NOTICE OF INTENT

ADA Trail

Cloverdale Conservation Land

Submitted By:

Littleton Conservation Department

March 19, 2024

Cloverdale Conservation Land

ADA Trail

Great Road, Littleton

Notice of Intent Narrative

A Grant from the Department of Conservation and Recreation Recreational Trails Program has been awarded for the construction of approximately 300 linear feet of an ADA trail from the existing parking lot to the boardwalk. Figures 1 and 2 show the general location. Photographs are provided as Figure 3. The project includes both a gravel path as well as boardwalk improvements, as described below. The project location is through the mowed meadow area for the ADA trail, and the existing boardwalk for the boardwalk improvements. Bordering vegetated wetlands were flagged and surveyed, as shown on the Plans in Attachment C.

ADA Trail. The proposed trail is approximately 300 feet long and the surface will be densely packed gravel. As shown on the plans in Attachment C, this work will occur in the 50-foot and 100-foot buffer zone, based on the surveyed wetland line. The pathway will be across the existing field. Erosion controls will be placed prior to excavation for the subbase and will remain in place until the area is stabilized. Following construction, disturbed areas will be seeded with a native grass seed mix. Given the surface type, no increase stormwater runoff is anticipated. A Stormwater report is provided in Attachment D

Boardwalk Improvements. The original boardwalk was constructed to be ADA compliant in and of itself. As such, the only improvements are to the access interface between the gravel trail and the boardwalk, and a sitting area/turn around at the far end (see Plans in Attachment C). For the access interface, the old fill will be scraped away to allow for a flat boardwalk surface. As with the original boardwalk construction, the excess material will be placed on top of the adjacent old fill berm to keep it flat enough for mowing. Because of direct wetland impacts from the turn around, a minor over excavation of 10 sf (or more) will occur to mitigate impacts from the turn around. The turn around will be approximately 8x8 feet and will include a bench. It will be supported by tough blocks which have been used with great success on many of our recent boardwalks. These blocks are about 1 square foot and it is anticipated that a maximum of ten will be used. The turn around itself is not expected to impact the wetland since, as evidenced by the existing boardwalk sections, the boardwalk is not inhibiting growth and will continue to allow free movement of water.

Construction is expected to start on the boardwalk turn around this spring/summer. The gravel path is assumed to be constructed this fall, although if DPW staffing does not allow for this year, the grant is good through Fall 2025. The access interface between the boardwalk and the path will be completed last. A wooden guardrail/fence will be installed along the edge of parking lot, with an opening for the path, to make sure that vehicles do not drive in. This fence will be outside the 100-foot buffer zone.

Since work will occur within bordering vegetated wetlands and the Littleton 50-foot No Disturb Area, a Waiver Request form has been attached. In general, this project is expected to provide a significant public benefit by allowing easy access to the heart of the Cloverdale meadow from the parking lot. In addition, mitigation has been provided so that there will be no net loss of wetland functions or values.

Attachment A: NOI Forms and Waiver Request

Attachment B: Abutter Notification

Attachment C: Plans

Attachment D: Stormwater Memorandum

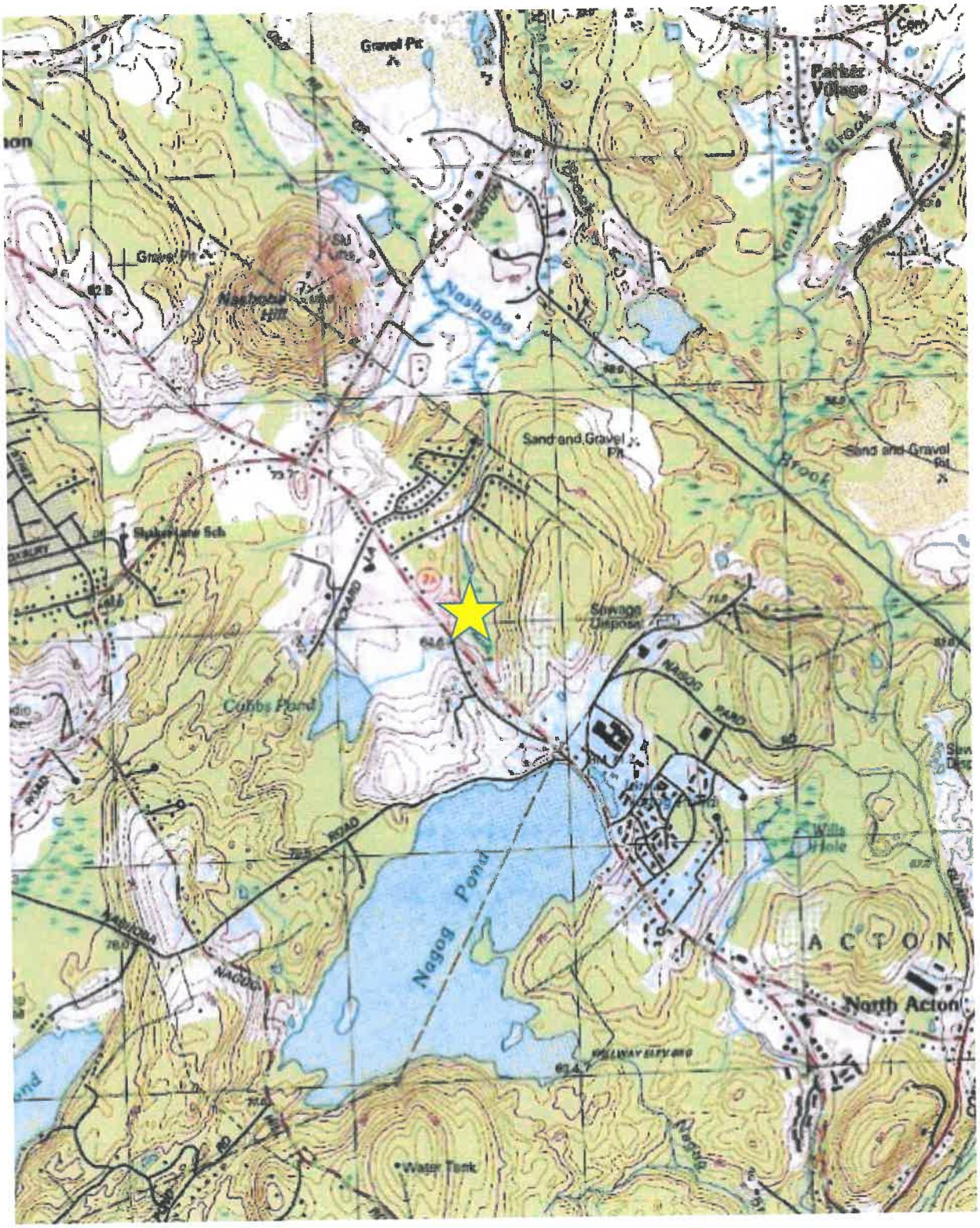
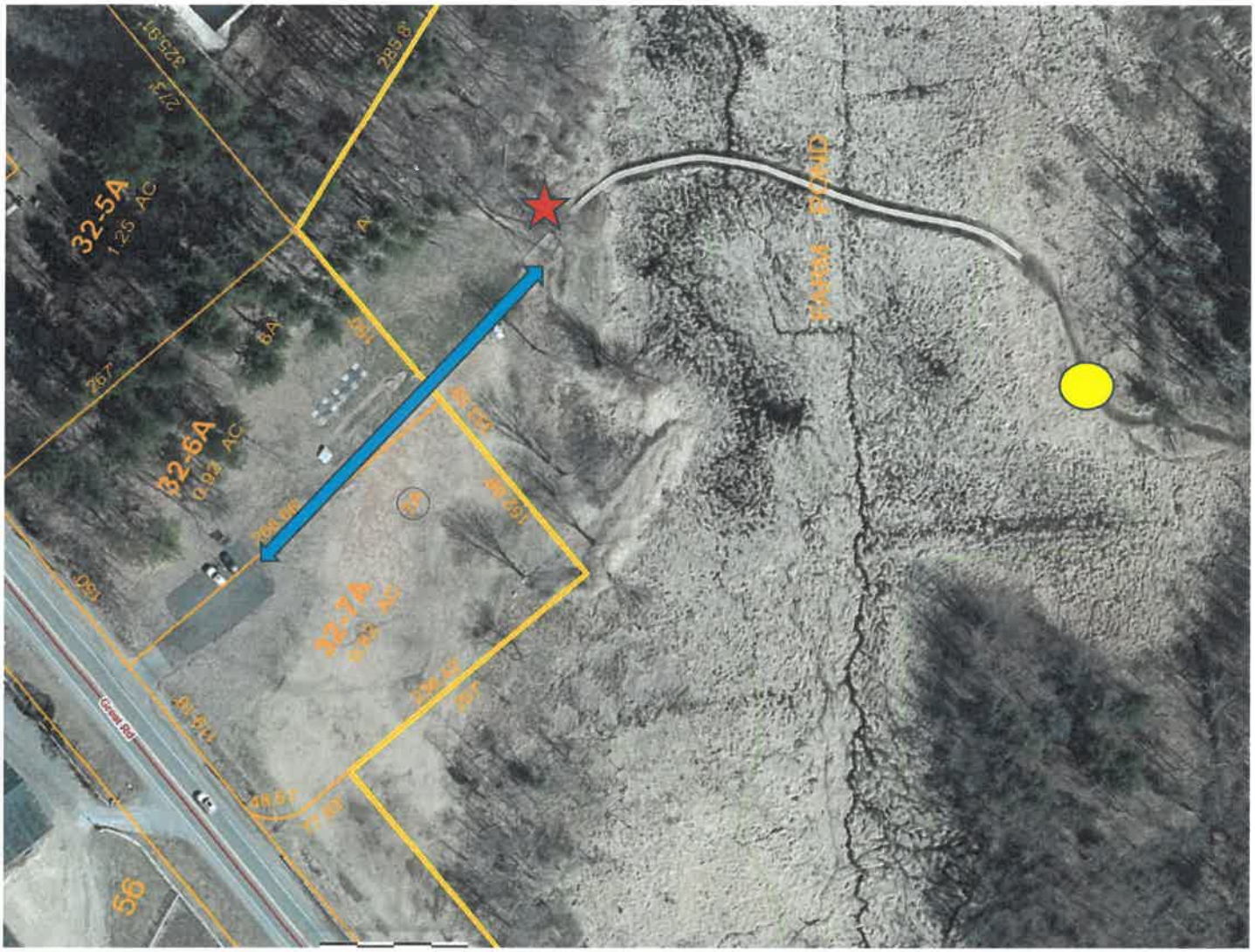


FIGURE 1 – USGS LOCUS MAP



Approx location ADA Path

Approx location Turnaround

Approx location boardwalk completion

FIGURE 2 – AERIAL PHOTOGRAPH

Photo 1. View from parking lot to boardwalk; approximate location of ADA trail

Photo 2. Area of boardwalk completion across upland "hump"

FIGURE 3 - PHOTOGRAPHS

Photo 3. Approximate location of bump out/turn around

Photo 4. View from bump out

FIGURE 3 - PHOTOGRAPHS

ATTACHMENT A

NOI Forms

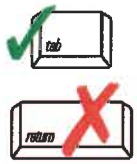
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

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

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):

a. Street Address	b. City/Town	c. Zip Code
Great Road	Littleton	01460

Latitude and Longitude:

d. Latitude	e. Longitude
42.52851	-71.44076

f. Assessors Map/Plat Number	g. Parcel /Lot Number
U-02	32-0; 32-6A and 32-7A

2. Applicant:

a. First Name	b. Last Name
Amy	Green

c. Organization: Littleton Conservation Department

d. Street Address: 37 Shattuck Street

e. City/Town	f. State	g. Zip Code
Littleton	MA	01460

h. Phone Number	i. Fax Number	j. Email Address
978-540-2428		conservation@littletonma.org

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

a. First Name	b. Last Name

c. Organization

d. Street Address

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

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

4. Representative (if any):

a. First Name	b. Last Name

c. Company

d. Street Address

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

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

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

a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid
FEE EXEMPT		

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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

Provided by MassDEP:
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A. General Information (continued)

6. General Project Description:

Construction of an ADA trail from the parking lot to the boardwalk, and improvements to the boardwalk

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. ☐ 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. ☐ 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)

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:

Middlesex South	
a. County	b. Certificate # (if registered land)
See attached	
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. ☒ 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.

Cloverdale ADA Trail

Notice of Intent Forms

Insert Section A.8 – Recording Information

U02-32-0

Bk 30676 Pg 023

U02-32-6A

Bk 30676 Pg 020

U02-32-7A

Bk 30676 Pg 020

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
Littleton Wetlands Protection Bylaw

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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	1. linear feet	2. linear feet
b. ☒ Bordering Vegetated Wetland	10 1. square feet	10 2. square feet
c. ☐ Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☐ Riverfront Area	1. Name of Waterway (if 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

   ☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

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

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

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

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

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

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
Littleton Wetlands Protection Bylaw

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MassDEP File Number
Document Transaction Number
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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. ☐ Project Involves Stream Crossings

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

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
Littleton Wetlands Protection Bylaw

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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. ☐ Yes ☒ No **If yes, include proof of mailing or hand delivery of NOI to:**

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   b. Date of map

   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. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area _____ percentage/acreage

         (b) outside Resource Area _____ percentage/acreage

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

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

   (b) ☐ Photographs representative of the site

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* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/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.

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
Littleton Wetlands Protection Bylaw

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

City/Town

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

(c) ☐ MESA filing fee (fee information available at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). 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, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; 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. ☐ 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@state.ma.us

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@state.ma.us

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.

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
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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 ☒ 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 ☒ 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 ☒ 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. ☐ A portion of the site constitutes redevelopment

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

   b. ☐ 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. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

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
Littleton Wetlands Protection Bylaw

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D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Cloverdale – Final Design
a. Plan Title

Greeb International
b. Prepared By

Dennis Vertiyev
c. Signed and Stamped by

2-9-2024
d. Final Revision Date

e. Scale

Stormwater Memo
f. Additional Plan or Document Title

3-13-2024
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. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. ☐ Attach NOI Wetland Fee Transmittal Form

9. ☐ Attach Stormwater Report, if needed.

E. Fees

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

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

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

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Littleton Wetlands Protection Bylaw

Provided by MassDEP:

MassDEP File Number

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City/Town

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: 3-19-2024
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.

Waiver Request Form

First Name*

Amy

Last Name*

Green

Date*

3/18/2024

Map/Lot*

U02-32-0

Project Address*

Great Road

Project purpose and need*

ADA TRail and boardwalk improvements

In order to request a waiver, this provides a guidance for required information

Attach additional text, plans, photos, or graphics if needed

Choose File No file chosen

What specific action(s) is the waiver being asked for?*

Construction of the ADA trail partially within the 50-foot No Disturb Area and improvements to the boardwalk which will necessitate 10 sf of wetland impact

How is the action(s) in the public interest, necessary to prevent a safety hazard or water dependent?*

The ADA trail is of great public interest and has been supported by the Disability Commission and Council on Aging.

How is the action(s) consistent with the intent and purpose of the bylaw?*

10 sf of direct wetland impact will occur and will be mitigated by removing part of the old fill berm.

Existing and proposed site conditions (ie, impervious, lawn & disturbed areas) (square feet;show on plan)*

The ADA pathway is entirely in the mowed field portion of Cloverdale

Existing and proposed distances of land uses from wetland resource areas (show on plan)*

The ADA trail will abut the wetland, and the boardwalk improvements will be in the wetland

Analysis of less environmentally damaging practicable alternative*

The only alternative would be No Build

Proposed short term and long term protection of wetland resource areas*

Erosion controls will be established prior to ADA path construction and will remain in place until the area is stabilized.

Is the site in a Zone I, II, or III (groundwater) or Zone A, B, or C (surface water) water supply area*

No

Are there critical, unique, or sensitive resource areas in the area (ie, NHESP mapped habitat, vernal pools, unusual wetland types, cold water fisheries, outstanding resource waters, core habitat, conservation land, etc); show on plan*

No

Other factors for consideration

Electronic Signature Agreement*

By checking the "I agree" box below, you agree and acknowledge that 1) your application will not be signed in the sense of a traditional paper document, 2) by signing in this alternate manner, you authorize your electronic signature to be valid and binding upon you to the same force and effect as a handwritten signature, and 3) you may still be required to provide a traditional signature at a later date.

☑ I agree.

Electronic Signature

Amy Green, Conservation Agent

Project*

Cloverdale ADA Trail

ATTACHMENT B

Abutter Notification

NOTIFICATION TO ABUTTERS

CLOVERDALE ADA TRAIL

Pick one:

___X__Notice of Intent/Abbreviated NOI

_____Abbreviated Notice of Resource Area Delineation

_____Request for Determination of Applicability

_____Request to Amend an Order of Conditions (MADEP File # 204_____)

Modification for Virtual Meetings

Under MA Wetlands Protection Act and Littleton Wetlands Protection ByLaw (Chapter 171), this form must be completed and mailed, certified mail return receipt requested, to all abutters at their mailing addresses shown on the most recent Town Assessor's records as well as the owner (if not applicant).

In accordance with the MA Wetlands Protection Act and Littleton Wetlands Protection ByLaw Chapter 171-2D, you are hearby notified of a public hearing on the matter described below:

A. The applicant has filed a permit application with the Littleton Conservation Commission for work in an area subject to protection under the Massachusetts Wetlands Protection Act and Littleton Wetlands Protection ByLaw.

B. The name of the applicant is Amy Green, Conservation Agent

C. The address of the land where the activity is proposed is Cloverdale Conservation Land

D. The work proposed is Construction of an ADA trail from parking lot to boardwalk, and improvements to boardwalk

E. Copies of the filing may be examined at the Conservation Commission office at 37 Shattuck Street Monday through Thursday; 9:00 – 1:00 (please call first to ensure the Conservation Agent is available and not out on site visits). The office phone number is 978-540-2428.

F. Copies of the filing may be obtained electronically from (check one) the _x___applicant or ___ the applicant's representative by calling 978 - 540 - 2429 during the following times: __ Monday through Thursday; 9:00 – 1:00 (please call first to ensure the Conservation

Agent is available and not out on site visits). The office phone number is 978-540-2428

G. The public hearing/meeting will be held on April 2, 2024. Information regarding the date and time of the public hearing/meeting may be obtained from the Littleton Conservation Commission (see contact info at the end of this notice).

H. Notice of the public hearing/meeting, including date and time will be published at least five business days in advance in a paper of local circulation. The agenda, noting times will be posted at Town Hall and at https://ma-littleton.civicplus.com/AgendaCenter/Search/?term=&CIDs=13,&startDate=&endDate=&dateRange=&dateSelector= at least 48 hours in advance of the meeting. It is currently anticipated that this meeting will be held entirely remotely, pursuant to "An Act Relative to Extending Certain State of Emergency Accommodations" (July 16, 2022) and the extension of that Act through March 21, 2025. If the meeting is held remotely, instructions for remote viewing of, and participation in, the meeting will be included in the agenda and may also be obtained from the Littleton Conservation Commission.

You may contact the Littleton Conservation Commission staff (Conservation@littletonma.org; 978-540-2428), or the Massachusetts Department of Environmental Protection/ Central Region (508-792-7650) at 8 New Bond Street, Worcester, MA 01606) for information about this application

9-14-2023

AFFIDAVIT OF SERVICE

Cloverdale ADA Trail

Under Massachusetts Wetlands Protection Act and the Littleton Wetlands Protection ByLaw (Chapter 171), this form must be completed and submitted with the Notice of Intent, Abbreviated Notice of Resource Area Delineation or Request for Determination of Applicability.

I, Amy Green, Conservation Agent (*name of applicant or representative*) certify under the pains and penalties of perjury that on 3-20-2024 (*date*) I gave notification to abutters in compliance with the second paragraph of the Massachusetts General Laws Chapter 131, Section 40, DEP requirements for Abutter Notification and with the Littleton Wetlands ByLaw 171-2.D in connection with the following matter:

A *(choose one of below)*

_____Abbreviated Notice of Resource Area Delineation

_____Request for Determination of Applicability

__X___Notice of Intent / Abbreviated Notice of Intent

_____Request for Amended Order of Conditions (MADEP File # 204-_____

has been filed under the Massachusetts Wetlands Protection Act and Littleton Wetlands Protection ByLaw by Amy Green Conservation Agent (*name of applicant*) with the Littleton Conservation Commission on 3-20-2024 (*date*) for the property located at Cloverdale Conservation Land, Great Road (*address of land where work is proposed*).

The list of abutters with their addresses and a copy of the Notification Abutter form as sent to the abutters is attached to this Affidavit of Service.

Amy G 3-20-2024

Name Date

Rev 9-14-2023

TOWN OF LITTLETON
BOARD OF ASSESSORS
P.O. BOX 1305
LITTLETON, MA 01460
(978) 540-2410
FAX: (978) 952-2321

Date: March 19, 2024

Re: Certified List of Abutters Conservation Commission

Applicant: Amy Green
Name of Firm: Town of Littleton MA
Mailing Address 37 Shattuck St, Littleton MA 01460

Subject Parcel Location: Cloverdale
Subject Parcel No.: U02-32-0, U02-32-6A & U02-32-7A
Subject Owner Name: Town of Littleton

M.G.L. Chapter 131: Section 40 ..... "Any person filing a notice of intention with a conservation commission shall at the same time give written notification thereof, by delivery in hand or certified mail, return receipt requested, to all abutters within one hundred feet of the property line of the land where the activity is proposed, but not limited to, owners of land directly opposite said proposed activity on any public or private street or way, and in another municipality or across a body of water. When a notice of intent proposes activities on land under water bodies and waterways or on a tract of land greater than 50 acres, written notification shall be given to all abutters within 100 feet of the proposed project site. For the purposes of this action, "project site" shall mean lands where the following activities are proposed to take place: dredging, excavating, filling, grading, the erection, reconstruction or expansion of a building or structure, the driving of pilings, the construction or improvement of roads or other ways and the installation of drainage, sewerage and water systems, and "land under water bodies and waterways" shall mean the bottom of, or land under, the surface of the ocean or an estuary, creek, river stream, pond or lake. When a notice of intent proposes activity on a linear shaped project site longer than 1,000 feet in length, notification shall be given to all abutters within 1,000 feet of the proposed project site. If the linear project site takes place wholly within an easement through another person's land, notice shall also be given to the landowner. Said notification shall be at the applicant's expense, and shall state where copies of the notice of intention may be examined and obtained and where information regarding the date, time and place of the public hearing may be obtained. Proof of such notification, with a copy of the notice mailed or delivered, shall be filed with the conservation commission."…….

I hereby certify the attached list of abutter (s) as stated in the M.G.L. Chapter 131, Section 40.

Number of Abutter(s) **28** including the subject parcels.

Certified by:

Katherine E Miller

Katherine Miller, Chief Assessor

25 MANNION PL — R01 1 0 — LUC: 101

BEAN ADAM D
BEAN MARCELA J
25 MANNION PL
LITTLETON, MA 01460

56 GREAT RD — R01 2 1 — LUC: 0718

CUPP GERALD M
CUPP LISA A
198 SHADYSIDE AVE
CONCORD, MA 01742

15 MANNION PL — R01 3 0 — LUC: 101

FEEHAN JAMES E
FEEHAN BONNIE J
15 MANNION PL
LITTLETON, MA 01460

14 SURREY RD — U01 32 100 — LUC: 101

NAMDURI HARIBABU
NAMDURI KAVITHA
14 SURREY ROAD
LITTLETON, MA 01460

12 SURREY RD — U01 32 101 — LUC: 101

BENTLEY CHRISTOPHER R
BENTLEY TIARRA W
12 SURREY RD
LITTLETON, MA 01460

10 SURREY RD — U01 32 102 — LUC: 936

LITTLETON TOWN OF
P.O. BOX 1305
LITTLETON, MA 01460

79 GRIST MILL RD — U01 32 103 — LUC: 101

MEHTA VIVEK S
MEHTA PRATIKSHA B
79 GRIST MILL RD
LITTLETON, MA 01460

81 GRIST MILL RD — U01 32 104 — LUC: 101

CARUSO KIMBERLEY A
81 GRIST MILL RD
LITTLETON, MA 01460

83 GRIST MILL RD — U01 32 105 — LUC: 101

SLAVINSKY ANTHONY J
SLAVINSKY JERILYNN G
83 GRIST MILL ROAD
LITTLETON, MA 01460

GREAT RD — U01 32 14 — LUC: 936

LITTLETON TOWN OF
P O BOX 1305
LITTLETON, MA 01460

20 SURREY RD — U01 32 97 — LUC: 936

LITTLETON TOWN OF
P O BOX 1305
LITTLETON, MA 01460

18 SURREY RD — U01 32 98 — LUC: 101

DWIVEDULA SASHANKA
MADALA SRAVANTHI
18 SURREY RD
LITTLETON, MA 01460

16 SURREY RD — U01 32 99 — LUC: 101

KOLUKULA ANAND
KOLUKULA USHA
16 SURREY RD
LITTLETON, MA 01460

5 DROVER LN — U02 23 0 — LUC: 101

DICARLO JAMES A
DICARLO MARY LOU
5 DROVER LN
LITTLETON, MA 01460

17 GRIST MILL RD — U02 24 0 — LUC: 101

EISENLORD STEPHEN MICHAEL
EISENLORD JESSICA ELEANOR
17 GRIST MILL RD
LITTLETON, MA 01460

15 GRIST MILL RD — U02 25 0 — LUC: 101

MORINE MARK R
MORINE DEBORAH L
15 GRIST MILL RD
LITTLETON, MA 01460

GREAT RD — U02 32 0 — LUC: 932

LITTLETON TOWN OF
CONSERVATION COMMISSION
P.O. BOX 1305
LITTLETON, MA 01460

5 OLD FARM RD — U02 32 110 — LUC: 101

ADEMA RODI W
ADEMA MAUREEN G
5 OLD FARM RD
LITTLETON, MA 01460

2 OLD FARM RD — U02 32 115 — LUC: 101

YURKOVETSKIY ALEKSANDR
YURKOVETSKIY ANNA TRS
2 OLD FARM RD
LITTLETON, MA 01460

GREAT RD — U02 32 116 — LUC: 932

LITTLETON TOWN OF
CONSERVATION COMMISSION
P.O. BOX 1305
LITTLETON, MA 01460

OFF DROVER LN — U02 32 117 — LUC: 130

DICARLO JAMES A
DICARLO MARY LOU
5 DROVER LN
LITTLETON, MA 01460

GREAT RD — U02 32 5A — LUC: 932

LITTLETON TOWN OF
CONSERVATION COMMISSION
P O BOX 1305
LITTLETON, MA 01460

GREAT RD — U02 32 6A — LUC: 932

LITTLETON TOWN OF
CONSERVATION COMMISSION
P.O BOX 1305
LITTLETON, MA 01460

GREAT RD — U02 32 7A — LUC: 932

LITTLETON TOWN OF
CONSERVATION COMMISSION
P.O. BOX 1305
LITTLETON, MA 01460

7 DROVER LN — U02 32 91 — LUC: 101

ENIGMA FAMILY TRUST
TRUSTEE PILLAI BRYAN K
7 DROVER LANE
LITTLETON, MA 01460

9 DROVER LN — U02 32 92 — LUC: 101

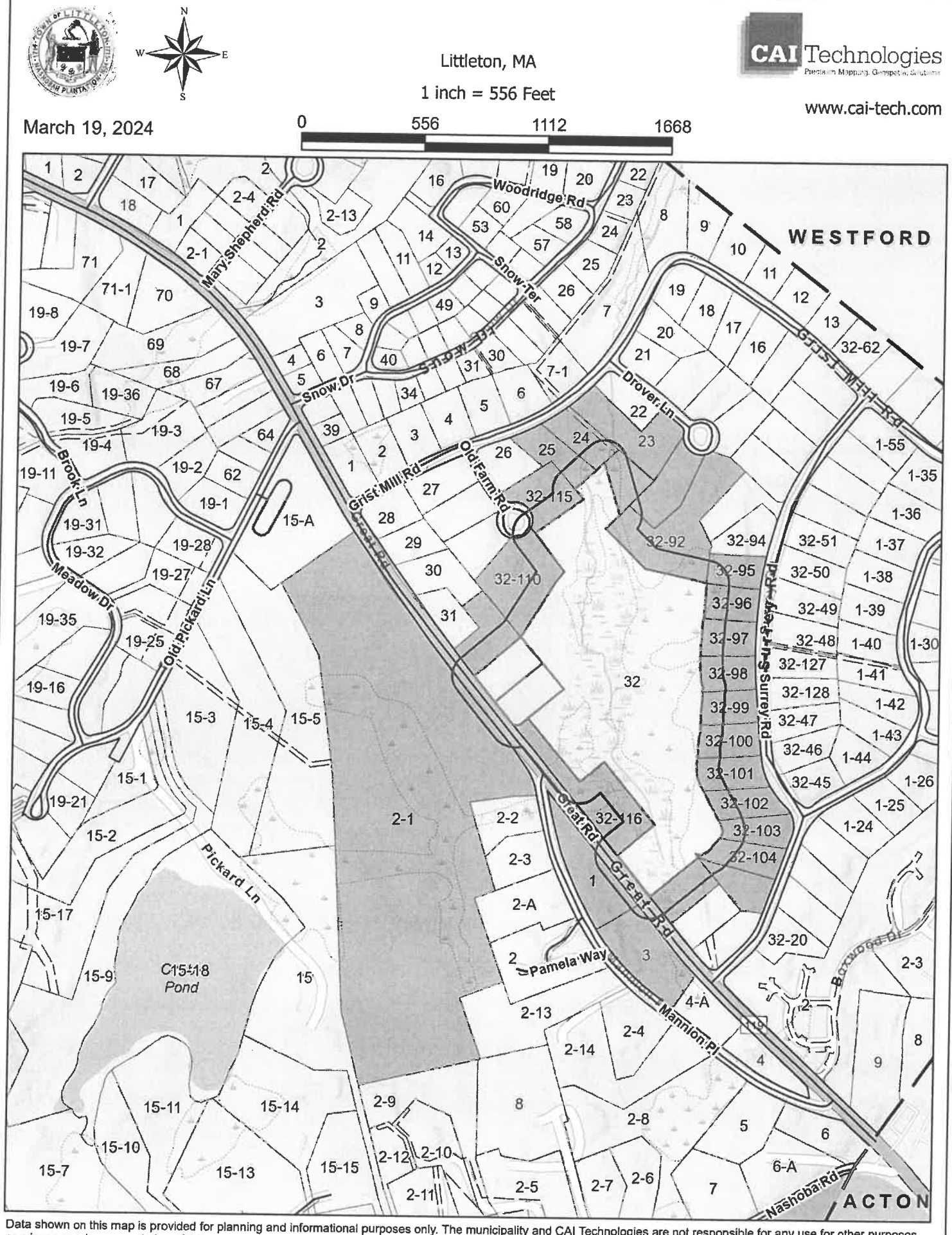
PADAMATI SASIDHAR
PADAMATI LAVANYA B
9 DROVER LANE
LITTLETON, MA 01460

24 SURREY RD — U02 32 95 — LUC: 936

LITTLETON TOWN OF
P O BOX 1305
LITTLETON, MA 01460

22 SURREY RD — U02 32 96 — LUC: 936

LITTLETON TOWN OF
P O BOX 1305
LITTLETON, MA 01460



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

ATTACHMENT C

Plans

PROJECT: LITTLETON CLOVERDALE

DESIGN SUBMISSION: FINAL DESIGN

DRAWING TITLE: EXISTING CONDITIONS PLAN

PREPARED FOR:
TOWN OF LITTLETON
CONSERVATION COMMISSION
37 SHATTUCK STREET
LITTLETON, MA 01460

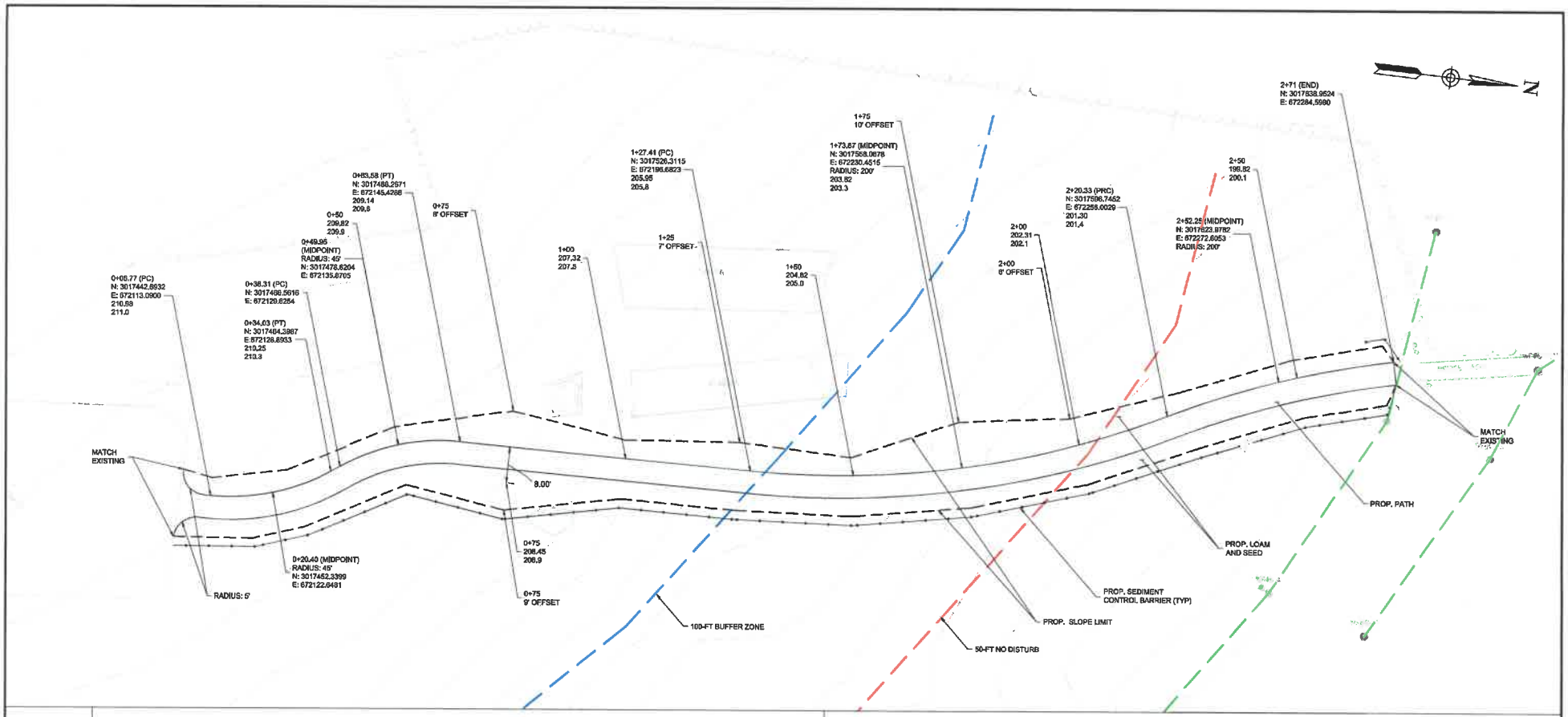
PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
TRANSPORTATION | STRUCTURAL | WATER RESOURCES | CIVIL/SITE
100 AMES POND DRIVE, SUITE 200, TEWKSBURY, MA 01876
978.623.8400 | www.greenintl.com

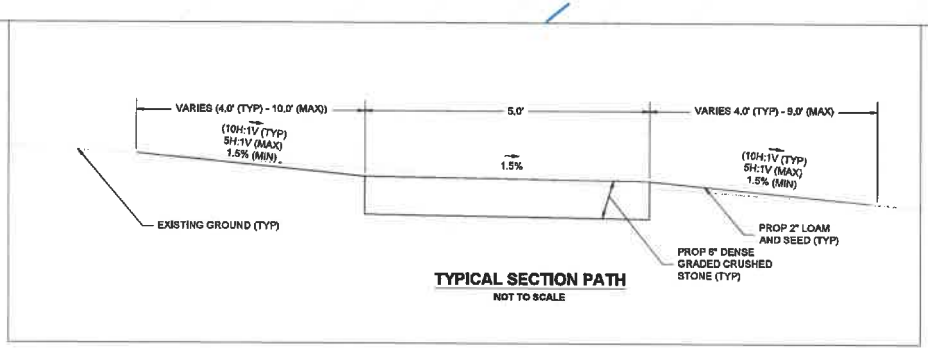
SCALE: AS NOTED
DATE: 2/9/24
PROJECT NO.: 23087

DESIGNED BY: SS
DRAWN BY: AH
CHECKED BY: BS

SHEET NO. 1 OF 2

NO	DATE	REVISIONS





TYPICAL SECTION PATH
NOT TO SCALE

LEGEND
PROPOSED GRADE = XXX.XX
EXISTING GRADE = XXX.X
PC = POINT OF CURVATURE
PT = POINT OF TANGENCY
PRC = POINT OF REVERSE CURVATURE
MIDPOINT = MIDPOINT OF CURVE

0 10 20 30 40
SCALE: 1" = 10'

NO.	DATE	REVISIONS

PROJECT: LITTLETON CLOVERDALE

DESIGN SUBMISSION: FINAL DESIGN

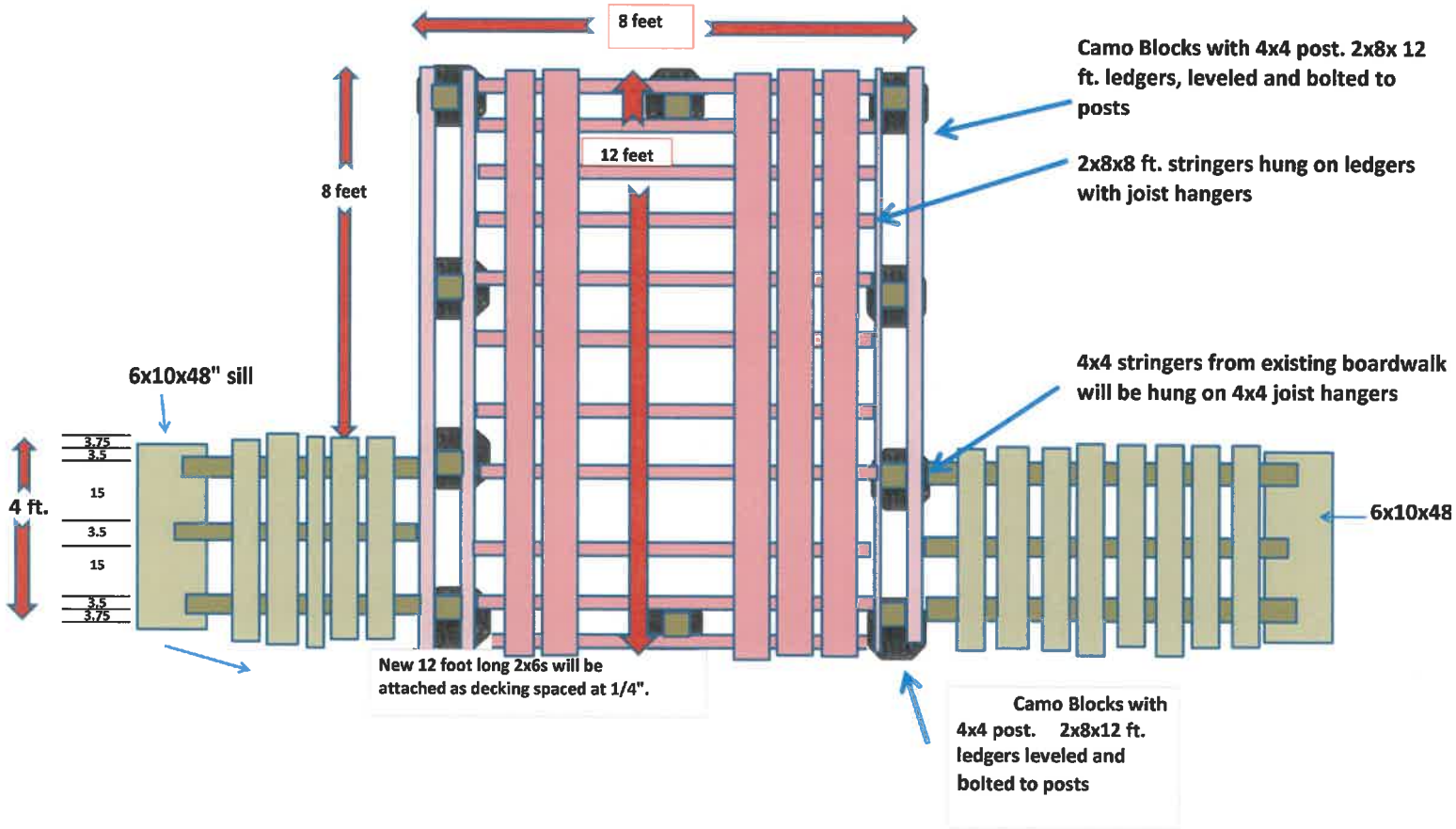
DRAWING TITLE: CONSTRUCTION AND GRADING PLAN

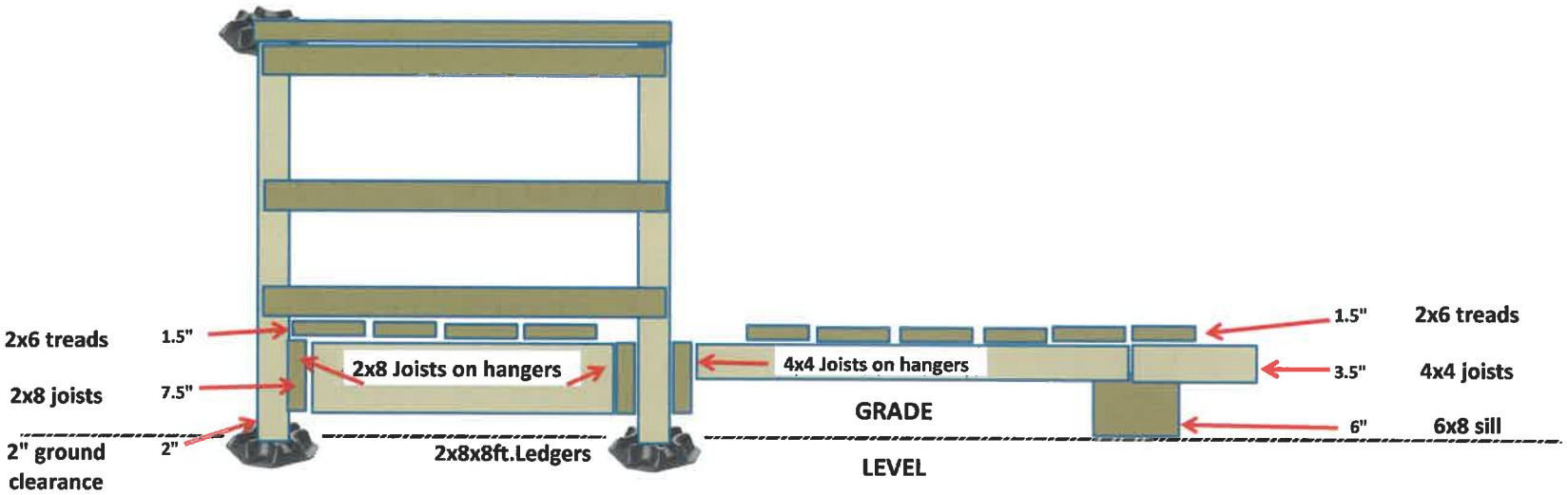
PREPARED FOR:
TOWN OF LITTLETON
CONSERVATION COMMISSION
37 SHATTUCK STREET
LITTLETON, MA 01460

PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
TRANSPORTATION | STRUCTURAL | WATER RESOURCES | CIVIL/SITE
100 AMES POND DRIVE, SUITE 200, TEWKSBURY, MA 01876
978.923.0400 | www.greenintl.com

SCALE: AS NOTED	DESIGNED BY: SS	SHEET NO. 2 OF 2
DATE: 2/9/24	DRAWN BY: AH	
PROJECT NO. 23087	CHECKED BY: SS	

PLAN FOR BUMP-OUT AT CLOVERDALE





PROPOSED PLATFORM ELEVATION

11 "

CURRENT BOARDWALK ELEVATION

11 "

Will need to dig in Camo Blocks slightly below grade to make level transition from current boardwalk to platform

Original boardwalk structure shown in TAN.
BUMP-OUT modification shown in PINK.

Modification will be made by installing Camo Blocks with 12 foot long 2"x8" pressure treated lumber ledgers attached to 4x4 posts to carry the load.
8 foot long 2x8 stringers will be attached to the ledgers with joist hangers.
12 foot long 2x6s will be installed as decking on top of the 2x8s creating a 12 foot wide by 8 foot long bump-out section along the boardwalk.
Pipe railings or 4x4 post railings will be installed on the 8x8 foot bump out area for safety.

Materials for 8 X 8 foot bump-out		
Camo Blocks	10 ea.	$110.00
2x8x8 foot stringers	18 ea.	$250.00
2x8x12 foot transition treads	2 ea.	$40.00
2x8x12 foot ledgers	4 ea.	$80.00
2x6x8 foot railing caps	4 ea.	$40.00
2x6x12 foot treads	20 ea.	$300.00
2x4x8 foot railings	12 ea.	$100.00
4x4x8 foot posts	10 ea.	$150.00
4x4x10 foot transition stringers	6 ea.	$120.00
Dense base gravel from Town Forest		Free
5/16 x 6" GRK screws	75 ea.	$150.00
No. 10 x 3 1/2" deck screws	20 lbs.	$150.00
2x8 joist hangers	20 ea.	$100.00
4x4 joist hangers	4 ea.	$180.00
Simpson joist hanger screws	1 bx.	$20.00
Weed Block Material- VEVOR/Amazon		
8 oz. non-woven 6' x 100' roll	1 ea. 6x100' roll	$150.00
Bench		$500.00
ESTIMATED	TOTAL COST	$2,440.00

Materials for 20 foot connector boardwalk		
Camo Blocks	8 ea.	$90.00
2x6x8 foot treads	20 ea.	$160.00
2x6x8 foot ledgers	8 ea.	$64.00
2x4x8 foot bumpers & spacers	10 ea.	$70.00
4x4x8 foot stringers and posts	12 ea.	$180.00
5/16 x 6" GRK screws	25 ea.	$50.00
No. 10 x 3 1/2" deck screws	10 lbs.	$50.00
ESTIMATED	TOTAL COST	$664.00

Materials for Parking Lot Guard Rail		
6x6x8 foot posts	6 ea.	$200.00
3x10x12 foot guard rail planks	2 ea.	$120.00
Bolt Depot		
10" x 1/2" Galv. Hex bolts ($3.18)	16 ea.	$50.88
1/2" Galv. Hex nuts ($0.33)	16 ea.	$5.28
1/2" Galv. Flat washers ($0.24)	32 ea.	$7.68
1/2" Galv. Lock washers ($0.19)	16 ea.	$3.04
ESTIMATED	TOTAL COST	$386.88

THESE ARE HOME DEPOT PRICES. LITTLETON LUMBER PRICES WILL PROBABLY BE HIGHER.

$2,440.00
$664.00
$386.88

GRAND TOTAL	$3,490.88

ATTACHMENT D

Stormwater Memorandum

GREEN INTERNATIONAL AFFILIATES, INC.
100 AMES POND DRIVE, SUITE 200 TEWKSBURY, MA 01876
T: (978) 923-0400 I WWW.GREENINTL.COM

STORMWATER MEMORANDUM

To:	Amy Green, Conservation Agent, Town of Littleton
From:	James Thorne, P.E., Green International Affiliates, Inc. and Venus Rohra, E.I.T., Green International Affiliates, Inc.
Date:	March 13, 2024
Subject:	**Stormwater Memo for Littleton Cloverdale Project**

Project Summary

On behalf of the Littleton Conservation Commission, Green has prepared this Stormwater Memo for the Littleton Cloverdale project.

The project improvements include a new stone dust path connecting the existing gravel parking lot to the existing boardwalk. Under existing conditions, there is no path and visitors must walk through the grass to get to the boardwalk. By providing a path it will provide better connectivity for visitors between the parking lot and the boardwalk. The proposed improvements will result in no increase in impervious area. The proposed project will result in less than 1 acre of disturbance.

There is a wetland downgradient from the proposed stone dust path. The proposed project will need to perform work within the 100-ft buffer and 50-ft no disturb zones.

Per the Massachusetts Stormwater Management Standards, the state stormwater standards shall apply to the maximum extent practicable to footpaths, bikepaths and other paths for pedestrian and/or nonmotorized vehicle access. Since the project is a stone dust path it is required to meet the state stormwater standards to the maximum extent practicable.

The proposed project is within an existing developed site and the proposed project will result in no increase of impervious area. Therefore, it is categorized as a "Redevelopment Project" under the Massachusetts Stormwater Management Standards. The project is required to meet only Standards 2 & 3 and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 & 6 to the maximum extent practicable.

Soils

The Natural Resources Conservation Service (NRCS) Soil Survey of Middlesex County, Massachusetts was used to define the soils within the limit of work. The soils are a mix of A/D and C/D soils. Table 1 lists soil designations, soil names and the hydrological soil groups. See Watershed Plans in Appendix C for location of soils within the site limits and see Appendix D for soils report generated using the NRCS website containing soil definitions for the soils within the analyzed watershed.

Table 1 – NRCS Soil Classification

Map Designation State/Publ. Sym.	Soil Name	Hydrologic Soil Group
32B	Wareham loamy fine sand, 0 to 5 percent slopes	A/D
310B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D

Standard 1: No New Untreated Discharges

The Massachusetts Stormwater Handbook, Standard 1, requires that the project demonstrates that there are no new untreated discharges and that new discharges will not cause erosion or scour to downstream wetlands.

There are no new untreated point source discharges created as a result of this project. The project will follow existing drainage patterns and there is no new impervious area. This standard is fully met.

Standard 2: Peak Rate Attenuation

Standard 2 requires that the rates of flow be attenuated for the proposed development condition. This project is a redevelopment project and a footpath project. Therefore, it is required to meet Standard 2 to the maximum extent feasible. The project proposes a new gravel pathway which will not increase peak rates. The project results in no new impervious area.

EDA-1

The existing drainage area consists of impervious surfaces including roof area from the house to the north of the site and from Great Road. This drainage area also consists of pervious surfaces including lawn, gravel driveway, woods, and gravel parking area. Stormwater travels via sheet flow off of impervious surfaces then via overland flow to the discharge point DP-1. The drainage area eventually discharges to the wetland to the east which is outside of project limits. The Existing Watershed Plan is in Appendix C.

PDA-1

The proposed drainage follows existing drainage patterns. The only difference is the stone dust path will replace a portion of the grass area. The stone dust path is graded to allow stormwater to flow over it and towards the discharge point and eventually the wetland. The stone dust path will be a pervious surface. The Proposed Watershed Plan is in Appendix C.

Peak Rates

The peak flow rates were calculated for the 2-, 10-, 25- and 100-year storm events under proposed conditions and compared to the existing peak flow rates. The proposed site improvements result in no increase in impervious area within the project limits. The project proposes a new stone dust path which will be a pervious surface. Since the watershed area is large due to the site receiving runoff from the north and the west, the change in land cover type for the path has a negligible impact on the watershed area. This results in no increase in peak flow rates for the 2-, 10-, 25-, and 100-year storm events. Therefore, this standard is fully met.

The following Table 2 Peak Rates of Runoff represents a comparison between existing and proposed conditions of the peak rates of runoff from the proposed development tributary to the discharge point. The supporting HydroCAD calculations are in Appendix B.

The peak rates are noted below:

Table 2 – Peak Rates of Runoff

DISCHARGE POINT		2-YEAR STORM (CFS)	10-YEAR STORM (CFS)	25-YEAR STORM (CFS)	100-YEAR STORM (CFS)
DP-1	Existing	2.31	4.91	7.11	11.75
	Proposed	2.31	4.91	7.11	11.75

Hydrologic Model Description

The drainage analysis was performed using the Soil Conservation Service (SCS) TR-55 and TR-20 methodologies and the computer program HydroCAD 10.0 by HydroCAD Software Solutions, LLC.

Design Storms and Rainfall Depth

The analysis was performed on the 2-, 10-, 25- and 100-year frequency rainfall events. Rainfall depths were taken from the NOAA Rainfall Frequency Atlas of the United States (Atlas-14). The events were based on the 24-Hour Type-III duration storm.

Standard 3: Stormwater Recharge

Standard 3 requires that three computations or demonstrations be fulfilled in order to satisfy the stormwater recharge requirements. They are as follows:

- Impervious Area
- Required Recharge Volume
- Bottom Area Sizing for BMP

As stated previously, this project is a redevelopment and footpath project and is required to meet Standard 3 to the maximum extent practicable. The project does not propose new BMPs. The project has no increase in impervious area and there is no impervious area within the project limits. Since there is no impervious area within the project area, there is no required recharge volume for the project. Therefore, this standard is not applicable to this project.

Standard 4: Water Quality

Standard 4 requires that all stormwater management systems be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The Massachusetts Stormwater Handbook states that this standard is met when:

- Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

- Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and

- Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

As stated previously, this project is a redevelopment and footpath project and is required to meet Standard 4 to the maximum extent practicable. The project does not propose new BMPs. As mentioned in Standard 3 section, there is no increase in impervious area and no impervious area within the project limits. Therefore, there is no required water quality treatment for the project. This standard is not applicable to this project.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The project site is not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL); therefore, Standard 5 is not applicable to this project.

Standard 6: Critical Areas

The project is not located within a "critical" area as defined in the Massachusetts Stormwater Handbook. Therefore, Standard 6 is not applicable to the proposed project.

Standard 7: Redevelopment

The improvements are considered a Redevelopment; therefore, Standard 7 is applicable to this project. Standard 7 requires a redevelopment project to meet Standards 2, 3 and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5 and 6 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The project is a footpath project and is required to meet the standards to the maximum extent practicable. The project meets the standards to the maximum extent practicable and it is noted under each standard within this memo.

Standard 8: Construction Period Pollution Prevention and Erosion & Sediment Control

Construction period pollution prevention and erosion and sedimentation control measures will be implemented at the project site to control construction related impacts during construction and land disturbance activities. The Town will be responsible for implementation of the construction period controls.

The project will not disturb more than one acre of land during the construction process and therefore, will not require a NPDES Construction General Permit issued by the Environmental Protection Agency.

Without proper erosion and sediment control measures, grading, filling and installing new structures may cause erosion and sedimentation, resulting in temporarily increased turbidity and suspended solid loads. Runoff from construction sites may also transport sediment to downstream watercourses, where sediment deposition and accumulation will occur as flow velocities decrease.

Erosion and sedimentation controls will be employed to prevent the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and

sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

Below is a description of some of the erosion and sediment control measures that will be employed at the project.

Erosion and Sediment Control Measures

Minimize Disturbed Area and Protect Natural Features and Soil

The most important aspects of controlling erosion and sedimentation are limiting the extent of disturbance and limiting the size and length of the tributary drainage areas to the worksite and drainage structures. These fundamental principles will be the key factors in the Town's control of erosion on the project site. If appropriate, the Town will construct temporary diversion swales and settling basins or use a settling tank. If additional drainage or erosion control measures are needed, they will be located up-gradient from the compost filter tubes and sedimentation fences when possible.

The Town is responsible for the maintenance and repair of all on-site erosion control devices. All erosion control devices will be regularly inspected. At no time will silt-laden water be allowed to enter sensitive areas (wetlands, streams, and drainage systems). Any runoff from disturbed surfaces will be directed through a sedimentation process prior to being discharged to the existing on-site drainage system.

The Town will establish a staging area(s) on areas to be disturbed for the overnight storage of equipment and stockpiling of materials.

In the staging area, the Town will have a stockpile of materials required to control erosion on-site to be used to supplement or repair erosion control devices. These materials will include, but are not limited to, compost filter tubes, sedimentation fence, erosion control matting and crushed stone. As mentioned previously, erosion and sedimentation controls will be employed to minimize the erosion and transport of sediment into resource areas during the earthwork and construction phases of the project. Erosion and sedimentation control measures will be installed prior to site excavation or disturbance and will be maintained throughout the construction period.

The Town is responsible for erosion control on the site and will utilize erosion control measures where needed, regardless of whether the measures are specified on the construction plans.

Primary erosion control techniques proposed include compost filter tubes, sedimentation fence barriers, and a stabilized construction entrance. A detailed description of each technique is discussed below.

Best Management Practices (BMPs)

COMPOST FILTER TUBES

Erosion control barriers (compost filter tubes and/or sedimentation fence) will be installed where required prior to the start of construction. These barriers will remain in place until all tributary surfaces have been fully stabilized.

Compost filter tube barriers will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. In areas where high runoff velocities or high sediment loads are expected, sedimentation fencing may be installed adjacent to the compost filter tubes. This semi-permeable barrier made of a synthetic porous fabric will provide additional protection. The

sedimentation fences and compost filter tube barrier will be replaced as determined by periodic field inspection. Compost filter tubes and sedimentation fences will be maintained and cleaned until the tributary area is fully stabilized.

STABILIZATION ACTIVITIES

All disturbed surfaces will be stabilized a maximum of 14 days after construction on any portion of the project site that is completed or is temporarily halted, unless additional construction is intended to be initiated within 21 days. The Town will not disturb more area than can be stabilized within 14 days unless the area is to remain active. The Town will not disturb more area than can be stabilized within the same construction season.

The smallest practicable area of land will be exposed at a time. Slopes greater than three-to-one (horizontal to vertical) will be stabilized with seed, organic mulch, jute fabric, or rip-rap, as appropriate, to prevent erosion during construction. After disturbed areas have been stabilized, the temporary erosion control measures will be removed, and accumulated sediment will be removed and disposed of in an appropriate location. Disturbed areas will be stabilized with appropriate ground cover as soon as possible. After the removal of temporary erosion control measures, disturbed areas will receive a layer of topsoil for stabilization.

STABILIZED CONSTRUCTION ENTRANCE

Temporary stabilized construction entrances may be installed at the project site. The purpose of the stabilized construction entrance is to remove sediment attached to vehicle tires and to minimize sediment transport and deposition onto public road surfaces. The construction entrances will be composed of beds of crushed stone which will be replenished as necessary to maintain their proper function.

Construction Period Pollution Prevention

Good Housekeeping BMPs

The following good housekeeping practices will be followed onsite during the construction project:

- An effort will be made to store only enough product required to do the job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect daily to ensure proper use and disposal of materials.
- The Town will be required in the Contract documents to control dust.

Material Handling & Waste Management

HAZARDOUS PRODUCTS

These practices will be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDSs) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used. Since work is located adjacent to wetland resource areas, hazardous fuels or other potential contaminants shall not be stored on site. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product they are using, particularly regarding spill control techniques.

- Products will be kept in original containers unless they are not re-sealable.
- Original labels and material safety data will be retained, as they contain important product information.
- Manufacturer, local state, and/or federal recommended methods for proper disposal will be followed if surplus product must be disposed of.

HAZARDOUS WASTE

All hazardous waste material will be disposed of by the Town in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

SOLID AND CONSTRUCTION WASTES

All waste materials will be collected and stored in accordance with state and federal law in an appropriately covered container and/or securely lidded metal dumpster.

All trash and construction debris from the site will be deposited in the dumpster. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers will be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

SANITARY WASTES

All sanitary waste will be collected from the portable units as required to maintain proper operation and sanitary conditions of these units. All maintenance work on portable sanitation units shall be performed by a licensed portable facility provider in complete compliance with local and state regulations.

All sanitary waste units will be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

Spill Prevention & Control Plan

The Town will train all personnel in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water

discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job site superintendent to properly train all personnel in spill prevention and clean up procedures.

In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

- All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

- During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

- The minimum practical quantity of all such materials will be kept on the job site.

- A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

- Manufacturers recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed:

- All spills will be cleaned up immediately after discovery.

- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

- The project manager and the Engineer of Record will be notified immediately.

- Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.

- If the spill exceeds a Reportable Quantity, the plans must identify measures to prevent the recurrence of such releases and to respond to such releases.

The job site superintendent will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer on-site.

<u>Allowable Non-Stormwater Discharge Management</u>

Certain types of discharges are allowed under the NPDES General Permit for Construction Activity and it is the intent of this project to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come into contact with the water prior to or after its discharge. The control measures that have been outlined previously in this report will be strictly followed to ensure that no contamination of these non-stormwater discharges takes place. The following non-stormwater discharges that may occur from the job site include:

- Discharges from fire-fighting activities
- Fire hydrant flushing
- Waters used to wash vehicles where detergents are not used
- Water used to control dust in accordance with off-site vehicle tracking
- Potable water including uncontaminated water line flushing
- Routine external building wash down that does not use detergents
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
- Uncontaminated air conditioner compressor condensate
- Uncontaminated ground water or spring water
- Foundation or footing drains where flows are not contaminated with process materials such as solvents
- Uncontaminated excavation dewatering
- Landscape irrigation

Standard 9: Operation & Maintenance Plan

The goal of the Operation and Maintenance (O&M) plan is not only to protect resources on-site or nearby, but also to protect resources in the region that may be affected by the activities at the site. The Town of Littleton will continue to be responsible for the operation and maintenance of the site using current practices which include litter pick-up, mowing, and repairing signs of erosion. The purpose of the O&M Plan standard is to ensure stormwater systems are maintained to function as designed. There are no proposed BMPs for the project, therefore this standard is not applicable.

Standard 10: Prohibition of Illicit Discharges

Standard 10 of the Massachusetts Stormwater Handbook prohibits illicit discharges to stormwater management systems. As stated in the handbook, "The stormwater management system is the system for conveying, treating, and infiltrating stormwater on-site, including stormwater best management practices and any pipes intended to transport stormwater to the groundwater, a surface water, or municipal separate storm sewer system. Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater."

Proponents of projects within Wetlands jurisdiction must demonstrate compliance with this requirement by submitting to the issuing authority an Illicit Discharge Compliance Statement verifying

that no illicit discharges exist on the site and by including in the pollution prevention plan measures to prevent illicit discharges to the stormwater management system.

Standard 10 also states that "The Illicit Discharge Compliance Statement must be accompanied by a site map that is drawn to scale and that identifies the location of any systems for conveying stormwater on the site and shows that these systems do not allow the entry of any illicit discharges into the stormwater management system. The site map shall identify the location of any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater management systems and the location of any measures taken to prevent the entry of illicit discharges into the stormwater management system." Included with the Stormwater Memo are construction plans that displays the location of all of the stormwater management components as well as other utilities (existing and proposed) on the project site and conforms to requirements of a "site map" to accompany the Illicit Discharge Compliance Statement.

There is no closed drainage system or sewer systems within the project limits. Stormwater runoff discharges via overland flow. This standard is not applicable.

STORMWATER APPENDICIES

Appendix A – Checklists

Appendix B – Hydrologic Calculations

Appendix C – Watershed Plans

Appendix D – Soil Information

Appendix E – Plans (Under Separate Cover)

APPENDIX A

CHECKLISTS

- Massachusetts Stormwater Report Checklist

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

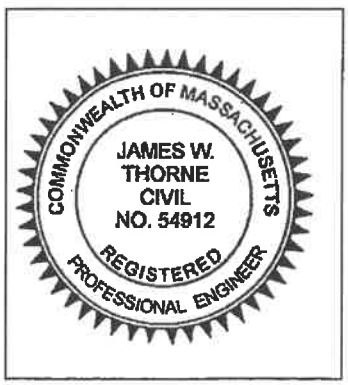
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date 3/7/2024

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

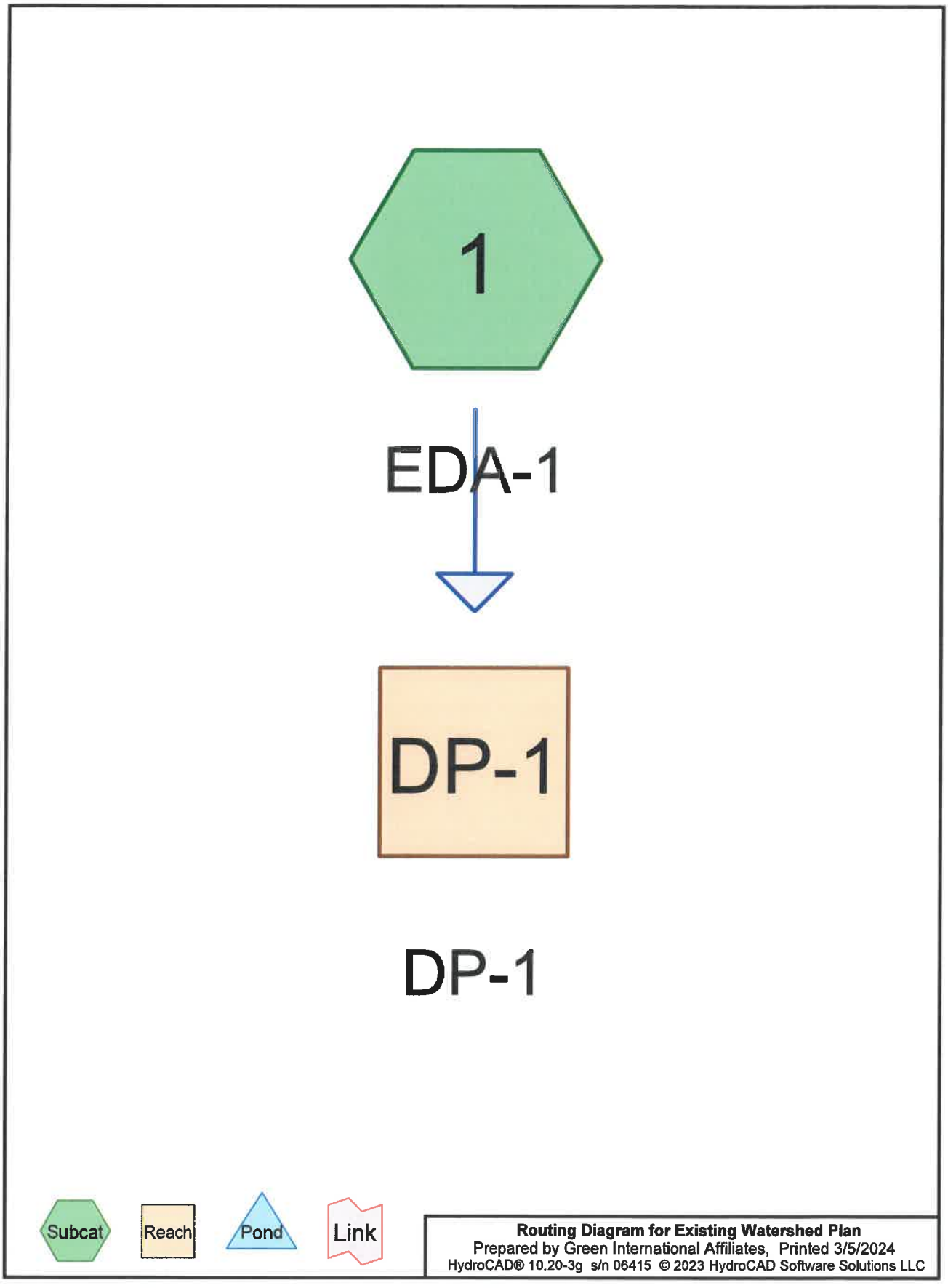
☐ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX B

HYDROLOGIC CALCULATIONS

- Existing Conditions Calculations
- Proposed Conditions Calculations



Routing Diagram for Existing Watershed Plan
Prepared by Green International Affiliates, Printed 3/5/2024
HydroCAD® 10.20-3g s/n 06415 © 2023 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "Atlas-14-Rain.txt" for 444 MA Middlesex Central

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.09	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.65	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.87	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.36	2

Summary for Subcatchment 1: EDA-1

Runoff = 2.31 cfs @ 12.21 hrs, Volume= 0.223 af, Depth= 1.13"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.09"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	3,673	84	Gravel roads, HSG A/D
*	4,444	60	>75% Grass cover, Good, HSG A/D
*	32,514	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.9	51	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
2.2	75	0.0130	0.57		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
2.7	160	0.0380	0.97		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
1.3	152	0.0760	1.93		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	516	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 1.13" for 2-Year event
Inflow = 2.31 cfs @ 12.21 hrs, Volume= 0.223 af
Outflow = 2.31 cfs @ 12.21 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1: EDA-1

Runoff = 4.91 cfs @ 12.20 hrs, Volume= 0.458 af, Depth= 2.33"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.65"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	3,673	84	Gravel roads, HSG A/D
*	4,444	60	>75% Grass cover, Good, HSG A/D
*	32,514	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.9	51	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
2.2	75	0.0130	0.57		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
2.7	160	0.0380	0.97		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
1.3	152	0.0760	1.93		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	516	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 2.33" for 10-Year event
Inflow = 4.91 cfs @ 12.20 hrs, Volume= 0.458 af
Outflow = 4.91 cfs @ 12.20 hrs, Volume= 0.458 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1: EDA-1

Runoff = 7.11 cfs @ 12.20 hrs, Volume= 0.661 af, Depth= 3.37"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.87"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	3,673	84	Gravel roads, HSG A/D
*	4,444	60	>75% Grass cover, Good, HSG A/D
*	32,514	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.9	51	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
2.2	75	0.0130	0.57		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
2.7	160	0.0380	0.97		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
1.3	152	0.0760	1.93		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	516	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 3.37" for 25-Year event
Inflow = 7.11 cfs @ 12.20 hrs, Volume= 0.661 af
Outflow = 7.11 cfs @ 12.20 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1: EDA-1

Runoff = 11.75 cfs @ 12.20 hrs, Volume= 1.101 af, Depth= 5.61"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.36"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	3,673	84	Gravel roads, HSG A/D
*	4,444	60	>75% Grass cover, Good, HSG A/D
*	32,514	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

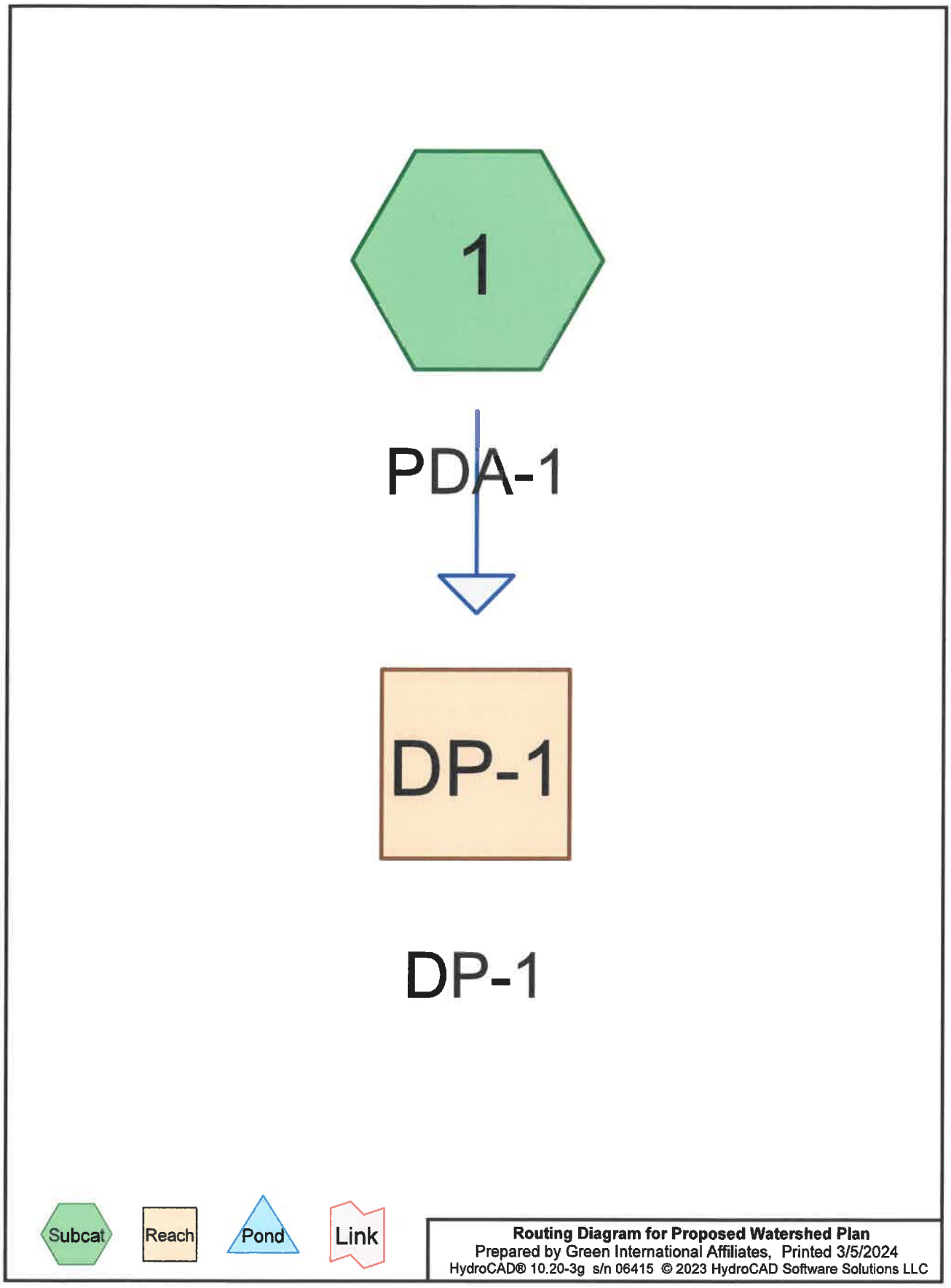
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.9	51	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
2.2	75	0.0130	0.57		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
2.7	160	0.0380	0.97		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
1.3	152	0.0760	1.93		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	516	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 5.61" for 100-Year event
Inflow = 11.75 cfs @ 12.20 hrs, Volume= 1.101 af
Outflow = 11.75 cfs @ 12.20 hrs, Volume= 1.101 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs



Routing Diagram for Proposed Watershed Plan
Prepared by Green International Affiliates, Printed 3/5/2024
HydroCAD® 10.20-3g s/n 06415 © 2023 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "Atlas-14-Rain.txt" for 444 MA Middlesex Central

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.09	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.65	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.87	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.36	2

Summary for Subcatchment 1: PDA-1

Runoff = 2.31 cfs @ 12.21 hrs, Volume= 0.223 af, Depth= 1.13"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.09"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	5,073	84	Gravel roads, HSG A/D
*	3,862	60	>75% Grass cover, Good, HSG A/D
*	31,696	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.9	51	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
2.2	75	0.0130	0.57		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
2.7	160	0.0380	0.97		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
1.2	136	0.0770	1.94		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.0	5	0.0630	4.04		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.1	6	0.0630	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	511	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 1.13" for 2-Year event
Inflow = 2.31 cfs @ 12.21 hrs, Volume= 0.223 af
Outflow = 2.31 cfs @ 12.21 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1: PDA-1

Runoff = 4.91 cfs @ 12.20 hrs, Volume= 0.458 af, Depth= 2.33"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.65"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	5,073	84	Gravel roads, HSG A/D
*	3,862	60	>75% Grass cover, Good, HSG A/D
*	31,696	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
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0.1	6	0.0630	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	511	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 2.33" for 10-Year event
Inflow = 4.91 cfs @ 12.20 hrs, Volume= 0.458 af
Outflow = 4.91 cfs @ 12.20 hrs, Volume= 0.458 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1: PDA-1

Runoff = 7.11 cfs @ 12.20 hrs, Volume= 0.661 af, Depth= 3.37"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.87"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	5,073	84	Gravel roads, HSG A/D
*	3,862	60	>75% Grass cover, Good, HSG A/D
*	31,696	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
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2.7	160	0.0380	0.97		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
1.2	136	0.0770	1.94		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
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14.4	511	Total			

Summary for Reach DP-1: DP-1

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

Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 3.37" for 25-Year event
Inflow = 7.11 cfs @ 12.20 hrs, Volume= 0.661 af
Outflow = 7.11 cfs @ 12.20 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 1: PDA-1

Runoff = 11.75 cfs @ 12.20 hrs, Volume= 1.101 af, Depth= 5.61"
Routed to Reach DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.36"

	Area (sf)	CN	Description
	9,635	98	Paved roads w/curbs & sewers, HSG D
*	5,073	84	Gravel roads, HSG A/D
*	3,862	60	>75% Grass cover, Good, HSG A/D
*	31,696	77	>75% Grass cover, Good, HSG C/D
*	52,364	74	Woods, Good, HSG C/D
	102,630	77	Weighted Average
	92,995		90.61% Pervious Area
	9,635		9.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0120	0.12		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.09"
0.3	28	0.0120	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Unpaved Kv= 16.1 fps
0.9	51	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
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0.1	6	0.0630	1.76		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
14.4	511	Total			

Summary for Reach DP-1: DP-1

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

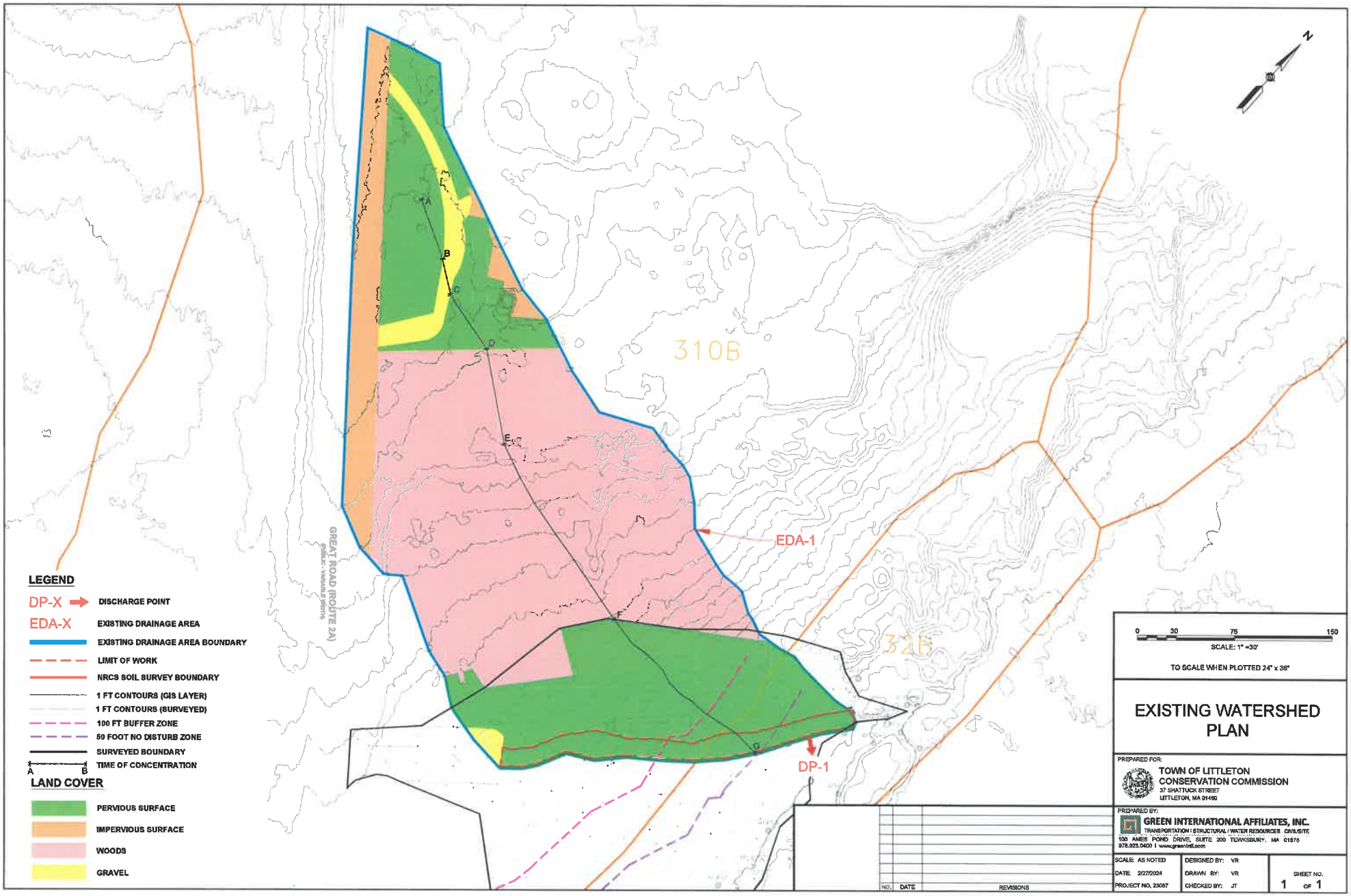
Inflow Area = 2.356 ac, 9.39% Impervious, Inflow Depth = 5.61" for 100-Year event
Inflow = 11.75 cfs @ 12.20 hrs, Volume= 1.101 af
Outflow = 11.75 cfs @ 12.20 hrs, Volume= 1.101 af, Atten= 0%, Lag= 0.0 min

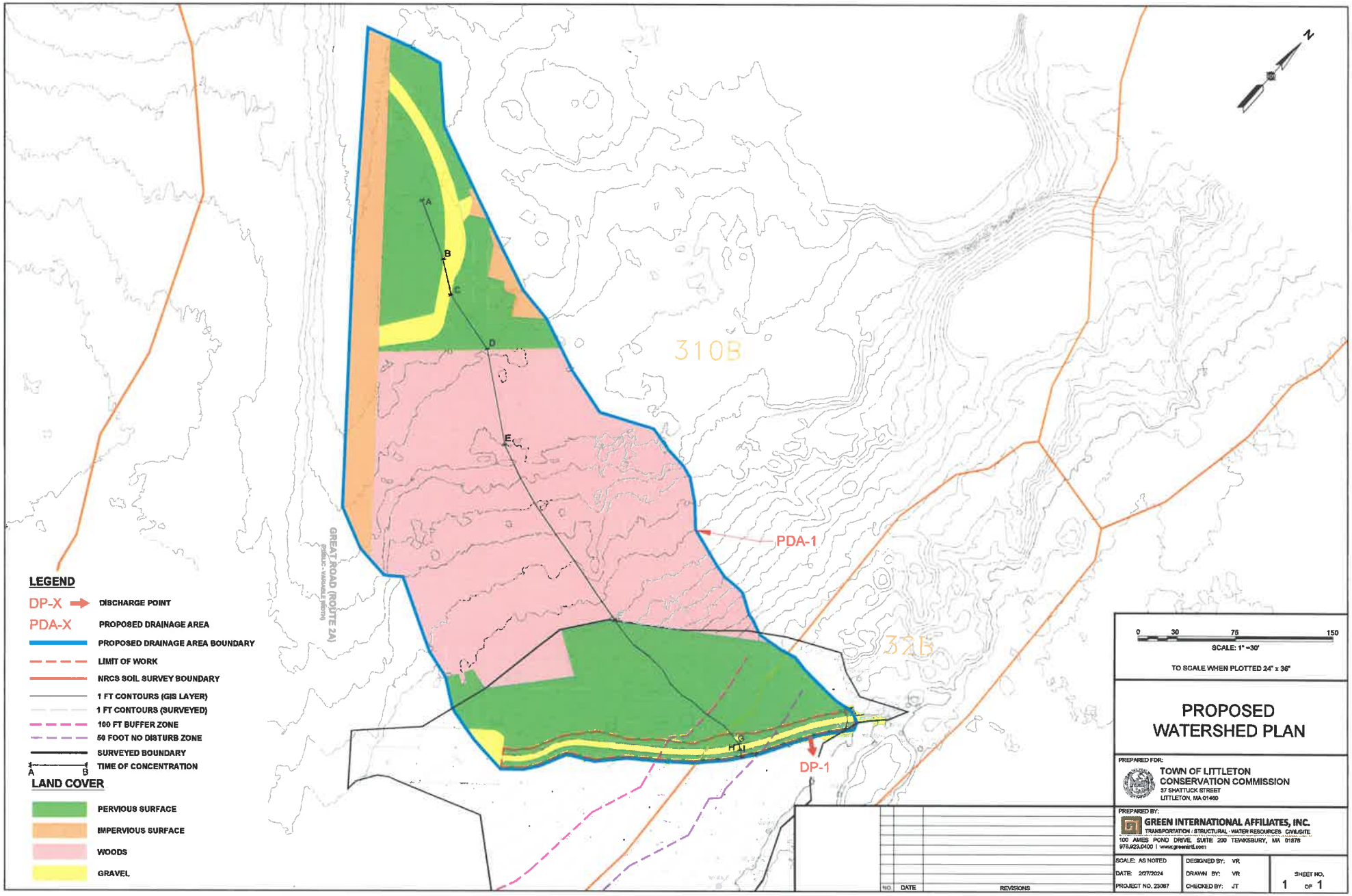
Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX C

WATERSHED PLANS

- Existing Watershed Plan
- Proposed Watershed Plan


A
B
C
D
E
F
G
EDA-1
DP-1
310B
32B
GREAT ROAD (ROUTE 2A)
(PUBLIC - VARIABLE WIDTH)
LEGEND
DP-X
DISCHARGE POINT
EDA-X
EXISTING DRAINAGE AREA
EXISTING DRAINAGE AREA BOUNDARY
LIMIT OF WORK
NRCS SOIL SURVEY BOUNDARY
1 FT CONTOURS (GIS LAYER)
1 FT CONTOURS (SURVEYED)
100 FT BUFFER ZONE
50 FOOT NO DISTURB ZONE
SURVEYED BOUNDARY
TIME OF CONCENTRATION
A
B
LAND COVER
PERVIOUS SURFACE
IMPERVIOUS SURFACE
WOODS
GRAVEL
N
0
30
75
150
SCALE: 1" =30'
TO SCALE WHEN PLOTTED 24" x 36"
EXISTING WATERSHED PLAN
PREPARED FOR:
TOWN OF LITTLETON
CONSERVATION COMMISSION
37 SHATTUCK STREET
LITTLETON, MA 01460
PREPARED BY:
GREEN INTERNATIONAL AFFILIATES, INC.
TRANSPORTATION : STRUCTURAL / WATER RESOURCES . CIVIL/SITE
100 AMES POND DRIVE, SUITE 200 TEWKSBURY, MA 01876
978.923.0400 | www.greenintl.com
NO. DATE REVISIONS
SCALE: AS NOTED
DATE: 2/27/2024
PROJECT NO. 23087
DESIGNED BY: VR
DRAWN BY: VR
CHECKED BY: JT
SHEET NO.
1 OF 1


LEGEND
DP-X DISCHARGE POINT
PDA-X PROPOSED DRAINAGE AREA
PROPOSED DRAINAGE AREA BOUNDARY
LIMIT OF WORK
NRCS SOIL SURVEY BOUNDARY
1 FT CONTOURS (GIS LAYER)
1 FT CONTOURS (SURVEYED)
100 FT BUFFER ZONE
50 FOOT NO DISTURB ZONE
SURVEYED BOUNDARY
TIME OF CONCENTRATION
A B
LAND COVER
PERVIOUS SURFACE
IMPERVIOUS SURFACE
WOODS
GRAVEL
310B
32B
PDA-1
DP-1
A
B
C
D
E
G
H
I
GREAT ROAD (ROUTE 2A)
(public - variable width)
N
0 30 75 150
SCALE: 1" =30'
TO SCALE WHEN PLOTTED 24" x 36"
PROPOSED
WATERSHED PLAN
PREPARED FOR:
TOWN OF LITTLETON
CONSERVATION COMMISSION
37 SHATTUCK STREET
LITTLETON, MA 01460
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978.823.0400 | www.greenintl.com
SCALE: AS NOTED
DATE: 2/27/2024
PROJECT NO. 23087
DESIGNED BY: VR
DRAWN BY: VR
CHECKED BY: JT
NO DATE REVISIONS
SHEET NO. 1 OF 1

APPENDIX D

SOIL INFORMATION

- NRCS Soils Report (from NRCS Website)

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 Middlesex County, Massachusetts

February 22, 2024

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.

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

Contents

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.

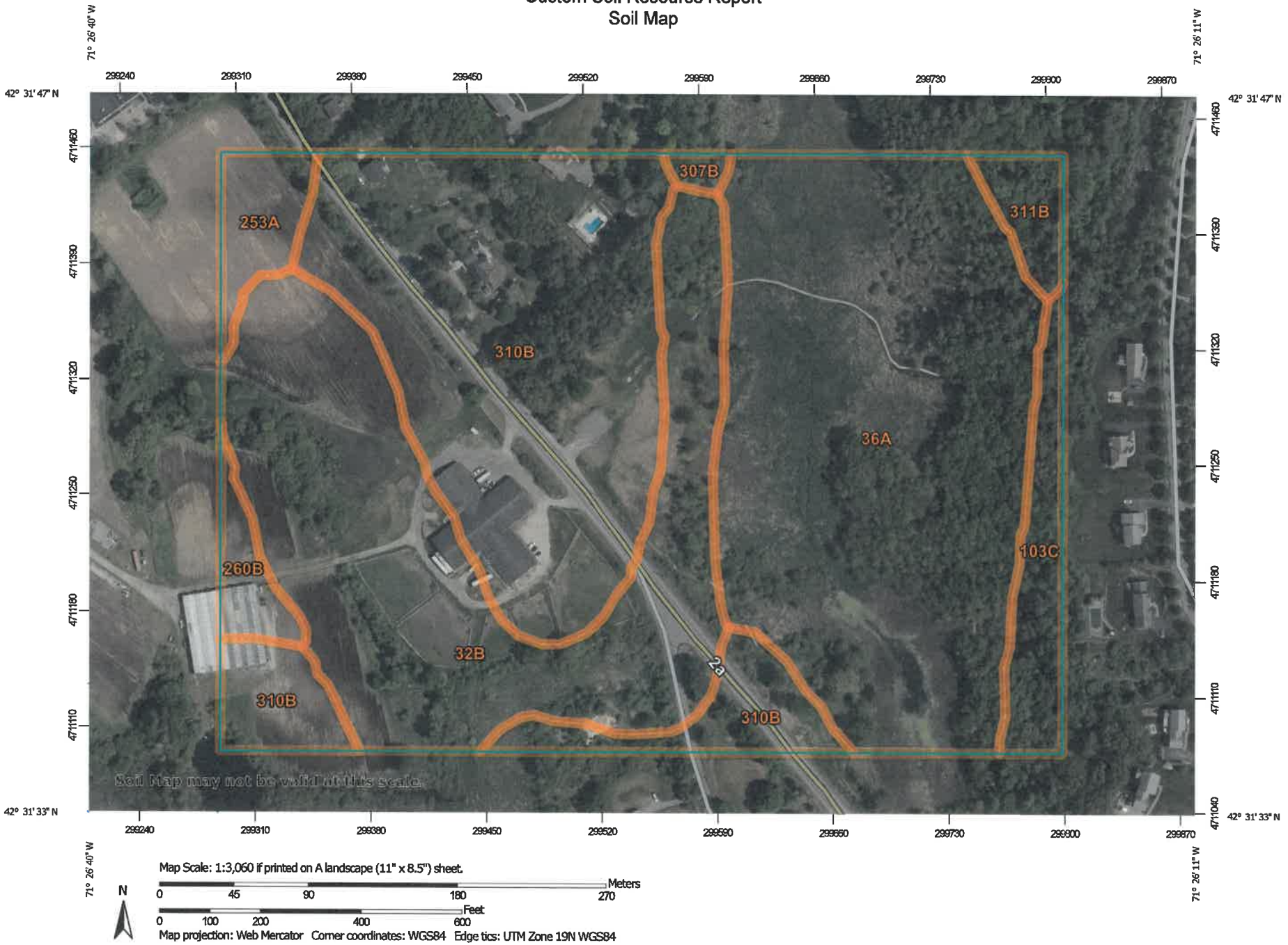
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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.

Custom Soil Resource Report
Soil Map



MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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
32B	Wareham loamy fine sand, 0 to 5 percent slopes	12.1	26.4%
36A	Saco mucky silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded	15.1	33.1%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	1.7	3.7%
253A	Hinckley loamy sand, 0 to 3 percent slopes	1.1	2.3%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	0.7	1.6%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	0.2	0.4%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	14.1	30.8%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	0.8	1.7%
Totals for Area of Interest		**45.7**	**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.

Middlesex County, Massachusetts

32B—Wareham loamy fine sand, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: vqnd
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Wareham

Setting

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

Typical profile

H1 - 0 to 10 inches: loamy fine sand
H2 - 10 to 24 inches: loamy sand
H3 - 24 to 34 inches: stratified sand to fine sand
H4 - 34 to 65 inches: stratified coarse sand to sand

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

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

Minor Components

Sudbury

Percent of map unit: 10 percent
Landform: Plains, terraces

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Scarboro

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

Deerfield

Percent of map unit: 5 percent
Landform: Depressions, stream terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

36A—Saco mucky silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2zvfl
Elevation: 30 to 500 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Saco

Setting

Landform: Terraces, alluvial flats
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Silty alluvium

Typical profile

H1 - 0 to 13 inches: mucky silt loam
H2 - 13 to 30 inches: silt loam
H3 - 30 to 45 inches: silt loam
H4 - 45 to 65 inches: loamy sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
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: About 0 to 2 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F144AY016MA - Very Wet Low Floodplain
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 8 percent
Landform: Depressions, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Freetown

Percent of map unit: 8 percent
Landform: Bogs, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Limerick

Percent of map unit: 4 percent
Landform: Terraces, alluvial flats
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 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

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 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 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: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 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: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

253A—Hinckley loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svm7
Elevation: 0 to 1,420 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: 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 terraces, outwash plains, kame terraces, outwash deltas
Landform position (three-dimensional): Tread
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: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively 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: 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): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Outwash deltas, kame terraces, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Outwash deltas, outwash terraces, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 4 percent
Landform: Outwash deltas, outwash terraces, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Walpole

Percent of map unit: 1 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

260B—Sudbury fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9915
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days

Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Sudbury

Setting

Landform: Plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable loamy eolian deposits over loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 20 inches: fine sandy loam
H3 - 20 to 27 inches: loamy sand
H4 - 27 to 65 inches: stratified gravelly coarse sand to sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.9 inches)

Interpretive groups

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

Minor Components

Merrimac

Percent of map unit: 8 percent
Landform: Terraces, plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Wareham

Percent of map unit: 4 percent
Landform: Depressions, deltas, terraces
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Windsor

Percent of map unit: 2 percent
Landform: Flats, deltas, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent

307B—Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w675
Elevation: 0 to 1,580 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

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

Description of Paxton, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 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 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 4 percent
Landform: Drumlins, drainageways, depressions, ground moraines, hills
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, extremely stony

Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

310B—Woodbridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t2ql
Elevation: 0 to 1,470 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: All areas are prime farmland

Map Unit Composition

Woodbridge, fine sandy loam, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Fine Sandy Loam

Setting

Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 18 inches: fine sandy loam
Bw2 - 18 to 30 inches: fine sandy loam
Cd - 30 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 30 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): 2w
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands

Hydric soil rating: No

Minor Components

Paxton

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Ridgebury

Percent of map unit: 8 percent
Landform: Depressions, ground moraines, hills, drainageways
Landform position (two-dimensional): Toeslope, backslope, footslope
Landform position (three-dimensional): Base slope, head slope, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

311B—Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2t2qr
Elevation: 0 to 1,440 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

Woodbridge, very stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Very Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam

Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 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 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton, very stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, very stony

Percent of map unit: 8 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (Great Road Soils - Littleton, MA)

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

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

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

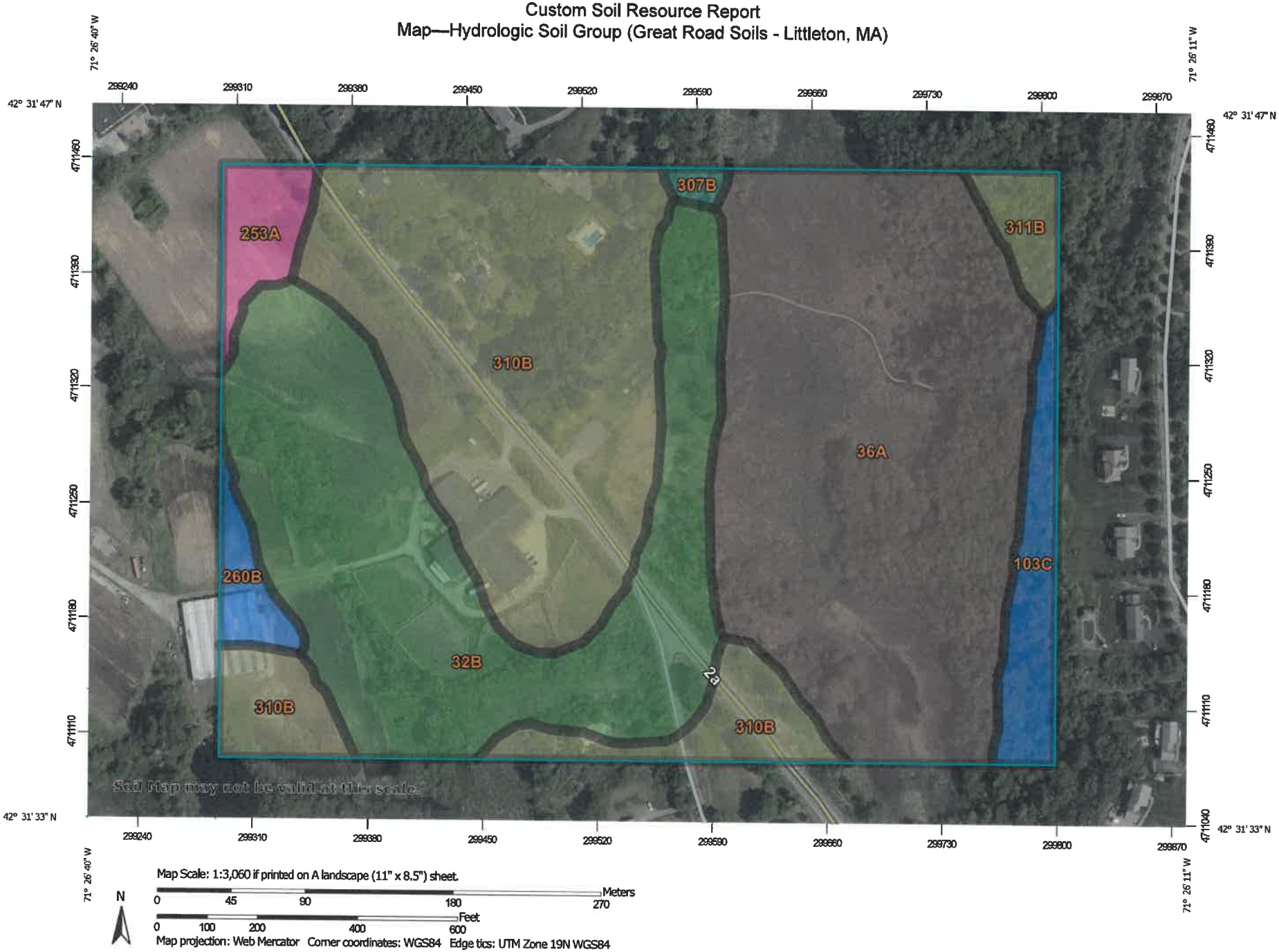
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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

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

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

Custom Soil Resource Report
Map—Hydrologic Soil Group (Great Road Soils - Littleton, MA)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Table—Hydrologic Soil Group (Great Road Soils - Littleton, MA)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
32B	Wareham loamy fine sand, 0 to 5 percent slopes	A/D	12.1	26.4%
36A	Saco mucky silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded	B/D	15.1	33.1%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	1.7	3.7%
253A	Hinckley loamy sand, 0 to 3 percent slopes	A	1.1	2.3%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B	0.7	1.6%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	0.2	0.4%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	14.1	30.8%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	0.8	1.7%
Totals for Area of Interest			**45.7**	**100.0%**

Rating Options—Hydrologic Soil Group (Great Road Soils - Littleton, MA)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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