NOI PERMIT APPLICATION

24-inch Culvert Replacement

Near 29 South Ferry Road
Montague, MA

May 2nd, 2022

Prepared by:
SVE Associates
439 West River Road
Brattleboro, VT 05301
802-257-0561

SVE

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SVE PR# G2051

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

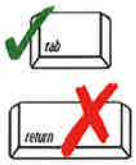
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

City/Town

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.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

South Ferry Road	Montague	01376
a. Street Address	b. City/Town	c. Zip Code

Latitude and Longitude:

42.54382	72.54357
d. Latitude	e. Longitude

39	N/A
f. Assessors Map/Plat Number	g. Parcel /Lot Number

2. Applicant:

Walter	Ramsey
a. First Name	b. Last Name

Town of Montague
c. Organization

1 Avenue A
d. Street Address

Turners Falls	MA	01376
e. City/Town	f. State	g. Zip Code

(413)863-3200		planner@montague-ma.gov
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

Walter	Ramsey
a. First Name	b. Last Name

Town of Montague
c. Organization

1 Avenue A
d. Street Address

Turners Falls	MA	01376
e. City/Town	f. State	g. Zip Code

(413)863-3200		planner@montague-ma.gov
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

Anthony	Wonseski
a. First Name	b. Last Name

SVE Associates
c. Company

439 West River Road
d. Street Address

Brattleboro	VT	05302
e. City/Town	f. State	g. Zip Code

(802)257-0561		twonseski@sveassoc.com
h. Phone Number	i. Fax Number	j. Email address

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

0	0	0
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid

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A. General Information (continued)

6. General Project Description:

Replacement of a 24 inch culvert with an 8'x5' concrete box culvert at South Ferry Road

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ___ Single Family Home
2. ___ Residential Subdivision
3. ___ Commercial/Industrial
4. ___ Dock/Pier
5. ___ Utilities
6. ___ Coastal engineering Structure
7. ___ Agriculture (e.g., cranberries, forestry)
8. X Transportation
9. ___ Other

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

1. X Yes ___ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

310 CMR 10.53 (3)(i)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

N/A

a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

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

1. ___ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. X Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

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

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ___ Bank	65 1. linear feet	130 2. linear feet
b. ___ Bordering Vegetated Wetland	754 1. square feet	869 2. square feet
c. ___ Land Under Waterbodies and Waterways	202 1. square feet	487 2. square feet
	3. cubic yards dredged	

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
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	Tributary to Saw Mill River 1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

___ 25 ft. - Designated Densely Developed Areas only

___ 100 ft. - New agricultural projects only

X 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: 4,473 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.
4,473	4,473	0

5. Has an alternatives analysis been done and is it attached to this NOI? ___ Yes X No

6. Was the lot where the activity is proposed created prior to August 1, 1996? X Yes ___ No

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

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.

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

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

	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 Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ___	Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ___	Coastal Dunes	1. square feet	2. cubic yards dune nourishment

		Size of Proposed Alteration	Proposed Replacement (if any)
f. ___	Coastal Banks	1. linear feet	
g. ___	Rocky Intertidal Shores	1. square feet	
h. ___	Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
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
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 enter the additional amount here.

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

5. X Project Involves Stream Crossings

a. number of new stream crossings | b. number of replacement stream crossings: One

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C. Other Applicable Standards and Requirements

___ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

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 and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. X 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

   MassMapper
   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

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

         (a) within wetland Resource Area — 1,027 percentage/acreage

         (b) outside Resource Area — 3,446 percentage/acreage

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

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

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

   (b) X Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.
** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

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C. Other Applicable Standards and Requirements (cont'd)

(c) X MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" 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

(f) 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, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; 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 # 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.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. X Not applicable – project is in inland resource area only b. ___ Yes ___ No

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

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

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project 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.

c. ___ Is this an aquaculture project? d. ___ Yes ___ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

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

   a. ___ Yes X No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. 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 X No

6. 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 X No

7. 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. X A portion of the site constitutes redevelopment

      3. ___ Proprietary BMPs are included in the Stormwater Management System.

   b. X No. Check why the project is exempt:

      1. ___ Single-family house

      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

___ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

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.

1. X 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. X 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.

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D. Additional Information (cont'd)

3. X 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. X List the titles and dates for all plans and other materials submitted with this NOI.

South Ferry Road Culvert Replacement
a. Plan Title

SVE Associates
b. Prepared By

Anthony Wonseski Jr., P.E
c. Signed and Stamped by

April 25, 2022
d. Final Revision Date

Varies
e. Scale

f. Additional Plan or Document Title

g. Date

5. — If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. X 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. X Attach NOI Wetland Fee Transmittal Form

9. — Attach Stormwater Report, if needed.

E. Fees

1. X 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. Payor name on check: First Name

7. Payor name on check: Last Name

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

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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.

1. Signature of Applicant	2. Date
3. Signature of Property Owner (if different)	4. Date
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 any part of Section C, Item 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.

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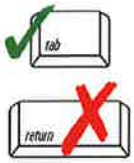
NOI Wetland Fee Transmittal Form

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

A. Applicant Information

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



1. Location of Project:

South Ferry Road	Montague
a. Street Address	b. City/Town
N/A	N/A
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Walter	Ramsey
a. First Name	b. Last Name

Town of Montague
c. Organization

1 Avenue A
d. Mailing Address

Montague	MA	01376
e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name

c. Organization

d. Mailing Address

e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

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B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee: 0
a. Total Fee from Step 5

State share of filing Fee: _____
b. 1/2 Total Fee **less** $12.50

City/Town share of filling Fee: _____
c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Existing Conditions

The 24-inch concrete culvert is located near 29 South Ferry Road in the town of Montague, MA. Its location is immediately east of the Wills Ferry Road and South Ferry Road intersection. South Ferry Road is a rural country road that is paved and approximately 16-feet wide at the vicinity of the culvert. The area consists of single-family residency and agricultural fields. The existing 24-inch culvert and stone headwalls appear to be in relatively good condition. The concerns relating to this culvert is that it appears to be undersized and does not have the capacity to convey runoff with out over topping South Ferry Road. The owner of 29 South Ferry Road has stated that his basement has started to get wet which historically has not been the case. A reason for this condition may be that there was improvement work done to Greenfield Road recently which is up stream from the location and most likely improved drainage allowing additional flow to drain without constriction to this location causing this culvert to fail from a performance standpoint.

Preliminary Data Collection

1. Wetland Resource Delineation

Wendell Wetland Services visited the site on November 3rd, 2020 to delineate Wetland Resources in the vicinity of the Culvert. See attached report.
Wetland Resources identified at the project location included: Bank Bordering Vegetated Wetlands; Land Under a Waterway; and River Front Resource Area.

2. Natural Heritage and Endangered Species Program (MESA)

The area south of South Ferry Road is located within priority habitats of rare species.

3. Topographic Survey

SVE Associates performed a Topographic and Detail Survey of the project area. Significant features, grades and wetland resources were located in order to create a base plan for elevation and design purposes.

4. Flood Plain

The culvert is located relatively close to the Sawmill River. Review of available FEMA mapping indicates the special Hazard Flood Zone A is located on the south side of South Ferry Road and the perennial stream associated with the culvert is located in Zone B.

5. Soils and Bed Materials

According to the Natural Resource Conservation Services (NRCS) web soil survey, soils at the location of the culvert consists of Raynham Silt loam and Windsor Loamy sand. These are two distinctly different classifications with significantly different hydrological characteristics. The bad material at the culvert is gravel with surface stones ranging from ½-inch to 2-inch in size with subsurface of sand and gravel. See attached photo. Therefore, we would expect that the subsurface soils at the location to be more of the Windsor Soils.

Hydrology/Hydraulics Summary

Hydrology information was detailed from stream stats and calculated using Hydro Cad software, version 10.10-45.

Hydrology	Stream Stats	Hydro Cad
Basic Area	0.37 Sq. Miles 238.6 Acres	0.29 Sq. Miles 186.0 Acres
Basin Slope	0.939 %	1.2%
Q2/50% Flood	17.1 CFS.	3.62 CFS.
Q10/10% Flood	38.6 CFS.	16.7 CFS.
Q100/1% Flood	76.8 CFS.	72.0 CFS.

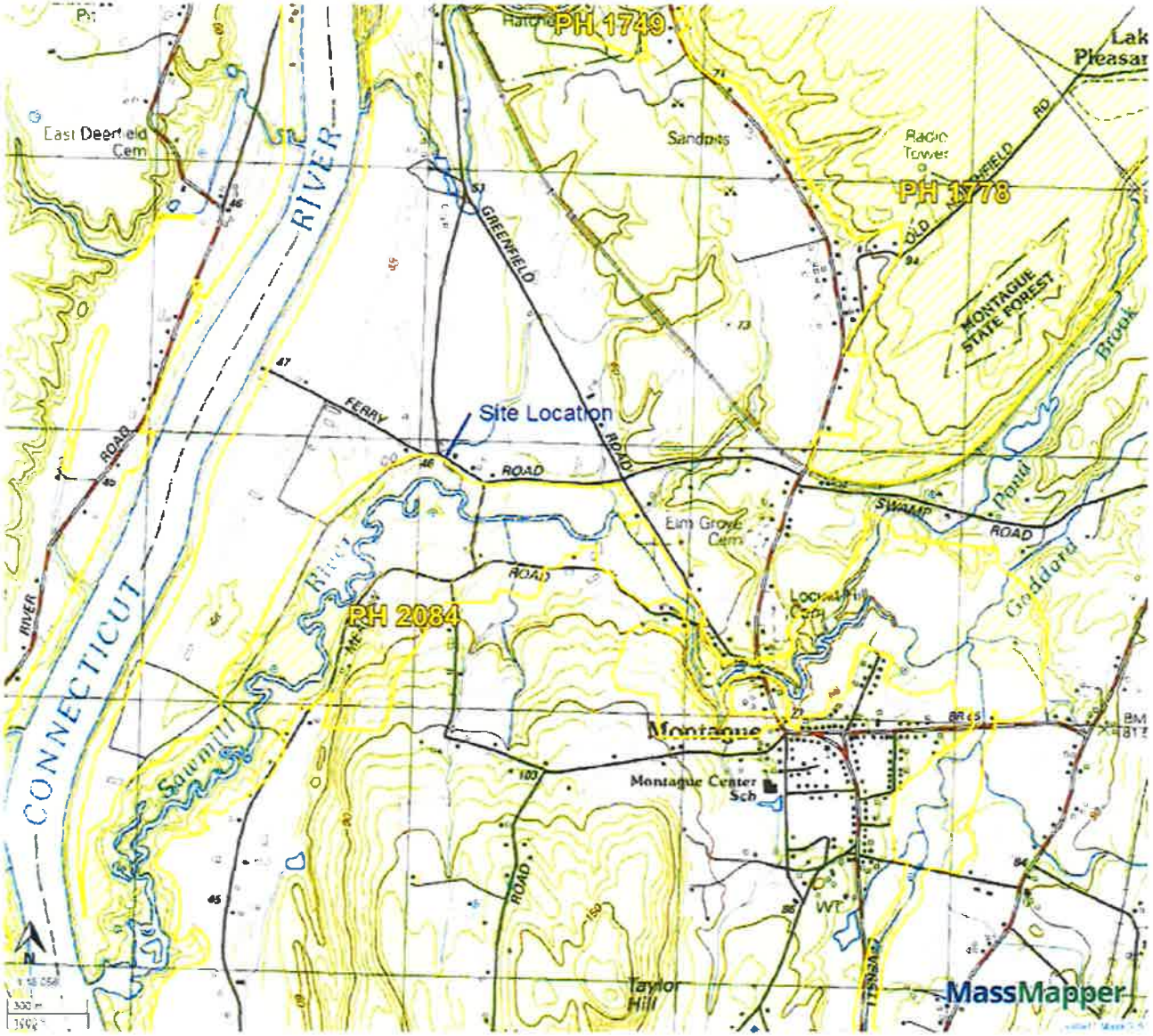
Hydraulics	Headwater Depths Q2	Q10	Q100
Ex. 24" Concrete	136.8	138.2	139.8*
8' x 3' Reinforced Concrete Box	136.1	136.6	138.0

*Flow tops South Ferry Road as witnessed by abutter to culvert. Edge road elevation 139.3 +/-

Channel Summary Data Table

	Reference Reach	Existing Structure	Proposed Replacement
Structure Type		24-Inch Concrete Culvert	8′ x 5′ RC Box Culvert
Estimated Channel Bankfull width (feet)	7′		
Structure Span (feet)		2′	8′
Structure Span (% of Channel Bankfull Width)		28.5%	114.2%
Estimated Channel Bankfull Depth (feet)	2.4′		
Structure Rise (feet)		2′	3′
Structure Rise (% of Channel Bankfull Depth)		83.3%	125%
Structure Length (feet)		32′	32′
Openness Ratio		.10	0.75
Embeddedness Depth (feet)		0′	2′
Slope	0.120	0.015	0.01
Approach Angle/Skew to Stream Centerline		0	0
Dominate Channel Bed Particle Size (mm)	25.4		Same
Low Flow Channel Width (feet)	5′		5′
Low Flow Channel Depth (feet)	0.5′		0.5′

29 South Ferry Road



Potential Vernal Pools

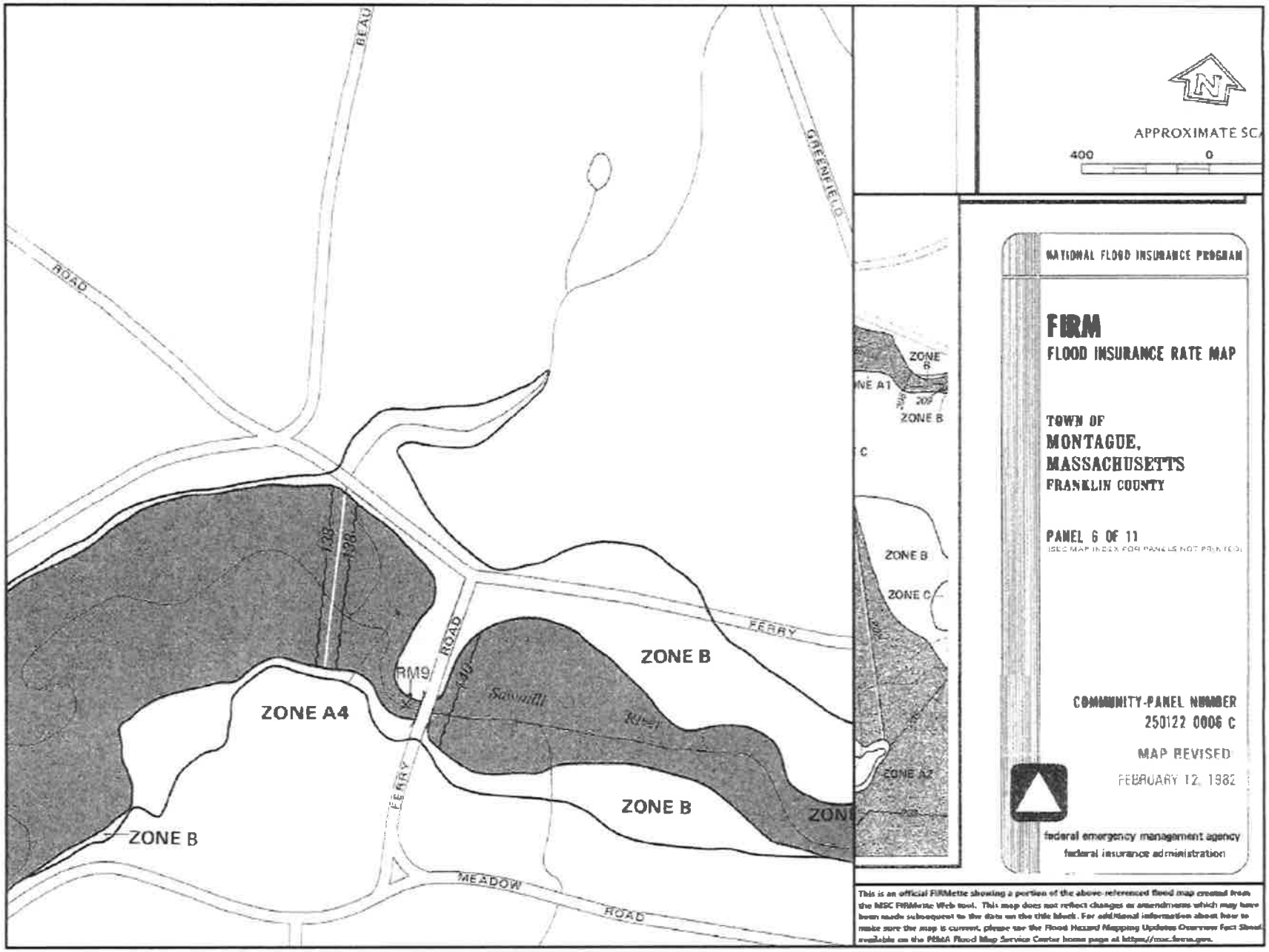
NHESP Priority Habitats of Rare Species

NHESP Estimated Habitats of Rare Wildlife

NHESP Certified Vernal Pools

USGS Topographic Maps

Property Tax Parcels



This is an official FIRMette showing a portion of the above-referenced flood map created from the NFIC FIRMette Web tool. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For additional information about how to make sure the map is current, please see the Flood Hazard Mapping Updates Overview Fact Sheet available on the FEMA Flood Map Service Center home page at https://msc.fema.gov.

Upstream View from Culvert

24″ Culvert Inlet

Downstream View from Culvert

24" Culvert Outlet

Bed Material

SOUTH FERRY ROAD CULVERT REPLACEMENT

PREPARED FOR:

TOWN OF MONTAGUE

1 AVENUE A
MONTAGUE MA 01376
413.863.3200

PREPARED BY:

SVE

Engineering
Planning
Landscape Architecture
Surveying

SVE Associates
P.O. Box 1818
439 West River Road
Brattleboro, VT 05302
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ANTHONY WONSIEWSKI JR
R.C.E. NUMBER 46615

DATE

G2051
21-APR-22
CULVERT REPLACEMENT

NOTES

GENERAL

1. APPROVAL OF THESE PLANS BY THE CITY/TOWN ENGINEER DOES NOT AUTHORIZE ANY WORK TO BE PERFORMED UNTIL A PERMIT/A NOTICE TO PROCEED HAS BEEN ISSUED.

2. THE APPROVAL OF THIS PLAN OR ISSUANCE OF A PERMIT BY THE CITY/TOWN OF **MONTAGUE** DOES NOT AUTHORIZE THE SUBDIVIDER, OWNER AND CONTRACTOR TO VIOLATE ANY FEDERAL, STATE OR LOCAL LAWS, ORDINANCES, REGULATIONS, OR POLICIES. ALL IMPROVEMENTS (I.E. SEWER, WATER, DRAINAGE, ROAD, ETC.) SHALL CONFORM TO THE CITY/TOWN OF **MONTAGUE** CONSTRUCTION STANDARD SPECIFICATIONS AND DETAILS. ALL WORK MUST BE INSPECTED AND APPROVED BY THE DEPARTMENT OF PUBLIC WORKS PRIOR TO FINAL ACCEPTANCE.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SURVEY MONUMENTS AND/OR VERTICAL CONTROL BENCHMARKS WHICH ARE DISTURBED OR DESTROYED BY CONSTRUCTION. A LAND SURVEYOR MUST FIELD LOCATE, REFERENCE, AND/OR PRESERVE ALL HISTORICAL OR CONTROLLING MONUMENTS PRIOR TO ANY EARTHWORK. IF DESTROYED, A MASSACHUSETTS LICENSED LAND SURVEYOR SHALL REPLACE SUCH MONUMENTS WITH APPROPRIATE MONUMENTS AT NO COST TO THE OWNER, SUBDIVIDER AND/OR ENGINEER.

4. CONTRACTOR SHALL IMPLEMENT AN EROSION AND SEDIMENT CONTROL PROGRAM DURING THE PROJECT GRADING AND/OR CONSTRUCTION ACTIVITIES. THE PROGRAM SHALL MEET ALL APPLICABLE REQUIREMENTS OF THE STATE STORM WATER MANAGEMENT PLAN AND THE GENERAL PERMIT FOR CONSTRUCTION ACTIVITIES NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES).

5. PUBLIC IMPROVEMENT SUBJECT TO DESUETUDE OR DAMAGE: IF REPAIR OR REPLACEMENT OF SUCH PUBLIC IMPROVEMENTS IS REQUIRED, THE OWNER SHALL OBTAIN THE REQUIRED PERMITS FOR WORK IN THE PUBLIC RIGHT-OF-WAY, SATISFACTORY TO THE PERMIT-ISSUING AUTHORITY.

6. PRIOR TO ANY DISTURBANCE TO THE SITE, EXCLUDING UTILITY MARK-OUTS AND SURVEYING, THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR A PRE-CONSTRUCTION MEETING WITH THE CITY/TOWN OF **MONTAGUE** AND SVE ASSOCIATES.

7. DEVIATIONS FROM THESE PLANS WILL NOT BE ALLOWED UNLESS A CONSTRUCTION CHANGE IS APPROVED BY THE CITY/TOWN ENGINEER AND SVE ASSOCIATES.

8. CONTRACTOR SHALL BE AWARE THAT THE UTILITIES SHOWN ARE APPROXIMATE AND ARE BASED ON AVAILABLE INFORMATION. OTHER UNKNOWN UTILITIES MAY LIKELY BE PRESENT THAT ARE NOT SHOWN ON THE PLAN. THE CONTRACTOR SHALL CONTACT AT LEAST 72 HOURS PRIOR TO CONSTRUCTION: DIG SAFE, CITY/TOWN OF **MONTAGUE** PUBLIC WORKS DEPARTMENT, ELECTRIC AND TELEPHONE UTILITY SERVICE PROVIDER TO VERIFY THE LOCATIONS OF EXISTING UTILITIES PRIOR STARTING CONSTRUCTION. THE CONTRACTOR IS CAUTIONED TO PROCEED WITH CARE.

9. THE CONTRACTOR IS EXPECTED TO BE AWARE OF AND COMPLY WITH ALL PERMITS AND PERMIT CONDITIONS ASSOCIATED WITH THE PROJECT.

10. ALL TRENCHING, EXCAVATION, SHEETING, SHORING, ETC. SHALL COMPLY WITH THE MOST CURRENT OSHA REGULATIONS.

11. CONTRACTOR SHALL VERIFY INVERT ELEVATIONS OF ALL PIPES AND STRUCTURES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY SVE ASSOCIATES IF FIELD CONDITIONS VARY FROM THAT SHOWN ON THE PLAN(S).

12. IN CASE OF CONFLICTS BETWEEN SPECIFICATION, THE MOST STRINGENT INTERPRETATION OF THE PLANS, SPECIFICATIONS, LOCAL OR STATE REGULATION, OR PERMIT CONDITIONS SHALL APPLY.

13. CONTRACTOR WILL BE RESPONSIBLE FOR ALL CONSTRUCTION LAYOUT. LAYOUT SHALL BE PERFORMED BY A LICENSED SURVEYOR OR LICENSED ENGINEER.

14. CONTRACTOR SHALL PROVIDE A FULL SET OF AS-BUILT DRAWING TO THE OWNER WITH SWING TIE COORDINATES, LOCATING ALL VALVES, FITTINGS, CORPORATIONS, STRUCTURES, PIPES, ETC. THE AS-BUILTS BUILT SHALL INDICATE MATERIALS, PIPE LENGTHS INSTALLED, ALL INVERTS, AND ALL STRUCTURE ELEVATIONS. ACCEPTANCE OF THE WORK IS SUBJECT TO ACCEPTANCE OF THE AS-BUILTS BY THE ENGINEER AND OWNER.

15. ALL SURFACES SHALL BE GRADED TO DRAIN.

16. THE CONTRACTOR SHALL RESTORE ALL DISTURBED SURFACES TO THEIR ORIGINAL CONDITION OR BETTER AND EXISTING PIPES AND STRUCTURES SHALL BE CLEANED. ALL SIGNS SHALL BE REPLACED. ALL DAMAGED VEGETATION REPLACED.

EROSION AND SEDIMENT CONTROL

1. PROVIDE GRAVEL BAG CHECKING IMMEDIATELY UPSTREAM OF DRAINAGE INLETS AS INDICATED ON DETAILS.

2. THE CONTRACTOR OR QUALIFIED PERSON SHALL BE RESPONSIBLE FOR CLEANUP OF SILT AND MUD ON ADJACENT STREET(S) AND STORM DRAIN SYSTEM DUE TO CONSTRUCTION ACTIVITY.

3. THE CONTRACTOR OR QUALIFIED PERSON SHALL CHECK AND MAINTAIN ALL LINED AND UNLINED DITCHES AFTER EACH RAINFALL.

4. THE CONTRACTOR SHALL REMOVE SILT AND DEBRIS AFTER EACH MAJOR RAINFALL (0.5" OR GREATER).

5. EQUIPMENT AND WORKERS FOR EMERGENCY WORK SHALL BE MADE AVAILABLE AT ALL TIMES. ALL NECESSARY MATERIALS SHALL BE STOCKPILED ON SITE AT CONVENIENT LOCATIONS TO FACILITATE RAPID CONSTRUCTION OF TEMPORARY DEVICES WHEN RAIN IS IMMINENT.

6. THE CONTRACTOR SHALL RESTORE ALL EROSION/SEDIMENT CONTROL DEVICES TO WORKING ORDER TO THE SATISFACTION OF THE **MONTAGUE** CONSERVATION COMMISSION.

7. THE CONTRACTOR SHALL INSTALL ADDITIONAL EROSION/SEDIMENT CONTROL MEASURES AS MAY BE REQUIRED BY THE CITY/TOWN ENGINEER DUE TO UNCOMPLETED GRADING OPERATIONS OR UNFORESEEN CIRCUMSTANCES WHICH MAY ARISE.

8. THE CONTRACTOR SHALL BE RESPONSIBLE AND SHALL TAKE NECESSARY PRECAUTIONS TO PREVENT PUBLIC TRESPASS ONTO AREAS WHERE IMPOUNDED WATERS CREATE A HAZARDOUS CONDITION.

9. GRADED AREAS AROUND THE PROJECT PERIMETER MUST DRAIN AWAY FROM THE FACE OF THE SLOPE AT THE CONCLUSION OF EACH WORKING DAY.

10. ALL REMOVABLE PROTECTIVE DEVICES SHOWN SHALL BE IN PLACE AT THE END OF EACH WORKING DAY WHEN RAIN IS IMMINENT.

11. THE CONTRACTOR SHALL ONLY GRADE, INCLUDING CLEARING AND GRUBBING FOR THE AREAS FOR WHICH THE CONTRACTOR OR QUALIFIED PERSON CAN PROVIDE EROSION/SEDIMENT CONTROL MEASURES.

12. DISCHARGING SEDIMENT-LADEN WATER INTO ANY RECEIVING WATER OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.

13. SEDIMENT CONTROL BMP'S ARE REQUIRED AT APPROPRIATE LOCATIONS ALONG THE SITE PERIMETER AND AT ALL OPERATIONAL INTERNAL INLETS TO THE STORM DRAIN SYSTEM AT ALL TIMES.

14. THE OUTLETS OF ALL SEDIMENT BASINS, TRAPS, AND LOCATIONS OF ARTIFICIALLY CONCENTRATED FLOW SHALL BE PROVIDED WITH OUTLET PROTECTION TO PREVENT EROSION AND SCOUR.

15. INSPECTIONS BY THE CONTRACTOR SHALL BE PERFORMED BEFORE AND AFTER STORM EVENTS AND ONCE EACH 24-HOUR PERIOD DURING EXTENDED STORM EVENTS TO IDENTIFY BMP EFFECTIVENESS AND IMPLEMENT REPAIRS OR DESIGN CHANGES AS SOON AS FEASIBLE, DEPENDING ON FIELD CONDITIONS. EQUIPMENT, MATERIALS, AND WORKERS MUST BE AVAILABLE FOR RAPID RESPONSE TO FAILURES AND EMERGENCIES. ALL CORRECTIVE MAINTENANCE TO BMP'S SHALL BE PERFORMED AS SOON AS POSSIBLE AFTER THE CONCLUSION OF EACH STORM, DEPENDING UPON WORKER SAFETY.

16. A CONCRETE WASHOUT SHALL BE INSTALLED FOR ALL PROJECTS THAT PROPOSE CONCRETE TO BE MIXED ON SITE OR DELIVERED FROM A BATCH PLANT. THE CONCRETE WASHOUT SHALL BE LOCATED A MINIMUM OF 50' FROM ANY DRAINAGE INFRASTRUCTURE OR NATURAL DRAINAGE FEATURES OR WATER BODIES AND INCORPORATE AN IMPERMEABLE LINER (6 MIL MIN.) TO CONTAIN THE REQUIRED VOLUME. ALL DRIED CONCRETE WASTE SHALL BE BROKEN INTO MANAGEABLE PIECES AND DISPOSED OF IN A PROPER MANNER.

NOTES

WORK TO BE DONE

THE IMPROVEMENTS CONSIST OF THE FOLLOWING WORK TO BE DONE ACCORDING TO THESE PLANS AND THE SPECIFICATIONS AND STANDARD DRAWINGS OF THE CITY/TOWN OF **MONTAGUE**.

DIG SAFE

OTHER UNKNOWN UTILITIES MAY LIKELY BE PRESENT THAT ARE NOT SHOWN ON THE PLAN.
THE CONTRACTOR SHALL CONTACT (1-888-DIG-SAFE) AT LEAST 72 HOURS PRIOR TO CONSTRUCTION.

STANDARD SPECIFICATIONS

1. STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION [illegible] EDITION.
2. MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) FOR STREETS AND HIGHWAYS [illegible] EDITION.
3. STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, MASSACHUSETTS HIGHWAY DEPARTMENT CURRENT EDITION.
4. STANDARD SPECIFICATIONS FOR CITY / TOWN OF **MONTAGUE**.

BENCHMARK DATA

(2) BENCHMARKS EXIST ON THE SITE. THEY ARE BASED ON AN **ASSUMED DATUM**.

BENCHMARK #1
LOCATION DESCRIPTION: SPIKE SET IN UTILITY POLE 8B/5 NORTHWEST OF CULVERT IN GRASS ISLAND AREA AT THE INTERSECTION OF SOUTH FERRY ROAD AND WILLS FERRY ROAD.
POINT DESCRIPTION: TBM SPIKE IN UP 8B/5 ELEVATION: 142.37

BENCHMARK #2
LOCATION DESCRIPTION: SPIKE IN UTILITY POLE LOCATED AT END OF DRIVEWAY TO HOUSE #29 ON LEFT SIDE.
POINT DESCRIPTION: TBM SPIKE IN UP WMECO 13 NET&T
ELEVATION: 140.[illegible]

TOPOGRAPHY AND BOUNDARY INFORMATION

EXISTING TOPOGRAPHY IS BASED ON AN ASSUMED DATUM SURVEYED BY SVE ASSOCIATES IN NOVEMBER AND DECEMBER OF 2021.

EXISTING PROPERTY LINE INFORMATION IS FROM GIS RESEARCH DATA.

WETLAND DELINEATION

EXISTING WETLAND DELINEATION WAS PERFORMED BY WENDELL WETLAND SERVICES AND SURVEYED BY SVE ASSOCIATES NOVEMBER, 2021.

FLOOD PLAIN INFORMATION

PROPERTY AS SHOWN LIES WITHIN FLOOD INSURANCE RATE MAP REFERENCED DIRECTLY BELOW AS PREPARED BY THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA).

NUMBER: [illegible] DATED: FEBRUARY [illegible]

THE SUBJECT PROPERTY IS LOCATED WITHIN ZONE "[illegible]"

GENERAL PROPERTY INFORMATION

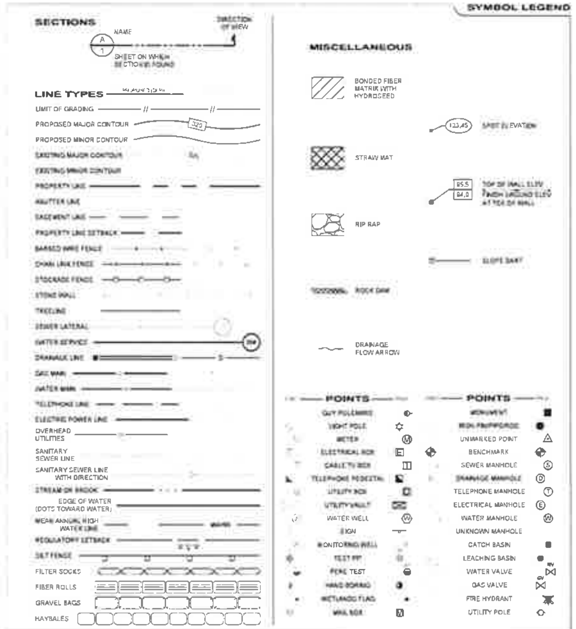
OWNER: TOWN OF MONTAGUE
SOUTH FERRY ROAD
MONTAGUE, MA 01376

ASSESSOR MAP INFORMATION: [illegible]

ABUTTERS LIST:

OWNER	PARCEL ID
1. [illegible]	39-0-042
2. [illegible]	39-0-043
3. [illegible]	39-0-045

SYMBOL LEGEND



ABBREVIATIONS

IP	IRON PIPE / PIN
GMON	GRANITE MONUMENT
CMON	CONCRETE MONUMENT
MHB	MASSACHUSETTS HIGHWAY BOUND
DH	DRILL HOLE
P.I.L.	PIN IN LEAD
PCB	PROPOSED CATCH BASIN
PLB	PROPOSED LEACHING BASIN
PDMH	PROPOSED DRAINAGE MANHOLE
PSMH	PROPOSED SANITARY SEWER MANHOLE
PTMH	PROPOSED TELECOMM MANHOLE
PEMH	PROPOSED ELECTRIC MANHOLE
WM	WATER MAIN
GAS	GAS MAIN / LINE
SS	SANITARY SEWER
STM	STORM / DRAINAGE SEWER
OHD	OVERHEAD
UGD	UNDERGROUND
CB	EXISTING CATCH BASIN
LB	EXISTING LEACHING BASIN
DMH	EXISTING DRAINAGE MANHOLE
SMH	EXISTING SEWER MANHOLE
TMH	EXISTING TELECOMM MANHOLE
EMH	EXISTING ELECTRIC MANHOLE
MH	UNKNOWN MANHOLE
INV / IF	INVERT / INVERT ELEVATION
TG	TOP OF GRATE ELEVATION
RIM	STRUCTURE RIM ELEVATION
FL	FLOW LINE ELEVATION
HDPE	HIGH DENSITY POLYETHYLENE PIPE
RCP	REINFORCED CONCRETE PIPE
PVC	POLYVINYL CHLORIDE PIPE
CMP	CORRUGATED METAL PIPE
ACCMP	ASPHALT COATED CORRUGATED METAL PIPE
VC	VITRIFOUS CLAY PIPE
AC	ASBESTOS CONCRETE PIPE (TRANSITE)
DI	DUCTILE IRON PIPE
PROP	PROPOSED
EXIST	EXISTING
CONC	CONCRETE
RET	RETAINING
ROW	RIGHT-OF-WAY
CL	CENTERLINE
EL	ELEVATION
EOP / LP	EDGE OF PAVEMENT
BB	BITUMINOUS BERM CURBING
GC	GRANITE CURBING
CC	CONCRETE CURBING
TYP	TYPICAL
N/F	NOW OR FORMERLY
WF	WOOD FRAME
TBM	TEMPORARY BENCHMARK
BM	BENCHMARK
PL	PROPERTY LINE
EASE	EASEMENT / EASEMENT LINE
SETB	PROPERTY / LOT LINE SETBACK LINE
WET	WETLAND
BVW	BORDERING VEGETATED WETLAND
RA	RIVER FRONT RESOURCE AREA
EOW	EDGE OF WATER
EOWET	EDGE OF WETLANDS
MAHW	MEAN ANNUAL HIGH WATER
WETSL	WETLAND SETBACK LINE
PT	PERCOLATION TEST SITE
TP	SOIL TEST PIT
BOR	BORING
MW	MONITOR WELL
SF	SILTFENCE
CHLF	CHAIN LINK FENCE
STOCK	STOCKADE FENCE
BWF	BARBED WIRE FENCE
STWL	STONE WALL

TABLE OF CONTENTS

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RESOURCE IMPACT CALCULATIONS — SHEET 05
STREAM CROSSING PLAN AND CONSTRUCTION NOTES — SHEET 06
CONSTRUCTION DETAILS — SHEET 07

ANTHONY WONSESKI, JR. DATE
R.C.E. NUMBER 46615

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STANDARD NOTES, LEGEND, & TABLE OF CONTENTS

S. FERRY RD CULVERT REPLACEMENT PROJECT

TOWN OF MONTAGUE
1 AVENUE A
TURNERS FALLS MA 01376

PROJ. # G2051

DATE 21-APR-22

DESIGN: AW
DRAWN: TAF
CHECKED: AW

SHEET 1/7

ANTHONY WONSEWSKI JR. DATE
R.C.E. NUMBER 45615

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EXISTING CONDITION PLAN

S. FERRY RD CULVERT REPLACEMENT PROJECT

TOWN OF MONTAGUE
MASSACHUSETTS
TURNERS FALLS, MA 01376

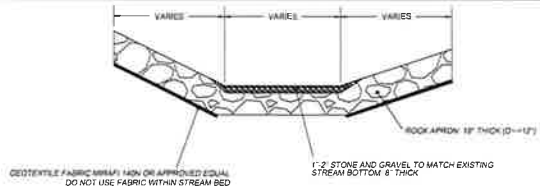
GRAPHIC SCALE 1" = 10'

PROJ. # G2051

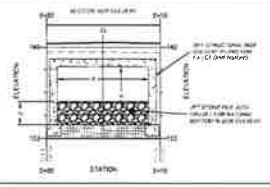
DATE 21 - APR - 22

DESIGN AW
DRAWN MJS
CHECKED AW

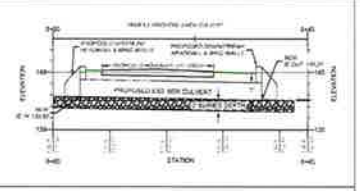
SHEET 2/7



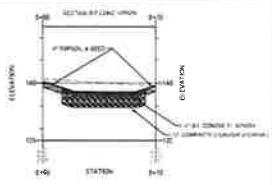
ROCK APRON & STREAM BOTTOM SECTION D-D NOT TO SCALE



TYPICAL X-SECTION OF PROPOSED CULVERT SECTION C-C

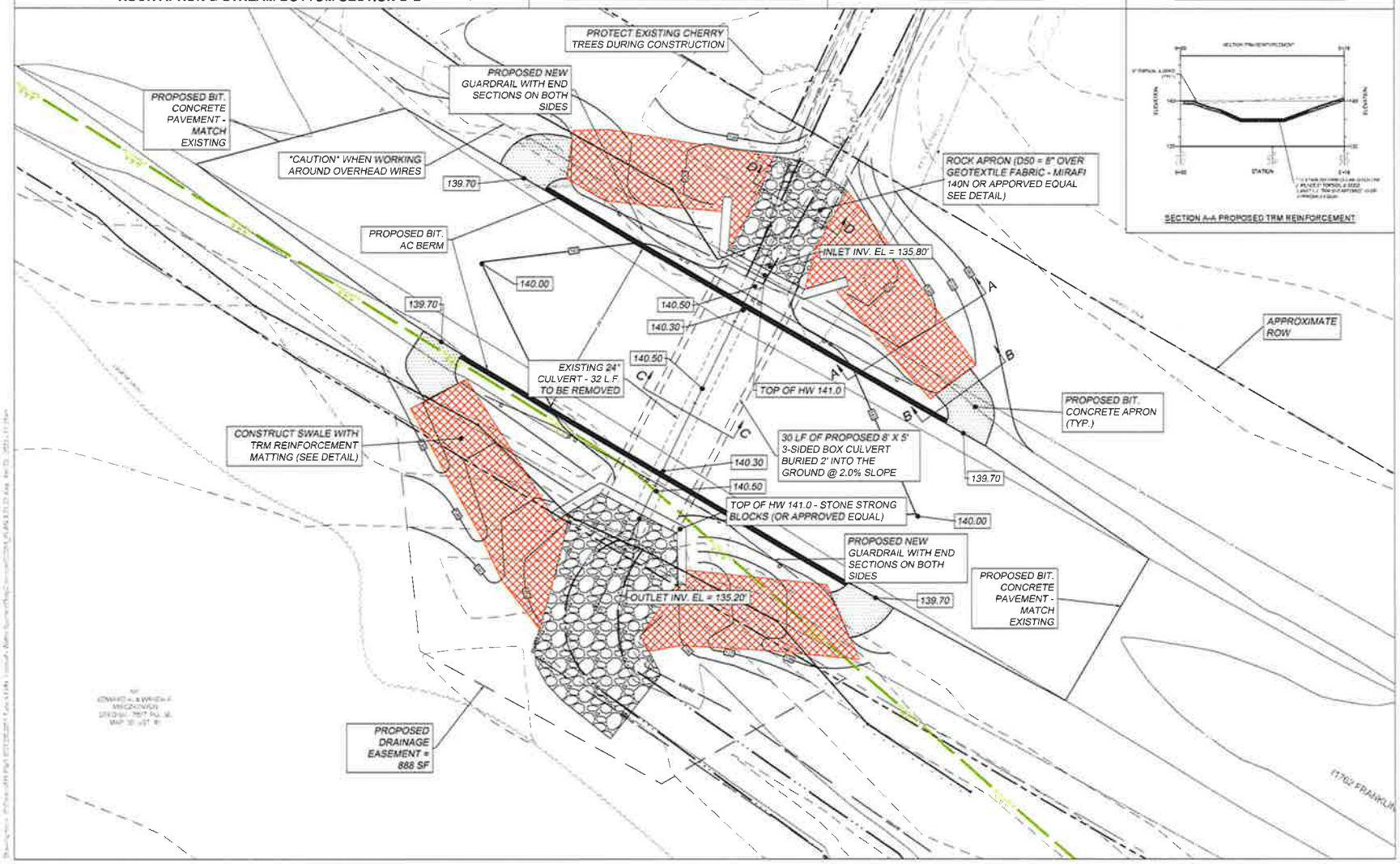


PROFILE PROPOSED CULVERT



PROPOSED BIT CONC APRON SECTION B-B

SECTION A-A PROPOSED TRM REINFORCEMENT



ANTHONY WONISESKI JR. DATE
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CULVERT PLAN

S. FERRY RD CULVERT REPLACEMENT PROJECT
TOWN OF MONTAGUE

GRAPHIC SCALE

PROJ. # 02061
DATE 21-APR-22
DESIGN AW
DRAWN TAT
CHECKED AW
SHEET 3/7

ANTHONY WONSESKI JR.
R.C.E. NUMBER 46613

DATE

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EROSION CONTROL PLAN

S. FERRY RD CULVERT REPLACEMENT PROJECT

TOWN OF MONTAGUE

GRAPHIC SCALE

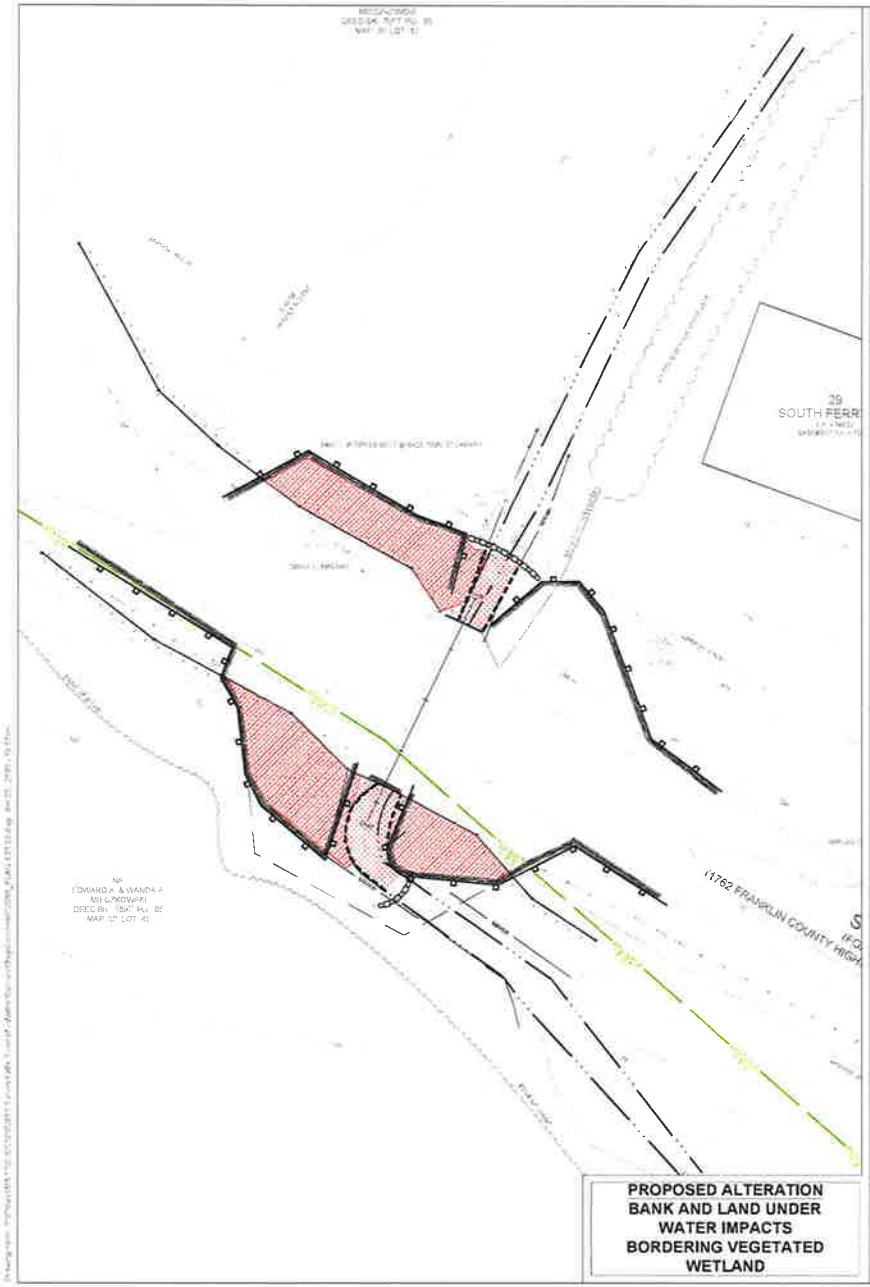
N

PROJ. # G2051

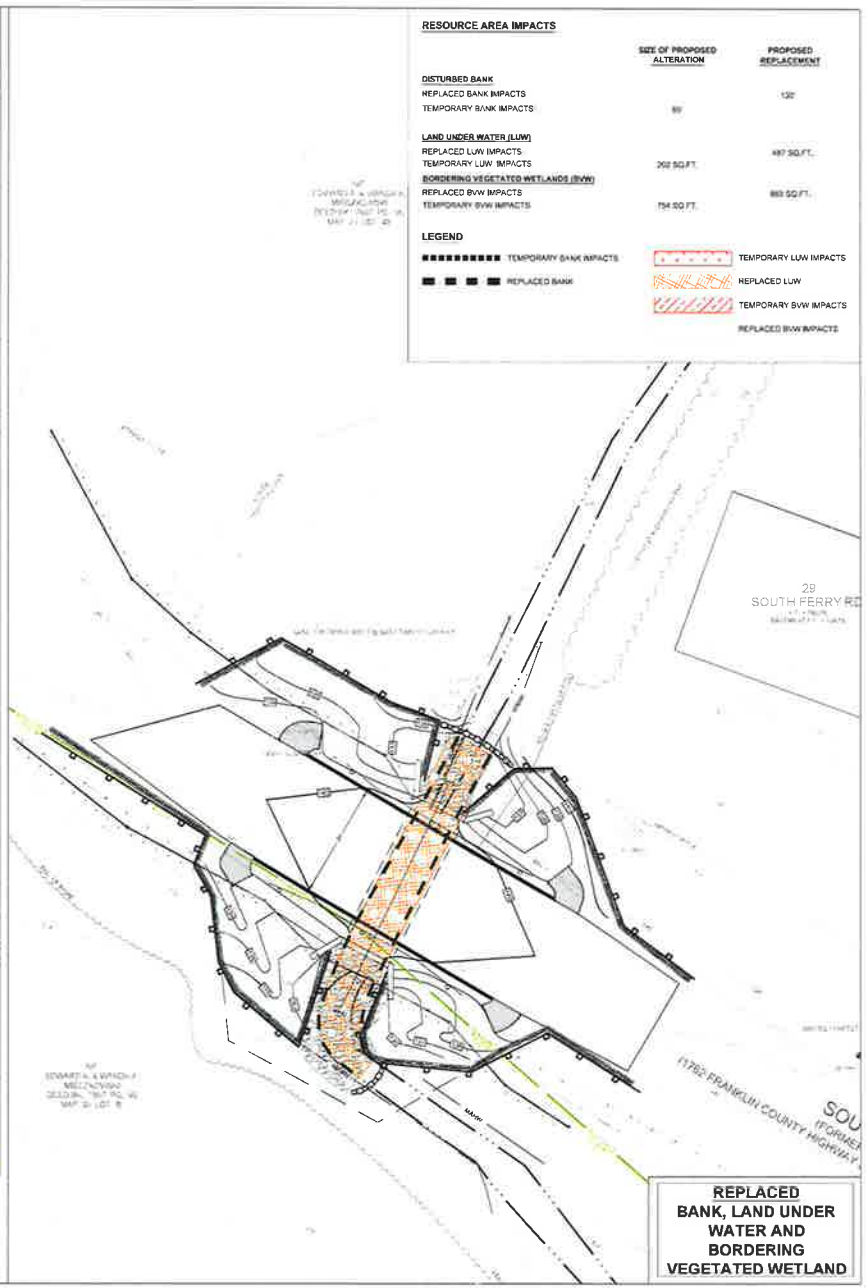
DATE 21-APR-22

DESIGN AW
DRAWN TAT
CHECKED AW

SHEET 4/7



PROPOSED ALTERATION
BANK AND LAND UNDER
WATER IMPACTS
BORDERING VEGETATED
WETLAND



REPLACED
BANK, LAND UNDER
WATER AND
BORDERING
VEGETATED WETLAND

RESOURCE AREA IMPACTS

	SIZE OF PROPOSED ALTERATION	PROPOSED REPLACEMENT
DISTURBED BANK		
REPLACED BANK IMPACTS		132
TEMPORARY BANK IMPACTS	99	
LAND UNDER WATER (LUW)		
REPLACED LUW IMPACTS		497 SQ.FT.
TEMPORARY LUW IMPACTS	202 SQ.FT.	
BORDERING VEGETATED WETLANDS (BVW)		
REPLACED BVW IMPACTS		863 SQ.FT.
TEMPORARY BVW IMPACTS	754 SQ.FT.	

LEGEND

- TEMPORARY BANK IMPACTS
- REPLACED BANK
- TEMPORARY LUW IMPACTS
- REPLACED LUW
- TEMPORARY BVW IMPACTS
- REPLACED BVW IMPACTS

ANTHONY WONSESKI JR. DATE
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RESOURCE IMPACT CALCULATIONS

S. FERRY RD CULVERT REPLACEMENT PROJECT

TOWN OF MONTAGUE

0 5 10 20
GRAPHIC SCALE

N

PROJ. # G2051
DATE 21-APR-22
DESIGN AW
DRAWN TAF
CHECKED AW
SHEET 5/7

INTERMITTENT STREAM CROSSING

CONSTRUCTION SEQUENCE

1. CONTRACTOR SHALL INSTALL EROSION CONTROL BARRIERS TO PREVENT SEDIMENTATION OF THE STREAM DURING GRADING OPERATIONS PRIOR TO VEGETATION ESTABLISHMENT.
2. CONTRACTOR TO NOTIFY CONSERVATION COMMISSION WHEN EROSION CONTROL BMP HAVE BEEN INSTALLED TO ALLOW FOR THEM TO VISIT THE SITE AND REVIEW THE BMP INSTALLATION.
3. CONTRACTOR TO BLOCK STREAM AND SET UP A SUMP PUMP TO PUMP STREAM AROUND CROSSING.
4. CONTRACTOR SHALL EXCAVATE FOR PROJ SHORO CONCRETE BOX CULVERT WITH A 24-INCH EMBEDMENT. EXCAVATED MATERIAL SHALL BE REMOVED AND STOCKPILE OUTSIDE OF THE 100-FOOT BUFFER ZONE TO THE WEST.
5. CONTRACTOR SHALL INSTALL GEOTEXTILE MATTING FOR SLOPE PROTECTION.
6. CONTRACTOR TO NOTIFY THE CONSERVATION COMMISSION WHEN THE CHANNEL HAS BEEN RESTORED FOR THEIR REVIEW AND APPROVAL.
7. THE CONTRACTOR SHALL GRADE ROAD AND REPAIR EXISTING DRIVEWAYS TO THE ELEVATIONS INDICATED ON THE APPROVED CONSTRUCTION DRAWINGS.
8. CREATED SLOPES SHALL RECEIVE A MINIMUM OF 6 INCHES OF LOAM AND SHALL BE SEEDED IN ACCORDANCE WITH MASSDOT SPECIFICATION M6.01.0 FOR SLOPES AND SHOULDER CONDITIONS.
9. CONTRACTOR TO INSTALL GUARD RAIL IN ACCORDANCE WITH APPROVED DRAWINGS.

DEWATERING CONDITIONS

IF GROUND WATER IS ENCOUNTERED DURING EXCAVATION FOR THE BOX CULVERT FOOTING AND HEAD WALLS THE CONTRACTOR SHALL GRADE THE BOTTOM OF THE EXCAVATION TO SLOPE TOWARDS THE LOW SIDE OF THE EXCAVATION AND OVER EXCAVATE AN ADDITIONAL FOOT TO CREATE A SUMP OR SMALL STONE PIT. CONTRACTOR USE SMALL CONSTRUCTION SUMP PUMP TO REMOVE GROUND WATER FROM THE EXCAVATION SO THAT A STABLE SUBGRADE IS ACHIEVED FOR FOOTING INSTALLATION. DISCHARGE FROM THE SUMP PUMP WILL BE CONNECTED TO A SILT SAC FOR TREATMENT. THE SILT SAC SHALL BE PLACED AS FAR FROM RESOURCE AREA AS PRACTICAL. SILT FENCE AND STRAW BALES SHALL BE PLACED AROUND THE LOW SITE OF THE SILT SAC TO PROVIDE ADDED PROTECTION.

GUIDELINES - REFERENCE MASSACHUSETTS RIVER AND STREAM CROSSING STANDARDS CONSTRUCTION BEST MANAGEMENT PRACTICES FOR STREAM CROSSING

- MINIMIZE THE EXTENT AND DURATION OF THE HYDROLOGICAL DISRUPTION.
- CONSIDER THE USE OF BYPASS CHANNELS TO MAINTAIN SOME RIVER AND STREAM CONTINUITY DURING CONSTRUCTION.
- USE BANDS TO PREVENT BACKWATERING OF CONSTRUCTION AREAS.
- GRADUALLY DEWATER AND REWATER RIVER AND STREAM SEGMENTS TO AVOID ABRUPT CHANGES IN STREAM FLOW.
- SALVAGE AQUATIC ORGANISM (FISH, SALAMANDERS, CRAYFISH, MUSSELS) STRANDED DURING DEWATERING.
- BIODEGRADE CLEAN DIVERSION WATER FROM SEDIMENTATION BASIN RUNOFF OR SEEPAGE WATER.
- USE ANTI-SEEP COLLARS AROUND DIVERSION PIPES.
- USE UPSTREAM SUMPS TO COLLECT GROUNDWATER AND PREVENT IT FROM ENTERING THE CONSTRUCTION SITE.
- COLLECT CONSTRUCTION DRAINAGE FROM GROUNDWATER, STORMS, AND LEAKS AND ROUTE TO REMOVE SEDIMENT.
- USE DOWNSTREAM SEDIMENT CONTROL SUMP TO COLLECT WATER THAT SEEPS OUT OF THE CONSTRUCTION AREA.
- USE FISH SCREENS AROUND THE INTAKE OF DIVERSION PIPES.
- WHEN USING DIVERSION PIPES MAKE SURE ADEQUATE PUMPING CAPACITY IS AVAILABLE TO HANDLE STORM FLOWS.
- AFTER CONSTRUCTION REMOVE COFFERDAMS DOWNSTREAM TO STREAM IN A MANNER THAT MINIMIZES INTRODUCTION OF SEDIMENT TO THE WATERWAY.

STORM WATER MANAGEMENT, EROSION AND SEDIMENT CONTROL

USE OF DOWNSTREAM SEDIMENT RETENTION POND IS STRONGLY RECOMMENDED FOR ALL PROJECTS THAT INVOLVE WORK WITHIN THE STREAMBED

- MINIMIZE BARE GROUND
- MINIMIZE IMPACTS TO RIPARIAN VEGETATION
- PREVENT EXCAVATED MATERIAL FROM RUNNING INTO WATER BODIES AND OTHER SENSITIVE AREAS
- USE APPROPRIATE SEDIMENT BARRIERS (SILT FENCE, HAY BALES, MATS, COIR LOGS OR LOW-COMPOST FILTER TUBES)
- DEWATER PRIOR TO EXCAVATION
- MANAGE AND TREAT SURFACE AND GROUNDWATER ENCOUNTERED DURING EXCAVATION WITH THE FOLLOWING
  1. SEDIMENT BASINS
  2. FABRIC, RIPRAP OR HAY BALE CURALS
  3. IRRIGATION SPRINKLERS OR DRAIN PIPES DISCHARGING INTO VEGETATED UPLAND AREAS
  4. SAND FILTER
  5. GEOTEXTILE FILTER BAGS
- TURBIDITY OF WATER 100-200 FEET DOWNSTREAM OF THE SITE SHOULD NOT BE VISIBLY GREATER THAN TURBIDITY UPSTREAM OF THE PROJECT SITE.

POLLUTION CONTROL

- WASH EQUIPMENT PRIOR TO BRINGING TO THE WORK AREA TO REMOVE LEAKED PETROLEUM PRODUCTS AND AVOID INTRODUCTION OF INVASIVE PLANTS
- TO AVOID LEAKS, REPAIR EQUIPMENT PRIOR TO CONSTRUCTION
- BE PREPARED TO USE PETROLEUM ABSORBING "BOOMS" IF NECESSARY
- LOCATE REFUELING AREAS AND HAZARDOUS MATERIAL CONTAINMENT AREAS AWAY FROM STREAMS AND OTHER SENSITIVE AREAS
- ESTABLISH APPROPRIATE AREAS FOR WASHING CONCRETE TRUCKS. PREVENT CONCRETE WASH WATER FROM ENTERING RIVERS AND STREAMS
- TAKE STEPS TO PREVENT LEAKAGE OF STOCKPILED MATERIALS INTO STREAMS OR OTHER SENSITIVE AREAS (LOCATE AWAY FROM WATER BODIES AND OTHER SENSITIVE AREAS, PROVIDE SEDIMENT BARRIERS AND TRAPS, COVER STOCKPILES DURING HEAVY RAINS)

UNITED STATES ARMY CORPS OF ENGINEERS TIME OF YEAR (TOY) RESTRICTIONS NOTE:

- WORK SHALL NOT BE CONDUCTED DURING THE TOY RESTRICTIONS FOR ANY TIDAL WATER, INCLUDING STREAMS OR ANY NON-TIDAL STREAM
  - ** TOY RESTRICTION OCT. 01 TO JUN. 30
  - ** TOY WORK WINDOW JUL. 01 TO SEP. 30
- PROJECT PROPONENTS MAY OBTAIN A WRITTEN MODIFICATION TO THE WORK WINDOWS/RESTRICTIONS IN (A) ABOVE FROM THE MassDEP OR CONSERVATION COMMISSION PROVIDED THOSE OFFICES FIRST OBTAIN A WRITTEN MODIFICATION FROM THE MA DIVISION OF FISHERIES AND WILDLIFE

CONSTRUCTION OF STREAMBED AND BANKS WITH STRUCTURES

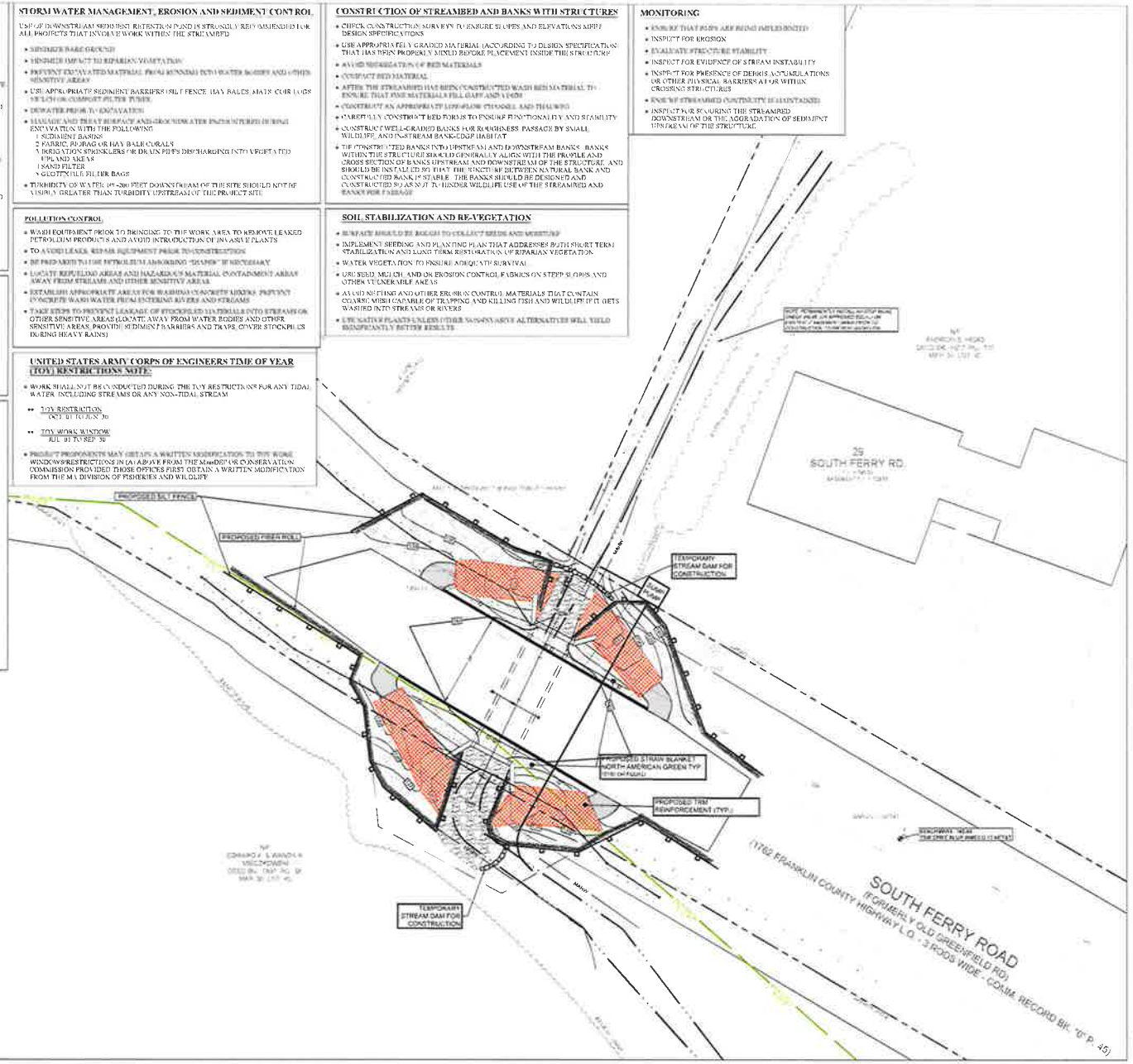
- CHECK CONSTRUCTION SURVEYS TO ENSURE SLOPES AND ELEVATIONS ARE PER DESIGN SPECIFICATIONS
- USE APPROPRIATELY GRADED MATERIAL (ACCORDING TO DESIGN SPECIFICATIONS) THAT HAS BEEN PROPERLY MIXED BEFORE PLACEMENT INSIDE THE STRUCTURE
- AVOID SEGREGATION OF BED MATERIALS
- COMPACT BED MATERIAL
- AFTER THE STREAMBED HAS BEEN CONSTRUCTED WASH BED MATERIAL TO ENSURE THAT FINE MATERIALS FILL GAPS AND VOIDS
- CONSTRUCT AN APPROPRIATE LOW-FLOW CHANNEL AND THALWEG
- CAREFULLY CONSTRUCT BED FORMS TO ENSURE FUNCTIONALITY AND STABILITY
- CONSTRUCT WELL-GRADED BANKS FOR ROUGHNESS, PASSAGE BY SMALL WILDLIFE, AND IN-STREAM BANK-EDGE HABITAT
- TIE CONSTRUCTED BANKS INTO UPSTREAM AND DOWNSTREAM BANKS. BANKS WITHIN THE STRUCTURE SHOULD GENERALLY ALIGN WITH THE PROFILE AND CROSS SECTION OF BANKS UPSTREAM AND DOWNSTREAM OF THE STRUCTURE, AND SHOULD BE INSTALLED SO THAT THE JUNCTURE BETWEEN NATURAL BANK AND CONSTRUCTED BANK IS STABLE. THE BANKS SHOULD BE DESIGNED AND CONSTRUCTED SO AS NOT TO HINDER WILDLIFE USE OF THE STREAMBED AND BANKS FOR PASSAGE.

SOIL STABILIZATION AND RE-VEGETATION

- SURFACE SHOULD BE ROUGH TO COLLECT SEEDS AND MOISTURE
- IMPLEMENT SEEDING AND PLANTING PLAN THAT ADDRESSES BOTH SHORT TERM STABILIZATION AND LONG TERM RESTORATION OF RIPARIAN VEGETATION
- WATER VEGETATION TO ENSURE ADEQUATE SURVIVAL
- USE SEED, MULCH, AND/OR EROSION CONTROL FABRICS ON STEEP SLOPES AND OTHER VULNERABLE AREAS
- AVOID SEEDING AND OTHER EROSION CONTROL MATERIALS THAT CONTAIN COARSE MESH CAPABLE OF TRAPPING AND KILLING FISH AND WILDLIFE IF IT GETS WASHED INTO STREAMS OR RIVERS
- USE NATIVE PLANTS UNLESS OTHER VARIETIES ARE ALTERNATIVES WILL YIELD SIGNIFICANTLY BETTER RESULTS

MONITORING

- ENSURE THAT PIPES ARE BEING IMPLEMENTED
- INSPECT FOR EROSION
- EVALUATE STRUCTURE STABILITY
- INSPECT FOR EVIDENCE OF STREAM INSTABILITY
- INSPECT FOR PRESENCE OF DEBRIS ACCUMULATIONS OR OTHER PHYSICAL BARRIERS AT OR WITHIN CROSSING STRUCTURES
- ENSURE STREAMBED CONTINUITY IS MAINTAINED
- INSPECT FOR SCOURING THE STREAMBED DOWNSTREAM OR THE AGGRADATION OF SEDIMENT UPSTREAM OF THE STRUCTURE.



ANTHONY WONSEWSKI JR
R.C.E. NUMBER 46615
DATE

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STREAM CROSSING PLAN & CONSTRUCTION NOTES

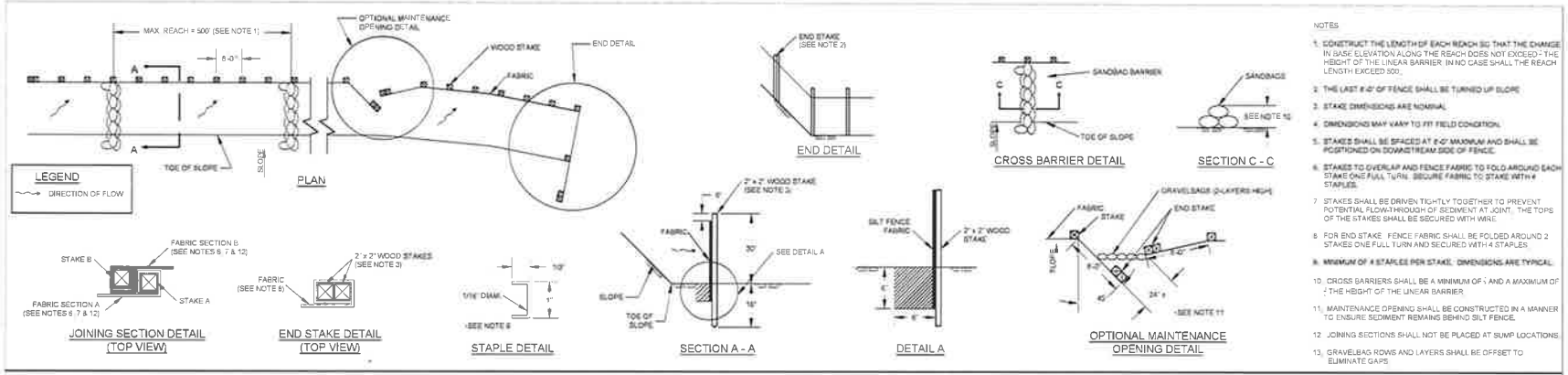
S. FERRY RD CULVERT REPLACEMENT PROJECT

TOWN OF MONTAGUE
1 AVENUE A
TURNERS FALLS, MA 01376

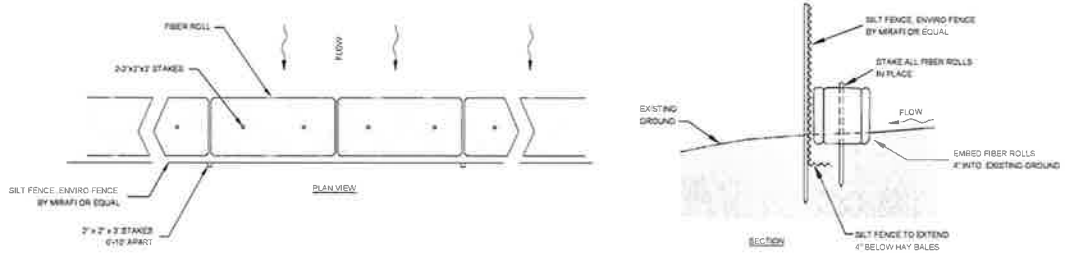
GRAPHIC SCALE 1" = 10'

N

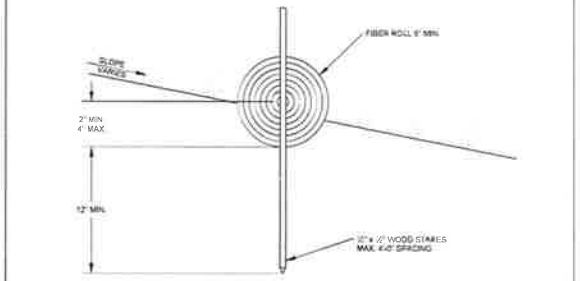
PROJ. # G2051
DATE 21-APR-22
DESIGN AW
DRAWN TAT
CHECKED AW
SHEET 6/7



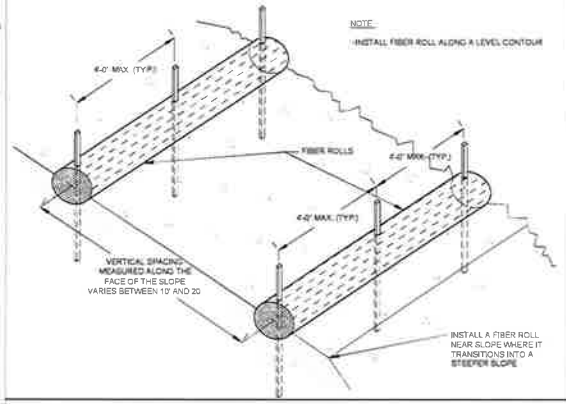
SILT FENCE NOT TO SCALE



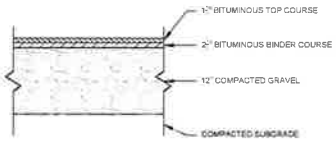
FIBER ROLL WITH SILT FENCE NOT TO SCALE



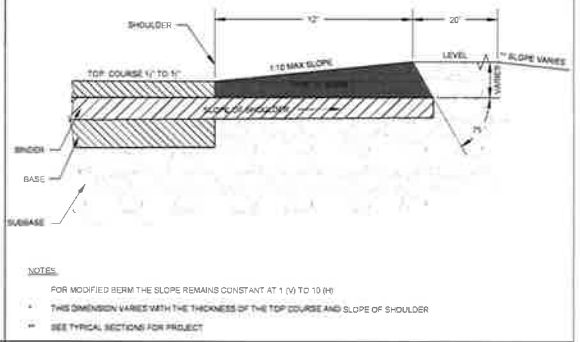
FIBER ROLL ENTRENCHMENT DETAIL NOT TO SCALE



TYPICAL FIBER ROLL INSTALLATION NOT TO SCALE



BITUMINOUS CONCRETE SECTIONS NOT TO SCALE



BITUMINOUS CONCRETE BERM - TYPE "A" NOT TO SCALE

ANTHONY WONIESKI, JR. DATE
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CONSTRUCTION DETAILS

S. FERRY RD CULVERT REPLACEMENT PROJECT

TOWN OF MONTAGUE
1 AVENUE A
TURNERS FALLS MA 01376

SCALE OF DETAILS:
AS NOTED

PROJ. # G2057
DATE 21 - APR - 22
DESIGN AW
DRAWN TAF
CHECKED AW
SHEET 7/7

Wendell Wetland Services
105 Montague Road
Wendell, MA 01379
(978) 544-5607
ward.ves@gmail.com

November 5, 2020

Mr. Tony Wonseski
SVE Associates
P.O. Box 1818
Brattleboro, VT 05302

Re: Wetland Delineation, 29 South Ferry Road, Montague

Dear Mr. Wonseski:

As requested, Wendell Wetland Services (WWS) visited the above referenced site on November 3, 2020 in order to delineate all wetlands in the vicinity of a proposed culvert replacement. All wetlands in this area that may be protectable under the Massachusetts Wetlands Protection Act (M.G.L. chapter 131, section 40) and Regulations (310 CMR 10.00) have been marked in the field with consecutively numbered pink "wetland delineation" flagging tape, while the Mean Annual High Water Line (MAHWL) of the perennial stream has been marked with pink and black-striped flagging tape. While these boundaries have been accurately identified, only the Montague Conservation Commission, or the Massachusetts Department of Environmental Protection (DEP) on appeal, can make the final determination of the extent of the wetland resource areas on the site.

Delineation Methodology

The methodology employed in delineating the "bordering vegetated wetland" boundary utilized both vegetation and hydrology as outlined in the Regulations at 310 CMR 10.55 and in the DEP handbook *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act* (1995). Hydrophytic Vegetation was based upon the US Fish and Wildlife Service's *National List of Plant Species that Occur in Wetlands* (1988), as well as all plant species listed in the Act. Wetland hydrology includes a high water table, water-stained leaves, and hydric soils, which were determined based upon the interagency document *Field Indicators for Identifying Hydric Soils in New England, Version 4* (2016).

The Mean Annual High Water Line (MAHWL) of the perennial stream on the site was delineated in accordance with the Regulations. In the project vicinity, this line was the same as the top of the "bank" resource area.

Site Description

The culvert crosses beneath the roadway just to the west of the residence at 29 South Ferry Road. An un-named tributary to the Sawmill River flows from north to south through the culvert. To the northwest of the stream is a wet meadow wetland that is

vegetated by multiflora rose (*Rosa multiflora*) and reed-canary grass (*Phalaris aruninacea*). To the south of the road, there is a wetland adjacent to the stream that is vegetated by speckled alder (*Alnus rugosa*), and a mown wet meadow to the west that is underlain by hydric soils and contains scattered soft rush (*Juncus effusus*). Flags HW-1 to HW-9 mark the MAHWL to the north of the road, while flags A-1 to A-6 mark the wetland boundary. To the south, the MAHWL is marked by flags HW-10 to HW-21, and the wetland boundary by B-1 to B-4 and C-1 to C-4.

Wetland Resource Areas

Under the state Regulations (310 CMR 10.00), wetlands are broken up into different "resource areas," each of which is regulated in a slightly different manner. The wetland delineation marks the boundary of the following resource areas, to which there is a 100 foot buffer zone:

* Bank (10.54);
* Bordering Vegetated Wetland (10.55);
* Land Under a Waterway (10.56).

The following resource area is not field delineated, and does not have any additional "buffer zone:"

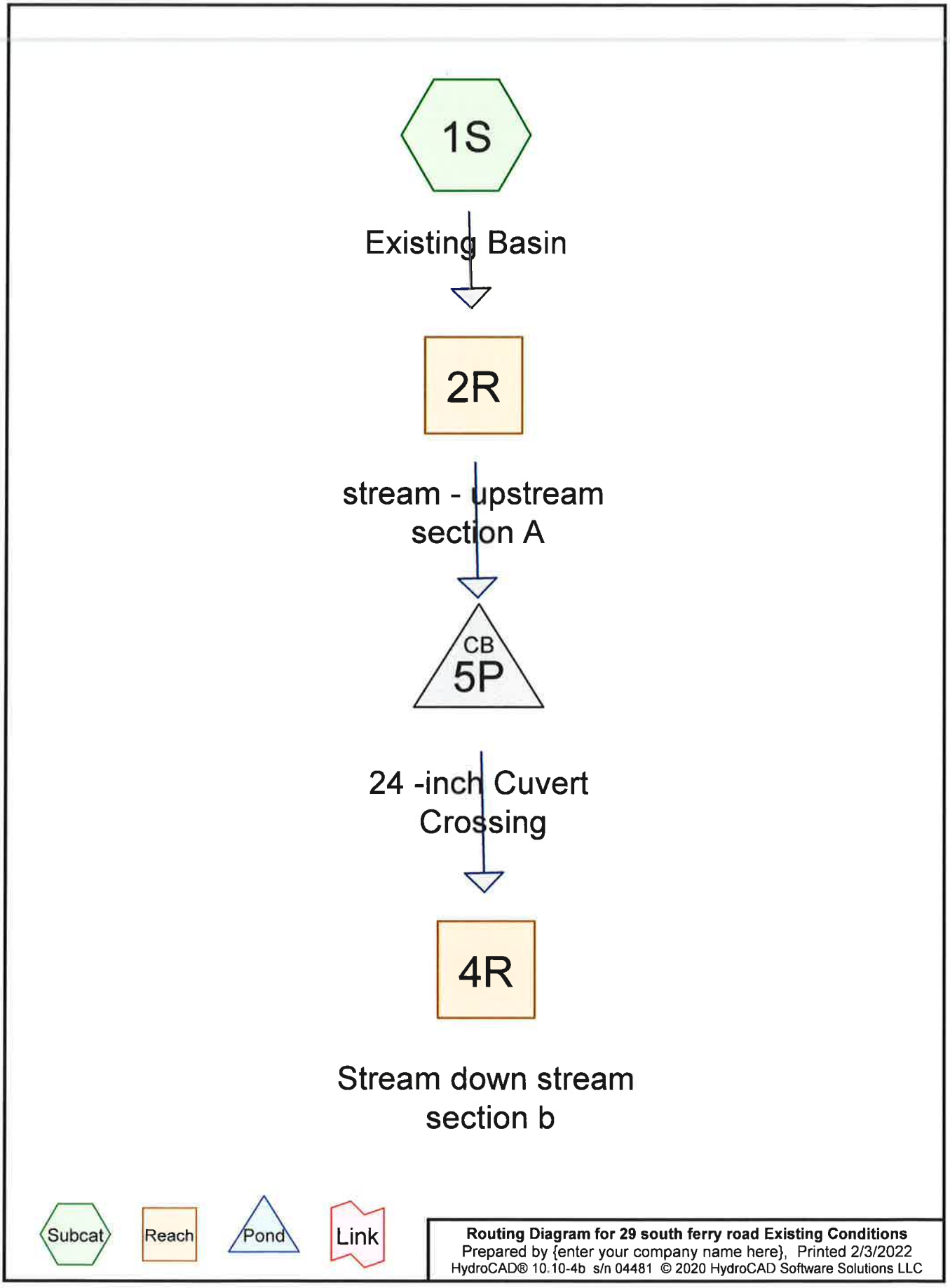
* Riverfront Area (10.58) – the area within 200 feet of the "HW" line.

The area to the south of the road lies within *Priority Habitats of Rare Species* according to the most recent online mapping. Therefore, a filing with the Natural Heritage and Endangered Species Program will be required.

Please feel free to contact me if you have any questions regarding my delineation.

Sincerely,
Wendell Wetland Services

Ward Smith, PWS
Professional Wetland Scientist



Routing Diagram for 29 south ferry road Existing Conditions
Prepared by {enter your company name here}, Printed 2/3/2022
HydroCAD® 10.10-4b s/n 04481 © 2020 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4191 MA Montague Franklin County

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	C	Default	24.00	1	3.02	2
2	10-Year	NRCC 24-hr	C	Default	24.00	1	4.33	2
3	100-Year	NRCC 24-hr	C	Default	24.00	1	7.29	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
17.040	30	Meadow, non-grazed, HSG A (1S)
16.670	58	Meadow, non-grazed, HSG B (1S)
10.420	71	Meadow, non-grazed, HSG C (1S)
1.250	85	Row crops, straight row, Good, HSG C (1S)
10.580	89	Row crops, straight row, Good, HSG D (1S)
52.240	36	Woods, Fair, HSG A (1S)
58.880	60	Woods, Fair, HSG B (1S)
18.960	73	Woods, Fair, HSG C (1S)
186.040	**54**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
69.280	HSG A	1S
75.550	HSG B	1S
30.630	HSG C	1S
10.580	HSG D	1S
0.000	Other	
186.040		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchmer Numbers
17.040	16.670	10.420	0.000	0.000	44.130	Meadow, non-grazed	1S
0.000	0.000	1.250	10.580	0.000	11.830	Row crops, straight row, Good	1S
52.240	58.880	18.960	0.000	0.000	130.080	Woods, Fair	1S
69.280	**75.550**	**30.630**	**10.580**	**0.000**	**186.040**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	5P	136.00	135.50	32.0	0.0156	0.015	0.0	24.0	0.0

Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 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 1S: Existing Basin Runoff Area=186.040 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=5,063' Slope=0.0120 '/' Tc=213.9 min CN=54 Runoff=3.62 cfs 2.731 af

Reach 2R: stream - upstream section A Avg. Flow Depth=0.41' Max Vel=2.02 fps Inflow=3.62 cfs 2.731 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=256.41 cfs Outflow=3.62 cfs 2.731 af

Reach 4R: Stream down stream section Avg. Flow Depth=0.49' Max Vel=1.83 fps Inflow=3.62 cfs 2.731 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=74.37 cfs Outflow=3.62 cfs 2.731 af

Pond 5P: 24 -inch Cuvert Crossing Peak Elev=136.82' Inflow=3.62 cfs 2.731 af
Outflow=3.62 cfs 2.731 af

Total Runoff Area = 186.040 ac Runoff Volume = 2.731 af Average Runoff Depth = 0.18"
100.00% Pervious = 186.040 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Basin

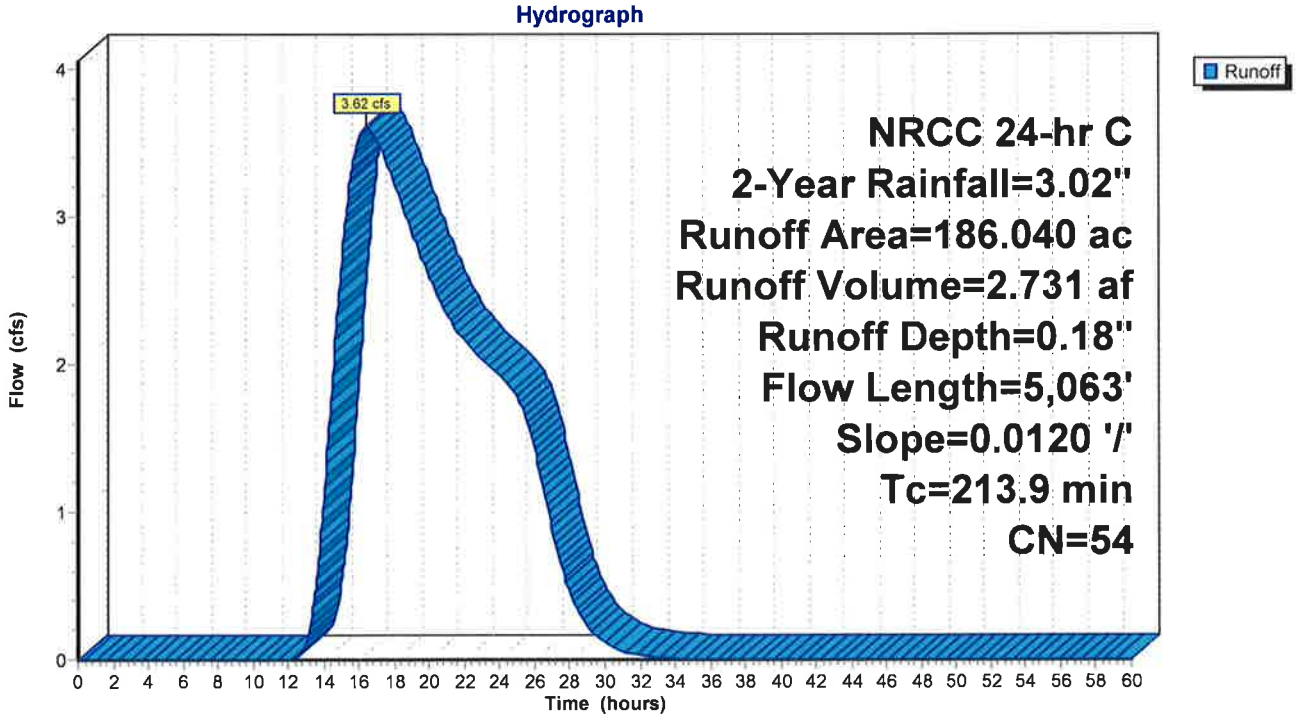
Runoff = 3.62 cfs @ 16.40 hrs, Volume= 2.731 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.02"

Area (ac)	CN	Description
52.240	36	Woods, Fair, HSG A
58.880	60	Woods, Fair, HSG B
18.960	73	Woods, Fair, HSG C
17.040	30	Meadow, non-grazed, HSG A
16.670	58	Meadow, non-grazed, HSG B
10.420	71	Meadow, non-grazed, HSG C
1.250	85	Row crops, straight row, Good, HSG C
10.580	89	Row crops, straight row, Good, HSG D
186.040	54	Weighted Average
186.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
213.9	5,063	0.0120	0.39		**Lag/CN Method,**

Subcatchment 1S: Existing Basin



Summary for Reach 2R: stream - upstream section A

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 3.62 cfs @ 16.40 hrs, Volume= 2.731 af
Outflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af, Atten= 0%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 2.02 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 4.2 min

Peak Storage= 538 cf @ 16.42 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 4.77'
Bank-Full Depth= 3.20' Flow Area= 61.7 sf, Capacity= 256.41 cfs

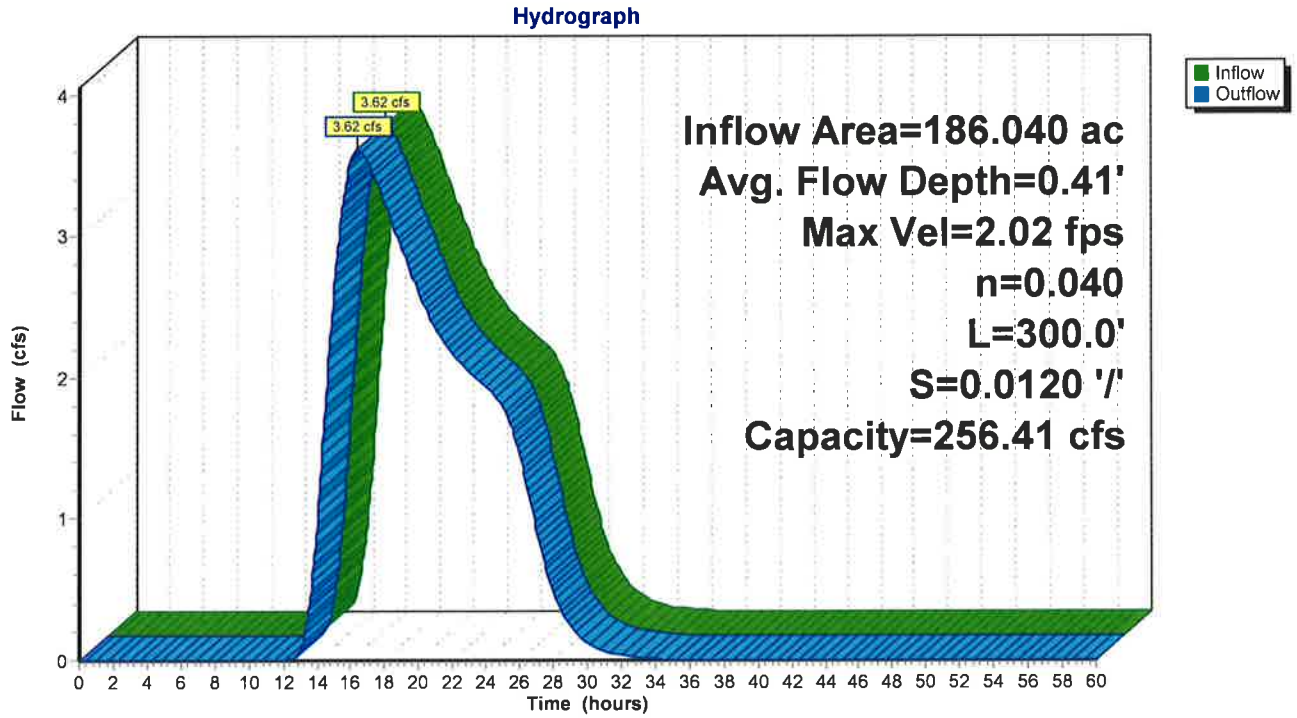
Custom cross-section, Length= 300.0' Slope= 0.0120 '/' (101 Elevation Intervals)
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 139.60', Outlet Invert= 136.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	139.00	0.00
25.00	138.00	1.00
32.00	137.50	1.50
48.00	138.20	0.80
51.00	135.80	3.20
55.00	135.80	3.20
57.00	139.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0.0	0	0.00
1.70	9.5	8.7	7.3	2,853	40.62
2.20	17.9	28.6	26.6	5,383	53.55
2.40	24.2	38.7	36.5	7,275	72.25
3.20	61.7	59.7	57.0	18,495	256.41

Reach 2R: stream - upstream section A



Summary for Reach 4R: Stream down stream section b

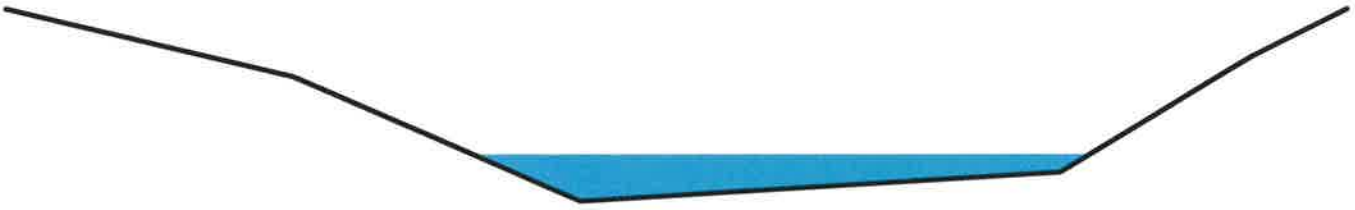
[79] Warning: Submerged Pond 5P Primary device # 1 OUTLET by 0.49'

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af
Outflow = 3.62 cfs @ 16.54 hrs, Volume= 2.731 af, Atten= 0%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 4.7 min

Peak Storage= 594 cf @ 16.49 hrs
Average Depth at Peak Storage= 0.49' , Surface Width= 6.43'
Bank-Full Depth= 2.00' Flow Area= 16.8 sf, Capacity= 74.37 cfs

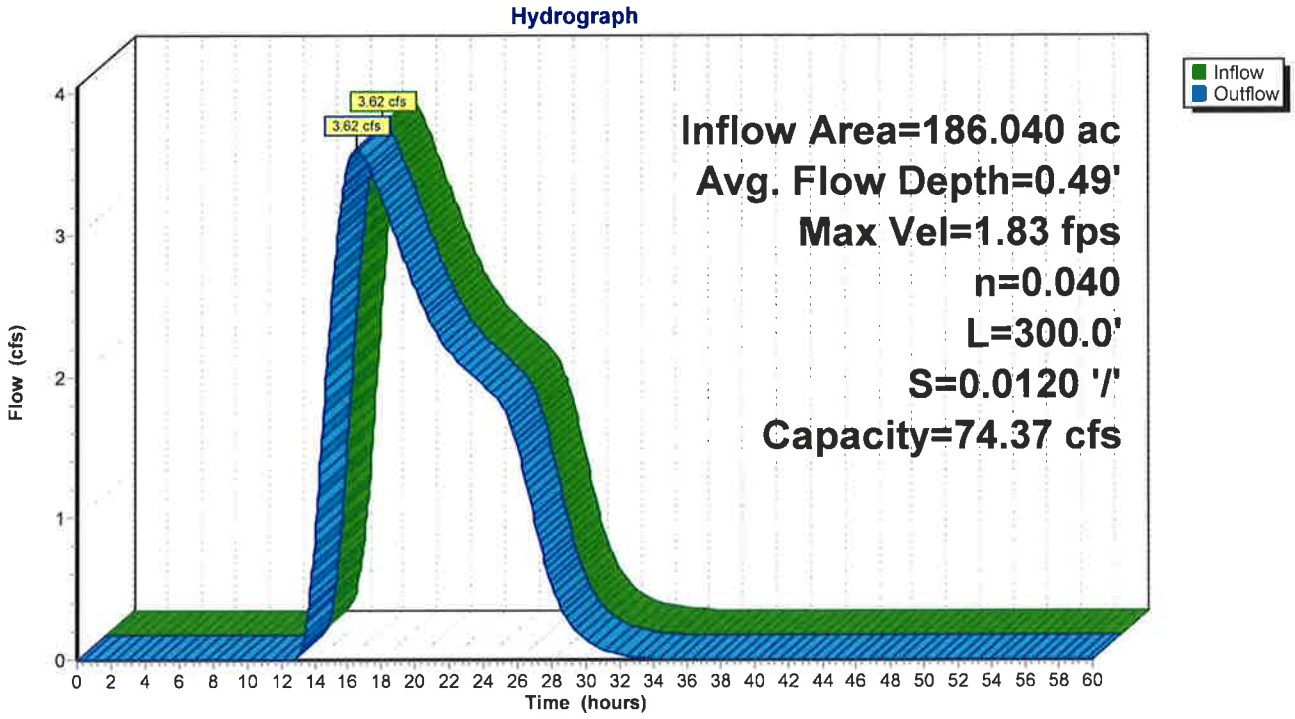
Custom cross-section, Length= 300.0' Slope= 0.0120 '/'
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 135.50', Outlet Invert= 131.90'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
42.00	136.00	0.00
45.00	135.30	0.70
48.00	134.00	2.00
53.00	134.30	1.70
55.00	135.50	0.50
56.00	136.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.30	0.9	5.8	5.7	256	0.97
1.30	8.5	10.2	9.7	2,560	30.79
1.50	10.6	11.5	10.9	3,176	40.79
2.00	16.8	14.8	14.0	5,040	74.37

Reach 4R: Stream down stream section b



Summary for Pond 5P: 24 -inch Cuvert Crossing

[57] Hint: Peaked at 136.82' (Flood elevation advised)
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.41' @ 16.50 hrs

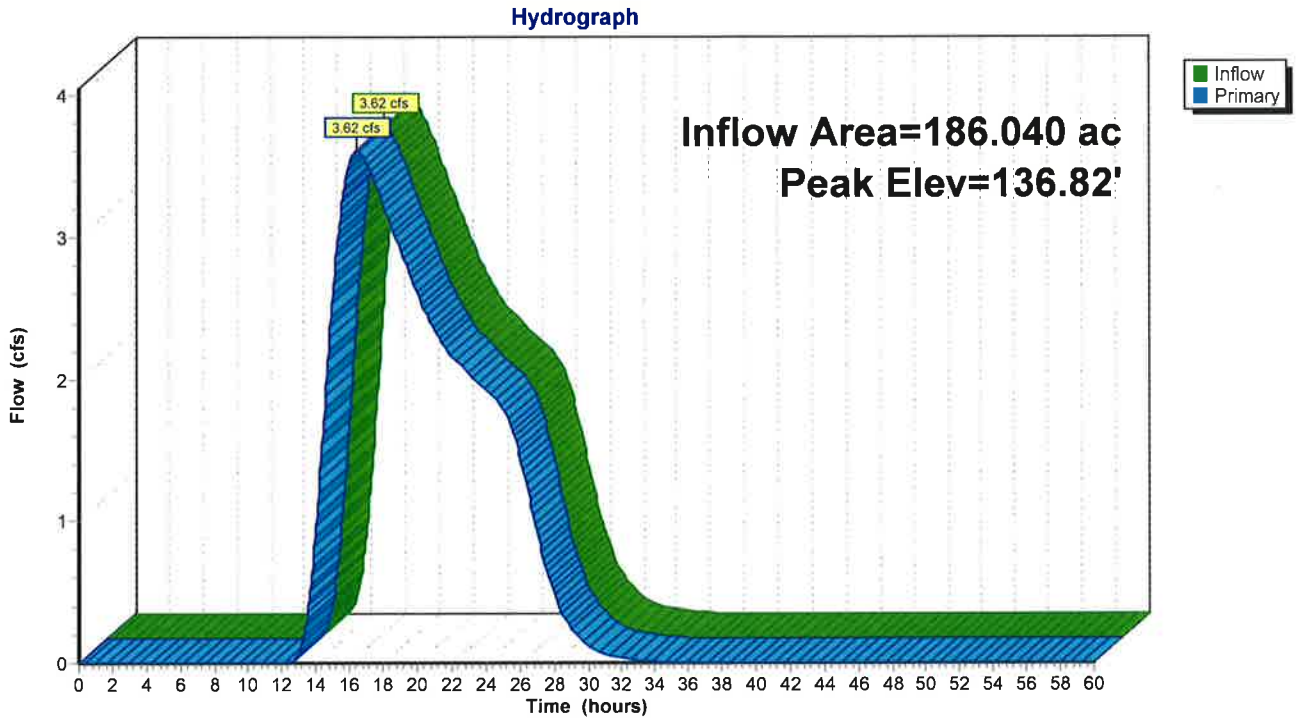
Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af
Outflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af, Atten= 0%, Lag= 0.0 min
Primary = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 136.82' @ 16.46 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**24.0" Round Culvert** L= 32.0' Ke= 0.500 Inlet / Outlet Invert= 136.00' / 135.50' S= 0.0156 '/' Cc= 0.900 n= 0.015, Flow Area= 3.14 sf
#2	Primary	139.65'	**208.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.62 cfs @ 16.46 hrs HW=136.82' (Free Discharge)
└**1=Culvert** (Barrel Controls 3.62 cfs @ 4.39 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: 24 -inch Cuvert Crossing



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 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 1S: Existing Basin Runoff Area=186.040 ac 0.00% Impervious Runoff Depth=0.62"
Flow Length=5,063' Slope=0.0120 '/' Tc=213.9 min CN=54 Runoff=16.76 cfs 9.595 af

Reach 2R: stream - upstream section A Avg. Flow Depth=1.02' Max Vel=3.32 fps Inflow=16.76 cfs 9.595 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=256.41 cfs Outflow=16.75 cfs 9.595 af

Reach 4R: Stream down stream Avg. Flow Depth=0.97' Max Vel=3.01 fps Inflow=16.75 cfs 9.595 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=74.37 cfs Outflow=16.75 cfs 9.595 af

Pond 5P: 24 -inch Cuvert Crossing Peak Elev=138.23' Inflow=16.75 cfs 9.595 af
Outflow=16.75 cfs 9.595 af

Total Runoff Area = 186.040 ac Runoff Volume = 9.595 af Average Runoff Depth = 0.62"
100.00% Pervious = 186.040 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Basin

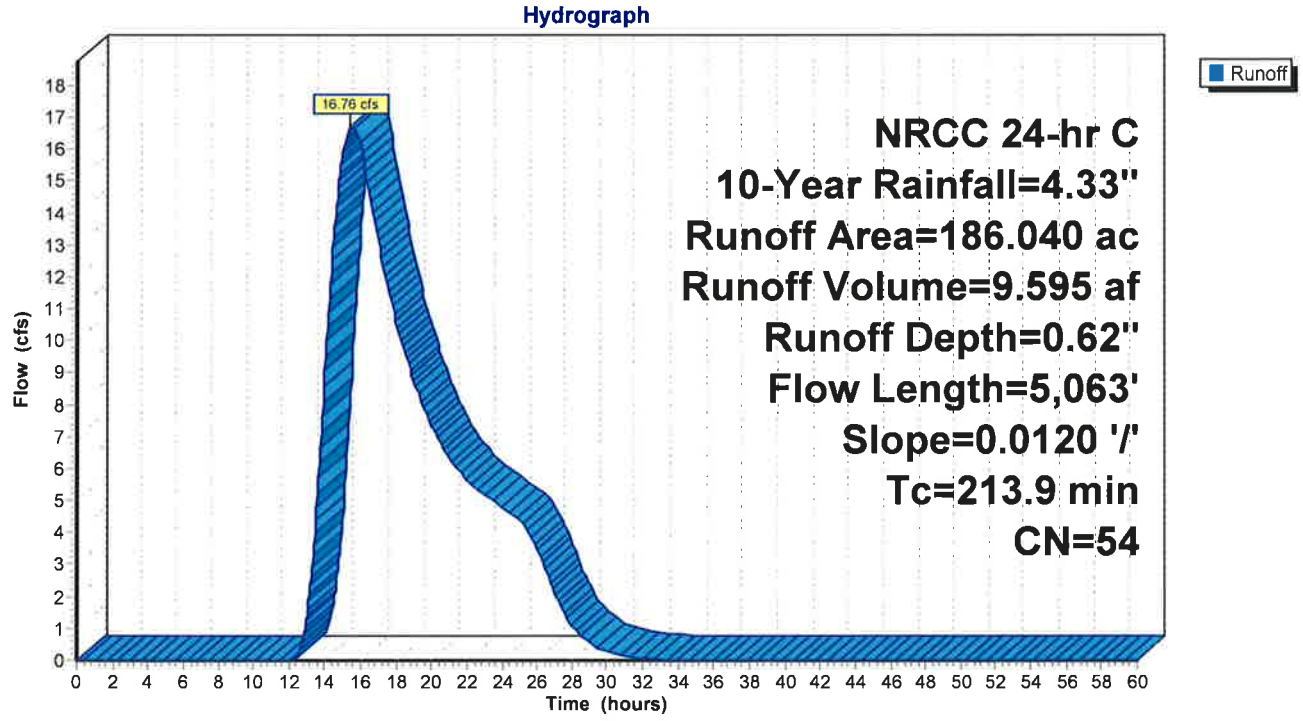
Runoff = 16.76 cfs @ 15.48 hrs, Volume= 9.595 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.33"

Area (ac)	CN	Description
52.240	36	Woods, Fair, HSG A
58.880	60	Woods, Fair, HSG B
18.960	73	Woods, Fair, HSG C
17.040	30	Meadow, non-grazed, HSG A
16.670	58	Meadow, non-grazed, HSG B
10.420	71	Meadow, non-grazed, HSG C
1.250	85	Row crops, straight row, Good, HSG C
10.580	89	Row crops, straight row, Good, HSG D
186.040	54	Weighted Average
186.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
213.9	5,063	0.0120	0.39		**Lag/CN Method,**

Subcatchment 1S: Existing Basin



Summary for Reach 2R: stream - upstream section A

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 16.76 cfs @ 15.48 hrs, Volume= 9.595 af
Outflow = 16.75 cfs @ 15.55 hrs, Volume= 9.595 af, Atten= 0%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 3.32 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 2.9 min

Peak Storage= 1,512 cf @ 15.52 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 5.91'
Bank-Full Depth= 3.20' Flow Area= 61.7 sf, Capacity= 256.41 cfs

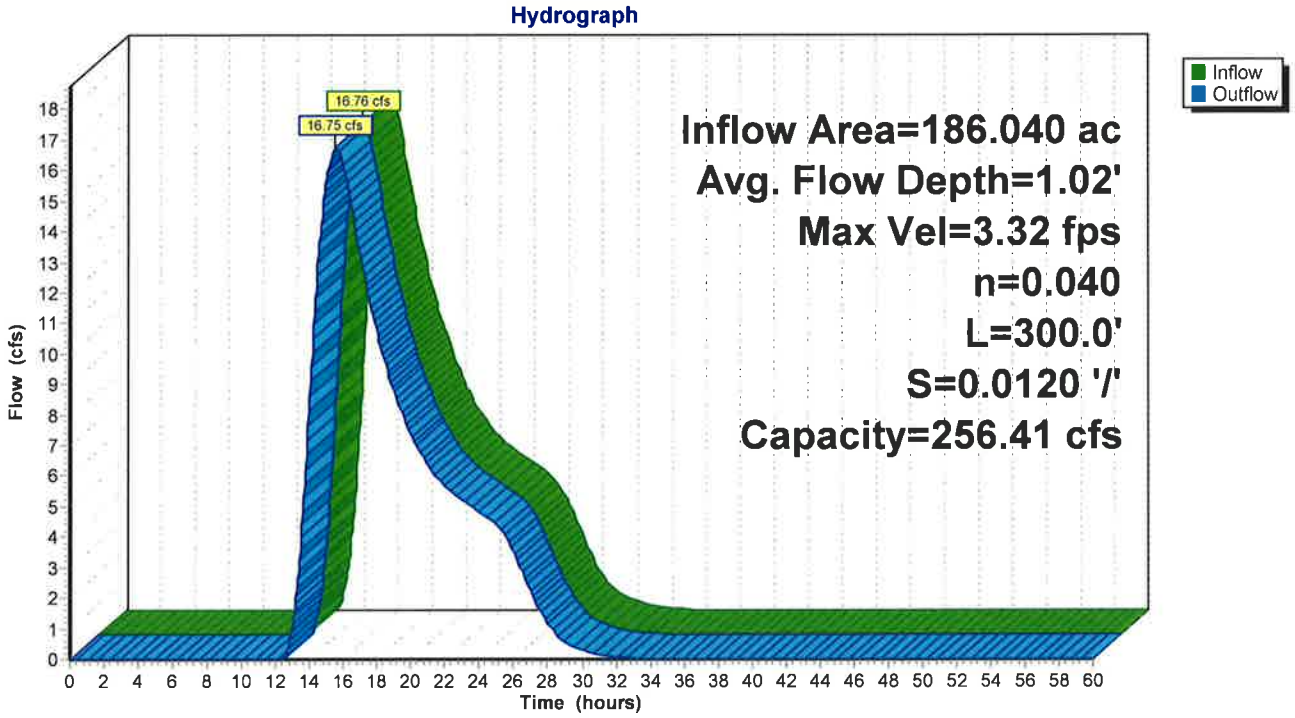
Custom cross-section, Length= 300.0' Slope= 0.0120 '/' (101 Elevation Intervals)
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 139.60', Outlet Invert= 136.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	139.00	0.00
25.00	138.00	1.00
32.00	137.50	1.50
48.00	138.20	0.80
51.00	135.80	3.20
55.00	135.80	3.20
57.00	139.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0.0	0	0.00
1.70	9.5	8.7	7.3	2,853	40.62
2.20	17.9	28.6	26.6	5,383	53.55
2.40	24.2	38.7	36.5	7,275	72.25
3.20	61.7	59.7	57.0	18,495	256.41

Reach 2R: stream - upstream section A



Summary for Reach 4R: Stream down stream section b

[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 0.47'

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 16.75 cfs @ 15.55 hrs, Volume= 9.595 af
Outflow = 16.75 cfs @ 15.61 hrs, Volume= 9.595 af, Atten= 0%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 3.3 min

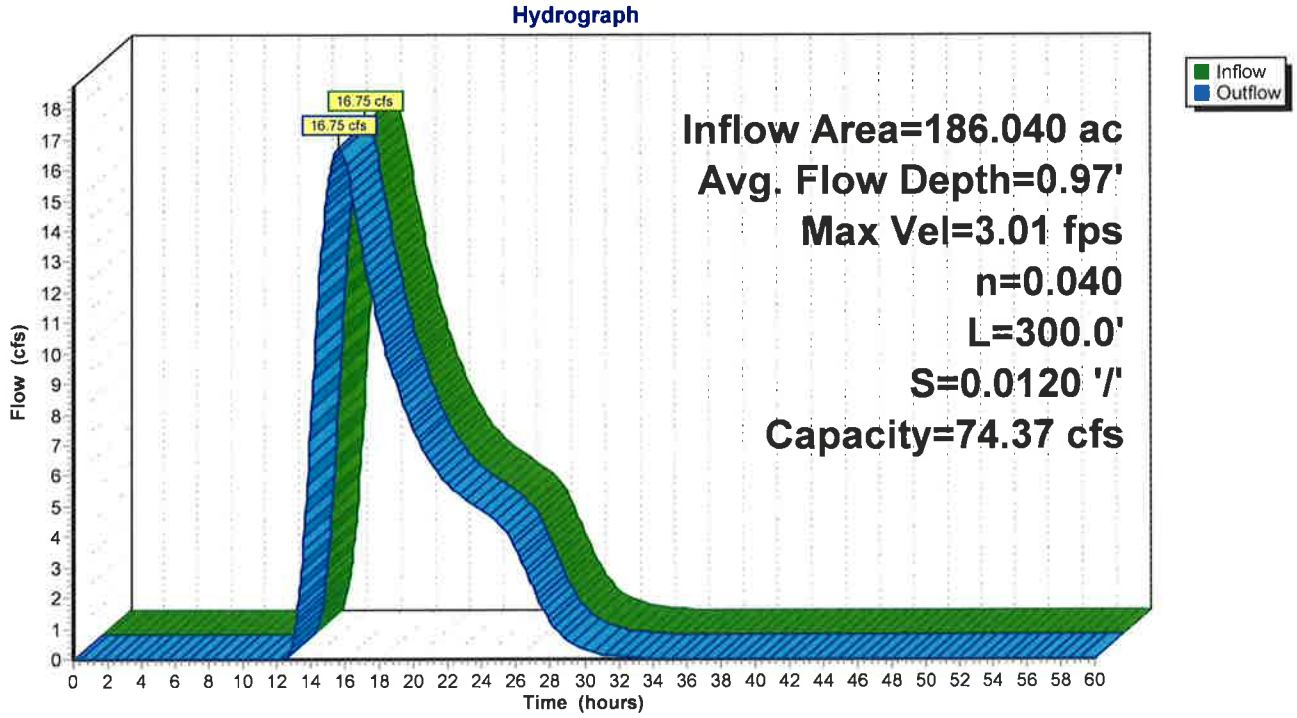
Peak Storage= 1,670 cf @ 15.57 hrs
Average Depth at Peak Storage= 0.97' , Surface Width= 8.36'
Bank-Full Depth= 2.00' Flow Area= 16.8 sf, Capacity= 74.37 cfs

Custom cross-section, Length= 300.0' Slope= 0.0120 '/'
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 135.50', Outlet Invert= 131.90'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
42.00	136.00	0.00
45.00	135.30	0.70
48.00	134.00	2.00
53.00	134.30	1.70
55.00	135.50	0.50
56.00	136.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.30	0.9	5.8	5.7	256	0.97
1.30	8.5	10.2	9.7	2,560	30.79
1.50	10.6	11.5	10.9	3,176	40.79
2.00	16.8	14.8	14.0	5,040	74.37

Reach 4R: Stream down stream section b



Summary for Pond 5P: 24 -inch Cuvert Crossing

[57] Hint: Peaked at 138.23' (Flood elevation advised)
[62] Hint: Exceeded Reach 2R OUTLET depth by 1.21' @ 15.55 hrs

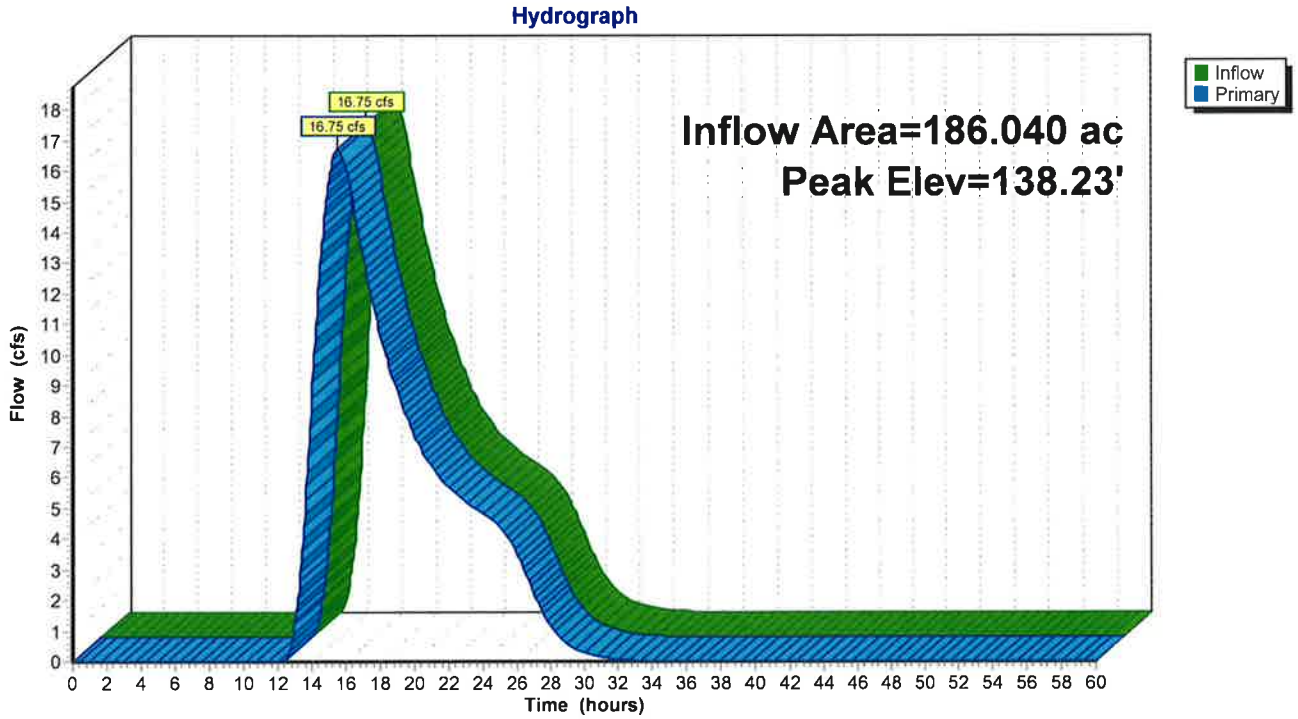
Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 16.75 cfs @ 15.55 hrs, Volume= 9.595 af
Outflow = 16.75 cfs @ 15.55 hrs, Volume= 9.595 af, Atten= 0%, Lag= 0.0 min
Primary = 16.75 cfs @ 15.55 hrs, Volume= 9.595 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 138.23' @ 15.55 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**24.0" Round Culvert** L= 32.0' Ke= 0.500 Inlet / Outlet Invert= 136.00' / 135.50' S= 0.0156 '/' Cc= 0.900 n= 0.015, Flow Area= 3.14 sf
#2	Primary	139.65'	**208.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=16.76 cfs @ 15.55 hrs HW=138.23' (Free Discharge)
└**1=Culvert** (Barrel Controls 16.76 cfs @ 5.97 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: 24 -inch Cuvert Crossing



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 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 1S: Existing Basin Runoff Area=186.040 ac 0.00% Impervious Runoff Depth=2.21"
Flow Length=5,063' Slope=0.0120 '/' Tc=213.9 min CN=54 Runoff=71.96 cfs 34.301 af

Reach 2R: stream - upstream section Avg. Flow Depth=2.40' Max Vel=4.29 fps Inflow=71.96 cfs 34.301 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=256.41 cfs Outflow=71.95 cfs 34.295 af

Reach 4R: Stream down stream Avg. Flow Depth=1.97' Max Vel=4.39 fps Inflow=71.95 cfs 34.295 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=74.37 cfs Outflow=71.95 cfs 34.295 af

Pond 5P: 24 -inch Cuvert Crossing Peak Elev=139.84' Inflow=71.95 cfs 34.295 af
Outflow=71.95 cfs 34.295 af

Total Runoff Area = 186.040 ac Runoff Volume = 34.301 af Average Runoff Depth = 2.21"
100.00% Pervious = 186.040 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Basin

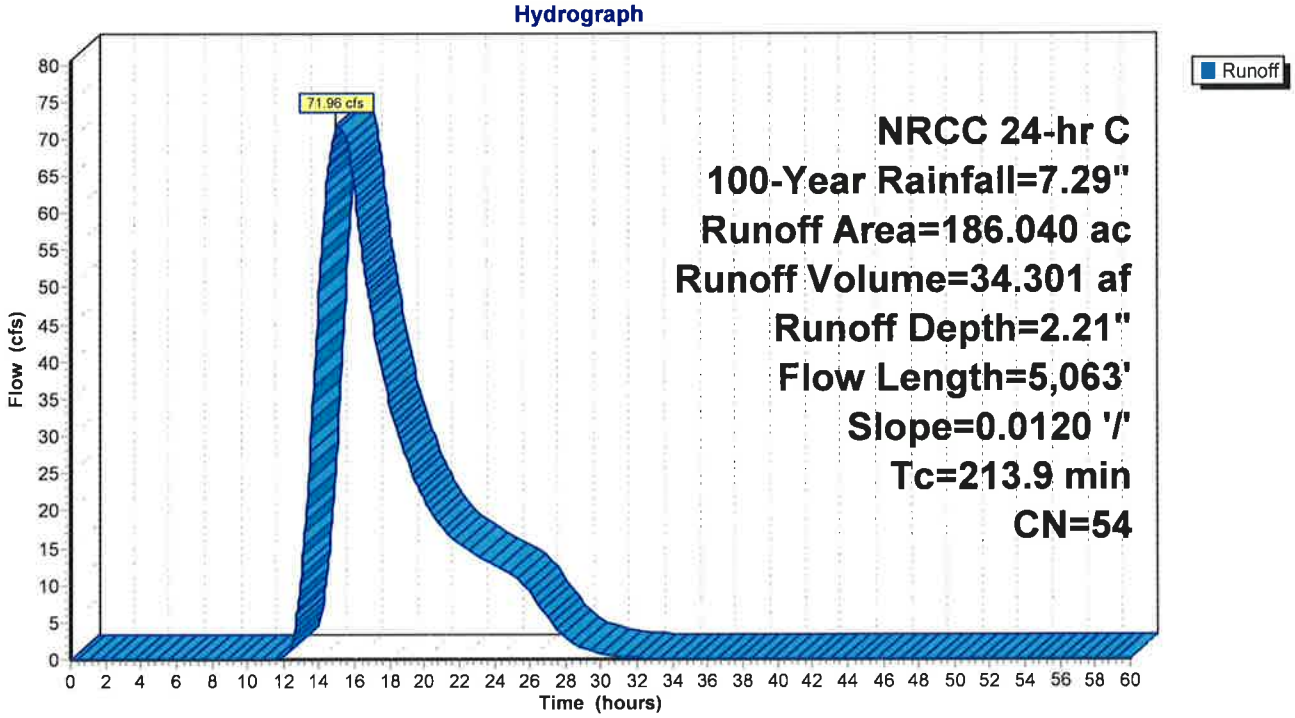
Runoff = 71.96 cfs @ 15.00 hrs, Volume= 34.301 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=7.29"

Area (ac)	CN	Description
52.240	36	Woods, Fair, HSG A
58.880	60	Woods, Fair, HSG B
18.960	73	Woods, Fair, HSG C
17.040	30	Meadow, non-grazed, HSG A
16.670	58	Meadow, non-grazed, HSG B
10.420	71	Meadow, non-grazed, HSG C
1.250	85	Row crops, straight row, Good, HSG C
10.580	89	Row crops, straight row, Good, HSG D
186.040	54	Weighted Average
186.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
213.9	5,063	0.0120	0.39		**Lag/CN Method,**

Subcatchment 1S: Existing Basin



Summary for Reach 2R: stream - upstream section A

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100-Year event
Inflow = 71.96 cfs @ 15.00 hrs, Volume= 34.301 af
Outflow = 71.95 cfs @ 15.14 hrs, Volume= 34.295 af, Atten= 0%, Lag= 8.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs / 2
Max. Velocity= 4.29 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 2.3 min

Peak Storage= 7,247 cf @ 15.11 hrs
Average Depth at Peak Storage= 2.40' , Surface Width= 36.37'
Bank-Full Depth= 3.20' Flow Area= 61.7 sf, Capacity= 256.41 cfs

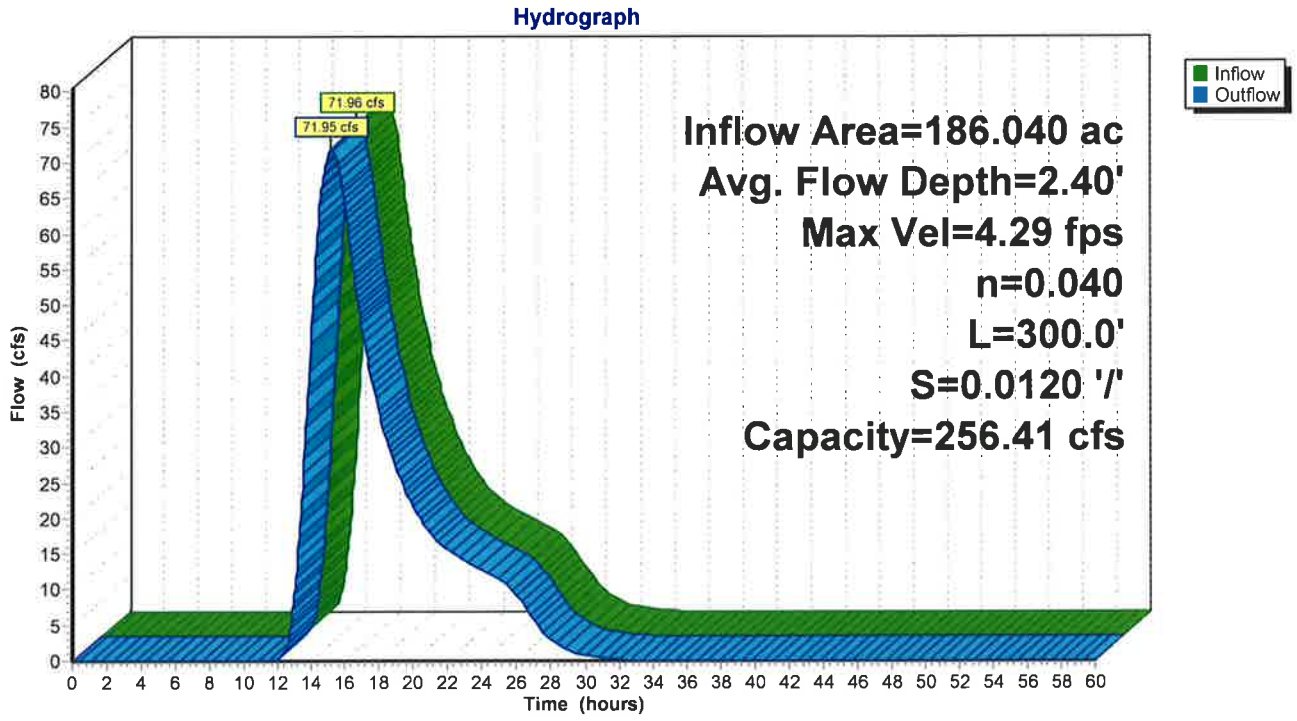
Custom cross-section, Length= 300.0' Slope= 0.0120 '/' (101 Elevation Intervals)
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 139.60', Outlet Invert= 136.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	139.00	0.00
25.00	138.00	1.00
32.00	137.50	1.50
48.00	138.20	0.80
51.00	135.80	3.20
55.00	135.80	3.20
57.00	139.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0.0	0	0.00
1.70	9.5	8.7	7.3	2,853	40.62
2.20	17.9	28.6	26.6	5,383	53.55
2.40	24.2	38.7	36.5	7,275	72.25
3.20	61.7	59.7	57.0	18,495	256.41

Reach 2R: stream - upstream section A



Summary for Reach 4R: Stream down stream section b

[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 1.47'

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100-Year event
Inflow = 71.95 cfs @ 15.14 hrs, Volume= 34.295 af
Outflow = 71.95 cfs @ 15.18 hrs, Volume= 34.295 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.11 fps, Avg. Travel Time= 2.4 min

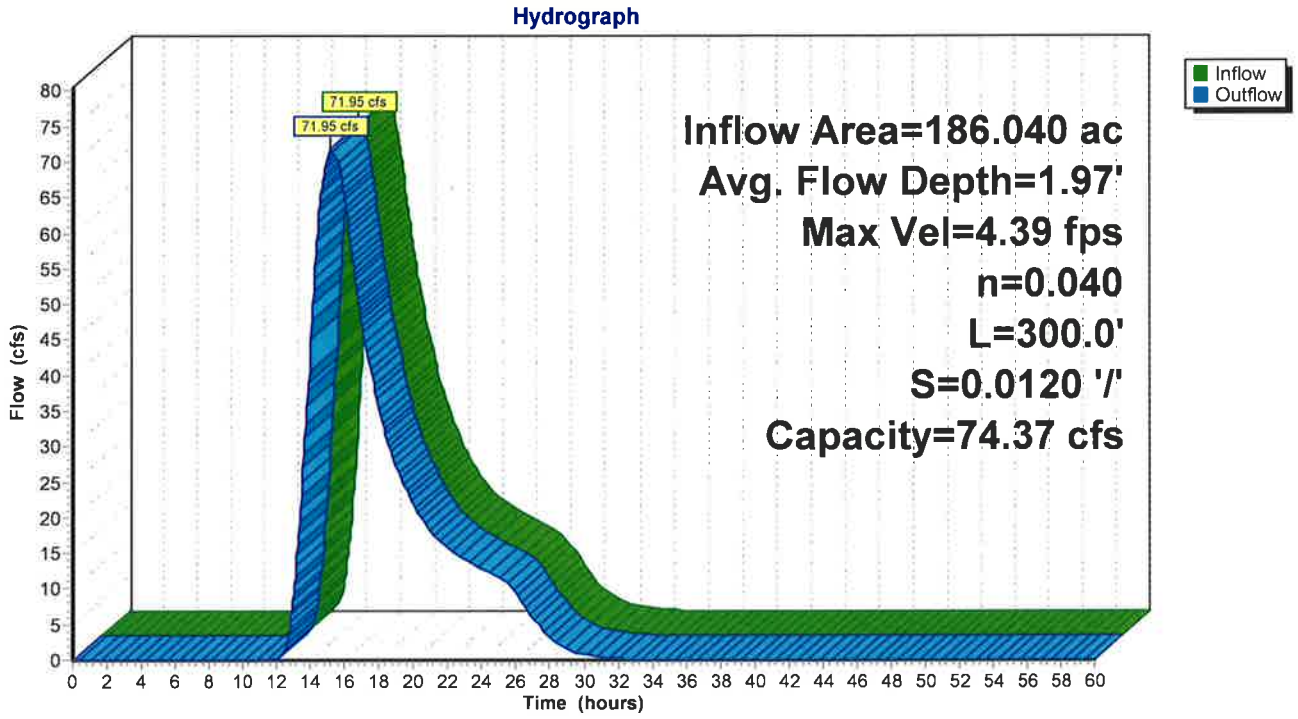
Peak Storage= 4,914 cf @ 15.16 hrs
Average Depth at Peak Storage= 1.97' , Surface Width= 13.81'
Bank-Full Depth= 2.00' Flow Area= 16.8 sf, Capacity= 74.37 cfs

Custom cross-section, Length= 300.0' Slope= 0.0120 '/'
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 135.50', Outlet Invert= 131.90'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
42.00	136.00	0.00
45.00	135.30	0.70
48.00	134.00	2.00
53.00	134.30	1.70
55.00	135.50	0.50
56.00	136.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.30	0.9	5.8	5.7	256	0.97
1.30	8.5	10.2	9.7	2,560	30.79
1.50	10.6	11.5	10.9	3,176	40.79
2.00	16.8	14.8	14.0	5,040	74.37

Reach 4R: Stream down stream section b



Summary for Pond 5P: 24 -inch Cuvert Crossing

[57] Hint: Peaked at 139.84' (Flood elevation advised)
[62] Hint: Exceeded Reach 2R OUTLET depth by 2.38' @ 19.35 hrs

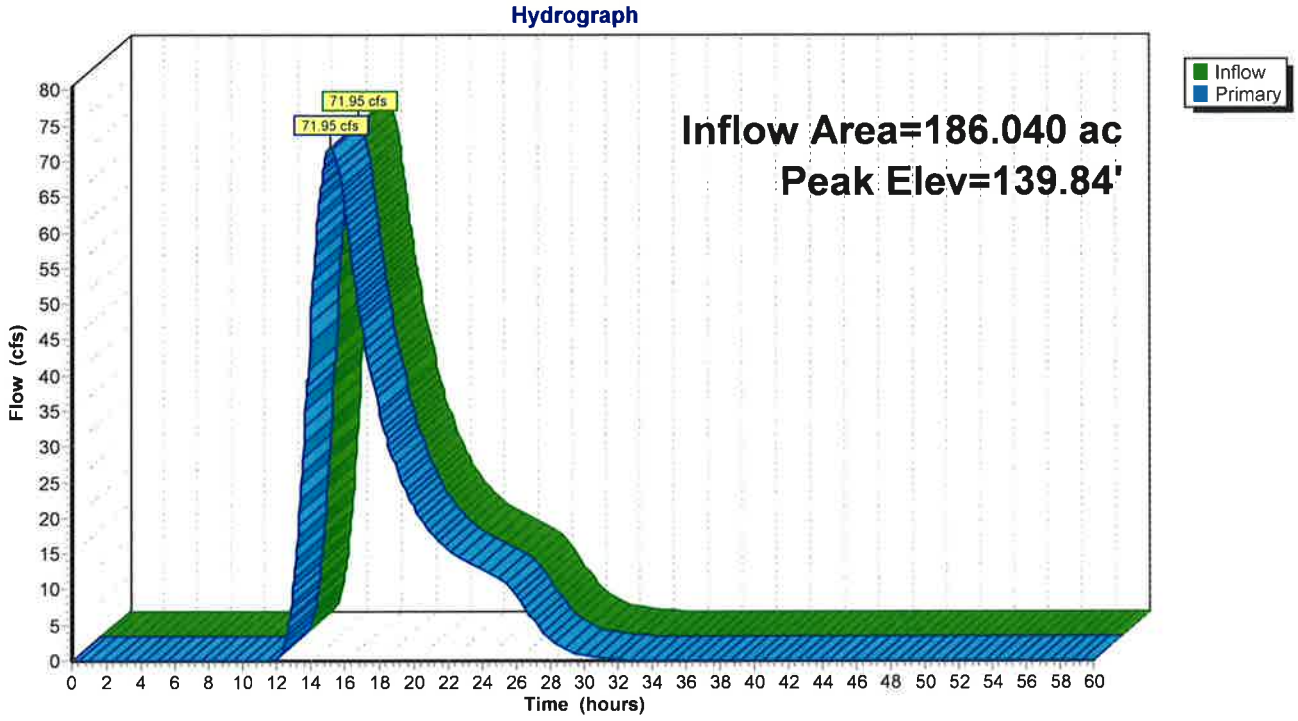
Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100-Year event
Inflow = 71.95 cfs @ 15.14 hrs, Volume= 34.295 af
Outflow = 71.95 cfs @ 15.14 hrs, Volume= 34.295 af, Atten= 0%, Lag= 0.0 min
Primary = 71.95 cfs @ 15.14 hrs, Volume= 34.295 af

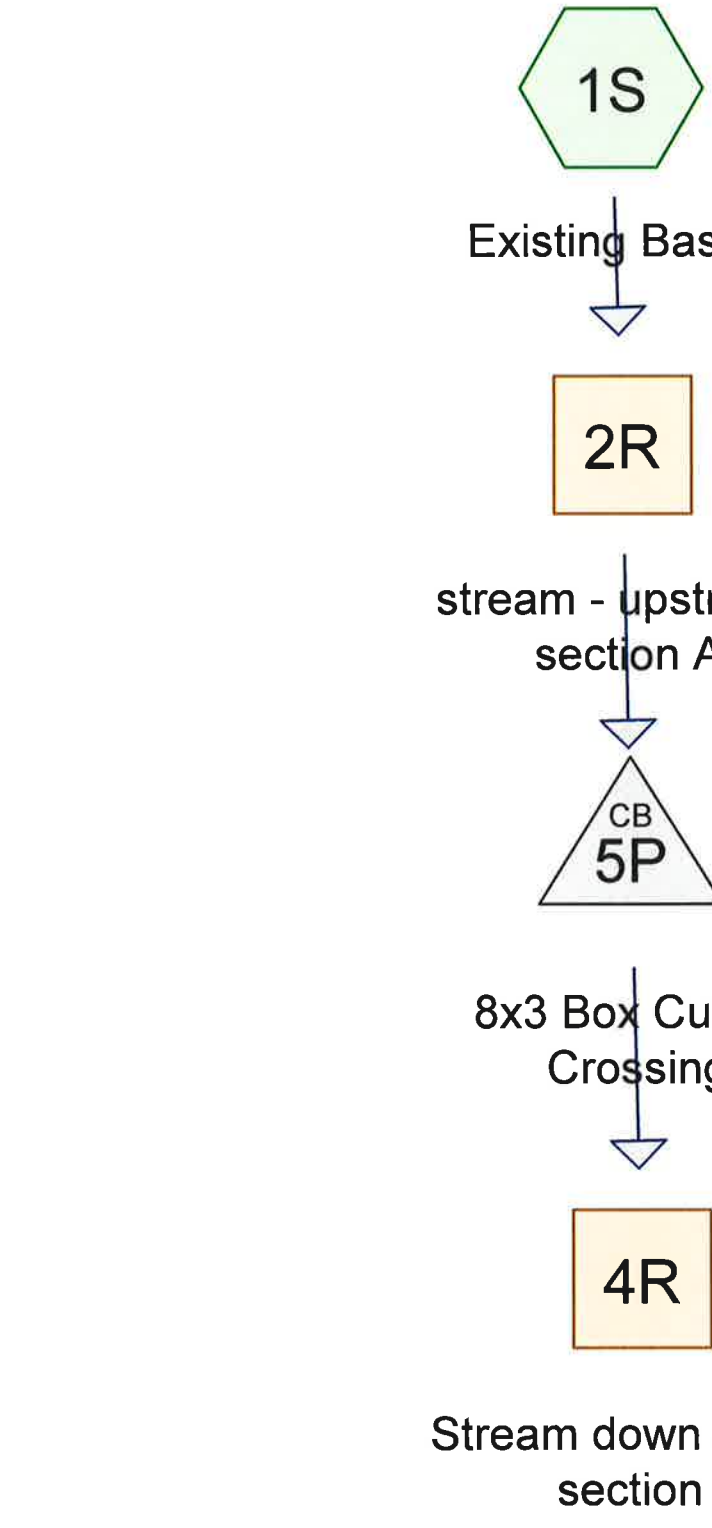
Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 139.84' @ 15.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	136.00'	**24.0" Round Culvert** L= 32.0' Ke= 0.500 Inlet / Outlet Invert= 136.00' / 135.50' S= 0.0156 '/' Cc= 0.900 n= 0.015, Flow Area= 3.14 sf
#2	Primary	139.65'	**208.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=71.83 cfs @ 15.14 hrs HW=139.84' (Free Discharge)
└**1=Culvert** (Inlet Controls 25.49 cfs @ 8.12 fps)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 46.34 cfs @ 1.17 fps)

Pond 5P: 24 -inch Cuvert Crossing





Subcat Reach Pond Link

Routing Diagram for 29 south ferry road Proposed Conditions 8x3
Prepared by {enter your company name here}, Printed 2/3/2022
HydroCAD® 10.10-4b s/n 04481 © 2020 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4191 MA Montague Franklin County

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	C	Default	24.00	1	3.02	2
2	10-Year	NRCC 24-hr	C	Default	24.00	1	4.33	2
3	100-Year	NRCC 24-hr	C	Default	24.00	1	7.29	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
52.240	36	(1S)
58.880	60	(1S)
18.960	73	(1S)
17.040	30	(1S)
16.670	58	(1S)
10.420	71	(1S)
1.250	85	(1S)
10.580	89	(1S)
186.040	**54**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
186.040	Other	1S
186.040		**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	0.000	0.000	0.000	186.040	186.040		1S
0.000	**0.000**	**0.000**	**0.000**	**186.040**	**186.040**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	5P	135.80	135.50	31.0	0.0097	0.024	96.0	36.0	0.0

Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 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 1S: Existing Basin Runoff Area=186.040 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=5,063' Slope=0.0120 '/' Tc=213.9 min CN=54 Runoff=3.62 cfs 2.731 af

Reach 2R: stream - upstream section A Avg. Flow Depth=0.41' Max Vel=2.02 fps Inflow=3.62 cfs 2.731 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=256.41 cfs Outflow=3.62 cfs 2.731 af

Reach 4R: Stream down stream section Avg. Flow Depth=0.49' Max Vel=1.83 fps Inflow=3.62 cfs 2.731 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=74.37 cfs Outflow=3.62 cfs 2.731 af

Pond 5P: 8x3 Box Cuvert Crossing Peak Elev=136.09' Inflow=3.62 cfs 2.731 af
Outflow=3.62 cfs 2.731 af

Total Runoff Area = 186.040 ac Runoff Volume = 2.731 af Average Runoff Depth = 0.18"
100.00% Pervious = 186.040 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Basin

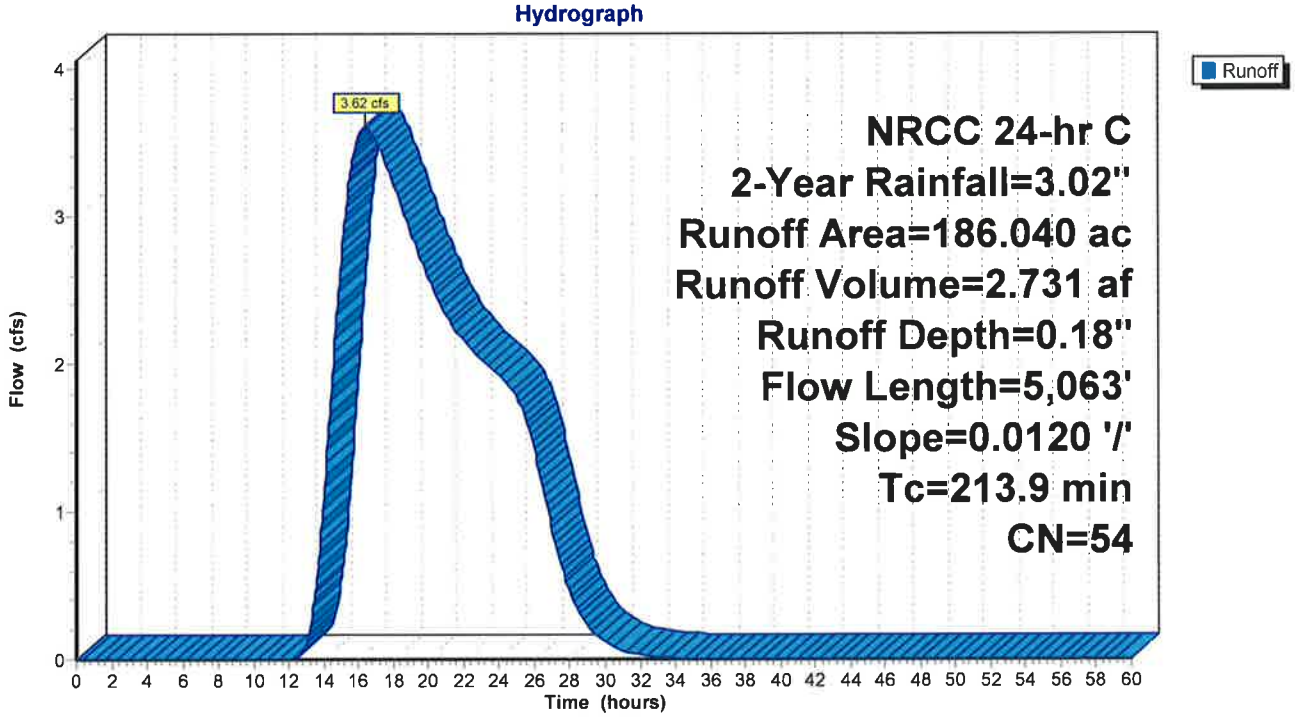
Runoff = 3.62 cfs @ 16.40 hrs, Volume= 2.731 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 2-Year Rainfall=3.02"

	Area (ac)	CN	Description
*	52.240	36	
*	58.880	60	
*	18.960	73	
*	17.040	30	
*	16.670	58	
*	10.420	71	
*	1.250	85	
*	10.580	89	
	186.040	54	Weighted Average
	186.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
213.9	5,063	0.0120	0.39		**Lag/CN Method,**

Subcatchment 1S: Existing Basin



Summary for Reach 2R: stream - upstream section A

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 3.62 cfs @ 16.40 hrs, Volume= 2.731 af
Outflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af, Atten= 0%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.02 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 4.2 min

Peak Storage= 538 cf @ 16.42 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 4.77'
Bank-Full Depth= 3.20' Flow Area= 61.7 sf, Capacity= 256.41 cfs

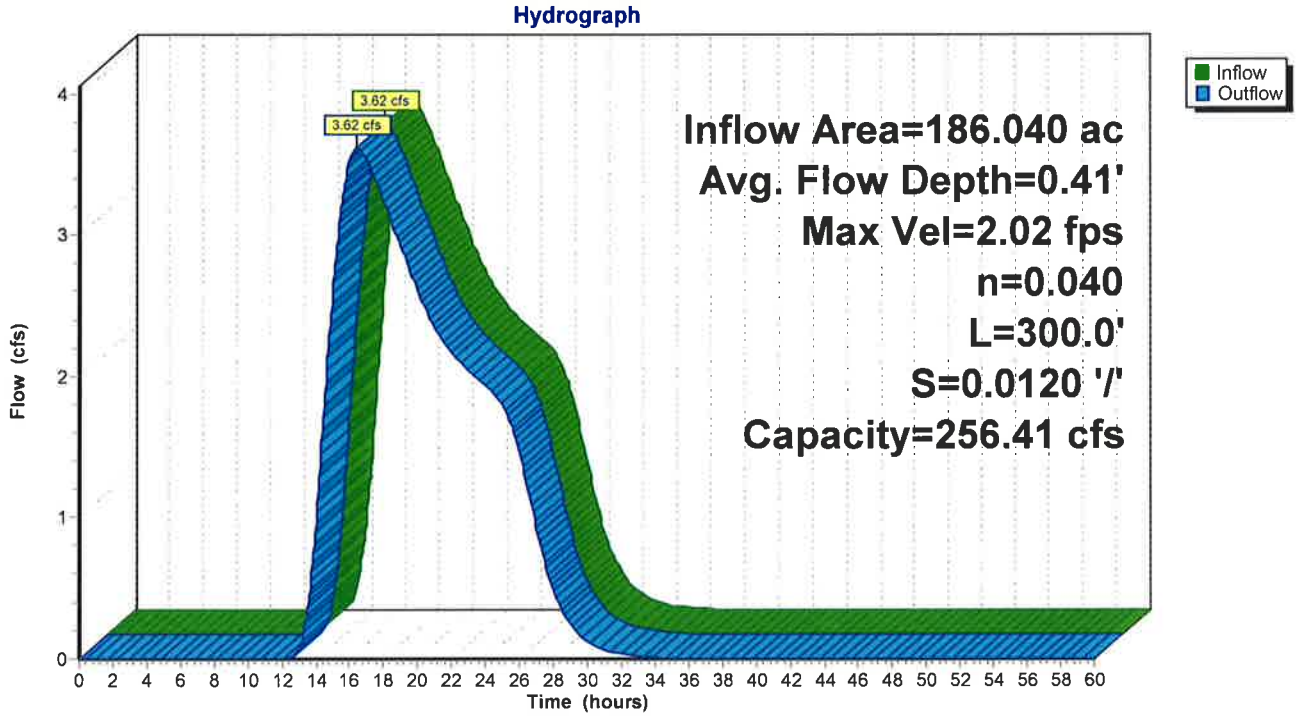
Custom cross-section, Length= 300.0' Slope= 0.0120 '/' (101 Elevation Intervals)
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 139.60', Outlet Invert= 136.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	139.00	0.00
25.00	138.00	1.00
32.00	137.50	1.50
48.00	138.20	0.80
51.00	135.80	3.20
55.00	135.80	3.20
57.00	139.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0.0	0	0.00
1.70	9.5	8.7	7.3	2,853	40.62
2.20	17.9	28.6	26.6	5,383	53.55
2.40	24.2	38.7	36.5	7,275	72.25
3.20	61.7	59.7	57.0	18,495	256.41

Reach 2R: stream - upstream section A



Summary for Reach 4R: Stream down stream section b

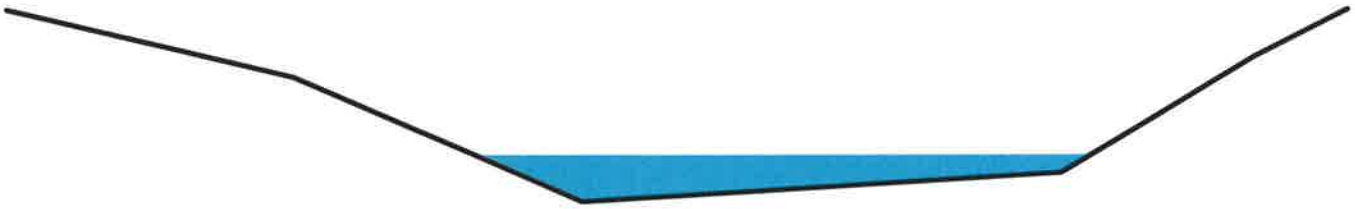
[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 0.19'

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af
Outflow = 3.62 cfs @ 16.54 hrs, Volume= 2.731 af, Atten= 0%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 4.7 min

Peak Storage= 594 cf @ 16.49 hrs
Average Depth at Peak Storage= 0.49' , Surface Width= 6.43'
Bank-Full Depth= 2.00' Flow Area= 16.8 sf, Capacity= 74.37 cfs

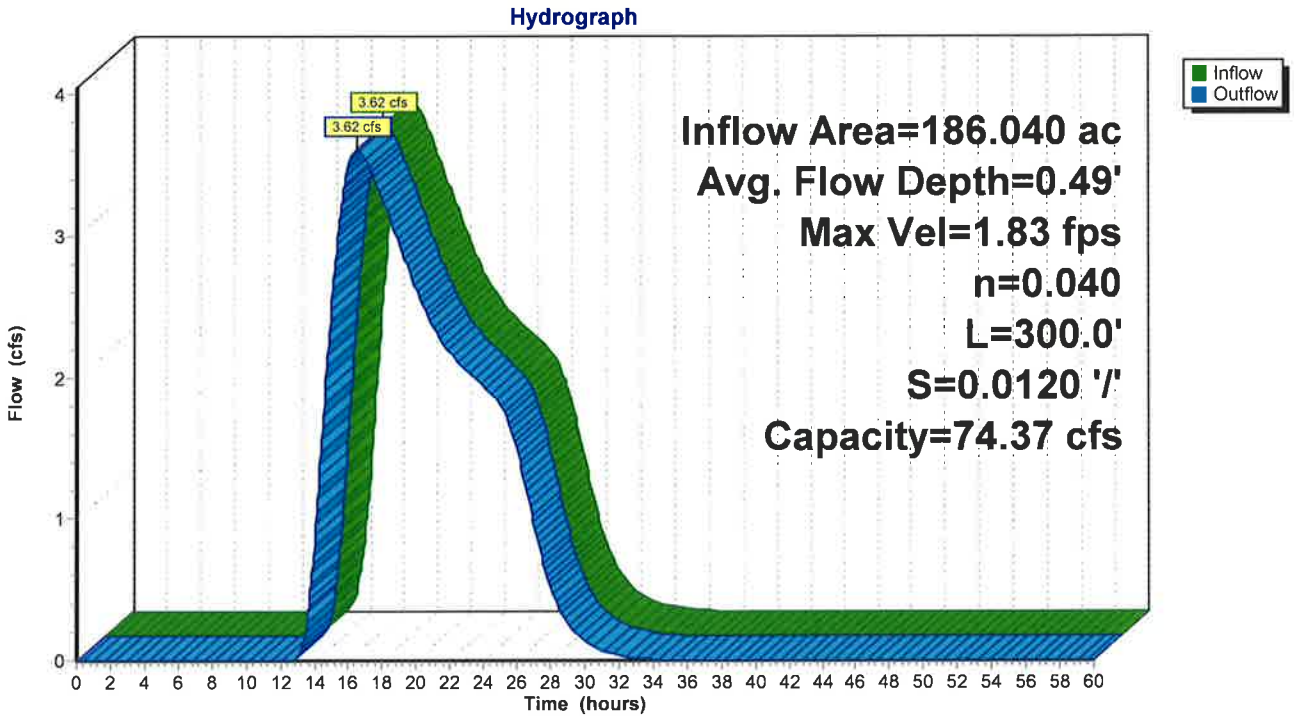
Custom cross-section, Length= 300.0' Slope= 0.0120 '/'
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 135.50', Outlet Invert= 131.90'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
42.00	136.00	0.00
45.00	135.30	0.70
48.00	134.00	2.00
53.00	134.30	1.70
55.00	135.50	0.50
56.00	136.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.30	0.9	5.8	5.7	256	0.97
1.30	8.5	10.2	9.7	2,560	30.79
1.50	10.6	11.5	10.9	3,176	40.79
2.00	16.8	14.8	14.0	5,040	74.37

Reach 4R: Stream down stream section b



Summary for Pond 5P: 8x3 Box Cuvert Crossing

[61] Hint: Exceeded Reach 2R outlet invert by 0.09' @ 16.45 hrs

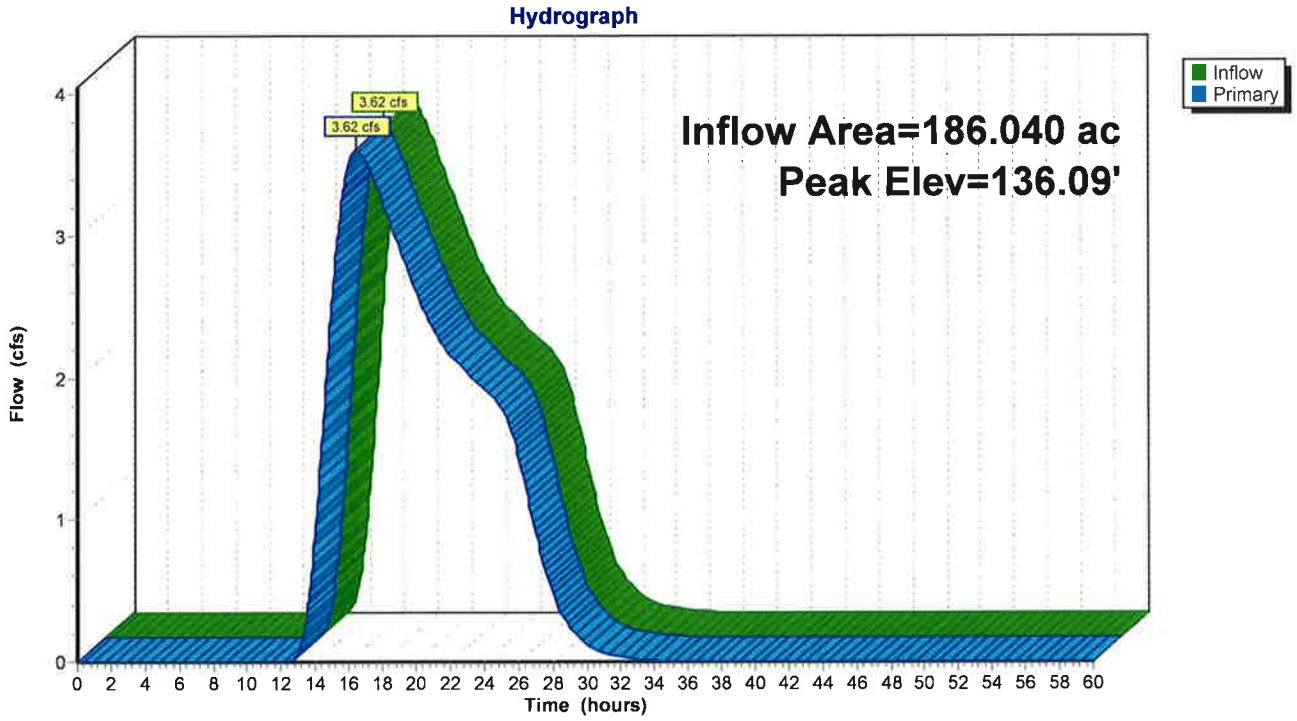
Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af
Outflow = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af, Atten= 0%, Lag= 0.0 min
Primary = 3.62 cfs @ 16.46 hrs, Volume= 2.731 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 136.09' @ 16.46 hrs
Flood Elev= 139.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	135.80'	**96.0" W x 36.0" H Box Culvert** L= 31.0' Ke= 0.500 Inlet / Outlet Invert= 135.80' / 135.50' S= 0.0097 '/' Cc= 0.900 n= 0.024, Flow Area= 24.00 sf
#2	Primary	139.65'	**208.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.61 cfs @ 16.46 hrs HW=136.09' (Free Discharge)
└**1=Culvert** (Barrel Controls 3.61 cfs @ 2.05 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: 8x3 Box Cuvert Crossing



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 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 1S: Existing Basin Runoff Area=186.040 ac 0.00% Impervious Runoff Depth=0.62"
Flow Length=5,063' Slope=0.0120 '/' Tc=213.9 min CN=54 Runoff=16.76 cfs 9.595 af

Reach 2R: stream - upstream section A Avg. Flow Depth=1.02' Max Vel=3.32 fps Inflow=16.76 cfs 9.595 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=256.41 cfs Outflow=16.76 cfs 9.595 af

Reach 4R: Stream down stream Avg. Flow Depth=0.97' Max Vel=3.01 fps Inflow=16.76 cfs 9.595 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=74.37 cfs Outflow=16.75 cfs 9.595 af

Pond 5P: 8x3 Box Cuvert Crossing Peak Elev=136.61' Inflow=16.76 cfs 9.595 af
Outflow=16.76 cfs 9.595 af

Total Runoff Area = 186.040 ac Runoff Volume = 9.595 af Average Runoff Depth = 0.62"
100.00% Pervious = 186.040 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Basin

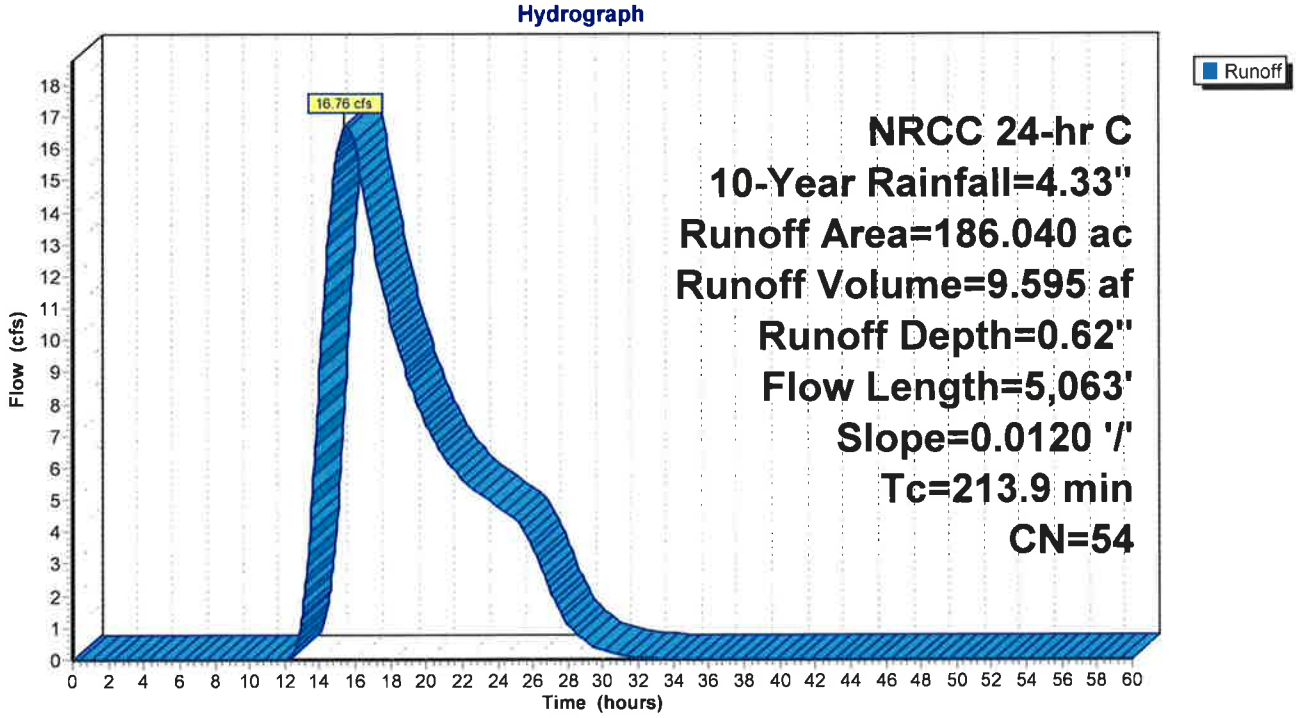
Runoff = 16.76 cfs @ 15.48 hrs, Volume= 9.595 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 10-Year Rainfall=4.33"

	Area (ac)	CN	Description
*	52.240	36	
*	58.880	60	
*	18.960	73	
*	17.040	30	
*	16.670	58	
*	10.420	71	
*	1.250	85	
*	10.580	89	
	186.040	54	Weighted Average
	186.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
213.9	5,063	0.0120	0.39		**Lag/CN Method,**

Subcatchment 1S: Existing Basin



Summary for Reach 2R: stream - upstream section A

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 16.76 cfs @ 15.48 hrs, Volume= 9.595 af
Outflow = 16.76 cfs @ 15.55 hrs, Volume= 9.595 af, Atten= 0%, Lag= 4.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.32 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 2.9 min

Peak Storage= 1,513 cf @ 15.51 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 5.91'
Bank-Full Depth= 3.20' Flow Area= 61.7 sf, Capacity= 256.41 cfs

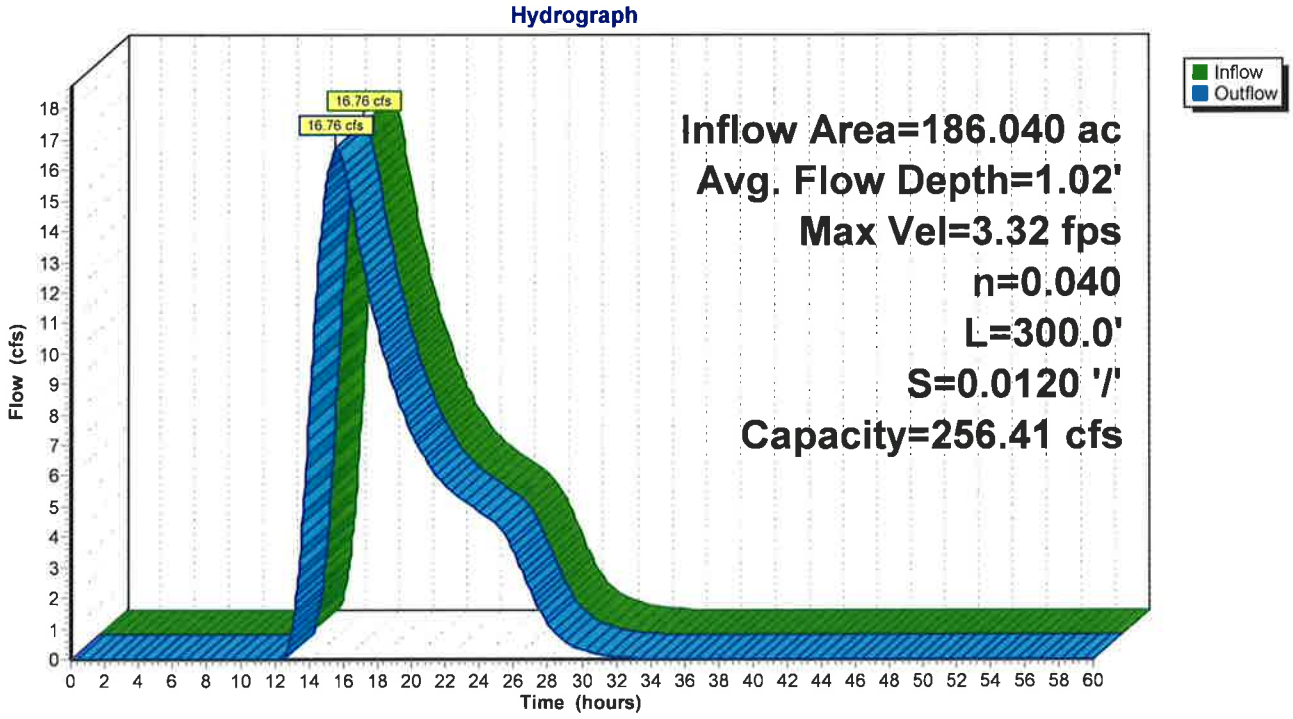
Custom cross-section, Length= 300.0' Slope= 0.0120 '/' (101 Elevation Intervals)
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 139.60', Outlet Invert= 136.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	139.00	0.00
25.00	138.00	1.00
32.00	137.50	1.50
48.00	138.20	0.80
51.00	135.80	3.20
55.00	135.80	3.20
57.00	139.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0.0	0	0.00
1.70	9.5	8.7	7.3	2,853	40.62
2.20	17.9	28.6	26.6	5,383	53.55
2.40	24.2	38.7	36.5	7,275	72.25
3.20	61.7	59.7	57.0	18,495	256.41

Reach 2R: stream - upstream section A



Summary for Reach 4R: Stream down stream section b

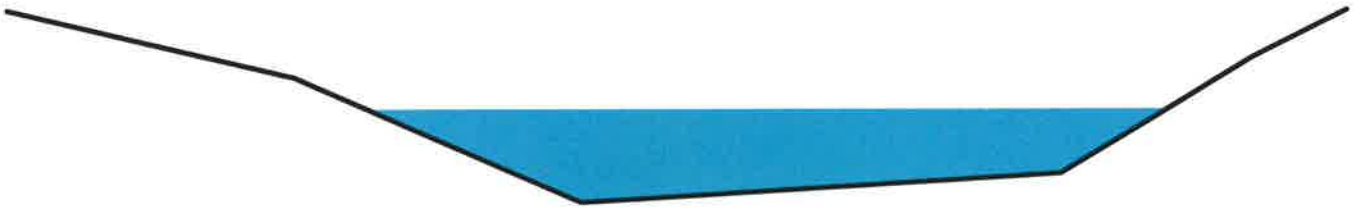
[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 0.67'

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 16.76 cfs @ 15.55 hrs, Volume= 9.595 af
Outflow = 16.75 cfs @ 15.61 hrs, Volume= 9.595 af, Atten= 0%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.53 fps, Avg. Travel Time= 3.3 min

Peak Storage= 1,670 cf @ 15.57 hrs
Average Depth at Peak Storage= 0.97' , Surface Width= 8.36'
Bank-Full Depth= 2.00' Flow Area= 16.8 sf, Capacity= 74.37 cfs

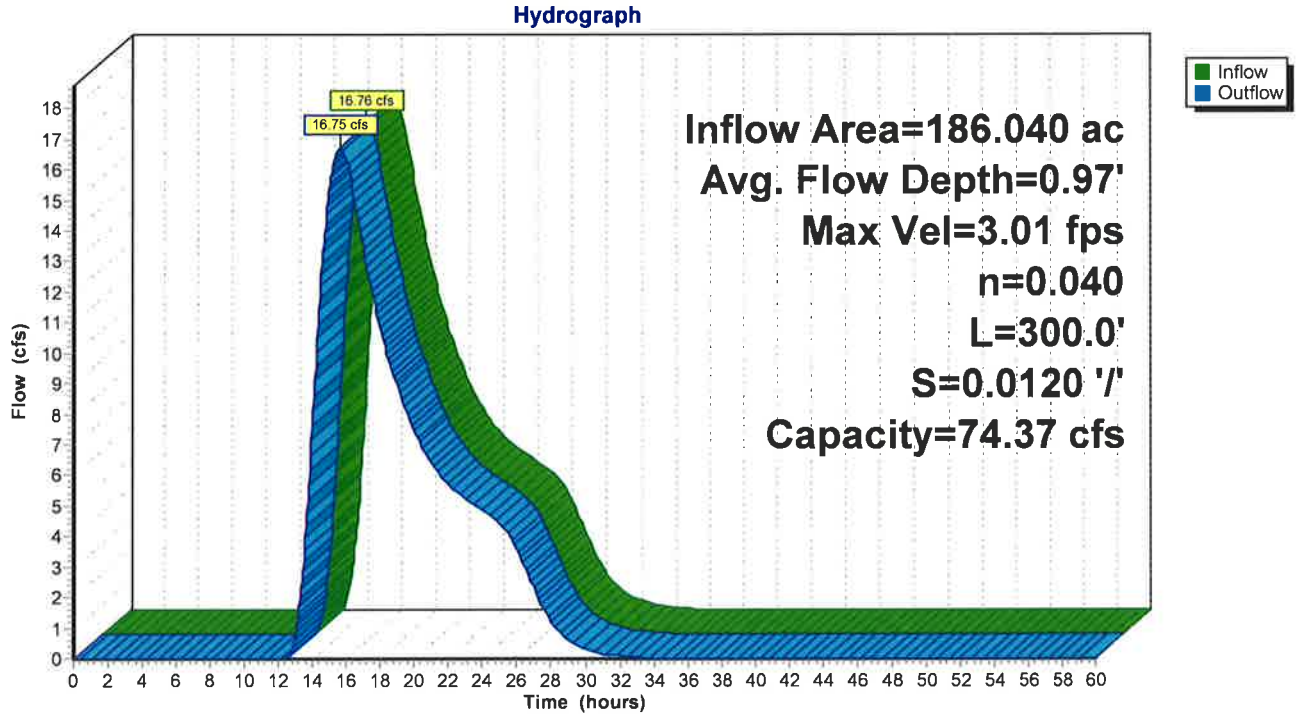
Custom cross-section, Length= 300.0' Slope= 0.0120 '/'
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 135.50', Outlet Invert= 131.90'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
42.00	136.00	0.00
45.00	135.30	0.70
48.00	134.00	2.00
53.00	134.30	1.70
55.00	135.50	0.50
56.00	136.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.30	0.9	5.8	5.7	256	0.97
1.30	8.5	10.2	9.7	2,560	30.79
1.50	10.6	11.5	10.9	3,176	40.79
2.00	16.8	14.8	14.0	5,040	74.37

Reach 4R: Stream down stream section b



Summary for Pond 5P: 8x3 Box Cuvert Crossing

[61] Hint: Exceeded Reach 2R outlet invert by 0.61' @ 15.55 hrs

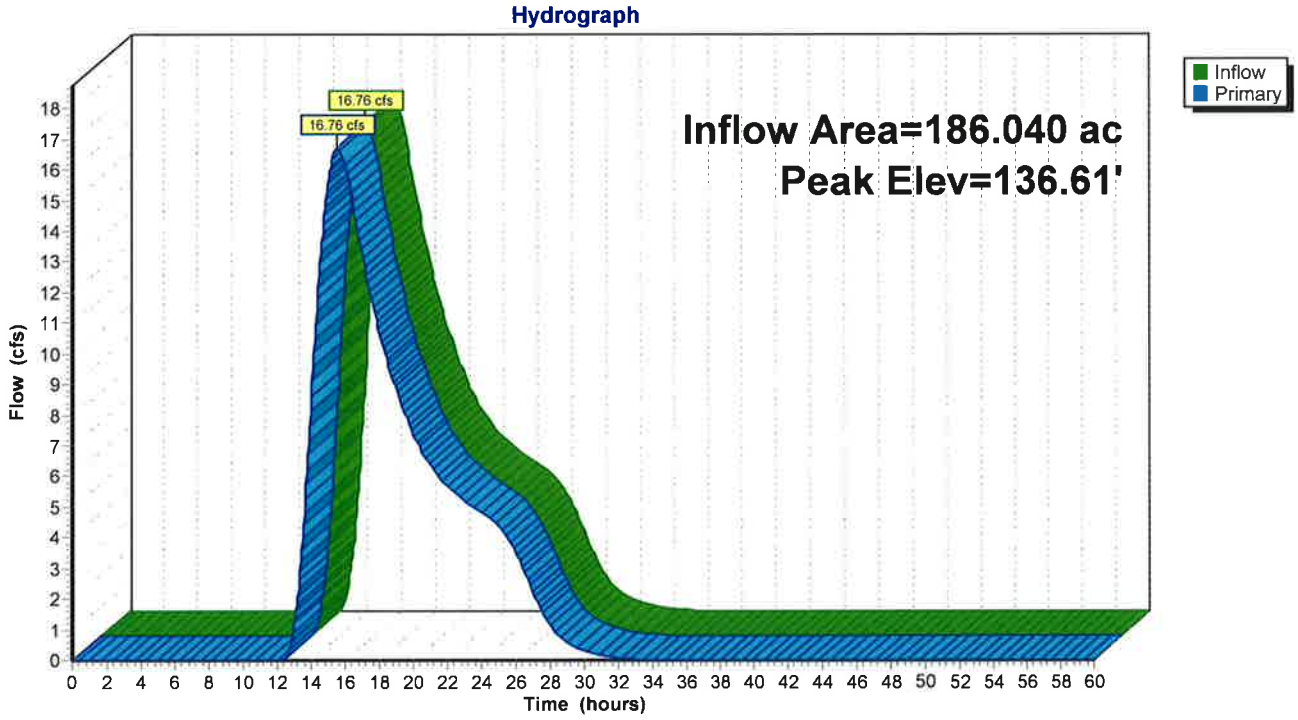
Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 0.62" for 10-Year event
Inflow = 16.76 cfs @ 15.55 hrs, Volume= 9.595 af
Outflow = 16.76 cfs @ 15.55 hrs, Volume= 9.595 af, Atten= 0%, Lag= 0.0 min
Primary = 16.76 cfs @ 15.55 hrs, Volume= 9.595 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 136.61' @ 15.55 hrs
Flood Elev= 139.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	135.80'	**96.0" W x 36.0" H Box Culvert** L= 31.0' Ke= 0.500 Inlet / Outlet Invert= 135.80' / 135.50' S= 0.0097 '/' Cc= 0.900 n= 0.024, Flow Area= 24.00 sf
#2	Primary	139.65'	**208.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=16.75 cfs @ 15.55 hrs HW=136.61' (Free Discharge)
└**1=Culvert** (Barrel Controls 16.75 cfs @ 3.45 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: 8x3 Box Cuvert Crossing



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 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 1S: Existing Basin Runoff Area=186.040 ac 0.00% Impervious Runoff Depth=2.21"
Flow Length=5,063' Slope=0.0120 '/' Tc=213.9 min CN=54 Runoff=71.96 cfs 34.301 af

Reach 2R: stream - upstream section Avg. Flow Depth=2.40' Max Vel=4.30 fps Inflow=71.96 cfs 34.301 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=256.41 cfs Outflow=71.95 cfs 34.301 af

Reach 4R: Stream down stream Avg. Flow Depth=1.97' Max Vel=4.39 fps Inflow=71.95 cfs 34.301 af
n=0.040 L=300.0' S=0.0120 '/' Capacity=74.37 cfs Outflow=71.96 cfs 34.301 af

Pond 5P: 8x3 Box Cuvert Crossing Peak Elev=138.03' Inflow=71.95 cfs 34.301 af
Outflow=71.95 cfs 34.301 af

Total Runoff Area = 186.040 ac Runoff Volume = 34.301 af Average Runoff Depth = 2.21"
100.00% Pervious = 186.040 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Basin

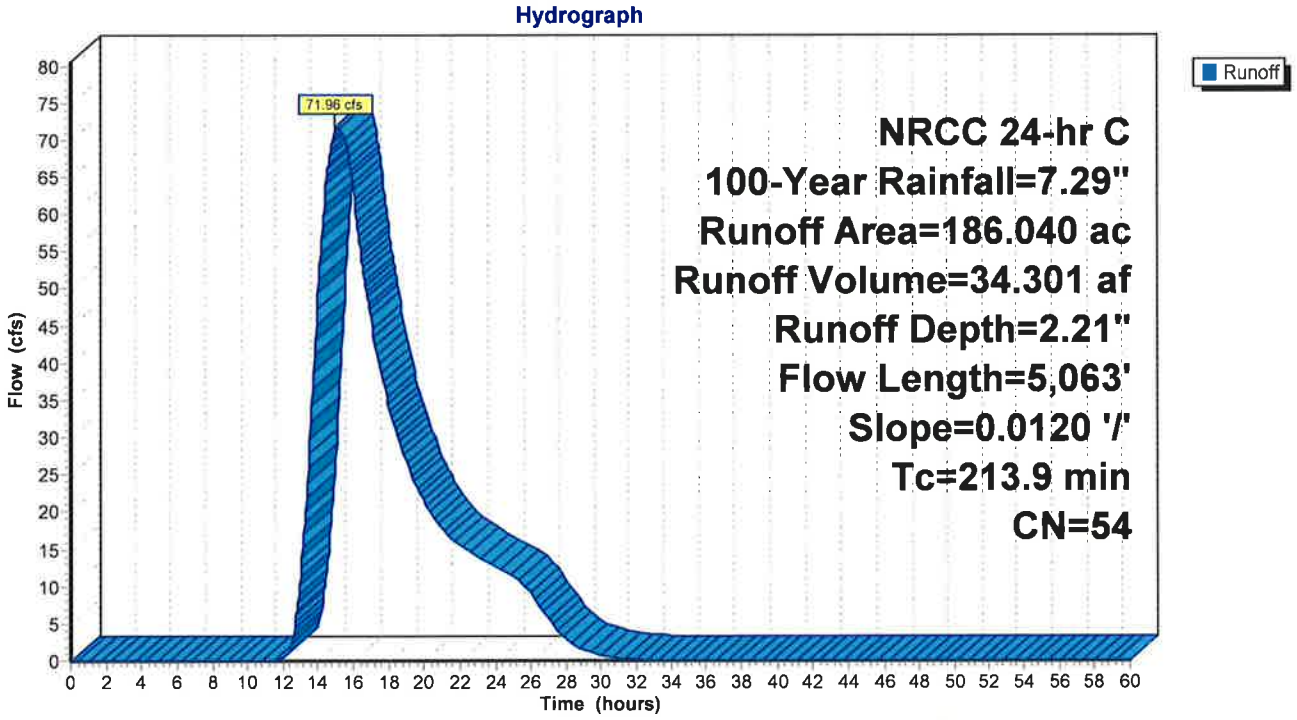
Runoff = 71.96 cfs @ 15.00 hrs, Volume= 34.301 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 100-Year Rainfall=7.29"

	Area (ac)	CN	Description
*	52.240	36	
*	58.880	60	
*	18.960	73	
*	17.040	30	
*	16.670	58	
*	10.420	71	
*	1.250	85	
*	10.580	89	
	186.040	54	Weighted Average
	186.040		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
213.9	5,063	0.0120	0.39		**Lag/CN Method,**

Subcatchment 1S: Existing Basin



Summary for Reach 2R: stream - upstream section A

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100-Year event
Inflow = 71.96 cfs @ 15.00 hrs, Volume= 34.301 af
Outflow = 71.95 cfs @ 15.10 hrs, Volume= 34.301 af, Atten= 0%, Lag= 6.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.30 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 2.18 fps, Avg. Travel Time= 2.3 min

Peak Storage= 7,247 cf @ 15.05 hrs
Average Depth at Peak Storage= 2.40' , Surface Width= 36.37'
Bank-Full Depth= 3.20' Flow Area= 61.7 sf, Capacity= 256.41 cfs

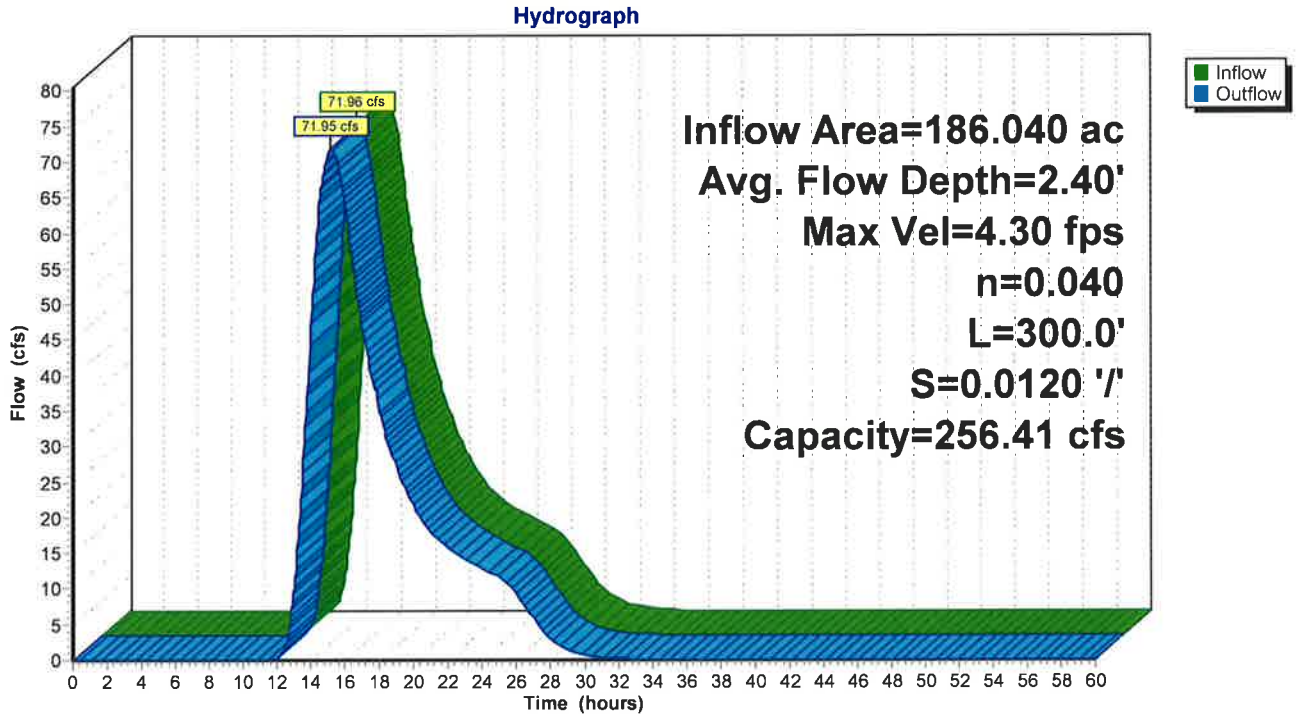
Custom cross-section, Length= 300.0' Slope= 0.0120 '/' (101 Elevation Intervals)
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 139.60', Outlet Invert= 136.00'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	139.00	0.00
25.00	138.00	1.00
32.00	137.50	1.50
48.00	138.20	0.80
51.00	135.80	3.20
55.00	135.80	3.20
57.00	139.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	4.0	0.0	0	0.00
1.70	9.5	8.7	7.3	2,853	40.62
2.20	17.9	28.6	26.6	5,383	53.55
2.40	24.2	38.7	36.5	7,275	72.25
3.20	61.7	59.7	57.0	18,495	256.41

Reach 2R: stream - upstream section A



Summary for Reach 4R: Stream down stream section b

[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 1.67'

Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100-Year event
Inflow = 71.95 cfs @ 15.10 hrs, Volume= 34.301 af
Outflow = 71.96 cfs @ 15.17 hrs, Volume= 34.301 af, Atten= 0%, Lag= 4.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.11 fps, Avg. Travel Time= 2.4 min

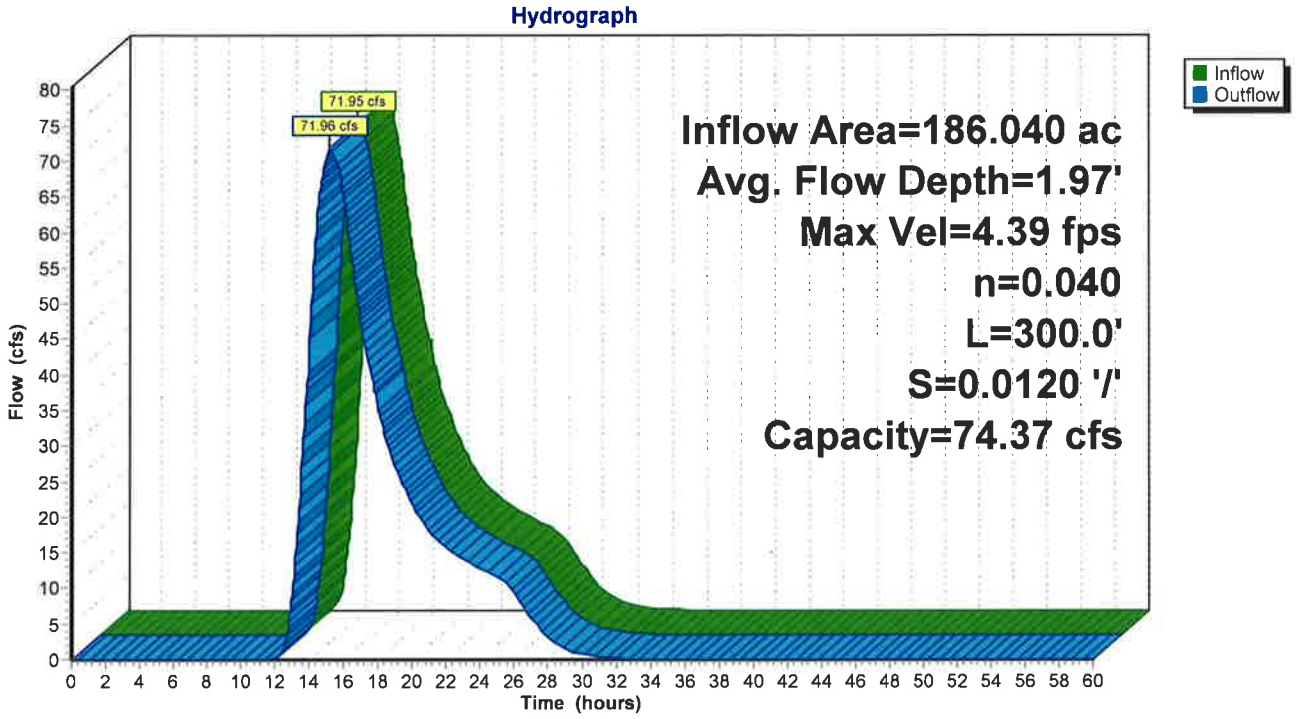
Peak Storage= 4,914 cf @ 15.14 hrs
Average Depth at Peak Storage= 1.97' , Surface Width= 13.81'
Bank-Full Depth= 2.00' Flow Area= 16.8 sf, Capacity= 74.37 cfs

Custom cross-section, Length= 300.0' Slope= 0.0120 '/'
Constant n= 0.040 Winding stream, pools & shoals
Inlet Invert= 135.50', Outlet Invert= 131.90'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
42.00	136.00	0.00
45.00	135.30	0.70
48.00	134.00	2.00
53.00	134.30	1.70
55.00	135.50	0.50
56.00	136.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Width (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0.0	0	0.00
0.30	0.9	5.8	5.7	256	0.97
1.30	8.5	10.2	9.7	2,560	30.79
1.50	10.6	11.5	10.9	3,176	40.79
2.00	16.8	14.8	14.0	5,040	74.37

Reach 4R: Stream down stream section b



Summary for Pond 5P: 8x3 Box Cuvert Crossing

[61] Hint: Exceeded Reach 2R outlet invert by 2.03' @ 15.10 hrs

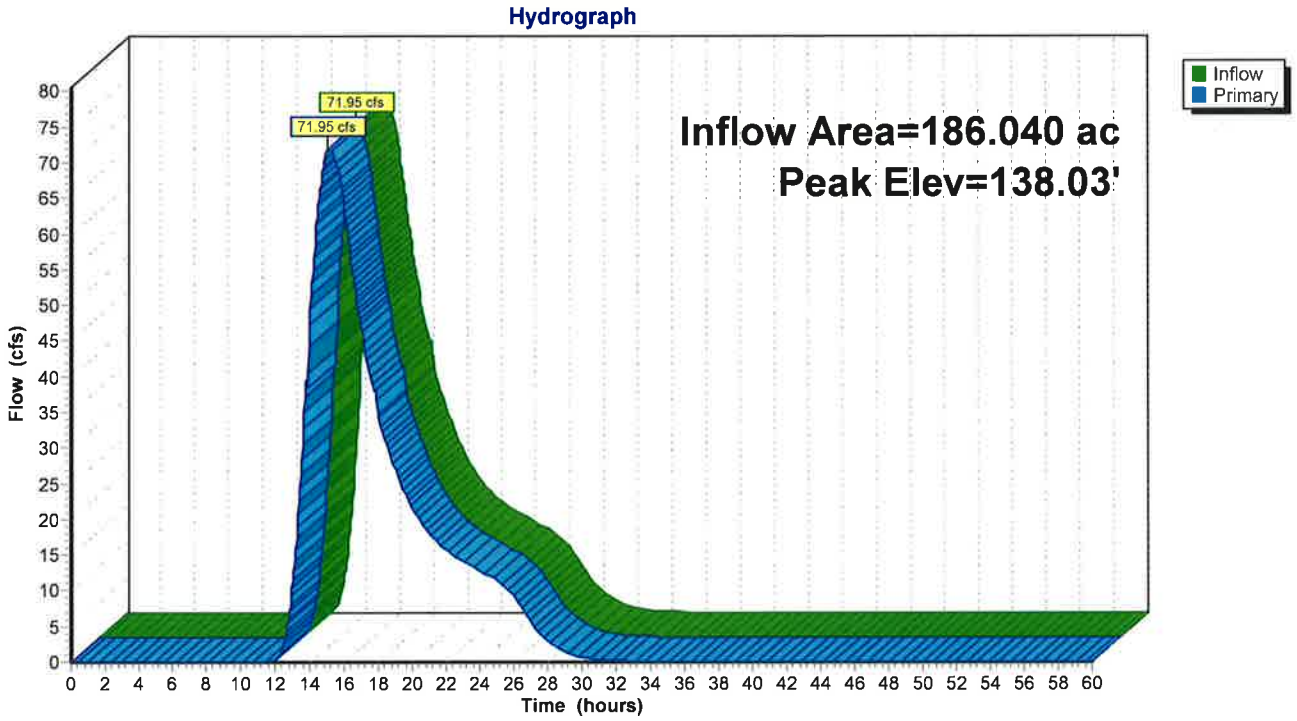
Inflow Area = 186.040 ac, 0.00% Impervious, Inflow Depth = 2.21" for 100-Year event
Inflow = 71.95 cfs @ 15.10 hrs, Volume= 34.301 af
Outflow = 71.95 cfs @ 15.10 hrs, Volume= 34.301 af, Atten= 0%, Lag= 0.0 min
Primary = 71.95 cfs @ 15.10 hrs, Volume= 34.301 af

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 138.03' @ 15.10 hrs
Flood Elev= 139.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	135.80'	**96.0" W x 36.0" H Box Culvert** L= 31.0' Ke= 0.500 Inlet / Outlet Invert= 135.80' / 135.50' S= 0.0097 '/' Cc= 0.900 n= 0.024, Flow Area= 24.00 sf
#2	Primary	139.65'	**208.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=71.95 cfs @ 15.10 hrs HW=138.03' (Free Discharge)
└**1=Culvert** (Barrel Controls 71.95 cfs @ 5.37 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: 8x3 Box Cuvert Crossing



29 South Ferry Road, Montague, MA StreamStats Report

Region ID: MA
Workspace ID: MA20220118165501254000
Clicked Point (Latitude, Longitude): 42.54465, -72.55054
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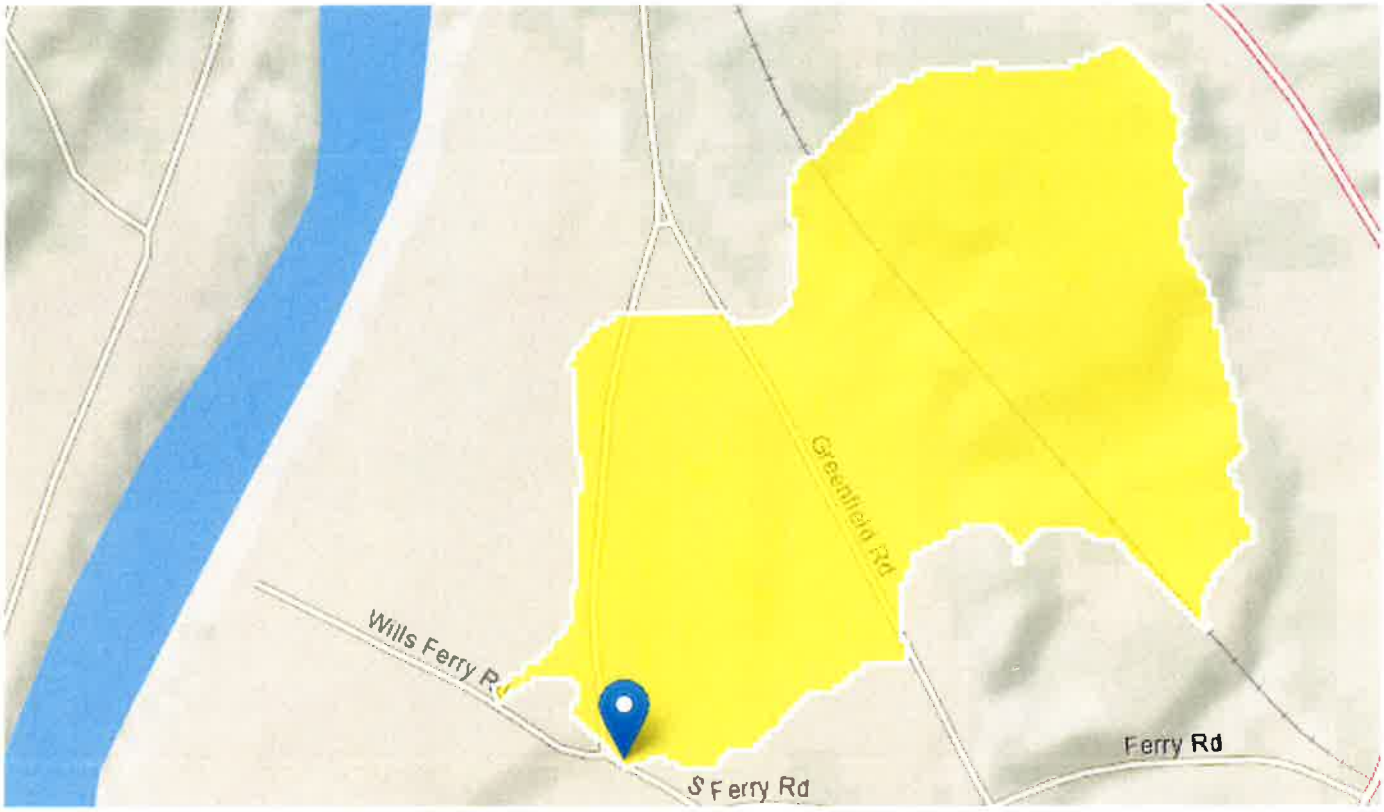

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.37	square miles
ELEV	Mean Basin Elevation	188	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	7.47	percent
BSLDEM250	Mean basin slope computed from 1:250K DEM	0.939	percent

Parameter Code	Parameter Description	Value	Unit
DRFTPERSTR	Area of stratified drift per unit of stream length	0.46	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	1	dimensionless
BSLDEM10M	Mean basin slope computed from 10 m DEM	4.96	percent
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	85.93	percent
FOREST	Percentage of area covered by forest	49.57	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	0.16	512
ELEV	Mean Basin Elevation	188	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	7.47	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	ASEp
50-percent AEP flood	17.1	ft^3/s	8.63	33.9	42.3
20-percent AEP flood	29	ft^3/s	14.4	58.4	43.4
10-percent AEP flood	38.6	ft^3/s	18.7	79.7	44.7
4-percent AEP flood	52.6	ft^3/s	24.6	113	47.1
2-percent AEP flood	64.3	ft^3/s	29.1	142	49.4
1-percent AEP flood	76.8	ft^3/s	33.6	175	51.8
0.5-percent AEP flood	90.4	ft^3/s	38.4	213	54.1
0.2-percent AEP flood	110	ft^3/s	44.5	272	57.6

Peak-Flow Statistics Citations

Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (https://dx.doi.org/10.3133/sir20165156)

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	0.939	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.46	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

Low-Flow Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0532	ft^3/s
7 Day 10 Year Low Flow	0.0222	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	0.6	329

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
BSLDEM10M	Mean Basin Slope from 10m DEM	4.96	percent	2.2	23.9

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	0.07722	940.1535

Bankfull Statistics Parameters [New England P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	3.799224	138.999861

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	0.07722	59927.7393

Bankfull Statistics Disclaimers [Bankfull Statewide SIR2013 5155]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

Statistic	Value	Unit
Bankfull Width	9.55	ft
Bankfull Depth	0.68	ft
Bankfull Area	6.39	ft^2
Bankfull Streamflow	13.3	ft^3/s

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	10.1	ft
Bieger_D_channel_depth	0.843	ft
Bieger_D_channel_cross_sectional_area	8.56	ft^2

Bankfull Statistics Disclaimers [New England P Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Bankfull Statistics Flow Report [New England P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	19.1	ft
Bieger_P_channel_depth	1.11	ft
Bieger_P_channel_cross_sectional_area	20.8	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	8.73	ft
Bieger_USA_channel_depth	0.975	ft
Bieger_USA_channel_cross_sectional_area	9.99	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
Bankfull Width	9.55	ft
Bankfull Depth	0.68	ft
Bankfull Area	6.39	ft^2
Bankfull Streamflow	13.3	ft^3/s
Bieger_D_channel_width	10.1	ft
Bieger_D_channel_depth	0.843	ft
Bieger_D_channel_cross_sectional_area	8.56	ft^2
Bieger_P_channel_width	19.1	ft
Bieger_P_channel_depth	1.11	ft
Bieger_P_channel_cross_sectional_area	20.8	ft^2
Bieger_USA_channel_width	8.73	ft
Bieger_USA_channel_depth	0.975	ft
Bieger_USA_channel_cross_sectional_area	9.99	ft^2

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)
Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_can

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.46	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	0.939	percent	0.32	24.6

Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
50 Percent Duration	0.346	ft^3/s
60 Percent Duration	0.25	ft^3/s
70 Percent Duration	0.225	ft^3/s
75 Percent Duration	0.195	ft^3/s
80 Percent Duration	0.163	ft^3/s
85 Percent Duration	0.115	ft^3/s
90 Percent Duration	0.0895	ft^3/s
95 Percent Duration	0.0474	ft^3/s

Statistic	Value	Unit
98 Percent Duration	0.0357	ft^3/s
99 Percent Duration	0.0247	ft^3/s

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.37	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	85.93	percent	0	100
FOREST	Percent Forest	49.57	percent	0	100
MAREGION	Massachusetts Region	1	dimensionless	0	1

Probability Statistics Flow Report [Perennial Flow Probability]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PC
Probability Stream Flowing Perennially	0.915	dim	71

Probability Statistics Citations

Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

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Application Version: 4.6.2
StreamStats Services Version: 1.2.22
NSS Services Version: 2.1.2

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Franklin County, Massachusetts

February 1, 2022

Preface

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

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

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

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

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

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

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

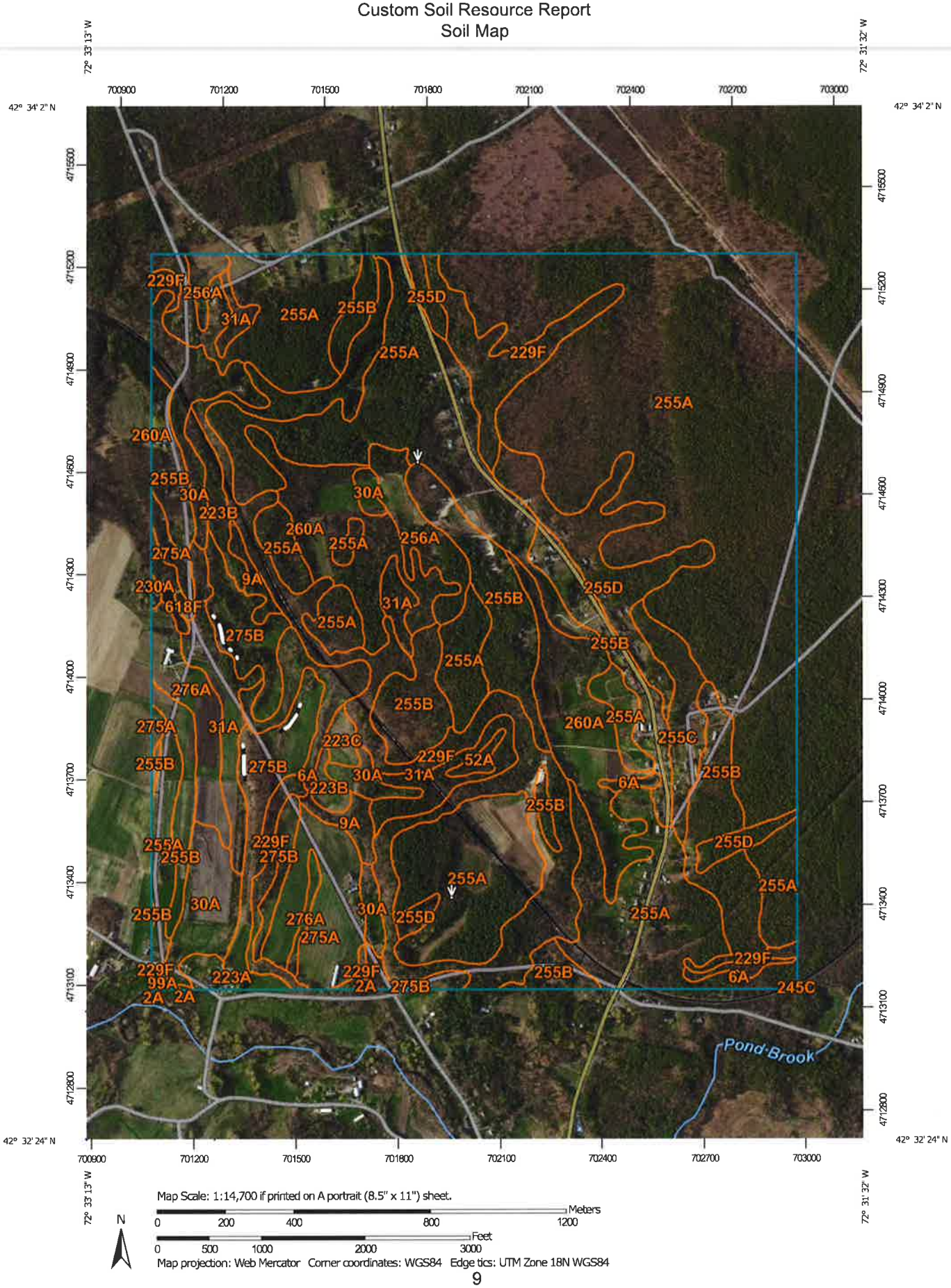
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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


72° 33' 13" W
72° 31' 32" W
42° 34' 2" N
42° 32' 24" N
700900
701200
701500
701800
702100
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702700
703000
4715500
4715200
4714900
4714600
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4713100
4712800
229F
256A
31A
255A
255B
255D
260A
30A
223B
275A
9A
230A
618F
276A
223C
52A
6A
223B
245C
99A
2A
223A
Pond Brook
Map Scale: 1:14,700 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0
200
400
800
1200
Feet
0
500
1000
2000
3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Franklin County, Massachusetts
Survey Area Data: Version 16, 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: Apr 9, 2011—May 12, 2011

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	1.2	0.1%
2A	Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded	0.3	0.0%
6A	Scarboro mucky sandy loam, 0 to 2 percent slopes	15.4	1.5%
9A	Birdsall mucky silt loam, 0 to 2 percent slopes	7.5	0.7%
30A	Raynham silt loam, 0 to 3 percent slopes	40.5	4.0%
31A	Walpole sandy loam, 0 to 3 percent slopes	30.3	3.0%
52A	Freetown muck, 0 to 1 percent slopes	1.9	0.2%
99A	Occum fine sandy loam, 0 to 3 percent slopes, occasionally flooded	0.7	0.1%
223A	Scio silt loam, 0 to 3 percent slopes	4.8	0.5%
223B	Scio silt loam, 3 to 8 percent slopes	9.5	0.9%
223C	Scio silt loam, 8 to 15 percent slopes	3.0	0.3%
229F	Windsor and Merrimac soils, 25 to 60 percent slopes	104.4	10.3%
230A	Unadilla silt loam, 0 to 3 percent slopes	0.5	0.0%
245C	Hinckley loamy sand, 8 to 15 percent slopes	0.0	0.0%
255A	Windsor loamy sand, 0 to 3 percent slopes	463.3	45.7%
255B	Windsor loamy sand, 3 to 8 percent slopes	108.7	10.7%
255C	Windsor loamy sand, 8 to 15 percent slopes	13.7	1.4%
255D	Windsor loamy sand, 15 to 25 percent slopes	38.1	3.8%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	16.7	1.6%
260A	Sudbury sandy loam, 0 to 3 percent slopes	60.8	6.0%
275A	Agawam fine sandy loam, 0 to 3 percent slopes	29.7	2.9%
275B	Agawam fine sandy loam, 3 to 8 percent slopes	41.3	4.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
276A	Ninigret fine sandy loam, 0 to 3 percent slopes	17.4	1.7%
618F	Udorthents, 25 to 60 percent slopes, frequently flooded	4.5	0.4%
Totals for Area of Interest		**1,014.3**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Franklin County, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: bpfr
Elevation: 0 to 1,970 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

2A—Pootatuck very fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 9c46
Elevation: 100 to 980 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Pootatuck, occasionally flooded, and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pootatuck, Occasionally Flooded

Setting

Landform: Flood plains, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 9 inches: very fine sandy loam
Bw - 9 to 21 inches: fine sandy loam
BC - 21 to 28 inches: fine sandy loam
C - 28 to 44 inches: loamy fine sand
Cg - 44 to 52 inches: loamy fine sand
C' - 52 to 65 inches: loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 19 to 23 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F144AY012CT - Sandy Low Floodplain
Hydric soil rating: No

Minor Components

Occum, occasionally flooded

Percent of map unit: 5 percent
Landform: Flood plains, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Limerick, frequently flooded

Percent of map unit: 5 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear, concave
Hydric soil rating: Yes

Winooski, occasionally flooded

Percent of map unit: 2 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

6A—Scarboro mucky sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 9c48
Elevation: 40 to 1,120 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 93 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Deltas, outwash plains, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Stratified sandy glaciofluvial deposits

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 10 inches: mucky sandy loam
Cg1 - 10 to 13 inches: sand
Cg2 - 13 to 16 inches: loamy sand
Cg3 - 16 to 23 inches: loamy sand
C - 23 to 26 inches: sand
C'g1 - 26 to 33 inches: fine sand
C'g2 - 33 to 53 inches: sand
C'g3 - 53 to 65 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Minor Components

Walpole

Percent of map unit: 5 percent
Landform: Outwash plains, deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Saco

Percent of map unit: 2 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear, convex
Hydric soil rating: Yes

9A—Birdsall mucky silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 9c49
Elevation: 120 to 1,030 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Birdsall and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Birdsall

Setting

Landform: Stream terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Silty glaciolacustrine deposits

Typical profile

A - 0 to 10 inches: mucky silt loam
Bg - 10 to 29 inches: silt loam
Cg1 - 29 to 36 inches: silt loam
Cg2 - 36 to 43 inches: silt loam
Cg3 - 43 to 52 inches: silty clay loam
Cg4 - 52 to 58 inches: silt loam
Cg5 - 58 to 65 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None

Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Raynham

Percent of map unit: 10 percent
Landform: Depressions, terraces
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Swansea

Percent of map unit: 1 percent
Landform: Outwash plains, outwash terraces, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 1 percent
Landform: Outwash plains, deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

30A—Raynham silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2qk83
Elevation: 30 to 1,040 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Raynham and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Raynham

Setting

Landform: Terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty glaciolacustrine deposits

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 7 inches: silt loam
Bg - 7 to 12 inches: silt loam
Bw - 12 to 16 inches: very fine sandy loam
B'g - 16 to 31 inches: very fine sandy loam
Cg - 31 to 38 inches: silt loam
C1 - 38 to 53 inches: stratified silt loam to silty clay loam
C2 - 53 to 65 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 12.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: F145XY004CT - Wet Lake Plain
Hydric soil rating: Yes

Minor Components

Scio

Percent of map unit: 5 percent
Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Enosburg

Percent of map unit: 2 percent
Landform: Terraces, deltas, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Walpole

Percent of map unit: 2 percent
Landform: Outwash plains, deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Amostown

Percent of map unit: 2 percent
Landform: Deltas, terraces, lake plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Birdsall

Percent of map unit: 2 percent
Landform: Stream terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

31A—Walpole sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkl
Elevation: 0 to 1,020 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Walpole and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walpole

Setting

Landform: Depressions, outwash plains, outwash terraces, depressions, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Typical profile

Oe - 0 to 1 inches: mucky peat
A - 1 to 7 inches: sandy loam
Bg - 7 to 21 inches: sandy loam
BC - 21 to 25 inches: gravelly sandy loam
C - 25 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 10 percent
Landform: Outwash plains, deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 10 percent
Landform: Outwash plains, deltas, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear

Hydric soil rating: No

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown

Setting

Landform: Depressions, depressions, swamps, kettles, marshes, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 5 percent
Landform: Bogs, swamps, marshes, depressions, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

99A—Occum fine sandy loam, 0 to 3 percent slopes, occasionally flooded

Map Unit Setting

National map unit symbol: 9c4v
Elevation: 100 to 940 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Occum, occasionally flooded, and similar soils: 86 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Occum, Occasionally Flooded

Setting

Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, rise

Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium over sandy alluvium

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 21 inches: fine sandy loam
Bw2 - 21 to 32 inches: sandy loam
C - 32 to 46 inches: loamy fine sand
Ab - 46 to 49 inches: loamy very fine sand
C' - 49 to 65 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Ecological site: F144AY010NH - Sandy High Floodplain
Hydric soil rating: No

Minor Components

Pootatuck, occasionally flooded

Percent of map unit: 5 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Suncook, occasionally flooded

Percent of map unit: 5 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Winooski, occasionally flooded

Percent of map unit: 2 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hadley, occasionally flooded

Percent of map unit: 2 percent
Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

223A—Scio silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9c5y
Elevation: 120 to 980 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Scio

Setting

Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty glaciolacustrine deposits and/or old alluvium

Typical profile

Ap - 0 to 9 inches: silt loam
Bw1 - 9 to 15 inches: silt loam
Bw2 - 15 to 22 inches: silt loam
Bw3 - 22 to 28 inches: silt loam
C1 - 28 to 46 inches: silt loam
C2 - 46 to 53 inches: very fine sandy loam
C3 - 53 to 65 inches: stratified silt loam to silty clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 20 to 24 inches
Frequency of flooding: None

Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Raynham

Percent of map unit: 10 percent
Landform: Terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Unadilla

Percent of map unit: 2 percent
Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ninigret

Percent of map unit: 2 percent
Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Birdsall

Percent of map unit: 2 percent
Landform: Stream terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

223B—Scio silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9c5z
Elevation: 100 to 940 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Scio and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scio

Setting

Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty glaciolacustrine deposits and/or old alluvium

Typical profile

Ap - 0 to 9 inches: silt loam
Bw1 - 9 to 15 inches: silt loam
Bw2 - 15 to 22 inches: silt loam
Bw3 - 22 to 28 inches: silt loam
C1 - 28 to 46 inches: silt loam
C2 - 46 to 53 inches: very fine sandy loam
C3 - 53 to 65 inches: stratified silt loam to silty clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 20 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Raynham

Percent of map unit: 10 percent
Landform: Terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Amostown

Percent of map unit: 2 percent
Landform: Lake plains, terraces, deltas
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

223C—Scio silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9cbq
Elevation: 130 to 780 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Scio and similar soils: 86 percent
Minor components: 14 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scio

Setting

Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty glaciolacustrine deposits and/or old alluvium

Typical profile

Ap - 0 to 9 inches: silt loam
Bw1 - 9 to 15 inches: silt loam
Bw2 - 15 to 22 inches: silt loam
Bw3 - 22 to 28 inches: silt loam
C1 - 28 to 46 inches: silt loam
C2 - 46 to 53 inches: very fine sandy loam
C3 - 53 to 65 inches: stratified silt loam to silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: About 20 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B/D
Hydric soil rating: No

Minor Components

Raynham

Percent of map unit: 5 percent
Landform: Terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Agawam

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Amostown

Percent of map unit: 2 percent
Landform: Lake plains, terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Birdsall

Percent of map unit: 2 percent
Landform: Stream terraces, depressions
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

229F—Windsor and Merrimac soils, 25 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2w2wr
Elevation: 100 to 1,150 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Windsor and similar soils: 60 percent
Merrimac and similar soils: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, kames
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, tread, riser, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Pollux

Percent of map unit: 5 percent
Landform: Terraces, deltas, plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear

Hydric soil rating: No

230A—Unadilla silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9c60
Elevation: 110 to 500 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Unadilla and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Unadilla

Setting

Landform: Terraces, plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty glaciolacustrine deposits and/or old alluvium

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Ap - 1 to 10 inches: silt loam
Bw1 - 10 to 21 inches: very fine sandy loam
Bw2 - 21 to 30 inches: silt loam
C - 30 to 55 inches: silt loam
2C - 55 to 65 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 12.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B

Ecological site: F144AY024NY - Well Drained Eolian Outwash
Hydric soil rating: No

Minor Components

Scio

Percent of map unit: 10 percent
Landform: Plains, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

245C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Shoulder, toeslope, footslope, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Outwash deltas, moraines, outwash plains, kame terraces, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, crest, side slope, nose slope, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, outwash terraces, moraines, eskers
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope

Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

255A—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg
Elevation: 0 to 990 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash plains, outwash terraces, deltas, dunes
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Dunes, outwash plains, deltas, outwash terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, head slope, nose slope, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

255C—Windsor loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svkq
Elevation: 0 to 1,260 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: — error in exists on —
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Ap - 1 to 11 inches: loamy sand
Bw - 11 to 31 inches: loamy sand
C - 31 to 65 inches: sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley
Percent of map unit: 10 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield
Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

255D—Windsor loamy sand, 15 to 25 percent slopes

Map Unit Setting
National map unit symbol: 2svlb
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Windsor and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Deerfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

260A—Sudbury sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9cbm
Elevation: 130 to 1,010 feet
Mean annual precipitation: 37 to 52 inches
Mean annual air temperature: 35 to 59 degrees F
Frost-free period: 127 to 182 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sudbury and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Oa - 0 to 2 inches: highly decomposed plant material
Ap - 2 to 8 inches: sandy loam
Bw1 - 8 to 15 inches: fine sandy loam
Bw2 - 15 to 21 inches: loamy fine sand
C1 - 21 to 55 inches: stratified fine sand to sand
C2 - 55 to 65 inches: stratified fine sand to very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 6 to 10 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Deerfield

Percent of map unit: 10 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

275A—Agawam fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyqw
Elevation: 0 to 1,040 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Agawam and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agawam

Setting

Landform: Moraines, kames, kame terraces, outwash plains, outwash terraces
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, tread, riser, rise, dip
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 11 inches: fine sandy loam
Bw1 - 11 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C1 - 26 to 39 inches: loamy fine sand
2C2 - 39 to 55 inches: loamy fine sand
2C3 - 55 to 65 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 35 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Ninigret
Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Windsor
Percent of map unit: 4 percent
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Walpole
Percent of map unit: 3 percent
Landform: Deltas, depressions, outwash terraces, depressions, outwash plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, talf, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Hinckley
Percent of map unit: 3 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

275B—Agawam fine sandy loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2tyqx
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Agawam and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agawam

Setting

Landform: Outwash plains, kames, kame terraces, outwash terraces, moraines
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, riser, tread, rise, dip
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 11 inches: fine sandy loam
Bw1 - 11 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C1 - 26 to 45 inches: loamy fine sand
2C2 - 45 to 55 inches: loamy fine sand
2C3 - 55 to 65 inches: loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 15 to 35 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Dunes, outwash plains, deltas, outwash terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

276A—Ninigret fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyr6
Elevation: 0 to 1,250 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ninigret and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ninigret

Setting

Landform: Drainageways, depressions, kame terraces, outwash plains, moraines, kames, outwash terraces
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, tread, dip, rise
Down-slope shape: Concave, convex, linear

Across-slope shape: Concave, convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 8 inches: fine sandy loam
Bw1 - 8 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C - 26 to 65 inches: stratified loamy sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 18 to 38 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 17 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Ecological site: F144AY026CT - Moist Silty Outwash
Hydric soil rating: No

Minor Components

Deerfield

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Kame terraces, moraines, outwash plains, outwash terraces, kames
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, tread, riser, rise
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: No

618F—Udorthents, 25 to 60 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2qk8c
Elevation: 100 to 270 feet
Mean annual precipitation: 37 to 51 inches
Mean annual air temperature: 37 to 59 degrees F
Frost-free period: 135 to 182 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, frequently flooded, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Frequently Flooded

Setting

Landform: Terraces, flood plains
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 6 inches: very fine sandy loam
C1 - 6 to 21 inches: stratified loamy very fine sand to loamy fine sand
C2 - 21 to 34 inches: loamy very fine sand
C3 - 34 to 65 inches: stratified loamy very fine sand to loamy fine sand

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.60 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Poocham

Percent of map unit: 5 percent
Landform: Drainageways, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Linear
Across-slope shape: Complex, linear
Hydric soil rating: No

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