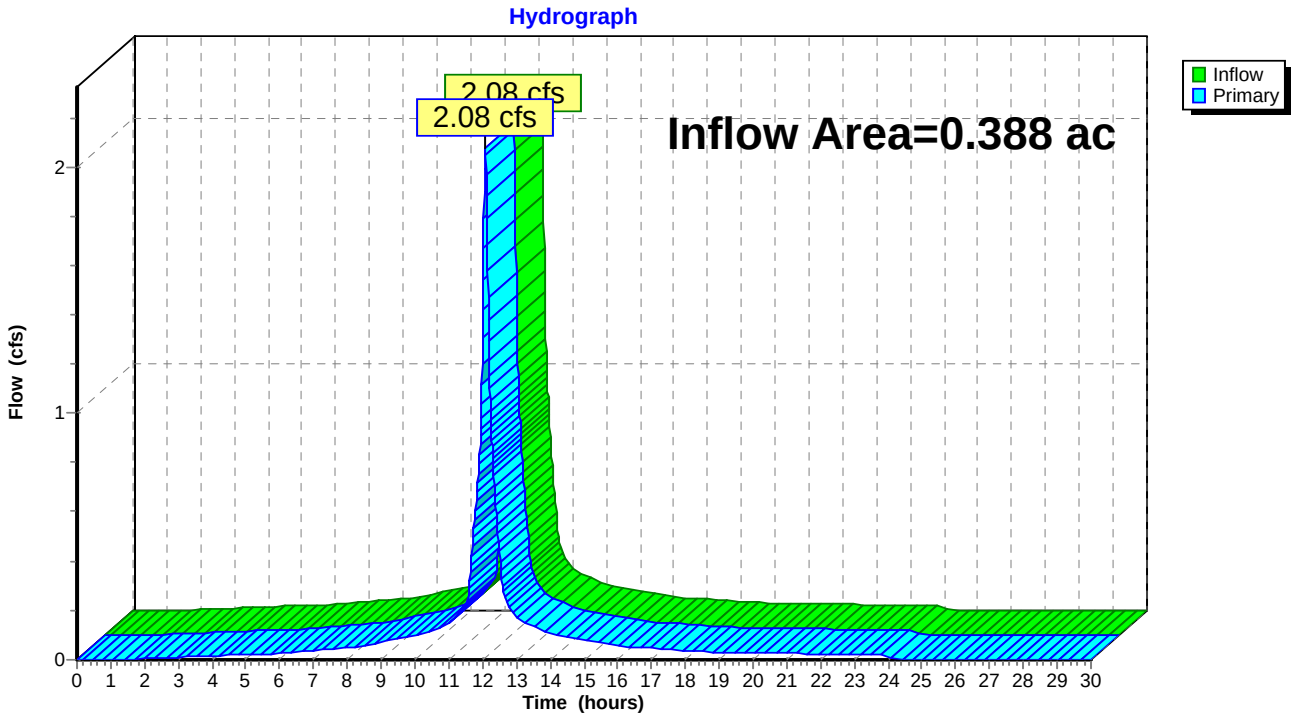
Summary for Pond CB B4: B4

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.388 ac, 96.61% Impervious, Inflow Depth = 5.15" for 25 YR event
Inflow = 2.08 cfs @ 12.08 hrs, Volume= 0.166 af
Primary = 2.08 cfs @ 12.08 hrs, Volume= 0.166 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B4: B4



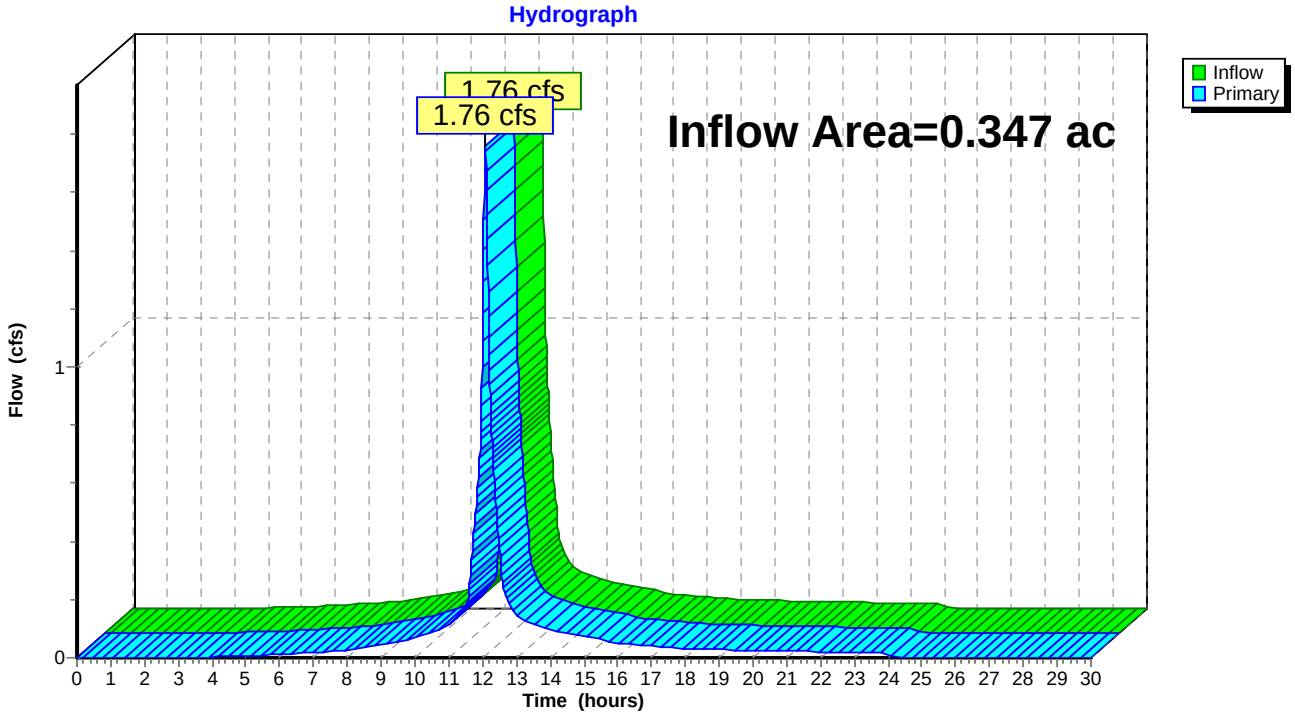
Summary for Pond CB B5: CB B5

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.347 ac, 76.73% Impervious, Inflow Depth = 4.58" for 25 YR event
Inflow = 1.76 cfs @ 12.08 hrs, Volume= 0.132 af
Primary = 1.76 cfs @ 12.08 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB B5: CB B5



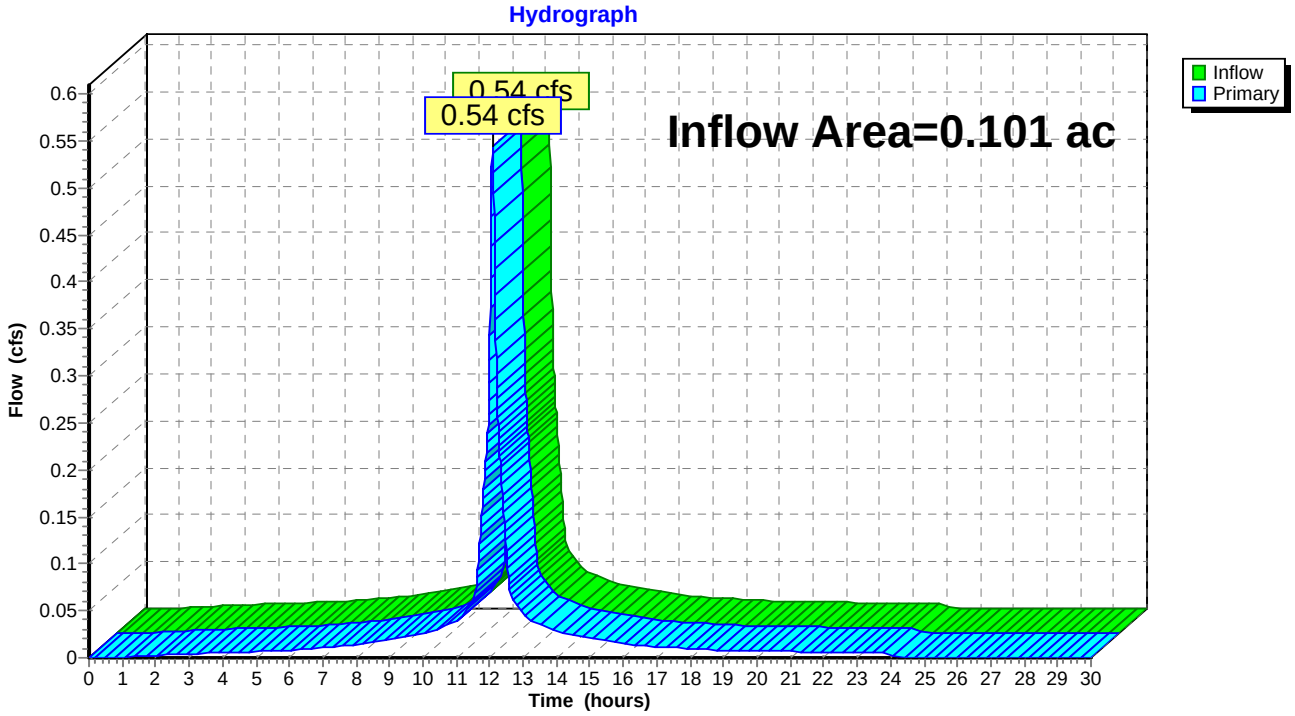
Summary for Pond CB C1: C1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.101 ac,100.00% Impervious, Inflow Depth = 5.26" for 25 YR event
Inflow = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af
Primary = 0.54 cfs @ 12.08 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond CB C1: C1



Summary for Pond DET 2: DET 2

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 3.52" for 25 YR event
Inflow = 7.53 cfs @ 12.11 hrs, Volume= 0.546 af
Outflow = 3.09 cfs @ 12.43 hrs, Volume= 0.546 af, Atten= 59%, Lag= 19.0 min
Primary = 3.09 cfs @ 12.43 hrs, Volume= 0.546 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 90.97' @ 12.43 hrs Surf.Area= 1,811 sf Storage= 5,587 cf

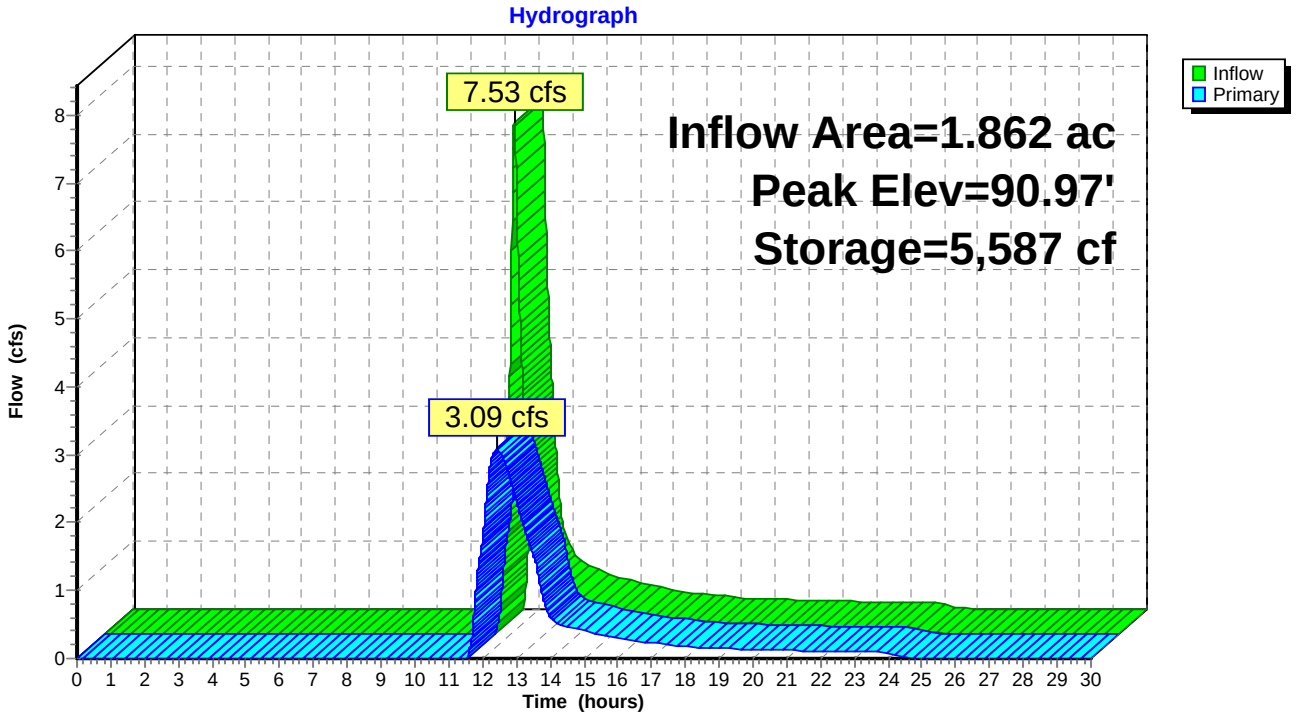
Plug-Flow detention time= 15.6 min calculated for 0.546 af (100% of inflow)
Center-of-Mass det. time= 15.5 min (855.5 - 840.0)

Volume	Invert	Avail.Storage	Storage Description
#1	86.50'	3,190 cf	**28.50'W x 63.54'L x 7.00'H Prismatoid** 12,676 cf Overall - 4,702 cf Embedded = 7,975 cf x 40.0% Voids
#2	87.50'	4,702 cf	**100.0"W x 60.0"H x 4.03'L Parabolic Arch** x 42 Inside #1
		7,891 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	86.30'	**12.0" x 52.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 81.00' S= 0.1019 '/' Cc= 0.900 n= 0.012
#2	Device 1	86.30'	**7.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=3.09 cfs @ 12.43 hrs HW=90.97' TW=80.20' (Dynamic Tailwater)
└**1=Culvert** (Passes 3.09 cfs of 6.10 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 3.09 cfs @ 10.06 fps)

Pond DET 2: DET 2



Summary for Pond DET O: OPEN BASIN

Inflow Area = 1.862 ac, 74.30% Impervious, Inflow Depth = 4.53" for 25 YR event
Inflow = 9.12 cfs @ 12.08 hrs, Volume= 0.704 af
Outflow = 8.68 cfs @ 12.11 hrs, Volume= 0.556 af, Atten= 5%, Lag= 1.6 min
Primary = 7.53 cfs @ 12.11 hrs, Volume= 0.546 af
Secondary = 1.15 cfs @ 12.11 hrs, Volume= 0.010 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 91.55' @ 12.11 hrs Surf.Area= 0 sf Storage= 8,319 cf

Plug-Flow detention time= 145.2 min calculated for 0.556 af (79% of inflow)
Center-of-Mass det. time= 66.2 min (838.0 - 771.8)

Volume	Invert	Avail.Storage	Storage Description
#1	88.42'	9,834 cf	**Custom Stage Data** Listed below

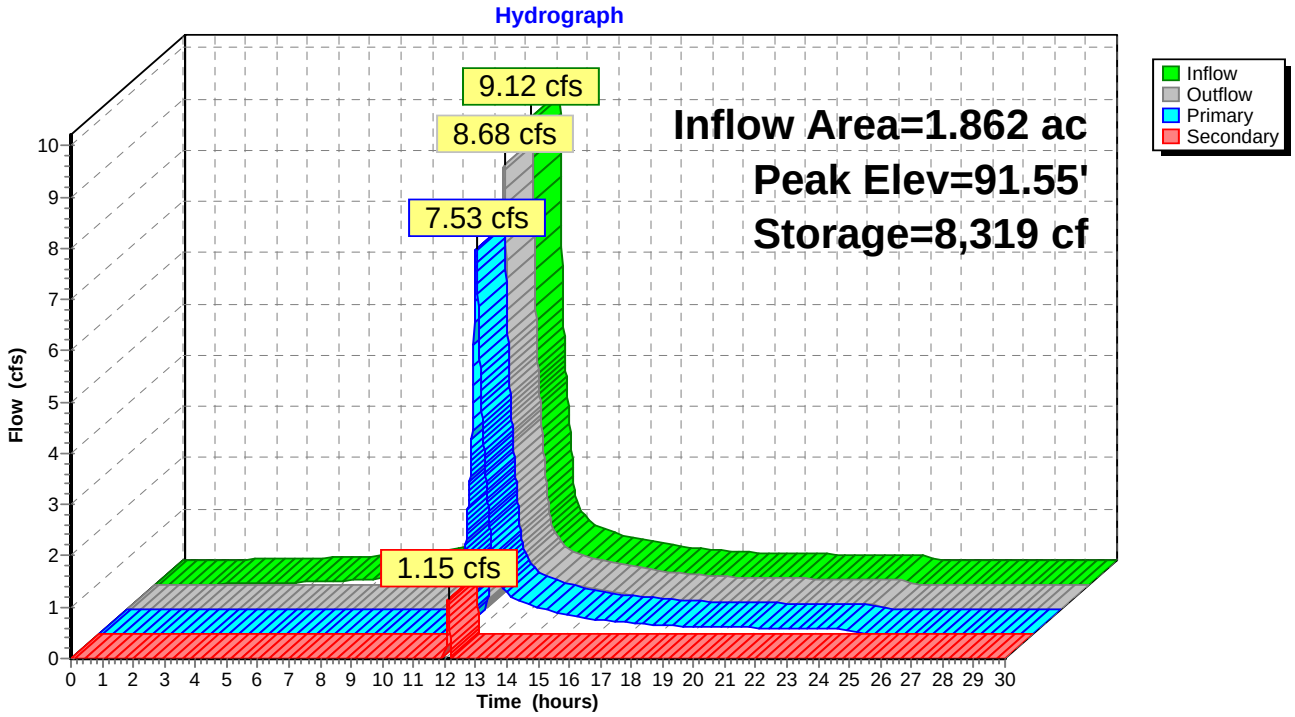
Elevation (feet)	Cum.Store (cubic-feet)
88.42	0
89.00	1,177
90.00	3,560
91.00	6,438
92.00	9,834

Device	Routing	Invert	Outlet Devices
#1	Primary	88.00'	**24.0" x 20.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 86.50' S= 0.0750 '/' Cc= 0.900 n= 0.012
#2	Device 1	91.00'	**6.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Secondary	91.45'	**13.0' long x 14.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

Primary OutFlow Max=7.53 cfs @ 12.11 hrs HW=91.55' TW=89.11' (Dynamic Tailwater)
└**1=Culvert** (Passes 7.53 cfs of 18.66 cfs potential flow)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 7.53 cfs @ 2.26 fps)

Secondary OutFlow Max=1.15 cfs @ 12.11 hrs HW=91.55' TW=80.04' (Dynamic Tailwater)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.15 cfs @ 0.85 fps)

Pond DET O: OPEN BASIN



APPENDIX F

Open Detention Basin Stage Storage Computations

STAGE STORAGE CALCULATIONS

Sediment Forebay Volume

Stage	Elevation (ft)	Area (sq.ft)	Volume (cubic.ft)
0	85	17	0
1	86	120	69
2	87	307	282
3	88	568	720

Permanent Pool

Stage	Elevation (ft)	Area (sq.ft)	Volume (cubic.ft)	
0	88.42	1895	0	
0.58	89	2162	1,177	
1.58	90	2630	3,573	
2.58	91	3127	6,451	6252 WQv Required
3.58	92	3664	9,847	

APPENDIX G

Water Quality Summary Chart and Computations

Stormwater Quality Treatment Computation Sheet
Stormtreat System

Area Tributary to the WQ Treatment Area

Subcatchment ID	Pervious Area	Impervious Area	Total Area
B1	0	4,719	4,719
B2	9,498	12,346	21,844
B3	148	21,696	21,844
B4	573	16,330	16,903
B5	3,516	11,593	15,109
Sub Total (B Series)	13,735	66,684	80,419
Sub Total (B Series)	0.32	1.53	1.85
WQF (SF)	7,116	0	7,116
WQF (AC)	0.16	0.00	0.16
Treatement Total (SF)	20,851	66,684	87,535
Treatement Total (AC)	0.48	1.53	2.01

Site Area

AREA	UNIT	DESCRIPTION
3.24	AC	Original Parcel
0.12	AC	Entrance Easement Area
3.36	AC	Total Project Area

Offisite Area Being Treated	6,572	1,343	SF
Onsite Developed Area NOT Being Treated	15,277	3,109	SF
Total Onsite Impervious Area (SF)		68,450	SF
Total Onsite Impervious Area (SF)		1.57	AC
Total Onsite Developed Pervious Area (SF)	29,556		SF
Total Onsite Development Pervious Area (SF)	0.68		AC

Total Onsite Developed Area	98,006	2.25	AC

Percent of Impervious Area Treated		97.42%		≥ 95% Required
Percent of Devolped Area Treated			89.32%	≥ 80% Required
			Total	
Water Quality Volume Required (CF)	695	5557	6252	CF
Water Quality Volume Provided (CF)			6451	CF
Stormfilter Cartridges Required (Units)			5.41	Units*
Stormfilter Cartridges Provided (Units)			6	Units*

*** Stormtreats can treat upwards of 1155 CF of Water Quality Volume per unit per the MeDEP Chapter 500 Regulations**

APPENDIX H

Orifice Drawdown Computations

STORMTREAT OUTLET CONTROL

DRAWDOWN CALCULATIONS
C-STORE AND FUELING STATION
Portland, ME

3118
BEK
MARCH 2013

ORIFICE DIAMETER FOR STORMTREAT OUTLET DISCHARGE

Description of Elevation	Elevation	Depth (ft)	Incremental Stage Volume (c.f)	Cumulative Volume (c.f.)	Head (ft)	Orifice Flow (cfs)	**Orifice Flow (gal/min)	Drawdown Time (secs)	Drawdown Time (hours)	Cumulative *Drawdown Time (hours)
	91.50	3.08	1698.00	8136.00	3.55	0.0293	13.161	57902.31	16.1	95.7
Elevation of Overflow Weir	91.00	2.58	2878.00	6438.00	3.05	0.0272	12.199	105879.83	29.4	79.6
	90.00	1.58	2383.00	3560.00	2.05	0.0223	10.001	106934.91	29.7	50.2
	89.00	0.58	1177.00	1177.00	1.05	0.0159	7.158	73799.63	20.5	20.5
Bottom of Storage	88.42	0.00	0.00	0.00	0.47	0.0107	4.789	0.00	0.0	0.0
Invert of Orifice	87.50									
Bottom of Stormtreat Tank	87.50									

*TARGET IS 72 HOURS OR LESS AT ELEVATION 91.00

**Target outflow is 2 gal/min per tank

StormTreat Tanks	6	EA
Target Flow at Peak 3 above outlet of tank	12	Gal/min

$Q=CA\ (2gh)^{1/2}$

Orifice Diameter	0.77	inch
Area	0.0032	sq.ft
Head		feet
g	32.174	ft/s^2
C	0.6	Orifice/Grate

APPENDIX I

Geotechnical Exploration Test Pit Logs

REPORT

March 29, 2013
12-0946.1 S

Geotechnical Engineering Services

Proposed Gas Station & Convenience Store
2282 Congress Street
Portland, Maine

PREPARED FOR:
CJ Developers, Inc.
Attn: David Latulippe
35 Primrose Lane
Freeport, ME 04032

PREPARED BY:
S.W.COLE ENGINEERING, INC.
286 Portland Road
Gray, Maine 04039
207-657-2866

S.W.COLE ENGINEERING, INC.

- *Geotechnical Engineering*
- *Construction Materials Testing*
- *GeoEnvironmental Services*
- *Ecological Services*

www.swcole.com

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Sheet 1	Exploration Location Plan
Sheet 2	Underdrain Detail
Appendix A	Exploration Logs
Appendix B	Gradation Test Results

12-0946.1 S

March 29, 2013

CJ Developers, Inc.
Attn: David Latulippe
35 Primrose Lane
Freeport, ME 04032

Subject: Geotechnical Engineering Services
Proposed Gas Station and Convenience Store
2282 Congress Street
Portland, Maine

Dear David:

In accordance with our Agreement dated February 26, 2013, we have performed subsurface explorations for the subject project in Portland, Maine. This report presents our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Attachment A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services were to obtain subsurface information at the site in order to provide geotechnical recommendations relative to foundations and earthwork associated with the proposed construction. Our scope of services included the making of thirteen test pits, soils laboratory testing, a geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Proposed Construction

Based on the information provided, we understand development plans call for construction of a single-story commercial building, pump islands, underground storage tanks (USTs) and associated paved areas. We understand the building will be a lightly-loaded, steel or wood-framed structure. We understand the building will occupy a plan area of 3,850 SF with finished floor elevation of 98 to 99 feet. Two, UST areas are

proposed for the site. A stormwater management area is proposed along the east edge of the site. We understand tapered cuts approaching 2 feet and tapered fills approaching 15 feet are proposed on the site grading plan prepared by DeLuca-Hoffman Associates (project engineer). Proposed and existing site features are shown on the "Exploration Location Plan" attached as Sheet 1.

2.0 EXPLORATION AND TESTING

2.1 Explorations

Thirteen test pits (TP-1 to TP-13) were made at the site on March 21, 2013, by Shaw Brothers Construction, Inc. of Gorham, Maine working under subcontract to S.W.COLE ENGINEERING, INC. The exploration locations were selected and established at the site using taped measurements from existing site features by S.W.COLE ENGINEERING, INC. The approximate exploration locations are shown on the "Exploration Location Plan" attached as Sheet 1. Logs of the explorations are attached as Appendix A.

2.2 Testing

Soil samples obtained from the test pits were returned to our laboratory for classification and testing. The results of two gradation tests and moisture content tests are attached as Appendix B.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Conditions

The proposed site is at 2282 Congress Street in Portland, Maine. The site is undeveloped and partially vegetated. The site slopes downward from northwest to southeast with about 20 feet of topographic relief across the site. Existing site features are shown on the Exploration Location Plan attached as Sheet 1.

3.2 Subsurface Conditions

Below a surficial layer of topsoil, the test pits generally encountered a soil and bedrock profile consisting of silty sand overlying sandy silt with gravel overlying relatively shallow bedrock. A stratum of relatively stiff silty clay was encountered below the sandy silt at several of the test pit locations. The soils were observed to be generally saturated below a depth of about 2 feet and, where encountered, groundwater seepage was observed at

depths of 1.8 to 3.4 feet in the lower elevations of the site. It should be anticipated that seasonal groundwater levels will fluctuate, especially during periods of snowmelt and precipitation. Refer to the attached logs for more detailed subsurface information.

3.3 Seismic and Frost Considerations

The 25-year Air Freezing Index for the Portland, Maine area is about 1,290-Fahrenheit degree-days, which corresponds to a frost penetration depth on the order of 4.5 feet. Based on the subsurface findings and our understanding of the proposed construction, we interpret the site soils to correspond to Seismic Site Class C in accordance with IBC 2009.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 General Findings

Based on the subsurface findings, the proposed construction appears feasible from a geotechnical standpoint. The principle geotechnical considerations are as follows:

- Spread footing foundations and on-grade floor slabs bearing on properly prepared subgrades appear appropriate for the proposed construction.

- Relatively shallow bedrock was encountered at the site that will likely require blasting and hoe-ramming for excavation. The depth of blasting should be controlled to a depth of about 1-foot below proposed subgrade elevations to reduce overblasting that can compromise bearing surfaces for foundations, floor slabs and buried utilities.

- The native silty sand and sandy silt appear suitable for reuse as compacted fill to raise site grades outside of the building footprint, provided they are used during drier, non-freezing weather and are aerated to a compactable moisture content.

4.2 Site and Subgrade Preparation

We recommend site preparation begin with the construction of an erosion control system to protect adjacent drainage ways and areas outside the construction limits. As much vegetation and pavement as possible should remain outside the construction areas to lessen the potential for erosion and site disturbance.

Following stripping and grubbing of the site, blasting will be required to achieve proposed grades in the building area and portions of the paved areas. We recommend that blasting for bedrock removal be performed to at least 1 foot below proposed subgrade elevations. Loose and overblasted bedrock should be removed beneath the building footprint after blasting. Crushed stone should be thoroughly worked into the bedrock surface to choke any voids or fractures in the bedrock. Soil subgrades that become disturbed as a result of adjacent blasting should be removed and replaced with compacted Structural Fill. We recommend footings be founded on 6-inches of compacted Crushed Stone overlying properly prepared subgrades.

The contractor must take appropriate measures to protect exposed subgrades. Construction traffic should be limited on exposed subgrades. Final cuts in soil subgrades should be performed with a smooth-edged bucket to help minimize soil disturbance. If native soil subgrades become disturbed, they should be recompacted or overexcavated and backfilled with compacted Structural Fill, as appropriate.

4.3 Excavation and Dewatering

Excavations will generally encounter silty sand, sandy silt, and bedrock. Final cuts in soil subgrades should be performed with a smooth-edged bucket to help minimize soil disturbance. Care must be exercised during construction to minimize disturbance of the bearing soils.

Significant groundwater was not observed during the explorations. Sumping and pumping dewatering techniques should be adequate to control groundwater in excavations. Controlling the water levels, if encountered, to at least one foot below planned excavation depths will help stabilize the subgrade during construction.

Excavations must be properly shored and/or sloped to prevent sloughing and caving of the sidewalls during construction. All excavations should be consistent with the OSHA trenching regulations. Handling and disposal of existing soils must be performed in accordance with all local and federal regulations.

4.4 Foundations

We recommend the proposed building be supported on spread footings founded on 6-inches of compacted crushed stone overlying properly prepared subgrades. Due to

relatively shallow bedrock, we recommend insulated, frost-protect footings cast 2.5 feet below exterior grades. Rigid, extruded polystyrene foundation insulation should be provided along the vertical faces of the perimeter frost wall and horizontally off the frost wall. For insulated frost-protected footings founded on properly prepared subgrade, we recommend the following geotechnical parameters for design consideration:

- Design Frost Depth = 4.5 feet (uninsulated)
- Design Frost Depth = 2.5 feet (insulated)
- Net Allowable Bearing Pressure = 2.0 ksf or less
- Base Friction Factor = 0.4
- Passive Lateral Earth Pressure Coefficient = 3.0 (ultimate)
- At-Rest Lateral Earth Pressure Coefficient = 0.5
- Total Unit Weight of Backfill = 130 pcf
- Internal Friction Angle = 30 degrees
- Seismic Soil Site Class = C (IBC 2009)

General details of the recommended insulated frost-protected footings are shown on Sheet 2.

4.5 Foundation Drainage

We recommend installation of foundation underdrains around the building perimeter footings. The underdrain should consist of 4-inch diameter perforated underdrain pipe enveloped in ¾-inch crushed stone wrapped in filter fabric, such as Mirafi 140N. The underdrain must have a gravity outlet. General underdrain details are shown on Sheet 2.

4.6 Floor Slabs

We recommend on-grade concrete floors be supported on a minimum of 12 inches of compacted crushed stone. On-grade floor slabs founded on properly prepared subgrades may be designed considering a modulus of subgrade reaction of 120 pci. The structural engineer or concrete consultant must design steel reinforcing and joint spacing appropriate to slab thickness and function.

We recommend a sub-slab vapor retarder particularly in areas of the building where the concrete slab will be covered with an impermeable surface treatment or floor covering that may be sensitive to moisture vapors. The presence of shallow bedrock beneath the

proposed building increases the risk of radon intrusion in the building. Consequently, building design should include a subslab radon venting system and positive building pressurization.

The floor slab should be appropriately cured using moisture retention methods after casting. Typical floor slab curing methods should be used for at least 7 days. The architect or flooring consultant should assign curing methods consistent with current applicable American Concrete Institute (ACI) procedures with consideration of curing method compatibility to proposed surface treatments, flooring and adhesive materials.

4.7 Entrance Slabs and Sidewalks

Entrance slabs and sidewalks adjacent to buildings must be designed to reduce the effects of differential frost action between adjacent pavement, doorways, and entrances. We recommend that clean, non-frost susceptible Structural Fill be provided to a depth of 2.5 feet (insulated footings) or 4.5 feet (uninsulated footings) below the top of entrance slabs. This thickness of Structural Fill should extend the full width of the entrance slabs and outward at least 4.5 feet, thereafter transitioning up to the bottom of the adjacent sidewalk or pavement subbase gravel at a 3H:1V or flatter slope. General details of the recommended frost transition zone are shown on Sheet 2.

4.8 Backfill and Compaction

Based on the subsurface findings, the existing soils are frost susceptible and unsuitable for reuse as foundation backfill, but may be reused as compacted fill in paved and landscape areas. We recommend the following fill and backfill materials.

Granular Borrow: Compacted fill to raise site grades should be sand, silty sand or sand and gravel meeting the requirements of MDOT Standard Specification 703.19 “Granular Borrow”.

Rock Borrow: Blasted bedrock to raise site grades in paved areas should meet the requirements of MDOT Standard Specification 703.21 “Rock Borrow” with a maximum particle size of 3 feet in greatest dimension.

Crushed Stone: Crushed Stone, used below footings, as drainage aggregate, and as choke material to fill voids in bedrock surfaces should meet the gradation requirements of MDOT Standard Specifications 703.22 "Underdrain Backfill Type C".

Structural Fill: Fill to raise site grades over wet subgrades, backfill for foundations, and base material below on-grade floor slabs should be clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

Structural Fill	
Sieve Size	**Percent Finer by Weight**
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 5

Reuse of Existing Soils and Bedrock: The existing site soils are moisture sensitive and frost susceptible and are unsuitable for reuse in the building area, but may be reused as to raise grades in proposed paved areas during dry and non-freezing conditions. Blasted bedrock may be reused as Rock Borrow to raise grades in the proposed paved areas. Additionally, blasted bedrock may be processed on-site and blended with sand to create Structural Fill and pavement gravels.

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building and paved areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557. Rock Borrow which may be placed in lifts not exceeded 3 feet, compacted and choked with stone such that voids are filled within the Rock Borrow mass prior to placing the next lift.

4.9 Stormwater Pond Considerations

Based on the subsurface findings and our understanding of the proposed construction, we anticipate that portions of the proposed stormwater management area will require bedrock removal and others will be at or above groundwater. Consequently, we recommend the stormwater management area be underlain with a stone drainage

blanket with underdrain pipes outlet to a gravity outlet. Alternatively, the stormwater management area could be lined with 12 inches of native sandy silt or silty clay to isolated the stormwater management area from groundwater.

4.10 Weather Considerations

The native soils on-site are easily disturbed especially when wet. Construction activity should be limited during wet and freezing weather and the native soils may require drying before construction activities may continue. The contractor should anticipate the need for water to temper fills in order to facilitate compaction during dry weather. If construction takes place during cold weather, subgrades, foundations and floor slabs must be protected during freezing conditions. Concrete and fill must not be placed on frozen soil; and once placed, the concrete and soil beneath the structure must be protected from freezing.

4.11 Design Review and Construction Testing

S.W.COLE ENGINEERING, INC. should be retained to review the final design and specifications to determine that our earthwork and foundation recommendations have been properly interpreted and implemented.

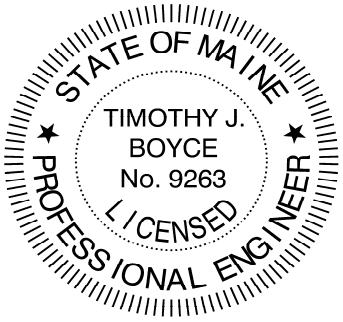
A soils and concrete testing program should also be implemented during construction to observe compliance with the design concepts, plans, and specifications. S.W.COLE ENGINEERING, INC. is available to provide subgrade observations for foundations, as well as testing services for soils, concrete, steel and asphalt.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you during the construction phase of the project.

Sincerely,

S.W.COLE ENGINEERING, INC.



Timothy J. Boyce, P.E.
Senior Geotechnical Engineer

TJB:emw

Attachment A
Limitations

This report has been prepared for the exclusive use of CJ Developers for specific application to the Proposed Gas Station & Convenience Store at 2282 Congress Street in Portland, Maine. S.W.COLE ENGINEERING, INC. has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

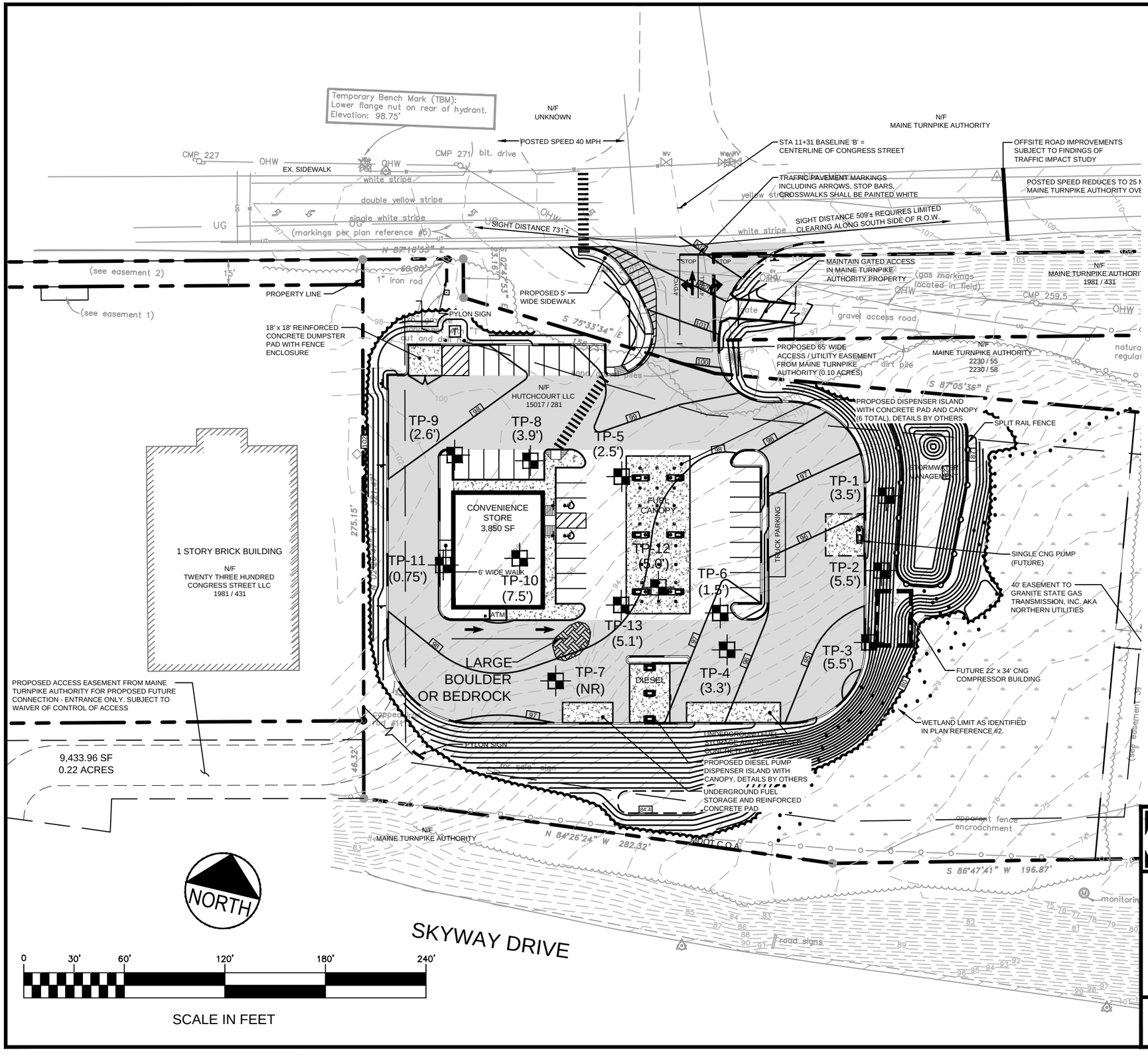
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE ENGINEERING, INC.'s scope of work has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE ENGINEERING, INC. should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE ENGINEERING, INC.



LEGEND:

APPROXIMATE TEST PIT LOCATION

(4.5') DEPTH TO REFUSAL

(NR) NO REFUSAL TO DEPTH EXPLORED

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=30' SCALE PLAN OF THE SITE ENTITLED "GRADING AND DRAINAGE PLAN", PREPARED BY DELUCA-HOFFMAN ASSOCIATES, INC., DATED 03-26-2013.
2. THE EXPLORATIONS WERE LOCATED IN THE FIELD BY TAPED MEASUREMENTS FROM EXISTING SITE FEATURES.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S.W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

S.W.COLE
ENGINEERING, INC.

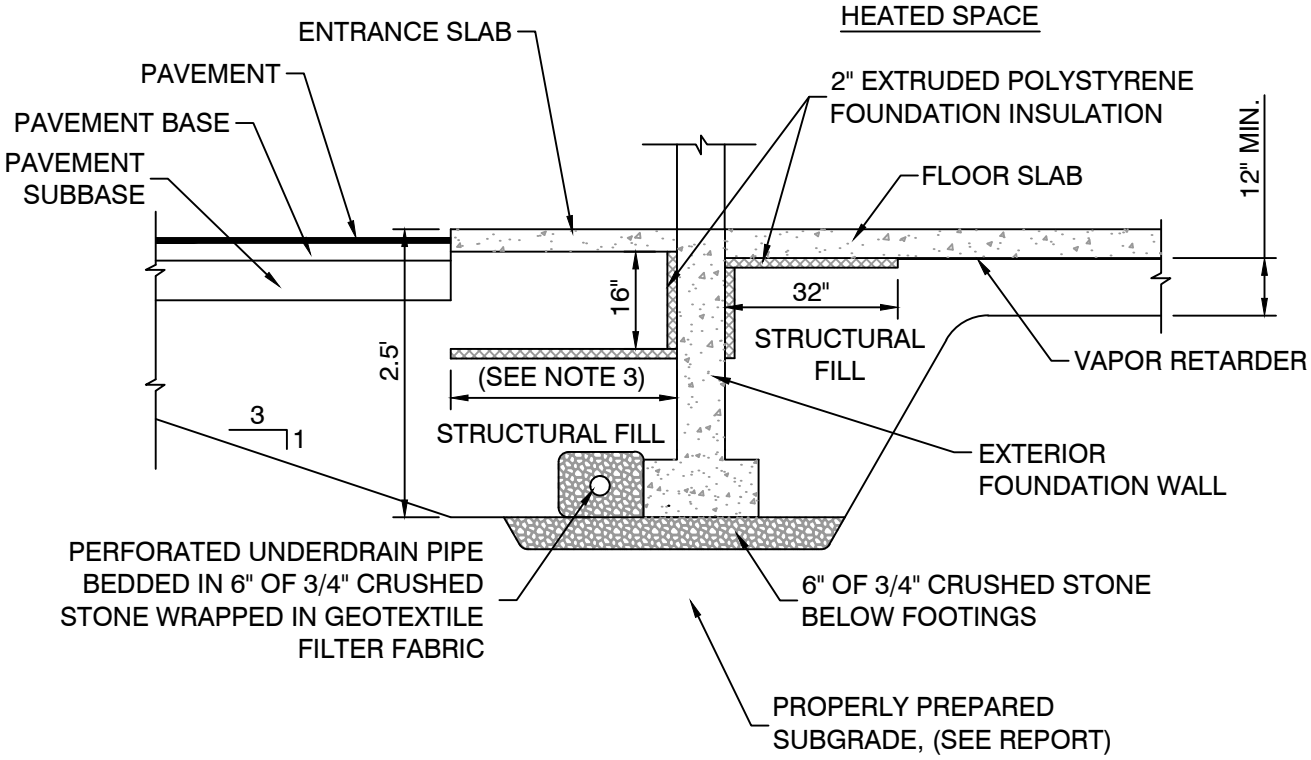
CJ DEVELOPERS, INC.

EXPLORATION LOCATION PLAN

PROPOSED GAS STATION AND CONVENIENCE STORE
2282 CONGRESS STREET
PORTLAND, MAINE

Job No. 12-0946.1 S
Date : 03/26/2013

Scale 1" = 60'
Sheet 1



NOTE:

1. UNDERDRAIN INSTALLATION AND MATERIAL GRADATION RECOMMENDATIONS ARE CONTAINED WITHIN THIS REPORT.

2. DETAIL IS PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY, NOT FOR CONSTRUCTION.

3. INSULATION WIDTH 32" IN LANDSCAPED AREAS AND 48" UNDER ENTRANCE SLABS.

S.W.COLE ENGINEERING, INC.

CJ DEVELOPERS, INC.

UNDERDRAIN DETAIL

PROPOSED GAS STATION AND CONVENIENCE STORE
2282 CONGRESS STREET
PORTLAND, MAINE

Job No.:	12-0946.1	Scale:	Not to Scale
Date :	03/29/2013	Sheet:	2

APPENDIX A

S.W.COLE ENGINEERING, INC.

www.swcole.com

Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed gas Station/Conv. Store

Symbol:	NA	O Horizon Thickness:	0 "

Test Pit	TP1	Hydric (y/n)	N
Soil Name:	Dixfield variant, deep		

Horiz		Texture	Consistence	Color	Mottling
Ap	1				
	2				
	3	fine sandy loam	friable	v.dk. grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
	9				
Bs	10			yellowish brown	
(8-18")	12				
	14				
	16				
(18-26")	18				
Bw	20	sandy loam		light olive brown	
	25				
C	30	grav. s. loam		olive brown	my. fine gray
(26-42")	35				
	40				
R	45		Bedrock		
(42")	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 42" due to bedrock; no seepage observed; pockets of saturation and l. fine sand observed in 26-42" layer; thin discontinuous sicl layer on top of bedrock in pockets

Applicant Name:	CJ Developers, Inc.

Symbol:	NA	O Horizon Thickness:	0 "

Test Pit	TP2	Hydric (y/n)	N
Soil Name:	Monadnock variant, deep		

Horiz		Texture	Consistence	Color	Mottling
Ap	1				
	2				
	3	v.f.. sandy loam	friab e	v. dark grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
Bs	9	fine sandy loam		dk. yellowish brown	
(12-18")	10				
	12				
Bs2	14			yellowish brown	
(8-18")	16				
	18				
Bw	20			light olive brown	cm. md. gray
(18-25")	25				
2C	30	l. fine sand	firm	olive brown	
(25-47")	35				
	40				
	45				
3C	50	grav. loamy sand	v. firm	olive	
(47-66')	55				
	60				
R	65		Bedrock		
(66')	70				
	75				
	80				

Limit of observation = 66" due to bedrock; some soft bedrock @ 47" in depth; seepage @ 41" in depth; saturated 25" +

STATE OF MAINE Stephen H. Howell No. 5511 CERTIFIED SOIL SCIENTIST .SS stamp

C.S.S.	Name:	Stephen H. Howell	Date:	3/25/13
			License #:	#108

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www.swcole.com

Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed Gas Station/Conv. store

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP3	Hydric (y/n)	N
Soil Name:	Lamoine variant		

Horiz		Texture	Consistence	Color	Mottling
Ap	1				
	2				
	3	v.f. sandy loam	friable	v. dk. grayish brown	none
	4				
	5				
	6				
Bs	7	loam		yellowish brown	
	8				
	9				
BC	10	silt loam	firm	olive	my. md. light gray
	12				
	14				
C	16				
	18				
	20				
C2	25	silty clay loam	ext. firm	olive	cont. light gray
	30				coating on
	35				ped faces
2C	40	cobbly silt loam	firm	lgt. olive brown	
	45				
	50				
	55				
	60				
	65				
R (66")	70		Bedrock		
	75				
	80				

Limit of observation = 66" due to bedrock; seepage and saturation @ 21" +

Applicant Name:	CJ Developers, Inc.

Symbol:		O Horizon Thickness:	0 "

Test Pit	TP4	Hydric (y/n)	N
Soil Name:	Monadnock variant, deep		

Horiz		Texture	Consistence	Color	Mottling
Ap (0-8")	1				
	2				
	3	v.f. sandy loam	friable	v. dk. grayish brown	none
	4				
	5				
	6				
	7				
	8				
2E (8-11")	9	fine sandy loam		pale brown	
	10				
Bs (11-19")	12				
	14			brown	
	16				
	18				
BC (19-25")	20			light olive brown	
	25				
2C (25-40")	30	l. fine sand	friable/moist	olive brown	
	35				
	40				
R (40")	45		Bedrock		
	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 40" due to bedrock; slight seepage on top of bedrock; saturated 25-40" in depth;

STATE OF MAINE Stephen H. Howell #SS187 CERTIFIED SOIL SCIENTIST (C.S.S.)

C.S.S.	Name:	Stephen H. Howell	Date:	3/25/13
			License #:	187

S.W.COLE ENGINEERING, INC.

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Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed Gas Station/Conv. store

Symbol:	NA	O Horizon Thickness:	1

Test Pit	TP5	Hydric (y/n)	N
Soil Name:	Tunbridge variant		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	f. sandy loam	friable	v.dk. grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
Bs	9			dk. yellowish brown	none
(8-15")	10				
	12				
	14				
(15-22")	16				
Bw	18	l. fine sand		yellowish brown	
(22-30")	20				
2C	25			olive brown	
R	30		Bedrock		
(30")	35				
	40				
	45				
	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 30" due to bedrock; no seepage or saturation observed; 0-15" dominated by very fine sand; 15-30" dominated by fine and medium sand

Applicant Name:	CJ Developers, Inc.

Symbol:	NA	O Horizon Thickness:	1

Test Pit	TP6	Hydric (y/n)	N
Soil Name:	Lyman variant		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	v. fine sandy loam	friable	v. dark grayish brown	none
(0-9")	4				
	5				
	6				
	7				
	8				
	9				
Bs	10			brown	
(9-14")	12				
	14				
Bs2	16			yellowish brown	
(14-18")	18				
R	20		Bedrock		
(18")	25				
	30				
	35				
	40				
	45				
	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 18" due to bedrock: no seepage or saturation observed; soil is dominated by very fine sand

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C.S.S.	Name:	Stephen H. Howell	Date:	3/25/13
			License #:	187

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Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed Gas Station/Conv. store

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP7	Hydric (y/n)	N
Soil Name:	Elmwood variant		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	v.f. sandy loam	friable	v.dk. grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
Bs	9			dk. yellowish brown	
(8-14")	10				
	12				
	14				
Bw	16			light olive brown	
(14-19")	18				
2BC	20	silt loam	firm	olive brown	cm. md. Gray
(19-27")	25				
2C	30			olive	my. md. lt. gray
(27-38")	35				
	40				
2C2	45	silty clay loam	v. firm	olive	
(38- 96+"	50				
	55				
	60				
	65				
	70				
	75				
	80				

No bedrock or seepage observed to 96" limit of observation; soil is saturated 27"+; north end of pit is dominated by sandy till

Applicant Name:	CJ Developers, Inc.

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP8	Hydric (y/n)	N
Soil Name:	Elmwood variant, deep		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	f. sandy loam	friable	v.dk. grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
Bs	9			dk. yellowish brown	
(8-15")	10				
	12				
	14				
Bw	16	l. fine sand		yellowish brown	
(15-22")	18				
	20				
2C	25				
(22-40")	30		friable/moist	olive brown	cm. md. Gray
	35				
(40-47")	40				
3C	45	silty clay loam	v.firm	olive	my.coarse gray
R	50		Bedrock		
(47")	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 47" due to bedrock: no seepage or saturation observed; 0-15" in depth dominated by very fine sand; 15-40" dominated by fine and medium sand; 40-47' dominated by silt and clay

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			License #:	187

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Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed Gas Station/Conv. store

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP9	Hydric (y/n)	N
Soil Name:	Tunbridge variant		

Horiz		Texture	Consistence	Color	Mottling
Ap (0-8")	1				
	2				
	3	fine sandy loam	friable	v. dark grayish brown	none
	4				
	5				
	6				
	7				
	8				
Bs (8-16")	9				
	10			dk yellowish brown	
	12				
	14				
Bs2 (16-22")	16				
	18				
R (22")	20				
	25		Bedrock		
	30				
	35				
	40				
	45				
	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 22" due to hard bedrock; no seepage or saturation observed; depth to bedrock ranges from 22-31" in pit; soil is dominated by very fine sand

Applicant Name:	CJ Developers, Inc.

Symbol:	NA	O Horizon Thickness:	1"

Test Pit	TP10	Hydric (y/n)	N
Soil Name:	Monadnock variant		

Horiz		Texture	Consistence	Color	Mottling
Ap (0-7"	1				
	2				
	3				
	4	fine sandy loam	friable	v. dark yellowish brown	none
	5				
	6				
	7				
Bs (7-12")	8				
	9			dk. yellowish brown	
	10				
	12				
Bs2 (12-26")	14	sandy loam			
	16				
	18				
	20				
2C (26-40")	25				
	30	loamy fine sand		olive brown	
	35				
3C (40-90")	40				
	45	cobbly loamy fine sand	firm		cm. med. olive gray
	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 90" due to bedrock; no seepage or saturation observed; 0-26" is dominated by very fine sand; 26" + is dominated by fine and medium sand

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			License #:	187

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Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed Gas Station/Conv. store

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP11	Hydric (y/n)	N
Soil Name:	Lyman varaint		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	v.f sandy loam	friable	v. dk grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
E	9			gray	
R	10		Bedrock		
(9")	12				
	14				
	16				
	18				
	20				
	25				
	30				
	35				
	40				
	45				
	50				
	55				
	60				
	65				
	70				
	75				
	80				

Limit of observation = 9" due to bedrock; no seepage or saturation observed; soil is dominated by very fine sand; leached E horizon 8-9" in depth over bedrock

Applicant Name:	CJ Developers, Inc.

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP12	Hydric (y/n)	N
Soil Name:	Monadnock variant, deep		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	v.f. sandy loam	friable	v.dk. grayish brown	none
(0-8")	4				
	5				
	6				
	7				
	8				
Bs	9	f. sandy loam		dk. yellowish brown	
(8-18")	10				
	12				
	14				
	16				
	18				
Bs2	20	sandy loam		yellowish brown	
	25				
C	30	l. fine sand	friable/ moist	olive brown	cm. md. gray
(26-60")	35				
	40				
	45				
	50				
	55				
	60				
R	65				
(60")	70		Bedrock		
	75				
	80				

Limit of observ. = 60" due to bedrock; no seepage observed; saturated 26"

STATE OF MAINE Stephen H. Howell No. CSS187 CERTIFIED SOIL SCIENTIST (C.S.S. Stamp)

C.S.S.	Name:	Stephen H. Howell	Date:	3/25/13
			License #:	187

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Soil Description and Classification

Job Number: 12-0946.1

Project Name:	Proposed gas Station/Conv. Store

Symbol:	NA	O Horizon Thickness:	1 "

Test Pit	TP13	Hydric (y/n)	N
Soil Name:	Elmwood variant		

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
Ap	3	v. f. sandy loam	friable	v. dk. yellowish brown	
(0-8")	4				
	5				
	6				
	7				
	8				
	9				
Bs	10			dk. yellowish brown	
(8-14")	12				
	14				
Bw	16			light olive brown	
(14-19")	18				
BC	20	silt loam	firm	olive brown	my. md. gray
(19-27")	25				
(27-38")	30				
C	35	silty clay loam	v. firm	olive	
(38-62")	40				
	45				
	50				
	55				
	60				
R	65		Bedrock		
	70	Limit of observation = 62" due to bedrock; soil is saturated @ 27" in depth; no seepage observed			
	75				
	80				

Applicant Name:	CJ Developers, Inc.

Symbol:		O Horizon Thickness:	

Test Pit		Hydric (y/n)	
Soil Name:			

Horiz		Texture	Consistence	Color	Mottling
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	12				
	14				
	16				
	18				
	20				
	25				
	30				
	35				
	40				
	45				
	50				
	55				
	60				
	65				
	70				
	75				
	80				

STATE OF MAINE
Stephen H. Howell
No. SS187
CERTIFIED SOIL SCIENTIST
(C.S.S. stamp)

C.S.S.	Name:	STEPHEN H. HOWELL	Date:	3/25/13
			License #:	187

APPENDIX B

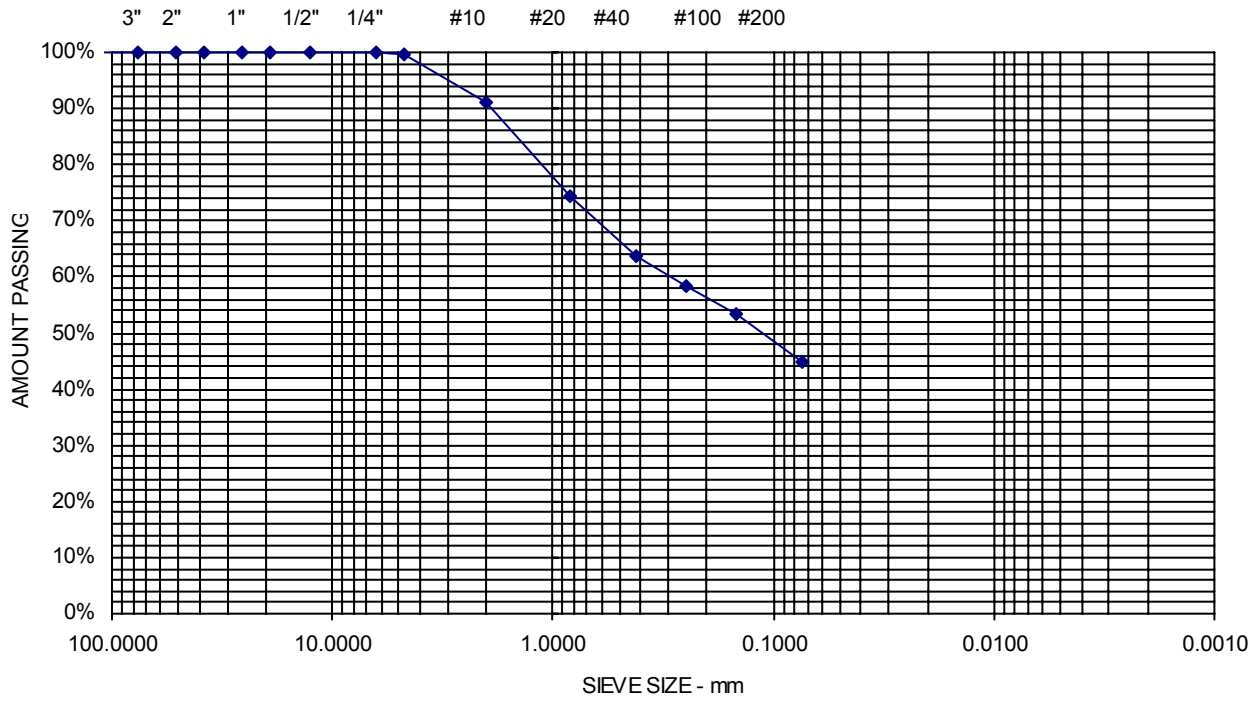
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTLAND ME - 2282 CONGRESS STREET PROPOSED GAS STATION AND CONVENIENCE STORE - GEOTECHNICAL	Project Number	12-0946.1
Client	CJ DEVELOPERS, INC.	Lab ID	16625G
		Date Received	3/21/2013
		Date Completed	3/25/2013
Material Source	**TP - 7 38"**	Tested By	JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
125 mm	**5"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**100**	
6.3 mm	**1/4"**	**100**	
4.75 mm	**No. 4**	**100**	0.4% Gravel
2.00 mm	**No. 10**	**91**	
850 um	**No. 20**	**74**	
425 um	**No. 40**	**64**	54.7% Sand
250 um	**No. 60**	**58**	
150 um	**No. 100**	**53**	
75 um	**No. 200**	**44.9**	44.9% Fines



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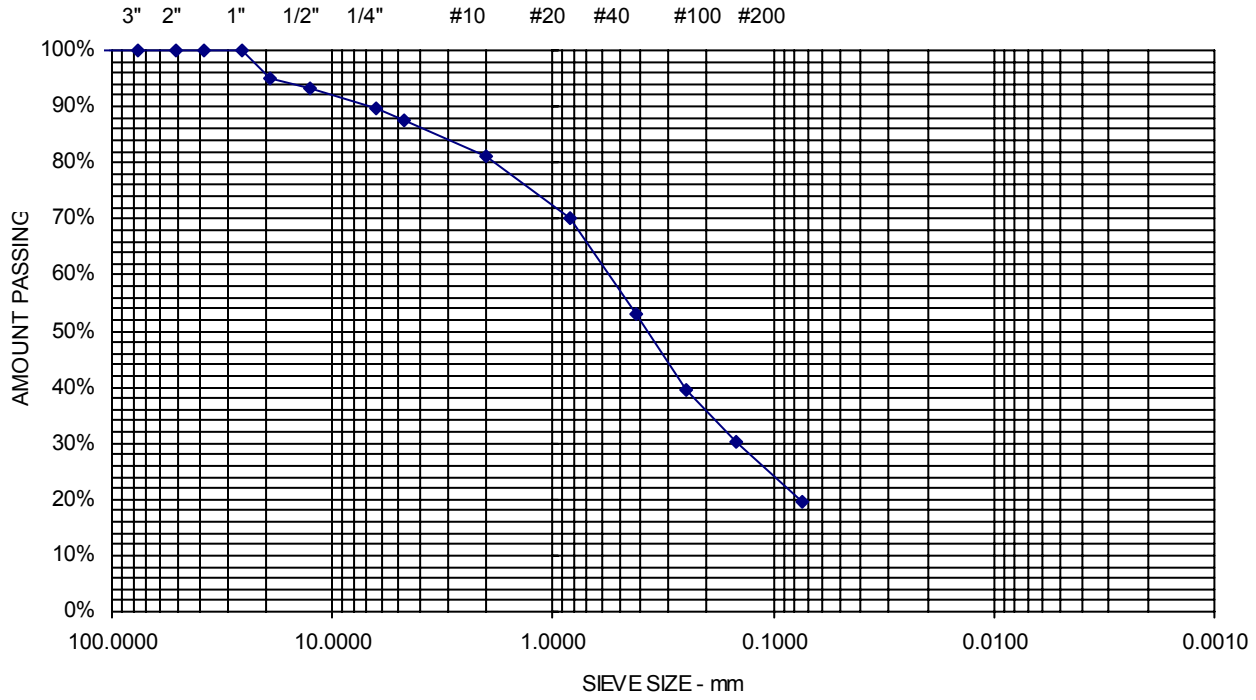
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	PORTLAND ME - 2282 CONGRESS STREET PROPOSED GAS STATION AND CONVENIENCE STORE - GEOTECHNICAL	Project Number	12-0946.1
Client	CJ DEVELOPERS, INC.	Lab ID	16626G
		Date Received	3/21/2013
		Date Completed	3/25/2013
Material Source	**TP - 10 12-40"**	Tested By	JUSTIN BISSON

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
125 mm	**5"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**95**	
12.5 mm	**1/2"**	**93**	
6.3 mm	**1/4"**	**90**	
4.75 mm	**No. 4**	**88**	12.4% Gravel
2.00 mm	**No. 10**	**81**	
850 um	**No. 20**	**70**	
425 um	**No. 40**	**53**	68.1% Sand
250 um	**No. 60**	**40**	
150 um	**No. 100**	**30**	
75 um	**No. 200**	**19.5**	19.5% Fines



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APPENDIX J

Erosion Control Plan

EROSION AND SEDIMENTATION CONTROL REPORT

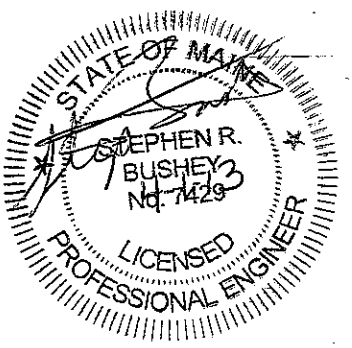
CONVENIENCE STORE AND FUEL STATION
PORTLAND, ME

PREPARED FOR:

CJ DEVELOPERS, INC.
35 PRIMROSE LAND
FREEPORT, MAINE 04032
(207) 865-4323

PREPARED BY:

DELUCA-HOFFMAN ASSOCIATES, INC.
778 MAIN STREET, SUITE 8
SOUTH PORTLAND, MAINE 04106
(207) 775-1121



April 2013

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Figures and Photographs (See Section 1 – Attachment A of the Application)

Figure 2 – USGS Location Map
Figure 3 – Tax Map
Figure 4 – Zoning Map
Figure 5 – Aerial Photograph
Figure 7 – FEMA Flood Map
Figure 8 – USDA SCS Soils Map
Figure 9 – GIS Sand and Gravel Aquifer Map
Figure 10 – Surficial Geology Map
Figure 11 – NWI Map

Attachments

Attachment A – Seeding Plan
Attachment B – Sample Erosion Control Compliance Certification and Inspection Forms
Attachment C – Open Channel, Outlet Aprons, and Temporary Sedimentation Sump Computations
Attachment D – DirtGlue™ Application and Use Requirements
Attachment E – SiteOps Computer Earthwork Analysis

A. INTRODUCTION

DeLuca-Hoffman Associates, Inc. has been retained by CJ Developers, Inc. for the preparation of site design and site permitting for the proposed convenience store and fuel station at 2282 Congress Street in Portland, Maine. The development will include a convenience store, drive-thru ATM and fueling facilities.

A USGS Map, Zoning, Aerial Photographs, Flood, Soils, and location figures are provided in Section 1 – Attachment A of the Level III Site Plan Application to depict the location of the project. The accompanying plan set includes erosion control details and overall erosion control plan.

This study and section of the permit application presents the Erosion Sediment Control Plan designed for the project. The erosion control plans will be contained in the contract documents for implementation by the Contractor who is awarded the bid for the project. This project is coordinated with the MeDEP erosion control requirements. The Contract documents will require that turbid discharges from the site do not occur (measured by NTU with non-turbid runoff defined by representative samples with turbidity below 280 NTU at any discharge location), fugitive dust emissions will be controlled, the requirements of this erosion control plan, and all permit requirements will be fulfilled. Winter construction may be required and have specific winter time construction standards. Specific erosion controls stipulated by the plan and this report are minimum requirements.

B. EXISTING SITE CONDITIONS

The current site cover conditions are summarized in the table below:

SUMMARY OF LAND USE COVER	
Current Land Cover	**Area (acre)**
Woods	3.04
Meadow (Natural Gas Easement)	0.20
Total	**3.24**

C. EXISTING DRAINAGE FEATURES

The drainage is divided into two areas; the majority of the site is tributary to the North Branch of the Long Creek Subwatershed C as identified in the Long Creek Watershed Management Plan. A small portion of the northwest corner of the site flows westerly along Congress Street and is tributary to the Stroudwater River.

Topography slopes from west to east with slopes ranging from 3% to 14%. The site elevations range from 73 to 102 based on NGVD29. Existing topography sheet flows across the southerly and easterly property lines and drainage is towards a 24" RCP culvert adjacent to the abutting I-95 interstate highway (SB lanes).

The soils on the site are shown on the USDA medium intensity soils map to be primarily Hollis fine sandy loam and Scantic silt loam. Geotechnical explorations by SW Cole in March 2013 show that the soils are predominantly silty sand overlying sandy silt with gravel overlying relatively shallow bedrock.

D. OVERVIEW OF SOIL EROSION AND SEDIMENTATION CONCERNS

The susceptibility of soils to erosion is indicated on a relative "K" scale of values over a range of 0.02 to 0.69. The "K" value is frequently used with the universal soil loss equation. The higher values are indicative of the more erodible soils. The relative K values of the underlying material at the site would be as follows:

Soil Symbol	Soil Description	"K" Value
Scantic - Sn	Silt Loam	0.37 – 0.49
Hollis - Hr	Fine sandy loam	0.20 - 0.43

The primary emphasis of the Erosion and Sedimentation Control Plan to be implemented for this project is as follows:

- **Temporary Measures:** Planning the project to have erosion resistant measures in place by implementing measures intended to prevent erosion from occurring.

- **Phasing Sequencing:** The plan includes measures to intercept and convey runoff to temporary sediment ponds and control devices as the construction of the project occurs. The use of small collection sumps with a clean sand filter above an underdrained discharge is recommended to supplement the principal sumps to help reduce turbidity. Turbidity should be controlled to fewer than 280 NTU's in any discharge through the use of settling, filters, or chemical coagulants.

- **Use of Type 1 Settling:** Installing sediment sumps and swales early in the construction sequence to provide secondary relief for erosion control measures within the site until late in the project when the sedimentation areas need to be removed for final restoration.

- **Restabilization:** Stabilization of areas denuded to underlying parent material must occur within stipulated time frame to minimize the period of soil exposure and stabilization of drainage paths to avoid rill and gully erosion.

- **Interim Entrapment:** The use of on-site measures to capture sediment (hay bales/silt fence, etc.) before it is conveyed to sediment sumps.

- **Long Term Site Protection:** The implementation of long-term measures for erosion/sediment and pollutant treatment through the construction of permanent water quality measures.

- **Special Winter Construction Measures:** These will be required for work between September 15 and April 15.

E. DESCRIPTION AND LOCATION OF LIMITS OF ALL PROPOSED EARTH MOVEMENTS

The construction of the project will disturb about 2.25 acres of land. The limit of disturbance is generally coincident with the limit of grading. The earthwork involved is summarized on the SiteOps computer analysis graphic provided in Attachment E following this report as well as a summary of the proposed earthwork.

The earth moving will include trenching for underground utilities, excavation for the water quality measures, earthwork to prepare and shape the parking lots, and excavation attendant with the buildings and excavation and borrow for the project improvements.

F. PROPOSED DRAINAGE FEATURES

The postdevelopment plan includes consideration and design for water quality of stormwater runoff. These constitute the stormwater management.

Certain manholes on the project provide flow management by directing stormwater to different areas. The hydraulic control manholes for this project include hydraulic control manholes to regulate the discharge, flow splitting manholes, and overflow manholes.

The proposed cover conditions for the site upon completion of the project will be as follows:

Proposed Land Cover	Area (acre)	Change from Current (acre)
Woods	0.99	(2.05)
Meadow (Natural Gas Easement)	0.20	0
Meadow (Vegetated Fill Slopes)	0.42	+0.42
Lawn/Landscaped Planting Areas	0.01	+0.01
Pavement	1.48	+1.48
Roof	0.09	+0.09
Rip Rap Slope	0.05	+0.05
Total	**3.24**	**0**

G. CRITICAL AREAS

Critical resource areas include the scrub shrub wetlands on the easterly side of the property and the Long Creek downstream of the site. No special species habitats have been identified on the site. It is noted that certain stormwater systems including underground storage and StormTreat™ treatment units shall not be activated until the tributary areas have been stabilized and at least three weeks has passed subsequent to placement of bituminous concrete paving materials. It will be critical to establish the StormTreat™ vegetation prior to placing them permanently online.

H. EROSION/SEDIMENTATION CONTROL DEVICES

As part of the site development, the Contractor will be obligated to implement the following erosion and sediment control devices. These devices shall be installed as indicated on the plans or as described within this report. For further reference on these devices, see the *Maine Department of Environmental Protection Erosion and Sediment Control BMPS Manual (March, 2003)*.

1. Siltation Barrier shall be installed down slope of any disturbed areas to trap runoff borne sediments until the site is revegetated. The silt barrier shall be installed per the detail provided in the plan set and inspected immediately after each rainfall and at least daily during prolonged rainfall. The Contractor shall make repairs immediately if there are any signs of erosion or sedimentation below the barrier line. If such erosion is observed, the Contractor shall take proactive action to identify the cause of the erosion and take action to avoid its reoccurrence. Typically, this requires that

stabilization measures be undertaken. Proper placement of stakes and keying the bottom of silt fence fabric into the ground is critical to the fence's effectiveness. If there are signs of undercutting at the center or the edges, or impounding of large volumes of water behind the barrier, the barrier shall be replaced with a stone check dam and measures taken to avoid the concentration of flows not directed to the silt fence.

2. Silt barrier is shown by three types, depending upon the timing and intent, as follows:

SCHEDULE OF SILT FENCE REQUIREMENTS		
Silt Barrier	**Type/Purpose**	**Time of Installation**
Condition 1	To trap sediment along the grading edge where the new contours nearly parallel existing contours.	At initial site preparation, prior to other work.
Condition 2	To trap sediment from the work area; install in short sections parallel to existing contour; typically occurs where proposed and existing contours form a "V" shape.	At initial site preparation, prior to other work. On occasion, this needs to be deferred until the area for the silt fence installation can be reached.
Condition 3	To trap sediment along the base of proposed contours, typically in cut areas.	During construction after new grade is shaped. Time between work in area and shaping new grade to allow silt fence to be installed shall be minimized.

Conditions 2 and 3 silt barriers will be used extensively between project phases. In the event of frozen ground where silt fence cannot be installed, a wood waste berm may be used as a substitute.

3. Straw or hay mulch including hydroseeding is intended to provide cover for denuded or seeded areas until revegetation is established. Mulching should be occurring several times per week when the site construction activity is high and at sufficient intervals to reduce the period of exposure of bare soils to the time limits set forth in this plan. Mulch placed on slopes of less than 10 percent shall be anchored by applying water; mulch placed on slopes steeper than 10 percent shall be covered with fabric netting as immediately after mulching as practicable and anchored with staples in accordance with the manufacturer's recommendations. Proposed drainage channels, which are to be revegetated, shall receive Curlex blankets by American Green selected for the slope, velocity, and whether the measure is temporary or intended to be in place for a sustained period. Mulch application rates are provided in Attachment A of this section. Hay mulch shall be available on site at all times in order to provide immediate temporary stabilization when necessary. Where necessary, a windrow of crushed stone and/or gravel shall be placed at the top of the slope and directed to a temporary stone channel or pipe sluice to convey runoff down slopes. A dissipation device such as stone or a plunge pool should be installed at the base of the slope and sluice outlet to dissipate the energy of the water from the sluice or channel.

4. Temporary sediment sumps will provide sedimentation control for stormwater runoff from disturbed areas during construction until stabilization has been achieved. The sediment sumps need to include a sand filter above an underdrain or a chemical coagulant to remove fine-grained sediment. Appropriate measures to reduce sediment suspended in discharges to less than 280 NTU's will be required.
5. Riprap slopes, ditch linings, stone check dams, hay bale barriers, and culvert outlet aprons are intended to stabilize and protect denuded soil surfaces or dissipate the energy and erosive forces from concentrated flows. Installation details and stone sizes are provided in the construction plan set on the erosion control detail sheets.
6. A construction entrance will be constructed at all access points onto the site to prevent tracking of soil onto adjacent local roads and streets and the existing parking lot.
7. Stone sediment traps or a premanufactured SiltSack™ and a sediment bag will be installed at catch basin inlets to prevent silt from entering the storm drain system. Installation details are provided in the plan set on the erosion control detail sheets.
8. Dirtbags™ will be required to be on site and available for construction dewatering. The Contractor will be required to provide four Dirtbags™ with one prepared for operation prior to commencing any trenching operations. Dirtbags™ will need to be installed above filter sand and crushed stone in accordance with the details shown on the plan set will need to be installed.
9. Loam and seed is intended to serve as the primary permanent revegetative measure for all denuded areas not provided with other erosion control measures, such as riprap. Specific areas as shown on the Landscape Plan will receive sod. Application rates are provided in Attachment A of this section for temporary and permanent seeding.
10. Stone check dams will be installed in areas noted on the plan or as warranted, based upon observations during construction of the site.
11. Silt logs are an option for stone check dams and may be substituted provided the devices are well anchored.
12. Sorbent booms are intended to capture oils and the asphalt sheen from paved surfaces and shall be installed in all catch basins before pavement is installed.
13. DirtGlue™ is an acceptable means of temporary stabilization and is intended to form a "crust" on the surface that is resistant to erosion. However, applications where DirtGlue™ is used must be protected from traffic that would crack the "crust" and the DirtGlue™ has temperature limitations that restrict the periods of use. Use of this material shall conform to the requirements of Attachment D.
14. Wattles (constructed of rice straw) are to be used for small areas where the surface is irregular and where an immediate measure is needed to protect downstream measures.

I. TEMPORARY EROSION/SEDIMENTATION CONTROL MEASURES

The following are planned as temporary erosion/sedimentation control measures during construction:

1. Crushed stone-stabilized construction entrances shall be placed at any construction access points from adjacent streets. The locations of the construction entrances shown on the drawings should be considered illustrative and will need to be adjusted as appropriate and located at any area where there is the potential for tracking of mud

and debris onto existing roads or streets. Stone stabilized construction entrances will require the stone to be removed and replaced, as it becomes covered or filled with mud and material tracked by vehicles exiting the site.

2. Conditions 1 and 2 silt barriers shall be installed along the downgradient side of the proposed improvement areas. The silt fence will remain in place and properly maintained until the site is acceptably re-vegetated. Condition 3 silt barrier is to be used along the contour of significant fill slopes as illustrated on the erosion control plan site drawings. Silt barrier needs to be checked to insure the bottom is properly keyed in and inspected after significant rains. Wood chips or Erosion Control Mix is often used on the construction side of the silt fence to provide an extra margin of safety and security for the silt fence. This practice is encouraged, provided the chips are removed when the fence is removed.

3. Dirtbags™ shall be installed in accordance with the details in the plan set. The purpose of the Dirtbags™ is to receive any water pumped from excavations during construction. A Dirtbag™ shall be installed and prepared for operation prior to any trenching on site. When Dirtbags™ are observed to be at 50% capacity, they shall be cleaned or replaced. Stone and filter sand under the Dirtbag™ shall be removed and replaced concurrently with the replacement of the Dirtbag™.

4. Temporary stockpiles of common excavation will be protected as follows:

   a) Temporary stockpiles shall not be located at least 50 feet upgradient of the perimeter silt fence.

   b) Inactive stockpiles shall be stabilized within 5 days by either temporarily seeding the stockpile with a hydroseed method containing an emulsified mulch tackifier or by covering the stockpile with mulch. If necessary, mesh shall be installed to prevent wind from removing the mulch.

5. All denuded areas except gravel areas shall receive mulch, erosion control mesh fabric, or other approved temporary erosion sediment measure within 7 days of initial disturbance of soil or before a predicted rain event of >1/2" unless permanent measures are installed.

6. All soils disturbed between September 15 and April 15 will be covered with mulch within 5 days of disturbance, prior to any predicted storm event of the equivalent of ½" of rainfall in a 24-hour period, or prior to any work shutdown lasting more than 35 hours (including weekends and holidays). The mulch rate shall be double the normal rate.

   For work that is conducted between September 15 and April 15 of any calendar year, all denuded areas will be covered with hay mulch, applied at twice the normal application rate, and (in areas over 10% grade) anchored with a fabric netting. The time period for applying mulch shall be limited to 5 days for all areas, or immediately in advance of a predicted rainfall event.

7. Stone check dams, silt logs, or hay bale barriers will be installed at any evident concentrated flow discharge points during construction and earthwork operations.

8. Silt fencing with a maximum stake spacing of 6 feet should be used, unless the fence is supported by wire fence reinforcement of minimum 14 gauge and with a maximum mesh spacing of 6 inches, in which case stakes may be spaced a maximum of 10 feet apart. The bottom of the fence should be properly anchored a minimum of 6" per the plan detail and backfilled. Any silt fence identified by the owner or reviewing agencies

as not being properly installed during construction shall be immediately repaired in accordance with the installation details.

9. Storm drain catch basin inlet protection shall be provided through the use of stone sediment barriers or a premanufactured SiltSack™. Stone sediment barrier installation details are provided in the plan set. The barriers or SiltSacks™ shall be inspected after each rainfall and repairs made as necessary, including the removal of sediment. Sediment shall be removed and the barrier or SiltSack™ restored to its original dimensions when the sediment has accumulated to one-half the design depth of the barrier. Sediment shall be removed from SiltSacks™ as necessary. Inlet protection shall be removed when the tributary drainage area has been stabilized.
10. All slopes steeper than 4:1 shall receive erosion control mesh.
11. Slopes steeper than 3:1 shall receive reinforced turf.
12. Condition 3 silt barriers shall be installed as construction progresses.
13. Areas of visible erosion and the temporary sediment sumps shall be stabilized with crushed stone. The size of the stone shall be determined by the contractor's designated representative in consultation with the Owner.
14. New catch basins and certain existing catch basins shall all be installed with an opening 2'-6" below finish grade to receive a 4" underdrain with an end cap except for inlets along underdrains and within 100 feet of nearby wells. A 3'-0" stub of underdrain surrounded by 6" of ¾" crushed stone and filter fabric shall be installed. The purpose of this measure is to provide drainage relief until site grades are at finish elevations.
15. All catch basins, which receive runoff from current or paved areas being constructed as part of this project, shall have a sorbent boom installed prior to placing the basin in operation installing binder pavement, or overlays. These sorbent booms shall be checked weekly for the three weeks following paving and replaced as necessary with the booms disposed of in accordance with local and State regulations.
16. Any flow from the site that is concentrated must be directed to a sump with sand filter and underdrained discharge.
17. Concentrated runoff shall be diverted away from slopes of over 10 percent unless the slope is armored with stone.
18. Underground utilities must be installed in compliance with the following standards and other requirements of this erosion control plan:

    - No more than 500 linear feet of trench may be opened at one time;
    - Excavated materials shall be placed on the uphill side of trenches;
    - Dewatering of the trench shall be pumped through a Dirtbag™ and appropriate sediment control facilities to avoid a turbid discharge; and
    - Stabilization shall occur as soon as practicable.

19. Rice straw wattles shall be used to control localized erosion.
20. Maintenance of the erosion control, sedimentation facilities, and control of fugitive dust must occur until the site is stabilized with permanent erosion control measures. For turf areas, stabilization shall be defined to be the establishment of a 90 percent "catch

of grass" with no areas larger than 2 square feet, and no spots that cumulatively add up to more than 5 square feet per 100 square feet.

J. STANDARDS FOR STABILIZING SITES FOR THE WINTER

The construction of the project will require winter construction. The project is anticipated to require about 18 months to construct. For permitted winter construction, the erosion control measures are substantially more stringent due to the cold temperatures and lack of weather conditions which aid in drying the subgrade soils through evaporation.

If construction activities involving earth disturbance continue past September 15 or begin before April 15, the following must be incorporated with the erosion control plan and implementation:

1. Enlarged access points must be stabilized to provide for snow stockpiling.
2. Limits of disturbance shall be reduced to the extent practicable.
3. A snow management plan including adequate storage and control of snowmelt, requiring cleared snow to be stored downgradient of all areas of disturbance shall be prepared by the contractor and submitted to the Owner for review and approval.
4. Snow shall not be stored in sediment basins or to preclude drainage structures from operating as intended.
5. A minimum 25-foot buffer maintained from perimeter controls such as silt fence shall be maintained on the "work area side" to allow for snow clearing and maintenance.
6. Drainage systems intended to operate during the winter shall be catalogued, shown on a plan, and inspected after each snow removal period to make sure the drainage structures are open and free of snow and ice dams.
7. To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
    - If no precipitation within 24 hours is forecast and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
    - Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches.
8. Standard for the timely stabilization of ditches and channels: The Contractor shall construct and stabilize all stone-lined ditches and channels on the site by September 15. The contractor shall construct and stabilize all grass-lined ditches and channels on the site by September 1. If the Contractor fails to stabilize a ditch or channel to be grass-lined by September 1, then the Contractor shall take one of the following actions to stabilize the ditch for late fall and winter.
    i. Install a sod lining in the ditch. The contractor shall line the ditch with properly installed sod by September 15. Proper installation includes the applicant pinning the sod onto the soil with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, watering the sod to promote root growth into the disturbed soil, and anchoring the sod with jute or plastic mesh to prevent the sod strips from sloughing during flow conditions.

ii. Install a stone lining in the ditch. The contractor shall line the ditch with stone riprap by September 15. The contractor shall hire a registered professional engineer to determine the stone size and lining thickness needed to withstand the anticipated flow velocities and flow depths within the ditch. If necessary, the Contractor shall regrade the ditch prior to placing the stone lining so as to prevent the stone lining from reducing the ditch's cross-sectional area.

9. Standard for the timely stabilization of disturbed slopes: The Contractor shall construct and stabilize stone-covered slopes by September 15. The Contractor shall seed and mulch all slopes to be vegetated by September 1. The Department will consider any area having a grade greater than 15% (10H:1V) to be a slope. If the Contractor fails to stabilize any slope to be vegetated by September 1, then the Contractor shall take one of the following actions to stabilize the slope for late fall and winter.

   i. Stabilize the soil with temporary vegetation and erosion control mesh. By September 15, the Contractor shall seed the disturbed slope with winter rye at a seeding rate of 3 pounds per 1,000 square feet and apply erosion control mats over the mulched slope. The contractor shall monitor growth of the rye over the next 30 days. If the rye fails to grow at least three inches or fails to cover at least 75% of the disturbed slope by September 15, then the Contractor shall cover the slope with a layer of wood waste compost as described in item iii of this standard or with stone rip rap as described in item iv of this standard.

   ii. Stabilize the slope with sod. The Contractor shall stabilize the disturbed slope with properly installed sod by September 15. Proper installation includes the Contractor pinning the sod onto the slope with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, and watering the sod to promote root growth into the disturbed soil. The Contractor shall not use late-season sod installation to stabilize slopes having a grade greater than 33% (3H:1V) or having groundwater seeps on the slope face.

   iii. Stabilize the slope with wood waste compost. The Contractor shall place a six-inch layer of wood waste compost on the slope by September 15. Prior to placing the wood waste compost, the Contractor shall remove any snow accumulation on the disturbed slope. The contractor shall not use wood waste compost to stabilize slopes having grades greater than 50% (2H:1V) or having groundwater seeps on the slope face.

   iv. Stabilize the slope with stone rip rap. The Contractor shall place a layer of stone riprap on the slope by September 15. The Contractor shall hire a registered professional engineer to determine the stone size needed for stability and to design a filter layer for underneath the riprap.

10. Standard for the timely stabilization of disturbed soil: By September 1, the Contractor shall seed and mulch all disturbed soils on areas having a slope less than 15%. If the Contractor fails to stabilize these soils by this date, then the Contractor shall take one of the following actions to stabilize the soil for late fall and winter.

    i. Stabilize the soil with temporary vegetation. By September 15, the Contractor shall seed the disturbed soil with winter rye at a seeding rate of 3 pounds per 1,000 square feet, lightly mulch the seeded soil with hay or straw at 75 pounds per 1,000 square feet, and anchor the mulch with plastic netting. The Contractor shall

monitor the growth of the rye over the next 30 days. If the rye fails to grow at least three inches or fails to cover at least 75% of the disturbed soil before September 15, then the Contractor shall mulch the area for over-winter protection as described in item iii of this standard.

ii. Stabilize the soil with sod. The Contractor shall stabilize the disturbed soil with properly installed sod by September 15. Proper installation includes the Contractor pinning the sod onto the soil with wire pins, rolling the sod to guarantee contact between the sod and underlying soil, and watering the sod to promote root growth into the disturbed soil.

iii. Stabilize the soil with mulch. By September 15, the Contractor shall mulch the disturbed soil by spreading hay or straw at a rate of at least 150 pounds per 1,000 square feet on the area so that no soil is visible through the mulch. Prior to applying the mulch, the Contractor shall remove any snow accumulation on the disturbed area. Immediately after applying the mulch, the Contractor shall anchor the mulch with plastic netting to prevent wind from moving the mulch off the disturbed soil.

iv. Stabilize all stockpiles with mulch within 24 hours.

K. SPECIAL MEASURES FOR SUMMER CONSTRUCTION

The summer period is generally optimum for construction in Maine, but it is also the period when intense short duration storms are most common, making denuded areas very susceptible to erosion, when dust control needs to be the most stringent, and when the potential to establish vegetation is often restricted by moisture deficit. During these periods, the Contractor must:

1. Implement a program to apply dust control measures on a daily basis except those days where the precipitation exceeds 0.25 inch. This program shall extend to and include adjacent streets used by construction vehicles.

2. Spray any mulches with water after anchoring to dampen the soil and encourage early growth. Spraying may be required several times. Temporary seed may be required until the late summer seeding season.

3. Mulch, cover, and moisten stockpiles of fine-grained materials, which are susceptible to erosion. In the summer months, the potential for wind erosion is of concern, as well as erosion from the intense, short-duration storms, which are more prevalent in the summer months.

4. Take additional steps needed to control fugitive dust emissions to minimize reductions in visibility and the airborne disbursement of fine-grained soils. This is particularly important along the adjacent streets.

These measures may also be required in the spring and fall during the drier periods of these seasons.

L. SEDIMENTATION SUMPS

The sediment sumps shall be sized in accordance with the plan and specifications. The bottom of the sumps is intended to be used for infiltration.

Discharge must be through a sand filter over an underdrained outlet to aid in the control of turbidity levels in the discharge. An emergency bypass shall be included and shall be constructed of 6" of stone overlaying filter fabric and discharge to undisturbed turf.

M. PERMANENT EROSION CONTROL MEASURES

The following permanent erosion control measures have been designed as part of the Erosion/Sedimentation Control Plan:

1. The drainage conveyance systems have been designed to intercept and convey the 25-year storm. In the case of open channels or swales, this includes the design of measures to resist scour of the channel. Velocity computation for channel aprons and the sizing of the temporary riser for the sediment pond will be appended to the NOI.

2. All storm drain pipes shall have riprap aprons at their outlet to protect the outlet and receiving channel of the culverts from scour and deterioration. Installation details are provided in the plan set. The aprons shall be installed and stabilized prior to directing runoff to the tributary pipe or culvert. It is noted that all inlets and outlets over 18" in diameter are to have a flared concrete inlet and an aluminum bar rack. Small pipes will be protected with rodent guards. Orifices in hydraulic control structures will be protected with a wire mesh screen with an opening of no more than 25 percent of the orifice size and a surface are of at least 25 times the area of the orifice.

3. All areas disturbed during construction, but not subject to other restoration (paving, riprap, etc.), will be loamed, limed, fertilized, mulched, and seeded. Fabric netting, anchored with staples, shall be placed over the mulch in areas where the finish grade slope is greater than 10 percent. Native topsoil shall be stockpiled and temporarily stabilized with seed and mulch and reused for final restoration when it is of sufficient quality.

4. Catch basins shall be provided with sediment sumps for all outlet pipes that are 12" in diameter or greater. Catch basins that are not within 100 feet of wells have been designed with an under drain connection to allow the subbase gravel to drain and reduce frost heave and movement at the basin. A sediment collection bag and an oil sorbent pillow shall be installed in all basins.

5. Permanent seeding shall be conducted only in April through May and in late summer until September 15.

6. A riprap plunge pool will be installed at the stormwater management discharge at the wetland edge to disperse the flows.

N. TIMING AND SEQUENCE OF EROSION/SEDIMENTATION CONTROL MEASURES

The site is quite susceptible to erosion when denuded soils are wet and caution is made to the contractor to limit construction activity during inclement weather. The Contractor must control fugitive dust emissions, respect and not impede the neighboring land uses, control sediment laden runoff to 280 NTU or less. For all grading activities, the Contractor

shall exercise extreme caution not to overexpose the site by limiting the disturbed area and shall stabilize any steep slopes within 24 hours if final slope grading and stabilization will not be completed within 7 days. Any final slopes shall have the specified erosion control measures installed within 7 days of final stabilization.

The following construction sequence shall be required, (unless otherwise authorized in writing by the Owner's project manager or authorized permit agent).

The description of the work is:

Phase 1: The initial phase of the project will include the removal of the overhead utility lines, the razing of existing buildings, and the installation of the sedimentation facilities to serve the construction of the project. The Contractor will need to perform the following work

- Mark the Phase 1 work limits.
- Install safety fence and security signs around the perimeter of the site.
- Establish and install construction entrances with gates.
- Install silt fence along the perimeter and other designated areas requiring Type 1 silt fence.
- Initialize the relocation of overhead utilities.
- Establish Dirtbag™ area and pump system for dewatering activities.
- Construct sedimentation facilities with riprap discharge to the Fore River.
- Construct a diversion swale to direct as much of the site to the sedimentation basins as possible including the installation of culverts and rip rap where the diversion swale passes under the construction access drives.
- Fill monitoring wells designated to be abandoned.
- Install temporary seed and mulch around the perimeter of the sedimentation facility.
- Raze existing buildings and bring the foundation holes back to subgrade.

Subsequent Phases: There is more flexibility for the contractor to schedule the work provided that the erosion control measures are in place. The measures shown on Drawing C-6.0 and C-5.1 of the plan set are the measures that need to be installed as soon as practicable during construction in subsequent phases.

This includes diversion of stormwater from the site to the sedimentation ponds, providing berms to restrict the runoff from flowing off the steep banks of the site, maintaining construction entrances, providing and use of the Dirtbag™ for pretreatment of water pumped from excavations, maintaining a crushed stone working pad around the foundation area until gravels and pavements are placed, and diversion of stormwater runoff away from the underground treatment, detention, and infiltration areas. The

manhole details included with the drawing set include specific locations and elevations for the diversion lines. Placement of the underground systems in service shall not occur until the site has been stabilized and pavement has been allowed to "cure" for a period of three weeks.

The underground facilities and treatment units shall not be activated until authorized by the design engineer or a certified erosion control professional who has signed an affidavit indicating they have reviewed the plans, Stormwater Management, Erosion Sediment Control Plan, Stormwater O&M Manual, and any State and Local site permits issued for the project.

O. CONTRACTING PROCEDURE

The onsite components of the project will be constructed by a General Contractor under contract to the Developer. The Contractor shall submit a schedule for the completion of the work, which will satisfy the following criteria:

1. The construction sequence of Section M should generally be completed in the specified order; however, several separate items may be constructed simultaneously. Work must also be scheduled or phased to prevent the duration of areas exposed or susceptible to erosion as specified below. The intent of this sequence is to provide for erosion control and to have structural measures such as silt fence and construction entrances in place before large areas of land are denuded.
2. The work shall be conducted in sections which will:
   a) Limit the amount of exposed area to those areas in which work is expected to be undertaken during the preceding 30 days.
   b) Revegetate disturbed areas as rapidly as possible. All areas shall be permanently stabilized within 7 days of final grading and temporarily stabilized within 7 days of initial disturbance or before a predicted storm event of over ½" of rain.
   c) Incorporate planned inlets and drainage system as early as possible into the construction phase. The ditches shall be immediately lined or revegetated as soon as their installation is complete.
   d) Achieve the parking space numbers indicated in the construction phasing.
3. Once final grade has been established, the Contractor may choose to dormant seed the disturbed areas prior to placement of mulch and placement of fabric netting anchored with staples.
   a) If dormant seeding is used for the site, all disturbed areas shall receive 6" of loam and seed at an application rate of 5#/1,000 s.f.

      All areas seeded during the winter months will be inspected in the spring for adequate catch. All areas insufficiently vegetated (less than 75 percent catch) shall be revegetated by replacing loam, seed, and mulch.
   b) If dormant seeding is not used for the site, all disturbed areas shall be revegetated in the spring.
4. The area of denuded, non-stabilized construction shall be limited to the minimum area practicable. An area shall be considered to be denuded until the subbase gravel is installed in parking areas, or the areas of future loam and seed have been loamed,

seeded, and mulched. The mulch rate shall be twice the rate specified in the seeding plan. [For example, 115#/1,000 s.f. x 2 = 230#/s.f.]

5. Within the exposed work area, temporary sedimentation sumps shall be provided any concentrated flow area with sand filter or chemical coagulation. Additional information is provided in prior sections of this narrative and on the Erosion Control Details of the plan set. Along the sedimentation sumps, barriers shall be provided at sufficient intervals to permit runoff to be accumulated to a minimum depth of 12" before overflowing.
6. The schedule shall be subject to the approval of the Owner.
7. The Contractor must maintain an accurate set of record drawings indicating the date when an area is first denuded, the date of temporary stabilization, and the date of final stabilization. On September 15 of any calendar year, the Contractor shall submit a detailed plan for stabilizing the site for the winter and a description of what activities are planned during the winter.
8. The Contractor must install any added measures which may be necessary to control erosion/sedimentation and fugitive dust emissions from the site, with adjustments made dependent upon forecasted and actual site and weather conditions.
9. The Contractor shall note that no area within 50 feet of a slope with a vertical drop of more than 3' in 50 feet shall remain denuded for a period of over 5 days before it is temporarily stabilized. Temporary stabilization shall be the installation of mulching. All other areas shall be stabilized within 7 days or before a predicted rain event. For construction between September 15 and April 15 of any calendar year, all areas shall be temporarily stabilized at the earlier time frames specified above.
10. Contractor shall be responsible for theirs and their subcontractor's compliance with LEED requirements (construction waste, low voc materials, etc.) and shall provide upon Owner request any documentation or data pertaining to these standards.
11. Certain erosion control products (such as DirtGlue™) come in a form that a release could occur on the site or into the environs. The Contractor shall include MSDS information for all products that have the potential for release to the environment and shall be responsible for implementing a safety control program for proper handling of these materials on the site.
12. The Stormwater Pollution Prevention Plan (SWPPP) is defined to consist of the Erosion Control Report, the Stormwater Management Plan, and the Stormwater O&M Plan. The SWPPP shall be maintained at a secure locked location at the contractor's field trailer from commencement of the project. These documents shall be moved to a designated locked location inside the building(s) at the period when the contractor's trailers are removed and maintained until the Notice of Termination has been filed by the Owner.

    A notice and point of contact with cell phone number shall be posted at the trailer to permit access to the records during normal work hours and in case of emergency at other times. All additions and construction records shall be copied via e-mail to the following addresses:

    sbushey@delucahoffman.com
    ddlatulip@aol.com

The Owner reserves the right to add additional personnel to this list at the pre-construction conference or at reasonable intervals during the project.

13. The Owner will provide a copy of the NOI acceptance letter to the Contractor. This letter shall be maintained at the site with the SWPPP.

14. Any revisions to the SWPPP must be authorized in writing by the Preparer of the Plan (DeLuca-Hoffman Associates, Inc.) The Preparer of the Plan shall be permitted reasonable time to review and notify the city and other agencies of said changes. Revisions to the SWPPP will be required:

    a. Whenever the current provisions prove to be ineffective in minimizing pollutants in stormwater *discharges* from the site;

    b. Whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants; and

    c. To address issues or deficiencies identified during an inspection by the *qualified inspector*, the Department, or other regulatory authority.

15. Should the Owner notify the contractor that the activity on the site is in violation of the SWPPP, the Contractor shall at its sole cost correct the deficiencies and file a photographic log with a list of corrective actions with the Owner within 7 days of notification by the Owner.

16. The project is currently undergoing a Phase II Environmental Study. The results of this study will be provided as part of the VRAP plan and as an appendix to the SWPPP plan prior to the preconstruction conference, and shall be incorporated by reference when appended.

17. The Contractor shall engage a qualified inspector to monitor the work. This inspector shall be approved by the Owner prior to the individual being engaged on the project. This inspection shall be a part of the Contractor's Quality Control Plan for the project by the Contractor. The inspector's qualifications and duties that he shall perform are as follows:

    a. Licensed Professional Engineer or Certified Professional in Erosion Control`

    b. Covered by Workman's Compensation Insurance

    c. Experienced in this type of work, the specific erosion controls applicable to this project with a resume approved by the engineer

    d. Compensated on a unit rate basis with no incentives for reduced costs or subject to any type of compensation for passing inspections

    e. Approved by the Owner and the preparer of this plan

The *qualified inspector*s shall conduct site inspections in accordance with the following timetable:

a. Where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

b. Where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the City's stormwater contact person or, in areas under the jurisdiction of a *regulated traditional land use control MS4*, the MS4 (provided the MS4 is not the *owner or operator* of the construction activity) in writing prior to reducing the frequency of inspections.

c. Where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the City's stormwater contact person in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the Contractor shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization*, and all temporary, structural erosion and sediment control measures have been removed, and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice" certification statements on the Notice of Termination. The *owner or operator* shall then submit the completed Notice of Termination form to the City of Portland.

At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization*, all points of discharge to natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

a. Date and time of inspection;

b. Name and title of person(s) performing inspection;

c. A description of the weather which shall be consistent with the National Weather Service Forecast Office, Portland-Gray, ME and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

d. A description of the condition of the runoff at all points of discharge from the construction site and sampling to determine the turbidity in NTU's. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

e. A description of the condition of all natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site which received runoff from disturbed areas. This shall include identification of any *discharge* of sediment to the surface water body;

f. Identification of all erosion and sediment control practices that need repair or maintenance;

g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

k. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

Within one business day of the completion of an inspection, the *qualified inspector* shall notify the owner the appropriate contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame, at its sole cost.

All inspection reports shall be signed by the *qualified inspector*. The inspection reports shall be maintained on site with the SWPPP and distributed via email at the time of filing.

18. The Owner reserves the right to have quality assurance monitoring of the work. The Contractor shall, at its sole cost, cooperate with the Owner and their quality assurance monitoring of the work including maintaining an accurate schedule for performing the work. The Owner will notify the contractor if any particular elements of the work should be uncovered or available for observation by the Quality Assurance Monitor selected by the Owner. The Owner reserves the right to conduct the quality assurance monitoring during working hours at any time during the project.

P. PROVISIONS FOR MAINTENANCE OF THE EROSION/SEDIMENTATION CONTROL FEATURES

The project will be contracted to a General Contractor. The project is subject to the requirements of the local permits, and a state regulated Construction General Permit and Stormwater Permit.

This project requires the Contractor to prepare a list and designate by name, address and telephone number all individuals who will be responsible for implementation, inspection, and maintenance of all erosion control measures identified within this section and as contained in the Erosion and Sedimentation Control Plan of the contract drawings. Specific responsibilities of the inspector(s) will include:

1. Execution of the Contractor/Subcontractor Certification contained in Attachment B by any and all parties responsible for erosion control measures on the site as required by the permit authorities.
2. Assuring and certifying the Owner's construction sequence is in conformance with the specified schedule of this section. A weekly certification stating compliance, any deviations, and corrective measures necessary to comply with the erosion control requirements of this section shall be prepared and signed by the inspector(s).
3. In addition to the weekly certifications, the inspector(s) shall maintain written reports recording construction activities on site which include:
    - Dates when major grading activities occur in a particular areas.
    - Dates when major construction activities cease in a particular area, either temporarily or permanently.
    - Dates when an area is stabilized.
4. Inspection of this project work site on a weekly basis and after each significant rainfall event (0.5 inch or more within any consecutive 24-hour period) during construction until permanent erosion control measures have been properly installed and the site has been stabilized. Inspection of the project work site shall include:
    - Identification of proper erosion control measure installation in accordance with the erosion control detail sheet or as specified in this section.
    - Determine whether each erosion control measure is properly operating. If not, identify damage to the control device and determine remedial measures.

- Identify areas which appear vulnerable to erosion and determine additional erosion control measures which should be used to improve conditions.
- Inspect areas of recent seeding to determine percent catch of grass. A minimum catch of 90 percent is required prior to removal of erosion control measures.
- All erosion controls shall be removed within 30 days of permanent stabilization except for mulch and netting not detrimental to the project. Removals shall include but not be limited to all silt fence, hay bales, inlet protection, and stone check dams.
- Accumulated silt/sediment should be removed when the depth of sediment reaches 50 percent of the barrier height. Accumulated silt/sediment should be removed from behind silt fencing when the depth of the sediment reaches 6 inches.
- Silt sacks should be removed and replaced at least every three months and at any time where the weekly inspection reveals that siltation has significantly retarded the rate of flow through the silt sack.
- Discharges should be measured during storm events to document the turbidity of stormwater discharge is <280 NTU.

5. If inspection of the site indicates a change should be made to the erosion control plan, to either improve effectiveness or correct a site-specific deficiency, the inspector shall immediately implement the corrective measure and notify the Owner of the change.
6. Arranging for an on-site meeting prior to commencing winter construction to assure that all special winter construction measures will be implemented and to review the specific requirements of this plan for winter construction.

All certifications, inspection forms, and written reports prepared by the inspector(s) shall be filed with the Owner, and the Permit File contained on the project site. All written certifications, inspection forms, and written reports must be filed within one (1) week of the inspection date.

The Contractor has sole responsibility for complying with the erosion/sediment control report, including control of fugitive dust, and shall be responsible for any monetary penalties resulting from failure to comply with these standards.

Once construction has been completed, long-term maintenance of the stormwater management system will be the responsibility of the applicant. Inspection and Maintenance items with a list of maintenance requirements and frequency are described in a separate document. In the event of defective workmanship or any failure by the contractor and its subcontractors to adhere to the Standards set forth in these documents, the Contractor shall be responsible to correct, at its sole cost, any latent defects together with reimbursement of Owner for any expenses borne by the Owner up to the time of said correction. This provision shall remain in effect beyond any stated or implied warranty period.

Q. PRECONSTRUCTION CONFERENCE

Prior to any construction at the site, representatives of the Contractor, the Owner, and the site design engineer and any personnel identified in the permit conditions shall meet to discuss the scheduling of the site construction and the designation of the responsible parties for implementing the plan. The Contractor shall be responsible for scheduling the meeting. Prior to the meeting, the Contractor will prepare a detailed schedule and a marked-up site plan indicating areas and components of the work and key dates showing date of disturbance and completion of the work. The Contractor shall conduct a meeting with employees and sub-contractors to review the erosion control plan, the construction techniques which will be employed to implement the plan, and provide a list of attendees and items discussed at the meeting to the Owner. Three copies of the schedule, the Contractor's meeting minutes, and marked-up site plan shall be provided to the Owner.

R. APPENDICES

Attachment A – Seeding Plan

Attachment B – Sample Erosion Control Compliance Certification and Inspection Forms

Attachment C – Open Channel, Outlet Aprons, and Temporary Sedimentation Sump Computations

Attachment D – DirtGlue™ Application and Use Requirements

Attachment E – SiteOps Computer Earthwork Analysis and Summary of Proposed Earthwork

S. PLAN REFERENCES

Drawings C-6.0 to C-5.1 Erosion/Sediment Control Plans
Drawings C-8.6 to C-8.7 Erosion/Sediment Control Details and Notes

ATTACHMENT A

Seeding Plan

PERMANENT SEEDING PLAN (TURF AROUND PERIMETER)

Project: Convenience Store and Fuel Station

Site Location: 2282 Congress Street, Portland, ME

X Permanent Seeding _____ Temporary Seeding

1. **Area to be Seeded:** Approximately 0.06 acre(s) or ____/M. Sq. Ft. (refer to Surface Treatment plan)

2. **Instructions on Preparation of Soil:** Prepare a good seed bed for planting method use (do not overcompact).

3. **Apply Lime as Follows:** _____ #/acres or 138# /M Sq. Ft. or per soil test

4. **Fertilize:** _____ pounds of _____ - _____N-P-K/ac.

   20 pounds of 3-27-5 N-P-K/M Sq. Ft. or per soil test

5. **Method of Applying Lime and Fertilizer:** Spread and work into the soil before seeding.

6. **Seed with the following mixture (slice seed in each direction where practical):**

   30% Perennial Rye
   35% Kentucky Bluegrass
   35% Penn Lawn Tall Fescue

7. **Mulching Instructions**: Apply at the rate of __ tons per acre or 115 pounds per M. Sq. Ft.

8. **Application:**

Type	Unit#	Tons, Etc.
Total Lime	138	#/1,000 s.f.
Total Fertilizer	20	#/1,000 s.f.
Total Seed	8.0	#/1,000 s.f.
Total Mulch	115	#/1,000 s.f.
Total Other		

9. **Remarks:**

Seeding dates April 15 to May 31 and August 1 until September 1. Permanent seeding should be made prior to September 1 or as a dormant seeding after the first killing frost and before the first snowfall. If seeding cannot be done within these seeding dates, temporary seeding and mulching shall be used to protect the site. Permanent seeding shall be delayed until the next recommended seeding period.

Fertilizer requirements shall be subject to actual test results of the topsoil used for the project. The Contractor shall be responsible for providing topsoil test results for pH and recommended fertilizer application rates to the Owner.

Seed mixture shall be fresh, clean, new crop seed. Seed may be mixed by an appropriate method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers bearing the dealer's guaranteed analysis.

Deep tine aerate if soil is compacted.

If seed is mixed by the dealer, the Seeding Contractor shall furnish to the Owner the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

Seed shall be purchased from a recognized distributor and shall test to a minimum percentage of 95% for purity and 85% for germination.

All loam shall have compost or peat admixtures to raise the organic content to 6%.

PERMANENT SEEDING PLAN (LAWNS)

Project: Convenience Store and Fuel Station

Site Location: 2282 Congress Street, Portland, ME

__X__ Permanent Seeding _____ Temporary Seeding

1. **Area to be Seeded:** Approximately 0.01 acre(s) or _____/M. Sq. Ft. (per AGTEK analysis)

2. **Instructions on Preparation of Soil:** Prepare a good seed bed for planting method used (do not over compact).

3. **Apply Lime as Follows:** _____ #/acres or 138# /M Sq. Ft. or per soil test

4. **Fertilize:** _____ pounds of _____ - _____N-P-K/ac.

   20 pounds of 10-20-20 N-P-K/M Sq. Ft. or per soil test

5. **Method of Applying Lime and Fertilizer:** Spread and work into the soil before seeding.

6. **Seed with the following mixture:**

   35% Kentucky Bluegrass
   20% Creeping Red Fescue
   15% Chewings Fescue
   15% Perennial Ryegrass
   15% Annual Ryegrass

7. **Mulching Instructions**: Apply at the rate of __ tons per acre or 230 pounds per M. Sq. Ft.

8. **Application:**

Type	Unit#	Tons, Etc.
Total Lime	138	#/1,000 s.f.
Total Fertilizer	20	#/1,000 s.f.
Total Seed	5	#/1,000 s.f.
Total Mulch	230	#/1,000 s.f.
Total Other		

9. **Remarks:**

   Seeding dates April 15 to May 31 and August 1 until September 1. Permanent seeding should be made prior to September 1 or as a dormant seeding after the first killing frost and before the first snowfall. If seeding cannot be done within these seeding dates, temporary seeding and mulching shall be used to protect the site. Permanent seeding shall be delayed until the next recommended seeding period.

   Fertilizer requirements shall be subject to actual test results of the topsoil used for the project. The Contractor shall be responsible for providing topsoil test results for pH and recommended fertilizer application rates to the Owner.

Seed mixture shall be fresh, clean, new crop seed. Seed may be mixed by an appropriate method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers bearing the dealer's guaranteed analysis. If seed is mixed by the dealer, the Seeding Contractor shall furnish to the Owner the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

Seed shall be purchased from a recognized distributor and shall test to a minimum percentage of 95% for purity and 85% for germination.

All loam shall have compost or peat admixtures to raise the organic content to 8%.

Deep tine aerate if soil is compact.

PERMANENT SEEDING PLAN (LOW MAINTENANCE AREAS)

Project: Convenience Store and Fuel Station

Site Location: 2282 Congress Street, Portland, ME

X Permanent Seeding _____ Temporary Seeding

1. **Area to be Seeded:** Approximately 0 .05 acre(s) or 40 /M. Sq. Ft. (per AGTEK analysis)

2. **Instructions on Preparation of Soil:** Prepare a good seed bed for planting method used (do not over compact).

3. **Apply Lime as Follows:** _____ #/acres or 138# /M Sq. Ft. or per soil test

4. **Fertilize:** _____ pounds of _____ - _____N-P-K/ac.

   20 pounds of 10-20-20 N-P-K/M Sq. Ft. or per soil test

5. **Method of Applying Lime and Fertilizer:** Spread and work into the soil before seeding.

6. **Seed with the following mixture:**

   35% Tall Fescue
   30% Creeping Red Fescue
   20% Perennial Ryegrass
   15% Annual Ryegrass

7. **Mulching Instructions**: Apply at the rate of __ tons per acre or 230 pounds per M. Sq. Ft.

8. **Application:**

Type	Unit#	Tons, Etc.
Total Lime	138	#/1,000 s.f.
Total Fertilizer	20	#/1,000 s.f.
Total Seed	5	#/1,000 s.f.
Total Mulch	230	#/1,000 s.f.
Total Other	0	0

9. **Remarks:**

   Seeding dates April 15 to May 31 and August 1 until September 1. Permanent seeding should be made prior to September 1 or as a dormant seeding after the first killing frost and before the first snowfall. If seeding cannot be done within these seeding dates, temporary seeding and mulching shall be used to protect the site. Permanent seeding shall be delayed until the next recommended seeding period.

   Fertilizer requirements shall be subject to actual test results of the topsoil used for the project. The Contractor shall be responsible for providing topsoil test results for pH and recommended fertilizer application rates to the Owner.

Seed mixture shall be fresh, clean, new crop seed. Seed may be mixed by an appropriate method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers bearing the dealer's guaranteed analysis. If seed is mixed by the dealer, the Seeding Contractor shall furnish to the Owner the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

Seed shall be purchased from a recognized distributor and shall test to a minimum percentage of 95% for purity and 85% for germination.

All loam shall have compost or peat admixtures to raise the organic content to 6%.

TEMPORARY SEEDING PLAN (EROSION CONTROL MIX)

Project: Convenience Store and Fuel Station

Site Location: 2282 Congress Street, Portland, ME

__X__ Permanent Seeding __X__ Temporary Seeding

1. **Area to be Seeded:** Approximately __1__ acre(s) or _____/M. Sq. Ft.

2. **Instructions on Preparation of Soil:** Prepare a good seed bed for planting method used.

3. **Apply Lime as Follows:** _____ #/acres or __138#__/M Sq. Ft. or per soil test

4. **Fertilize:** _____ pounds of _____ - _____N-P-K/ac.

   __20__ pounds of 10-10-10 N-P-K/M Sq. Ft. or per soil test

5. **Method of Applying Lime and Fertilizer:** Spread and work into the soil before seeding.

6. **Seed with the following mixture:**

Annual Rye-grass	50%
Timothy	25%
Winter Rye	25%

7. **Mulching Instructions**: Apply at the rate of __ tons per acre or 230 pounds per M. Sq. Ft.

8. **Application:**

Type	Unit#	Tons, Etc.
Total Lime	138	#/1,000 s.f.
Total Fertilizer	20	#/1,000 s.f.
Total Seed	1	#/1,000 s.f.
Total Mulch	230	#/1,000 s.f.
Total Other		

9. **Remarks:**
   For areas with slopes >10% and fall and winter erosion control areas, mulch netting shall be used per manufacturer's specifications.

   R Permanent seeding should be made prior to September 1 or as a dormant seeding after the first killing frost and before the first snowfall. If seeding cannot be done within these seeding dates, temporary seeding and mulching shall be used to protect the site. Permanent seeding shall be delayed until the next recommended seeding period.

   Fertilizer requirements shall be subject to actual test results of the topsoil used for the project. The Contractor shall be responsible for providing topsoil test results for pH and recommended fertilizer application rates to the Owner.

   Seed mixture shall be fresh, clean, new crop seed. Seed may be mixed by an appropriate method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers bearing the dealer's guaranteed analysis.

If seed is mixed by the dealer, the Seeding Contractor shall furnish to the Owner the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

Seed shall be purchased from a recognized distributor and shall test to a minimum percentage of 95% for purity and 85% for germination.

All loam shall have compost or peat admixtures to raise the organic content to 6%.

ATTACHMENT B

Sample Erosion Control Compliance Certification and Inspection Forms

MAINE CONSTRUCTION GENERAL PERMIT
CONTRACTOR/SUBCONTRACTOR CERTIFICATION

PROJECT INFORMATION

Project Name: Convenience Store and Fuel Station

Address: 2282 Congress Street, Portland, Maine

CONTRACTOR/SUBCONTRACTOR INFORMATION

Firm Name:

Address:

Telephone:

Type of Firm:

CERTIFICATION STATEMENT

"I certify under penalty of law that I understand the terms and conditions of the Maine Construction General Permit (MCGP) permit that authorizes the stormwater discharges associated with construction activity from the project site identified as part of this certification."

_____
Signature

_____
Typed Name

_____
Title

_____
Date

MAINE CONSTRUCTION GENERAL PERMIT

INSPECTION REPORT

PROJECT INFORMATION

Project Name: Convenience Store and Fuel Station

Address: 2282 Congress Street, Portland, Maine

INSPECTOR INFORMATION

Inspector Name: _____

Firm: _____

Title: _____

Qualifications: _____

Weather and Soil Conditions: _____

INSPECTION SUMMARY

Date of Inspection: _____

Major Observations: _____

_____

_____

_____

1. Attach the following to the Report:

   a. A description of the condition of the runoff at all points of discharge from the construction site and sampling to determine the NTU. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

   b. A description of the condition of all natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site which received runoff from disturbed areas. This shall include identification of any discharge of sediment to the surface water body;

   c. Identification of all erosion and sediment control practices that need repair or maintenance.

   d. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

   e. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

f. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPP and technical standards;

g. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

h. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

2. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the owner the appropriate contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

3. All inspection reports shall be signed by the *qualified inspector*. The inspection reports shall be maintained on site with the SWPP and distributed via email at the time of filing.

THE FACILITY IS IN COMPLIANCE WITH THE STORMWATER POLLUTION PREVENTION PLAN WITH THE FOLLOWING EXCEPTIONS:

_____

_____

_____

_____

ACTIONS NECESSARY TO BRING FACILITY INTO COMPLIANCE:

_____

_____

REQUIRED MODIFICATIONS TO STORMWATER POLLUTION PREVENTION PLAN (MUST BE SUBMITTED WITHIN 2 DAYS OF INSPECTION TO OWNER FOR APPROVAL):

_____

_____

_____

_____

CERTIFICATION STATEMENT:

"I certify under penalty of law that this document and all Appendices were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the systems, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of find and imprisonment for knowing violations."

_____
Signature

_____
Typed Name

_____
Title

_____
Date

ATTACHMENT C

Open Channel, Outlet Aprons and Temporary Sedimentation Sump Computations

(To Be Provided Upon Request)

ATTACHMENT D

DirtGlue™ Application and Use Requirements

DIRTGLUE™
APPLICATION INSTRUCTIONS FOR DUST CONTROL

METHODOLOGY

A. Heavy Duty Driving Surface

Application Rates (per surface area)

DirtGlue™ polymer emulsion:	2,400 gallons
Water:	3,600 -14,400 gallons

Application Process

1. Loosen the existing soil using a scarifying attachment mounted on a grader (or similar piece of equipment) or a tractor with an agriculture disk attachment. If additional soil is required, it should be applied and mixed into the existing soil at this time. It is important to loosen the soil to ensure penetration of the DirtGlue™/water mixture into the soil.

2. Apply DirtGlue™/water mixture to soil using a water truck equipped with a gravity feed drip bar, spray bar, or automated distributor truck. Multiple passes will be necessary to get the desired amount of DirtGlue™ polymer emulsion for the specific application. Multiple passes will also ensure gradual, thorough saturation of the soil.

3. Thoroughly blend the DirtGlue™/water mixture into the soil with a rototiller, “S” harrow, or similar attachment. The soil must be evenly mixed and saturated with the DirtGlue™/water mixture to a depth of four (4”) inches.

4. Grade the soil to finish grade with a grader, a small dozer or other suitable equipment.

5. Compact the soil with a vibratory roller. The final compaction should be greater than asphalt (Strive for 100% compaction, but always in excess of 95%).

6. Immediately after compacting, apply a topcoat of DirtGlue™ polymer emulsion to seal the road surface. In order to ensure a longer life and superior performance of the application, an additional coat should be applied between twenty four to forty eight hours after completion and then annually as an ongoing maintenance procedure. This topcoat should be applied at a rate of 250 gallons per surface acre.

B. Temporary Light Duty Driving Surface

This type of application will provide acceptable performance when used by cars and light trucks. It is not intended for constant use by heavy-duty trucks and/or tracked construction equipment. Areas that will be used by this type of equipment should be treated as a heavy-duty application as noted above.

Application Rates (per surface acre)

DirtGlue™ polymer emulsion:	1,200 gallons
Water:	3,600-6000 gallons

Application Process:

7. Loosen the existing soil for a depth of two (2") inches using a scarifying attachment mounted on a grader (or similar piece of equipment) or a tractor with a rototiller or agriculture disk attachment. If additional soil is required, it should be applied and mixed into the existing soil at this time. It is important to loosen the soil to ensure penetration of the **DirtGlue™/**water mixture into the soil.

8. Apply **DirtGlue™**/water mixture to soil using a water truck equipped with gravity feed drip bar, spray bar, or automated distributor truck. Multiple passes will be necessary to get the desired amount of **DirtGlue™** polymer emulsion for the specific application. Multiple passes will also ensure gradual, thorough saturation of the soil. Do not apply the **DirtGlue™/**water mixture so heavy as to create run-off.

9. Grade the soil to finish grade with a grader, a small dozer or other suitable equipment.

10. Compact with a vibratory roller. The final compaction should be greater than asphalt (Strive for 100% compaction, but always in excess of 95%).

11. Immediately after compacting, apply a topcoat of **DirtGlue™** polymer emulsion to seal the road surface. In order to ensure a longer life and superior performance of the application, an additional coat should be applied between twenty four to forty eight hours after completion and then again annually as an ongoing maintenance procedure.

C. Dust & Erosion Control (Non-driving Areas)

This type of application is intended for pedestrian use only. Vehicular use will break through the skin and adversely affect the performance of the application. Areas that will require any vehicular use should be treated as a light-duty application as noted above or retreated as traffic damage occurs.

Application Rates (per surface acre)

DirtGlue™ polymer emulsion:	300 gallons (windblown dust control)
	600 gallons (bank stabilization, erosion/silt, run-off control)
Water:	2,000-6,000 gallons

Application Process

1. Apply *DirtGlue*™/water mixture to existing soil using a water truck equipped with a gravity feed spray bar or tank and pump (i.e. hydro seeder).

2. Add *DirtGlue*™ to water rather than water to *DirtGlue*™ or place a fill hose at bottom of tank, underneath surface of liquid to prevent foaming.

3. When applying *DirtGlue*™/water mixture, dispense large droplets. Avoid any fine mist. The intent is to apply a sheet of liquid onto the soil.

4. It is important to determine the moisture content of the soil prior to starting an application. The moisture content will have an effect on the dilution ratio of the *DirtGlue*™/water mixture. Your *DirtGlue*™ representative will assist you in determining the correct dilution ratio for the conditions on your site.

5. Temperature and, to a lesser extent, humidity have a significant effect on curing/drying time. Testing has shown that applications should be done only when the air temperature will be above 50° F for at least 72 hours following the application. Soil temperature must be above 40° F for several days.

6. The *DirtGlue*™ application must be protected from the rain until the curing process has formed a skin on the surface. Uncured *DirtGlue*™ is water soluble. If the application is exposed to rain before it has the opportunity to cure, the rainwater will dilute the polymer and wash it out of the soil. If this happens, the application will not be as strong.

CONDITIONS FOR USE OF DIRTGLUE™ (REGISTERED TRADEMARK OF DIRTGLUE™ ENTERPRISES)
APPROVED MATERIALS LIST

Applicant: DirtGlue™ Enterprises

General Conditions

1. DirtGlue™ Enterprises shall ensure that every applicator of DirtGlue™™ is provided a copy of these conditions.

2. These Conditions do not override the need for any applicator to obtain permits (including DEP permits) or approvals that may be required (e.g., use associated with activities in or near regulated wetlands, surface waters, or other regulated natural resources).

3. DirtGlue™ shall only be used as stated in these conditions and shall not be mixed with any other chemicals, including petroleum products.

4. No application shall be conducted when the National Weather Service forecasts greater than 25% probability of precipitation in the application area to occur within 24 hours, or the temperature will drop below 35° F anytime within 24 hours after the application.

5. Applications shall not be conducted when the ground is saturated (due to precipitation or wetting) as defined by visible pools of water at or in the vicinity of the application, in order to prevent movement of DirtGlue™ beyond the shoulder of the road.

6. DirtGlue™ must not be applied or handled in a manner that could result in spillage or application within 100 feet of a wetland regulated by New York State, or 50 feet of all other water bodies and bridges.

7. Any spill which could enter the waters of the state shall be reported to the DEC Spills Hotline within two hours (1-800-457-7362). Any required response (including any needed cleanup) in addition to that being conducted shall then be determined by the DEC regional office.

8. The time of application shall be chosen to take meteorological conditions into account, to avoid significant potential airborne or odor impacts.

9. Prior to application, DirtGlue™ Material Safety Data Sheet shall be provided to applicators and others who would come in proximity or contact with the material.

ATTACHMENT E

SiteOps Computer Earthwork Analysis

(To Be Provided Upon Request)

APPENDIX K

Inspection & Maintenance Manual for Stormwater Management and Related Stormwater Facilities

INSPECTION AND MAINTENANCE MANUAL FOR STORMWATER MANAGEMENT AND RELATED STORMWATER FACILITIES

CONVENIENCE STORE AND FUEL STATION PORTLAND, ME

PREPARED FOR:

CJ DEVELOPERS, INC.
35 PRIMROSE LAND
FREEPORT, MAINE 04032
(207) 865-4323

PREPARED BY:

DELUCA-HOFFMAN ASSOCIATES, INC.
778 MAIN STREET, SUITE 8
SOUTH PORTLAND, MAINE 04106
(207) 775-1121

APRIL 2013

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I. INTRODUCTION

Relatively complex stormwater management facilities are commonly installed in development projects including, commercial facilities, and many other developments. The complexity and goals of these systems vary with the nature of the receiving water, as well as the type of development. Runoff from developed areas of the project, including rooftops, paved or lawn areas, typically contain materials that can impact the receiving waters. Source control and the installation of wet ponds, infiltration galleries, and water quality units, often combined with pretreatment measures or followed by vegetated buffer strips and other best management practices, can significantly reduce the non-point pollution discharge from the developed area. These measures are particularly important to projects in the watersheds of sensitive water bodies, or projects with potential impacts to groundwater. With the increased cost of land and development, there is an increased tendency to construct portions of the stormwater management systems underground.

The effectiveness of water quality management provisions and other components of the stormwater management system are dependent on their design, upkeep, and maintenance to assure they meet their intended function over an extended period of years. It is critical that the stormwater management facilities are regularly inspected, and that maintenance is performed on an as-needed basis. It must also be recognized that the effectiveness of these facilities, and their maintenance requirements, are related to the stormwater drainage facilities that collect and transport the flow to the ponds, infiltration galleries, and other treatment measures. Thus, maintenance should be directed to the total system, not just the pond or primary stormwater management facility.

The purpose of this document is to define, in detail, the inspection and maintenance requirements deemed necessary to assure that the stormwater management facilities function as intended when they were designed. Subsequent sections identify individual maintenance items, give a brief commentary of the function and need for the item, a description of the work required, and a suggested frequency of accomplishment. While the suggested programs and schedules must be adapted to specific projects, the material presented should provide guidance for a successful long-term program for operation and maintenance. A supplemental section provides guidance for construction monitoring of the facilities during their installation and more detailed checklists. Certain facilities, specifically the groundwater recharge and infiltration beds are not intended to be placed in service until the tributary catchment area has the permanent cover in place and any contributing turf areas have achieved a 90% catch of vegetation (i.e. established).

A. GUIDELINES OVERVIEW

A summary of the individual components of stormwater management facilities has been prepared. The format used in the summary is as follows:

Preface: A general description of what function/benefit the element is intended to provide. This is a short summary and not intended to provide the design basis which can be found in other sources.

Inspection: This section provides the inspection requirements for the individual component.

Maintenance: The section provides general information on the routine maintenance requirements of this element.

Frequency: This section outlines the best judgment of the designer on the system to the frequency of maintenance.

Comments: This section provides any particular comment on the site-specific features of this element. This is a summary only. The owner/operator should review the design drawings and documents carefully to understand the particular elements of the project. The end of this section should allow for the owner/operator to make notes on the specific program. This may include the selected maintenance procedure, cross-references to applicable design drawings, etc.

A list of the individual inspection/maintenance elements is provided in the table of contents. The guidelines are proposed for initial use with adjustments made as appropriate based upon specific project experience.

II. PROJECT OVERVIEW

Key permits issued (or applied for) on the project include:

- MeDEP Site Location of Development (City of Portland Delegated Review Authority)
- City of Portland Site Plan Review

The permit applications pending for the project include the design information for the stormwater system.

A copy of the permits for the project should be appended to this manual as Appendix B. The Owner/Operator of the stormwater management system should review these permits for a general description and background of the project, as well as any specific permit conditions or requirements of the project.

The applicant has retained DeLuca-Hoffman Associates, Inc. for civil engineering for the Convenience Store and Fuel Station development in Portland, Maine. DeLuca-Hoffman Associates, Inc. has prepared the design for the stormwater management facilities and may be contacted at:

DeLuca-Hoffman Associates, Inc.
778 Main Street, Suite 8
South Portland, Maine 04106
(207) 775-1121

It is recommended the preparer of the plan be contacted with any particular questions on the design intent or similar issues.

The applicable plans/design documents which apply to the project are:

1. Civil Site Plans/Permit Applications Prepared by DeLuca-Hoffman Associates, Inc.
2. The Erosion Control/Sedimentation Control Plan for the project.
3. The Stormwater Management Plan for the project.

A copy of these documents should be retained with the manual.

The site is tributary to the Long Creek Watershed.

The proposed design will include deep sump catch basins, oil absorbent sorbent booms, underground detention including the use of an arched chamber system and StormTreat™ system tank, Filterra® tree box filters (or approved equal), and collection, conveyance, and discharge systems.

The project is subject to the requirements of the City of Portland Code of Ordinances, Chapter 32. Specifically the post construction stormwater management plan. The City requirements have been reiterated for ease of reference; however, the owner shall be responsible to meet the current City code.

"Any person owning, operating or otherwise having control over a BMP required by a post construction stormwater management plan shall maintain the BMP's in accordance with the approved plan and shall demonstrate compliance with that plan as follows:

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

(b) Maintenance and repair. If the BMP requires maintenance, repair or replacement to function as intended by the approved post-construction stormwater management plan, the owner or operator of the BMP shall take corrective action (s) to address the deficiency or deficiencies as soon as possible after the deficiency is discovered and shall provide a record of the deficiency and corrective action (s) to the department of public services ("DPS") in the annual report.

(c) Annual report. The owner or operator of a BMP or a qualified post-construction stormwater inspector hired by that person, shall, on or by June 30 of each year, provide a completed and signed certification to DPS in a form provided by DPS, certifying that the person has inspected the BMP (s) and that they are adequately maintained and functioning as intended by the approved post-construction stormwater management plan, or that they require maintenance or repair, including the record of the deficiency and corrective action (s) taken.

(d) Filing fee. Any persons required to file an annual certification under this section shall include with the annual certification a filing fee established by DPS to pay the administrative and technical costs of review of the annual certification.

(e) Right of entry. In order to determine compliance with this article and with the post-construction stormwater management plan, DPS may enter upon property at reasonable hours with the consent of the owner, occupant or agent to inspect the BMP's."

III. STANDARD INSPECTION/MAINTENANCE DESCRIPTIONS

The following narratives describe the inspection/maintenance provisions for the Stormwater Management area. These O&M procedures will complement scheduled sweeping of the pavement areas anticipated to occur at least twice per year. The MeDEP will require the stormwater system be certified to meet the basis of design at five year increments. Proper O&M is necessary to make sure the system can be certified.

A. POND OVERFLOW

Preface: The stormwater detention facilities proposed for the project includes underground detention systems under the paved parking area and an open detention basin. The underground units are a proprietary system called StormTech® MC-4500 Chambers. The storage portion of the 60-inch high chambers will travel to a level-lip spreader and discharge to the wetlands on the easterly side of the property. The open graded detention basin will store the water quality volume processed by the StormTreat™ units. If the detention storage volume were exceeded, water would spill over the emergency overflows weir at the northeast corner of the detention basin.

Inspection: There are inspection ports that should be checked semiannually to make sure that water is not ponded due to blockage.

Maintenance: The upstream measures are intended to reduce and presumably eliminate maintenance cleanings. Major cleaning would likely require excavation of the system although some success has been reported with fire flow flushing.

B. CONTROL STRUCTURES

Preface: The water quality volume will be detained in the open detention basin and bleed through the treatment measure (StormTreat™). A 4 ft dia. Manhole will control the release from the StormTreat Units with an orifice cap on the outlet pipe. Runoff for storm events larger than 1" will overflow a 6 ft long weir wall and enter the underground storage system. The proposed underground storage systems will serve as a detention pond controlled by the hydraulic outlet control structure. The outlet control structure will be designed to detain the runoff from the 2, 10, and 25-year storm events with a slow release through the restricting orifice plate. Therefore, flow is anticipated to be released during and after every major storm event. Minor events will filter through the StormTreat™ units. The StormTreat™ units have a controlled discharge of 2 gpm per unit. The control structure will be designed to be inspected by removing the manhole covers and inspection of the valve, orifice, weir, and channels. Debris should be removed whenever observed and reported to key maintenance personnel since any debris

would indicate lack of proper system O&M in the collection and conveyance system. Entry may require CONFINED SPACE ENTRY procedures and appropriately trained personnel.

Inspection: The outlet control structures must be inspected to assure it maintains its intended hydraulic characteristics. The inspection would note any debris or sediment which may accumulate in the structure and in the inlet and outlet pipes. It is noted that it does not take much debris or silt to alter the hydraulic characteristics of the discharge. The inlet should be inspected to assure it is not blocked or restricted or there is sediment to the extent that its flow characteristics may be altered.

Maintenance: Maintenance of the control structure will consist primarily of removing debris which may accumulate and sealing the bulkhead if leakage occurs.

Frequency: The control structure should be inspected quarterly, and after a high intensity rainfall event (in excess of 3 inches in a 24-hour period.

Maintenance/Inspection Responsibility:

Inspection Personnel: The maintenance personnel will be an outside agent hired by and will perform the scheduled maintenance/inspection.

Dates of inspections, maintenance performed, and any observed problems should be noted in the logs/records maintained by the outside agent.

Outside Contract Services: The outlet structure should be opened/inspected by the outside agent of CJ Developers, Inc. on a quarterly basis. The logs and records of inspections and maintenance of the control structures should be maintained during each 5-year re-certification interval.

Replacement Parts/Repairs: No normal replacement parts are required. Inspection personnel should have a bucket to remove debris from the structure. If leakage of the bulkhead occurs, it is recommended that repairs be made by a professional contractor familiar with hydraulic grouts.

C. STORMWATER INLETS

Preface: The success of any stormwater facility relies on the ability to intercept stormwater runoff at the design locations. Stormwater inlets may include catch basins, open culverts, culverts with bar screens, and field inlets. Inlets exist throughout the system at the points of collection as well as at the outlet of many ponds. Bar racks are common on many inlet locations which intercept an open channel. This section is directed at maintenance of the actual inlet point. A later section addresses more substantive maintenance of the structures and conveyance facilities. The inlets contain oil absorbent sorbent booms to retain oils and avoid discharge to downgradient areas. These will become saturated with oil over time and require replacement.

Inspection: The inspection of inlet points will need to be coordinated with other maintenance items, these include:

- Roadway/parking lot maintenance areas
- Building maintenance areas
- Grounds maintenance

The key elements of the inspection are to assure the inlet entry point is clear of debris and will allow the intended water entry.

Maintenance: The key maintenance is the removal of any blockage which restricts the entry of stormwater to the inlet. The removed material should be taken out of the area of the inlet and placed where it will not reenter the runoff collection system. Snow should be removed from inlets in parking lots/roadway areas. Grass clippings and leaves should be bagged and removed particularly near the yard inlets near the building.

Frequency: All inlets should be inspected on a monthly basis, and after/during significant storm events. A windshield survey is suitable for most inlets but off road inlets and pond structures require more rigorous inspection.

Maintenance/Inspection Responsibility:

Maintenance Personnel: The outside agent will perform the normal maintenance/inspections of the inlets and culvert crossings.

Comments: Maintenance of inlets is critical on this project.

POORLY STABILIZED INLET ALLOWS ENTRANCE OF DEBRIS AND REDUCED CAPACITY

STABILIZED INLETS REDUCE DEBRIS ACCUMULATION AND MAINTAIN DESIGN CAPACITY

D. TRIBUTARY DRAINAGE SYSTEM

Preface: Stormwater from most of the project will be directed through a conveyance system that transports the flow to water quality units. This conveyance system will be principally overland flow discharging to piped drain systems. Most of the sediment carried by the drainage system is intended to be trapped in the catch basin, sediment forebay, isolator row or water quality units. Maintenance of this system can play a major role in the long-term maintenance costs and the effectiveness of the treatment systems.

Inspection: The tributary drainage system should be periodically inspected to assure that it is operating as intended, and that its carrying capacity has not been diminished by accumulations of debris and sediment or other hydraulic impediments. On piped systems the inlets must be inspected to ensure the rims are set at the proper elevation to optimize flow entry and are not clogged with leaves or other debris. The inlet basins are normally equipped with sumps which will remove large sediment particles from the flow stream with hooded outlets. The inlet basins may be equipped with oil absorbent sorbent booms which should be inspected for saturation. Once the boom becomes saturated it will appear brown or black in color and will be ineffective at removing oils.

The level of sediment in the sumps should be checked to assure their effectiveness. Pipelines connecting the inlets should be checked to determine if siltation is occurring. This will be most critical on drain lines laid at minimal slopes. This can usually be accomplished by a light and mirror procedure.

In some projects most of the stormwater is carried in open swales, channels, or ditches. These conveyance channels may be rip rapped or vegetated, depending on the gradient and expected flow velocities. These facilities must be inspected to insure debris or sedimentation does not reduce their carrying capacity. Excess vegetative growth must also be noted. The surface protection

for the channels, either stone or vegetation, must be inspected to insure its integrity. Any areas subject to erosion should be noted.

Maintenance: Maintenance of the storm drainage system must assure that it continues to serve its design function on a long term basis, and that its operation does not transport excessive sedimentation to any downstream detention pond, or the receiving waters. Elevations on the rim of catch basins should be adjusted as needed to assure optimal water entry. Depending on the frost susceptibility of the soil, the rims may become elevated over time causing flow to circumvent the inlet. When the sump in an inlet restricts capacity and is half full with silt or other deleterious materials, the catch basin cleaning would normally be accomplished with vacuum trucks contracted as a maintenance service for the development center. The removed material must be disposed of at an approved site for such materials. The removed and replaced sorbent boom shall be disposed of in accordance with local and state regulations.

If sediment in the pipeline exceeds 20% of the diameter of the pipe, it should be removed. This may be accomplished by hydraulic flushing, or by mechanical means. If hydraulic flushing is used the downstream conditions should be analyzed. In general a sump or sediment trap should be used where it can be flushed into the underground detention pond, since it will reduce pond volume and hasten the time when it must be cleaned.

Frequency: The piped drainage system should be inspected on an annual basis. Adjustment of inlet rim elevations should be on an as needed basis. Cleaning catch basin sumps and pipelines will depend on the rate of accumulation.

Maintenance/Inspection Responsibility:

Maintenance Personnel: Outside agent appointed by CJ Developers, Inc.

Special Services: The owner will elect to contract with an independent agent for cleaning catch basins, sumps, pipelines, and replacement of sorbent booms. Remedial source control measures may be performed by the owner or an outside service depending upon the nature of the particular situation.

Comments: Maintenance of inlets is critical on this project.

A WELL STABILIZED VEGETATED SWALE SHOWS LITTLE SIGNS OF EROSIVE VELOCITIES OR FLOWS. THIS SWALE ALSO FUNCTIONS AS A POND SPILLWAY

E. STORMTREAT™ UNITS

During the first year, the basin should be inspected semi-annually and following major storm events. Recommended maintenance procedures for the first year are as follows:

- Watering may be necessary to aid plant establishment if rainfall intervals are longer than one week;
- Debris and weeds shall be removed from the bio-filter area as needed;
- Tank lids should be removed and sediment depth checked and recorded;
- Maintenance schedule should be designed based on the sediment loading of the first maintenance visits;
- Sediment should be removed at or before reaching a depth of 5 inches;
- Outflow rate should be checked and reset if necessary;
- Biofilter plants should be trimmed or harvested periodically to a minimum height of 6 inches.

The operation and maintenance of the StormTreat™ System, after the first year, is limited to annual inspections and solids removal on an as-needed basis.

The annual inspections should include the following steps:

1. Check the discharge flow rate: The outlet is designed to discharge at a rate of 2.0 gallons/minute per tank. This provides for a retention time of approximately three days for the full tank to empty following a runoff event. The discharge rate can be checked by directly measuring a timed-discharge volume if the outlet is “daylighted” or through “falling-level” measurements inside the central sedimentation chambers (the total static volume of each tank is 1,390 gallons and the height of the tank is 4 feet, therefore a 2.0 gallons/minute discharge rate can be observed as the water level in the tank falling at a rate of one inch per hour). If the falling level test is used, the inlet pipe must be temporarily plugged to avoid filling the underground storage chambers.

2. Change the inlet grit filter inside the sedimentation chamber.

3. Measure sediment depth inside the sedimentation chamber and schedule a pump-out if depth reaches 6 inches in depth. A future pump-out date can be estimated by projecting based upon sediment accumulation rates since the last measurement or since original installation. On average, StormTreat™ Systems need to have sediment removed once every three years. This can be done using a standard septic system suction pumper or with a vacuum-pumping unit.

4. Observe wetland plant conditions and height (during growing season). Wetland plants may need to be supplemented during the first three growing seasons depending upon local site conditions.

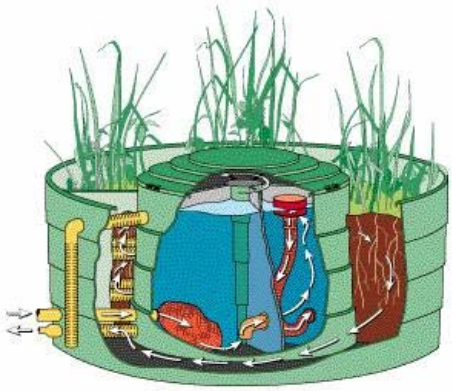
5. Perform (maintenance of) pretreatment devices as required in this manual.

A contract for third party maintenance needs to be established before occupancy.

Frequency: Once per year or as outlined above.

Applicability: StormTreat™ units are proposed for this project.

Special Note: 1.) These units are designed for a specific flow and catchment area. If the contributing watershed is increased, the need for design modifications or additional StormTreat™ units should be examined. 2.) Fertilization of the planting on the structure must be avoided.



F. PRETREATMENT SOLIDS REMOVAL (WATER QUALITY UNITS)

Preface: Certain vendors provide pre-manufactured systems which are effective in removal of suspended sediment particularly sand used for winter maintenance. Some of the units operate on a vortex principal with the sediment being swept from the stormwater stream and stored in the base of the unit. Other units are long linear units designed in accordance with Stokes Law. The units are constructed of durable materials requiring little maintenance of the physical component and typically are accessible via an at grade manhole cover.

The vendor of the unit should provide information on suggested maintenance which should be appended to this manual.

These units typically do not remove nutrients, metals, and dissolved materials.

Inspection: Most water quality units have an access manhole cover for inspection. The sediment storage zone is the bottom of the system and lies below the vortex in this type of unit or along the bottom. Because of the depth, a pole staff, or sludge judge is helpful in determining the depth of the sediment. Inspection should comply with applicable confined space regulations and vendor recommendations. Oil and floatables are also trapped in certain devices and should be removed.

Maintenance: The typical unit maintenance is the removal of sediment. DeLuca Hoffman Associates, Inc. typically recommends the units be inspected in the spring and late fall with adjustments based on historic operating experience.

The vendor may have specific scheduled maintenance schedules which should be followed.

The structural components of the system are principally stainless steel, concrete, and or climate resistant plastics.

Frequency: Twice per year or as outlined above.

Applicability: This system has three water quality units. The three linear units are in Zone A upstream of the underground sand filter.

Special Notes: These units are designed for a specific flow and catchment area. If the contributing watershed is increased, the need for design modifications or supplements to the water quality units should be examined.

G. SORBENT BOOMS

Preface: During construction, sorbent booms will be installed in the catch basins which have pavement areas. The intent of these is to absorb oil and runoff from new pavement surfaces. These will be removed and replaced when construction of the project is complete and should be inspected quarterly for the first year and annually thereafter.

Inspection: The sorbent boom should be raised out of the inlet, inspected, and replaced if necessary. Inspection should occur for the first year and annually thereafter concurrent with the catch basin cleaning.

Recommendation: It is recommended this project have additional sorbent booms or pillows onsite in the event of an unexpected spill or if oil sheen is observed frequently on any inlet.

Maintenance: The inspection and replacement should be conducted as part of a third party O&M contract and require disposal of used sorbent booms as “special wastes”.

H. PARKING LOT CLEANING

To protect the catch basin sediment sumps, underground storage, and StormTreat™ water quality filter, it is recommended the parking lot be swept at mid winter and spring and that power washing with an appropriate vacuum/power wash vehicle be done once a year.

Maintenance: It is recommended this service be contract with the firm that maintains lawns and landscaping.

I. LITTER

Litter should be removed as a matter of course by workers and a part of the grounds maintenance contract.

J. SUMMARY CHECKLIST

The above described inspection and maintenance items have been summarized on a checklist appended hereto as Appendix C.

IV. PROGRAM ADMINISTRATION

A. GENERAL

A reliable administrative structure must be established to assure implementation of the maintenance programs described in the foregoing section. Key factors that must be considered in establishing a responsive administrative structure include:

1. Administrative body must be responsible for long-term operation and maintenance of the facilities.

2. Administrative body must have the financial resources to accomplish the inspection and maintenance program over the life of the facility.

3. The administrative body must have a responsible administrator to manage the inspection and maintenance programs.

4. The administrative body must have the staff to accomplish the inspection and maintenance programs, or must have authority to contract for the required services.

5. The administrative body must have a management information system sufficient to file, retain, and retrieve all inspection and maintenance records associated with the inspection and maintenance programs.

If any of the above criteria cannot be met by the entity assigned inspection and maintenance responsibilities, it is likely that the system will fail to meet its water quality objectives at some point during its life. While each of the above criteria may be met by a variety of formats, it is critical to clearly establish the assigned administrative body in a responsible and sustainable manner.

B. RECORD KEEPING

Records of all inspections and maintenance work accomplished must be kept and maintained to document facility operations. These records should be filed and retained for a minimum 5-year time span. The filing system should be capable of ready retrieval of data for periodic reviews by appropriate regulatory bodies. Where possible, copies of such records should also be filed with the designated primary regulatory agency for their review for compliance with permit conditions. Typical inspection and maintenance record forms are attached hereto as Appendix A.

C. CONTRACT SERVICES

In some instances or at specific times, the Maintenance Personnel may not have the staff to conduct the required inspection and/or maintenance programs as outlined in this document. In such cases the work should be accomplished on a contractual basis with a firm or organization that has the staff and equipment to accomplish the required work.

The service contract for inspection and maintenance should be formal, well written legal document which clearly defines the services to be provided, the contractual conditions that will apply, and detailed payment schedules. Liability insurance should be required in all contracts.

APPENDIX A

Sample Inspection Logs

CONVENIENCE STORE AND FUEL STATION
PORTLAND, MAINE

STORMWATER MANAGEMENT
UNDERGROUND DETENTION
ANNUAL INSPECTION & MAINTENANCE LOG

FACILITY:		**YEAR:**	
LOCATION:		**CONTRACTOR:**	
FUNCTION:		**INSPECTOR:**	
DATE OF INSPECTION:			
ITEM IDENTIFICATION	**DESCRIPTION OF CONDITIONS**	**MAINTENANCE ACCOMPLISHED**	**DATE OF MAINTENANCE**
GENERAL COMMENTS:			

CONVENIENCE STORE AND FUEL STATION
PORTLAND, MAINE

STORMWATER MANAGEMENT
UNDERGROUND DETENTION
MONTHLY INSPECTION & MAINTENANCE LOG

FACILITY:			YEAR:			
LOCATION:			CONTRACTOR:			
FUNCTION:						
				OVERFLOW WEIR		
MONTH	DAY	INSPECTOR	WATER DEPTH	CLEAR	DEBRIS	WEIR CONDITION
JANUARY						
FEBRUARY						
MARCH						
APRIL						
MAY						
JUNE						
JULY						
AUGUST						
SEPTEMBER						
OCTOBER						
NOVEMBER						
DECEMBER						
LIST SPECIAL MAINTENANCE UNDERTAKEN:						

CONVENIENCE STORE AND FUEL STATION
PORTLAND, MAINE

STORMWATER MANAGEMENT
UNDERGROUND DETENTION
SEMI-ANNUAL INSPECTION & MAINTENANCE LOG

SEMI-ANNUAL INSPECT 1.2	FACILITY:
DATE:	LOCATION:
INSPECTOR:	FUNCTION:
WEIR CONDITION:	
OUTLET CONDITION	

FORE BAY SUMP	EST. DEPTH SED.	REMOVED? Y/N	EST. VOL. CY	WHERE DISPOSED OF	STRUCTURAL CONDITION

CONTROL STRUCTURE:
DESCRIBE CONDITIONS FOUND & MAINTENANCE ACCOMPLISHED:

APPENDIX B

Permits for Project

(To be Added at a Subsequent Time)

APPENDIX C

Summary Checklist
Inspection and Maintenance

Stormwater Management System Maintenance Program Summary Checklist						
		Frequency				
Item	Commentary	Monthly	Quarterly	Semi-Annual	Annual	Long Term
Control Structure	Inspect outlet control to assure it maintains its hydraulic characteristics. Inspect inlets for blockage.		X			
Stormwater Inlets in Series	Stormwater inlets allow flow entry from a surface swale to a piped system. Entry may or may not be equipped with a bar rack. Inspect entry for debris accumulation. Remove debris to allow unimpeded entry. Lawn clippings and leaves should be removed from yard areas.	X			X Clearing	
Tributary Drainage	Inspect to assure that the carrying capacity has not been diminished by debris, sediment or other hydraulic impediments.				X	
StormTreat™ Units	The operation and maintenance of the StormTreat™ System is limited to annual inspections and solids removal on an as-needed basis. Sediment removal once every three years or as needed			X (First year only)	X	X
Underground detention	Inspect for standing water not anticipated, sedimentation, outlet control, inlets. Jet Stream sediment removal from Isolator Row				X	X
Sorbent Booms	Sorbent boom should be raised out of the inlet, inspected, and replaced if necessary.		X For first 12 months		X After first year	
Parking Lot Cleaning	Parking lot should be swept at mid winter and spring. Power washing with an appropriate vacuum/power wash vehicle should be done once a year.			X	X	
Litter	Litter should be removed daily.					