10/12/2022

Topsfield Conservation Commission
Topsfield Town Hall
8 West Common Street
Topsfield, MA 01983

Re: Notice of Intent
10 High Street
(Map: 33, Parcel: 36A)

Dear Topsfield Conservation Commission:

Goddard Consulting, LLC (Goddard) is pleased to submit this Notice of Intent (NOI) on behalf of Emerson Homes, LP, for the property known as 10 High Street, in Topsfield, MA 01983 (Map: 33, Parcel: 36A). The applicant proposes the construction of a 44-unit rental apartment development within the Buffer Zone to Bordering Vegetated Wetland. This NOI application is being filed under the Massachusetts Wetlands Protection Act (WPA).

Four copies of this application have been submitted for your review, along with a digital submittal. A list of enclosed documents is as follows:

- NOI Application (WPA Form 3)
- Wetlands Fee Transmittal Form
- Copy of Checks
- Affidavit of Service, Notification to Abutters, Certified Abutters List
- *USGS of Site*, Goddard Consulting LLC. 10/3/2022
- *Orthophoto View of Site*, Goddard Consulting LLC. 10/3/2022
- *Order of Resource Area Delineation, ORAD,* Issued 5/19/2021
- *Drainage Report and Stormwater Management Plan,* DeVellis Zrein Inc., 9/16/2022
- *Notice of Intent – Emerson Homes,* (9 sheets), DeVellis Zrein Inc., 9/16/2022

Existing Conditions

The site of the proposed project is located at 10 High Street, totaling approximately 12.4 acres. The subject property is located in close proximity to the Village and Highway Business zoning districts, including shops, parks, Town Hall, and other amenities. The remainder of the surrounding area consists of single-family homes interspersed through the area. The site is presently undeveloped, but portions are previously disturbed, containing several disused grass baseball fields associated with the Topsfield Congregational Church. The remainder of the property is forested, with various wetland resources on-site.

The wetland resource areas found on-site include Bordering Vegetated Wetland (BVW), vernal pools, and a stream known as School Brook. The wetland resource areas have been confirmed to be accurate through an Order of Resource Area Delineation (ORAD) issued on 5/19/2021. The wetland resource areas are primarily found to the east, southeast, and south of the proposed development area.

According to the Mass GIS data layers for NHESP, this site is not mapped within Estimated and/or Priority Habitat of Rare Wildlife and has no mapped potential or certified vernal pools. The site is not located in an ACEC or a FEMA flood zone. Two vernal potential vernal pools were identified during the ANRAD process which likely meet NHESP criteria for certification. These vernal pools are located within the A-series and C-series wetlands, as shown on the site plans.

Photo 1. A view of the disused baseball fields where the proposed project is planned. Old dugout (fenced area) can be seen on the right side.

Photo 2. Another view of the disused baseball fields facing northwest.

Project Summary

The project proposes to construct a 44-unit residential rental housing development on the site. A Comprehensive Permit Application in accordance with M.G.L. c. 40B has been filed with the Topsfield Zoning Board of Appeals. The building will consist of a single two-story building with 44 residential units. Existing vegetation around the site will be preserved to the maximum extent possible and additional landscaping around the building and driveway is proposed. Of the 44 units, 43 (97.7%) will be dedicated as affordable units. The project will be on a septic system, however the leaching field is located outside the Buffer Zone and placed as far away as possible from any resource area. Erosion controls will be installed along the limit of work.

The proposed work has been designed to minimize the amount of forest loss by focusing the work in the open field. The majority of tree loss will take place in the western part of the site where the proposed driveway is planned. The entire building is located outside the Buffer Zone and only small portions of the driveway and parking lot are within the Buffer Zone. Most of the Buffer Zone impact is due to the project's stormwater management system and associated grading.

The Project's stormwater management system has been designed with a focus on Low-Impact Design (LID) techniques. The site's stormwater Best Management Practices will consist of an open, vegetated surface detention basin/pond located south of the main parking area. An additional vegetated rain garden will be located at the entrance to the site. The stormwater system complies with MassDEP Stormwater Management Standards and has been designed to adequately protect public and private water supply, groundwater supply, provide appropriate flood control and storm damage prevention, prevent pollution, protect fisheries, and protect

wildlife habitat. The Drainage Report and Stormwater Management Plan by DeVellis Zrein Inc., has been included with this NOI application.

Regulatory Compliance

The applicant has requested a waiver from the Town of Topsfield's Wetlands Protection Bylaw and Regulations under the 40B Comprehensive Permit Application. The 40B application is currently before the Topsfield Zoning Board of Appeals. Any/all activities subject to the local bylaw will be reviewed and approved by the ZBA as part of the Comprehensive Permit under M.G.L. c. 40B.

The Massachusetts Wetlands Protection Act Regulations [*310 CMR 10.02(2)(b)]* do not contain performance standards for Buffer Zone Alteration. All reasonable efforts to avoid, minimize and mitigate adverse impacts on the Buffer Zone have been considered, but the project design requires that Buffer Zone be altered in order to achieve the desired project design. Erosion and sedimentation controls will be installed along the limit of work throughout the project area in order to prevent any siltation into the wetlands during construction.

Conclusion

Goddard Consulting believes that the proposed project will not have any adverse impacts on the interests identified in the Wetlands Protection Act. The project meets all regulatory compliance standards under the Wetlands Protection Act; therefore, Goddard Consulting respectfully requests that the Topsfield Conservation Commission issues an Order of Conditions approving the proposed project. Please feel free to contact us if you have any questions.

Sincerely,

Goddard Consulting, LLC

Ryan Roseen
Wildlife Biologist & Wetland Scientist

CC: MassDEP Northeast Regional Office, Wetlands Division, 205B Lowell Street, Wilmington, MA 01887
Emerson Homes LP, 491 Humphrey Street, Swampscott, MA 01907
Congregational Church of Topsfield, 9 East Common Street, Topsfield, MA 01983

Massachusetts Department of Environmental Protection

eDEP Transaction Copy

Here is the file you requested for your records.

To retain a copy of this file you must save and/or print.

Username:	**RROSEEN**
Transaction ID:	**1436619**
Document:	**WPA Form 3 - NOI**
Size of File:	**247.85K**
Status of Transaction:	**In Process**
Date and Time Created:	**10/12/2022:9:04:02 AM**

Note: This file only includes forms that were part of your transaction as of the date and time indicated above. If you need a more current copy of your transaction, return to eDEP and select to “Download a Copy” from the Current Submittals page.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 3 - Notice of Intent
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:
eDEP Transaction #:1436619
City/Town:TOPSFIELD

A.General Information

1. Project Location:

a. Street Address	10 HIGH STREET		
b. City/Town	TOPSFIELD	c. Zip Code	01983
d. Latitude	42.64246N	e. Longitude	70.94777W
f. Map/Plat #	33	g.Parcel/Lot #	36A

2. Applicant:

☐ Individual ☑ Organization

a. First Name			b.Last Name		
c. Organization	EMERSON HOMES, LP				
d. Mailing Address	491 HUMPHREY STREET				
e. City/Town	SWAMPSCOTT	f. State	MA	g. Zip Code	01907
h. Phone Number		i. Fax		j. Email	

3.Property Owner:

☐ more than one owner

a. First Name			b. Last Name		
c. Organization	THE CONGREGATIONAL CHURCH OF TOPSFIELD				
d. Mailing Address	9 EAST COMMON STREET				
e. City/Town	TOPSFIELD	f.State	MA	g. Zip Code	01983
h. Phone Number		i. Fax		j.Email	

4.Representative:

a. First Name	RYAN	b. Last Name	ROSEEN		
c. Organization	GODDARD CONSULTING, LLC				
d. Mailing Address	291 MAIN STREET, SUITE 8				
e. City/Town	NORTHBOROUGH	f. State	MA	g. Zip Code	01532
h.Phone Number	508-393-3784	i.Fax		j.Email	ryan@goddardconsultingllc.com

5.Total WPA Fee Paid (Automatically inserted from NOI Wetland Fee Transmittal Form):

a.Total Fee Paid	1,550.00	b.State Fee Paid	762.50	c.City/Town Fee Paid	787.50

6.General Project Description:

THE PROJECT PROPOSES THE CONSTRUCTION OF A 44-UNIT RENTAL APARTMENT DEVELOPMENT ON THE PROPERTY WITH ASSOCIATED DRIVEWAY, PARKING, STORMWATER FEATURES, SEPTIC SYSTEM, GRADING, AND LANDSCAPING. THE APPLICANT HAS SUBMITTED AN APPLICATION PURSUANT TO M.G.L. C. 40B COMPREHENSIVE PERMIT APPLICATION TO THE TOPSFIELD ZONING BOARD OF APPEALS.

7a.Project Type:

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Limited Project Driveway Crossing
4. ☐ Commercial/Industrial
5. ☐ Dock/Pier
6. ☐ Utilities
7. ☐ Coastal Engineering Structure
8. ☐ Agriculture (eg., cranberries, forestry)

9. ☐ Transportation 10. ☑ Other

7b.Is any portion of the proposed activity eligible to be treated as a limited project subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☑ No If yes, describe which limited project applies to this project:
2. Limited Project

8.Property recorded at the Registry of Deeds for:

a.County:	b.Certificate:	c.Book:	d.Page:
SOUTHERN ESSEX	28732	4608	278

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1.Buffer Zone & Resource Area Impacts (temporary & permanent):

☑ This is a Buffer Zone only project - Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.

2.Inland Resource Areas: (See 310 CMR 10.54 - 10.58, if not applicable, go to Section B.3. Coastal Resource Areas)

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Bank	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land under Waterbodies and Waterways	1. Square feet	2. square feet
	3. cubic yards dredged	
d. ☐ Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced

f. ☐ Riverfront Area

1. Name of Waterway (if any)

2. Width of Riverfront Area (check one)
☐ 25 ft. - Designated Densely Developed Areas only
☐ 100 ft. - New agricultural projects only
☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project

square feet

4. Proposed Alteration of the Riverfront Area:

a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No
6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3.Coastal Resource Areas: (See 310 CMR 10.25 - 10.35)

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under	Land under the ocean below,
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coatstal Dunes, below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab, crea.
i. ☐ Land Under Salt Ponds	1. square feet	
	2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, Inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
	1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4.Restoration/Enhancement

☐ Restoration/Replacement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please entered the additional amount here.

a. square feet of BVW b. square feet of Salt Marsh

5.Projects Involves Stream Crossings

☐ Project Involves Streams Crossings

If the project involves Stream Crossings, please enter the number of new stream crossings/number of replacement stream crossings.

a. number of new stream crossings b. number of replacement stream crossings

C. Other Applicable Standards and Requirements

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage of Endangered Species program (NHESP)?

a. ☐ Yes ☑ No

If yes, include proof of mailing or hand delivery of NOI to:
Natural Heritage and Endangered Species
Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

b. Date of map:FROM MAP VIEWER

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18)....

c. Submit Supplemental Information for Endangered Species Review * (Check boxes as they apply)

1.☐ Percentage/acreage of property to be altered:

(a) within Wetland Resource Area percentage/acreage

(b) outside Resource Area percentage/acreage

2.☐ Assessor's Map or right-of-way plan of site

3.☐ Project plans for entire project site, including wetland resource areas and areas outside of wetland jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

a.☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

b.☐ Photographs representative of the site

c.☐ MESA filing fee (fee information available at: http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/regulatory-review/mass-endangered-species-act-mesa/mesa-fee-schedule.html)
Make check payable to "Natural Heritage & Endangered Species Fund" and **mail to NHESP** at above address

*Projects altering **10 or more acres** of land, also submit:*

d.☐ Vegetation cover type map of site

e.☐ Project plans showing Priority & Estimated Habitat boundaries

d. OR Check One of the following

1.☐ Project is exempt from MESA review. Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, http://www.mass.gov/eea/agencies/dfg/dfw/laws-regulations/cmr/321-cmr-1000-massachusetts-endangered-species-act.html#10.14; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2.☐ Separate MESA review ongoing.

a. NHESP Tracking Number

b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review...

2. For coastal projects only, is any portion of the proposed project located below the mean high waterline or in a fish run?
   a. ☑ Not applicable - project is in inland resource area only
   b. ☐ Yes ☐ No

   If yes, include proof of mailing or hand delivery of NOI to either:

   South Shore - Cohasset to Rhode Island, and the Cape & Islands:

   Division of Marine Fisheries -
   Southeast Marine Fisheries Station
   Attn: Environmental Reviewer
   836 S. Rodney French Blvd
   New Bedford, MA 02744

   North Shore - Hull to New Hampshire:

   Division of Marine Fisheries -
   North Shore Office
   Attn: Environmental Reviewer
   30 Emerson Avenue
   Gloucester, MA 01930

   If yes, it may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional office.

3. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☑ No

   If yes, provide name of ACEC (see instructions to WPA Form 3 or DEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC Name

4. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
   a. ☐ Yes ☑ No

5. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L.c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L.c. 130, § 105)?
   a. ☐ Yes ☑ No

6. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
   a. ☑ Yes, Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol.2, Chapter 3)
      2. ☐ A portion of the site constitutes redevelopment
      3. ☐ Proprietary BMPs are included in the Stormwater Management System
   b. ☐ No, Explain why the project is exempt:

1. ☐ Single Family Home

2. ☐ Emergency Road Repair

3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department by regular mail delivery.

1. ☑ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. ☑ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.
3. ☑ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s). Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.
4. ☑ List the titles and dates for all plans and other materials submitted with this NOI.

a. Plan Title:	b. Plan Prepared By:	c. Plan Signed/Stamped By:	c. Revised Final Date:	e. Scale:
NOTICE OF INTENT - EMERSON HOMES	DEVELLIS ZREIN INC.	IMAD A. ZREIN	09/16/2022	1"=40'

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.
6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.
7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.
8. ☑ Attach NOI Wetland Fee Transmittal Form.
9. ☑ Attach Stormwater Report, if needed.

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number	3. Check date
4. State Check Number	5. Check date
6. Payer name on check: First Name	7. Payer name on check: Last Name

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

Suzanne Decavele	10/12/2022
1. Signature of Applicant	2. Date
David Read	10/12/2022
3. Signature of Property Owner(if different)	4. Date
Ryan Roseen - Goddard Consulting, LLC	10/12/2022
5. Signature of Representative (if any)	6. Date

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in Section C, Items 1-3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Inter
plans, documents, and supporting data are true and complete to the best of m
that the Conservation Commission will place notification of this Notice in a loc
expense of the applicant in accordance with the wetlands regulations, 310 CM

I further certify under penalties of perjury that all abutters were notified of this
the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate o
hand delivery or certified mail (return receipt requested) to all abutters within
of the project location.

1. Signature of Applicant

2. Signature of Property Owner (if different)

3. Signature of Representative (if any)

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporti
two copies of the NOI Wetland Fee Transmittal Form, and the city/town fe
Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting
copy of the NOI Wetland Fee Transmittal Form, and a copy of the state fe
MassDEP Regional Office (see instructions) by certified mail or hand deli

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3
section and the instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the appli
timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 - Notice of Wetland FeeTransmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File #:
eDEP Transaction #:1436619
City/Town:TOPSFIELD

A. Applicant Information

1. Applicant:

a. First Name			b.Last Name		
c. Organization	EMERSON HOMES, LP				
d. Mailing Address	491 HUMPHREY STREET				
e. City/Town	SWAMPSCOTT	f. State	MA	g. Zip Code	01907
h. Phone Number		i. Fax		j. Email	

2.Property Owner:(if different)

a. First Name			b. Last Name		
c. Organization	THE CONGREGATIONAL CHURCH OF TOPSFIELD				
d. Mailing Address	9 EAST COMMON STREET				
e. City/Town	TOPSFIELD	f.State	MA	g. Zip Code	01983
h. Phone Number		i. Fax		j.Email	

3. Project Location:

a. Street Address	10 HIGH STREET	b. City/Town	TOPSFIELD

Are you exempted from Fee? ☐ (YOU HAVE SELECTED 'NO')

Note: Fee will be exempted if you are one of the following:

- City/Town/County/District
- Municipal Housing Authority
- Indian Tribe Housing Authority
- MBTA

State agencies are only exempt if the fee is less than $100

B. Fees

Activity Type	Activity Number	Activity Fee	RF Multiplier	Sub Total
C.) ROAD CONSTRUCTION NOT CROSSING OR DRIVEWAY;	1	1050.00		1050.00
G.) EACH PROJECT SOURCE (STORM DRAIN) DISCHARGE;	1	500.00		500.00

City/Town share of filling fee	State share of filing fee	Total Project Fee
$787.50	$762.50	$1,550.00

4153

THE CALEB FOUNDATION
491 HUMPHREY ST.
SWAMPSCOTT, MA 01907
781-595-4665

SalemFive
53-7055/2113

8/25/2022

PAY TO THE ORDER OF COMMONWEALTH OF MASS $ **762.50

Seven Hundred Sixty-Two and 50/100********** DOLLARS

COMMONWEALTH OF MASS

MEMO

AUTHORIZED SIGNATURE

Security features. Details on back.

⑈004153⑈ ⑆211370558⑆ 0883275232⑈

PRODUCT SSLT104 USE WITH 91663 ENVELOPE MCBEE To Reorder: 1-800-662-2331 or www.mcbeeinc.com

6941749500

D9A46F STKDK05 10/09/2020 20 56 -156-

4165

THE CALEB FOUNDATION
491 HUMPHREY ST.
SWAMPSCOTT, MA 01907
781-595-4665

SalemFive
53-7055/2113

8/25/2022

PAY TO THE ORDER OF TOWN OF TOPSFIELD $ **787.50

Seven Hundred Eighty-Seven and 50/100********** DOLLARS

TOWN OF TOPSFIELD
272 MAIN STREET
TOWNSEND, MA 01469

MEMO

AUTHORIZED SIGNATURE

Security features. Details on back.

⑈004165⑈ ⑆211370558⑆ 0883275232⑈

PRODUCT SSLT104 USE WITH 91663 ENVELOPE MCBEE To Reorder: 1-800-662-2331 or www.mcbeeinc.com

6941749500

D9A46F STKDK05 10/09/2020 20 56 -168-

AFFIDAVIT OF SERVICE

Under the Massachusetts Wetlands Protection Act

I, Ryan Roseen hereby certify under the pains and penalties of perjury that on 10/12/2022 I gave notification to abutters in Compliance with the second paragraph of Massachusetts General Law Chapter 131, Section 40, and the DEP Guide to Abutter Notification in connection with the following matter:

A Notice of Intent (NOI) application was filed under the Massachusetts Wetlands Protection Act by Emerson Homes LP with the Topsfield Conservation Commission on 10/12/2022 for property located at 10 High Street, (Map: 33, Parcel:36A) Topsfield, MA 01983.

The form of the notification, and the list of abutters to whom it was given, and their addresses, are attached to this Affidavit of Service.

(Name)

10/12/2022
(Date)

Notification to Abutters Under the Massachusetts Wetlands Protection Act

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40, you are hereby notified of the following.

A. The name of the applicant is: **Emerson Homes, LP**

B. The applicant has filed a **Notice of Intent (NOI)** with the Conservation Commission for the municipality of **Topsfield, MA,** seeking permission to perform activities within Areas Subject to Protection under the Wetlands Protection Act (General Laws Chapter 131, Section 40).

C. The project scope is for: **The proposed construction of a 44-unit residential rental development and associated site work within Buffer Zone.**

D. The address of the lot where the activity is proposed is: **10 High Street, Topsfield, MA (Map: 33, Parcel: 36A)**.

E. Copies of the NOI application may be examined at **Topsfield Town Hall** Monday and Wednesday 9:00am-12:00pm or by appointment**.** For additional information, call **978-887-1510**.

F. Copies of the NOI application may be obtained by calling **978-887-1510. There is a 25 cents per page charge for copying expenses.**

G. Information regarding the date, time, and place of the public hearing may be obtained from **Topsfield Town Hall bulletin board**, (Monday – Thursday 8:00AM – 4:00PM and Friday 8:00AM – Noon) not less than forty-right (48) hours in advance, or by contacting the Topsfield Conservation Commission office at 978-887-1510.

NOTE: Notice of the public hearing, including its date, time, and place, will be published at least five (5) days in advance in a local newspaper publication.

NOTE: Notice of the public hearing, including the date, time, and place, will be posted in the City or Town Hall not less than forty-eight (48) hours in advance.

Note: You also may contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. To contact DEP, call:

☐ Central Region: (508) 792-7650
☐ Southeast Region: (508) 946-2700
☒ Northeast Region: (978) 694-3200
☐ Western Region: (413) 784-1100

TOWN OF TOPSFIELD

BOARD OF ASSESSORS
8 West Common Street
Topsfield, Massachusetts 01983
Telephone: (978) 887-1514 Fax: (978) 887-1502

This form must be completed and Assessor fee of $20.00 must be paid before release of the certified abutters list.

Submission Date **Friday, July 22, 2022** Issue Date **Tuesday, July 26, 2022**

Department requiring list: **Conservation Commission**

300 Ft. ☐ 100 Ft. ☒ (Conservation Only) ☐ Direct Abutters

Person/Party requesting list: **Regnante Sterio LLP**

Address: **401 Edgewater Place, Suite 630, Wakefield, MA**

Phone #: **781-246-2525** Email Address **jschomer@regnante.com** Misc: ____

Property Owner: **Congregational Church**

Assessor's Map(s)**33** Lot(s) **36-A** Location **10 High Street**

Assessor's Fee Paid: x Yes ____ No

The Assessors' Office requires ten (10) working days to certify an Abutters List. This list is valid for sixty days only from date of issue.

Certified By:

Topsfield Assessors

TOWN OF TOPSFIELD
CERTIFIED COPY
7/26/22
ASSESSOR'S OFFICE

Certification of Parties in Interest

The Board of Assessors of the Town of Topsfield do hereby certify, in accordance with the provisions of Section 10 and 11 of Chapter 808 of the Acts of 1975, that the following named persons, firms and corporations are parties in interest, as in said Section 11 defined, with respect to the premises herein above described.

100 foot Abutters List Report

Topsfield, MA
July 26, 2022

TOWN OF TOPSFIELD
CERTIFIED COPY
ASSESSOR'S OFFICE
7/26/22

Subject Property:

Parcel Number:	33-36-A	Mailing Address:	CONGREGATIONAL CHURCH
CAMA Number:	33-36-A		9 EAST COMMON ST
Property Address:	10 HIGH ST		TOPSFIELD, MA 01983

Abutters:

Parcel Number:	33-22	Mailing Address:	LOVE, JAMES M
CAMA Number:	33-22		55 HOWLETT ST
Property Address:	55 HOWLETT ST		TOPSFIELD, MA 01983
Parcel Number:	33-23	Mailing Address:	STONE A HOWARD
CAMA Number:	33-23		49 HOWLETT ST
Property Address:	49 HOWLETT ST		TOPSFIELD, MA 01983
Parcel Number:	33-26	Mailing Address:	FISH GARY H
CAMA Number:	33-26		31 HOWLETT ST
Property Address:	31 HOWLETT ST		TOPSFIELD, MA 01983
Parcel Number:	33-29	Mailing Address:	KEOHANE JEREMY P
CAMA Number:	33-29		25 HOWLETT ST
Property Address:	25 HOWLETT ST		TOPSFIELD, MA 01983
Parcel Number:	33-30	Mailing Address:	ARRIAZA JAIME LOPEZ
CAMA Number:	33-30		7B HOWLETT ST
Property Address:	7 HOWLETT ST		TOPSFIELD, MA 01983
Parcel Number:	33-35	Mailing Address:	TOPSFIELD HISTORICAL SOCIETY
CAMA Number:	33-35		PO BOX 323
Property Address:	1 HOWLETT ST		TOPSFIELD, MA 01983
Parcel Number:	33-36	Mailing Address:	CONGREGATIONAL CHURCH
CAMA Number:	33-36		9 EAST COMMON ST
Property Address:	5 EAST COMMON ST		TOPSFIELD, MA 01983
Parcel Number:	33-37	Mailing Address:	TOWN OF TOPSFIELD
CAMA Number:	33-37		8 WEST COMMON ST
Property Address:	65 MAIN ST		TOPSFIELD, MA 01983
Parcel Number:	33-38	Mailing Address:	TOWN OF TOPSFIELD
CAMA Number:	33-38		1 SOUTH COMMON ST
Property Address:	1 SOUTH COMMON ST		TOPSFIELD, MA 01983
Parcel Number:	33-39	Mailing Address:	MCDONALD RYAN
CAMA Number:	33-39		14 HIGH ST
Property Address:	14 HIGH ST		TOPSFIELD, MA 01983

www.cai-tech.com
Data shown on this report is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this report.

100 foot Abutters List Report

Topsfield, MA
July 26, 2022

Parcel Number:	33-40	Mailing Address:	FITZGERALD BRIAN R
CAMA Number:	33-40		22 HIGH ST
Property Address:	22 HIGH ST		TOPSFIELD, MA 01983
Parcel Number:	33-45	Mailing Address:	ROBERTO JOHN
CAMA Number:	33-45		10 DEER RUN
Property Address:	10 DEER RUN		TOPSFIELD, MA 01983
Parcel Number:	33-46	Mailing Address:	THOMPSON RICHARD E TR
CAMA Number:	33-46		PO BOX 291
Property Address:	12 DEER RUN		TOPSFIELD, MA 01983
Parcel Number:	33-47	Mailing Address:	THOMPSON RICHARD E TR
CAMA Number:	33-47		PO BOX 291
Property Address:	11 DEER RUN		TOPSFIELD, MA 01983
Parcel Number:	33-48	Mailing Address:	DOOLEY JOSEPH J III
CAMA Number:	33-48		9 DEER RUN
Property Address:	9 DEER RUN		TOPSFIELD, MA 01983
Parcel Number:	33-49	Mailing Address:	WALLACE JOYCE J TR
CAMA Number:	33-49		7 DEER RUN
Property Address:	7 DEER RUN		TOPSFIELD, MA 01983
Parcel Number:	33-58	Mailing Address:	BANUSIEWICZ BRIAN
CAMA Number:	33-58		30 TOWNE LN
Property Address:	30 TOWNE LN		TOPSFIELD, MA 01983
Parcel Number:	33-59	Mailing Address:	KMETZ ROBERT A TR
CAMA Number:	33-59		32 TOWNE LN
Property Address:	32 TOWNE LN		TOPSFIELD, MA 01983
Parcel Number:	33-60	Mailing Address:	HUTT JENNIFER A
CAMA Number:	33-60		34 TOWNE LN
Property Address:	34 TOWNE LN		TOPSFIELD, MA 01983
Parcel Number:	33-61	Mailing Address:	THOMPSON RICHARD E TR
CAMA Number:	33-61		PO BOX 291
Property Address:	21 TOWNE LN		TOPSFIELD, MA 01983
Parcel Number:	41-64	Mailing Address:	MSCISZ CHESTER & CAROL M TRS
CAMA Number:	41-64		26 HIGH ST
Property Address:	26 HIGH ST		TOPSFIELD, MA 01983

www.cai-tech.com
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TOWN OF TOPSFIELD
CERTIFIED COPY
7/26/22
ASSESSOR'S OFFICE

10 High Street

Topsfield, MA

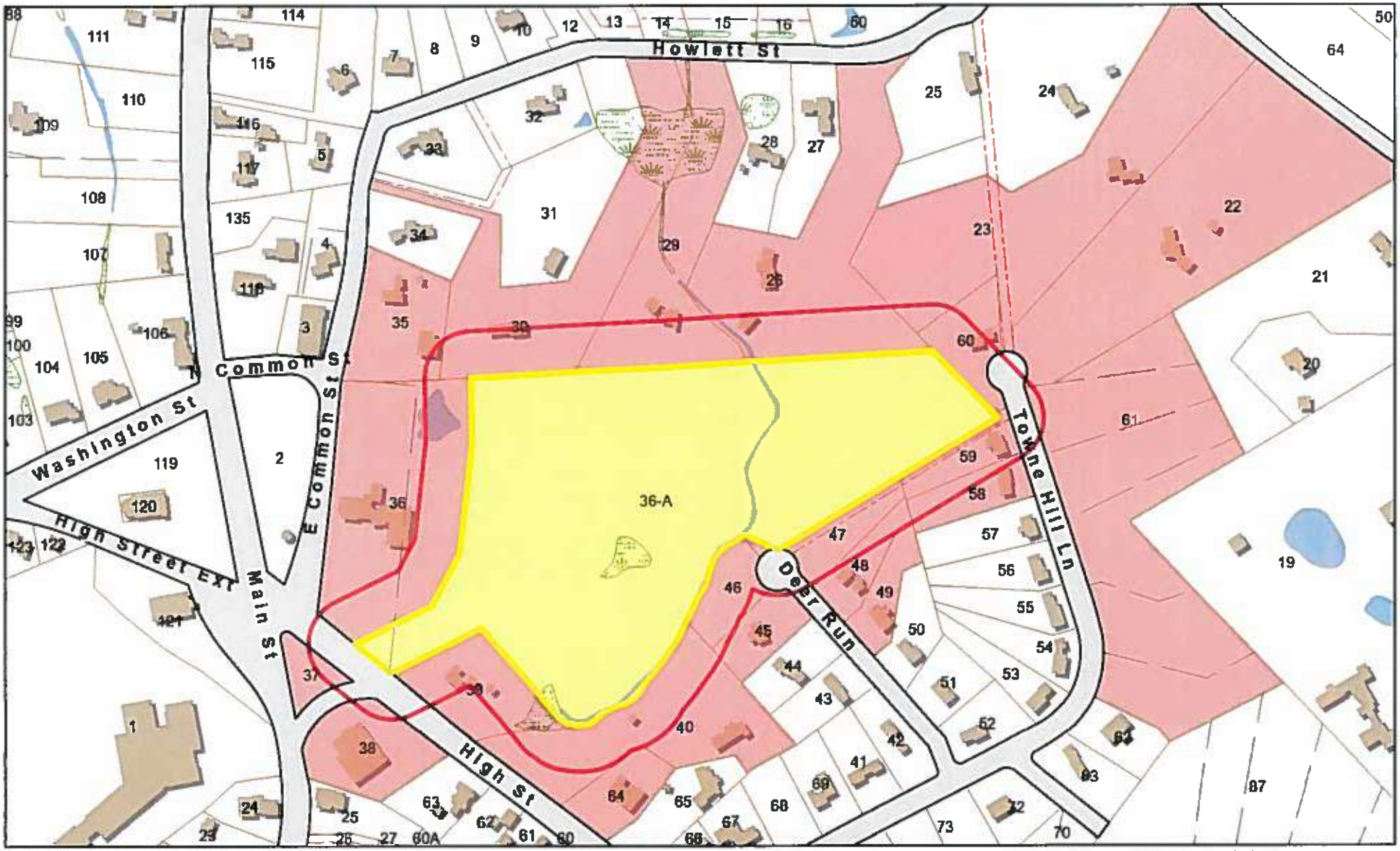
1 inch = 300 Feet

0 300 600 900

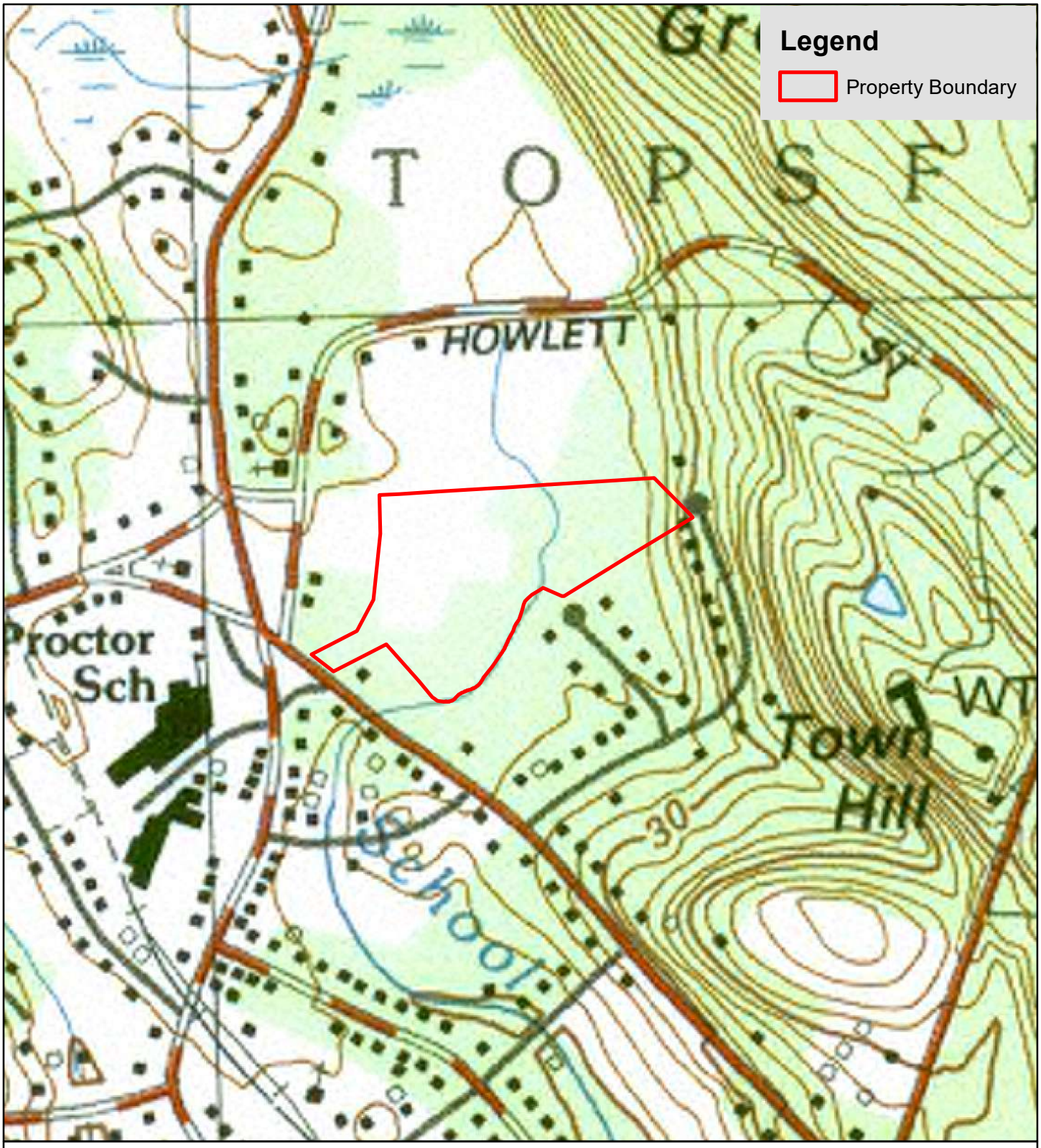
July 26, 2022

CAI Technologies
Precision Mapping Geospatial Solutions

www.cai-tech.com



Data shown on this map is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this map.



USGS of Site

10 High Street - Topsfield, MA

(Map: 33, Lots: 36A)

N

Date: 10/3/2022

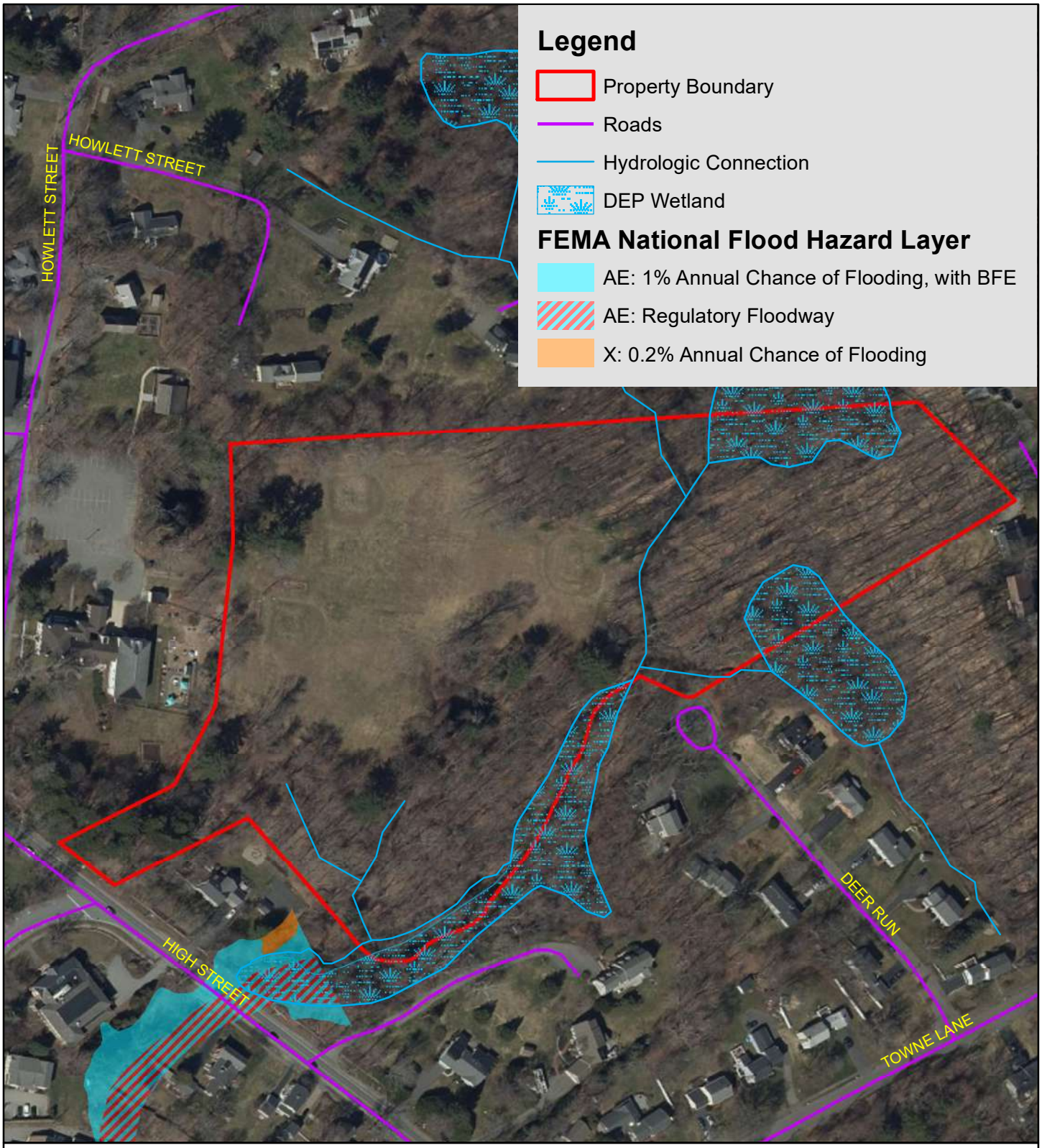
Feet

0 250 500

1 inch = 500 feet

GIS Data Source: "Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, MassIT"

GODDARD CONSULTING LLC
Strategic Wetland Permitting



Orthophoto View of Site

10 High Street - Topsfield, MA

(Map: 33, Lots: 36A)

N

Date: 10/3/2022

Feet

0 100 200

1 inch = 200 feet

GIS Data Source: "Office of Geographic Information (MassGIS), Commonwealth of Massachusetts, MassIT"

GODDARD CONSULTING LLC
Strategic Wetland Permitting

TOWN OF TOPSFIELD

Conservation Commission

8 West Common Street, Topsfield, Massachusetts 01983

May 19, 2021

Guido Voss
Congregational Church of Topsfield
9 East Common Street
Topsfield, MA 01983

Re: Order of Resource Area Delineation, MA DEP #307-0776, 5 East Common Street, (Map 33, Lots 036 & 036A), Topsfield

Dear Mr. Voss,

Enclosed is the Order of Resource Area Delineation (ORAD), issued under the Massachusetts Wetlands Protection Act, MGL Ch. 131, § 40, and the Topsfield General Wetlands Bylaw, Ch. 62, for verification of Wetland Resource Area boundaries, as specified in the ORAD, on the property at 5 East Common Street in Topsfield.

Please contact me at the TCC office with any questions: hgaffney@topsfield-ma.gov or 978-887-1510.

Sincerely,

Heidi Gaffney

Heidi Gaffney
Topsfield Conservation Administrator

cc: Lawrence Beals, Beals Associates, Inc. (via email)
DEP-NERO
Topsfield Board of Health
Topsfield Planning Board
TCC file

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wetlands & **Topsfield Conservation Commission**

WPA/GWB Form 4B – Order of Resource Area Delineation

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40
and Topsfield General Wetlands Bylaw, Ch. 62

Address/Applicant: **5 East Common St. / Voss - Congregational Church of Topsfield**

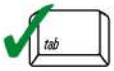
Provided by MassDEP: 307-0776
MassDEP File Number

eDEP Transaction Number

Topsfield
City/Town

A. General Information

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note: Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

From: Topsfield
1. Conservation Commission

2. This Issuance is for (check one):

a. ☒ Order of Resource Area Delineation

b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

Guido — a. First Name
Voss — b. Last Name
Congregational Church of Topsfield — c. Organization
9 East Common Street — d. Mailing Address
Topsfield — e. City/Town
MA — f. State
01983 — g. Zip Code

4. Property Owner (if different from applicant):

a. First Name
b. Last Name
c. Organization
d. Mailing Address
e. City/Town
f. State
g. Zip Code

5. Project Location:

5 East Common Street — a. Street Address
Topsfield — b. City/Town
01983 — c. Zip Code
33 — d. Assessors Map/Plat Number
036 & 036A — e. Parcel/Lot Number

Latitude and Longitude (in degrees, minutes, seconds):
f. Latitude
g. Longitude

6. Dates:
08/28/2019 — a. Date ANRAD filed
04/28/2021 — b. Date Public Hearing Closed
05/19/2021 — c. Date of Issuance

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

"Exhibit Plan, Resource Areas Delineation, 5 East Common Street, Topsfield, MA", Sheet Title: Abbreviated Notice of Resource Area Delineation, Sheet Number: C1.0; Prepared by: Beals Associates, Inc.; Signed and stamped by: Todd P. Morey, P.E., Civil No. 48865 — a. Title
Rev: 04/21/2021 — b. Date
c. Title
d. Date

B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable):

a. ☐ **Accurate**: The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

a.

b. ☒ **Modified**: The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☒ Bordering Vegetated Wetlands

2. ☒ Other resource area(s), specifically:

a. BVW Flags WF-A1 through WF-A29 are BVW under the **Act only.**
b. BVW Flags WF-C1 through WFC15 are BVW under the **Act and Bylaw.**
c. BVW Flags E1 through E28 are BVW under the **Bylaw only.**
d. Flags MAHW1 through MAHW21 are MAHW under the **Bylaw only.**
e. Vernal Pools are contained within the C-series wetland and in the area of WF-A12 through WF-A16 as noted on the plan.

c. ☐ **Inaccurate**: The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands

2. ☐ Other resource area(s), specifically:

3. ☐ The boundaries were determined to be inaccurate because:

Findings: Site visits were conducted with a representative on 9/3/2019, 4/7/2020 & 4/2/2021. The site visit on 4/7/2020 was with the peer reviewer, Arthur Allen of EcoTec, Inc., as the reviewer for the BVW line under the Bylaw. The Resource Area boundaries confirmed with this ORAD are as specified above in B.1.b.a.-e. The A-Series and C-Series wetlands contain Vernal Pools which likely meet the MA NHESP criteria, appropriate evidence is to be gathered and submitted to NHESP for Certification. School Brook in this area is identified as perennial under the Bylaw but is shown as intermittent on the USGS.

NOTE: No other Resource Area boundaries considered with this Abbreviated Notice of Resource Area Delineation or any others that may exist on this and/or any abutting properties are verified with this Order of Resource Area Delineation.

C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see http://www.mass.gov/eea/agencies/massdep/about/contacts/find-the-massdep-regional-office-for-your-city-or-town.html).

D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

Any appeal of the Bylaw portions of this Order shall be made through the appropriate legal process, to Superior Court.

E. Signatures

05/19/2021
Date of Issuance

Please indicate the number of members who will sign this form.

*The electronic signatures below are made in accordance with M.G.L. c.110G and pursuant to the commission's electronic signature authorization vote recorded on 6/18/2020 in **BOOK 38624 and PAGE 313** at the Southern Essex Registry of Deeds.*

4
1. Number of Signers

/Dodds Shamroth/
Signature of Conservation Commission Member

Signature of Conservation Commission Member

/Holger Luther
Signature of Conservation Commission Member

Signature of Conservation Commission Member

/Jen DiCarlo/
Signature of Conservation Commission Member

Signature of Conservation Commission Member

/Nick Betts/
Signature of Conservation Commission Member

This Order is valid for three years from the date of issuance.

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on 05/19/2024 unless extended in writing by the issuing authority.

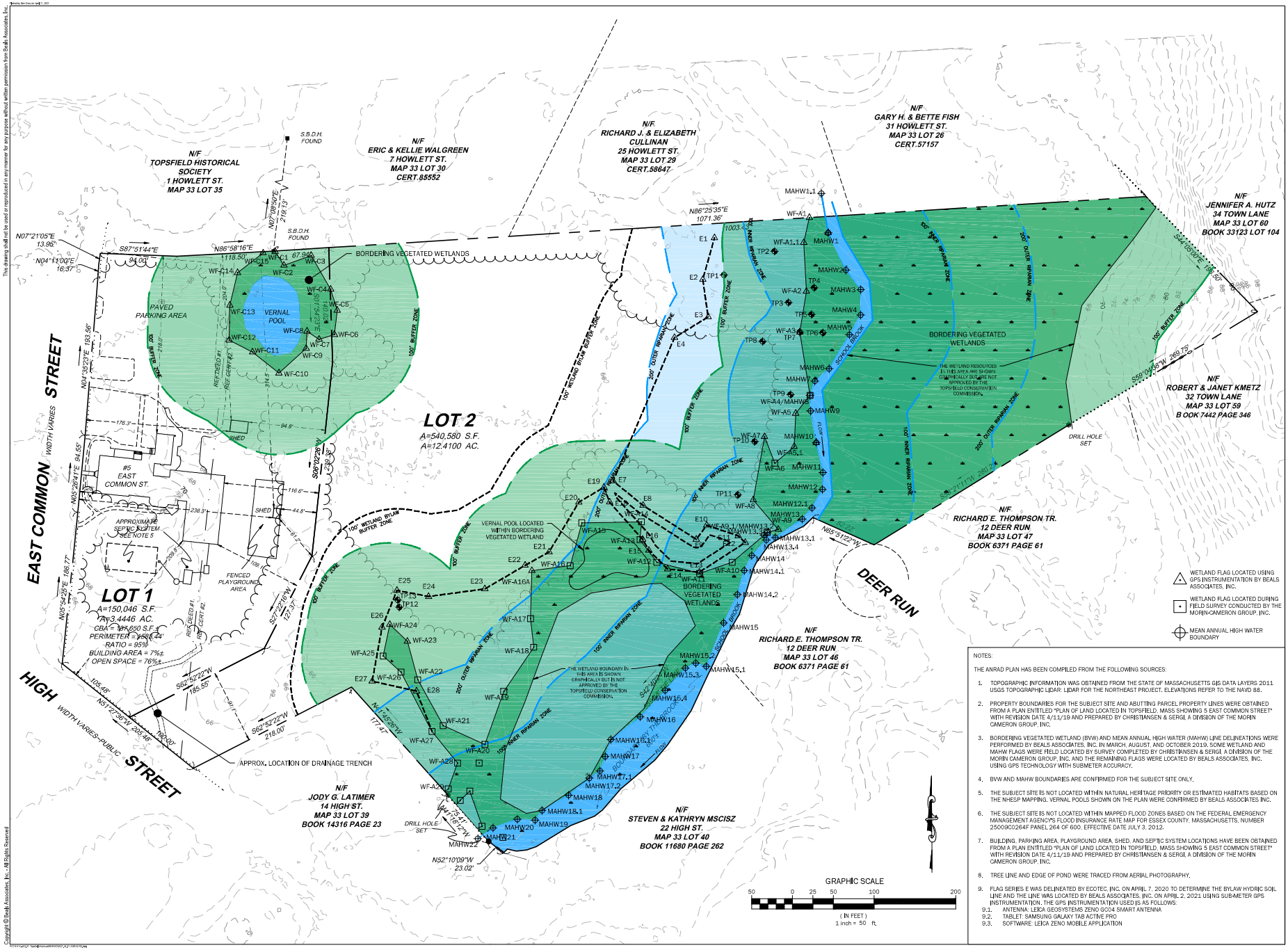
This Order is issued to the applicant and the property owner (if different) as follows:

2. ☐ By hand delivery on

a. Date

3. ☒ By certified mail, return receipt requested on

05/19/2021
a. Date



NOTES:

THE ANRAD PLAN HAS BEEN COMPILED FROM THE FOLLOWING SOURCES:

1. TOPOGRAPHIC INFORMATION WAS OBTAINED FROM THE STATE OF MASSACHUSETTS GIS DATA LAYERS 2011 USGS TOPOGRAPHIC LIDAR: LIDAR FOR THE NORTHEAST PROJECT. ELEVATIONS REFER TO THE NAVD 88.
2. PROPERTY BOUNDARIES FOR THE SUBJECT SITE AND ABUTTING PARCEL PROPERTY LINES WERE OBTAINED FROM A PLAN ENTITLED "PLAN OF LAND LOCATED IN TOPSFIELD, MASS SHOWING 5 EAST COMMON STREET" WITH REVISION DATE 4/11/19 AND PREPARED BY CHRISTIANSEN & SERGI, A DIVISION OF THE MORIN CAMERON GROUP, INC.
3. BORDERING VEGETATED WETLAND (BVW) AND MEAN ANNUAL HIGH WATER (MAHW) LINE DELINEATIONS WERE PERFORMED BY BEALS ASSOCIATES, INC. IN MARCH, AUGUST, AND OCTOBER 2019. SOME WETLAND AND MAHW FLAGS WERE FIELD LOCATED BY SURVEY COMPLETED BY CHRISTIANSEN & SERGI, A DIVISION OF THE MORIN CAMERON GROUP, INC. AND THE REMAINING FLAGS WERE LOCATED BY BEALS ASSOCIATES, INC. USING GPS TECHNOLOGY WITH SUBMETER ACCURACY.
4. BVW AND MAHW BOUNDARIES ARE CONFIRMED FOR THE SUBJECT SITE ONLY.
5. THE SUBJECT SITE IS NOT LOCATED WITHIN NATURAL HERITAGE PRIORITY OR ESTIMATED HABITATS BASED ON THE NHESP MAPPING. VERNAL POOLS SHOWN ON THE PLAN WERE CONFIRMED BY BEALS ASSOCIATES INC.
6. THE SUBJECT SITE IS NOT LOCATED WITHIN MAPPED FLOOD ZONES BASED ON THE FEDERAL EMERGENCY MANAGEMENT AGENCY'S FLOOD INSURANCE RATE MAP FOR ESSEX COUNTY, MASSACHUSETTS, NUMBER 25009C0264F PANEL 264 OF 600. EFFECTIVE DATE JULY 3, 2012.
7. BUILDING, PARKING AREA, PLAYGROUND AREA, SHED, AND SEPTIC SYSTEM LOCATIONS HAVE BEEN OBTAINED FROM A PLAN ENTITLED "PLAN OF LAND LOCATED IN TOPSFIELD, MASS SHOWING 5 EAST COMMON STREET" WITH REVISION DATE 4/11/19 AND PREPARED BY CHRISTIANSEN & SERGI, A DIVISION OF THE MORIN CAMERON GROUP, INC.
8. TREE LINE AND EDGE OF POND WERE TRACED FROM AERIAL PHOTOGRAPHY.
9. FLAG SERIES E WAS DELINEATED BY ECOTEC, INC. ON APRIL 7, 2020 TO DETERMINE THE BYLAW HYDRIC SOIL LINE AND THE LINE WAS LOCATED BY BEALS ASSOCIATES, INC. ON APRIL 2, 2021 USING SUB-METER GPS INSTRUMENTATION. THE GPS INSTRUMENTATION USED IS AS FOLLOWS:
   - 9.1. ANTENNA: LEICA GEOSYSTEMS ZENO GG04 SMART ANTENNA
   - 9.2. TABLET: SAMSUNG GALAXY TAB ACTIVE PRO
   - 9.3. SOFTWARE: LEICA ZENO MOBILE APPLICATION

No.	Revision	Date
1.	Revision of wetland boundary and MAHW.	2019.12.03
2.	Revision of takeoff areas called out.	2020.02.18
3.	Add Bylaw Buffer Zone	2021.04.21

BEALS+ASSOCIATES INC.
27 PARK PLAZA SUITE 200 BOSTON, MA 02116
PH (617) 357-9740 FAX (617) 357-9741
•PLANNING •ENGINEERING •PERMITTING •MANAGEMENT

Congregational Church of Topsfield
9 East Common Street,
Topsfield, MA

Exhibit Plan
Resource Areas Delineation
5 East Common Street
Topsfield, MA

TODD R. BOWEY
STATE OF MASSACHUSETTS
NO. 10288
4.21.2021

Not for Construction
PERMIT DOCUMENTS

Designed by: MEB | Checked by: LMB
Proj. No.: C-993.01 | Issue Date: 2021.04.07
Drawing Scale: 1"=50'

Sheet Title
ABBREVIATED NOTICE OF RESOURCE AREA DELINEATION

Sheet Number
C1.0

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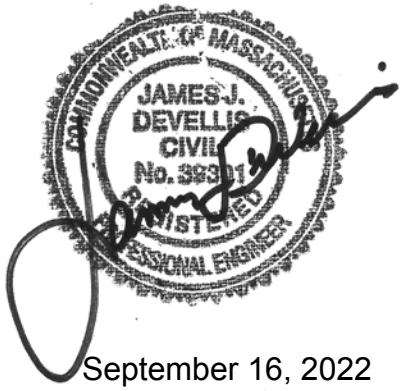
Drainage Report and Stormwater Management Plan

Emerson Homes
Comprehensive Permit

10 High Street
Topsfield, Massachusetts

Applicant
The Caleb Group/Emerson Homes

Civil Engineer, Landscape Architect & Site Planner
DeVellis Zrein Inc.
PO Box 307
Foxboro, MA 02035
www.develliszrein.com



September 16, 2022

1.0 Executive Summary

2.0 Existing Conditions
Description of Contributing Area
Existing Drainage Areas
Soil Conditions
Existing Drainage Area Summary
Peak Discharge Runoff Rates

3.0 Proposed Conditions
Description of Contributing Area
Proposed Drainage Areas
Proposed Drainage Area Summary
Peak Discharge Runoff Rates
Summary of Results

4.0 Methodology and Design Criteria
Hydrologic Model
Design Storms
Time of Concentration
Curve Numbers
Design Criteria
Rational Method

5.0 DEP Stormwater Management Standards

6.0 Operation and Maintenance Plan

Appendix A - Hydrologic Calculations and Drain Pipe Calculations
Hydrologic Model - Existing Conditions
Existing Conditions Calculations
Hydrologic Model - Proposed Conditions
Proposed Conditions Calculations

Appendix B –Water Quality & TSS Removal Calculations
TSS Removal Calculations
Infiltration Volume Recharge

Appendix C –Site Plans

1. Executive Summary

The Applicant is proposing a new residential building through the Comprehensive Permit Application process to be located at 10 High Street (the Site) in Topsfield, Massachusetts.

This project consists of one elderly housing residential apartment building serviced by a new access driveway from High Street with 48 parking spaces. Proposed utilities (water, gas, electric/cable/fire and drainage, on-site septic) are proposed within the proposed development.

The Site currently consists of grass, ball fields, a tennis court and wooded areas.

A Notice of Intent will be submitted to address working within the wetland jurisdictional areas. As there are on-site wetland resources areas on the eastern and western perimeters of the Site. The Site is outside of any FEMA-FIRM 100-year flood zones and within Zone X (Minimal Flood Hazard).

This report addresses the drainage characteristics of the proposed residential project with respect to current and future stormwater runoff. It qualifies and quantifies the drainage mitigation with respect to stormwater runoff volumes, runoff rates, and stormwater quality as well as the addressing sediment and runoff controls during and after the construction process.

DeVellis Zrein Inc. (DZI) has analyzed the pre-development and post-development conditions of the project site and developed a stormwater management plan to mitigate the impacts resulting from this proposed project. The report addresses the stormwater maintenance protocol required to help ensure that the drainage system is maintained properly and achieve longevity and effectiveness. The proposed construction will increase the impervious surface area on-site and the stormwater management system has been designed to mitigate any increase in stormwater runoff to ensure that the post-development peak runoff rate from the site will be less than to the existing peak runoff rates. DEP Regulations require an applicant to match the rate in which stormwater leaves the Site. The future stormwater runoff from the development area will be reduced with drainage improvements such as a closed piping system with catch basin structures, a surface rain garden and a surface stormwater detention basin.

The future maintenance and upkeep of the site will be the responsibility of the Applicant and the project. The stormwater design addresses ease of maintenance concerns while meeting all of the state stormwater requirements and standards. Massachusetts Performance Standards and Regulations for Stormwater Management “Best Management Practices” have all been exceeded.

The following narrative provides a description of both the existing and proposed site conditions, and the methodology for design and implementation of stormwater management systems for the project.

2. Existing Conditions

The project site is approximately 12.5+/- acres, located along the northern edge of High Street.

There are Massachusetts Department of Environmental Protection (DEP) regulated resources on site jurisdictional buffer limits. The site is serviced by Municipal water. The proposed building will require an on-site septic system as no municipal sewer service is available.

The site will be accessed from High Street which is a public way.

The site is currently undeveloped with the exception of playing fields and a tennis court and can be generally described as having a combination of woods and open grass.

The topography is sloping from higher areas (elevation 67 feet) along the northwestern area and towards the east (elevation 64) and west (elevation 66) site where the wetland resource areas exist. A small area abutting High Street drains back to High Street (elevation 68 down to elevation 66). In general, the site is considered relatively flat.

Description of Contributing Area

The following is a brief description of the drainage area:

The analysis has been prepared to identify each existing drainage area and the design has been performed to reduce pre- and post- runoff conditions to each area.

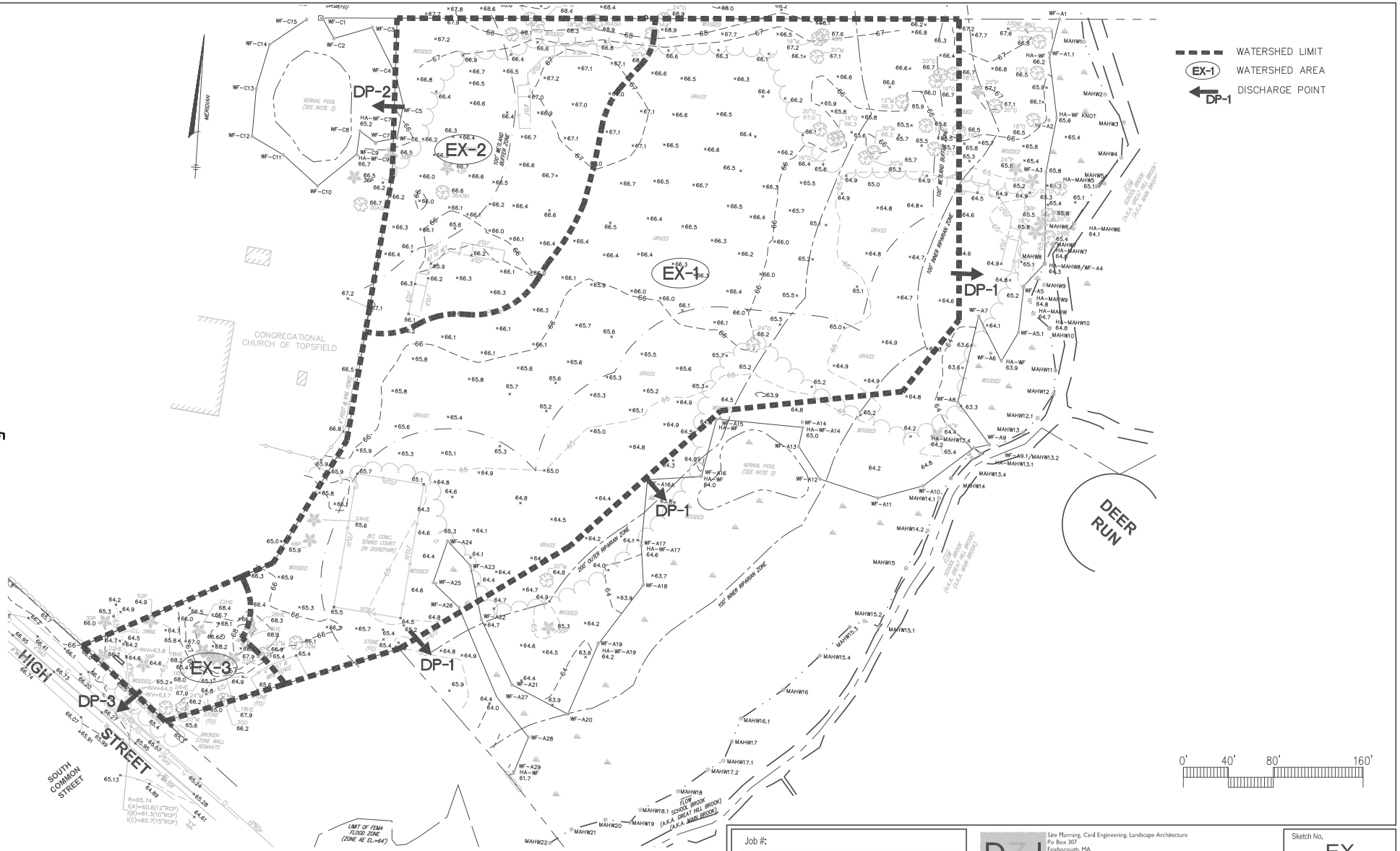
The existing development area and the area of effective drainage study is approximately 5.6 acres (Figure EX) and is categorized with three distinct watersheds; EX-1, EX-2 and EX-3 which are tributary to both wetland areas and the small area at High Street.

DZI has performed test pits throughout the site to determine subsurface conditions and current and historic high groundwater levels on the Site.

For the purpose of this hydrologic analysis, the following assumptions were made:

- Whenever possible, the property line and/or an arbitrary line, outside the limit of proposed work are delineated as the watershed boundary.

- The total watershed area for the existing conditions is used as the comparison base for the watershed area in the proposed conditions.



Job #:		
Drawn by: IAZ	Checked by:	
Date: 08.03.22		
Scale: 1" = 80'		

DZI
DeVellis Zrein Inc.
Site Planning, Civil Engineering, Landscape Architecture
Po Box 307
Foxborough, MA
508.473.4114 phone
devellszrein.com

Title: EXISTING WATERSHED MAP

Sketch No. EX

Project Name: 10 High Street Topsfield, MA

Soil Conditions

The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Essex County, Massachusetts. The site development area is comprised of soil Type B. See copy of the SCS Soils Survey at the end of this memo. The following table lists the soil designation, soil name and the soil group.

Table 1 - SCS Soil Types

Map Designation	Soil Name	Soil Group
260A	Sudbury Fine Sandy Loam 0 to 3% slopes	B

Existing Drainage Area Summary

The following table summarizes the existing drainage area, including the pertinent information used for the hydrologic analysis:

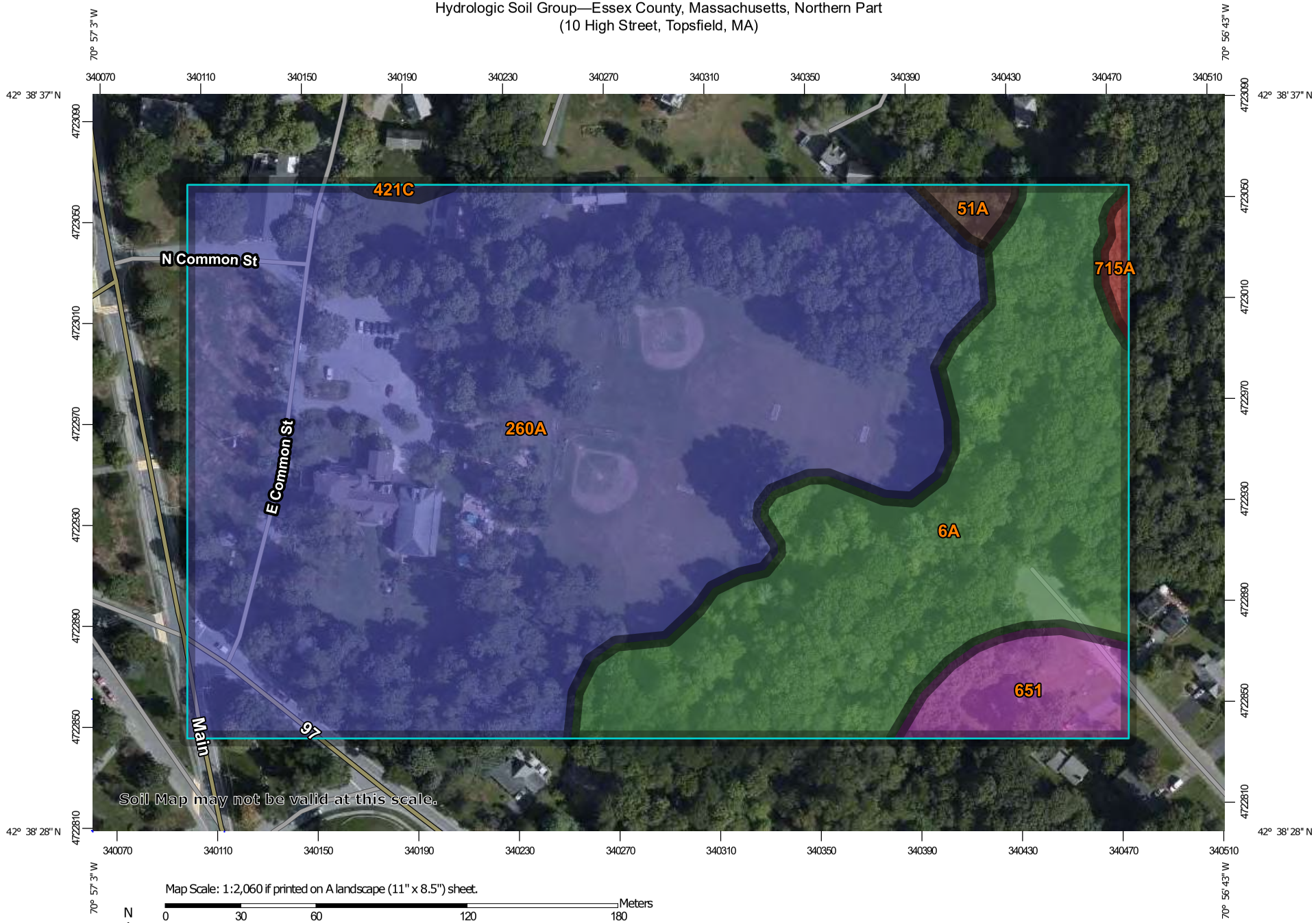
Existing Conditions Drainage Area - Characteristics

Drainage Area	Area (acres)	Curve Number	Tc (min.)
EX-1	4.2	68	16.5
EX-2	1.1	68	6.0
EX-3	0.3	60	6.0

Peak Discharge Runoff Rates

The existing peak flow rates, tributary to the drainage point, were calculated for the 2, 10, 25 and 100-year storm events in accordance with guidelines given in DEP's Stormwater Management Policy. Results are presented in the following section of this report. Refer to Existing Watershed Plan for a delineation of the watershed areas and their respective points of concentration.

Hydrologic Soil Group—Essex County, Massachusetts, Northern Part
(10 High Street, Topsfield, MA)



Map Scale: 1:2,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 17, Sep 2, 2021

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

Date(s) aerial images were photographed: Sep 13, 2019—Oct 5, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	5.4	26.5%
51A	Swansea muck, 0 to 1 percent slopes	B/D	0.2	0.8%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	13.9	68.1%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	B	0.0	0.1%
651	Udorthents, smoothed	A	0.8	3.9%
715A	Ridgebury and Leicester fine sandy loams, 0 to 3 percent slopes, extremely stony	D	0.1	0.6%
Totals for Area of Interest			**20.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

3. Proposed Conditions

This proposed project consists of one residential apartment building serviced by a new access driveway from High Street with 48 parking spaces. Proposed utilities (water, gas, electric/cable/fire and drainage, on-site septic) are proposed within the proposed development.

When impervious surfaces such as pavement and roof top are proposed, there will be an increase in stormwater runoff if mitigation is not provided. A stormwater management system is required to maintain the characteristics of the existing watersheds to the extent practicable.

Meeting current conditions are the requirement. Runoff rates at the discharge point are required to be maintained to existing conditions by temporarily holding runoff and slowly releasing it off site to meet existing peak flow rates.

The stormwater objectives of this project are summarized as follows:

1. Decrease the rate of runoff by providing stormwater retention
2. Exceed proper engineering standards of Topsfield's DPW and the DEP

Drainage Area PR-1A

Drainage Area PR-1A encompasses the proposed building, the majority of the access drive, the parking area and the above round stormwater detention basin with perimeter landscaping.

All areas within PR-1A will eventually enter into the stormwater detention area to reduce the rates of runoff by collection and detention.

Drainage Area PR-1B

Drainage Area PR-1B encompasses areas outside of the building and parking and generally described as lawn area, landscaping or woods. This area will sheet flows towards the direction of the wetland area (DP-1) un-detained.

Drainage Area PR-2

Drainage Area PR-2B encompasses areas outside of the building and parking and generally described as lawn area, landscaping or woods. This area will sheet flows towards the direction of the wetland area (DP-2) un-detained.

Drainage Area PR-3

Drainage Area PR-3 encompasses part of the access drive area closest to High Street, perimeter landscape areas and the rain garden along the site access drive near High Street. Runoff from the paved area is collected by a catch basin and is carried to the rain garden. Outflow from the rain garden is connected to an existing drain line that originates from the site and carries stormwater from the abutting land to the west (DP-3).

Proposed Drainage Area Summary

The following summarizes the proposed drainage areas, including the pertinent information used for the hydrologic analysis:

Proposed Conditions Drainage Area Characteristics Summary:

Drainage Area	Area (Acres)	Curve Number	T_c (min.)
PR-1A	1.99	93	6.0
PR-1B	2.20	61	6.0
PR-2	1.02	65	6.0
PR-3	0.38	70	6.0

Peak Discharge Runoff Rates

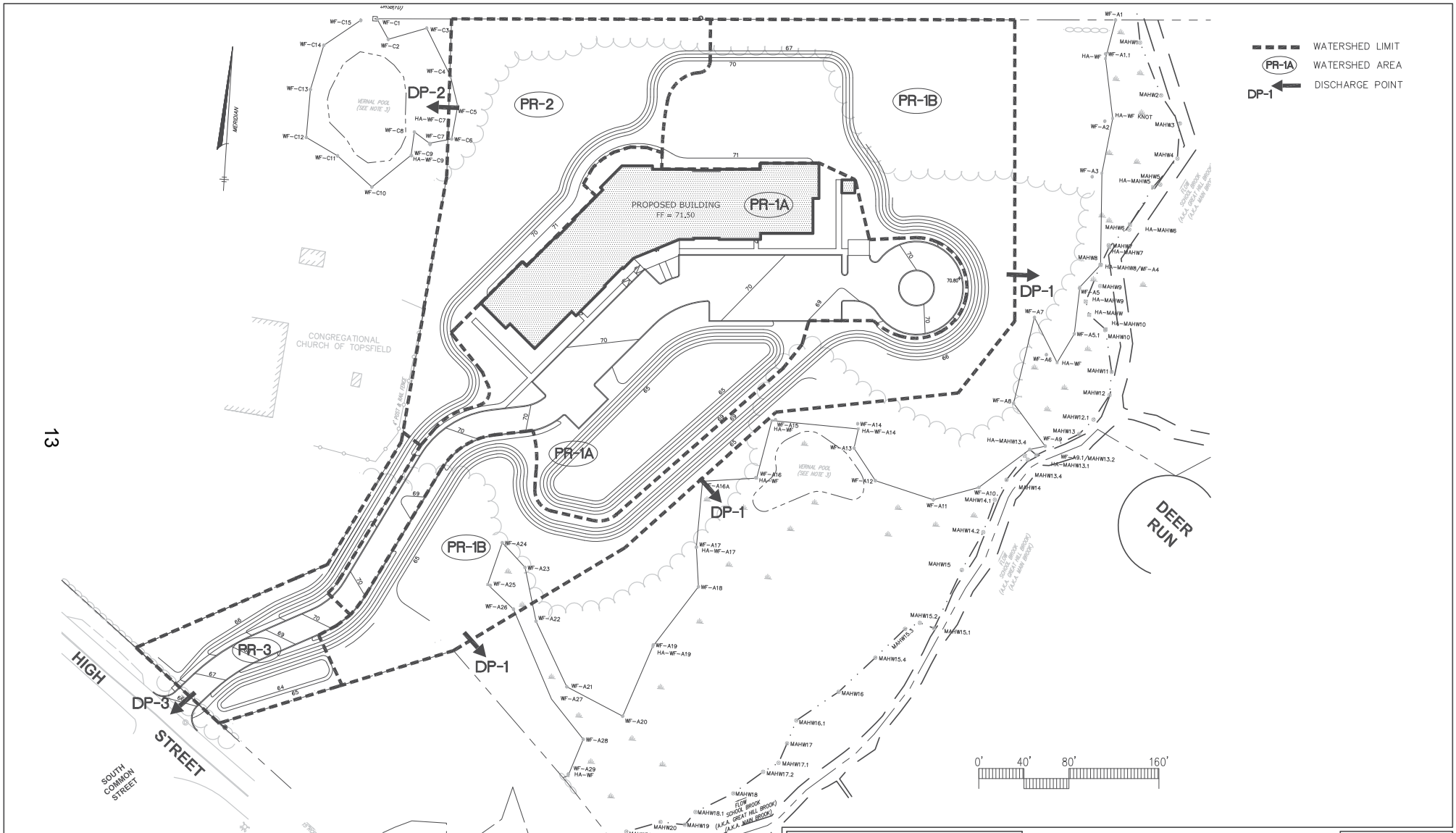
The proposed peak flow rates, tributary to the drainage point, were calculated for the 2, 10, 25 and 100-year storm events in accordance with guidelines given in DEP's Stormwater Management Policy. Results are presented in the following table. Refer to Proposed Watershed Plan for a delineation of the watershed areas and their respective points of concentration.

Summary of Results

As previously stated, the resultant post-development peak discharge rates for the discharge points are less than the pre-development peak discharge rates. The following table provides a summary of the pre and post development data. The following table demonstrates peak flows at the design points for each of the design storms has been met.

Peak Rates of Runoff Leaving the Site:

Location	2-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)	Exist (cfs)	Prop (cfs)
DP-1	2.39	0.69	5.45	2.78	8.11	4.67	11.52	7.26
DP-2	0.81	0.64	1.97	1.79	2.91	2.75	4.13	4.00
DP-3	0.07	0.00	0.30	0.07	0.50	0.33	0.76	0.53



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DeVellis Zrein Inc.

Title: PROPOSED WATERSHED MAP

Sketch No. PR

Project Name: 10 High Street Topsfield, MA

4. Methodology and Design Criteria Hydrologic Model

The drainage analysis was performed using the Soil Conservation Service (SCS) TR-20 method and the drainage software HydroCAD 7.10, as developed by Applied Microcomputer Systems. Data used in the design is as follows:

Design Storms

Rainfall data for the 2, 10, 25 and 100- year frequency rainfall events (for a 24-hour precipitation) was taken from the Rainfall Frequency Atlas of the Unites States (TP-40). The following table outlines the rainfall used for the TR-20 method.

Rainfall Data

Storm Event	Rainfall
2-Year	3.20 inches
10-Year	4.60 inches
25-Year	5.6 inches
100-Year	6.8 inches

Time of Concentration

The 'time of concentration' (T_c) for each watershed was determined by finding the time necessary for runoff to travel from the hydraulically most distant point in the watershed to the point of concentration. The travel path was drawn based on the topography and the time was calculated using the TR-55 Method and HydroCAD. A minimum T_c of 6.0 minutes was used.

Curve Numbers

Based on the cover type and hydrologic soil group, a weighted curve number (CN) was determined for each of the watersheds utilizing the SCS TR-55 method.

5. Department of Environmental Protection Stormwater Management Standards

Standard 1: **No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.**

The project does not propose any new untreated outfalls or discharge of untreated water into wetlands or waters of the Commonwealth. All proposed impervious surfaces will be collected and treated with catch basins and detained on-site with a detention / recharge system.

Standard 2: **Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.**

The project will reduce the post-development stormwater peak discharge rate to pre-development conditions via infiltration pipes and a detention system.

Standard 3: **Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.**

The intent of this standard is to ensure that the infiltration volume of precipitation into the ground under post-development conditions is at least as much as the infiltration volume under pre-development conditions. Standard 3 requires the restoration of recharge, using infiltration measures and careful site design.

The project will provide groundwater recharge. The infiltration provided within the detention / recharge system recharges stormwater back into the ground per the required amounts.

The NRCS classifies soils into one hydrologic groups B, indicative of the minimum infiltration obtained for a soil after prolonged wetting. Group A soils have the lowest runoff potential and the highest infiltration rates, while Group D soils have the highest runoff potential and the lowest infiltration rates. The required recharge volume, the stormwater volume that must be infiltrated, was determined using existing site conditions and the infiltration rates set forth below.

Hydrologic Group Volume to Recharge (Total Impervious Area)	
Hydrologic Group	Volume to Recharge Total Impervious Area
A	0.60 inches of runoff
B	**0.35 inches of runoff**
C	0.25 inches of runoff
D	0.10 inches of runoff

The soils are defined by the Soil Conservation Services (SCS) Soil Survey of Essex County, Massachusetts. The site area is comprised of one soil types.

Standard 4: **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).**

This standard is met by this project:

a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
b) Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and
c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

The stormwater runoff from the proposed parking and access drive will exceed the 80% TSS removal as the project is equipped with catch basins and a detention basin.

A long-term Operation and Maintenance Plan associated with this project has been designed and is included within this report.

Standard 5: **Regards land uses with higher potential pollutant loads:**

This is Not Applicable.

Standard 6: **Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best**

management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

This is Not Applicable.

Standard 7: **Regards redevelopment projects:**

This is Not Applicable.

Standard 8: **A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.**

The Sediment and Erosion Control Plan contains provisions for the construction related items such as silt controls, sequencing and Operation and Maintenance provisions for construction and post construction activities. A NPDES/SWPPP will be required and when a contractor is awarded the project, this plan will be submitted with all of the appropriate information on it.

Standard 9: **A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.**

The Long-Term Operation and Maintenance Plan has been prepared within this report and referenced on the plans that include the routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks.

Standard 10: **All illicit discharges to the stormwater management system are prohibited.**

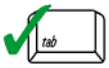
Standard 10 prohibits illicit discharges to stormwater management systems. By acceptance of this document, the Applicant acknowledges that the stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater. This document shall serve as the Illicit Discharge Compliance Statement verifying that no illicit discharges exist on the site and within the pollution prevention plan measures to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

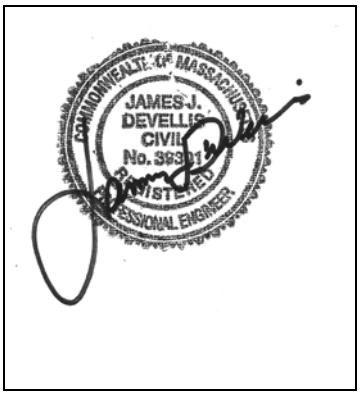
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Rain Garden / Detention Basin

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☒ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

6. Stormwater Operation and Maintenance Plan

Introduction

DeVellis Zrein Inc. has prepared this report as a guide to establish maintenance protocol for the on-site drainage improvements serving the Proposed Falcon Farms Subdivision. The goal of the Storm Water Operation and Maintenance Plan is not only to protect off-site wetlands and water resources abutting the site, but also to protect those resources in the region that may be affected by the activities at the site.
The proposed site drainage improvements include:

- Catch Basin Inlets
- Drain pipe network
- Rain Garden System
- Detention Basin System
- Landscaping

The proposed water quality treatment measures will result in improved removal of the total suspended solids (TSS) load in runoff from the site for the proposed parking improvements as well as throughout the existing parking areas.

An effective drainage maintenance program will ensure that the removal of TSS from the stormwater runoff continues for the life of the facility. The Operation and Maintenance Plan will be implemented by the Applicant and will not be the responsibility of the Town of Topsfield

Source Control

The first tier of non-structural controls includes a comprehensive source control program of regular maintenance of the stormwater management components.

Pavement Sweeping Program

The removal of contaminants directly from paved surfaces before contact with storm water is a valuable method for reducing pollutant loading in stormwater.

It is proposed that the parking and drive areas will be cleaned on a bi-annual basis with two sweepings per year. Sweeping at the beginning of spring is recommended and at the end of fall. Because of the small size of the project, the sweeping can be accomplished with a traditional street sweeper or through routine landscape maintenance with hands sweeping and blowers.

Catch Basins

The new catch basins along the road will be equipped with deep sumps to collect sands and solids and a hood to hold floatable materials and oil/gas contaminants from leaving the catch basin. The catch basins are recommended to be cleaned during the same schedule as the sweeping.

Detention Basin System

The actual removal of sediments and associated pollutants and trash occurs only when inlets are cleaned out; therefore, regular maintenance is required. At a minimum, the water quality basin and should be cleaned two times per year and inspected annually. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Rain Garden

The raingarden at the site entrance will collect stormwater from the southern portion of the drive. The selected plantings will clean the water and provide habitat and food for the wildlife. In the summer months, the raingardens also allow the stormwater water to cool and infiltrate into the root systems. This area provides surface stormwater mitigation which can easily be maintained and cared for and is located in a highly visible area that will be cared for.

Landscaping

The proposed project provides extensive landscaping along the perimeter and throughout.

A landscape plan has been provided to include hardy indigenous plants that are appropriate to survive in a parking environment in New England winters.

In the spring, the owner shall verify that the plants planted and included on the Planting Plan remain in good health in perpetuity. If there is damage, the plants are to be replaced in the same manner.

During Construction

- Prior to construction, install tree protection and erosion and sediment control measures as shown on the plan and details.
- The site contractor shall inspect all sediment and erosion control structures after each rainfall event and at the end of the working day.
- All measures shall be maintained in good working order. If repair is necessary, it shall be initiated within 24 hours of inspection.
- Silt shall be removed from the silt fence if 3-inches or greater and as needed.
- Sediment shall be contained within the construction site and away from drainage structures.

- Damaged or deteriorated erosion control measures will be repaired immediately after identification
- The silt fence shall be kept in close contact with the ground and reset as necessary.
- The contractor's site superintendent will be responsible for inspection, maintenance and repair activities.
- All disturbed areas will be treated with 4" of topsoil and seed.
- Remove siltation controls upon completion of permanent vegetation over disturbed areas.

Post Construction

The following site performance requirements are to be established at the property:

- Parking and drive areas will be cleaned with sweeper on a bi-annual basis with two (2) sweepings per year. Sweeping at the beginning of each season is recommended.
- Inspect the perimeter landscaping annually, in the spring, for erosion of side slopes, embankments, and accumulated sediment. Necessary sediment removal, earth repair and/or reseeding shall be performed immediately upon identification.
- Routinely pick up and remove litter from the parking areas, islands and perimeter landscape area, in addition to pavement sweeping.
- Inspect and clean drainage inlets and sediment forebays yearly. Clean and/or repair as needed.
- Inspect and clean outlet flared end sections and associated rip-rap yearly. Clean and/or repair as needed.

Stormwater Management System Owner

This site is owned by the Applicant (or successor/owner) who will be responsible for the Operation and Maintenance.

Estimated Operations Budget

It is not anticipated that the stormwater maintenance required would be considered extraordinary. A yearly estimated operations budget for consideration to carry out the Operations and Maintenance Plan requirements is as follows:

- **$1000:** Inspect the perimeter landscaping annually, in the spring, for erosion of side slopes, embankments, and accumulated sediment. Necessary sediment removal, earth repair and/or reseeding shall be performed immediately upon identification.

- **$2000:** Clean all catch basin structures bi-annually (twice per year) to remove accumulated sand, sediment, and floatable products. Dispose and transport accumulated sediment off-site in accordance with applicable local, state and federal guidelines and regulations.

- **$500:** Remove accumulated leaves and debris from catch basins and inlet/outlet openings.

- **$500:** Routinely pick up and remove litter from the Site.

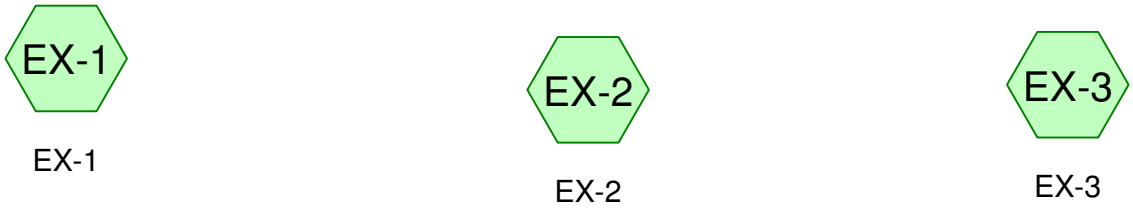
- **$500:** Replant/replenish the detention basin and rain garden systems with specific plantings. Trim and prune as needed.

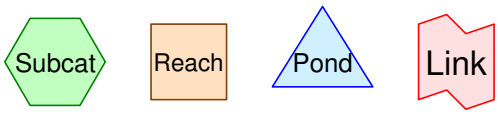
Appendix A –
Hydrologic Calculations and Drain Pipe Calculations

- Hydrologic Model - Existing Conditions
  Stormwater Runoff Area Calculations
  Existing Conditions Calculations
  2-Year Storm
  10-Year Storm
  25-Year Storm
  100-Year Storm

- Hydrologic Model - Proposed Conditions
  Stormwater Runoff Area Calculations
  Proposed Conditions Calculations
  2-Year Storm
  10-Year Storm
  25-Year Storm
  100-Year Storm

Hydrologic Model - Existing Conditions





Routing Diagram for Existing Conditions
Prepared by {enter your company name here}, Printed 8/4/2022
HydroCAD® 10.00-25 s/n 08761 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.906	69	50-75% Grass cover, Fair, HSG B (EX-1, EX-2)
0.020	98	Impervious, HSG B (EX-2)
0.165	98	Paved Tennis Court, HSG B (EX-1)
1.498	60	Woods, Fair, HSG B (EX-1, EX-2, EX-3)
5.589	**68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.589	HSG B	EX-1, EX-2, EX-3
0.000	HSG C	
0.000	HSG D	
0.000	Other	
5.589		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	3.906	0.000	0.000	0.000	3.906	50-75% Grass cover, Fair	EX-1, EX-2
0.000	0.020	0.000	0.000	0.000	0.020	Impervious	EX-2
0.000	0.165	0.000	0.000	0.000	0.165	Paved Tennis Court	EX-1
0.000	1.498	0.000	0.000	0.000	1.498	Woods, Fair	EX-1, EX-2, EX-3
0.000	**5.589**	**0.000**	**0.000**	**0.000**	**5.589**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: EX-1 Runoff Area=183,039 sf 3.93% Impervious Runoff Depth=0.73"
Flow Length=330' Tc=16.5 min CN=68 Runoff=2.23 cfs 0.257 af

Subcatchment EX-2: EX-2 Runoff Area=48,302 sf 1.78% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=68 Runoff=0.81 cfs 0.068 af

Subcatchment EX-3: EX-3 Runoff Area=12,123 sf 0.00% Impervious Runoff Depth=0.41"
Tc=6.0 min CN=60 Runoff=0.07 cfs 0.009 af

Total Runoff Area = 5.589 ac Runoff Volume = 0.334 af Average Runoff Depth = 0.72"
96.69% Pervious = 5.404 ac 3.31% Impervious = 0.185 ac

Summary for Subcatchment EX-1: EX-1

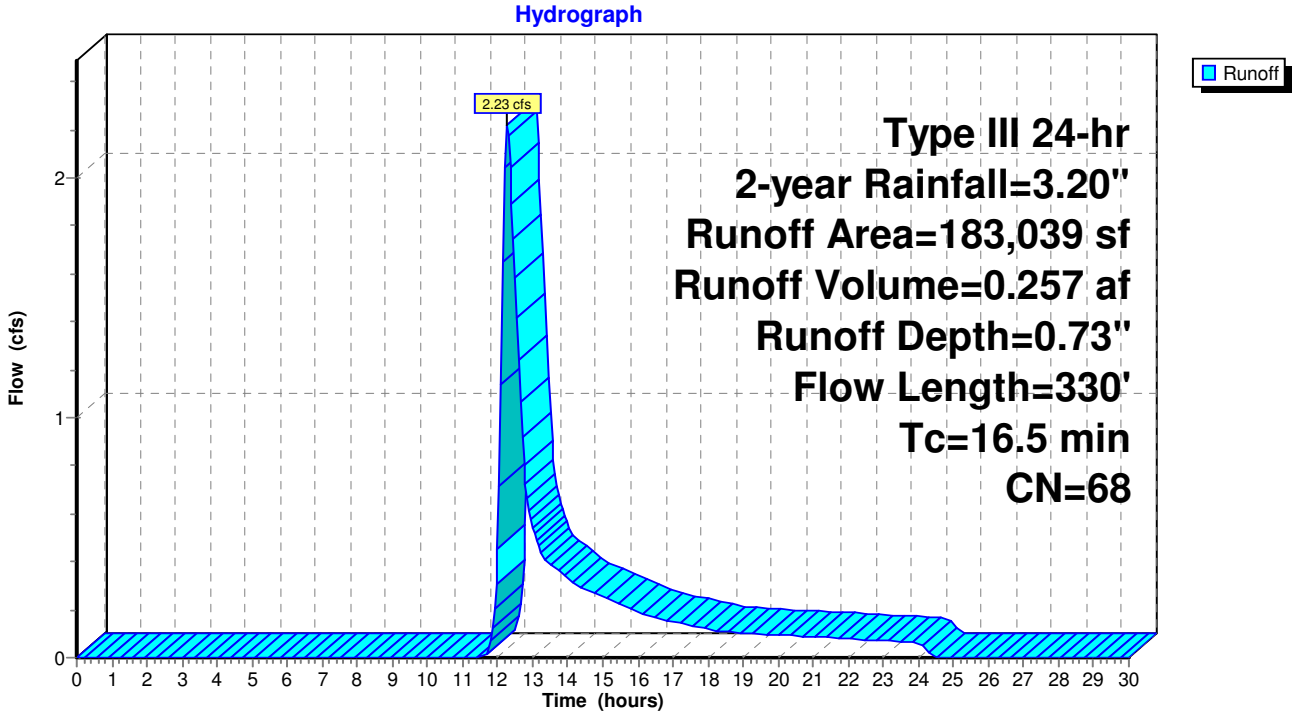
Runoff = 2.23 cfs @ 12.27 hrs, Volume= 0.257 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
*	7,192	98	Paved Tennis Court, HSG B
	44,957	60	Woods, Fair, HSG B
	130,890	69	50-75% Grass cover, Fair, HSG B
	183,039	68	Weighted Average
	175,847		96.07% Pervious Area
	7,192		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, T1** Grass: Short n= 0.150 P2= 3.20"
6.7	280	0.0100	0.70		**Shallow Concentrated Flow, T2** Short Grass Pasture Kv= 7.0 fps
16.5	330	Total			

Subcatchment EX-1: EX-1



Summary for Subcatchment EX-2: EX-2

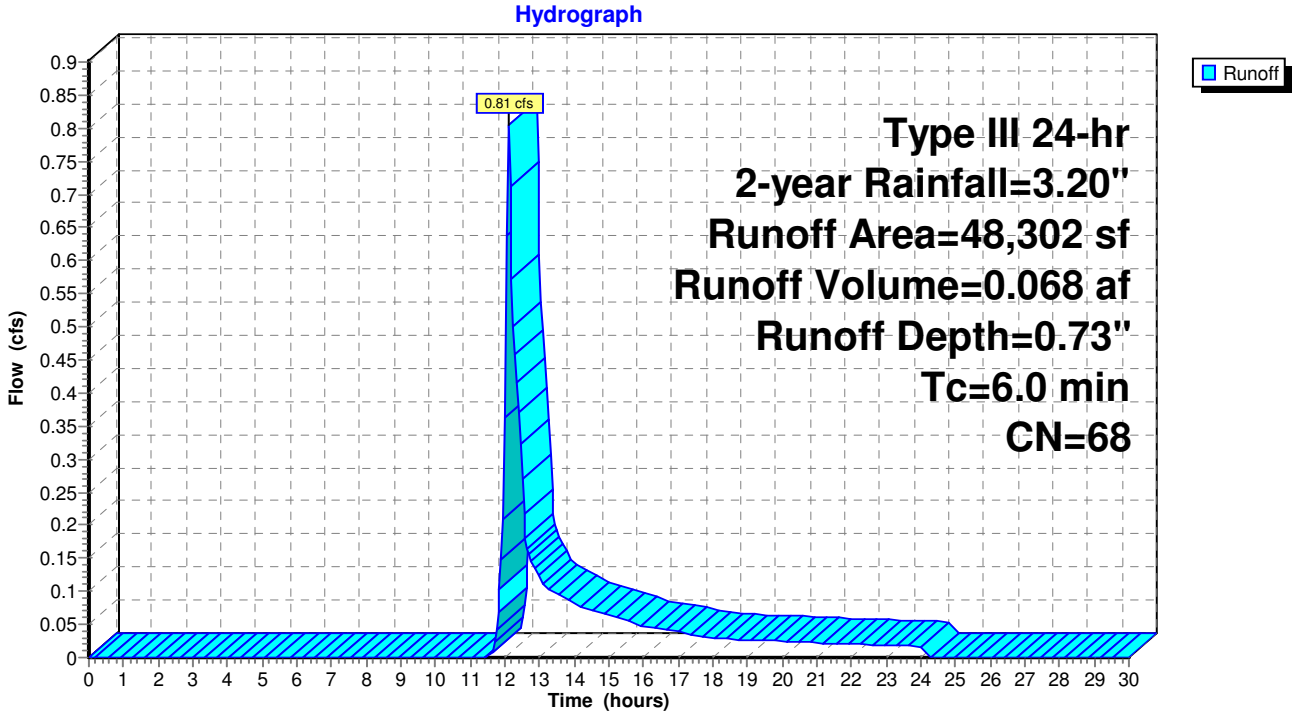
Runoff = 0.81 cfs @ 12.11 hrs, Volume= 0.068 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
	8,171	60	Woods, Fair, HSG B
	39,271	69	50-75% Grass cover, Fair, HSG B
*	860	98	Impervious, HSG B
	48,302	68	Weighted Average
	47,442		98.22% Pervious Area
	860		1.78% Impervious Area

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

Subcatchment EX-2: EX-2



Summary for Subcatchment EX-3: EX-3

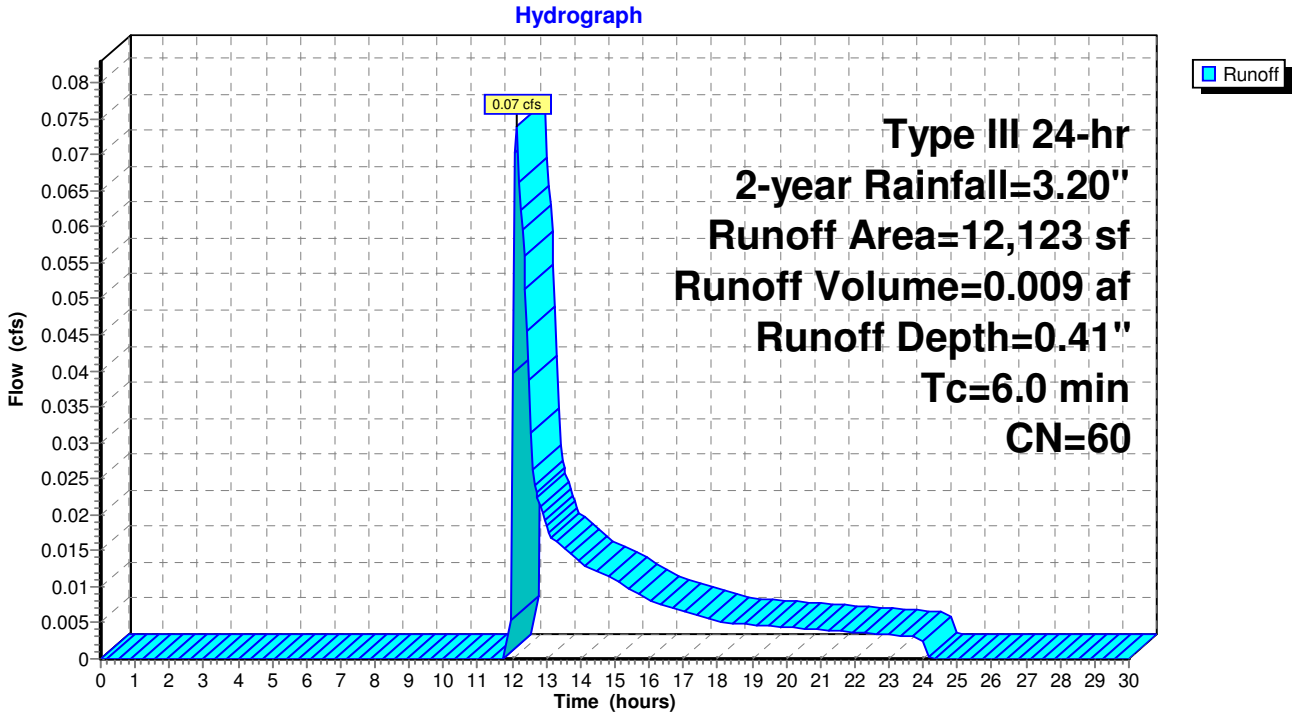
Runoff = 0.07 cfs @ 12.14 hrs, Volume= 0.009 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
12,123	60	Woods, Fair, HSG B
12,123		100.00% Pervious Area

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

Subcatchment EX-3: EX-3



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: EX-1 Runoff Area=183,039 sf 3.93% Impervious Runoff Depth=1.60"
Flow Length=330' Tc=16.5 min CN=68 Runoff=5.45 cfs 0.560 af

Subcatchment EX-2: EX-2 Runoff Area=48,302 sf 1.78% Impervious Runoff Depth=1.60"
Tc=6.0 min CN=68 Runoff=1.97 cfs 0.148 af

Subcatchment EX-3: EX-3 Runoff Area=12,123 sf 0.00% Impervious Runoff Depth=1.07"
Tc=6.0 min CN=60 Runoff=0.30 cfs 0.025 af

Total Runoff Area = 5.589 ac Runoff Volume = 0.733 af Average Runoff Depth = 1.57"
96.69% Pervious = 5.404 ac 3.31% Impervious = 0.185 ac

Summary for Subcatchment EX-1: EX-1

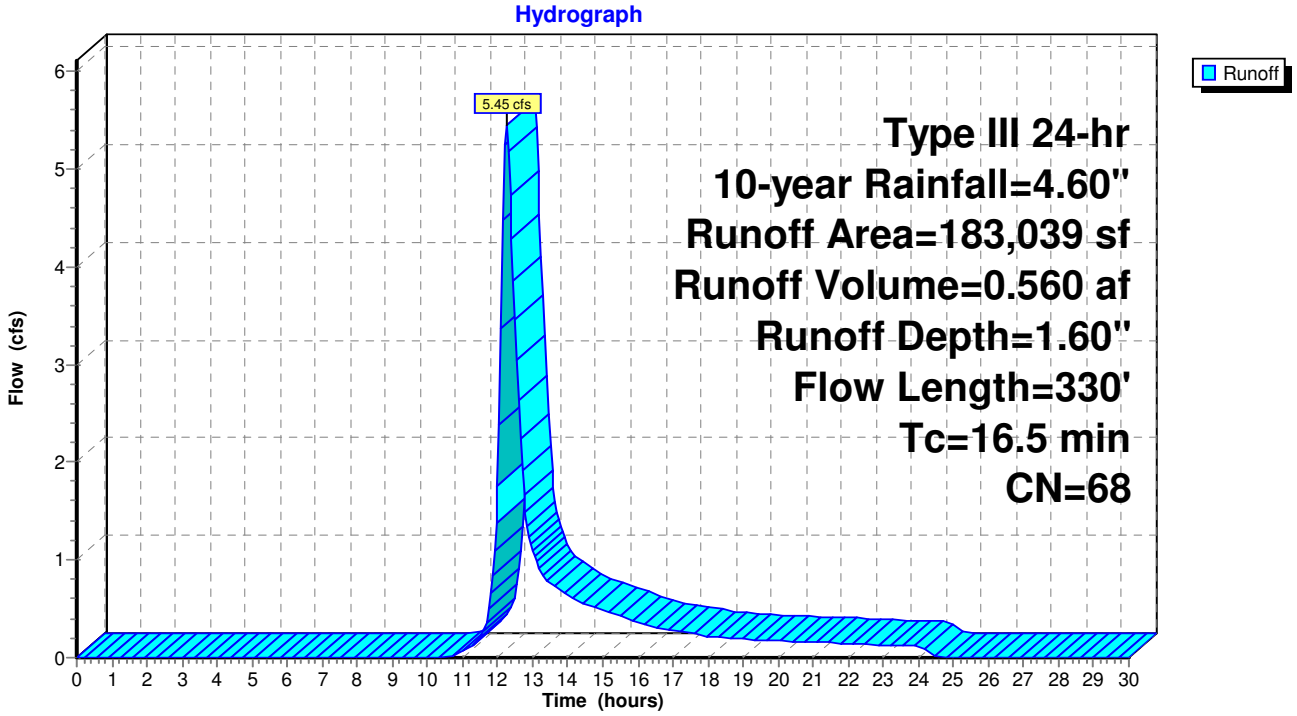
Runoff = 5.45 cfs @ 12.25 hrs, Volume= 0.560 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	7,192	98	Paved Tennis Court, HSG B
	44,957	60	Woods, Fair, HSG B
	130,890	69	50-75% Grass cover, Fair, HSG B
	183,039	68	Weighted Average
	175,847		96.07% Pervious Area
	7,192		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, T1** Grass: Short n= 0.150 P2= 3.20"
6.7	280	0.0100	0.70		**Shallow Concentrated Flow, T2** Short Grass Pasture Kv= 7.0 fps
16.5	330	Total			

Subcatchment EX-1: EX-1



Summary for Subcatchment EX-2: EX-2

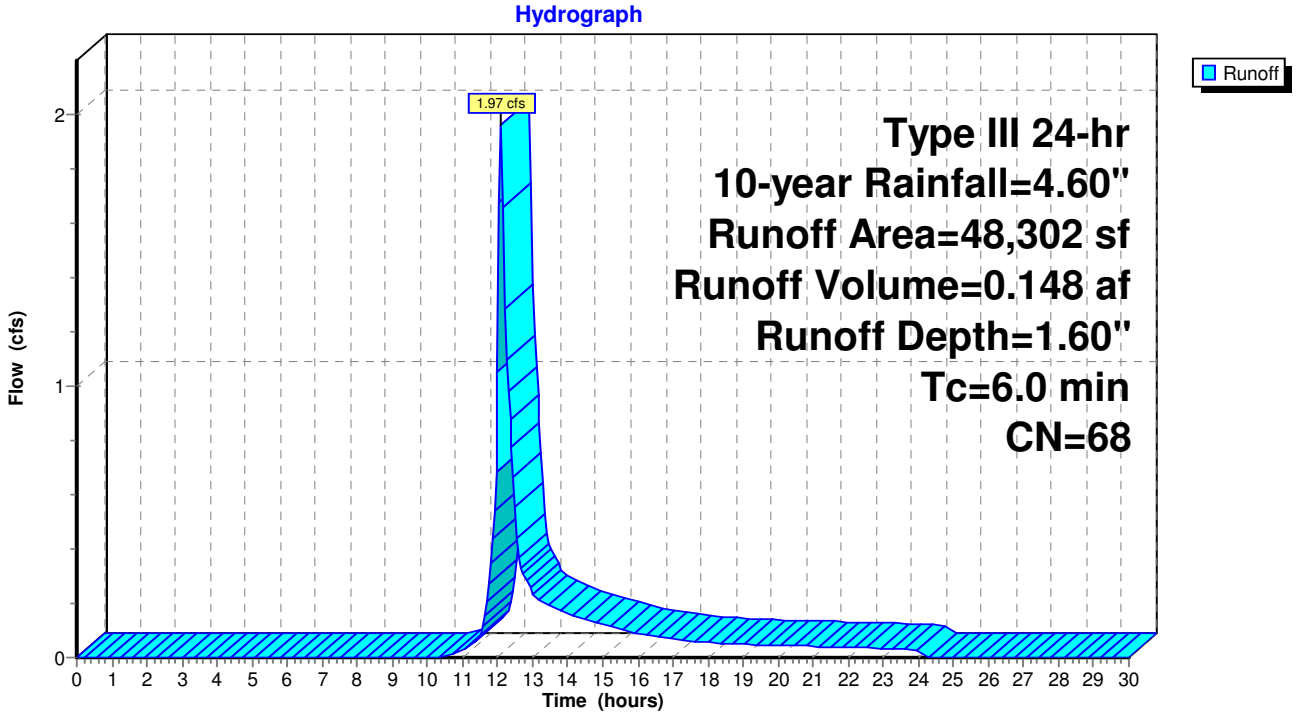
Runoff = 1.97 cfs @ 12.10 hrs, Volume= 0.148 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
	8,171	60	Woods, Fair, HSG B
	39,271	69	50-75% Grass cover, Fair, HSG B
*	860	98	Impervious, HSG B
	48,302	68	Weighted Average
	47,442		98.22% Pervious Area
	860		1.78% Impervious Area

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

Subcatchment EX-2: EX-2



Summary for Subcatchment EX-3: EX-3

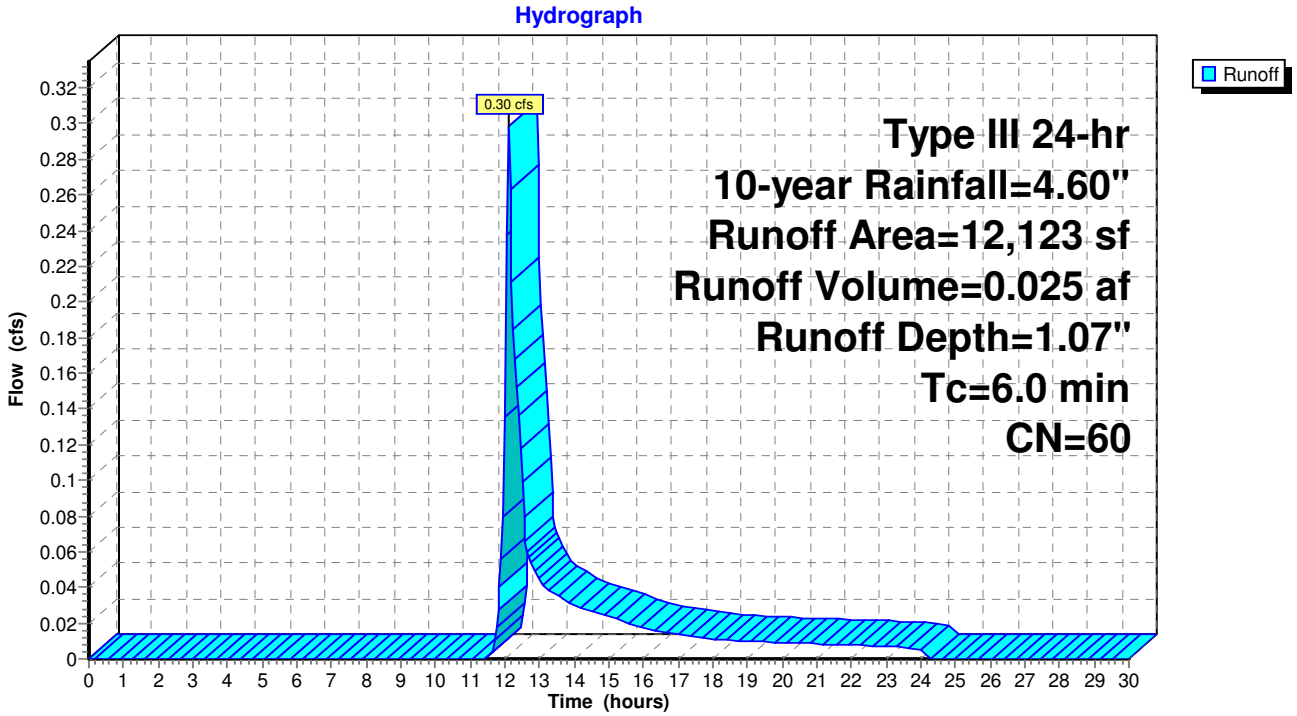
Runoff = 0.30 cfs @ 12.11 hrs, Volume= 0.025 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
12,123	60	Woods, Fair, HSG B
12,123		100.00% Pervious Area

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

Subcatchment EX-3: EX-3



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: EX-1 Runoff Area=183,039 sf 3.93% Impervious Runoff Depth=2.32"
Flow Length=330' Tc=16.5 min CN=68 Runoff=8.11 cfs 0.812 af

Subcatchment EX-2: EX-2 Runoff Area=48,302 sf 1.78% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=68 Runoff=2.91 cfs 0.214 af

Subcatchment EX-3: EX-3 Runoff Area=12,123 sf 0.00% Impervious Runoff Depth=1.67"
Tc=6.0 min CN=60 Runoff=0.50 cfs 0.039 af

Total Runoff Area = 5.589 ac Runoff Volume = 1.064 af Average Runoff Depth = 2.29"
96.69% Pervious = 5.404 ac 3.31% Impervious = 0.185 ac

Summary for Subcatchment EX-1: EX-1

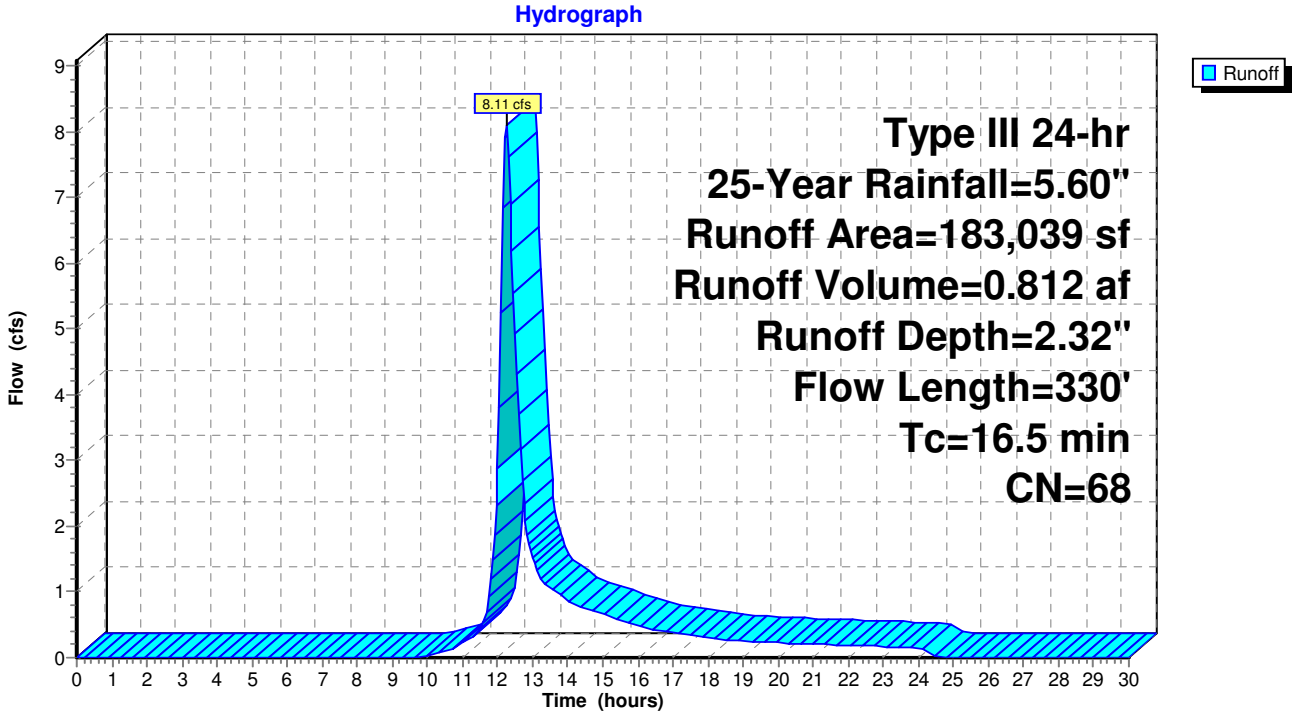
Runoff = 8.11 cfs @ 12.24 hrs, Volume= 0.812 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
*	7,192	98	Paved Tennis Court, HSG B
	44,957	60	Woods, Fair, HSG B
	130,890	69	50-75% Grass cover, Fair, HSG B
	183,039	68	Weighted Average
	175,847		96.07% Pervious Area
	7,192		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, T1** Grass: Short n= 0.150 P2= 3.20"
6.7	280	0.0100	0.70		**Shallow Concentrated Flow, T2** Short Grass Pasture Kv= 7.0 fps
16.5	330	Total			

Subcatchment EX-1: EX-1



Summary for Subcatchment EX-2: EX-2

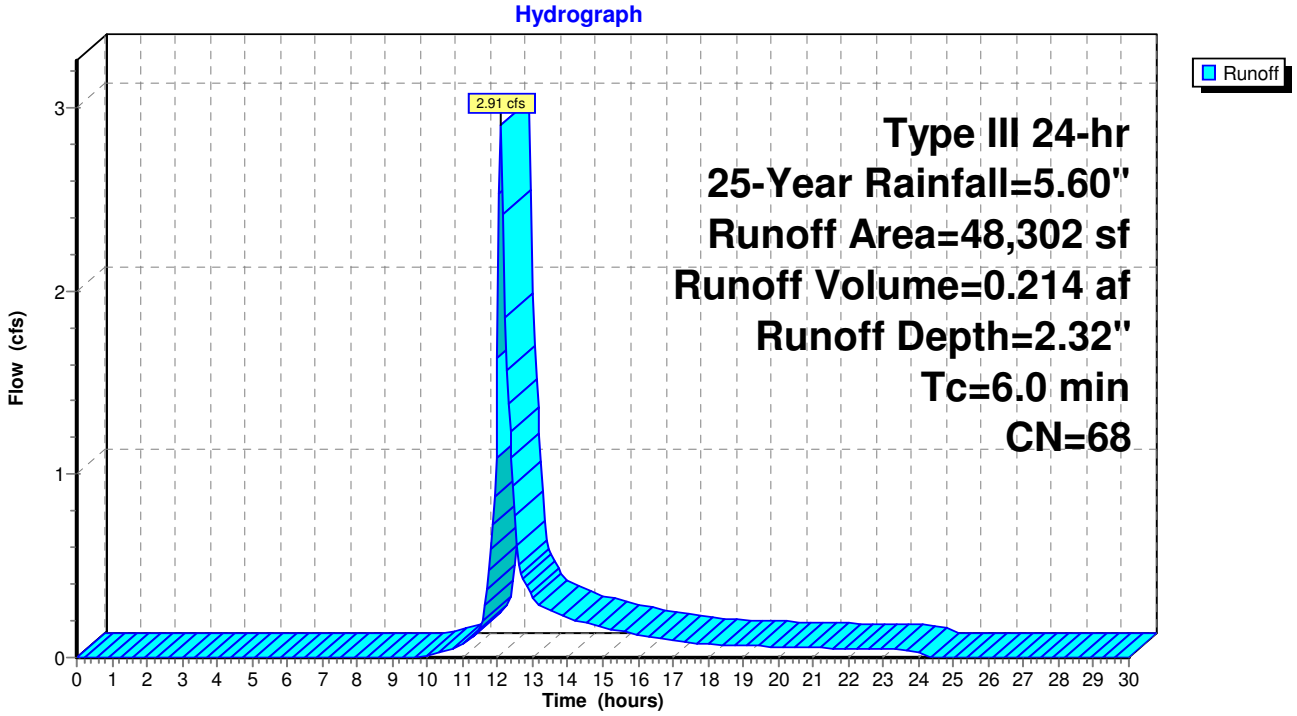
Runoff = 2.91 cfs @ 12.10 hrs, Volume= 0.214 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
	8,171	60	Woods, Fair, HSG B
	39,271	69	50-75% Grass cover, Fair, HSG B
*	860	98	Impervious, HSG B
	48,302	68	Weighted Average
	47,442		98.22% Pervious Area
	860		1.78% Impervious Area

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

Subcatchment EX-2: EX-2



Summary for Subcatchment EX-3: EX-3

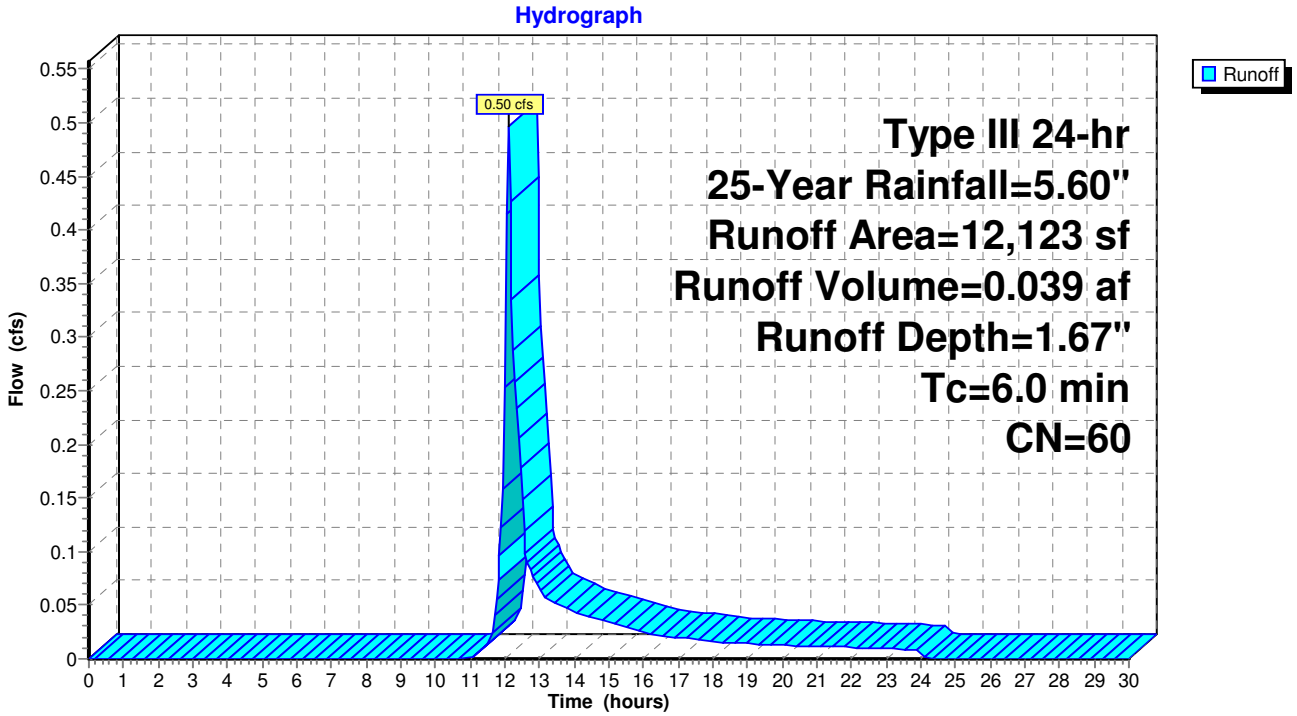
Runoff = 0.50 cfs @ 12.10 hrs, Volume= 0.039 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
12,123	60	Woods, Fair, HSG B
12,123		100.00% Pervious Area

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

Subcatchment EX-3: EX-3



Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: EX-1 Runoff Area=183,039 sf 3.93% Impervious Runoff Depth=3.25"
Flow Length=330' Tc=16.5 min CN=68 Runoff=11.52 cfs 1.138 af

Subcatchment EX-2: EX-2 Runoff Area=48,302 sf 1.78% Impervious Runoff Depth=3.25"
Tc=6.0 min CN=68 Runoff=4.13 cfs 0.300 af

Subcatchment EX-3: EX-3 Runoff Area=12,123 sf 0.00% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=60 Runoff=0.76 cfs 0.057 af

Total Runoff Area = 5.589 ac Runoff Volume = 1.495 af Average Runoff Depth = 3.21"
96.69% Pervious = 5.404 ac 3.31% Impervious = 0.185 ac

Summary for Subcatchment EX-1: EX-1

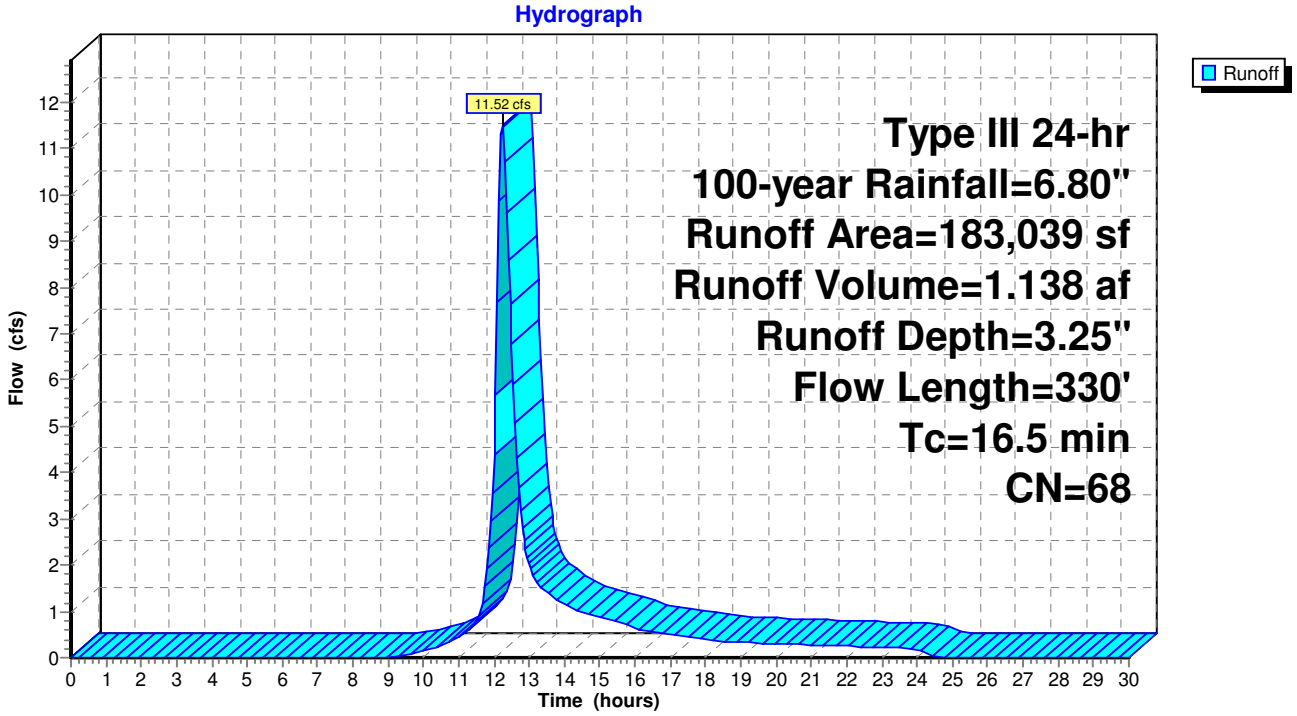
Runoff = 11.52 cfs @ 12.23 hrs, Volume= 1.138 af, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

	Area (sf)	CN	Description
*	7,192	98	Paved Tennis Court, HSG B
	44,957	60	Woods, Fair, HSG B
	130,890	69	50-75% Grass cover, Fair, HSG B
	183,039	68	Weighted Average
	175,847		96.07% Pervious Area
	7,192		3.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0050	0.09		**Sheet Flow, T1** Grass: Short n= 0.150 P2= 3.20"
6.7	280	0.0100	0.70		**Shallow Concentrated Flow, T2** Short Grass Pasture Kv= 7.0 fps
16.5	330	Total			

Subcatchment EX-1: EX-1



Summary for Subcatchment EX-2: EX-2

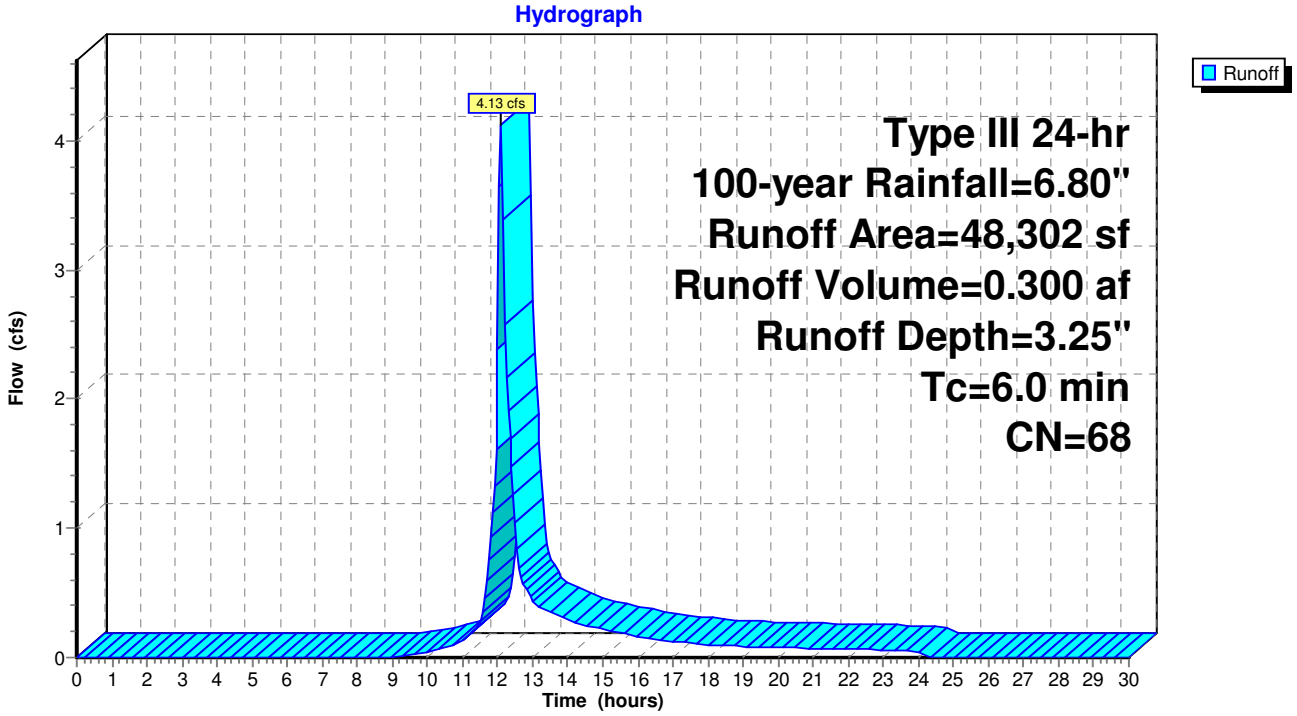
Runoff = 4.13 cfs @ 12.09 hrs, Volume= 0.300 af, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

	Area (sf)	CN	Description
	8,171	60	Woods, Fair, HSG B
	39,271	69	50-75% Grass cover, Fair, HSG B
*	860	98	Impervious, HSG B
	48,302	68	Weighted Average
	47,442		98.22% Pervious Area
	860		1.78% Impervious Area

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

Subcatchment EX-2: EX-2



Summary for Subcatchment EX-3: EX-3

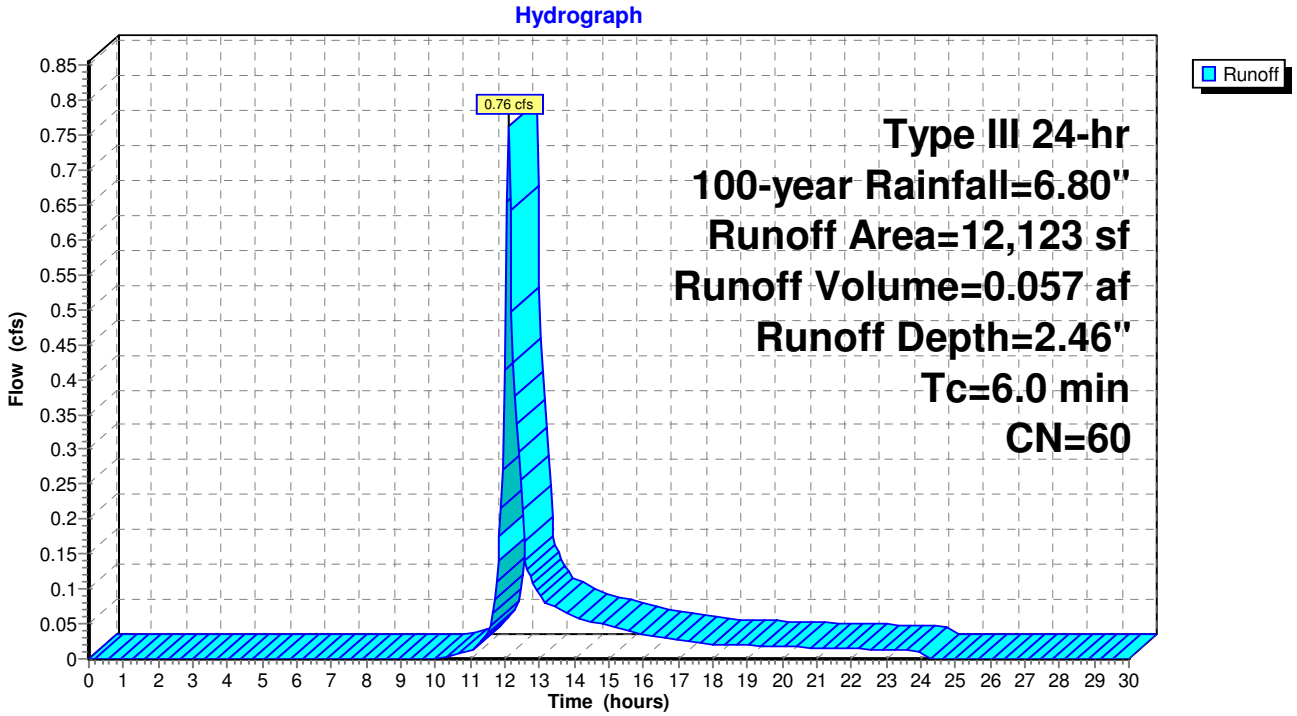
Runoff = 0.76 cfs @ 12.10 hrs, Volume= 0.057 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

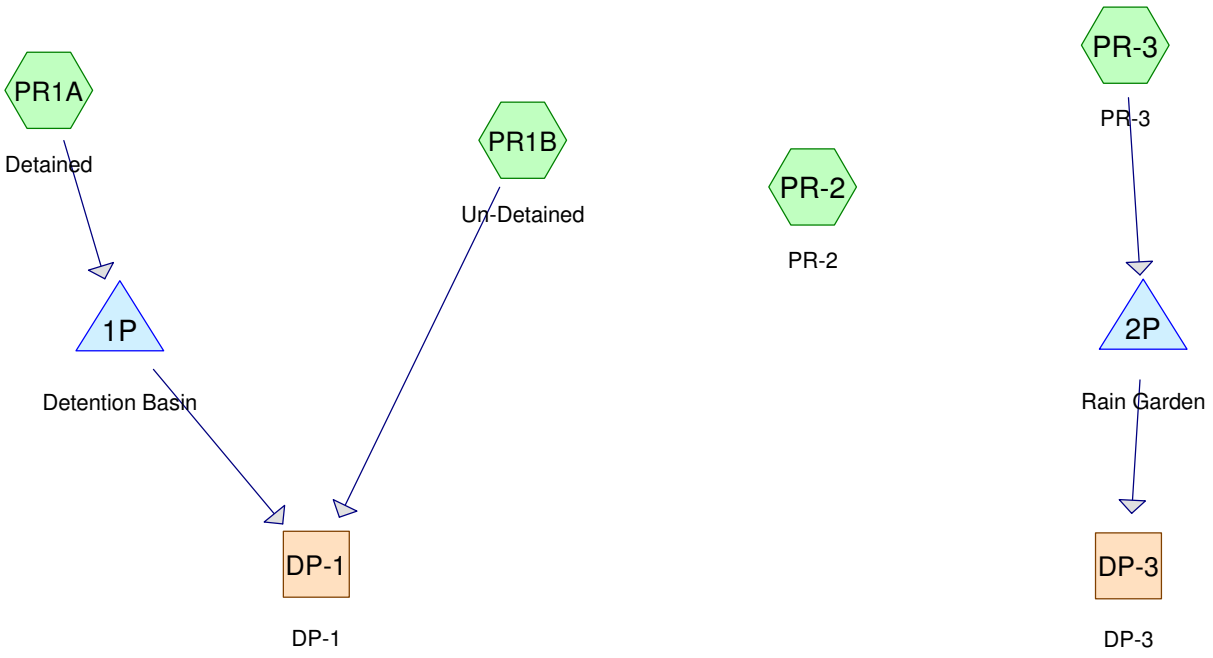
Area (sf)	CN	Description
12,123	60	Woods, Fair, HSG B
12,123		100.00% Pervious Area

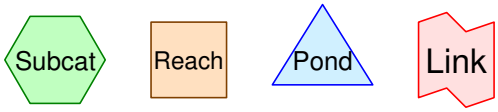
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment EX-3: EX-3



Hydrologic Model - Proposed Conditions





Routing Diagram for Proposed Conditions
Prepared by {enter your company name here}, Printed 8/9/2022
HydroCAD® 10.00-25 s/n 08761 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.518	69	50-75% Grass cover, Fair, HSG B (PR-2)
2.429	61	>75% Grass cover, Good, HSG B (PR-2, PR-3, PR1A, PR1B)
0.369	98	Detention Basin (PR1A)
1.343	98	Paved parking and roof, HSG B (PR1A)
0.098	98	Paved parking, HSG B (PR-3)
0.832	60	Woods, Fair, HSG B (PR-2, PR-3, PR1B)
5.589	**74**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
5.220	HSG B	PR-2, PR-3, PR1A, PR1B
0.000	HSG C	
0.000	HSG D	
0.369	Other	PR1A
5.589		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.518	0.000	0.000	0.000	0.518	50-75% Grass cover, Fair	PR-2
0.000	2.429	0.000	0.000	0.000	2.429	>75% Grass cover, Good	PR-2, PR-3, PR1A, PR1B
0.000	0.000	0.000	0.000	0.369	0.369	Detention Basin	PR1A
0.000	0.098	0.000	0.000	0.000	0.098	Paved parking	PR-3
0.000	1.343	0.000	0.000	0.000	1.343	Paved parking and roof	PR1A
0.000	0.832	0.000	0.000	0.000	0.832	Woods, Fair	PR-2, PR-3, PR1B
0.000	**5.220**	**0.000**	**0.000**	**0.369**	**5.589**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-2: PR-2 Runoff Area=44,310 sf 0.00% Impervious Runoff Depth=0.60"
Tc=0.0 min CN=65 Runoff=0.64 cfs 0.051 af

Subcatchment PR-3: PR-3 Runoff Area=16,655 sf 25.64% Impervious Runoff Depth=0.83"
Tc=6.0 min CN=70 Runoff=0.33 cfs 0.026 af

Subcatchment PR1A: Detained Runoff Area=86,719 sf 85.97% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=93 Runoff=5.40 cfs 0.406 af

Subcatchment PR1B: Un-Detained Runoff Area=95,780 sf 0.00% Impervious Runoff Depth=0.44"
Tc=6.0 min CN=61 Runoff=0.69 cfs 0.081 af

Reach DP-1: DP-1 Inflow=0.69 cfs 0.138 af
Outflow=0.69 cfs 0.138 af

Reach DP-3: DP-3 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: Detention Basin Peak Elev=85.79' Storage=8,131 cf Inflow=5.40 cfs 0.406 af
Discarded=0.26 cfs 0.350 af Primary=0.22 cfs 0.056 af Outflow=0.49 cfs 0.406 af

Pond 2P: Rain Garden Peak Elev=64.25' Storage=375 cf Inflow=0.33 cfs 0.026 af
Discarded=0.04 cfs 0.026 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.026 af

Total Runoff Area = 5.589 ac Runoff Volume = 0.564 af Average Runoff Depth = 1.21"
67.63% Pervious = 3.780 ac 32.37% Impervious = 1.809 ac

Summary for Subcatchment PR-2: PR-2

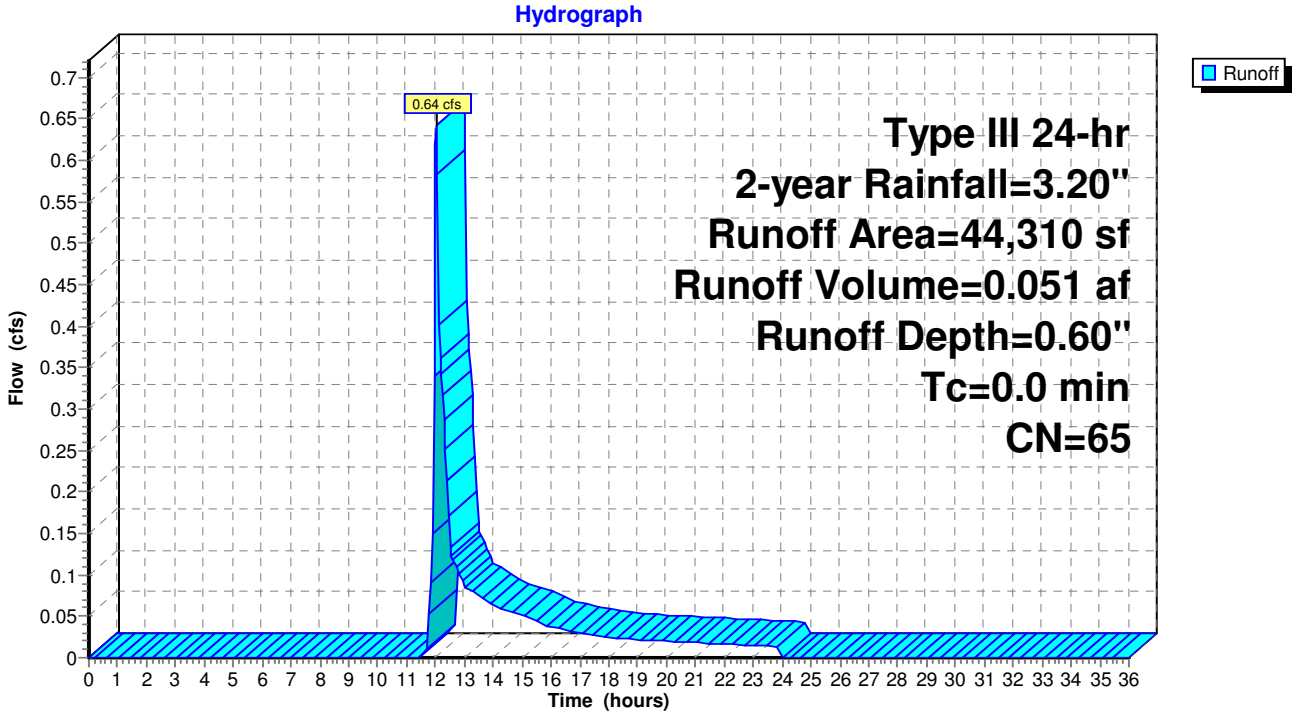
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.64 cfs @ 12.02 hrs, Volume= 0.051 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
11,793	61	>75% Grass cover, Good, HSG B
9,948	60	Woods, Fair, HSG B
22,569	69	50-75% Grass cover, Fair, HSG B
44,310	65	Weighted Average
44,310		100.00% Pervious Area

Subcatchment PR-2: PR-2



Summary for Subcatchment PR-3: PR-3

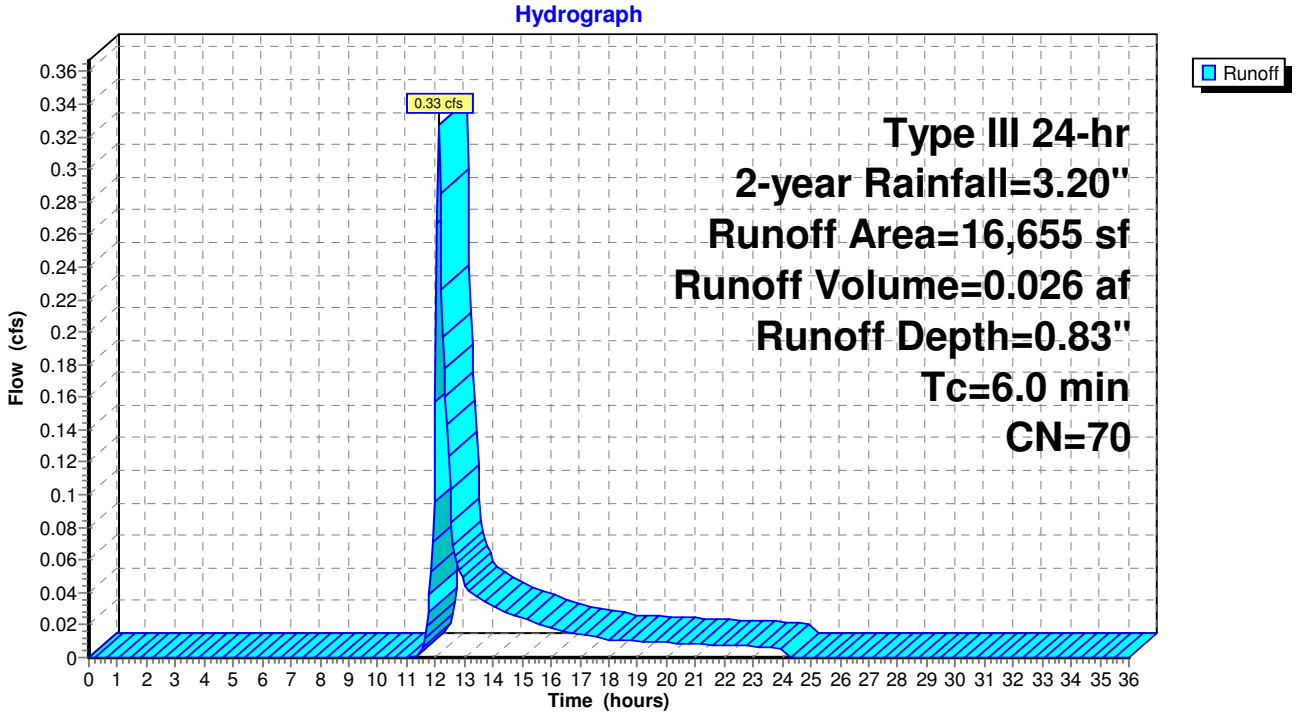
Runoff = 0.33 cfs @ 12.10 hrs, Volume= 0.026 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
4,270	98	Paved parking, HSG B
9,642	61	>75% Grass cover, Good, HSG B
2,743	60	Woods, Fair, HSG B
16,655	70	Weighted Average
12,385		74.36% Pervious Area
4,270		25.64% Impervious Area

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

Subcatchment PR-3: PR-3



Summary for Subcatchment PR1A: Detained

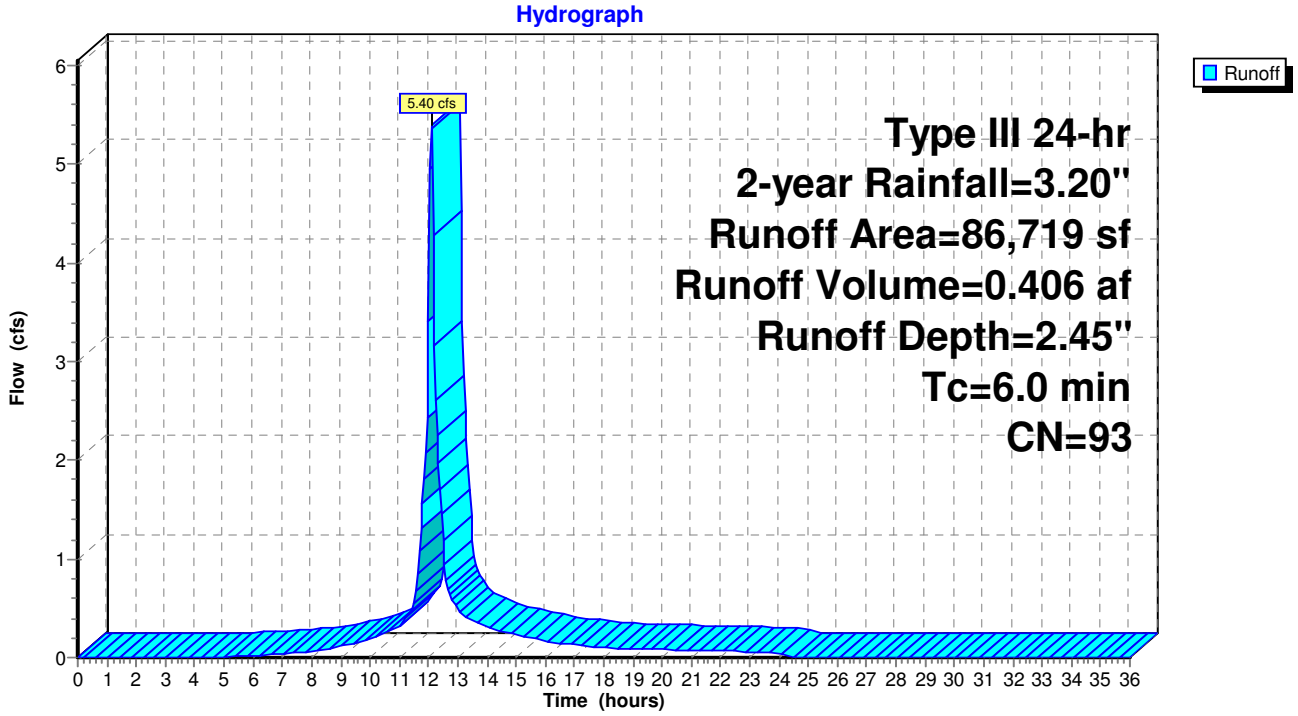
Runoff = 5.40 cfs @ 12.09 hrs, Volume= 0.406 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
*	58,487	98	Paved parking and roof, HSG B
	12,170	61	>75% Grass cover, Good, HSG B
*	16,062	98	Detention Basin
	86,719	93	Weighted Average
	12,170		14.03% Pervious Area
	74,549		85.97% Impervious Area

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

Subcatchment PR1A: Detained



Summary for Subcatchment PR1B: Un-Detained

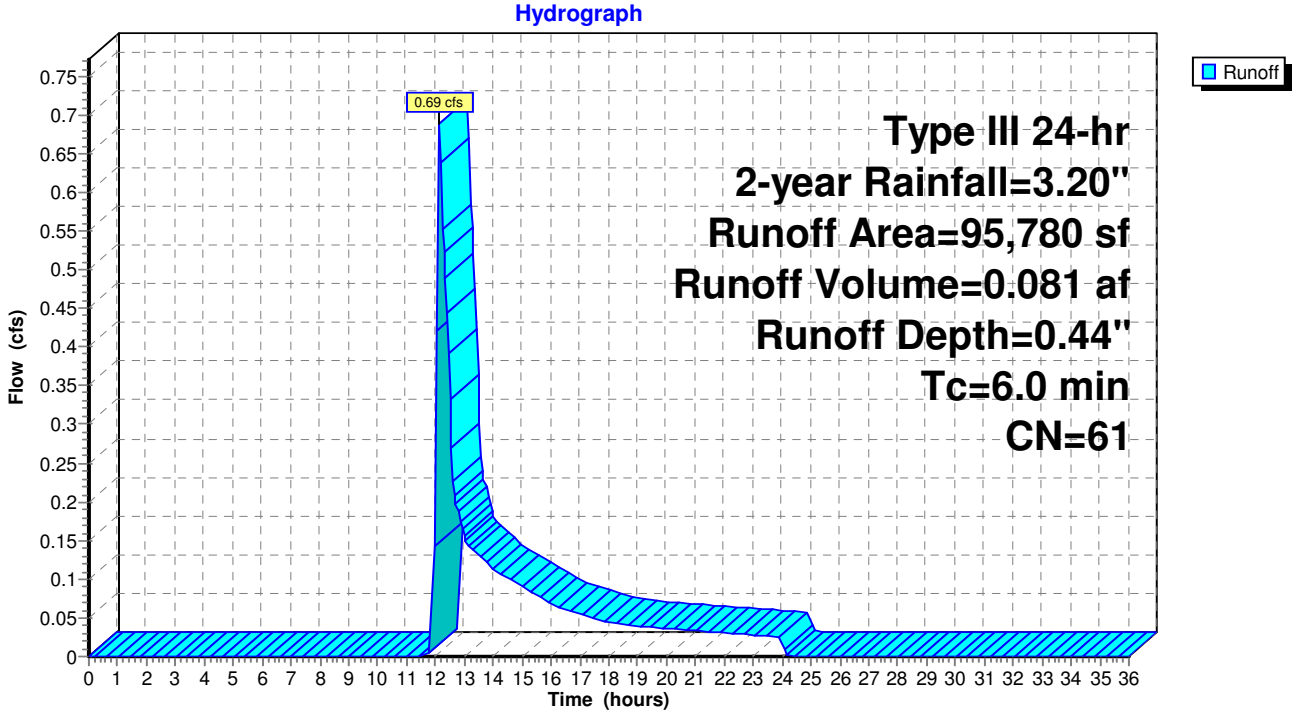
Runoff = 0.69 cfs @ 12.13 hrs, Volume= 0.081 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
23,560	60	Woods, Fair, HSG B
72,220	61	>75% Grass cover, Good, HSG B
95,780	61	Weighted Average
95,780		100.00% Pervious Area

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

Subcatchment PR1B: Un-Detained



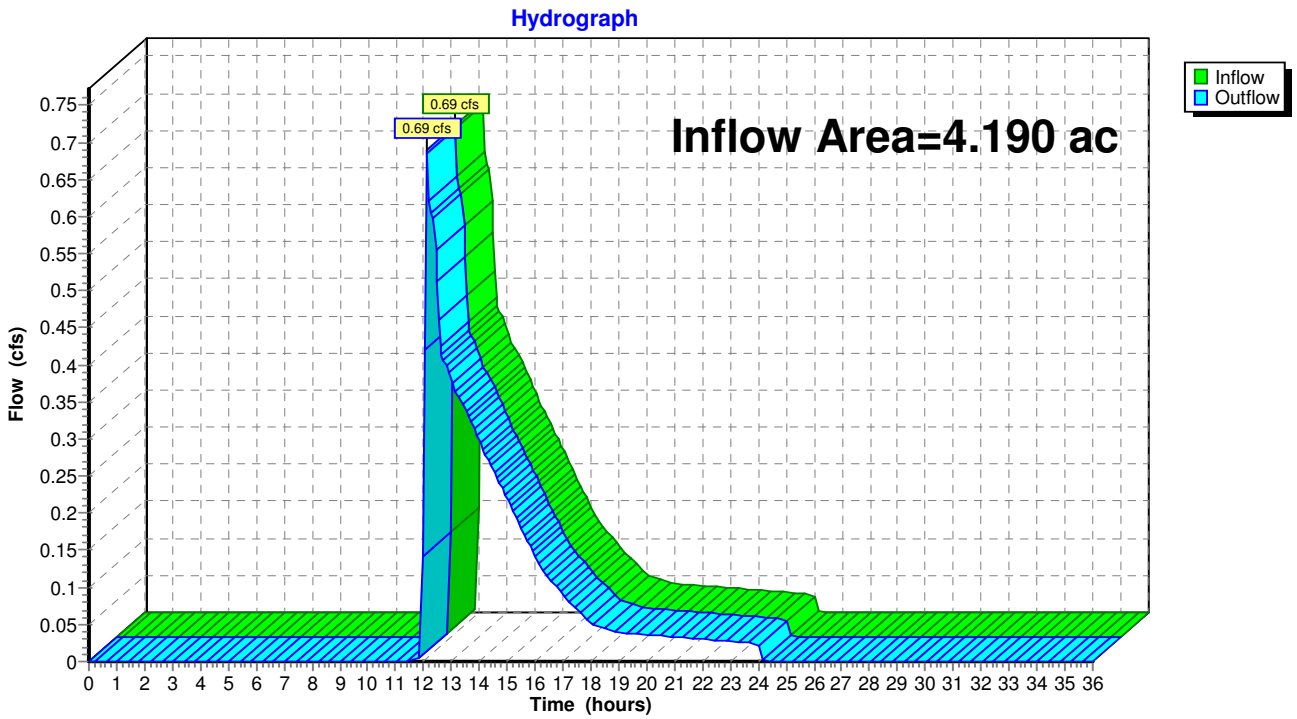
Summary for Reach DP-1: DP-1

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

Inflow Area = 4.190 ac, 40.85% Impervious, Inflow Depth = 0.39" for 2-year event
Inflow = 0.69 cfs @ 12.13 hrs, Volume= 0.138 af
Outflow = 0.69 cfs @ 12.13 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-1: DP-1



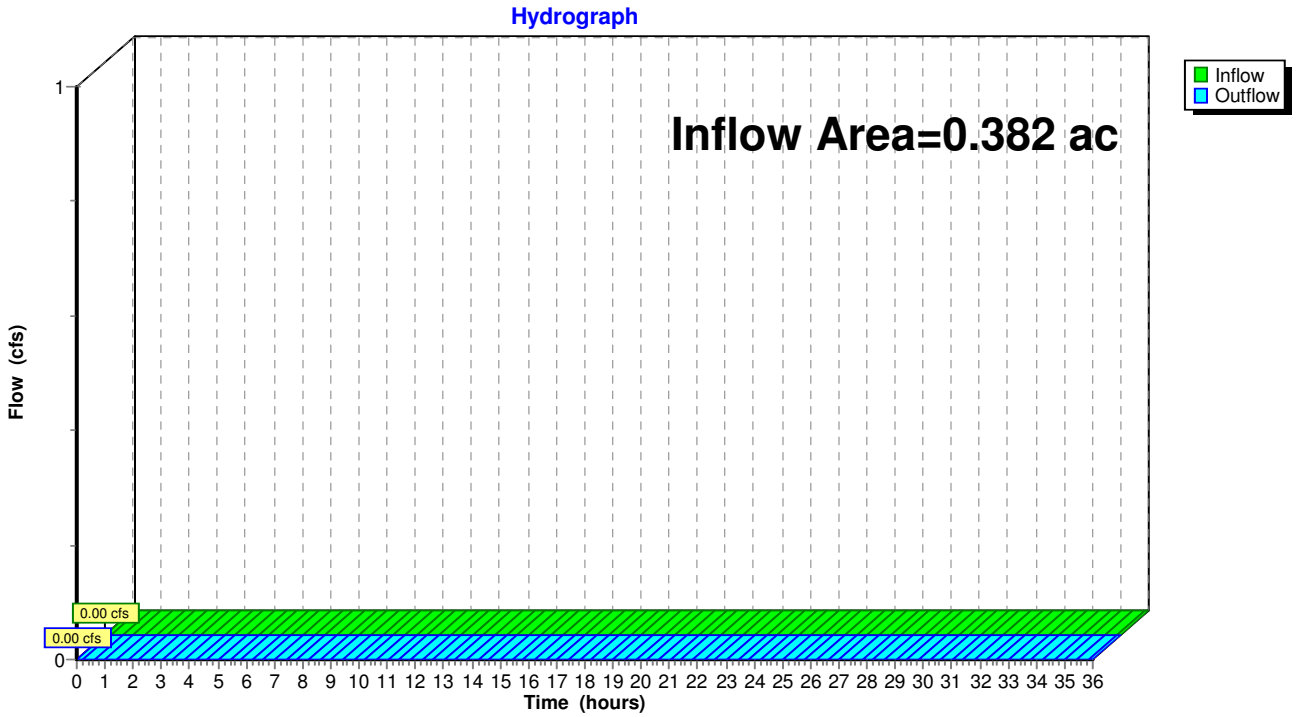
Summary for Reach DP-3: DP-3

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

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 0.00" for 2-year event
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 Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-3: DP-3



Summary for Pond 1P: Detention Basin

Inflow Area = 1.991 ac, 85.97% Impervious, Inflow Depth = 2.45" for 2-year event
Inflow = 5.40 cfs @ 12.09 hrs, Volume= 0.406 af
Outflow = 0.49 cfs @ 13.01 hrs, Volume= 0.406 af, Atten= 91%, Lag= 55.2 min
Discarded = 0.26 cfs @ 13.01 hrs, Volume= 0.350 af
Primary = 0.22 cfs @ 13.01 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 85.79' @ 13.01 hrs Surf.Area= 10,847 sf Storage= 8,131 cf

Plug-Flow detention time= 232.1 min calculated for 0.406 af (100% of inflow)
Center-of-Mass det. time= 231.8 min (1,024.5 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	51,122 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

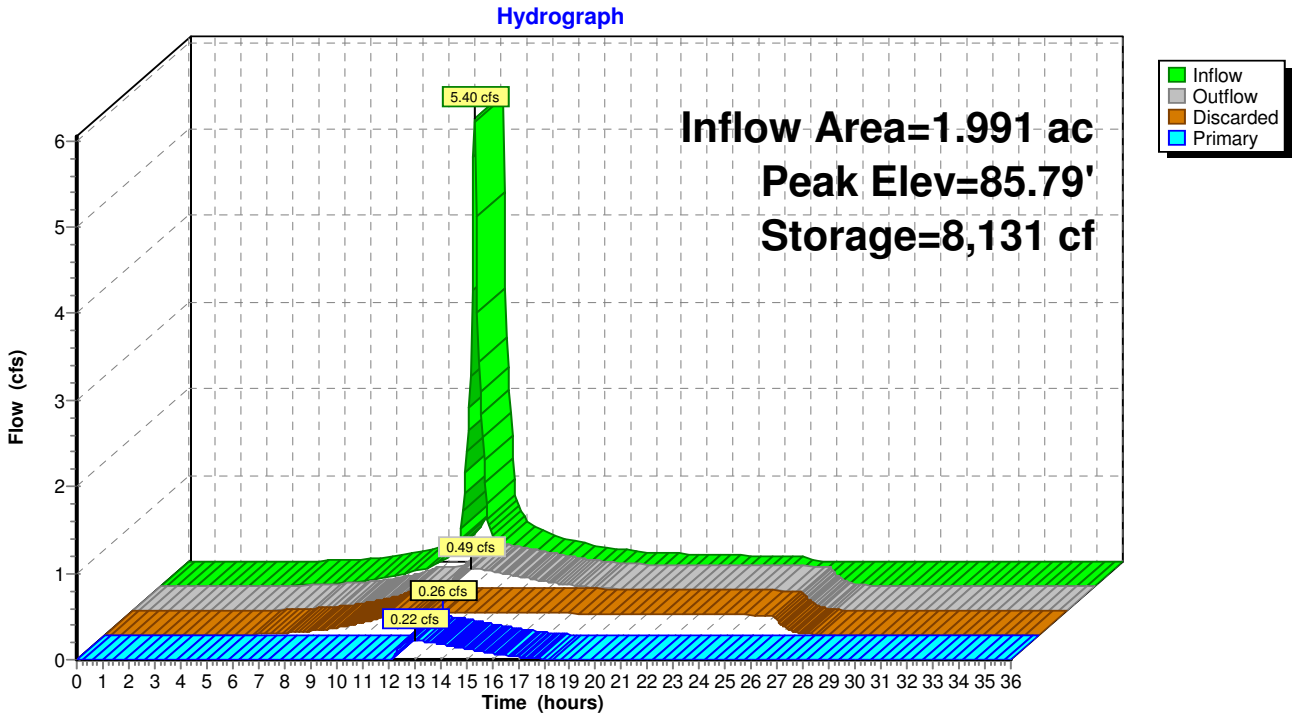
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	9,640	0	0
86.00	11,161	10,401	10,401
87.00	12,738	11,950	22,350
88.00	14,372	13,555	35,905
89.00	16,062	15,217	51,122

Device	Routing	Invert	Outlet Devices
#1	Discarded	85.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	86.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.26 cfs @ 13.01 hrs HW=85.79' (Free Discharge)
└─**1=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=0.22 cfs @ 13.01 hrs HW=85.79' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.22 cfs @ 1.85 fps)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Detention Basin



Summary for Pond 2P: Rain Garden

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 0.83" for 2-year event
Inflow = 0.33 cfs @ 12.10 hrs, Volume= 0.026 af
Outflow = 0.04 cfs @ 13.08 hrs, Volume= 0.026 af, Atten= 87%, Lag= 58.5 min
Discarded = 0.04 cfs @ 13.08 hrs, Volume= 0.026 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 64.25' @ 13.08 hrs Surf.Area= 1,615 sf Storage= 375 cf

Plug-Flow detention time= 85.8 min calculated for 0.026 af (100% of inflow)
Center-of-Mass det. time= 85.7 min (961.5 - 875.7)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,847 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

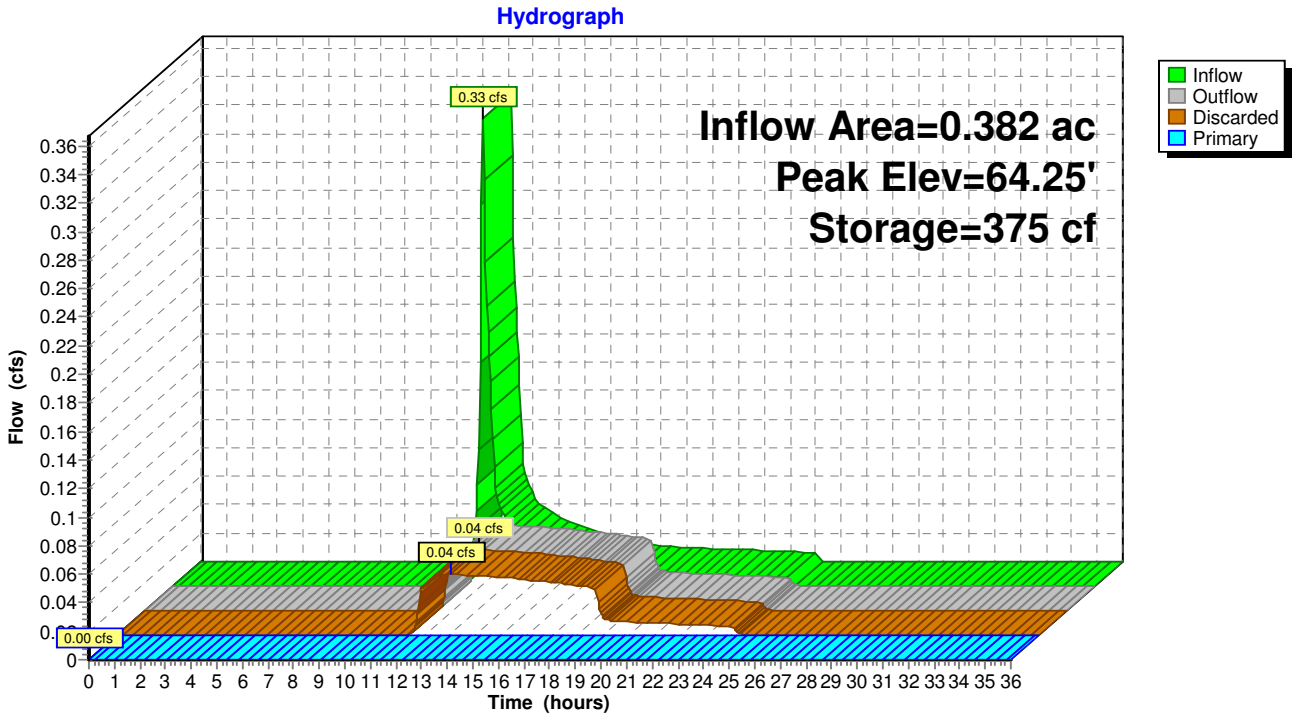
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,384	0	0
65.00	2,309	1,847	1,847

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	64.50'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 13.08 hrs HW=64.25' (Free Discharge)
└**1=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Rain Garden



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-2: PR-2 Runoff Area=44,310 sf 0.00% Impervious Runoff Depth=1.39"
Tc=0.0 min CN=65 Runoff=1.79 cfs 0.118 af

Subcatchment PR-3: PR-3 Runoff Area=16,655 sf 25.64% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=70 Runoff=0.75 cfs 0.056 af

Subcatchment PR1A: Detained Runoff Area=86,719 sf 85.97% Impervious Runoff Depth=3.81"
Tc=6.0 min CN=93 Runoff=8.20 cfs 0.631 af

Subcatchment PR1B: Un-Detained Runoff Area=95,780 sf 0.00% Impervious Runoff Depth=1.14"
Tc=6.0 min CN=61 Runoff=2.54 cfs 0.208 af

Reach DP-1: DP-1 Inflow=2.78 cfs 0.416 af
Outflow=2.78 cfs 0.416 af

Reach DP-3: DP-3 Inflow=0.07 cfs 0.006 af
Outflow=0.07 cfs 0.006 af

Pond 1P: Detention Basin Peak Elev=86.20' Storage=12,613 cf Inflow=8.20 cfs 0.631 af
Discarded=0.28 cfs 0.423 af Primary=0.74 cfs 0.208 af Outflow=1.02 cfs 0.631 af

Pond 2P: Rain Garden Peak Elev=64.56' Storage=916 cf Inflow=0.75 cfs 0.056 af
Discarded=0.06 cfs 0.049 af Primary=0.07 cfs 0.006 af Outflow=0.13 cfs 0.056 af

Total Runoff Area = 5.589 ac Runoff Volume = 1.013 af Average Runoff Depth = 2.18"
67.63% Pervious = 3.780 ac 32.37% Impervious = 1.809 ac

Summary for Subcatchment PR-2: PR-2

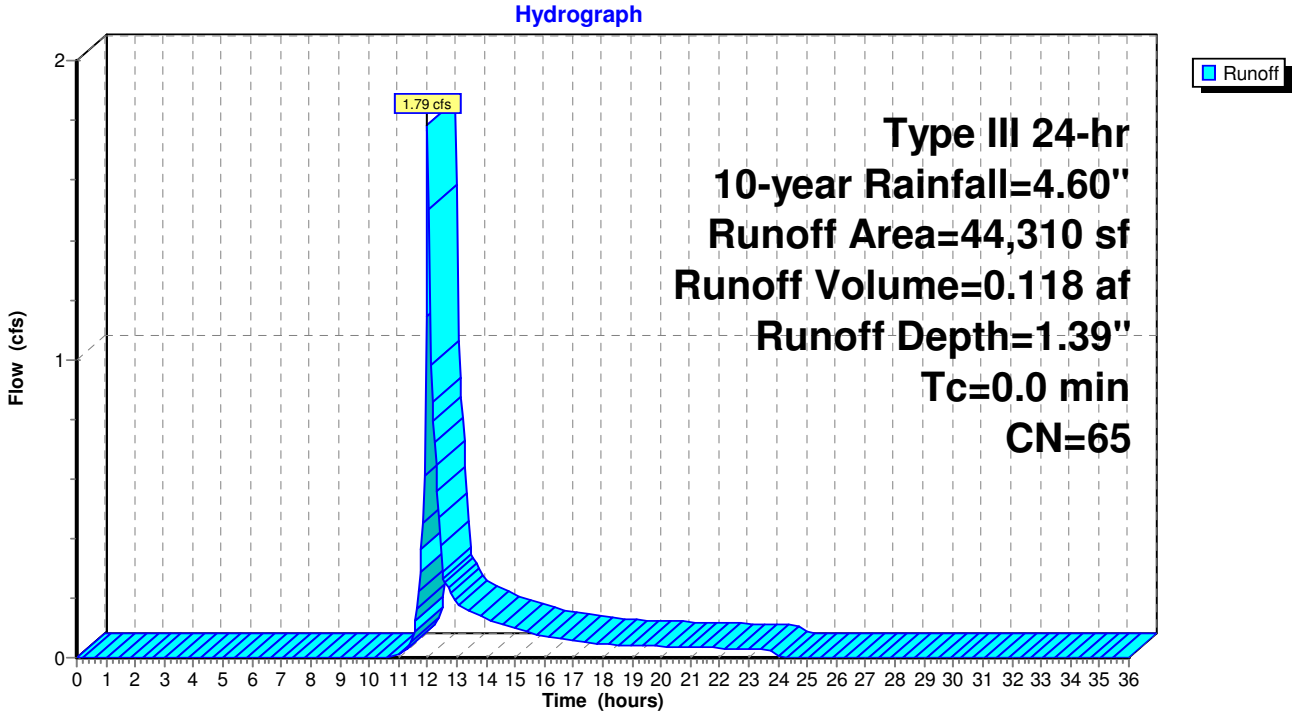
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.79 cfs @ 12.01 hrs, Volume= 0.118 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
11,793	61	>75% Grass cover, Good, HSG B
9,948	60	Woods, Fair, HSG B
22,569	69	50-75% Grass cover, Fair, HSG B
44,310	65	Weighted Average
44,310		100.00% Pervious Area

Subcatchment PR-2: PR-2



Summary for Subcatchment PR-3: PR-3

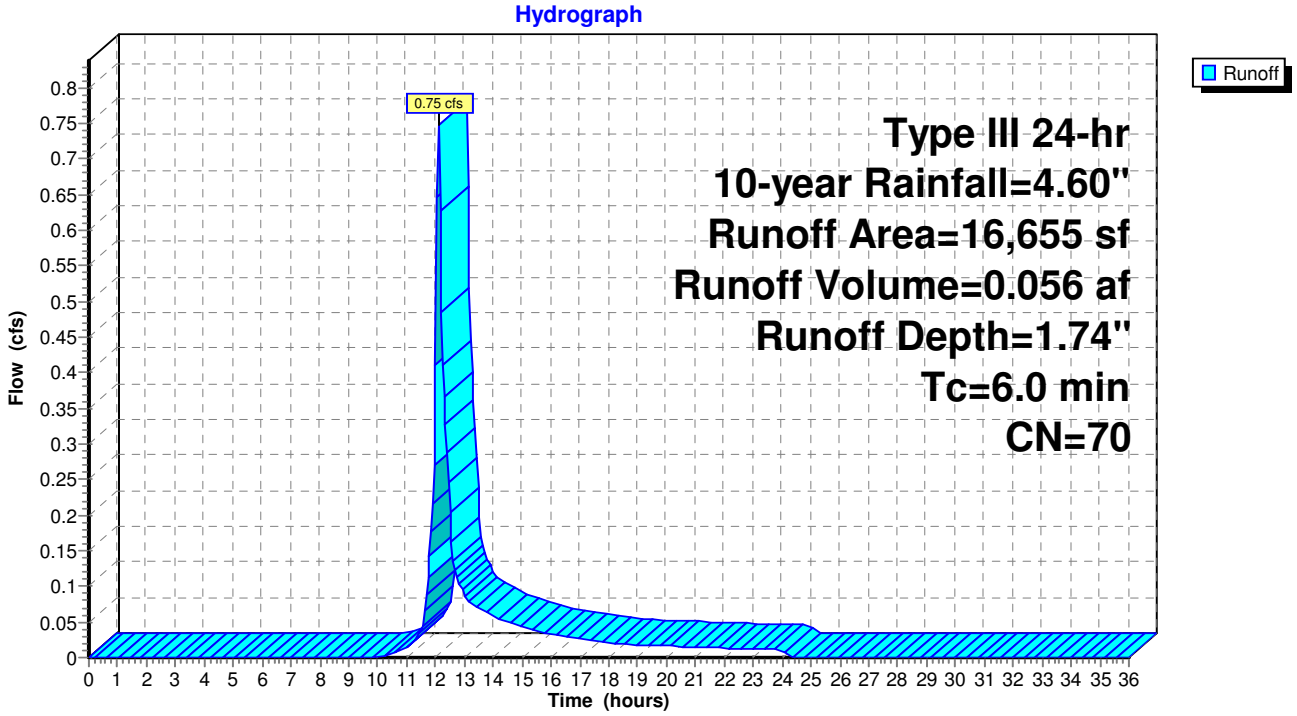
Runoff = 0.75 cfs @ 12.10 hrs, Volume= 0.056 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
4,270	98	Paved parking, HSG B
9,642	61	>75% Grass cover, Good, HSG B
2,743	60	Woods, Fair, HSG B
16,655	70	Weighted Average
12,385		74.36% Pervious Area
4,270		25.64% Impervious Area

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

Subcatchment PR-3: PR-3



Summary for Subcatchment PR1A: Detained

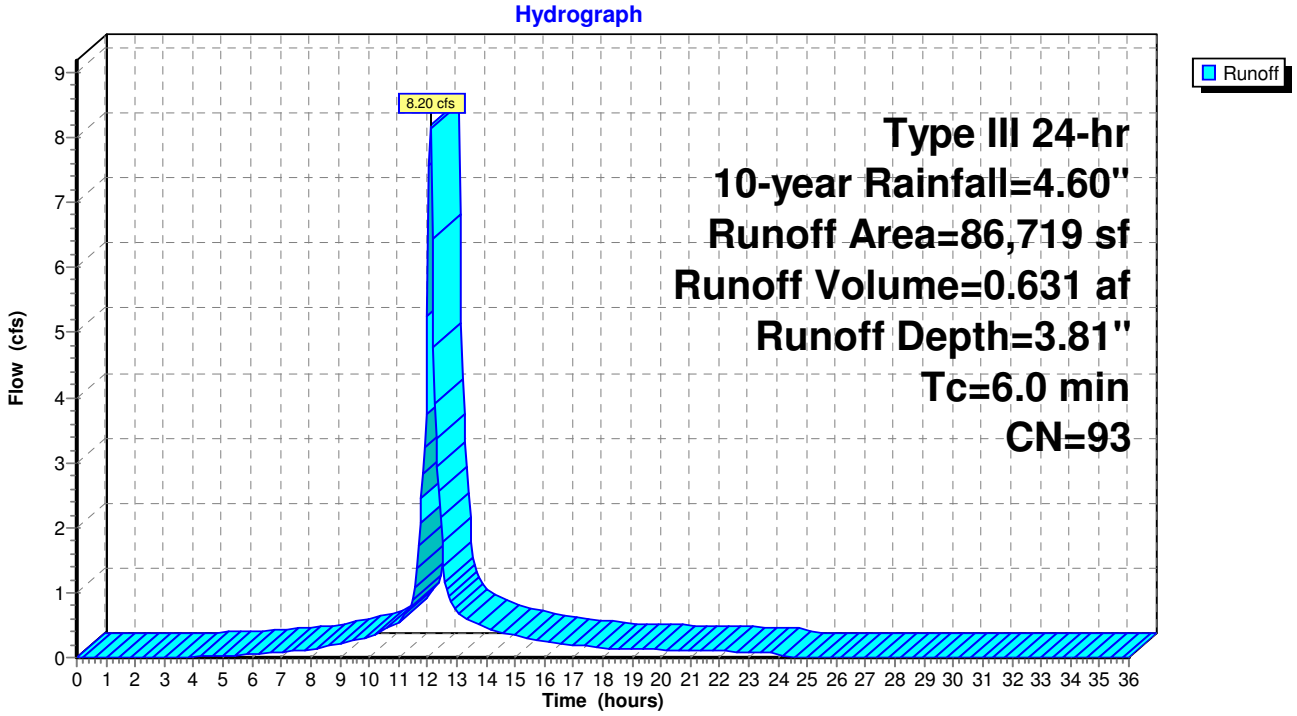
Runoff = 8.20 cfs @ 12.09 hrs, Volume= 0.631 af, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

	Area (sf)	CN	Description
*	58,487	98	Paved parking and roof, HSG B
	12,170	61	>75% Grass cover, Good, HSG B
*	16,062	98	Detention Basin
	86,719	93	Weighted Average
	12,170		14.03% Pervious Area
	74,549		85.97% Impervious Area

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

Subcatchment PR1A: Detained



Summary for Subcatchment PR1B: Un-Detained

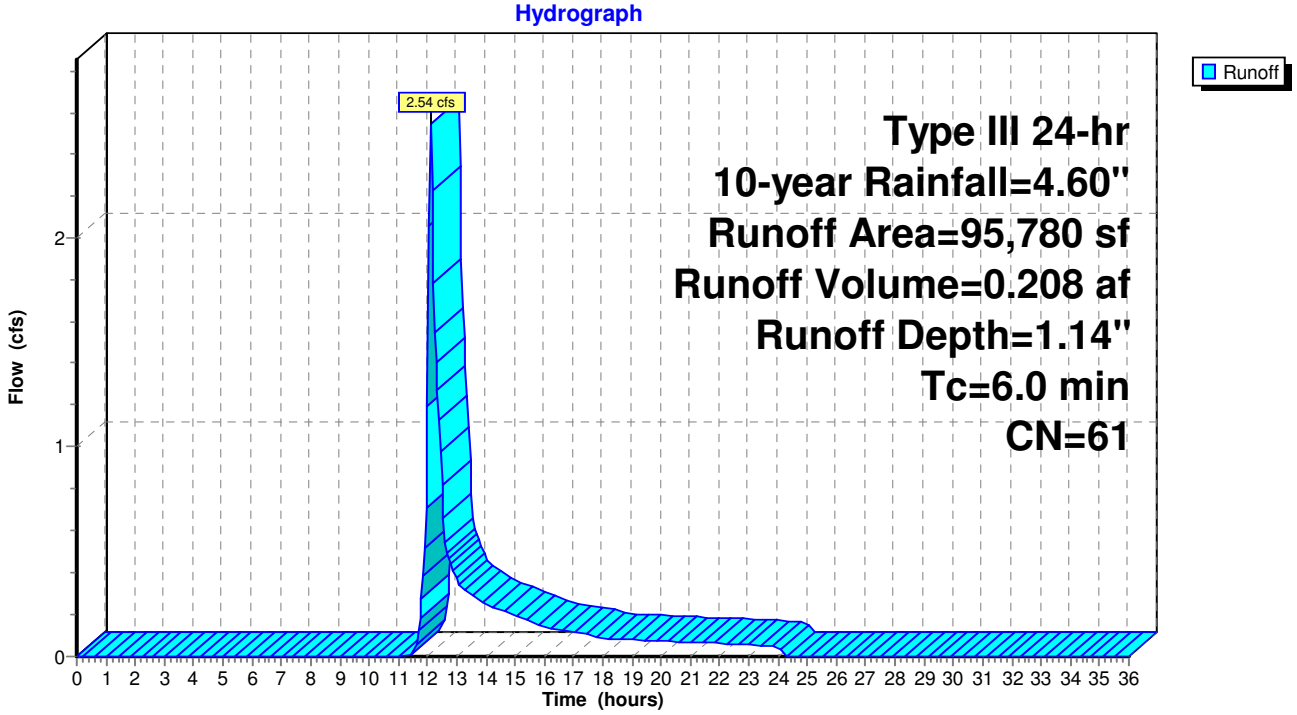
Runoff = 2.54 cfs @ 12.11 hrs, Volume= 0.208 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.60"

Area (sf)	CN	Description
23,560	60	Woods, Fair, HSG B
72,220	61	>75% Grass cover, Good, HSG B
95,780	61	Weighted Average
95,780		100.00% Pervious Area

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

Subcatchment PR1B: Un-Detained



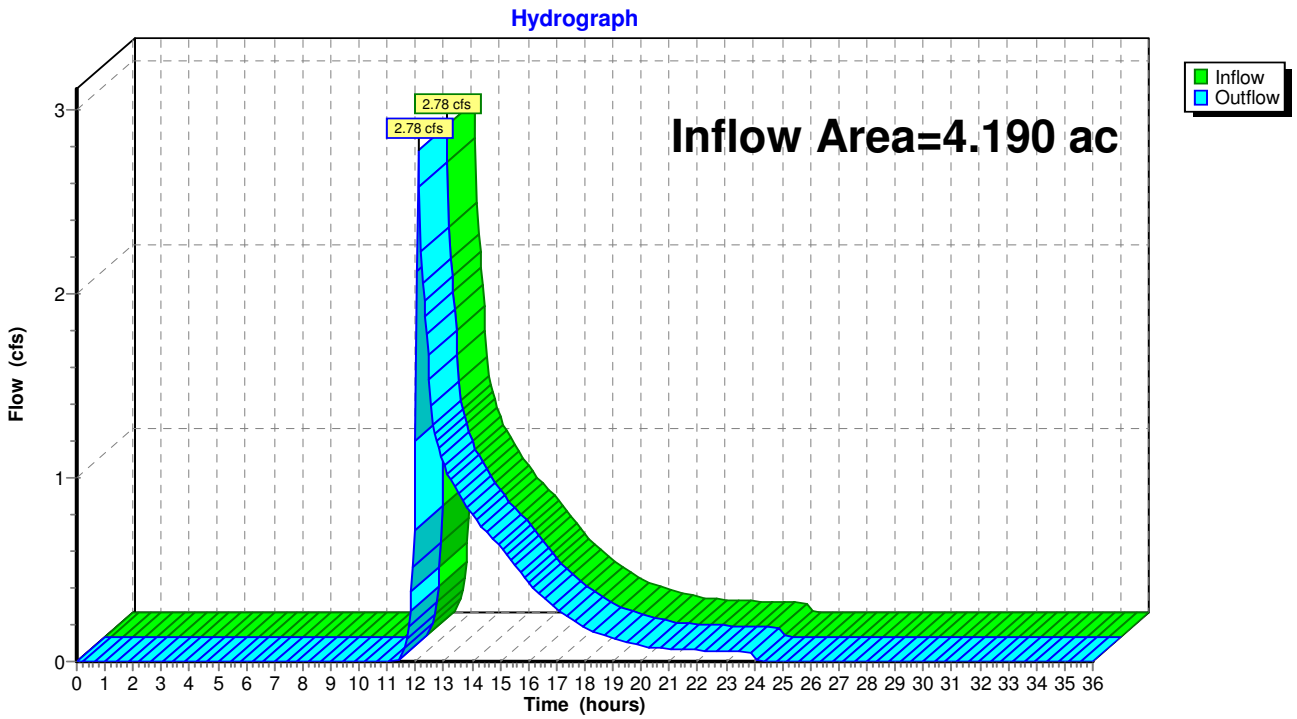
Summary for Reach DP-1: DP-1

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

Inflow Area = 4.190 ac, 40.85% Impervious, Inflow Depth = 1.19" for 10-year event
Inflow = 2.78 cfs @ 12.11 hrs, Volume= 0.416 af
Outflow = 2.78 cfs @ 12.11 hrs, Volume= 0.416 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-1: DP-1



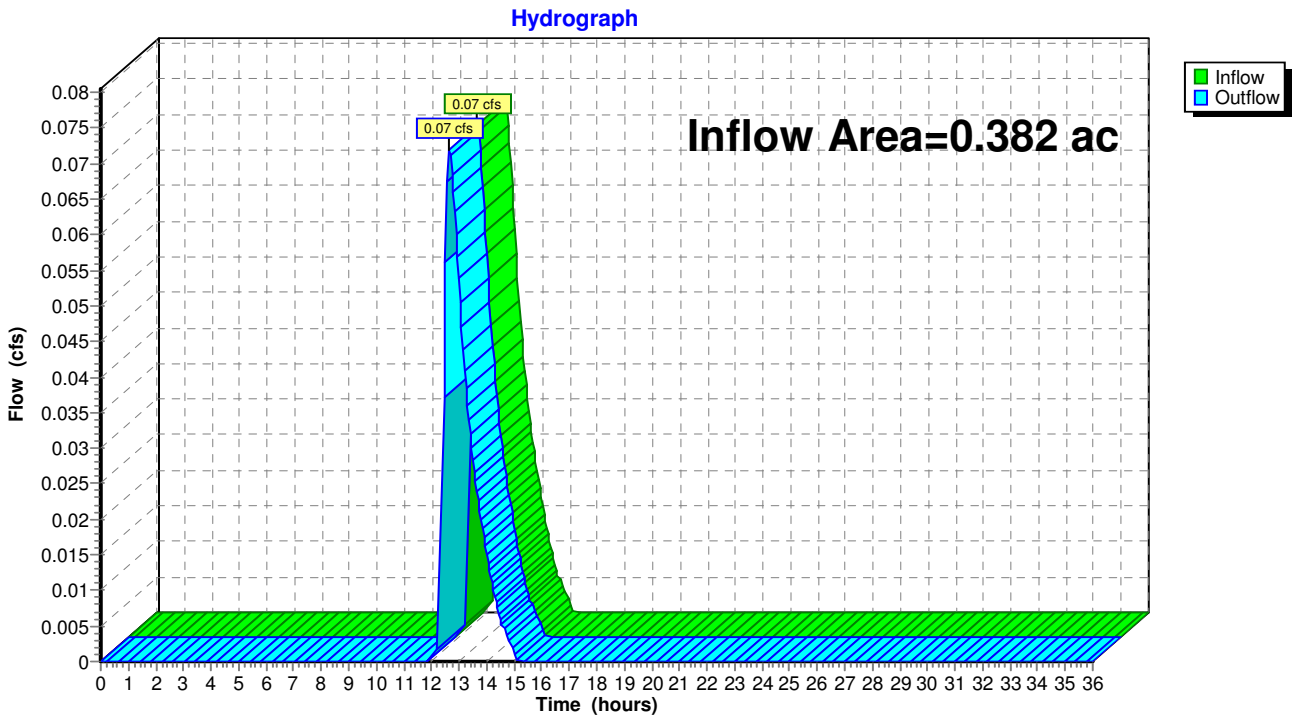
Summary for Reach DP-3: DP-3

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

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 0.19" for 10-year event
Inflow = 0.07 cfs @ 12.63 hrs, Volume= 0.006 af
Outflow = 0.07 cfs @ 12.63 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-3: DP-3



Summary for Pond 1P: Detention Basin

Inflow Area = 1.991 ac, 85.97% Impervious, Inflow Depth = 3.81" for 10-year event
Inflow = 8.20 cfs @ 12.09 hrs, Volume= 0.631 af
Outflow = 1.02 cfs @ 12.67 hrs, Volume= 0.631 af, Atten= 88%, Lag= 34.8 min
Discarded = 0.28 cfs @ 12.67 hrs, Volume= 0.423 af
Primary = 0.74 cfs @ 12.67 hrs, Volume= 0.208 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 86.20' @ 12.67 hrs Surf.Area= 11,469 sf Storage= 12,613 cf

Plug-Flow detention time= 219.7 min calculated for 0.630 af (100% of inflow)
Center-of-Mass det. time= 219.8 min (1,000.7 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	51,122 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

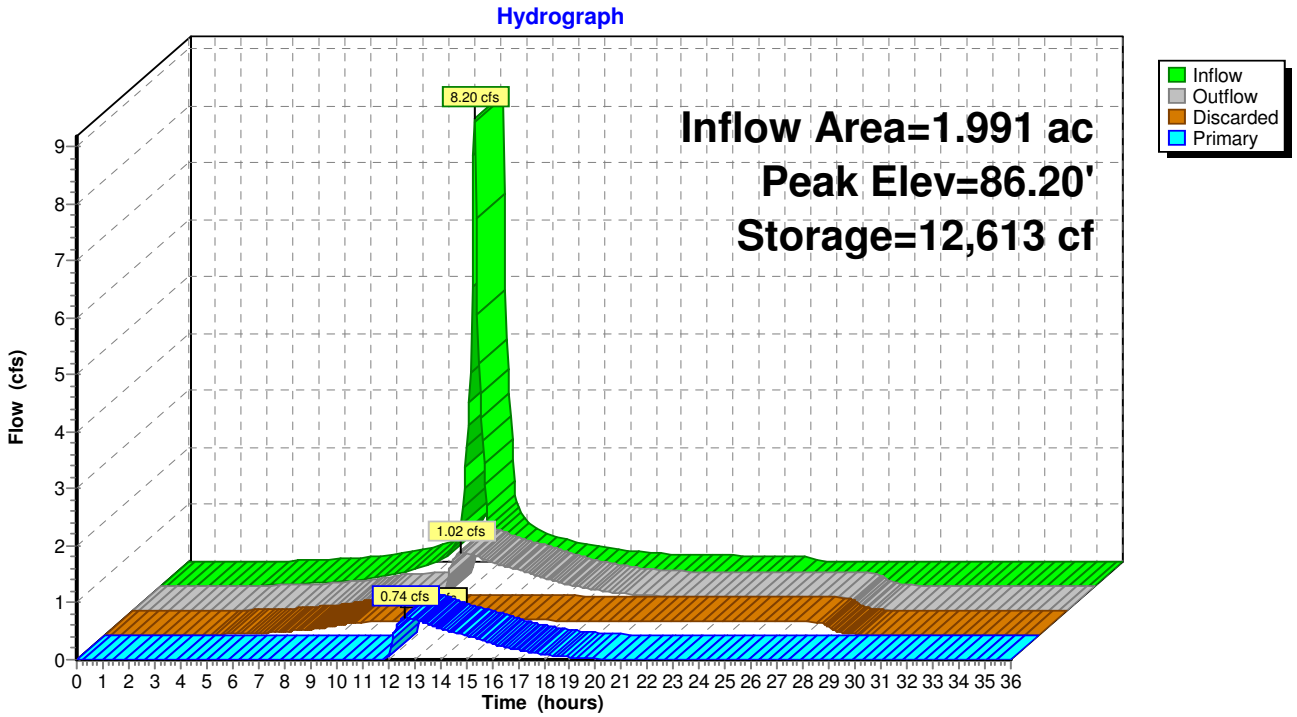
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	9,640	0	0
86.00	11,161	10,401	10,401
87.00	12,738	11,950	22,350
88.00	14,372	13,555	35,905
89.00	16,062	15,217	51,122

Device	Routing	Invert	Outlet Devices
#1	Discarded	85.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	86.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.28 cfs @ 12.67 hrs HW=86.20' (Free Discharge)
└─**1=Exfiltration** (Controls 0.28 cfs)

Primary OutFlow Max=0.74 cfs @ 12.67 hrs HW=86.20' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.63 cfs @ 3.21 fps)
└─**3=Orifice/Grate** (Orifice Controls 0.11 cfs @ 1.50 fps)

Pond 1P: Detention Basin



Summary for Pond 2P: Rain Garden

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 1.74" for 10-year event
Inflow = 0.75 cfs @ 12.10 hrs, Volume= 0.056 af
Outflow = 0.13 cfs @ 12.63 hrs, Volume= 0.056 af, Atten= 83%, Lag= 32.1 min
Discarded = 0.06 cfs @ 12.63 hrs, Volume= 0.049 af
Primary = 0.07 cfs @ 12.63 hrs, Volume= 0.006 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 64.56' @ 12.63 hrs Surf.Area= 1,900 sf Storage= 916 cf

Plug-Flow detention time= 160.8 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 160.6 min (1,012.8 - 852.3)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,847 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

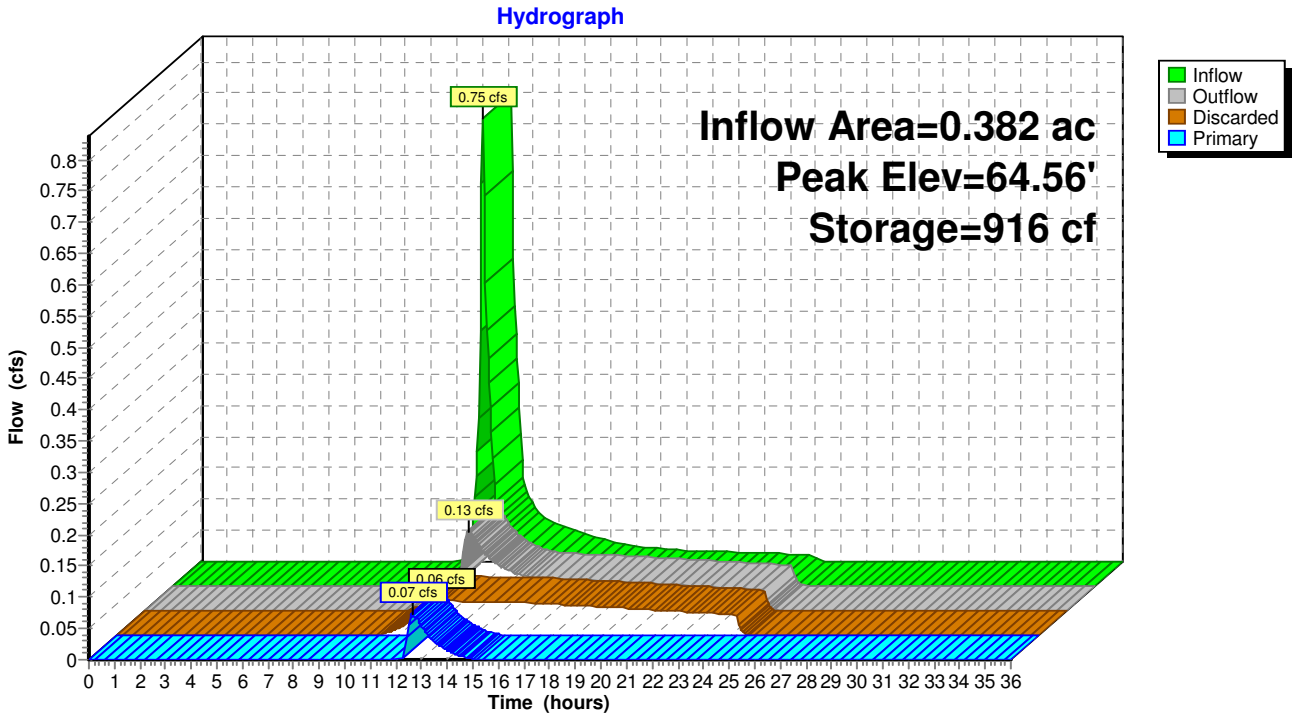
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,384	0	0
65.00	2,309	1,847	1,847

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	64.50'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.63 hrs HW=64.56' (Free Discharge)
└**1=Exfiltration** (Controls 0.06 cfs)

Primary OutFlow Max=0.07 cfs @ 12.63 hrs HW=64.56' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 0.07 cfs @ 0.79 fps)

Pond 2P: Rain Garden



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-2: PR-2 Runoff Area=44,310 sf 0.00% Impervious Runoff Depth=2.06"
Tc=0.0 min CN=65 Runoff=2.75 cfs 0.175 af

Subcatchment PR-3: PR-3 Runoff Area=16,655 sf 25.64% Impervious Runoff Depth=2.49"
Tc=6.0 min CN=70 Runoff=1.09 cfs 0.079 af

Subcatchment PR1A: Detained Runoff Area=86,719 sf 85.97% Impervious Runoff Depth=4.79"
Tc=6.0 min CN=93 Runoff=10.18 cfs 0.794 af

Subcatchment PR1B: Un-Detained Runoff Area=95,780 sf 0.00% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=61 Runoff=4.16 cfs 0.319 af

Reach DP-1: DP-1 Inflow=4.67 cfs 0.653 af
Outflow=4.67 cfs 0.653 af

Reach DP-3: DP-3 Inflow=0.33 cfs 0.023 af
Outflow=0.33 cfs 0.023 af

Pond 1P: Detention Basin Peak Elev=86.47' Storage=15,842 cf Inflow=10.18 cfs 0.794 af
Discarded=0.30 cfs 0.461 af Primary=1.25 cfs 0.333 af Outflow=1.55 cfs 0.794 af

Pond 2P: Rain Garden Peak Elev=64.66' Storage=1,113 cf Inflow=1.09 cfs 0.079 af
Discarded=0.06 cfs 0.057 af Primary=0.33 cfs 0.023 af Outflow=0.39 cfs 0.079 af

Total Runoff Area = 5.589 ac Runoff Volume = 1.368 af Average Runoff Depth = 2.94"
67.63% Pervious = 3.780 ac 32.37% Impervious = 1.809 ac

Summary for Subcatchment PR-2: PR-2

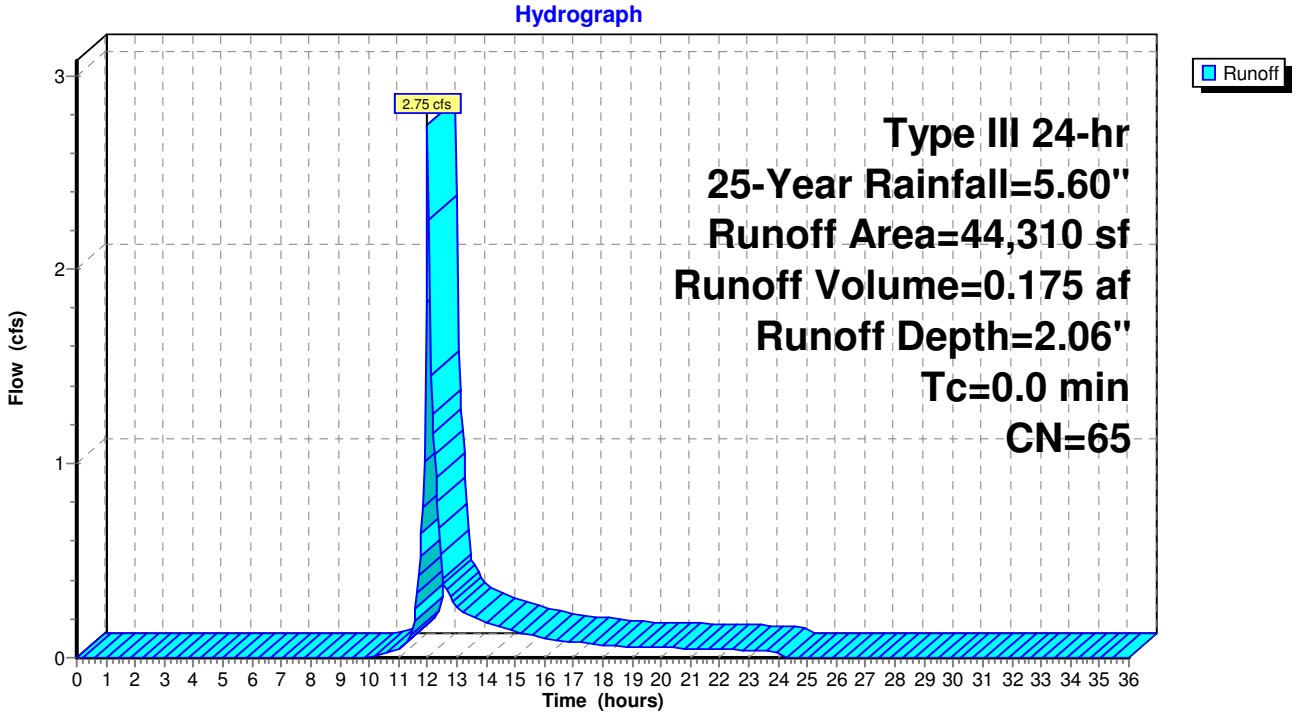
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.75 cfs @ 12.01 hrs, Volume= 0.175 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
11,793	61	>75% Grass cover, Good, HSG B
9,948	60	Woods, Fair, HSG B
22,569	69	50-75% Grass cover, Fair, HSG B
44,310	65	Weighted Average
44,310		100.00% Pervious Area

Subcatchment PR-2: PR-2



Summary for Subcatchment PR-3: PR-3

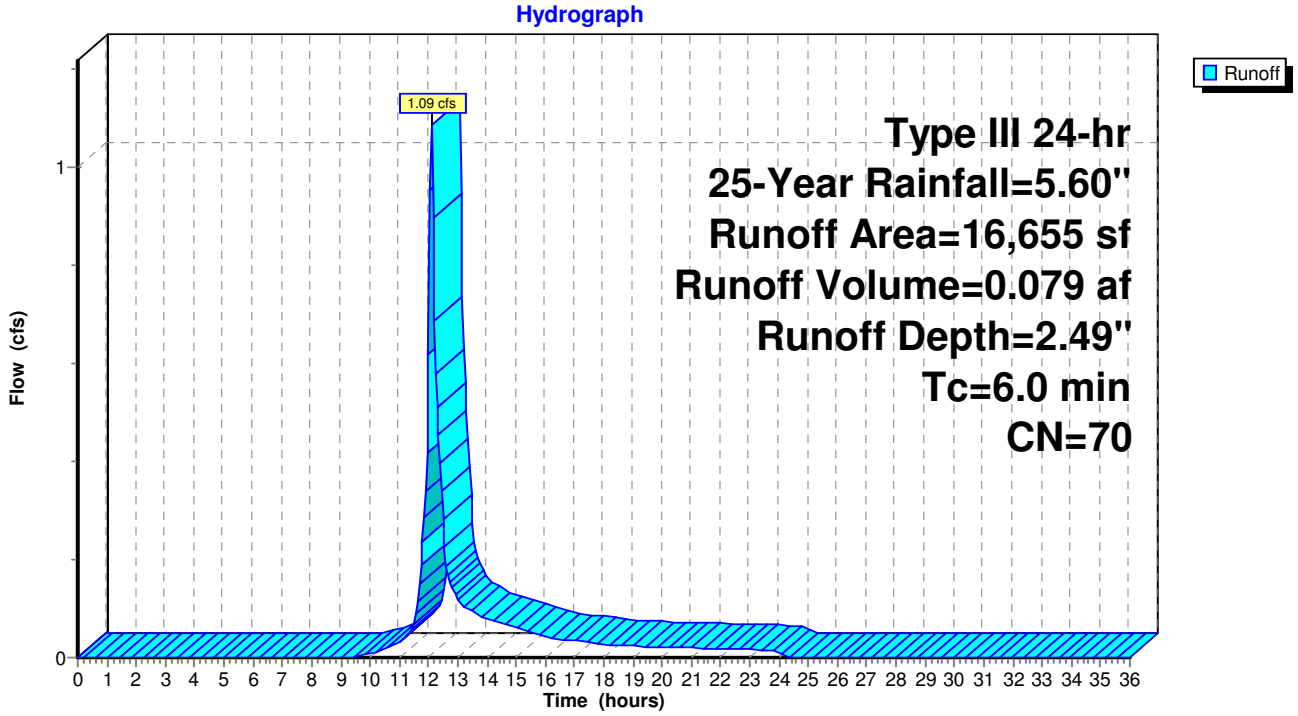
Runoff = 1.09 cfs @ 12.10 hrs, Volume= 0.079 af, Depth= 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
4,270	98	Paved parking, HSG B
9,642	61	>75% Grass cover, Good, HSG B
2,743	60	Woods, Fair, HSG B
16,655	70	Weighted Average
12,385		74.36% Pervious Area
4,270		25.64% Impervious Area

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

Subcatchment PR-3: PR-3



Summary for Subcatchment PR1A: Detained

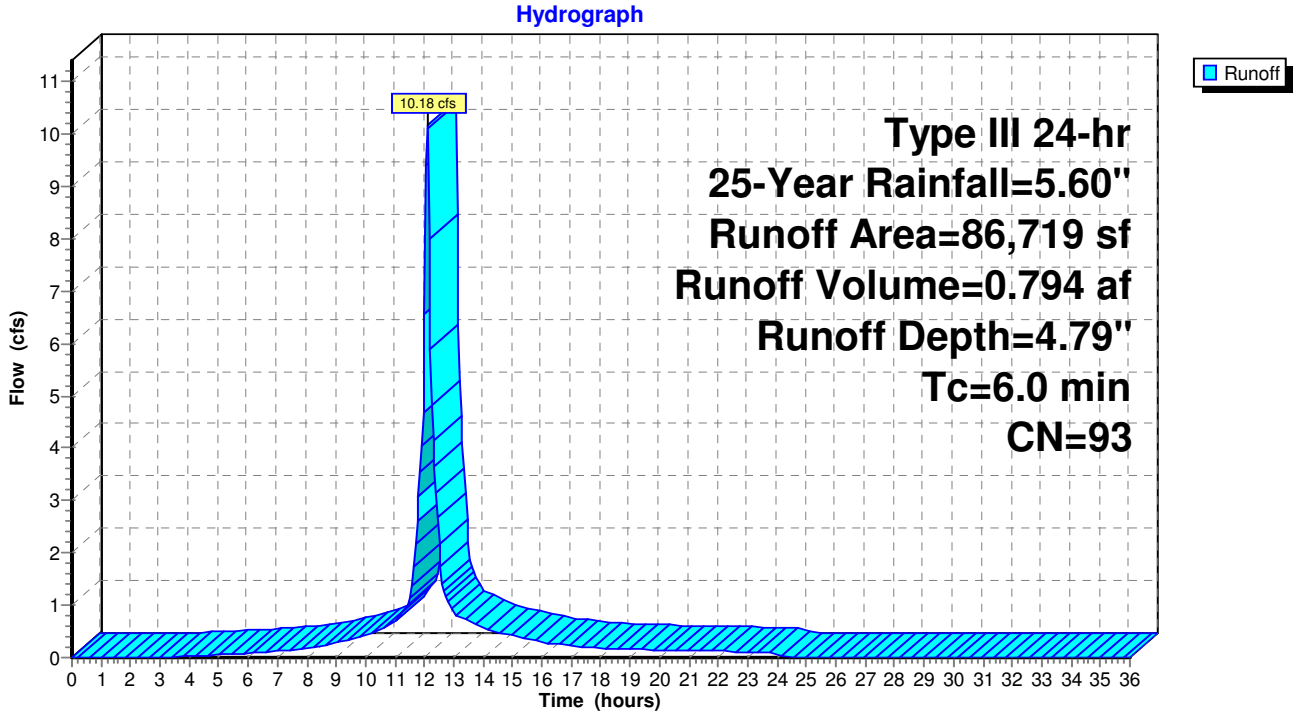
Runoff = 10.18 cfs @ 12.09 hrs, Volume= 0.794 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
*	58,487	98	Paved parking and roof, HSG B
	12,170	61	>75% Grass cover, Good, HSG B
*	16,062	98	Detention Basin
	86,719	93	Weighted Average
	12,170		14.03% Pervious Area
	74,549		85.97% Impervious Area

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

Subcatchment PR1A: Detained



Summary for Subcatchment PR1B: Un-Detained

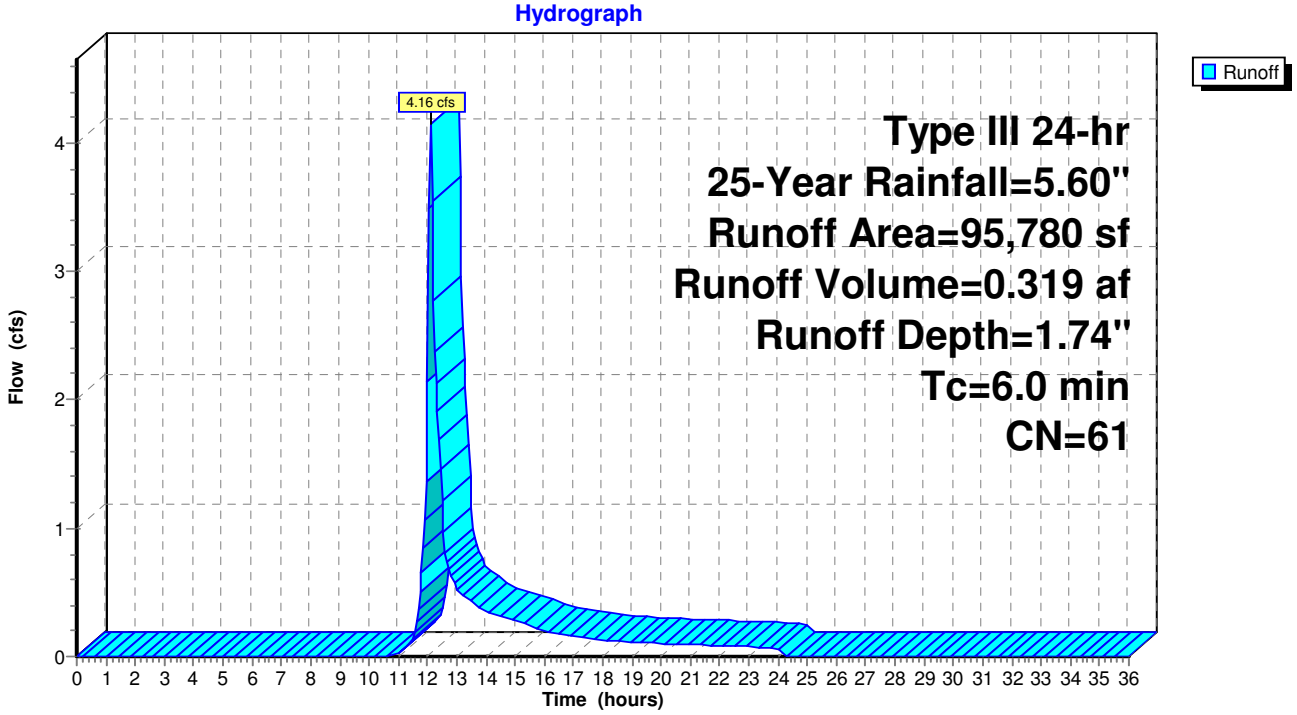
Runoff = 4.16 cfs @ 12.10 hrs, Volume= 0.319 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
23,560	60	Woods, Fair, HSG B
72,220	61	>75% Grass cover, Good, HSG B
95,780	61	Weighted Average
95,780		100.00% Pervious Area

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

Subcatchment PR1B: Un-Detained



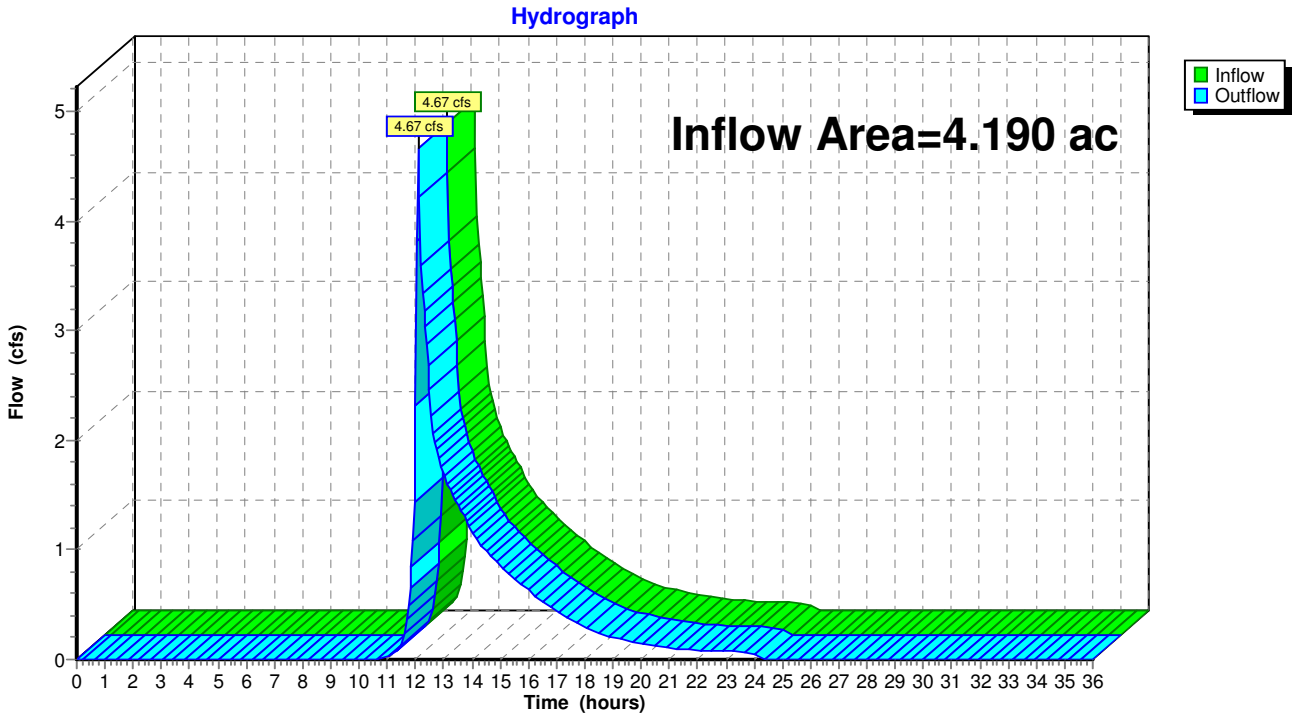
Summary for Reach DP-1: DP-1

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

Inflow Area = 4.190 ac, 40.85% Impervious, Inflow Depth = 1.87" for 25-Year event
Inflow = 4.67 cfs @ 12.11 hrs, Volume= 0.653 af
Outflow = 4.67 cfs @ 12.11 hrs, Volume= 0.653 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-1: DP-1



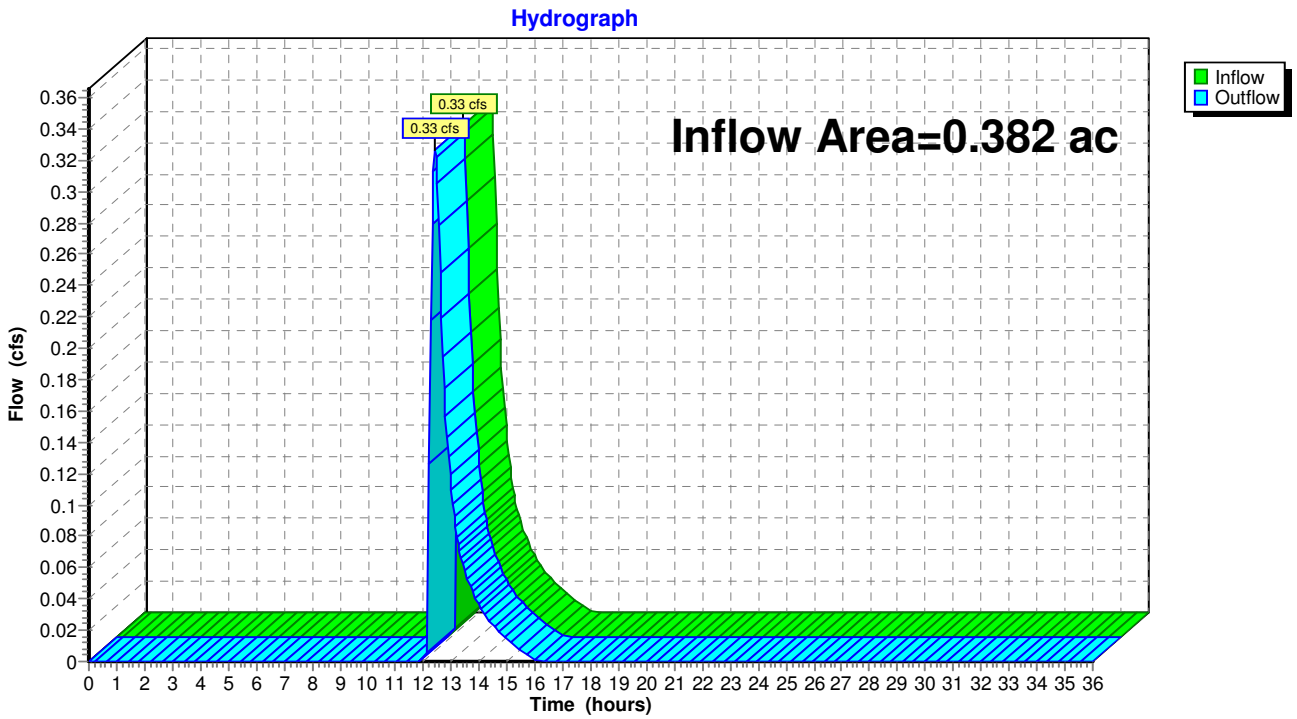
Summary for Reach DP-3: DP-3

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

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 0.71" for 25-Year event
Inflow = 0.33 cfs @ 12.41 hrs, Volume= 0.023 af
Outflow = 0.33 cfs @ 12.41 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-3: DP-3



Summary for Pond 1P: Detention Basin

Inflow Area = 1.991 ac, 85.97% Impervious, Inflow Depth = 4.79" for 25-Year event
Inflow = 10.18 cfs @ 12.09 hrs, Volume= 0.794 af
Outflow = 1.55 cfs @ 12.58 hrs, Volume= 0.794 af, Atten= 85%, Lag= 29.6 min
Discarded = 0.30 cfs @ 12.58 hrs, Volume= 0.461 af
Primary = 1.25 cfs @ 12.58 hrs, Volume= 0.333 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 86.47' @ 12.58 hrs Surf.Area= 11,905 sf Storage= 15,842 cf

Plug-Flow detention time= 208.9 min calculated for 0.793 af (100% of inflow)
Center-of-Mass det. time= 209.2 min (984.1 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	51,122 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

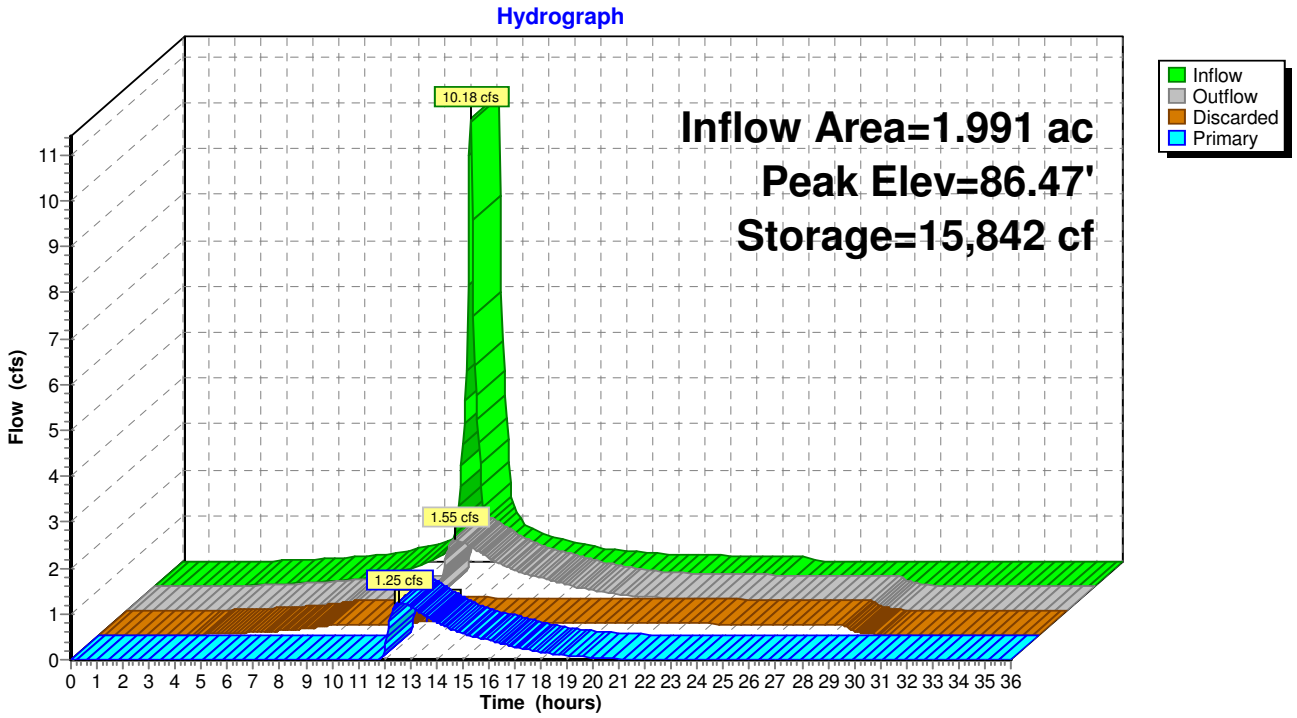
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	9,640	0	0
86.00	11,161	10,401	10,401
87.00	12,738	11,950	22,350
88.00	14,372	13,555	35,905
89.00	16,062	15,217	51,122

Device	Routing	Invert	Outlet Devices
#1	Discarded	85.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	86.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.30 cfs @ 12.58 hrs HW=86.47' (Free Discharge)
└─**1=Exfiltration** (Controls 0.30 cfs)

Primary OutFlow Max=1.25 cfs @ 12.58 hrs HW=86.47' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.80 cfs @ 4.09 fps)
└─**3=Orifice/Grate** (Orifice Controls 0.45 cfs @ 2.34 fps)

Pond 1P: Detention Basin



Summary for Pond 2P: Rain Garden

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 2.49" for 25-Year event
Inflow = 1.09 cfs @ 12.10 hrs, Volume= 0.079 af
Outflow = 0.39 cfs @ 12.41 hrs, Volume= 0.079 af, Atten= 64%, Lag= 19.0 min
Discarded = 0.06 cfs @ 12.41 hrs, Volume= 0.057 af
Primary = 0.33 cfs @ 12.41 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 64.66' @ 12.41 hrs Surf.Area= 1,994 sf Storage= 1,113 cf

Plug-Flow detention time= 136.3 min calculated for 0.079 af (100% of inflow)
Center-of-Mass det. time= 136.2 min (977.9 - 841.7)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,847 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

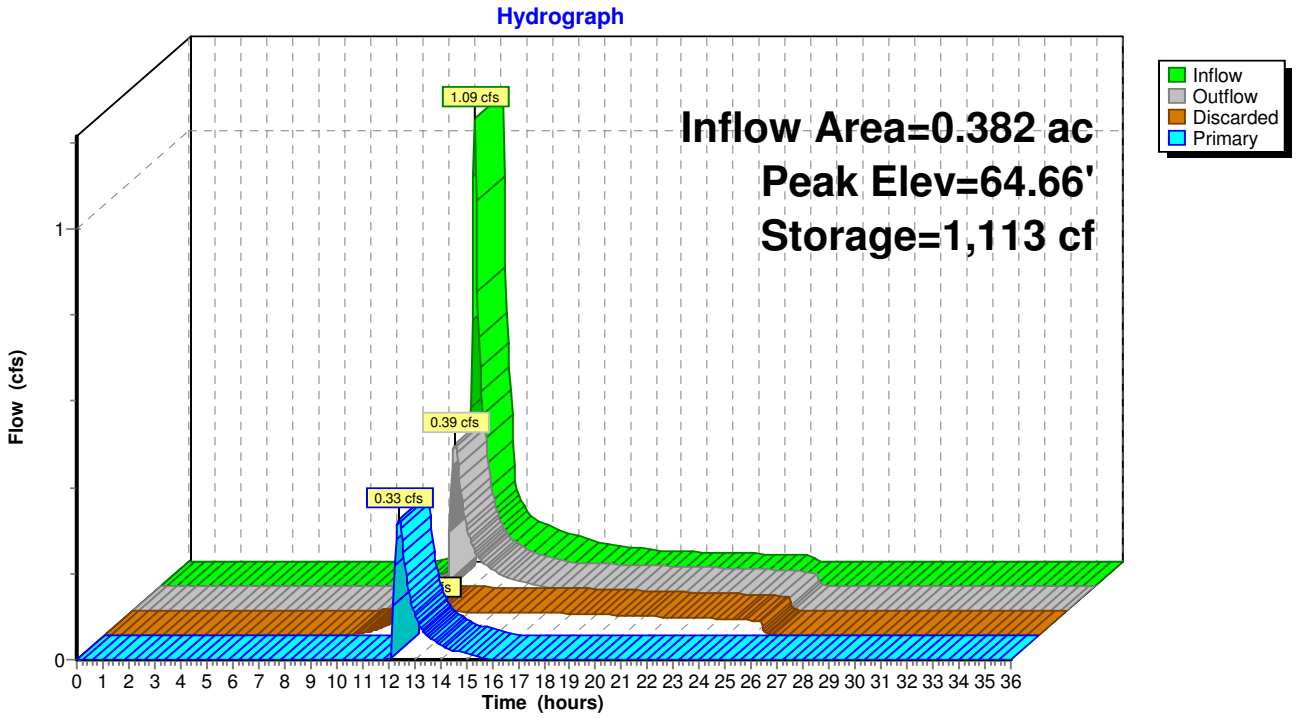
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,384	0	0
65.00	2,309	1,847	1,847

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	64.50'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.41 hrs HW=64.66' (Free Discharge)
└**1=Exfiltration** (Controls 0.06 cfs)

Primary OutFlow Max=0.32 cfs @ 12.41 hrs HW=64.66' (Free Discharge)
└**2=Orifice/Grate** (Weir Controls 0.32 cfs @ 1.30 fps)

Pond 2P: Rain Garden



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-2: PR-2 Runoff Area=44,310 sf 0.00% Impervious Runoff Depth=2.95"
Tc=0.0 min CN=65 Runoff=4.00 cfs 0.250 af

Subcatchment PR-3: PR-3 Runoff Area=16,655 sf 25.64% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=70 Runoff=1.52 cfs 0.110 af

Subcatchment PR1A: Detained Runoff Area=86,719 sf 85.97% Impervious Runoff Depth=5.97"
Tc=6.0 min CN=93 Runoff=12.54 cfs 0.991 af

Subcatchment PR1B: Un-Detained Runoff Area=95,780 sf 0.00% Impervious Runoff Depth=2.56"
Tc=6.0 min CN=61 Runoff=6.30 cfs 0.469 af

Reach DP-1: DP-1 Inflow=7.26 cfs 0.961 af
Outflow=7.26 cfs 0.961 af

Reach DP-3: DP-3 Inflow=0.53 cfs 0.046 af
Outflow=0.53 cfs 0.046 af

Pond 1P: Detention Basin Peak Elev=86.81' Storage=19,905 cf Inflow=12.54 cfs 0.991 af
Discarded=0.31 cfs 0.499 af Primary=1.68 cfs 0.492 af Outflow=1.99 cfs 0.991 af

Pond 2P: Rain Garden Peak Elev=64.81' Storage=1,423 cf Inflow=1.52 cfs 0.110 af
Discarded=0.07 cfs 0.064 af Primary=0.53 cfs 0.046 af Outflow=0.59 cfs 0.110 af

Total Runoff Area = 5.589 ac Runoff Volume = 1.820 af Average Runoff Depth = 3.91"
67.63% Pervious = 3.780 ac 32.37% Impervious = 1.809 ac

Summary for Subcatchment PR-2: PR-2

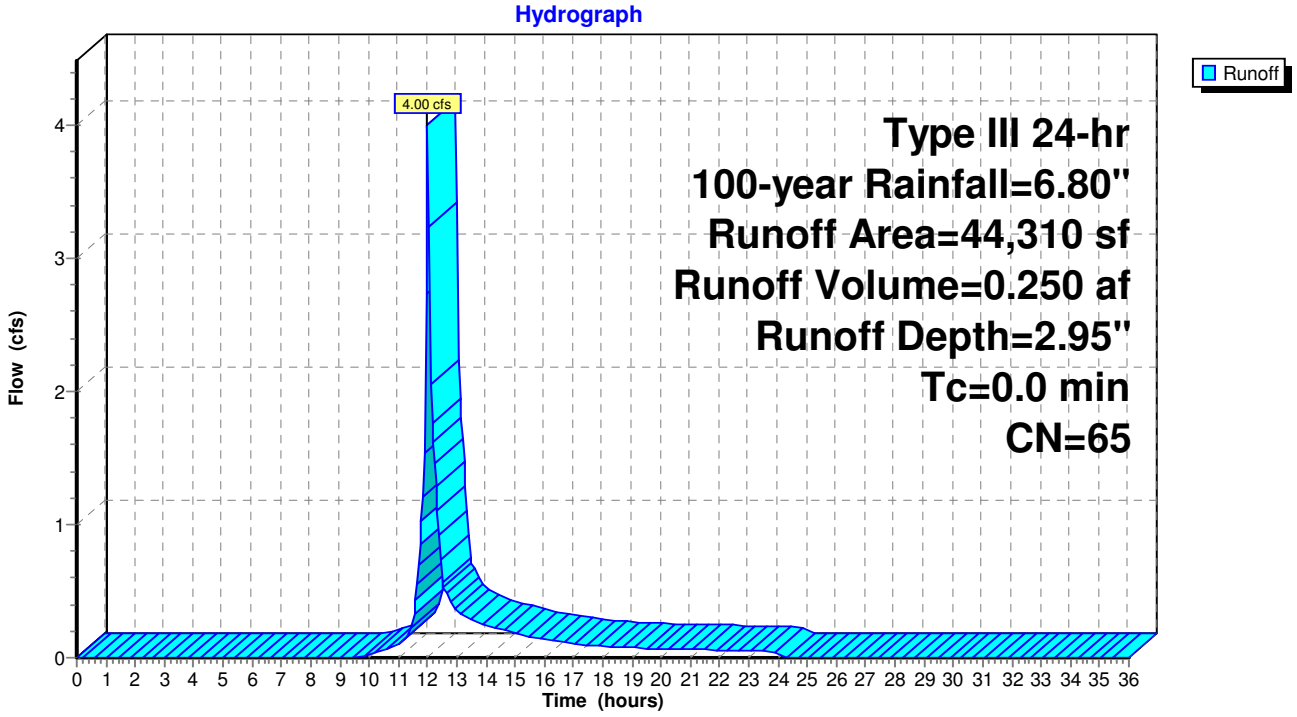
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 4.00 cfs @ 12.01 hrs, Volume= 0.250 af, Depth= 2.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
11,793	61	>75% Grass cover, Good, HSG B
9,948	60	Woods, Fair, HSG B
22,569	69	50-75% Grass cover, Fair, HSG B
44,310	65	Weighted Average
44,310		100.00% Pervious Area

Subcatchment PR-2: PR-2



Summary for Subcatchment PR-3: PR-3

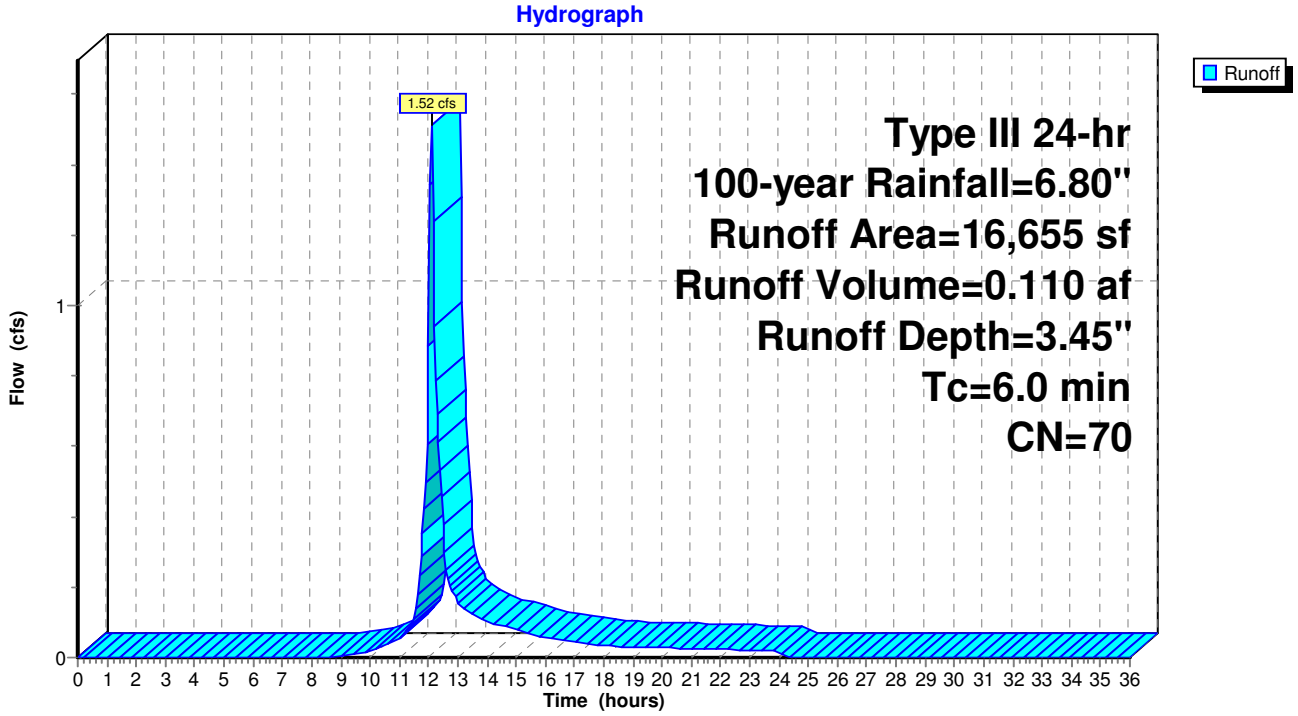
Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.110 af, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
4,270	98	Paved parking, HSG B
9,642	61	>75% Grass cover, Good, HSG B
2,743	60	Woods, Fair, HSG B
16,655	70	Weighted Average
12,385		74.36% Pervious Area
4,270		25.64% Impervious Area

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

Subcatchment PR-3: PR-3



Summary for Subcatchment PR1A: Detained

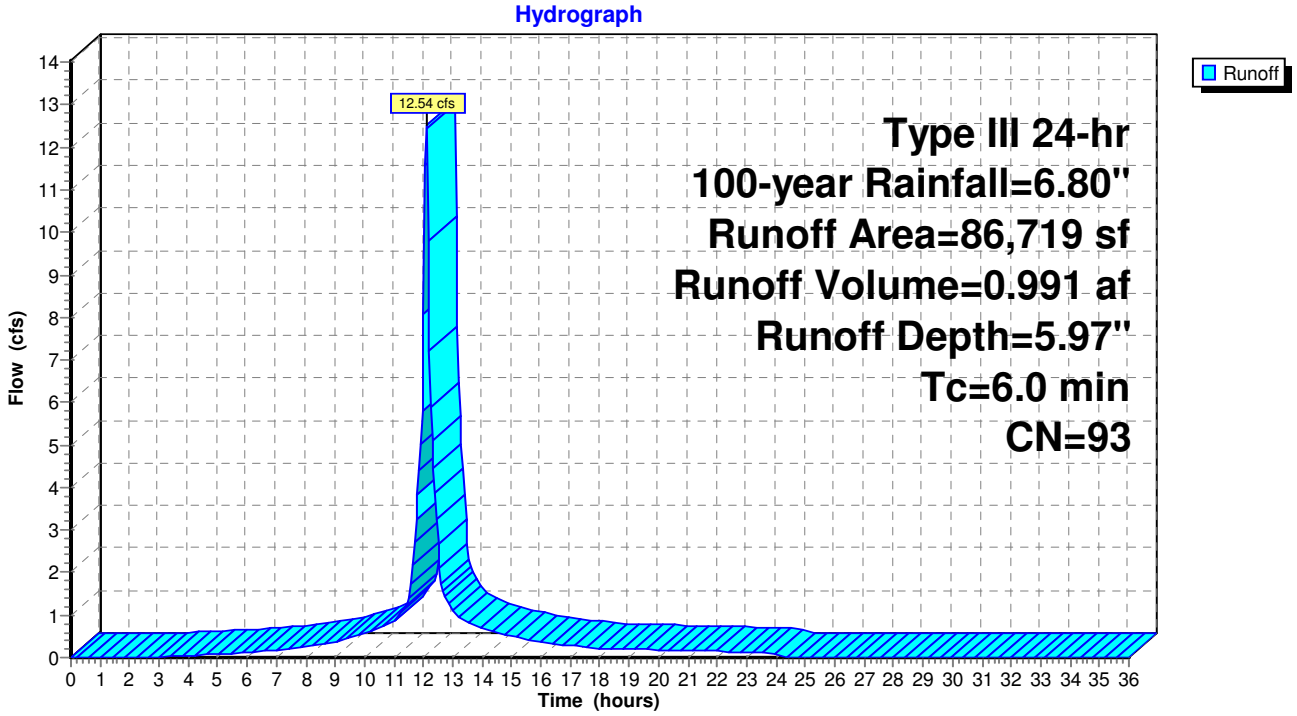
Runoff = 12.54 cfs @ 12.09 hrs, Volume= 0.991 af, Depth= 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

	Area (sf)	CN	Description
*	58,487	98	Paved parking and roof, HSG B
	12,170	61	>75% Grass cover, Good, HSG B
*	16,062	98	Detention Basin
	86,719	93	Weighted Average
	12,170		14.03% Pervious Area
	74,549		85.97% Impervious Area

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

Subcatchment PR1A: Detained



Summary for Subcatchment PR1B: Un-Detained

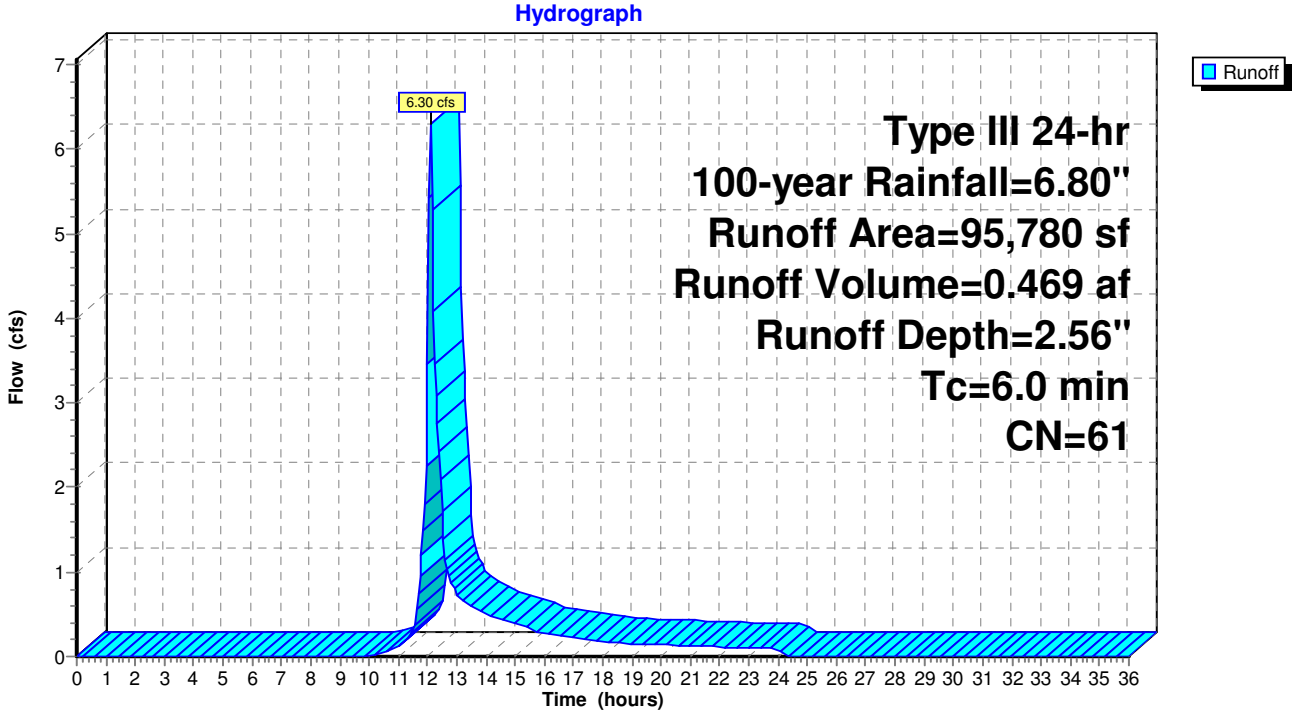
Runoff = 6.30 cfs @ 12.10 hrs, Volume= 0.469 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=6.80"

Area (sf)	CN	Description
23,560	60	Woods, Fair, HSG B
72,220	61	>75% Grass cover, Good, HSG B
95,780	61	Weighted Average
95,780		100.00% Pervious Area

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

Subcatchment PR1B: Un-Detained



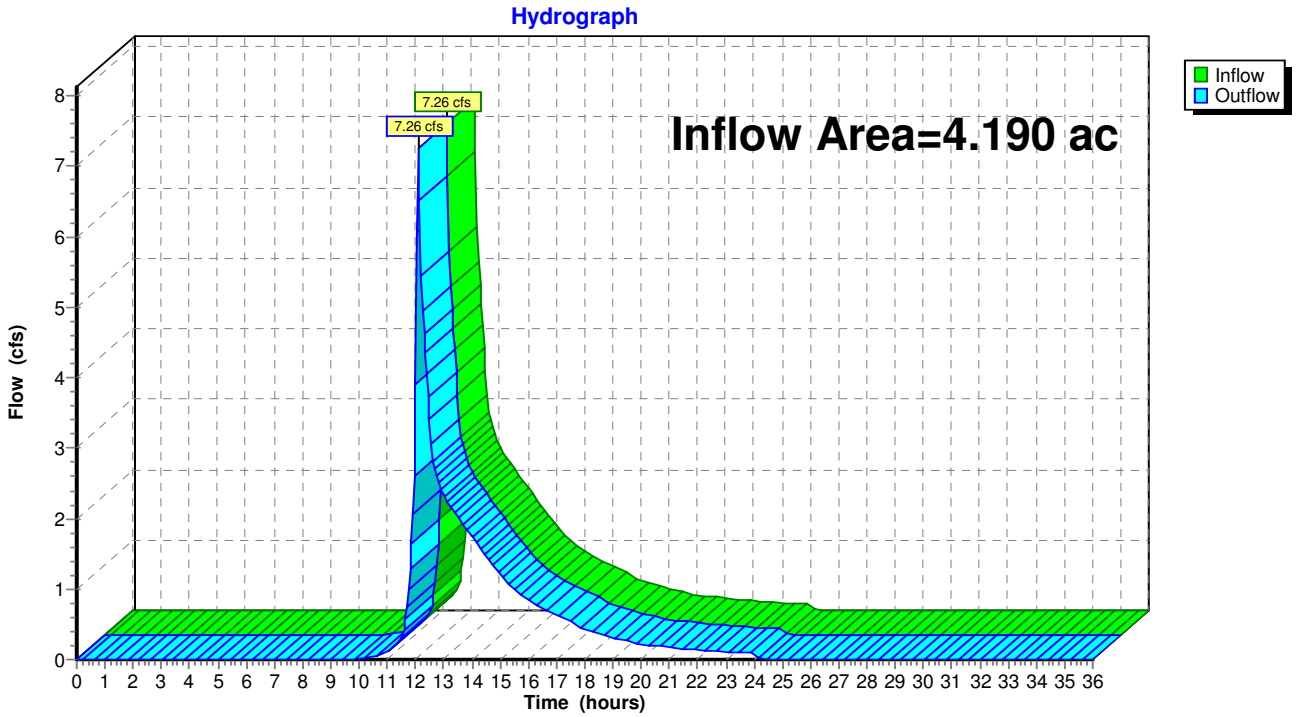
Summary for Reach DP-1: DP-1

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

Inflow Area = 4.190 ac, 40.85% Impervious, Inflow Depth = 2.75" for 100-year event
Inflow = 7.26 cfs @ 12.11 hrs, Volume= 0.961 af
Outflow = 7.26 cfs @ 12.11 hrs, Volume= 0.961 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-1: DP-1



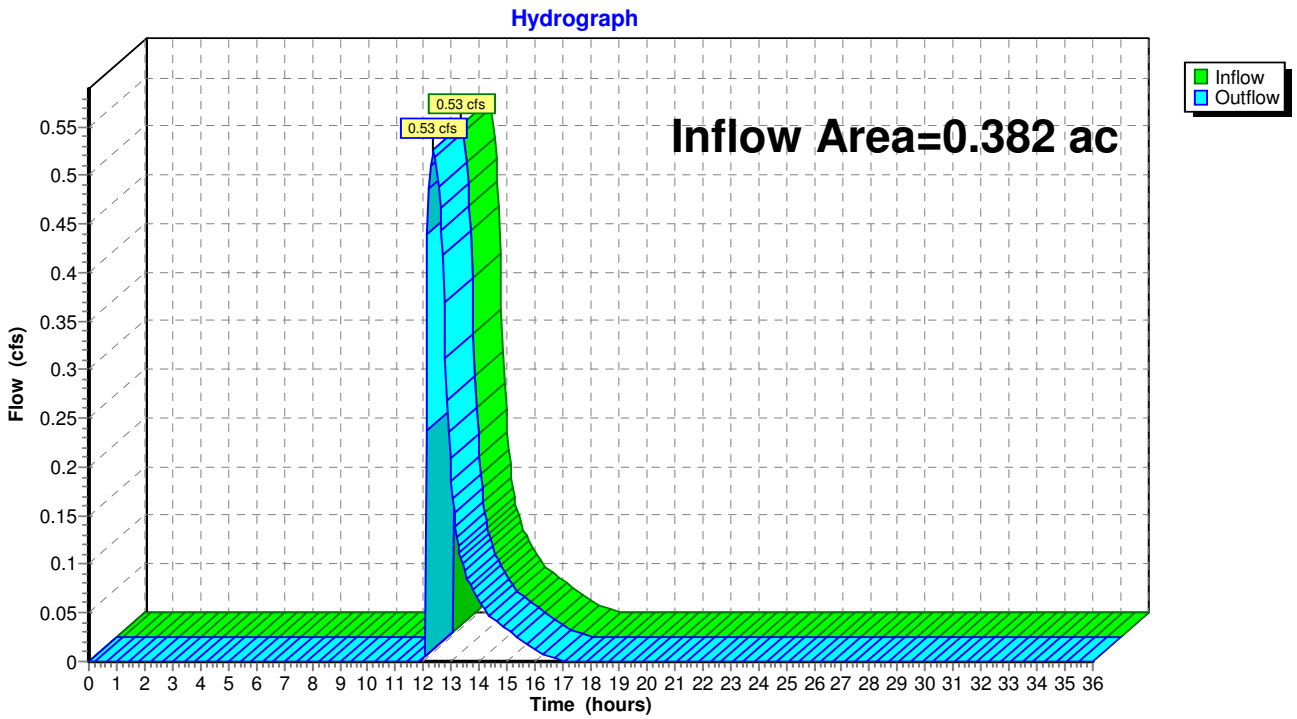
Summary for Reach DP-3: DP-3

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

Inflow Area = 0.382 ac, 25.64% Impervious, Inflow Depth = 1.43" for 100-year event
Inflow = 0.53 cfs @ 12.36 hrs, Volume= 0.046 af
Outflow = 0.53 cfs @ 12.36 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-3: DP-3



Summary for Pond 1P: Detention Basin

Inflow Area = 1.991 ac, 85.97% Impervious, Inflow Depth = 5.97" for 100-year event
Inflow = 12.54 cfs @ 12.09 hrs, Volume= 0.991 af
Outflow = 1.99 cfs @ 12.57 hrs, Volume= 0.991 af, Atten= 84%, Lag= 28.9 min
Discarded = 0.31 cfs @ 12.57 hrs, Volume= 0.499 af
Primary = 1.68 cfs @ 12.57 hrs, Volume= 0.492 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 86.81' @ 12.57 hrs Surf.Area= 12,432 sf Storage= 19,905 cf

Plug-Flow detention time= 200.7 min calculated for 0.991 af (100% of inflow)
Center-of-Mass det. time= 200.5 min (970.1 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	51,122 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

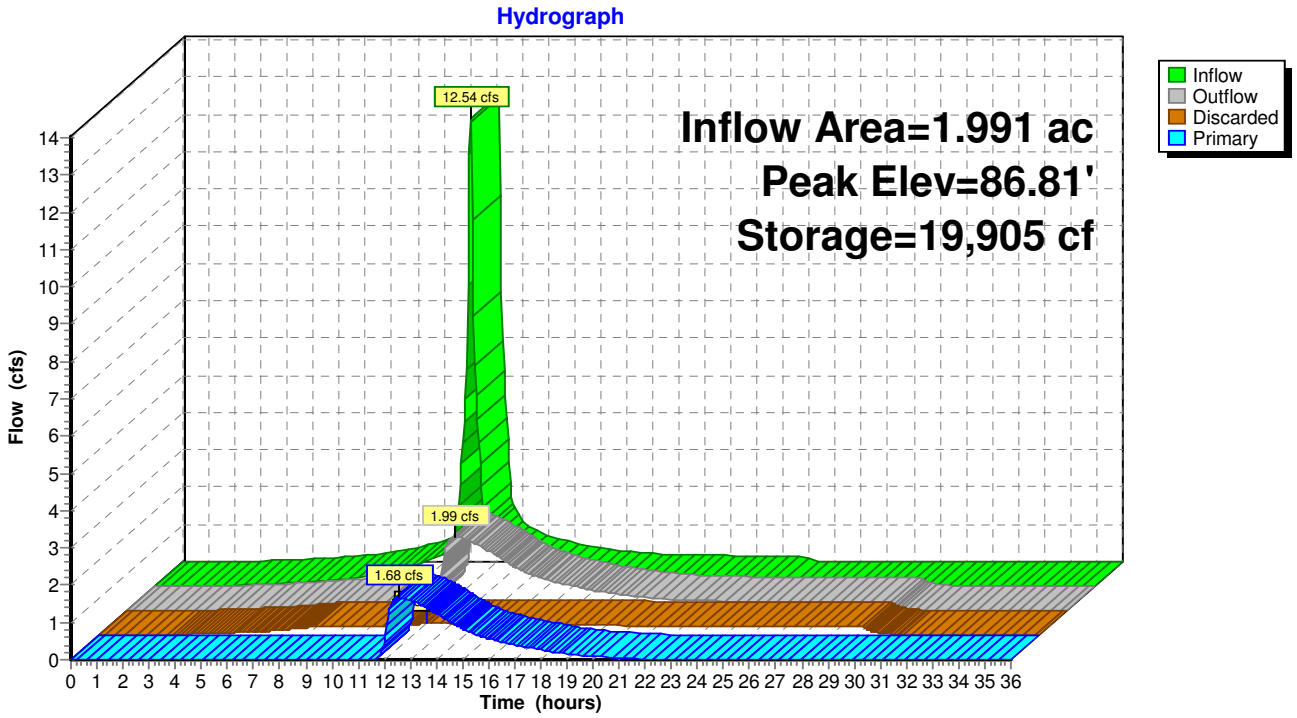
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	9,640	0	0
86.00	11,161	10,401	10,401
87.00	12,738	11,950	22,350
88.00	14,372	13,555	35,905
89.00	16,062	15,217	51,122

Device	Routing	Invert	Outlet Devices
#1	Discarded	85.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	86.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.31 cfs @ 12.57 hrs HW=86.80' (Free Discharge)
└─**1=Exfiltration** (Controls 0.31 cfs)

Primary OutFlow Max=1.68 cfs @ 12.57 hrs HW=86.80' (Free Discharge)
├─**2=Orifice/Grate** (Orifice Controls 0.97 cfs @ 4.95 fps)
└─**3=Orifice/Grate** (Orifice Controls 0.70 cfs @ 3.59 fps)

Pond 1P: Detention Basin



Summary for Pond 2P: Rain Garden

Inflow Area =	0.382 ac, 25.64% Impervious, Inflow Depth = 3.45" for 100-year event				
Inflow =	1.52 cfs @	12.09 hrs,	Volume=	0.110 af	
Outflow =	0.59 cfs @	12.36 hrs,	Volume=	0.110 af,	Atten= 61%, Lag= 16.2 min
Discarded =	0.07 cfs @	12.36 hrs,	Volume=	0.064 af	
Primary =	0.53 cfs @	12.36 hrs,	Volume=	0.046 af	

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 64.81' @ 12.36 hrs Surf.Area= 2,133 sf Storage= 1,423 cf

Plug-Flow detention time= 117.1 min calculated for 0.110 af (100% of inflow)
Center-of-Mass det. time= 117.0 min (949.2 - 832.2)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	1,847 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

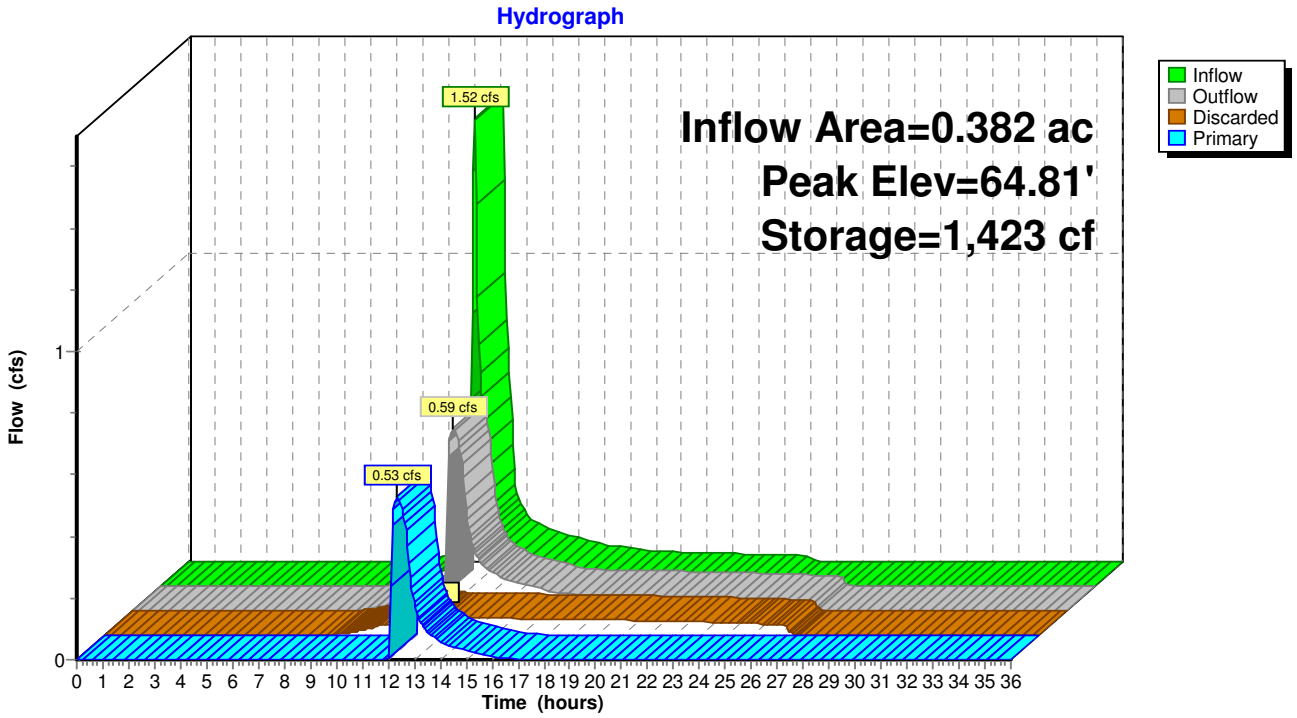
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,384	0	0
65.00	2,309	1,847	1,847

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 62.00'
#2	Primary	64.50'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.36 hrs HW=64.81' (Free Discharge)
└─**1=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.53 cfs @ 12.36 hrs HW=64.81' (Free Discharge)
└─**2=Orifice/Grate** (Orifice Controls 0.53 cfs @ 2.68 fps)

Pond 2P: Rain Garden



Appendix B –

TSS Calculations

The proposed design exceeds the Department of Environmental Protection requirements for Best Management Practices and water quality.

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Emerson Homes Topsfield

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 1%	**0.01**	**1.00**	**0.01**	**0.99**
Deep Sump and Hooded Catch Basin	**0.25**	**0.99**	**0.25**	**0.74**
Sediment Forebay	**0.25**	**0.74**	**0.19**	**0.56**
Infiltration Basin	**0.80**	**0.56**	**0.45**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**

Total TSS Removal = **89%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Emerson Homes Topsfield
Prepared By: **DeVellis Zrein, Inc.**
Date: **16-Sep-22**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

Water Volume Calculations

- Infiltration Volume Calculations
- Drawdown Calculations

DeVellis Zrein Inc.
Land Planning / Civil Engineering
PO Box 307
Foxboro MA 02035

Computations

Project	Emerson Homes Topsfield	Project #	21-2G1S-463
Location	Topsfield	Sheet	1 of 1
Calculated by	*JJD*	Date	9/16/2022
Checked by	*TOG*	Date	9/16/2022
Title	Recharge Volume		

Methodology DEP Stormwater Management Standards

Design Criteria 1: Based on the NRCS Hydrologic Soil Group "B"

Recharge Volume: Proposed Impervious Area within PR-1A = 62,770 SF

Required Recharge Volume = 62,770 sf x 0.35 inches/12 (in/ft)

Required Recharge Volume = 1,831 C.F.

Provided Recharge Volume within the basin exiltrated into the ground during the 2-year storm event = 0.350 ac feet = 15,250 C.F.

15,250 C.F. > 1,831 C.F therefore exceeds requirement

DeVellis Zrein Inc.
Land Planning / Civil Engineering
PO Box 307
Foxboro MA 02035

Computations

Project	10 High Street	Project #	21-2G1S-463
Location	Topsfield	Sheet	1 of 1
Calculated by	*IAZ*	Date	9/9/2022
Checked by		Date	
Title	Draw Down Calculations		

Methodology DEP Stormwater Management Standards

Design Criteria: Stormwater Infiltration system Draw down in less than 72 hours

Draw Down Time = Rv / (k)(Bottom Area)

Where:
Rv = Storage Volume
k = Hydraulic Conductivity

Rv = 1,831 CF
k = 1.02 in/hr
Bottom Area = 9,640 SF

Time = 1831 / (1.02)(1/12)(9640)

Time = 2.2 hours

Appendix C –

Site Plans

FULL SIZE PLANS PROVIDED WITHIN THE APPLICATION SUBMISSION UNDER SEPARATE COVER

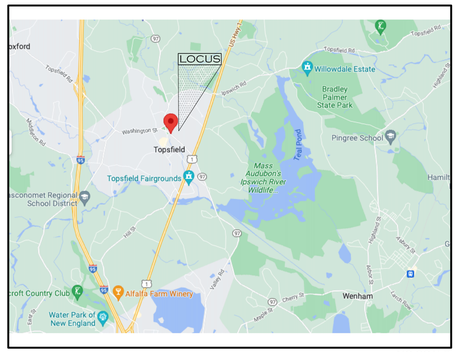
END OF DRAINAGE REPORT

Notice of Intent

EMERSON HOMES

10 High Street
Topsfield, Massachusetts

September 16, 2022



Locus Plan

NO SCALE

Applicant

The Caleb Group/Emerson Homes
491 Humphrey Street
Swampscott, MA 01907

Development Consultant

Community Square Associates, LLC
P.O. Box 286
Arlington, MA 02476

Civil Engineer/Landscape Architect

DeVellis Zrein Inc.
P.O. Box 307
Foxborough, MA 02035

Wetland Consultant

Goddard Consulting, LLC
291 Main Street
Northborough, MA 01532

LIST OF DRAWINGS

	Cover Sheet
	Existing Conditions Plan
C-1	Layout and Materials Plan
C-2	Grading and Drainage Plan
C-3	Planting Plan
C-4	Detail Sheet
C-5	Detail Sheet
C-6	Soil logs and Septic Details
SP-1	Erosion and Sedimentation Control Plan

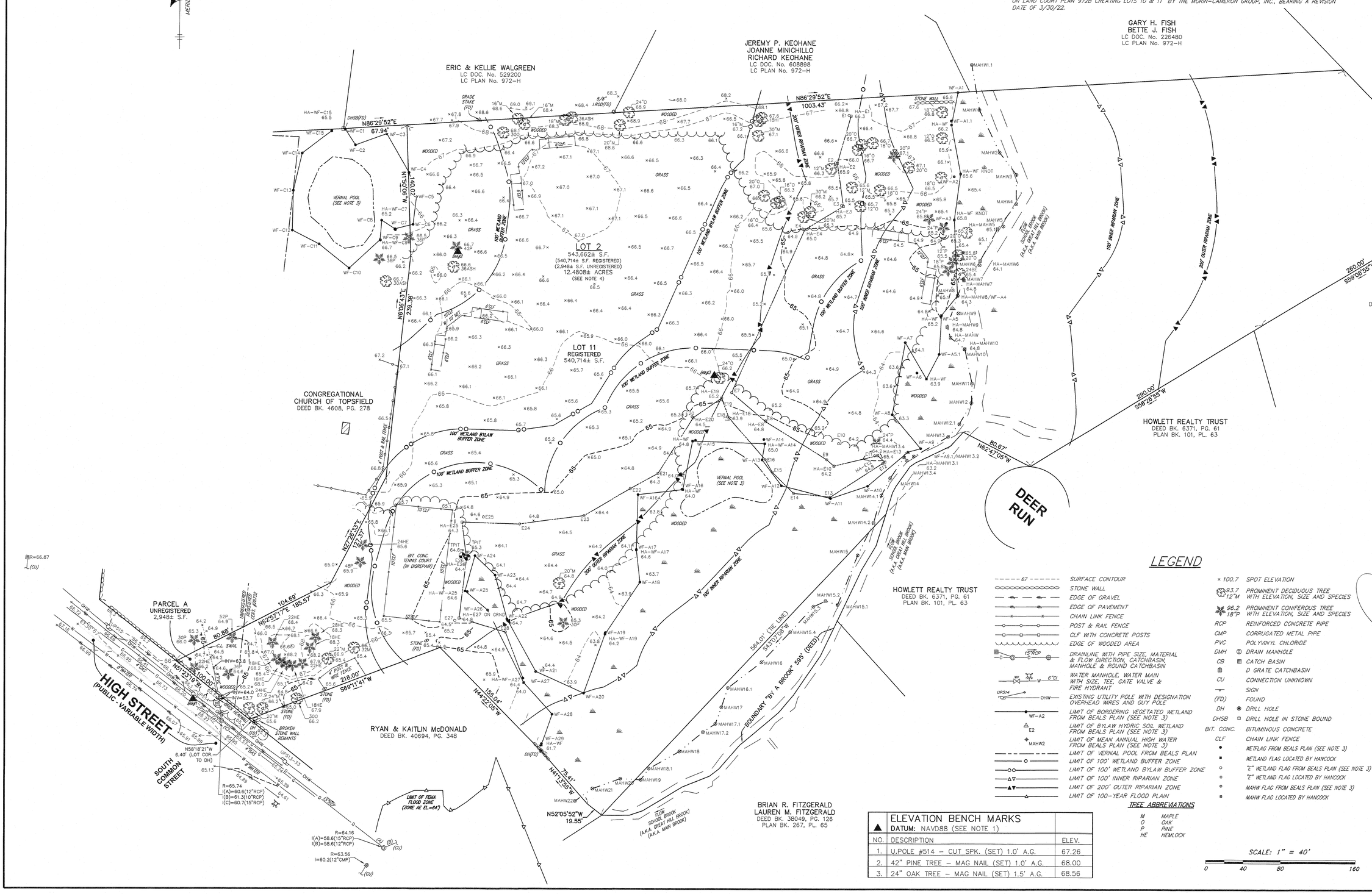
ASSESSORS: PARCEL ID: 33-36-A

REFERENCES: DEED BOOK 4608, PAGE 278
LCC PLAN No. 972B-B
PLAN ENTITLED "PLAN OF LAND, BEING A DIVISION OF LOT C SHOWN ON LAND COURT PLAN 972B CREATING LOTS 10 & 11" BY THE MORIN-CAMERON GROUP, INC., BEARING A REVISION DATE OF 3/30/22.

RECORD OWNER: CONGREGATIONAL CHURCH OF TOPSFIELD

NOTES:

1) THE VERTICAL DATUM FOR THIS SURVEY IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). SAID DATUM WAS ESTABLISHED VIA GPS OBSERVATIONS UTILIZING GEOID 18.
2) UNDERGROUND UTILITIES SHOWN HEREON ARE COMPILED FROM FIELD LOCATIONS OF STRUCTURES AND FROM AVAILABLE RECORD INFORMATION ON FILE AT THE TOWN D.P.W., AND UTILITY COMPANIES. OTHER UNDERGROUND UTILITIES MAY EXIST. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE LOCATION, SIZE & ELEVATION OF ALL UTILITIES WITHIN THE AREA OF PROPOSED WORK AND TO CONTACT "DIG-SAFE" AT 811 AT LEAST 72 HOURS PRIOR TO ANY EXCAVATION, DEMOLITION OR CONSTRUCTION.
3) WETLAND FLAGS, HYDRIC SOILS WETLAND FLAGS (E-SERIES), MEAN ANNUAL HIGH WATER (MAHW) FLAG, VERNAL POOLS, AND ALL ASSOCIATED BUFFER ZONES WERE COMPILED FROM HANCOCK INSTRUMENT SURVEY LOCATIONS OF FLAGS AND FROM PLAN ENTITLED "ABBREVIATED NOTICE OF RESOURCE AREA DELINEATION" BY BEALS ASSOCIATES, INC., BEARING A REVISION DATE OF 4/21/21.
4) PROPERTY LINES SHOWN HEREON BASED ON PLAN ENTITLED "PLAN OF LAND, BEING A DIVISION OF LOT C SHOWN ON LAND COURT PLAN 972B CREATING LOTS 10 & 11" BY THE MORIN-CAMERON GROUP, INC., BEARING A REVISION DATE OF 3/30/22.



LEGEND

67	SURFACE CONTOUR
	STONE WALL
	EDGE OF GRAVEL
	EDGE OF PAVEMENT
	CHAIN LINK FENCE
	POST & RAIL FENCE
	CLF WITH CONCRETE POSTS
	EDGE OF WOODED AREA
15"RCP	DRAINLINE WITH PIPE SIZE, MATERIAL & FLOW DIRECTION, CATCHBASIN, MANHOLE & ROUND CATCHBASIN
WV, GV, 6"CI	WATER MANHOLE, WATER MAIN WITH SIZE, TEE, GATE VALVE & FIRE HYDRANT
UP514, OHW	EXISTING UTILITY POLE WITH DESIGNATION OVERHEAD WIRES AND GUY POLE
WF-A2	LIMIT OF BORDERING VEGETATED WETLAND FROM BEALS PLAN (SEE NOTE 3)
E2	LIMIT OF BYLAW HYDRIC SOIL WETLAND FROM BEALS PLAN (SEE NOTE 3)
MAHW2	LIMIT OF MEAN ANNUAL HIGH WATER FROM BEALS PLAN (SEE NOTE 3)
	LIMIT OF VERNAL POOL FROM BEALS PLAN
	LIMIT OF 100' WETLAND BUFFER ZONE
	LIMIT OF 100' WETLAND BYLAW BUFFER ZONE
	LIMIT OF 100' INNER RIPARIAN ZONE
	LIMIT OF 200' OUTER RIPARIAN ZONE
	LIMIT OF 100-YEAR FLOOD PLAIN
× 100.7	SPOT ELEVATION
93.7 12"M	PROMINENT DECIDUOUS TREE WITH ELEVATION, SIZE AND SPECIES
96.2 18"P	PROMINENT CONIFEROUS TREE WITH ELEVATION, SIZE AND SPECIES
RCP	REINFORCED CONCRETE PIPE
CMP	CORRUGATED METAL PIPE
PVC	POLYVINYL CHLORIDE
DMH	DRAIN MANHOLE
CB	CATCH BASIN
	D GRATE CATCHBASIN
CU	CONNECTION UNKNOWN
	SIGN
(FD)	FOUND
DH	DRILL HOLE
DHSB	DRILL HOLE IN STONE BOUND
BIT. CONC.	BITUMINOUS CONCRETE
CLF	CHAIN LINK FENCE
	WETFLAG FROM BEALS PLAN (SEE NOTE 3)
	WETLAND FLAG LOCATED BY HANCOCK
	"E" WETLAND FLAG FROM BEALS PLAN (SEE NOTE 3)
	"E" WETLAND FLAG LOCATED BY HANCOCK
	MAHW FLAG FROM BEALS PLAN (SEE NOTE 3)
	MAHW FLAG LOCATED BY HANCOCK

TREE ABBREVIATIONS

M	MAPLE
O	OAK
P	PINE
HE	HEMLOCK

SCALE: 1" = 40'
0 40 80 160

ELEVATION BENCH MARKS
DATUM: NAVD88 (SEE NOTE 1)

NO.	DESCRIPTION	ELEV.
1.	U.POLE #514 – CUT SPK. (SET) 1.0' A.G.	67.26
2.	42" PINE TREE – MAG NAIL (SET) 1.0' A.G.	68.00
3.	24" OAK TREE – MAG NAIL (SET) 1.5' A.G.	68.56

#10 HIGH STREET

Topsfield, Massachusetts 01983

PREPARED FOR:

THE CALEB GROUP, INC.

491 Humphrey Street,
Swampscott, Massachusetts 01907

HANCOCK ASSOCIATES

Civil Engineers

Land Surveyors

Wetland Scientists

185 CENTRE STREET, DANVERS, MA 01923
VOICE (978) 777-3050, FAX (978) 774-7816
WWW.HANCOCKASSOCIATES.COM

COMMONWEALTH OF MASSACHUSETTS
JOSEPH M. SAMILL
No. 45717
REGISTERED PROFESSIONAL LAND SURVEYOR

NO.	BY	APP	DATE	ISSUE/REVISION DESCRIPTION

DATE: 4/11/22 DRAWN BY: EME
SCALE: 1"=40' CHECK BY: WCJ

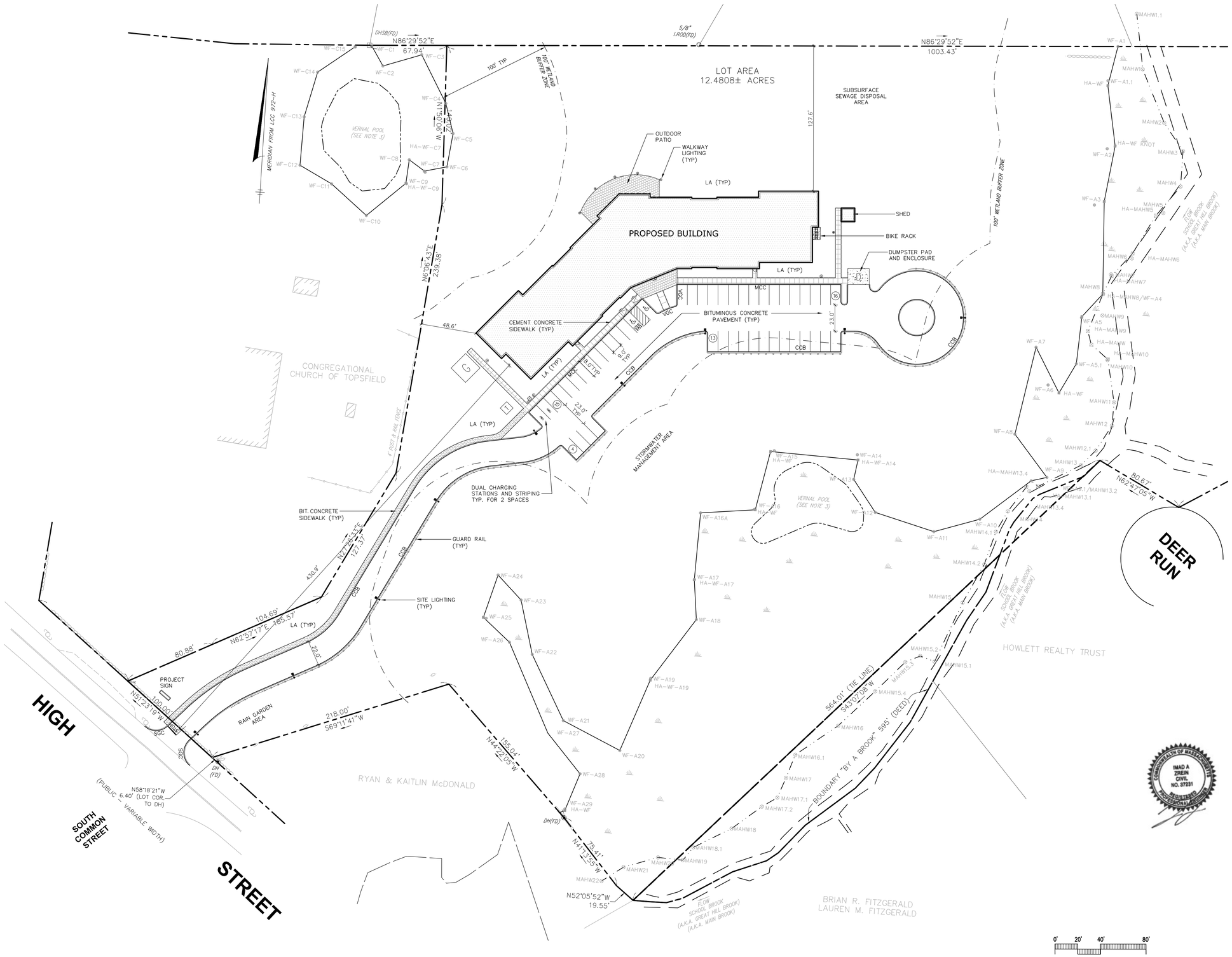
EXISTING CONDITIONS PLAN OF LAND IN TOPSFIELD, MA

PLOT DATE: Apr 11, 2022 3:26 pm
PATH: F:\Civil 3D Projects\25175-Caleb Group-Topsfield\Survey\DWG\

DWG: 25175ec.dwg
LAYOUT: EC30x42
SHEET: 1 OF 1
PROJECT NO.: 25175

EMERSON HOMES

10 HIGH STREET
TOPSFIELD, MA



LEGEND

	PROPERTY LINE
	SITE LIGHTING
	WALKWAY LIGHTING
	CEMENT CONCRETE PAVEMENT
	BRICK PAVERS
MCC	MONOLITHIC CONCRETE CURB
SGC	SLOPED GRANITE CURB
VGC	VERTICAL GRANITE CURB
TC	TRANSITION CURB
FC	FLUSH CURB
CCB	CAPE COD BERM
LA	LANDSCAPE AREA
	FENCE
T	TRANSFORMER
G	GENERATOR
	SAW CUT LINE
	STEEL BOLLARD
	BENCH
15	PARKING COUNT
	SIGN

DZI
Land Planning, Civil Engineering, Landscape Architecture
Po Box 307
Foxborough, MA
www.develliszrein.com
tel. 508.473.4114
DeVellis Zrein Inc.

COMMONWEALTH OF MASSACHUSETTS
IMAD A ZREIN
CIVIL
NO. 37531
REGISTERED PROFESSIONAL ENGINEER

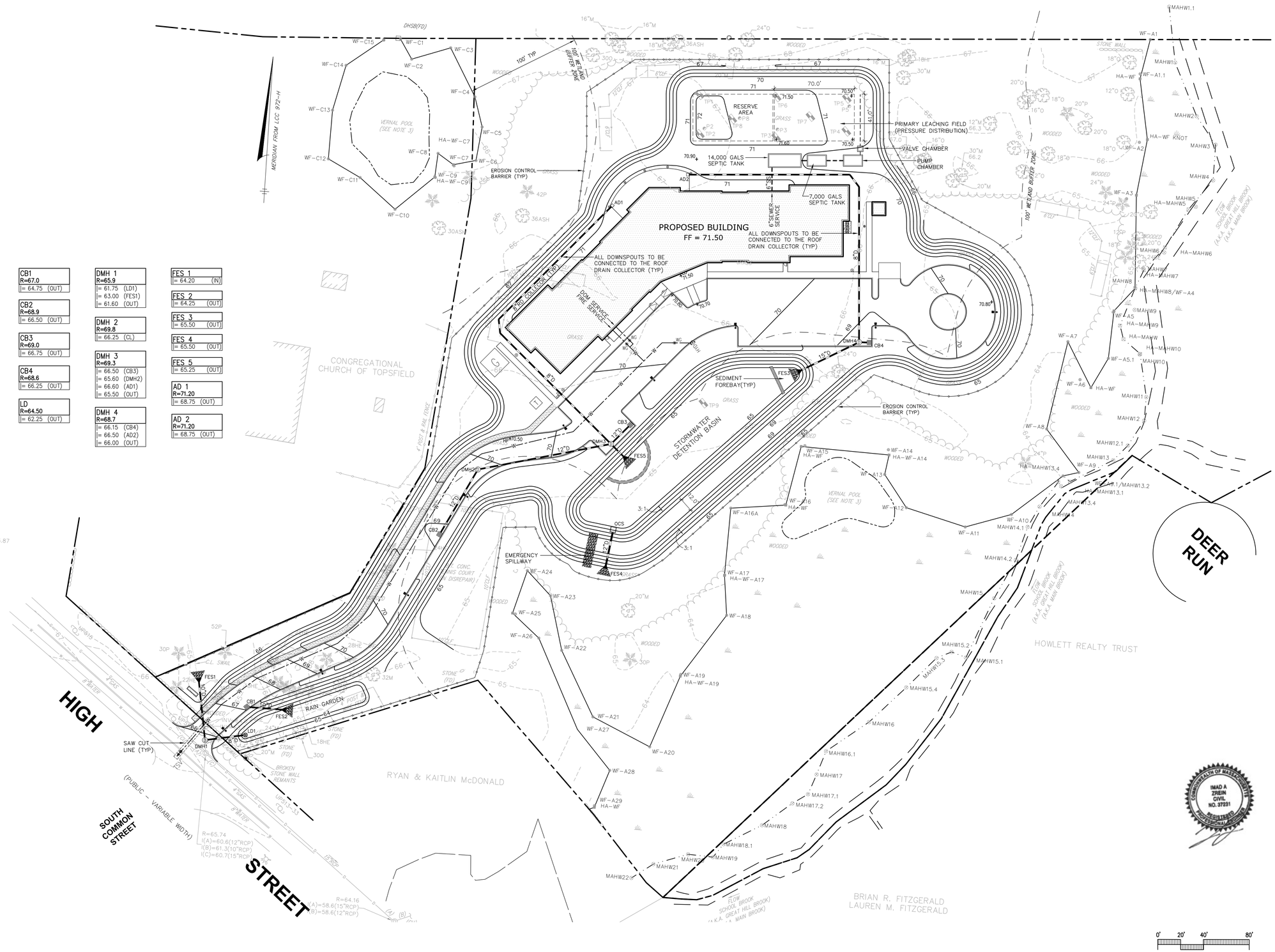
LAYOUT AND MATERIALS PLAN

SCALE:	1" = 40'
JOB:	2G1S-463
FILE:	
DRAWN:	IAZ
CHECKED:	
DATE:	09.16.22

C-1

EMERSON HOMES

10 HIGH STREET
TOPSFIELD, MA



GRADING AND UTILITY LEGEND

	PROPERTY LINE
12"D	DRAIN LINE
W	WATER LINE
G	GAS LINE
E/T/C	UNDERGROUND ELECTRIC, TELEPHONE, CABLE
420	PROPOSED CONTOUR LINE
+ 100.50	SPOTGRADE
CB	CATCH BASIN
LD	LAWN DRAIN
FES	FLARED END SECTION
DMH	DRAIN MANHOLE
OCS	OUTLET CONTROL STRUCTURE
	EROSION CONTROL BARRIER
WG	WATER GATE
TSV	TAPPING SLEEVE AND GATE
HYD	HYDRANT
	SAW CUT LINE
TP2	TEST PIT
P2	PERC

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tel. 508.473.4114
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COMMONWEALTH OF MASSACHUSETTS
IMAD A ZREIN
CIVIL
NO. 37231
REGISTERED PROFESSIONAL ENGINEER

GRADING AND UTILITY PLAN

SCALE:	1" = 40'
JOB:	2G1S-463
FILE:	
DRAWN:	IAZ
CHECKED:	
DATE:	09.16.22

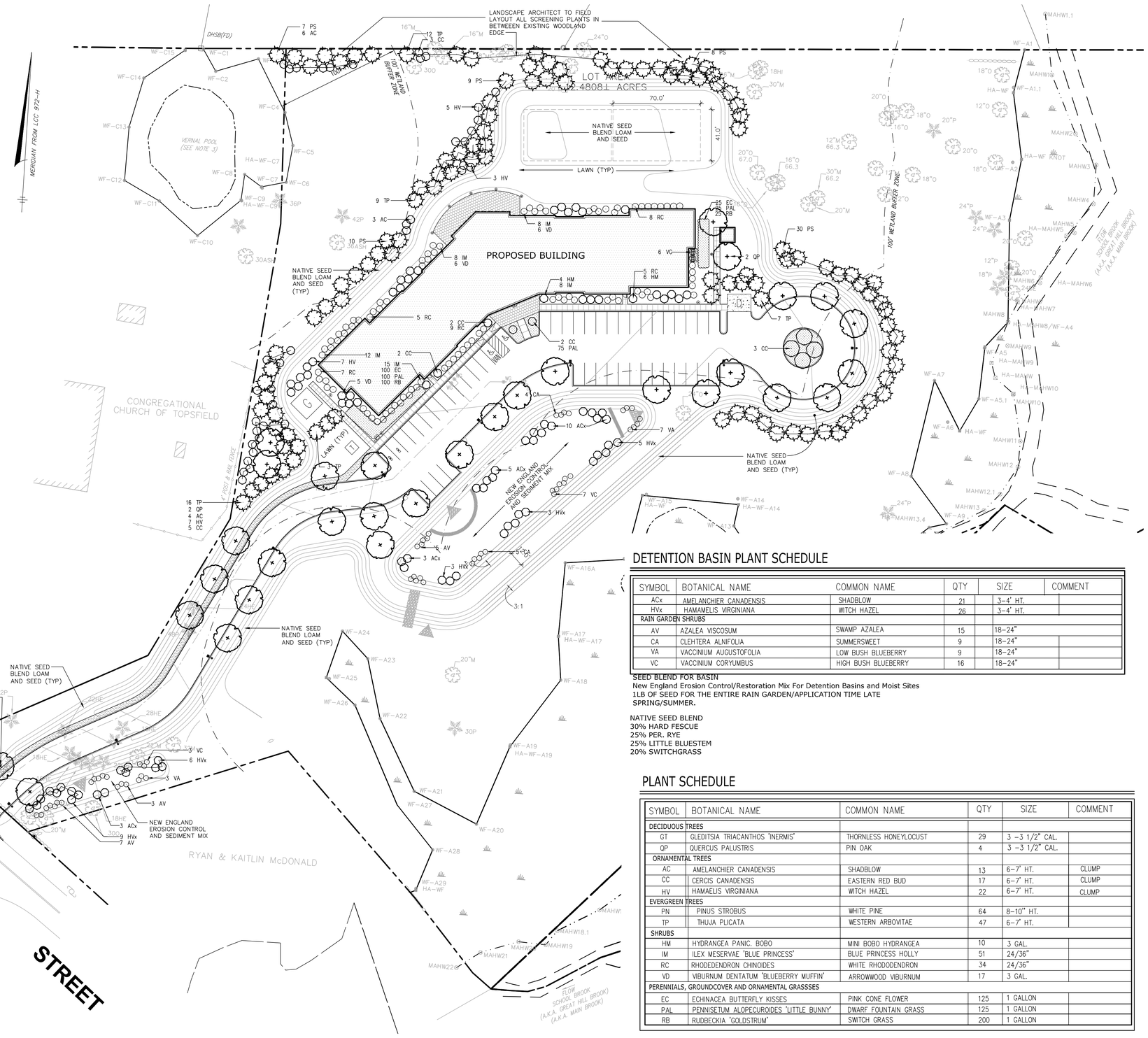
C-2

EMERSON HOMES

10 HIGH STREET
TOPSFIELD, MA

PLANTING NOTES

1. EXISTING CONDITIONS INFORMATION IS REPRODUCED FROM THE SURVEY PREPARED BY FELDMAN LAND SURVEYORS OF BOSTON, MA AND IS DATED JULY 07, 2015 AND REVISED THROUGH MAY 9, 2018.
2. THE LOCATIONS OF UNDERGROUND UTILITIES SHOWN ARE BASED ON THE SURVEY REFERENCED ABOVE. THE CONTRACTOR SHALL CONTACT DIGSAFE AND THE PROPER LOCAL AUTHORITIES OR RESPECTIVE UTILITY COMPANIES TO CONFIRM THE LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. ANY DAMAGE DUE TO FAILURE OF THE CONTRACTOR TO CONTACT THE PROPER AUTHORITIES SHALL BE BORNE BY THE CONTRACTOR.
3. CONTRACTOR SHALL BEGIN MAINTENANCE IMMEDIATELY AFTER PLANTING AND WILL CONTINUE UNTIL FINAL WRITTEN ACCEPTANCE OF PLANT MATERIAL.
4. LANDSCAPE ARCHITECT TO FLAG ALL TREES TO BE TRANSPLANTED PRIOR TO CONSTRUCTION START.
5. CONTRACTOR SHALL VERIFY ALL TREE REMOVALS AND/OR TRANSPLANTS WITH OWNER'S REPRESENTATIVE PRIOR TO CONSTRUCTION START.
6. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AWAY FROM ALL BUILDING FOUNDATIONS, STRUCTURES, AND PLANTING BEDS.
7. MAXIMUM SLOPE WITHIN DISTURBED AREAS SHALL NOT EXCEED 3:1, UNLESS OTHERWISE NOTED.
8. THE LANDSCAPE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIALS IN QUANTITIES SUFFICIENT TO COMPLETE ALL PLANTINGS SHOWN ON THIS DRAWING.
9. ALL MATERIALS SHALL CONFORM TO THE GUIDELINES ESTABLISHED BY THE AMERICAN NURSERY AND LANDSCAPE ASSOCIATION.
10. ALL PLANTS SHALL BEAR THE SAME RELATIONSHIP TO FINISH GRADE AS TO ORIGINAL GRADES BEFORE DIGGING.
11. ALL PLANTS TO BE BALLED IN BURLAP OR CONTAINERIZED.
12. MULCH FOR PLANTED AREAS TO BE AGED PINE BARK: PARTIALLY DECOMPOSED, DARK BROWN IN COLOR AND FREE OF WOOD CHIPS THICKER THAN 1/4 INCH.
13. PLANTING SOIL MIX: LOAM THOROUGHLY INCORPORATED WITH ROTTED MANURE PROPORTIONED 5 C.Y. TO 1 C.Y. OR EQUIVALENT. FERTILIZER ADDED PER RECOMMENDED RATES OF SOILS ANALYSIS.
14. THE LANDSCAPE CONTRACTOR SHALL GUARANTEE ALL PLANT MATERIALS FOR ONE (1) FULL YEAR FROM DATE OF ACCEPTANCE.
15. ALL PLANT MATERIALS ARE SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT, AT THE NURSERY, AND AT THE SITE.
16. ALL AREAS OF THE SITE WHICH HAVE BEEN DISTURBED AND NOT OTHERWISE DEVELOPED SHALL BE LOAMED AND SEEDED WITH A MINIMUM DEPTH OF 6" DEPTH TOPSOIL.
17. PLANT SPECIES AS INDICATED IN THE PLANT LIST ARE SUGGESTIONS ONLY. FINAL SELECTION OF SPECIES SHALL OCCUR AT THE TIME OF PLANT PURCHASE, DEPENDING ON AVAILABILITY. PLANT SIZE AND QUANTITY SHALL NOT CHANGE WITHOUT APPROVAL OF OWNER'S REPRESENTATIVE.



DETENTION BASIN PLANT SCHEDULE

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY	SIZE	COMMENT
ACx	AMELANCHIER CANADENSIS	SHADBLOW	21	3–4' HT.	
HVx	HAMAMELIS VIRGINIANA	WITCH HAZEL	26	3–4' HT.	
RAIN GARDEN SHRUBS					
AV	AZALEA VISCOSUM	SWAMP AZALEA	15	18–24"	
CA	CLEHTERA ALNIFOLIA	SUMMERSWEET	9	18–24"	
VA	VACCINIUM AUGUSTOFOLIA	LOW BUSH BLUEBERRY	9	18–24"	
VC	VACCINIUM CORYUMBUS	HIGH BUSH BLUEBERRY	16	18–24"	

SEED BLEND FOR BASIN
New England Erosion Control/Restoration Mix For Detention Basins and Moist Sites
1LB OF SEED FOR THE ENTIRE RAIN GARDEN/APPLICATION TIME LATE SPRING/SUMMER.

NATIVE SEED BLEND
30% HARD FESCUE
25% PER. RYE
25% LITTLE BLUESTEM
20% SWITCHGRASS

PLANT SCHEDULE

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY	SIZE	COMMENT
DECIDUOUS TREES					
GT	GLEDITSIA TRIACANTHOS 'INERMIS'	THORNLESS HONEYLOCUST	29	3 –3 1/2" CAL.	
QP	QUERCUS PALUSTRIS	PIN OAK	4	3 –3 1/2" CAL.	
ORNAMENTAL TREES					
AC	AMELANCHIER CANADENSIS	SHADBLOW	13	6–7' HT.	CLUMP
CC	CERCIS CANADENSIS	EASTERN RED BUD	17	6–7' HT.	CLUMP
HV	HAMAELIS VIRGINIANA	WITCH HAZEL	22	6–7' HT.	CLUMP
EVERGREEN TREES					
PN	PINUS STROBUS	WHITE PINE	64	8–10" HT.	
TP	THUJA PLICATA	WESTERN ARBOVITAE	47	6–7' HT.	
SHRUBS					
HM	HYDRANGEA PANIC. BOBO	MINI BOBO HYDRANGEA	10	3 GAL.	
IM	ILEX MESERVAE 'BLUE PRINCESS'	BLUE PRINCESS HOLLY	51	24/36"	
RC	RHODEDENDRON CHINOIDES	WHITE RHODODENDRON	34	24/36"	
VD	VIBURNUM DENTATUM 'BLUEBERRY MUFFIN'	ARROWWOOD VIBURNUM	17	3 GAL.	
PERENNIALS, GROUNDCOVER AND ORNAMENTAL GRASSSES					
EC	ECHINACEA BUTTERFLY KISSES	PINK CONE FLOWER	125	1 GALLON	
PAL	PENNISETUM ALOPECUROIDES 'LITTLE BUNNY'	DWARF FOUNTAIN GRASS	125	1 GALLON	
RB	RUDBECKIA 'GOLDSTRUM'	SWITCH GRASS	200	1 GALLON	

PLANTING LEGEND
- PROPERTY LINE
- GROUNDCOVER / PERENNIAL PLANTING
- SHRUB PLANTING
- ORNAMENTAL TREE
- EVERGREEN TREE
- DECIDUOUS TREE

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PLANTING PLAN

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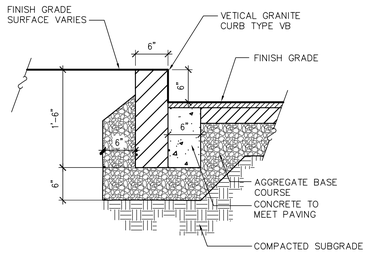
C-3

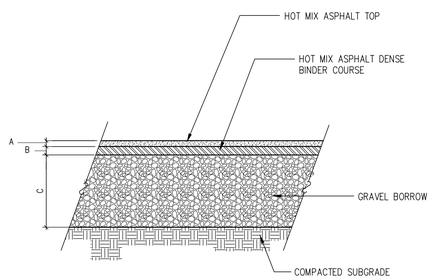
EMERSON HOMES

10 HIGH STREET
TOPSFIELD, MA

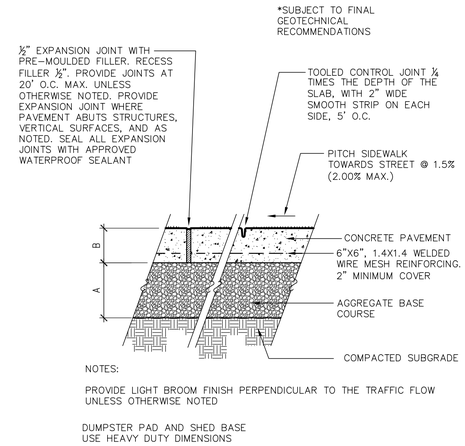


VERTICAL GRANITE CURB

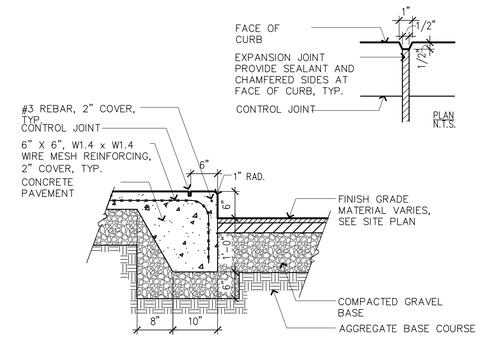
SECTION DIMESNIONS	A	B	C
ROADWAY	1.5"	2.5"	18"
WALKWAY	1"	2"	12"



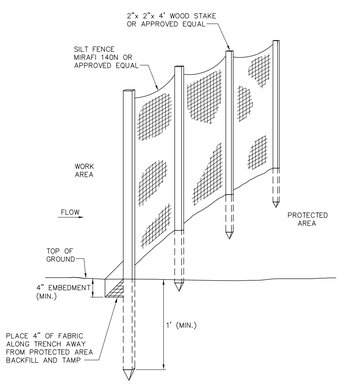
BITUMINUOUS CONCRETE PAVEMENT



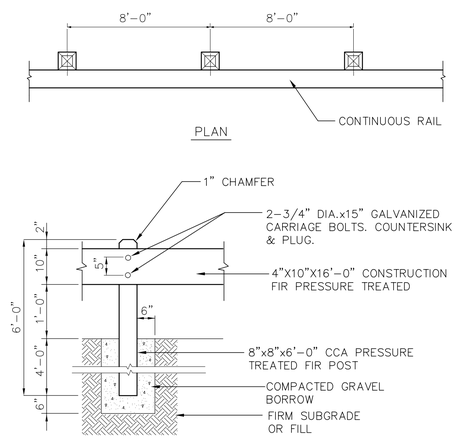
CEMENT CONCRETE SIDEWALK



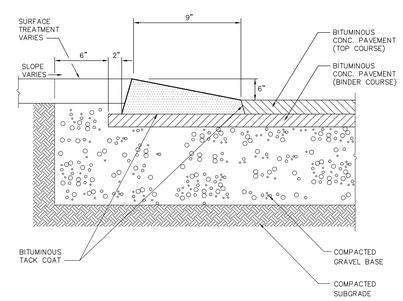
MONOLITHIC CONCRETE CURB



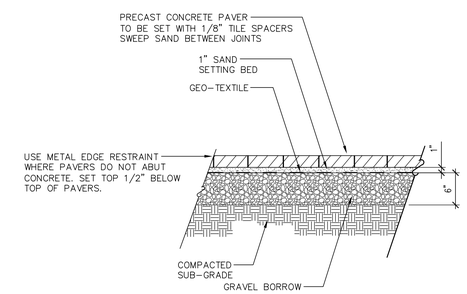
SILT FENCE



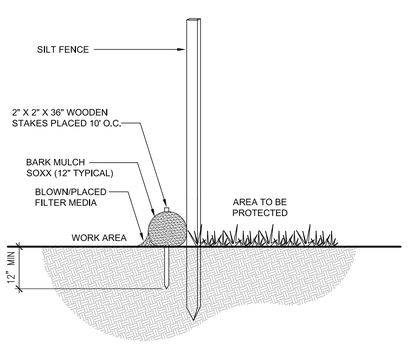
GUARD RAIL



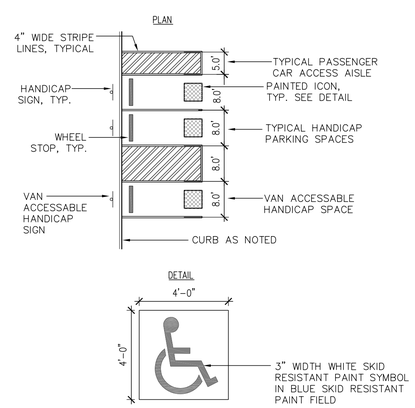
CAPE COD BERM



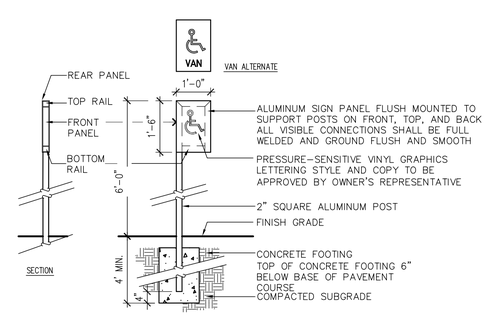
PRECAST CONCRETE PAVERS



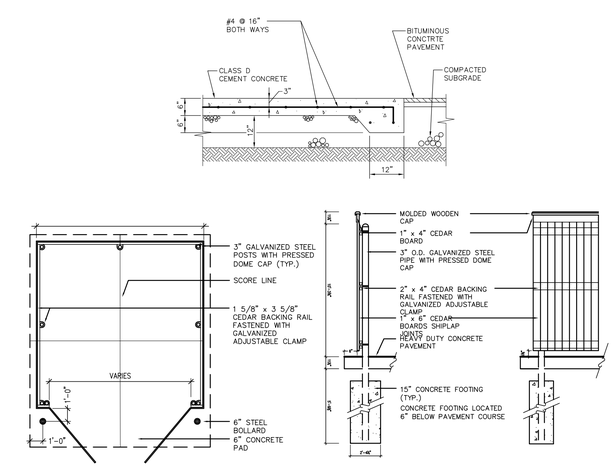
SILT SOXX



HP PARKING LAYOUT AND SIGN



CAPE COD BERM



DUMPSTER PAD AND ENCLOSURE

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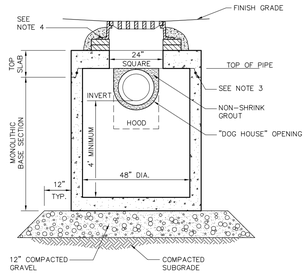
C-4

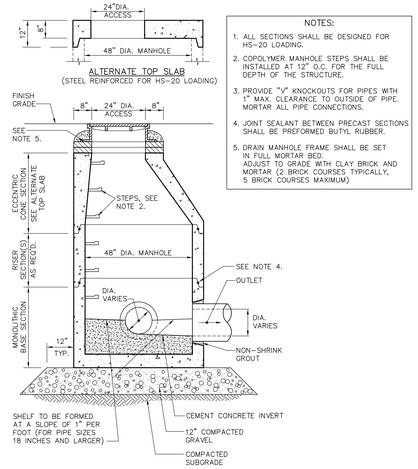
EMERSON HOMES

10 HIGH STREET
TOPSFIELD, MA

NOTES:
1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 1" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
4. CATCH BASIN FRAME SHALL BE SET IN FULL MORTAR BED.

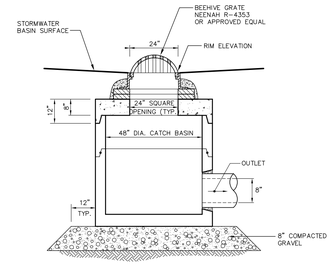


CATCH BASIN (CB)

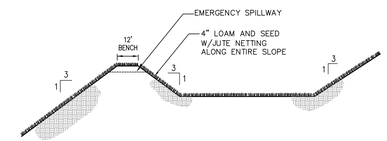


NOTES:
1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
2. COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. PROVIDE "V" KNOCKOUTS FOR PIPES WITH 1" MAX. CLEARANCE TO OUTSIDE OF PIPE. MORTAR ALL PIPE CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PREFORMED BUTYL RUBBER.
5. DRAIN MANHOLE FRAME SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM)

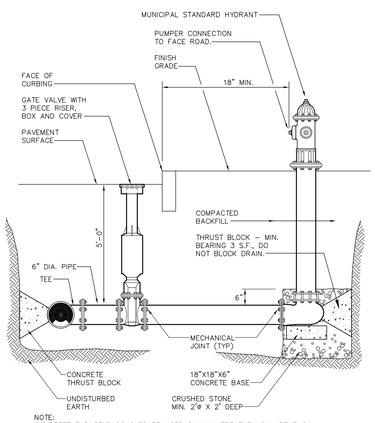
DRAIN MANHOLE (DMH)



LAWN DRAIN



STORMWATER BASIN

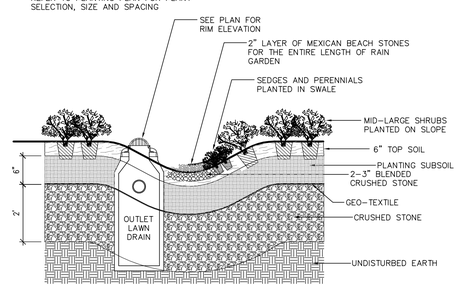


NOTE:
CONCRETE THRUST BLOCKS TO BE USED ONLY WHERE THEY CAN BEAR ON UNDISTURBED EARTH. USE CLAMPS AND TIE RODS OR OTHER ACCEPTABLE MEHTOD OF JOINT RESTRAINT WHERE SOIL CONDITIONS PROHIBIT THE USE OF THRUST BLOCKS.

HYDRANT

NOTE:
ALL RIVERSTONES AND PLANTS TO BE LAID OUT IN THE FIELD BY THE LANDSCAPE ARCHITECT

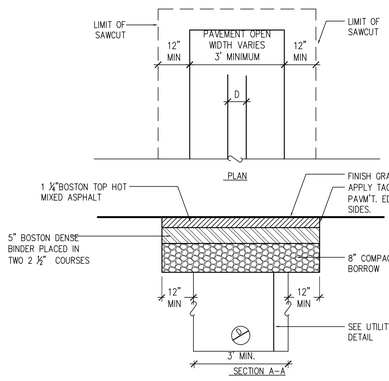
REFER TO PLANTING PLAN FOR PLANT SELECTION, SIZE AND SPACING



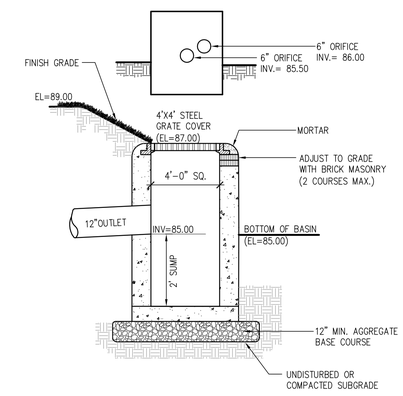
RAIN GARDEN SUBSOIL: RAIN GARDEN PRECISION BLEND OF SAND, SOIL AND COMPOST SHALL HAVE AN ORGANIC CONTENT OF BETWEEN 2.5 AND 4.0% BY WEIGHT,pH OF 5.5 TO 7.0 AND CONFORM TO THE FOLLOWING GRADATION REQUIREMENTS FOR MATERIAL PASSING A NUMBER 10 SIEVE:
#10 (100%), #18 (70–95%), #35 (40–75%), #60 (20–35%), #140 (10–20%) #270 (8–15%), CLAY (2–5%). MAX AGGREWGATE = 1/2", MAX 2MM RETAINED=15%

CONTRACTOR TO REVIEW PLANTING LIST WITH LANDSCAPE ARCHITECT AND COORDINATE ALL PLANTS, SIZES, AVAILABILITY AND SCHEDULE OF INSTALLATION PRIOR TO RAINGARDEN CONSTRUCTION.

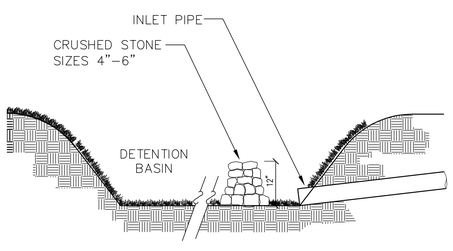
RAIN GARDEN



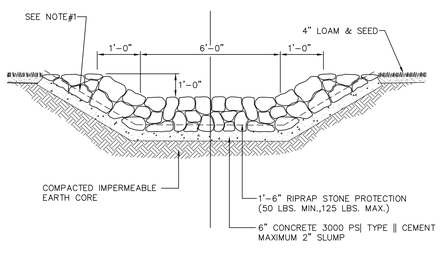
UTILITY PATCH



OUTLET CONTROL STRUCTURE

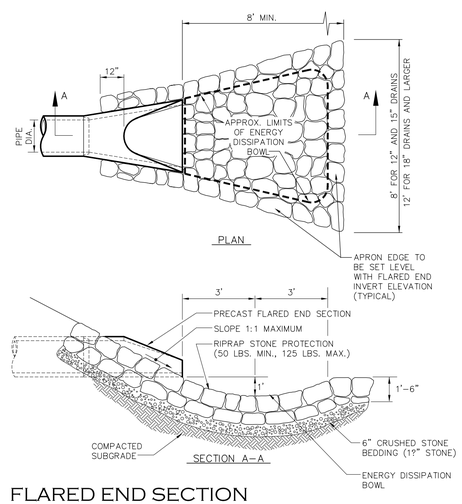


SEDIMENT FOREBAY

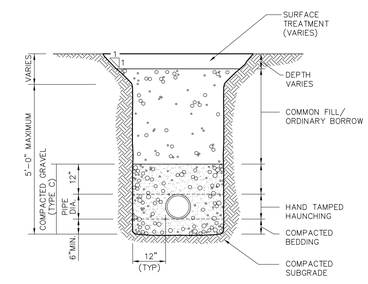


NOTES:
1. HAND SET FIRST LAYER OF RIPRAP INTO CONCRETE TO APPROXIMATELY MID-DEPTH OF THE LAYER.
2. HAND PLACE REMAINING RIPRAP AFTER CONCRETE HAS SET AND CHINK WITH SMALLER STONES.

EMERGENCY OVERFLOW SPILLWAY



FLARED END SECTION



UTILITY TRENCH

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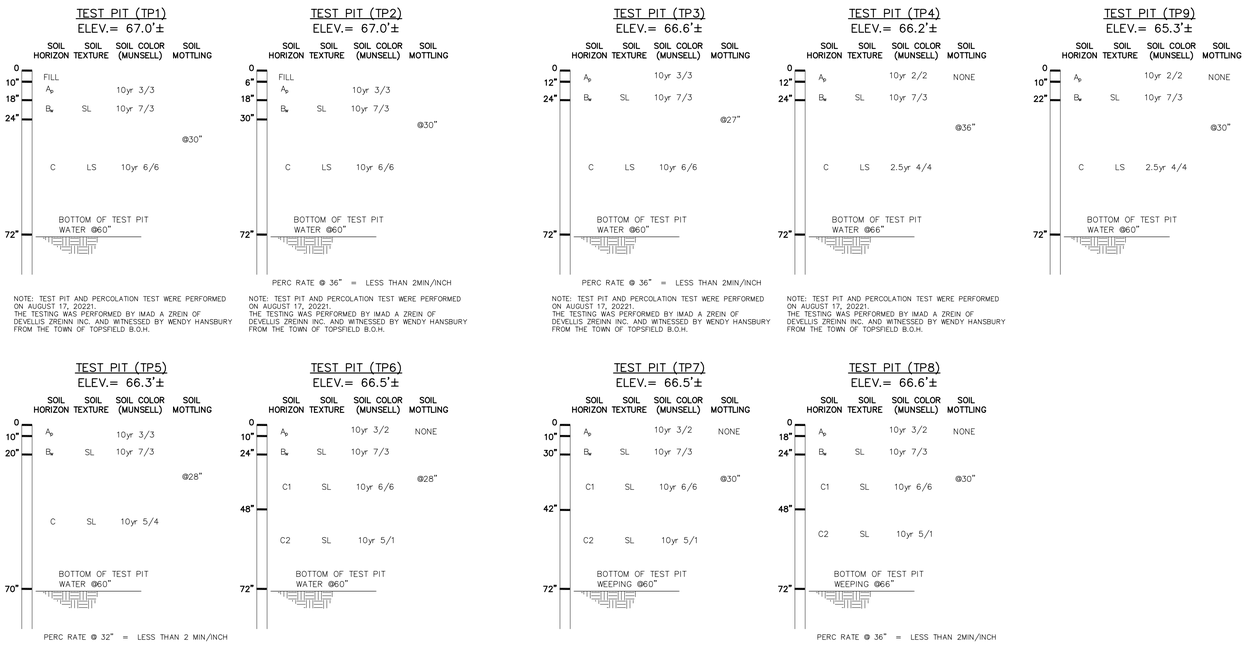
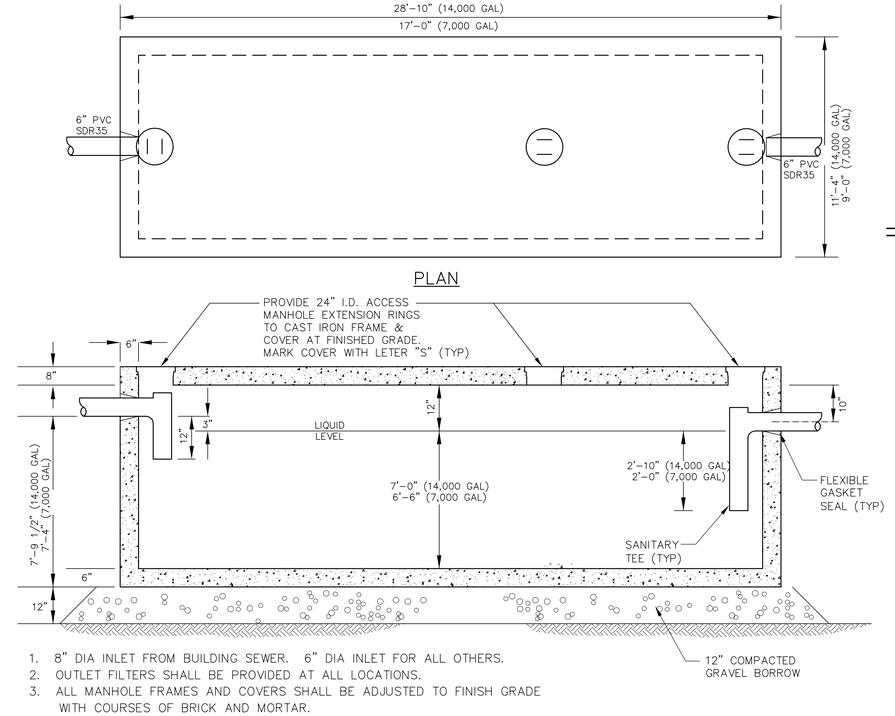
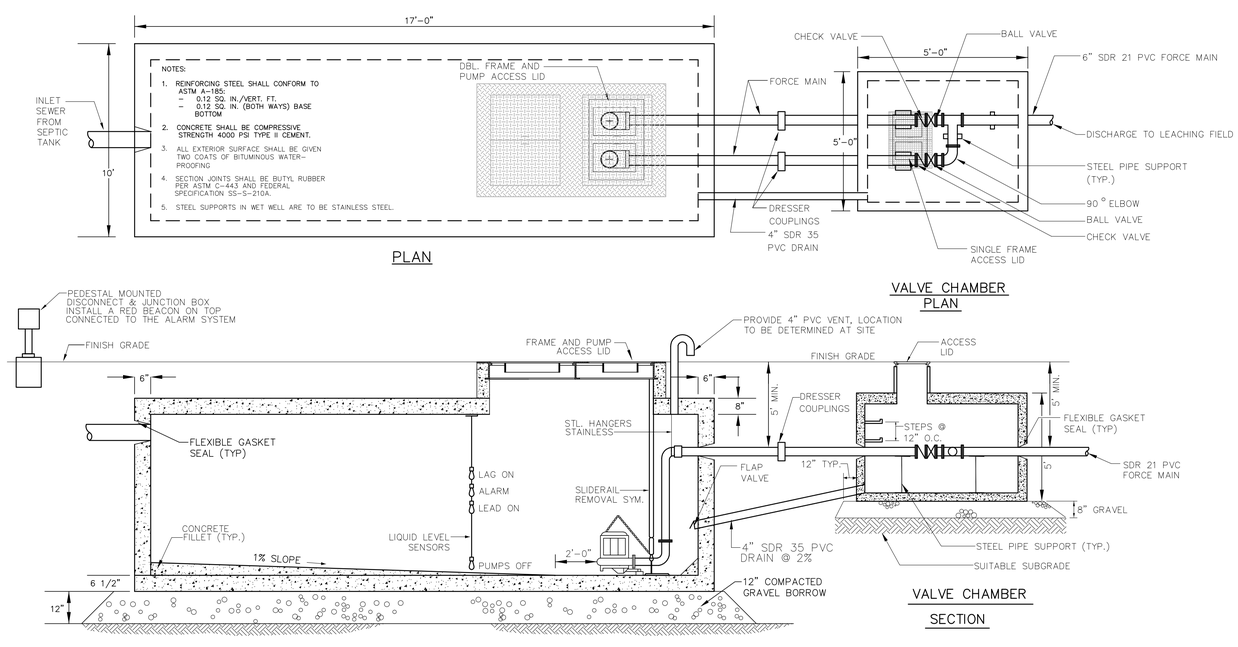


Soil Logs



1. 8" DIA INLET FROM BUILDING SEWER. 6" DIA INLET FOR ALL OTHERS.
2. OUTLET FILTERS SHALL BE PROVIDED AT ALL LOCATIONS.
3. ALL MANHOLE FRAMES AND COVERS SHALL BE ADJUSTED TO FINISH GRADE WITH COURSES OF BRICK AND MORTAR.

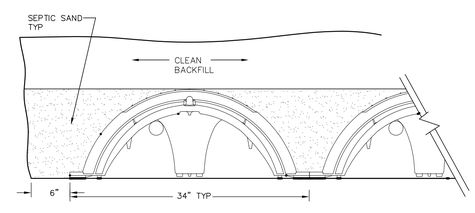
Septic Tanks



1. ALL MANHOLE FRAMES AND COVERS SHALL BE ADJUSTED TO FINISH GRADE WITH COURSES OF BRICK AND MORTAR.

SECTION

PUMP AND VALVE CHAMBERS



Infiltrator Quick4 Plus Standard Detail

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SOIL LOGS AND SEPTIC DETAILS

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C-6

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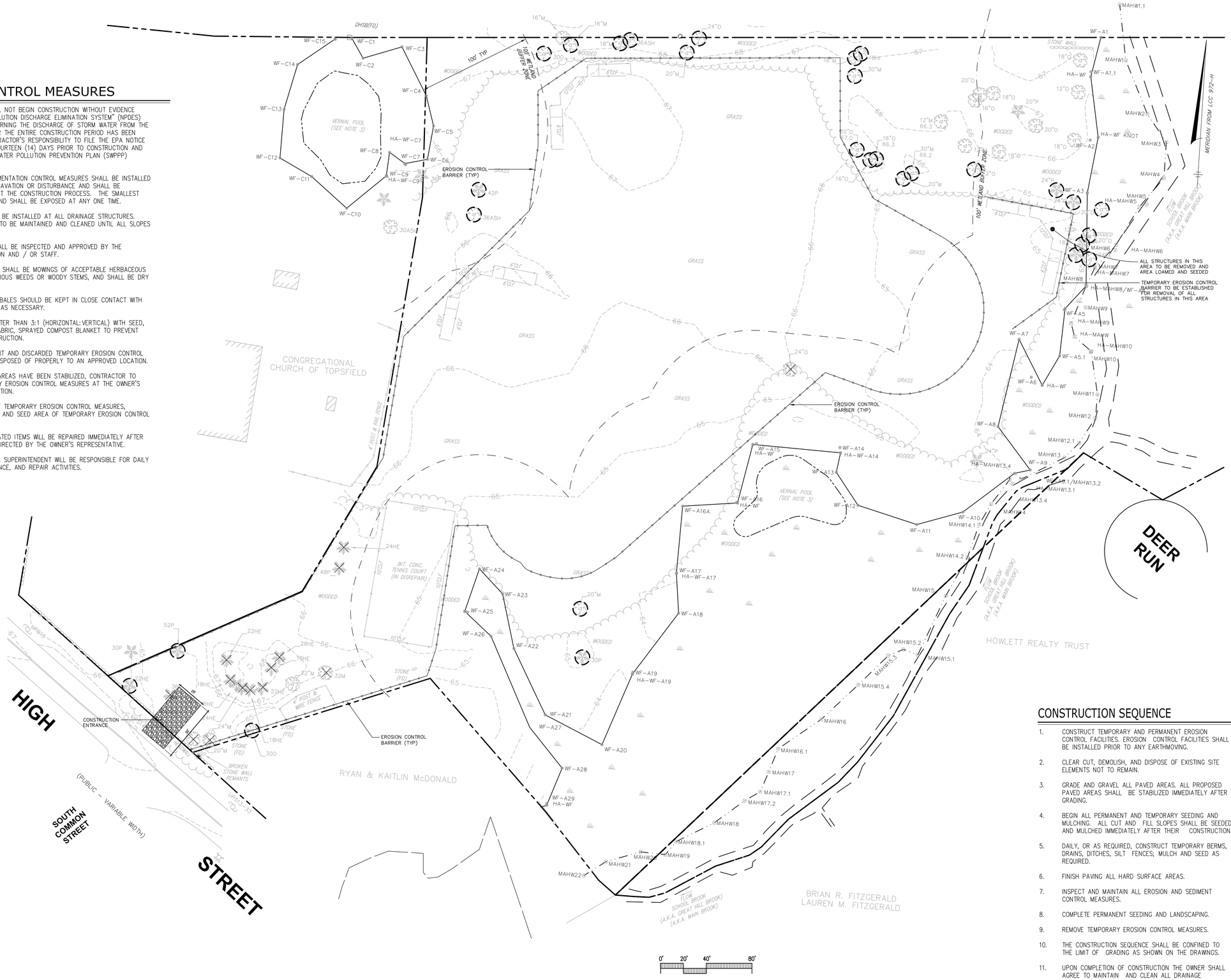
10 HIGH STREET
TOPSFIELD, MA

EROSION CONTROL MEASURES

1. THE CONTRACTOR SHALL NOT BEGIN CONSTRUCTION WITHOUT EVIDENCE THAT A "NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM" (NPDES) NOTICE OF INTENT GOVERNING THE DISCHARGE OF STORM WATER FROM THE CONSTRUCTION SITE FOR THE ENTIRE CONSTRUCTION PERIOD HAS BEEN FILED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FILE THE EPA NOTICE OF INTENT AT LEAST FOURTEEN (14) DAYS PRIOR TO CONSTRUCTION AND TO PREPARE A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) SPECIFIC TO THE SITE
2. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO ANY SITE EXCAVATION OR DISTURBANCE AND SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PROCESS. THE SMALLEST PRACTICAL AREA OF LAND SHALL BE EXPOSED AT ANY ONE TIME.
3. SEDIMENT TRAPS SHALL BE INSTALLED AT ALL DRAINAGE STRUCTURES. SILTATION FENCES ARE TO BE MAINTAINED AND CLEANED UNTIL ALL SLOPES HAVE BEEN STABILIZED.
4. SEDIMENT BARRIERS SHALL BE INSPECTED AND APPROVED BY THE CONSERVATION COMISSION AND / OR STAFF.
5. HAY BALES AND MULCH SHALL BE MOWINGS OF ACCEPTABLE HERBACEOUS GROWTH, FREE OF NOXIOUS WEEDS OR WOODY STEMS, AND SHALL BE DRY WHEN INSTALLED.
6. THE UNDERSIDE OF HAYBALES SHOULD BE KEPT IN CLOSE CONTACT WITH THE EARTH AND RESET AS NECESSARY.
7. STABILIZE SLOPES GREATER THAN 3:1 (HORIZONTAL:VERTICAL) WITH SEED, SECURED GEOTEXTILE FABRIC, SPRAYED COMPOST BLANKET TO PREVENT EROSION DURING CONSTRUCTION.
8. ALL COLLECTED SEDIMENT AND DISCARDED TEMPORARY EROSION CONTROL MATERIALS SHALL BE DISPOSED OF PROPERLY TO AN APPROVED LOCATION.
9. AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED, CONTRACTOR TO REMOVE ALL TEMPORARY EROSION CONTROL MEASURES AT THE OWNER'S REPRESENTATIVES DIRECTION.
10. AFTER THE REMOVAL OF TEMPORARY EROSION CONTROL MEASURES, CONTRACTOR TO GRADE AND SEED AREA OF TEMPORARY EROSION CONTROL MEASURE.
11. DAMAGED OR DETERIORATED ITEMS WILL BE REPAIRED IMMEDIATELY AFTER IDENTIFICATION OR AS DIRECTED BY THE OWNER'S REPRESENTATIVE.
12. THE CONTRACTOR'S SITE SUPERINTENDENT WILL BE RESPONSIBLE FOR DAILY INSPECTIONS, MAINTENANCE, AND REPAIR ACTIVITIES.



LEGEND

- PROPERTY LINE
- SILT SOXX WITH EMBEDDED SILT FENCE
- EXISTING TREE TO BE PROTECT DURING CONSTRUCTION
- EXISTING TREE TO BE REMOVEI
- CONSTRUCTION ENTRANCE
- CATCH BASIN SILT SACK

CONSTRUCTION SEQUENCE

1. CONSTRUCT TEMPORARY AND PERMANENT EROSION CONTROL FACILITIES. EROSION CONTROL FACILITIES SHALL BE INSTALLED PRIOR TO ANY EARTHMOVING.
2. CLEAR CUT, DEMOLISH, AND DISPOSE OF EXISTING SITE ELEMENTS NOT TO REMAIN.
3. GRADE AND GRAVEL ALL PAVED AREAS. ALL PROPOSED PAVED AREAS SHALL BE STABILIZED IMMEDIATELY AFTER GRADING.
4. BEGIN ALL PERMANENT AND TEMPORARY SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED AND MULCHED IMMEDIATELY AFTER THEIR CONSTRUCTION.
5. DAILY, OR AS REQUIRED, CONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, SILT FENCES; MULCH AND SEED AS REQUIRED.
6. FINISH PAVING ALL HARD SURFACE AREAS.
7. INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES.
8. COMPLETE PERMANENT SEEDING AND LANDSCAPING.
9. REMOVE TEMPORARY EROSION CONTROL MEASURES.
10. THE CONSTRUCTION SEQUENCE SHALL BE CONFINED TO THE LIMIT OF GRADING AS SHOWN ON THE DRAWINGS.
11. UPON COMPLETION OF CONSTRUCTION THE OWNER SHALL AGREE TO MAINTAIN AND CLEAN ALL DRAINAGE STRUCTURES ON A YEARLY BASIS.

COMMONWEALTH OF MASSACHUSETTS
IMAD A ZREIN
CIVIL
NO. 37231
REGISTERED PROFESSIONAL ENGINEER

DZI
Land Planning, Civil Engineering, Landscape Architecture
Po Box 307
Foxborough, MA
www.develliszrein.com
tel. 508.473.4114
DeVellis Zrein Inc.

SEDIMENTATION AND EROSION CONTROL PLAN

SCALE:	1" = 40'
JOB:	2G1S-463
FILE:	
DRAWN:	IAZ
CHECKED:	
DATE:	09.16.22

SP-1