



Notice of Intent  
Leicester Conservation  
Commission

**June 2022**

**Stafford Street 115kV  
Substation and Line Z126  
Extension Project**

**Prepared For:**

New England Power Company  
40 Sylvan Road  
Waltham, MA 02451

**Prepared By:**

TRC  
6 Ashley Drive  
Scarborough, ME 04074



650 Suffolk St., Suite 200  
Lowell, MA 01854

T 978.970.5600  
TRCcompanies.com

June 15, 2022

Mr. Stephen Parretti, Chair  
Town of Leicester Conservation Commission  
3 Washburn Square  
Leicester, MA 01524

**RE:     Stafford Street 115kV Substation Construction and Line Z126 Extension Project  
          Notice of Intent (NOI)**

Dear Mr. Parretti and Commissioners:

On behalf of New England Power Company (NEP), TRC Companies (TRC) is pleased to submit the enclosed Notice of Intent (NOI) for the Stafford Street 115 kilovolt (kV) Substation Construction and Line Z126 Extension Project (Project) located at 408 Stafford Street Leicester, MA (Site).

This NOI is being filed with the Leicester Conservation Commission (LCC) pursuant to the Massachusetts Wetland Protection Act (WPA; M.G.L. Ch. 131, § 40) and its Regulations (310 CMR 10.00) as well as the Leicester Wetlands Administration Bylaw (Wetlands Bylaw). Enclosed, please find checks for the \$262.50 fee under the WPA and the \$125.00 fee under the local Wetlands Bylaw.

We trust that the enclosed information meets the requirements of the LCC to issue an Order of Conditions for the proposed Project and appreciate your review of this information. If you should have any questions about this NOI, please do not hesitate to contact me at (207) 274-2655 or via email at [DHerzlinger@trccompanies.com](mailto:DHerzlinger@trccompanies.com).

Sincerely,

TRC Environmental Corporation

A handwritten signature in blue ink that reads "Dan J. Herzlinger". The signature is written in a cursive, flowing style.

Dan J. Herzlinger, PWS  
Senior Project Manager

C: MassDEP Central Regional Office

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**WPA FORM 3 – NOTICE OF INTENT**



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

**WPA Form 3 – Notice of Intent**

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Leicester

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):

408 Stafford Street

a. Street Address

Leicester

b. City/Town

01524

c. Zip Code

Latitude and Longitude:

42.22800

d. Latitude

-71.86829

e. Longitude

Map 34

f. Assessors Map/Plat Number

A3-0

g. Parcel /Lot Number

2. Applicant:

Michael

a. First Name

Tyrrell

b. Last Name

New England Power Company

c. Organization

40 Sylvan Road

d. Street Address

Waltham

e. City/Town

MA

f. State

02451

g. Zip Code

781.907.4868

h. Phone Number

i. Fax Number

michael.tyrrell@nationalgrid.com

j. Email Address

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

NEP fee-owned or easement on multiple properties. See attached supplemental Page 1A.

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):

Dan

a. First Name

Herzlinger

b. Last Name

TRC Companies

c. Company

6 Ashley Drive

d. Street Address

Scarborough

e. City/Town

ME

f. State

04074

g. Zip Code

207-274-2655

h. Phone Number

i. Fax Number

dherzlinger@trccompanies.com

j. Email address

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

\$500.00

a. Total Fee Paid

\$237.50

b. State Fee Paid

\$262.50

c. City/Town Fee Paid



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**A. General Information (continued)**

6. General Project Description:

The construction of the Substation and associated ROW clearing for Line Z126W is the subject of this NOI since it occurs within regulated wetland resource areas and is beyond the scope of the utility maintenance provision in 310 CMR 10.02(2)(a)2.

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

- |   |   |
|---|---|
| 1. <input type="checkbox"/> Single Family Home                        | 2. <input type="checkbox"/> Residential Subdivision       |
| 3. <input type="checkbox"/> Commercial/Industrial                     | 4. <input type="checkbox"/> Dock/Pier                     |
| 5. <input checked="" type="checkbox"/> Utilities                      | 6. <input type="checkbox"/> Coastal engineering Structure |
| 7. <input type="checkbox"/> Agriculture (e.g., cranberries, forestry) | 8. <input type="checkbox"/> Transportation                |
| 9. <input type="checkbox"/> 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)

"The construction, reconstruction, operation and maintenance of underground and overhead public utilities, such as electrical distribution or transmission lines, or communication...."

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR 10.24(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:

Worcester - deed reference below for NEP  
easement

2320

c. Book

b. Certificate # (if registered land)

4

d. Page Number

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

- ☐ 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.
- ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

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



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

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

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input checked="" type="checkbox"/> Bordering Vegetated Wetland	3,585 1. square feet	3,585 (in-situ) 2. square feet
c. <input type="checkbox"/> 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. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input type="checkbox"/> Riverfront Area	1. Name of Waterway (if available) - <b>specify coastal or inland</b>	

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.



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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.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	1. square feet _____ 2. cubic yards dredged _____	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	1. square feet _____	2. cubic yards beach nourishment _____
e. <input type="checkbox"/> Coastal Dunes	1. square feet _____	2. cubic yards dune nourishment _____
	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	1. linear feet _____	
g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet _____	
h. <input type="checkbox"/> Salt Marshes	1. square feet _____	2. sq ft restoration, rehab., creation _____
i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet _____	
	2. cubic yards dredged _____	
j. <input type="checkbox"/> Land Containing Shellfish	1. square feet _____	
k. <input type="checkbox"/> 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. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet _____	
4. <input type="checkbox"/> 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. <input type="checkbox"/> Project Involves Stream Crossings		
a. number of new stream crossings _____	b. number of replacement stream crossings _____	



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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](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**

August 2021

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

\* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <https://www.mass.gov/endangered-species-act-mesa-regulatory-review>).

Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

\*\* MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



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

- (c) ☐ MESA filing fee (fee information available at <https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review>).

Make check payable to "Commonwealth of Massachusetts - NHESP" and **mail to NHESP** at above address

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

- (d) ☐ Vegetation cover type map of site

- (e) ☐ Project plans showing Priority & Estimated Habitat boundaries

- (f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.  
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, <https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat>; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing.

a. NHESP Tracking #

b. Date submitted to NHESP

3. ☐ Separate MESA review completed.

Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

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

- a. ☒ 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:

North Shore - Hull to New Hampshire border:

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

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

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

- c. ☐ Is this an aquaculture project?

- d. ☐ Yes    ☐ No

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



**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.





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Bureau of Resource Protection - Wetlands

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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.

Stafford Street Substation Site Plans

a. Plan Title

Black & Veatch

b. Prepared By

4/27/22

d. Final Revision Date

Richard Costa

c. Signed and Stamped by

1"=100'

e. Scale

4/27/22

f. Additional Plan or Document Title

g. Date

5. ☒ If there is more than one property owner, please attach a list of these property owners not listed on this form.
6. ☐ 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:

1238788

6/15/22

2. Municipal Check Number

N/A - E-File

3. Check date

4. State Check Number

TRC

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name



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## **F. Signatures and Submittal Requirements**

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

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

*Michael Tyrrell*

1. Signature of Applicant

6/14/2022

2. Date

3. Signature of Property Owner (if different)

4. Date

6/14/2022

5. Signature of Representative (if any)

6. Date

### **For Conservation Commission:**

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

### **For MassDEP:**

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

### **Other:**

If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

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

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## FILING FEE DOCUMENTATION



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands  
**NOI Wetland Fee Transmittal Form**  
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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



## A. Applicant Information

### 1. Location of Project:

408 Stafford Street

a. Street Address

Leicester

b. City/Town

\$500.00

d. Fee amount

c. Check number

### 2. Applicant Mailing Address:

Michael

a. First Name

Tyrrell

b. Last Name

New England Power Company

c. Organization

40 Sylvan Road

d. Mailing Address

Waltham

e. City/Town

MA

f. State

02451

g. Zip Code

781.907.4868

h. Phone Number

i. Fax Number

Michael.Tyrrell@nationalgrid.com

j. Email Address

### 3. Property Owner (if different):

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

## B. Fees

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

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

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

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

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

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

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

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



**Massachusetts Department of Environmental Protection**

Bureau of Resource Protection - Wetlands

# NOI Wetland Fee Transmittal Form

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

### B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
2.e. Inland Limited Project	1	\$500.00	\$500.00
<b>Step 5/Total Project Fee:</b>			\$500.00

### Step 6/Fee Payments:

Total Project Fee:	\$500.00
	a. Total Fee from Step 5
State share of filing Fee:	\$237.50
	b. 1/2 Total Fee <b>less</b> \$12.50
City/Town share of filling Fee:	\$262.50
	c. 1/2 Total Fee <b>plus</b> \$12.50

### C. Submittal Requirements

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

Department of Environmental Protection  
Box 4062  
Boston, MA 02211

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

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

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## **ATTACHMENT A – Project Narrative**

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## 1.0 INTRODUCTION

### 1.1 Background Information

The Northeast Power Coordinating Council (NPCC) is one of six regional electric reliability councils<sup>1</sup> that, in concert with the North American Electric Reliability Corporation (NERC), seek to assure a reliable, resilient, and secure North American bulk power system through the effective and efficient identification, reduction, and mitigation of reliability risks. The NPCC carries out its mission, in part, through the development and enforcement of regional reliability standards and criteria. As a transmission provider, New England Power Company (NEP) must maintain its transmission system in compliance with these standards and criteria.

In 2009, the NPCC adopted a set of reliability requirements for the performance of the bulk power system (BPS) under certain contingencies in order to ensure that such contingencies will not result in the loss or unintentional separation of a major portion of the transmission system. It addresses topics including transmission planning, resource adequacy, and transmission operations, including the operation of fault clearing and protection systems on BPS equipment. In accordance with these requirements, New England transmission owners, which includes NEP, must install dual high-speed protection systems on all BPS elements by September 10, 2025.

NEP is required to make two significant upgrades to the BPS in Leicester, Auburn and Worcester to address these 2009 NPCC reliability requirements. The first upgrade requires NEP to construct a new greenfield 115kV gas insulated substation. The proposed Stafford Street Substation (Substation) will be sited on a 45-acre parcel of land NEP owns at 408 Stafford Street in Leicester (Attachment B – Figure 1). The Site is primarily surrounded by woodlands and bordered by Stafford Street and the residences to south and southeast and contains a 250-foot-wide public utility right-of-way corridor (ROW) that has been in operation for public utility purposes for over 90 years.

The second upgrade requires NEP to install a 115kV transmission line from the Webster Street Substation to the proposed Stafford Street Substation. This will be done with a 2,019-foot extension of NEP's existing 115kV Webster Street Tap #1 to the new Stafford Street Substation. This extension will be named the Z126W line. As discussed in more detail below, the extension will involve the construction of four (4) new transmission structures, the replacement of a fifth structure, and ROW clearing, all within NEP's ROW in the Towns of Auburn and Leicester. Once the Substation and Z126W extension is complete, the existing transmission lines A127 and B128 will also be looped in and out of the proposed Substation.

### 1.2 Focus of this Notice of Intent

TRC Environmental Corporation (TRC) has prepared this Notice of Intent (NOI) on behalf of the NEP for compliance with the Massachusetts Wetlands Protection Act (WPA) (M.G.L. Chapter 131, Section 40) and its associated regulations (310 CMR 10.00) as well as the Leicester

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<sup>1</sup> NPCC's geographic area includes the state of New York, the six New England states, Ontario, Québec, and the Canadian Maritime Provinces of New Brunswick and Nova Scotia.

Wetlands Protection Bylaw (Leicester Bylaw). The scope of work covered by this NOI includes the Substation construction, Z126W line extension and A127/B128 final line configuration. TRC had filed an NOI to cover the temporary transmission line bypass work associated with the Substation construction on February 18, 2022 and received an Order of Conditions (OOC) (MassDEP File# 197-0685) from the Leicester Conservation Commission on April 13, 2022. This NOI for the Stafford Street 115kV Substation and Z126 Line Extension Project (Project) will address all remaining work subject to regulation with the Leicester Conservation Commission that was not covered by the existing OOC (MassDEP File# 197-0685), including re-routing and removal of temporary structures and the installation of mats across jurisdictional resource areas after the Substation is built.

The construction of the Substation and associated ROW clearing for Line Z126W is the subject of this NOI since it occurs within regulated wetland resource areas and is beyond the scope of the utility maintenance provision in 310 CMR 10.02(2)(a)2. Construction and installation of the Substation, Line Z126W, and related equipment and facilities is necessary to increase the capacity and improve the overall reliability of electric service in Leicester and surrounding communities in the region per NPCC reliability requirements described in Section 1.1.

The Substation portion of the Project will be located within the ROW at 408 Stafford Street (Assessor's Map 34-A3-0) (Site). The ROW clearing for the Line Z126W portion of the Project will be located within the ROW on the parcel at 408 Stafford Street as well as two parcels at 0 Stafford Street (Assessor's Map 34B-B1-0 and 34B-B2-0) (Site). The Substation parcel location is shown on Figure 1 of Attachment B. All work associated with the Project qualifies as a Limited Project under 310 CMR 10.53(3)(d) which allows for the *"The construction, reconstruction, operation and maintenance of underground and overhead public utilities, such as electrical distribution or transmission lines."* Due to the location and extent of the resource areas at the Site, it is necessary for a portion of the proposed work to take place in buffer zone and wetland resource areas. A summary of the jurisdictional areas affected by the Project is shown below in Table 1.

**Table 1-Proposed Activities in Jurisdictional Resource Areas**

PROPOSED ACTIVITY	JURISDICTIONAL RESOURCES
Disturbance for work pads and temporary structures	<ul style="list-style-type: none"> <li>• 100-ft buffer zone</li> </ul>
A127/B128 Structure Installations (506B & 506D)	<ul style="list-style-type: none"> <li>• 100-ft buffer zone</li> </ul>
Access to A127/B128 Structures (506A & 506C) for final line configuration	<ul style="list-style-type: none"> <li>• Bordering Vegetated Wetland (BVW)</li> </ul>
Substation driveway	<ul style="list-style-type: none"> <li>• 100-ft buffer zone</li> </ul>



PROPOSED ACTIVITY	JURISDICTIONAL RESOURCES
Transmission line gravel access road construction	<ul style="list-style-type: none"><li>• 100-ft buffer zone</li><li>• 25-ft “No Disturb Zone”</li></ul>
Substation grading, fencing & crushed stone yard	<ul style="list-style-type: none"><li>• 100-ft buffer zone</li></ul>
Additional tree-clearing for existing Z126W ROW to accommodate line extension	<ul style="list-style-type: none"><li>• BVW</li><li>• 100-ft buffer zone</li><li>• 25-ft “No Disturb Zone”</li></ul>

## 2.0 SITE DESCRIPTION AND EXISTING CONDITIONS

The Sites are located northwest and northeast of the intersection of Stafford Street and Sunrise Avenue (See Attachment B, Figure 1). The Site of the proposed Substation is partially developed, with a ground-mounted photovoltaic system in the southwest quadrant, and a 250-foot wide maintained electrical transmission ROW bisecting the Site. The ROW contains related transmission and distribution lines, equipment, and infrastructure and woodlands to the north of the ROW. The Substation will be located entirely within the ROW and within the Business Industrial-A Zoning District and no overlay districts. The Substation will be setback over 650 feet from Stafford Street over 500 feet from the nearest residential property.

### 2.1 Jurisdictional Resource Areas

Multiple resource areas, as defined in the WPA and described in the following sections, exist at the Sites. TRC delineated multiple streams and wetlands on October 15, 16, 18, and November 13, 2019, as shown on Figure 2 in Attachment B and described in the Wetland and Waterbody Delineation Report included as Attachment C. Resource area boundaries on Assessor's Map 34-A3-0 (Stafford Substation parcel) were approved with an Order of Resource Area Delineation (MassDEP File #197-0658) that was issued by the Leicester Conservation Commission on May 27, 2020<sup>2</sup>. Refer to Section 4 herein for further details about impacts to each resource area associated with the proposed Project.

#### 2.1.1 Bordering Vegetated Wetland

Per 310 CMR 10.55(2), BVW are *"freshwater wetlands which border on creeks, rivers, streams, ponds and lakes"* and *"are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants."*

BVWs exist throughout the Site on both the Substation parcel and utility ROW as shown in Figure 2 (Attachment B).

The proposed Project includes conversion of forested BVW to scrub-shrub BVW from tree clearing activities associated with the construction of Line Z126W. In addition, approximately 1,971 square-feet of timber matting will be installed across BVW to access Structures 506A and 506C to support the final line configuration.

#### 2.1.2 Buffer Zones

Per 310 CMR 10.02, a buffer zone extends 100 feet outward from Bank and BVW, whichever abuts the upland portion of the Site.

Buffer zone exists along BVW throughout the Site as shown in Figure 2 (Attachment B).

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<sup>2</sup> After receiving the ORAD, an additional small parcel owned by NEP and a small area west of the existing solar farm was delineated. These minor updates are reflected on the plans submitted with this NOI.

The proposed Project includes impacts to buffer zone from the installation of two (2) new structures, the construction of the Substation, driveway, transmission line access road, and tree clearing activities associated with the construction of Line Z126W.

### **2.1.3 Leicester Bylaw 25-foot “No Disturb Zone”**

As stated within the Leicester Bylaw, the LCC regulates a 25-foot “No-Disturb Zone.” This area is protected for possible adverse effects from construction and acts as a buffer zone for adjacent resource areas. The Leicester Bylaw also states that structures which already exist within this 25-foot zone must be located as far from the resource area as practically possible if the footprint of the existing structure is changing. The LCC can waive this 25-foot zone restriction. Waivers may be granted if a project is within a highly developed/disturbed area or if there has been previous development. The proposed Project is eligible for a waiver since all work will be taking place in or adjacent to a previously cleared and maintained utility line ROW.

A 25-foot “No Disturb Zone” exists along BVW throughout the Site as shown in Figure 2 (Attachment B).

The proposed project includes impacts to the 25-ft “No Disturb Zone” from tree-clearing activities associated with the construction of Line Z126W, driveway side slopes and transmission line access road.

### 3.0 PROPOSED PROJECT DESCRIPTION

The Project includes the following primary components:

1. Tree-clearing and management of existing ROW for the installation of two new structures on the Z126W (Structure 27 and 28).
2. Grading to create a level Substation yard.
3. Construction of a new partially porous-paved access driveway.
4. Placement of crushed stone throughout the Substation.
5. Installation of Substation equipment.
6. Reconfiguration of existing transmission lines and supports within and outside of the new fence to loop in and out of the Substation, including transmission line structures outside of the new fence.
7. Installation of a perimeter fence with a security gate.
8. Construction of a new transmission line gravel access road that will run to the south of the Substation.

These components are described in more detail below and depicted on Figure 2 (Attachment B) and the Stafford Street Substation Site Plans (Attachment D).

#### 3.1 Work Descriptions and Sequence

##### 3.1.1 Tree Clearing for Substation and Z126W

Tree clearing for the Substation, driveway, and Line Z126W will be performed to construct the Project, facilitate access to the Site, and provide a safe work area for project personnel.

###### 3.1.1.1 Substation Tree Clearing

The Substation will be sited partially within the existing cleared ROW; however, clearing will occur within forested areas north of the maintained ROW to accommodate the Substation, driveway and the association grading of the surrounding area. The limits of clearing are depicted on Figure 2 (Attachment B) and on the Substation Site Plans (Attachment D). Trees and vegetation in this area will be stumped and grubbed.

###### 3.1.1.2 Line Z126W Transmission Line Tree Clearing

The minimum clearance for a 115kV transmission line is 50-feet from the structure centerline to the edge of the tree line when using structures of single circuit steel construction. The 115kV structures also need to be located at least 75-feet from the existing A127/B128 structures in the ROW. NEP's easement along the A127/B128 ROW in this area is 250-feet. However, only a portion of the full ROW easement width has been cleared to maintain proper clearances for the existing A127/B128 double-circuit structures. An additional 50-feet of easement will need to be cleared in order to accommodate the installation of the new Z126W and maintain the required 50-foot

clearance from the structures to edge of the tree line. The pre- and post-construction ROW clearances are depicted on Figure 3 (Attachment B). Trees that are cleared in the ROW will not be grubbed, leaving roots and shrubs intact. The overall tree-clearing area in the ROW is depicted on Figure 2 (Attachment B). The work involved will clear additional existing ROW to accommodate the line extension.

### **3.1.2 Grading**

The Substation Site requires grading to create a level pad for the Substation, driveway and the transmission line access road. The areas to the west and south of the proposed Substation footprint will be cut and lowered in elevation. Soil from the cut areas will be used to fill and raise the grade on the north and east sides of the Substation footprint. All of the grading details are depicted on the Stafford Street Substation Site Plans (Attachment D).

### **3.1.3 Installation of Substation Driveway**

The Substation driveway will be an approximately 750-foot-long paved access road with an entrance from Stafford Street. Most of the driveway will utilize porous pavement, which will infiltrate stormwater runoff. Driveway installation will involve cutting a slope and lowering the grade at some locations and placement of fill to raise the grade in other locations. Rip-rap will be utilized to stabilize the side-slopes and a culvert will be installed under the driveway low point for drainage. The driveway plan and profile is presented in the Stafford Street Substation Site Plans (Attachment D).

### **3.1.4 Substation Construction**

Various concrete foundations will be used for all new structures and equipment within the Substation footprint. A prefabricated building will also be placed within the Substation footprint. The 35-foot tall building will be approximately 9,100 square-feet and consist of a gas insulated switchgear equipment room and a control room.

The majority of the proposed Substation yard will be finished with 6-inches of crushed stone. The stone will be used to promote infiltration of stormwater and trap sediment to help prevent pollution. An asphalt paved circular drive within the Substation yard will be installed to allow access to equipment and the Substation side-slopes will be stabilized with rip-rap. See the Stafford Street Substation Site Plans for details on the areas inside the Substation yard (Attachment D).

The existing transmission line access road that runs down the middle of the ROW will be re-routed to the south of the Substation after it is constructed. The re-routed gravel access road will allow transmission line crews full access to the ROW without having to go through the Substation.

### **3.1.5 Fence and Gate Installation**

The fence and gate will consist of an 8-foot-tall perimeter fence plus 1-foot of barbed wire with a security gate. There will be approximately 1,300 linear foot of new chain link metallic

fence. Gates will be installed at the Substation and will include two 20-foot-wide vehicle access gates and one 3-foot-wide personnel swing gate.

#### **3.1.6 Final Configuration of the A127 and B128 and Z126 Structure Installation**

After the Substation is constructed, the temporary structures supporting the A127/B128 line bypass configuration that were permitted under MassDEP File #197-0685 will be removed and the final line configuration into the new Substation will be created. This final configuration will require the installation of four new structures on the A127/B128 circuits: 506B, 506D, 507A and 507B (Figure 2, Attachment B). Structures 506A and 506C will require temporary access across wetland W-GR-3 to support final work needed to run the conductors into the Substation after it is constructed. After all structures are installed, the conductors will be clipped in and run into the new Substation. New Structures 27 and 28 will be installed on the Z126 and carry new conductor into the Substation.

## 4.0 IMPACTS, PERFORMANCE STANDARDS, AND BMPs

The proposed Project will result in impacts to jurisdictional resource areas as described in the Table 2 below.

*Table 2 - Jurisdictional Resource Impacts.*

PROPOSED ACTIVITY	BVW	BUFFER ZONE (100-FT OF BVW)	25-FT “NO-DISTURB ZONE”
	Square-feet (SF)	Square-feet (SF)	Square-feet (SF)
Tree Clearing	1,614	25,352	3,499
Transmission Line Structure Installation (506B & 506D)	0	80	0
Access to Structure 506A & 506C	1,971	0	0
Substation Driveway Construction	0	27,702	0
Substation and Transmission Line Access Road Construction	0	10,804	278

The Project complies with performance standards for each resource area to be impacted. The following sections address performance standards for proposed Project impacts and provides an alternatives analysis with background on how the Substation driveway alignment was developed.

### 4.1 Alternatives Analysis

The majority, of the impact from the Project is the result of the Substation driveway construction through wetland buffer zone. In addition, the location and layout of the Substation is relatively fixed, and its proposed location will have minimal impact on buffer zone. Therefore, the following brief alternatives analysis focuses on the options the NEP Project team evaluated to determine the driveway location and why the proposed layout avoids and minimizes impacts:

1. *Construct driveway to the west of the existing solar farm* – The original driveway followed a route along the fence line to the west of the existing solar farm. However, this alternative was later ruled out after the wetland delineation was completed. A driveway along this route would impact Wetland W-GR-3 and lead to approximately 1,750 SF of permanent wetland impact and 0.23 acres of impact to the 25-foot ‘No-Disturb’ zone.
2. *Construct driveway to the east of the existing solar farm* – The second driveway route under consideration followed the solar farm fence line to the east. After further

analysis, the engineering team determined that the steep slope here would be challenging to construct a suitable road on and require large amounts of fill. Furthermore, this alternative would impact the wetland buffer zone of W-GR-4.

3. *Construct driveway within the ROW off Stafford Street* – The preferred alternative presented in the NOI has the driveway running down the ROW and then swinging north to avoid wetland W-GR-4. This alternative also leads to buffer zone impact but does not present the same engineering challenges as the route to the east of the solar farm. *Therefore, this is the preferred alternative that is presented in this NOI.*

## 4.2 Best Management Practices

Due to the nature of the work and the locations of the Project components, work in buffer zone and some disturbance to BVW is unavoidable. However, the tree clearing in BVW will not lead to a permanent wetland loss but a change in wetland vegetation from a forested wetland to a scrub-shrub wetland. Although work will occur in regulated areas, BMPs will be utilized and temporarily disturbed areas will be restored after the Project work is completed. Proposed BMPs are discussed further below and shown in the applicable pages of National Grid's Environmental Guidance Document – *Access, Maintenance and Construction Best Management Practices* (EG-303NE) (Attachment E).

NEP will meet the performance standards while working in BVW. In addition, BMPs that will be implemented at the Site will include:

- having an Environmental Inspector/Monitor on-site during construction;
- avoiding permanent disturbance to regulated wetlands;
- using erosion controls where an erosion hazard exists;
- restoring temporarily altered areas to pre-construction conditions by applying a wetland seed mix and or mulching with straw, if necessary;
- keeping spill response equipment on-hand and ready for deployment in the event of a spill; and
- refueling any equipment outside the BVW and buffer zone.

## 4.3 Bordering Vegetated Wetland

Proposed impacts to BVW are limited to 1,614 SF of permanent conversion to a scrub-shrub wetland due to the necessary clearances needed for the new Z126W line and 1,971 SF of temporary impact for timber matting for access. This work is unavoidable and is required to create a safe distance to the tree line. The proposed work complies with the WPA performance standards for BVW as described in the following table:



PERFORMANCE STANDARDS 310 CMR 10.55(4)	PROJECT'S COMPLIANCE WITH PERFORMANCE STANDARD
(a) Where the presumption set forth in 310 CMR 10.55(3) is not overcome, any proposed work in a Bordering Vegetated Wetland shall not destroy or otherwise impair any portion of said area.	This standard is met since there is no permanent loss of wetland associated with forested wetland conversion. The wetland functions will change post-clearing, but will still include flood storage capacity, water pollution prevention, protection of ground water supply and storm damage prevention. The scrub-shrub wetland will change the wildlife habitat value to support different species than a forested wetland. Timber matting for access is a temporary wetland impact.
(b) Notwithstanding the provisions of 310 CMR 10.55(4)(a), the issuing authority may issue an Order of Conditions permitting work which results in the loss of up to 5000 square feet of Bordering Vegetated Wetland when said area is replaced in accordance with the following general conditions and any additional, specific conditions the issuing authority deems necessary to ensure that the replacement area will function in a manner similar to the area that will be lost.	This standard is not applicable as there is no permanent wetland loss associated with the conversion from forested wetland to scrub-shrub wetland.
(d) Notwithstanding the provisions of 310 CMR 10.55(4)(a), (b) and (c), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.	No NHESP Estimated or Priority Habitats or Potential or Certified Vernal Pools are mapped within the proposed Project. Therefore, the proposed Project will have no adverse effects on rare species.
<i>Performance Standards c, and e are not applicable since the proposed impacts are greater than 500 SF and outside of an Area of Critical Environmental Concern and are, therefore, omitted here.</i>	

#### 4.4 25-Foot "No-Disturb Zone"

As stated in the Leicester Bylaw, "The Commission shall have the power to issue a waiver to an applicant requesting to perform specific activities within the 25-foot 'No-Disturb Zone'. A waiver may be granted to applicants whose projects occur within previously developed or highly disturbed areas and/or for projects and activities that will improve the protection to the resource area."

Since all of the work will be taking place in or directly adjacent to a previously cleared and maintained utility line ROW, the proposed Project is eligible for a waiver. A waiver is being requested to allow limited disturbance within areas of work that overlap with the 25-foot 'No Disturb' Zone.

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#### **4.5 Stormwater Management**

Since grade changes and impervious surfaces will be constructed, a Stormwater Management Report and Checklist have been included (Attachment F). Stormwater at the Site will generally be managed through the use of porous pavement along the driveway, rip-rapped lined channels and infiltration basins.

BMPs will be used, as described earlier in Section 4.2, to control erosion and sedimentation during construction.

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## 5.0 ADDITIONAL REGULATORY INFORMATION

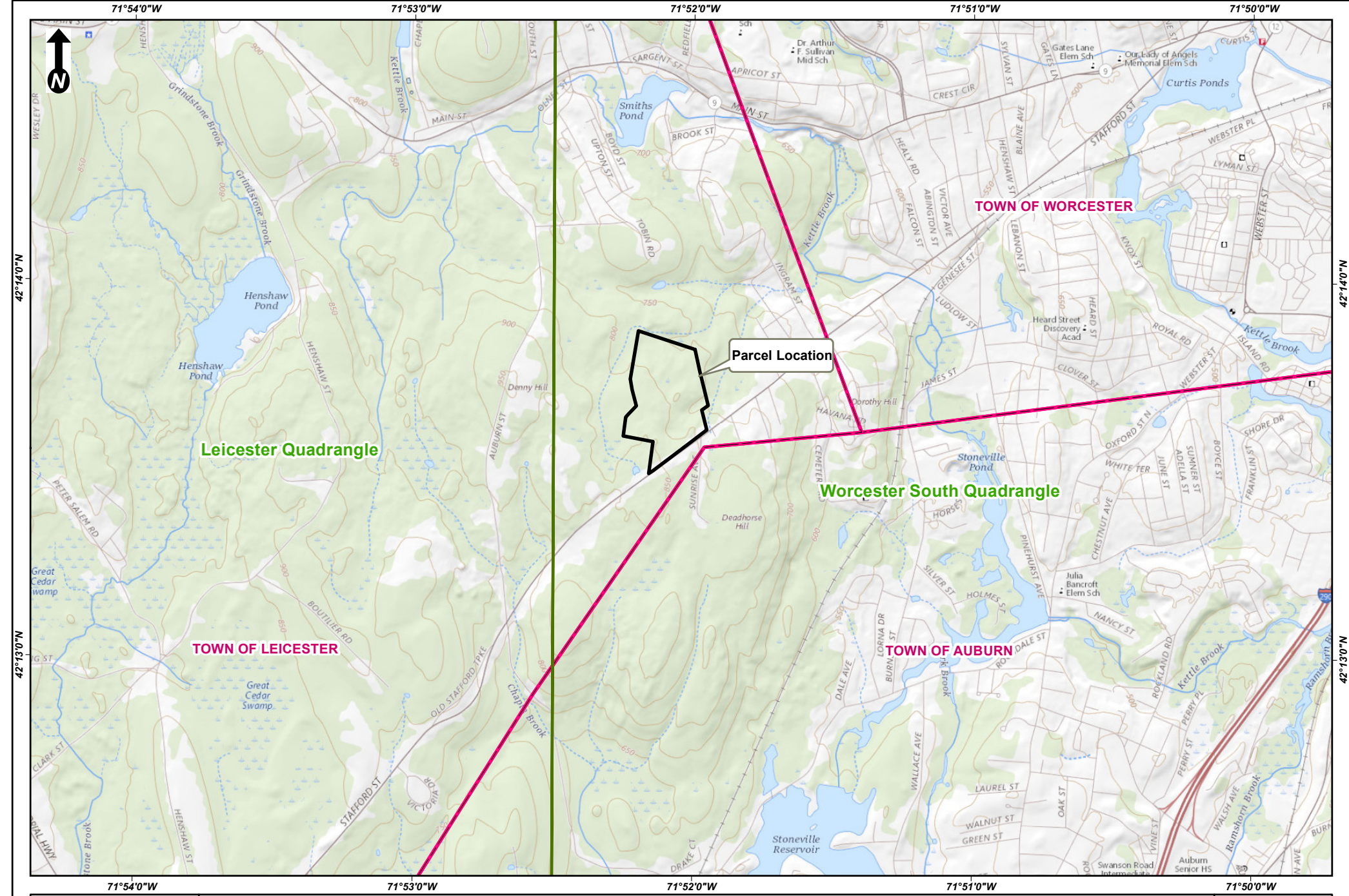
There are no Outstanding Resource Waters, Areas of Critical Environmental Concern, NHESP Estimated or Priority Habitats, or NHESP Potential or Certified Vernal Pools within the Site.

NEP will also be filing Site Plan Review and Stormwater Applications with the Leicester Planning Board.

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## **ATTACHMENT B – Figures**





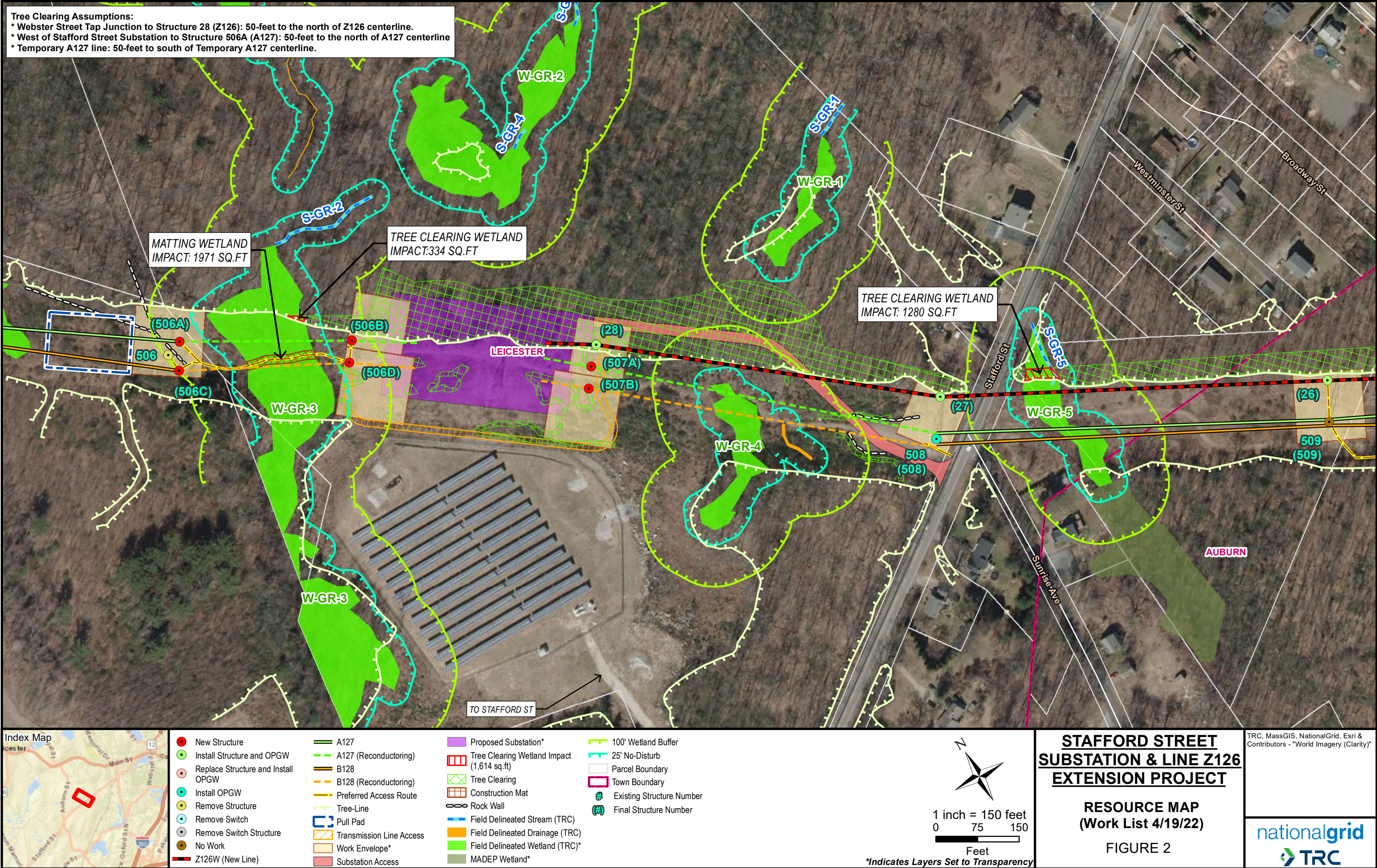
Scale:  
1 inch = 2,000 feet  
0 1,000 2,000  
Feet  
(Page Size 8.5 x 11)

**STAFFORD STREET SUBSTATION**

**Figure 1**  
**USGS Parcel Location Map**  
**Town of Leicester, MA**

Source: TRC, 2013  
National Geographic  
Society, i-cubed,  
"USGSTopo" Base Map  
  
nationalgrid  
TRC







[illegible]

### Figure 3

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## **ATTACHMENT C – Wetland Delineation Report**





# **Wetland and Waterbody Delineation Report**

Revised May 19, 2022

## **Stafford Street Substation Project**

**Stafford Street  
Leicester, Massachusetts**

### **Prepared By:**

TRC  
Wannalancit Mills  
650 Suffolk Street  
Lowell, Massachusetts 01854

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Figure 1. Project Location

Figure 2. Wetland Delineation

### Appendix B     Photographs

### Appendix C     Wetland Determination Data Forms

### Appendix D     NRCS Soil Report

### Appendix E     USGS StreamStats Report

## 1.0 Introduction

This report presents the results of a wetland and waterbody delineation conducted on October 15, 16, 18, and November 13, 2019 by TRC Companies, Inc. (TRC) off Stafford Street in the Town of Leicester, Worcester County, Massachusetts (Parcel). The survey included approximately 45 acres of the 45-acre parcel listed by the Leicester Tax Assessor as Map 34, Parcel 3. New England Power Company d/b/a National Grid is proposing to construct a new electrical substation at the Site. The wetland and waterbody delineation was completed to support the design of the new substation so resource areas can be avoided to the maximum extent possible.

The survey for wetlands and streams focused on the entire Parcel as well as adjacent parcels, when accessible, within 200 feet.

This report documents wetlands, streams, and other aquatic resources (ponds, lakes, impoundments, etc.) in the Parcel, regardless of assumed jurisdictional status and addresses the implementation of local and state regulated buffer areas. To the extent practicable, the delineated resources were investigated to determine drainage patterns and a physical nexus to Waters of the United States (WOUS).

Appendix A provides a Parcel location map (Figure 1) and a map of the resources delineated by TRC (Figure 2). Appendix B includes representative photographs of the Parcel, Appendix C includes wetland determination data forms, and Appendix D contains the Natural Resources Conservation Service (NRCS) Soil Report. Appendix E contains the U.S. Geological Survey (USGS) StreamStats Report.

This report has been revised to show that an additional wetland (W-GR-5) and stream (S-GR-5) were delineated in the transmission line ROW to the east.

## 2.0 Regulatory Authority

### 2.1 United States Army Corps of Engineers

In accordance with Section 404 of the Clean Water Act (CWA), the United States Army Corps of Engineers (USACE) asserts jurisdiction over WOUS, defined as wetlands, streams, and other aquatic resources under the regulatory authority per Title 33 Code of Federal Regulations (CFR) Part 328, and the United States Environmental Protection Agency (EPA) per Title 40 CFR Part 230.3(s). Wetlands are defined as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (EPA, 2019).

The USACE will assert jurisdiction over the following waters:

- Traditional navigable waters;
- Wetlands adjacent to traditional navigable waters;
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months); and
- Wetlands that directly abut such tributaries.

The USACE will decide jurisdiction over the following waters based on analysis to determine whether they have significant nexus with a traditional navigable water:

- Non-navigable tributaries that are not relatively permanent;
- Wetlands adjacent to non-navigable tributaries that are not relatively permanent; and
- Wetlands adjacent to, but that do not directly abut, a relatively permanent non-navigable tributary.

The USACE generally will not assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow); and
- Ditches (including roadside ditches) excavated wholly in and draining only uplands, and that do not carry a relatively permanent flow of water.

The USACE will apply the significant nexus standard as follows:

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of downstream traditional navigable waters; and
- Significant nexus includes consideration of hydrologic and ecologic factors.

The USACE also regulates navigable waters under Section 10 of the Rivers and Harbor Act (33 U.S.C. 401 et seq.), which requires that a permit must be issued by the USACE to construct any structure in or over any navigable WOUS, as well as any proposed action (such as excavation/dredging or deposition of materials) that would alter or disturb these waters. If the proposed structure or activity affects the course, location, condition, or capacity of the navigable water, even if the proposed activity is outside the boundaries of the stream in associated wetlands, a Section 10 permit from the USACE is required.

## **2.2 Massachusetts Department of Environmental Protection**

The Massachusetts Wetlands Protection Act (WPA) (Section 40 of Chapter 131 of the General Laws of Massachusetts and regulated under 310 Code of Massachusetts Regulations [CMR] section 10.00) defines multiple coastal (310 CMR 10.25-10.37) and inland resource areas (310 CMR 10.54-10.59) and gives the Massachusetts Department of Environmental Protection (MassDEP) jurisdiction over these resource areas. In most cases, the WPA also gives MassDEP jurisdiction over buffer zone extending 100 feet from the edge of the resource area. In addition to MassDEP, local municipalities' Conservation Commissions are responsible for administering the WPA and any local wetlands ordinance or bylaw.

The WPA defines two types of Land Subject to Flooding (310 CMR 10.57): isolated and bordering. Isolated Land Subject to Flooding (ILSF) is defined as "an isolated depression or a closed basin which serves as a ponding area for run-off or high ground water which has risen above the ground surface." Bordering Land Subject to Flooding (BLSF) is defined as "an area with low, flat topography adjacent to and inundated by flood waters rising from creeks, rivers, streams, ponds or lakes. It extends from the banks of these waterways and water bodies; where a bordering vegetated wetland occurs, it extends from said wetland." The boundary of BLSF is further defined as "the estimated maximum lateral extent of flood water which will theoretically result from the statistical 100-year frequency storm" as shown on the most recently available flood profile data prepared for the community by the National Flood Insurance Program (NFIP), currently administered by the Federal Emergency Management Agency (FEMA), successor to the U.S. Department of Housing and Urban Development). Under the WPA, ILSF and BLSF do not have associated buffer zones.

The WPA defines Bordering Vegetated Wetland (BVW) under 310 CMR 10.55 as any freshwater wetland which borders on creeks, rivers, stream ponds or lakes. Under the WPA, a 100-foot buffer zone is associated with BVWs. Isolated wetlands (IWs) are not connected to a waterway or waterbody and, therefore, are not regulated under the WPA and do not have an associated buffer zone under the WPA. IWs may have an associated buffer zone or similar zone associated with them under the local ordinance or bylaw. In some cases, IWs may qualify as ILSF and, in those instances, are regulated under the WPA.

The WPA defines Bank (310 CMR 10.54) as the portion of the land surface which normally abuts and confines a waterbody, occurring between a waterbody and a BVW and adjacent floodplain, or between a waterbody and an upland. Under the WPA, a 100-foot buffer zone is associated with Banks.

The WPA defines Riverfront Area (310 CMR 10.58) as the 200-foot area of land measured horizontally from a river's Mean Annual High Water (MAHW) line. The section defines a river as any stream that is perennial and includes, but is not limited to, streams shown as perennial on current USGS maps or that have a watershed size greater than or equal to one square mile. Riverfront Area is not associated with intermittent streams as they do not flow throughout the year. Under the WPA, Riverfront Area does not have an associated buffer zone.

A Notice of Intent filing is required from the MassDEP for any disturbance, including the removal of vegetation or alteration to a Banks, BVW, ILSF, BLSF, Riverfront Area, or buffer zone.

## **2.3 Town of Leicester Conservation Commission**

The Leicester Conservation Commission (LCC) administers a local wetlands bylaw and regulations in addition to the WPA. The LCC has jurisdiction over any freshwater wetland, marsh, wet meadow, bog, swamp, vernal pool, spring, bank, reservoir, lake, pond of any size, beaches, dunes, estuaries, lands under water bodies, intermittent streams, brooks, creeks, and land within 100 feet of any of these areas. The LCC also has jurisdiction over perennial rivers, streams, brooks, creeks, and land within 200 feet of these areas known as riverfront area. The LCC also has jurisdiction over land subject to flooding or inundation by groundwater or surface water, and lands subject to flooding. These resource areas are all protected whether or not they border surface waters.

The LCC also implements a 25 foot “No Disturb Zone” (also considered a “No Build Zone”) around all protected resource areas.

## **3.0 Project Site Characteristics**

TRC reviewed publicly available literature and materials used for the investigation, survey, and report preparation, including:

- MassGIS OLIVER<sup>1</sup>, the National Hydrography Dataset;
- The Worcester South and Leicester 7.5 Minute Quadrangles (USGS 2018);
- The FEMA Flood Insurance Rate Map (FIRM) Panel 2501280010A (effective date June 18, 1980);
- The U.S. Fish and Wildlife Service (USFWS), National Wetlands Inventory (NWI);

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<sup>1</sup> The MassDEP Wetlands Conservancy Program uses aerial photography and photo interpretation to delineate and map wetland boundaries. These boundaries are available via the Massachusetts Office of Geographic Information (MassGIS) online mapping tool, OLIVER. Desktop review consisted of utilizing MassGIS OLIVER to gather a general understanding of existing conditions and potential regulated resource areas.

- The U.S. Department of Agriculture (USDA), NRCS Web Soil Survey;
- Recent aerial orthoimagery.
- Massachusetts Natural Heritage and Endangered Species Program (NHESP) Certified and Potential Vernal Pools.

The following sections summarize TRC's review of each of these resources.

### 3.1 Hydrology

The Parcel is undulating with many hills and valleys throughout. The Parcel generally drains northward and eastward via three valleys to off-site wetlands and tributaries.

#### 3.1.1 Floodplains

Flood hazard areas identified on the FEMA's FIRMs are identified as Special Flood Hazard Areas (SFHAs). SFHAs are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. FEMA uses a variety of labels for SFHAs:

Zone A	Zone A99	Zone AR/A
Zone AO	Zone AR	Zone V
Zone AH	Zone AR/AE	Zone VE, and
Zones A1-A30	Zone AR/AO	Zones V1-V30
Zone AE	Zone AR/A1-A30	

Moderate flood hazard areas, labeled Zone B or Zone X (shaded on FEMA mapping) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded on FEMA mapping).

According to the FEMA FIRM 25027C0801E (effective date July 4, 2011) the Parcel is located within a Zone X area of minimal flood disturbance zone.

### 3.2 Federal and State Mapped Wetlands and Streams

The USFWS is the principal federal agency tasked with providing information to the public on the status and trends of wetlands on a national scale. The USFWS NWI is a publicly available resource that provides detailed information on the abundance, characteristics, and distribution of nationwide wetlands (where mapped). NWI mapping data is offered to promote the understanding, conservation, and restoration of wetlands. The online MassGIS OLIVER mapping tool was accessed to determine the extent of state-mapped aquatic resources.

According to TRC's review of NWI and MassGIS OLIVER mapping, there are three wetlands on site: one isolated in the central section, and two along the northern border of the site, each extending off site to the north.

### 3.3 Mapped Soils

The NRCS's Web Soil Survey identifies four soil map units within the Parcel. Map units can represent a type of soil, a combination of soils, or miscellaneous land cover types (e.g., water, rock outcrop, developed impervious surface). Map units are usually named for the predominant soil series or land types within the map unit. A summary of soil characteristics for soils mapped at the Site are included in Table 1, below. The following sections provide details about hydric ratings, drainage class, prime farmland, and hydrologic soil groups (HSGs). Details about soil map unit descriptions are provided in the NRCS Soil Report included as Appendix D.

**Table 1: Mapped Soils**

Symbol	Soil Name	Hydric Rating (%)	Drainage Class	Hydrologic Soil Group	Farmland Classification
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	99	Very poorly drained	D	Not prime farmland
420B	Canton fine sandy loam, 3 to 8 percent slopes	1	Well drained	B	All areas are prime farmland
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	4	Well drained	B	Not prime farmland
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	0	Well drained	B	Not prime farmland

#### 3.3.1 Hydric Rating

The *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory, 1987) (1987 Manual) defines a hydric soil as "...a soil that in its undrained condition, is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation."

Due to limitations imposed by the small scale of the soil survey mapping, it is not uncommon to identify wetlands within areas not mapped as hydric soil while areas mapped as hydric often do not support wetlands. This concept is emphasized by the NRCS:

*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.*

Hydric Soil Rating (HSR) indicates the percentage of a map unit that meets the criteria for hydric soils.

Map unit 73A has an HSR of 99 percent, map unit 422B has an HSR of 4 percent, map unit 420B has an HSR of 1 percent, and map unit 422C has an HSR of 0 percent. For map unit 73A, the hydric components within the map unit are Whitman, extremely stony; Ridgebury, extremely stony; Scarboro; and Swansea. For map units 420B and 422B, the hydric component within the map units are Swansea.



### **3.3.2 Natural Drainage Class**

Natural drainage class refers to the frequency and duration of wet periods under conditions similar to those under which the soil developed. Anthropogenic alteration of the water regime, either through drainage or irrigation, is not a consideration unless the alterations have significantly changed the morphology of the soil.

Map unit 73A is rated as very poorly drained. Map units 420B, 422B, and 422C are rated as well drained.

### **3.3.3 Prime Farmland**

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is available for these uses (the land could be cropland, pastureland, rangeland, forestland, or other land, but not urban built-up land or water). Land used for a specific high-value food or fiber crop is classified as “unique farmland.” Generally, additional “farmlands of statewide importance” include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. In some local areas, there is concern for certain additional farmlands, even though these lands are not identified as having national or statewide importance. These farmlands are identified as being of “local importance” through ordinances adopted by local government. The NRCS State Conservationist reviews and certifies lists of farmland of state and local importance. These lists, along with state and locally established Land Evaluation and Site Assessment (LESA) systems where applicable, are used by federal agencies to review and evaluate activities that may impact farmland. As defined in 7 CFR Part 657, important farmland encompasses prime and unique farmland, as well as farmland of statewide and local importance.

According to the NRCS, three map units (73A, 422B and 422C) are classified as “not prime farmland”, and one map unit (420B) is classified as “all areas are prime farmland.”

### **3.3.4 Hydrologic Soil Groups**

Soils are assigned to a HSG 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 have 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 have 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 have 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 have a very slow infiltration rate (high runoff potential) when thoroughly wet. Soils 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 in Group D are assigned to dual classes.

Map unit 73A, is in HSG D. Map units 420B, 422B, and 422D are in HSG B.

## **4.0 Wetland and Stream Delineation Methodology**

In addition to the desktop review described in Section 3.0, TRC biologists performed field investigations within the Parcel to identify wetlands, waterbodies, and other surface waters on October 15, 16, 18 and November 13, 2019.

### **4.1 Non-wetland Aquatic Resource Methodology**

Streams and other non-wetland aquatic features within the Parcel were identified by the presence of an OHWM, which is the line established by the fluctuations of water (33 CFR 328.3). The OHWM line is indicated by physical characteristics, which can include: a clear, natural line impressed on the bank; shelving; changes in the character of soil; destruction of terrestrial vegetation; the presence of litter and debris; or other characteristics of the surrounding areas. For streams five feet or more in width, each stream bank was delineated with blue flagging. For smaller streams, the stream centerline is delineated with notes for the width. Flags were located with a handheld global positioning system (GPS) unit with sub-meter accuracy.

### **4.2 Wetland Delineation Methodologies**

The delineation of wetlands was conducted in accordance with criteria set forth in the 1987 Manual, the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (USACE, 2012) (Supplement), and the *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act- A Handbook* (MassDEP, 1995) (the MassDEP Handbook).

The three-parameter approach to identify and delineate wetlands presented in the 1987 Manual and the Supplement requires that, except for atypical and disturbed situations, wetlands possess hydrophytic vegetation, hydric soils, and wetland hydrology. A two-parameter approach that considers only vegetation and hydrology indicators is presented in the MassDEP Handbook. Per the MassDEP Handbook, hydric soil is included as evidence of wetland hydrology.

Wetland boundary flags were located with a handheld GPS unit with sub-meter accuracy. Delineated resources were classified in accordance with the system presented in *The Classification of Wetlands and Deepwater Habitats of the United States, Second Edition* (Federal Geographic Data Committee, 2013).

No formal vernal pool surveys were conducted. Areas that appeared to show potential for meeting vernal pool classification were noted, photographed, and mapped as potential vernal pools.

#### **4.2.1 Hydrophytic Vegetation Methodologies**

Hydrophytic vegetation is defined in the 1987 Manual as:

...the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present.

Plants are categorized according to their occurrence in wetlands. Scientific names and wetland indicator statuses for vegetation are those listed in *The National Wetland Plant List: 2016 Wetland Ratings* (NWPL) (Lichvar et al., 2016). The indicator statuses specific to the “Northcentral and Northeast Region” as defined by the USACE apply to the Parcel. For upland species that are not listed on the NWPL, the Integrated Taxonomic Information System was referenced for currently accepted scientific names. The official short definitions for wetland indicator statuses are as follows:

- Obligate Wetland (OBL): Almost always occur in wetlands;
- Facultative Wetland (FACW): Usually occur in wetlands, but may occur in non-wetlands;
- Facultative (FAC): Occur in wetlands and non-wetlands (50/50 mix);
- Facultative Upland (FACU): Usually occur in non-wetlands, but may occur in wetlands; and
- Upland (UPL): Almost never occur in wetlands.

Plants that are not found in a region, but are found in an adjacent region, take on the indicator status of that adjacent region for dominance calculations. Plants that are included on the NWPL, but not within the Site region or an adjacent region, are not included in dominance calculations. Plants that are not found in wetlands in any region are considered “UPL” for dominance calculations.

Vegetation community sampling was accomplished using the methodologies outlined in the 2012 Supplement. The “50/20 rule” was applied to determine whether a species was dominant in its stratum. In using the 50/20 rule, the plants that comprise each stratum are ranked from highest to lowest in percent cover. The species that cumulatively equal or exceed 50 percent of the total percent cover for each stratum are dominant species, and any additional species that individually provides 20 percent or more percent cover is also considered dominant species of its respective strata.

A hydrophytic vegetation community is present when: 1) all of the dominant species are FACW and/or OBL (Rapid Test for Hydrophytic Vegetation); 2) greater than 50 percent of the dominant species’ (as determined by the 50/20 rule) indicator statuses are FAC, FACW, or OBL (Dominance Test); and/or 3) when the calculated Prevalence Index is equal to or less than 3.0. When applying the Prevalence Index, all plants are assigned a numeric value based on indicator status (OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5) and their abundance (absolute percent cover) is used to calculate the prevalence index.

Cover types are also assigned to each wetland and waterbody in accordance with the system presented in *The Classification of Wetlands and Deepwater Habitats of the United States, Second Edition* (Federal Geographic Data Committee, 2013).

#### **4.2.2 Hydric Soil Methodologies**

Hydric soil indicators described in *Field Indicators for Identifying Hydric Soils in New England, Version 4* (New England Hydric Soils Technical Committee, 2017) and in *Field Indicators of Hydric Soils in the United States, Version 8.2* (NRCS, 2018) were used to determine the presence of characteristic soil morphologies resulting from prolonged saturation and/or inundation. Soil color was described using standard color notations provided on Munsell® soil color charts (X-Rite, Inc., 2015). Soil texture was determined using the methods described by Thien (1979). Soil test pits were dug using a spade shovel to a depth of approximately 20 inches or more (if needed).

*Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin* (MLRA Handbook) (USDA NRCS, 2006) was referenced to determine the hydric soil indicators that apply to the Site. Per the MLRA Handbook, the Parcel is within Major Land Resource Area (MLRA) 144A (New England and Eastern New York Upland, Southern Part) of Land Resource Region (LRR) R (Northeastern Forage and Forest Region). Hydric soil indicators that do not apply to this MLRA were not considered on the wetland determination data forms.

The presence or absence of hydric soils was determined through examination of samples extracted with a hand shovel or hand auger from the upper horizons of the soil profile. Soils were examined to depths of approximately 18 to 20 inches, unless restrictive layers such as hard pan, rock, densely packed fill materials, etc. were encountered at shallower depths.

#### **4.2.3 Wetland Hydrology Methodologies**

Per the 1987 Manual:

*The term "wetland hydrology" encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some time during the growing season. Areas with evident characteristics of wetland hydrology are those where the presence of water has an overriding influence on characteristics of vegetation and soils due to anaerobic and reducing conditions, respectively. Such characteristics are usually present in areas that are inundated or have soils that are saturated to the surface for sufficient duration to develop hydric soils and support vegetation typically adapted for life in periodically anaerobic soil conditions. Hydrology is often the least exact of the parameters, and indicators of wetland hydrology are sometimes difficult to find in the field. However, it is essential to establish that a wetland area is periodically inundated or has saturated soils during the growing season. (Environmental Laboratory, 1987)*

Wetland hydrology indicators are grouped into 18 primary and 11 secondary indicators presented in the Supplement. The USACE considers wetland hydrology to be present when at least one primary indicator or two secondary indicators are identified.

## **5.0 Results**

### **5.1 Upland Areas**

The upland areas consist of successional forests throughout most the Parcel. The dominant vegetation in the uplands consists of red maple (*Acer rubrum*), northern red oak (*Quercus rubra*), sugar maple (*Acer saccharum*), shag-bark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), striped maple (*Acer pensylvanicum*), winged sumac (*Rhus copallinum*), mountain-laurel (*Kalmia latifolia*), American witch-hazel (*Hamamelis virginiana*), glossy false buckthorn (*Frangula alnus*), Allegheny blackberry (*Rubus allegheniensis*), common red raspberry (*Rubus idaeus*), northern spicebush (*Lindera benzoin*), marginal wood fern (*Dryopteris marginalis*), American hog-peanut (*Amphicarpaea bracteata*), wrinkle-leaf goldenrod (*Solidago rugosa*), evergreen woodfern (*Dryopteris intermedia*), northern bracken fern (*Pteridium aquilinum*), princess-pine (*Dendrolycopodium obscurum*), and annual ragweed (*Ambrosia artemisiifolia*). The terrain of the Parcel is undulating throughout generally sloping to the north or northeast. The soils observed throughout upland portions of the Parcel were generally classified as silt loam or sandy loam.

## 5.2 Delineated Wetlands and Waterbodies

TRC identified five wetlands and seven waterbodies within the Parcel during the October and November 2019 resource delineation efforts (Figure 2 in Appendix A). One offsite wetland (W-GR-5) appears on Figure 2 because the buffer zone associated with this resource area extends on to the Parcel. Delineated areas are described in the following sections and summarized at the end of this section in Table 2. Refer to the photographs in Appendix B and the wetland determination data forms in Appendix C for further details about each delineated area.

### 5.2.1 Delineated Wetlands

**Wetland W-GR-1** is a palustrine forested (PFO) wetland draining into intermittent stream S-GR-1. This wetland is in the eastern portion of the Parcel and drains off site to the east via stream S-GR-1. The dominant vegetation included yellow birch (*Betula alleghaniensis*), red maple (*Acer rubrum*), northern spicebush (*Lindera benzoin*), poison ivy (*Toxicodendron radicans*), and cinnamon fern (*Osmundastrum cinnamomeum*). Indicators of wetland hydrology included saturation, sparsely vegetated concave surface, moss trim lines, geomorphic position, shallow aquitard, microtopographic relief, and the FAC-neutral test. Soils were composed of a thick layer of dark silt loam with a restrictive layer of rock eight inches below the surface. This soil meets Hydric Soil Indicator A1 as described in *Field Indicators of Hydric Soils in the United States, Version 8.2* (Field Indicators) (USDA NRCS, 2018). **This wetland is MassDEP/LCC jurisdictional and it also falls under USACE jurisdiction, as it is likely connected to other WOUS.**

**Wetland W-GR-2** is a palustrine forested (PFO) wetland associated with intermittent stream S-GR-4. The wetland is in the central portion of the Parcel and extends off site to the East. The dominant vegetation included red maple, highbush blueberry (*Vaccinium corymbosum*), northern spicebush, royal fern (*Osmunda spectabilis*), and shallow sedge (*Carex lurida*). Indicators of wetland hydrology included saturation, sparsely vegetated concave surface, water-stained leaves, moss trim lines, microtopographic relief, and the FAC-neutral test. Soils were composed of a thick layer of organic matter and dark silt. This soil meets Hydric Soil Indicator A1 as described in *Field Indicators of Hydric Soils in the United States, Version 8.2* (Field Indicators) (USDA NRCS, 2018). A potential vernal pool was noted within this wetland. A follow up survey will need to be conducted in spring to determine whether it is an actual vernal pool or not. **This wetland is MassDEP/LCC jurisdictional and it also falls under USACE jurisdiction, as it is likely connected to other WOUS.**

**Wetland W-GR-3** is both a palustrine scrub-shrub (PSS) and palustrine forested (PFO) wetland associated with intermittent stream S-GR-2. The wetland is in the western portion of the Parcel and extends offsite to the West. The dominant vegetation included red maple, green ash (*Fraxinus pennsylvanica*), northern spicebush, purple meadow-rue (*Thalictrum dasycarpum*), evergreen woodfern (*Dryopteris intermedia*), maleberry (*Lyonia ligustrina*), and arrow-leaf tearthumb (*Persicaria sagittate*). Indicators of wetland hydrology included saturation, sparsely vegetated concave surface, drainage patterns, moss trim lines, microtopographic relief, and the FAC-neutral test. Soils were composed of a layer of organic matter and dark silty clay. This soil meets Hydric Soil Indicator A3 as described in *Field Indicators of Hydric Soils in the United States, Version 8.2* (Field Indicators) (USDA NRCS, 2018). **This wetland is MassDEP/LCC jurisdictional and it also falls under USACE jurisdiction, as it is likely connected to other WOUS.**

**Wetland W-GR-4** is both an isolated palustrine scrub-shrub (PSS) wetland and palustrine forested (PFO) wetland associated with non-jurisdictional drainage D-GR-3. The wetland is in the southeastern portion of the Parcel and is completely contained on site. The dominant vegetation included (*Spiraea latifolia*), maleberry, poison ivy, and bristly dewberry (*Rubus hispidus*). Indicators of wetland hydrology included



saturation, water-stained leaves, moss trim lines, microtopographic relief, and the FAC-neutral test. Soils were composed of a layer of dark mucky silt loam and a layer of gravelly clay loam, separated by a few inches of sand. This soil meets hydric soil indicator F3 as described in the Field Indicators (USDA NRCS, 2018). ***This wetland is not MassDEP jurisdictional as it does not border a waterbody and it does not have a basin that is large enough or deep enough to meet the definition of Isolated Land Subject to Flooding based on field review. This wetland is unlikely to be USACE jurisdiction, as it does not have a clear connection to other WOUS. However, it is LCC jurisdictional since the LCC regulates both bordering and isolated wetlands under the Leicester Wetlands Protection Bylaw.***

**Wetland W-GR-5** is a palustrine scrub-shrub (PSS) wetland associated with intermittent stream S-GR-5. The wetland is in the eastern portion of the Site (in T-line ROW to the east) and extends off site to the south. It begins at a culvert north of the wetland. The dominant vegetation within this wetland included maleberry (*Lyonia ligustrina*), early goldenrod (*Solidago gigantea*) jewelweed (*Impatiens capensis*), Japanese knotweed (*Persicaria sagittate*), and sensitive fern (*Onoclea sensibilis*). Indicators of wetland hydrology included saturation, drainage patterns, moss trim lines, microtopographic relief, and the FAC-neutral test. Soils were composed of a layer of dark silty clay loam, restricted at sixteen inches by rock. This soil meets Hydric Soil Indicators F3 as described in the Field Indicators (USDA NRCS, 2018). ***This wetland is MassDEP/LCC jurisdictional and it also falls under USACE jurisdiction, as it is likely connected to other WOUS.***

**Wetland W-DJH-1** a palustrine forested (PFO) wetland associated with non-jurisdictional drainage D-DJH-1 and intermittent stream S-DJH-2. The wetland is in the north-central portion of the Parcel and extends off site to the north. The dominant vegetation within this wetland included red maple, common winterberry (*Ilex verticillata*), northern spicebush, highbush blueberry, and sensitive fern (*Onoclea sensibilis*). Indicators of wetland hydrology included water-stained leaves, drainage patterns, geomorphic position, microtopographic relief, and the FAC-neutral test. Soils were composed of a layer of dark muck restricted at six inches by shallow rock. This soil meets Hydric Soil Indicators A1 as described in the Field Indicators (USDA NRCS, 2018). A potential vernal pool was noted within this wetland. A follow up survey will need to be conducted in spring to determine whether it is an actual vernal pool or not. ***This wetland is MassDEP/LCC jurisdictional and it also falls under USACE jurisdiction, as it is likely connected to other WOUS.***

## 5.2.2 Delineated Waterbodies

**Stream S-GR-1** is an intermittent stream (R4) that flows out of wetland W-GR-1 off site northeastward from the eastern side of the Parcel. The streambed was comprised of cobbles. TRC observed an average width of approximately 4 feet and no flow at the time of the survey. Stream S-GR-1 has defined banks such that the OHWM and the banks are coincident. The centerline of the stream was delineated.

The USGS does not map stream S-GR-1 nor is it digitized in the USGS StreamStats analysis ***This stream is MassDEP/LCC jurisdictional and falls under USACE jurisdiction, as it is likely connected to other WOUS.***

**Stream S-GR-2** is an intermittent stream (R4) that flows out of wetland W-GR-3 to its terminus near the center of the Parcel. The streambed was comprised of cobbles. TRC observed an average width of approximately 3 feet and no flow at the time of the survey. Stream S-GR-2 has defined banks such that the OHWM and the banks are coincident. The centerline of the stream was delineated.

The USGS does not map stream S-GR-2 nor is it digitized in the USGS StreamStats analysis ***This stream is MassDEP/LCC jurisdictional and falls under USACE jurisdiction, as it is likely connected to other WOUS.***

**Stream S-GR-4** is an intermittent stream (R4) that flows through narrow sections of wetland W-GR-2 ultimately dissipating within the wetland. The streambed was comprised of cobbles. TRC observed an average width of approximately 3 feet and a water depth of approximately 2 inches. Stream S-GR-4 has defined banks such that the OHWM and the banks are coincident. The centerline of the stream was delineated.

The USGS does not map stream S-GR-4 nor is it digitized in the USGS StreamStats analysis ***This stream is MassDEP/LCC jurisdictional and falls under USACE jurisdiction, as it is likely connected to other WOUS.***

**Stream S-GR-5** is an intermittent stream (R4) that flows out of a culvert and dissipates into wetland W-GR-5. It is located in the T-line ROW to the east. The streambed was comprised of cobble/gravel. TRC observed an average width of approximately 4 feet. Stream S-GR-5 has defined banks such that the OHWM and the banks are coincident. The centerline of the stream was delineated.

The USGS does not map stream S-GR-5 nor is it digitized in the USGS StreamStats analysis. ***This stream is MassDEP/LCC jurisdictional and falls under USACE jurisdiction, as it is likely connected to other WOUS.***

**Stream S-DJH-2** is an intermittent stream (R4) that flows out of wetland W-DJH-1 to the east. The streambed was comprised of cobbles. TRC observed an average width of approximately 4 feet and no flow at the time of the survey. Stream S-DJH-2 has defined banks such that the OHWM and the banks are coincident. The centerline of the stream was delineated. This stream is located just outside the limits of the Parcel but its buffer zone overlaps the Parcel.

The USGS does not map stream S-DJH-2 nor is it digitized in the USGS StreamStats analysis ***This stream is MassDEP/LCC jurisdictional and falls under USACE jurisdiction, as it is likely connected to other WOUS.***

**Drainage D-DJH-1** is a non-jurisdictional drainage feature (NJD) that flows through into wetland W-DJH-1 from surrounding uplands. The streambed was comprised of cobbles and leaf litter. TRC observed an average width of approximately 4 feet and no flow at the time of the survey. NJD D-DJH-1 has defined banks such that the OHWM and the banks are coincident. The centerline was delineated.

The USGS does not map NJD D-DJH-1 nor is it digitized in the USGS StreamStats analysis. The definition of a stream in the WPA regulations at 310 CMR 10.04 states that "such a body of water which does not flow throughout the year (i.e. which is intermittent) is a stream except for that portion upgradient of all bogs, swamps, wet meadows and marshes. ***Since ephemeral drainage D-DJH-1 does not flow out of a wetland, this stream is not MassDEP jurisdictional. However, it may fall under USACE jurisdiction and TRC assumes it is jurisdictional under the Leicester Wetlands Protection Bylaw.***

**Drainage D-GR-3** is a non-jurisdictional drainage feature (NJD) that flows out of uplands next to wetland W-GR-4 but does not connect to the wetland or any other waterbody. The streambed was comprised of cobbles and leaf litter. TRC observed an average width of approximately 5 feet and no flow at the time of the survey. NJD D-GR-3 has defined banks such that the OHWM and the banks are coincident. The centerline was delineated.

The USGS does not map NJD D-GR-3 nor is it digitized in the USGS StreamStats analysis. ***Since this drainage does not flow out of a wetland, it is not MassDEP jurisdictional and does not fall under USACE jurisdiction. We assume it is jurisdictional under the Leicester Wetlands Protection Bylaw.***

**Table 2. Delineated Wetlands and Waterbodies**

Wetland Field Designation	Field Designated NWI Classification <sup>1</sup>	Assumed Jurisdictional Status	Assumed Buffer/ Setback Requirements
W-GR-1	PFO	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
W-GR-2	PFO	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
W-GR-3	PFO/PSS	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
W-GR-4	PFO/PSS	Local	100-ft buffer zone 25-ft No Disturbance Zone
W-GR-5	PSS	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
W-DJH-1	PFO	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
S-GR-1	R4	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
S-GR-2	R4	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
S-GR-3	R4	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
S-GR-4	R4	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
S-GR-5	R4	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
S-DJH-2	R4	USACE/MassDEP/Local	100-ft buffer zone 25-ft No Disturbance Zone
D-DJH-1	N/A	Local	100-ft buffer zone 25-ft No Disturbance Zone
D-GR-3	N/A	Local	100-ft buffer zone 25-ft No Disturbance Zone

<sup>1</sup> *The Classification of Wetlands and Deepwater Habitats of the United States, Second Edition* (Federal Geographic Data Committee, 2013). Categories include: Palustrine Forested (PFO), Palustrine Shrub-Scrub (PSS), Riverine Intermittent (R4), and Ephemeral Stream (R6).

## 6.0 Conclusions

It is TRC's opinion that delineated wetlands W-GR-1, W-GR-2, W-GR-3, and W-DJH-1 are BVWs regulated by MassDEP and are also likely regulated under USACE jurisdiction. Wetland W-GR-4, is regulated under the Leicester Wetlands Protection Bylaw only. There are no buffers or setbacks associated with USACE-regulated wetlands. However, there is a 100-foot buffer zone associated with MassDEP and LCC-regulated wetlands as well as a 25-foot "No Disturbance Zone" around all LCC-regulated wetlands.

R4 streams S-GR-1, S-GR-2, S-GR-3, and S-DJH-1 are USACE jurisdictional, as they are hydrologically connected to WOUS. These streams are also regulated by the MassDEP/LCC, as they flow within, into, or



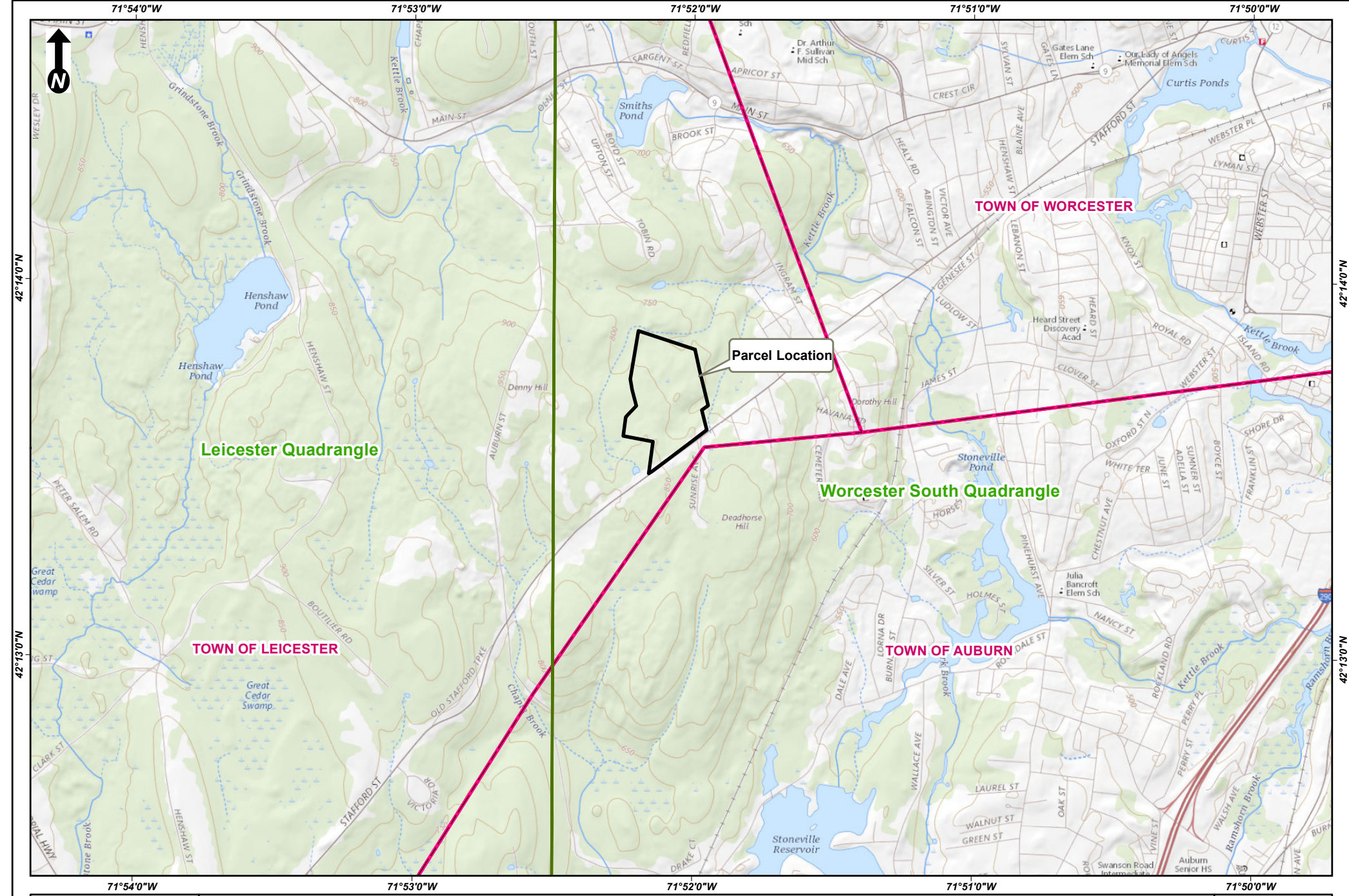
out of a MassDEP-regulated wetland resource area. TRC assumes the two ephemeral drainages at the site (D-DJH-1 and D-GR-3) are only regulated by the LCC.

Final determination of jurisdictional status for on-site wetlands and waterbodies must be made by regulatory agencies.

## 7.0 References

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- U.S. Department of the Interior, Geological Survey (USGS). 2018. Worcester South and Leicester Quadrangles. 7.5 Minute Series (Topographic).

## **Appendix A: Figures**



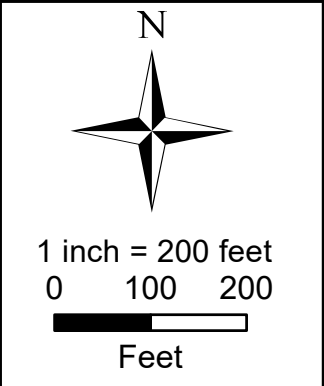
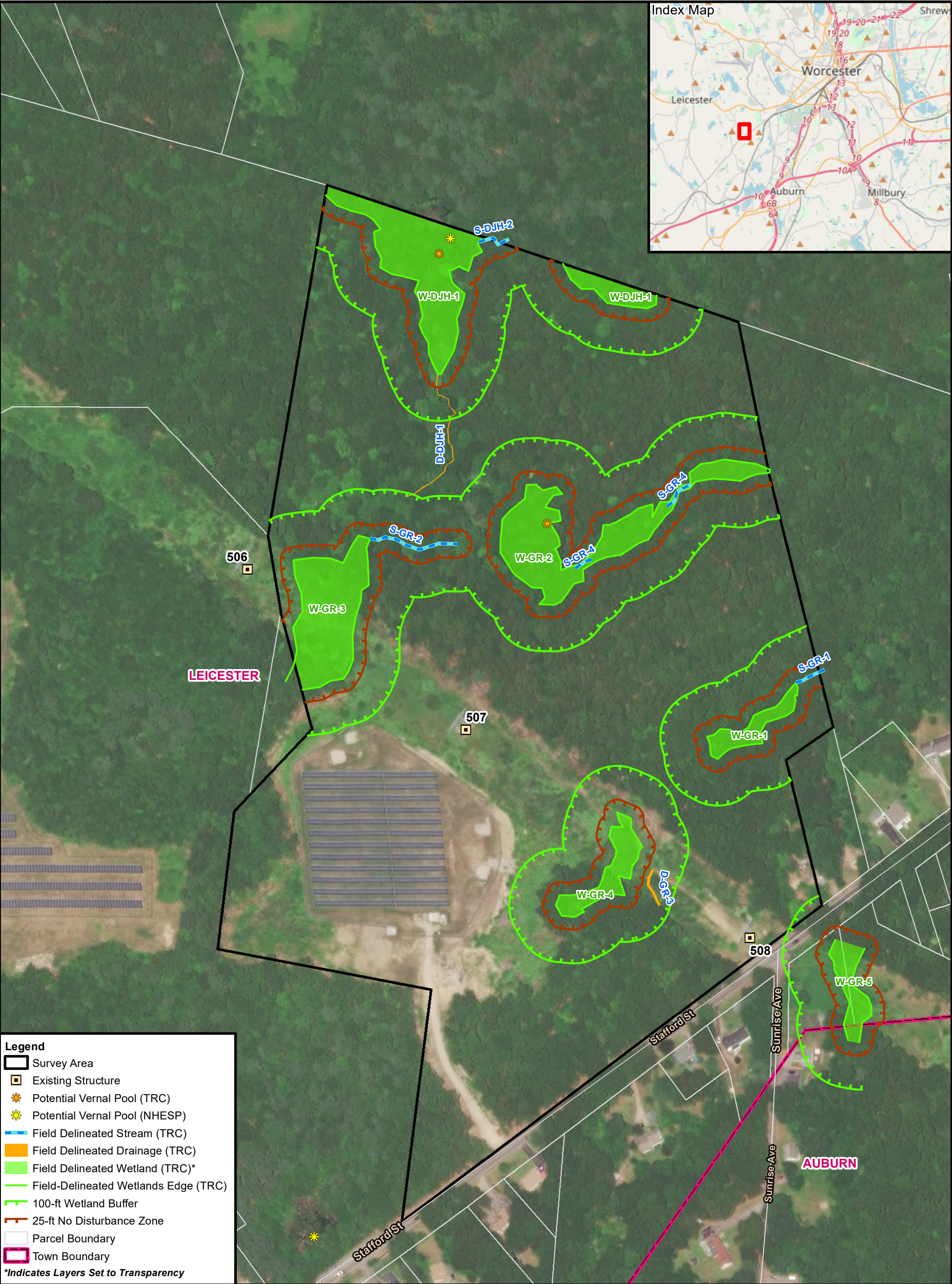
Scale:  
1 inch = 2,000 feet  
0 1,000 2,000  
Feet  
(Page Size 8.5 x 11)

**STAFFORD STREET SUBSTATION**

**Figure 1**  
**USGS Parcel Location Map**  
**Town of Leicester, MA**

Source: TRC, 2013  
National Geographic  
Society, i-cubed,  
"USGSTopo" Base Map  
  
nationalgrid  
TRC





**STAFFORD STREET SUBSTATION**

**Figure 2  
Wetland Delineation Results**



Town of Leicester, MA  
January, 2020



TRC, MassGIS, NationalGrid, Esri & Contributors - "World Imagery"









## **Appendix B: Photographs**

<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 1</p> <p>Date: 10/15/2019</p> <p>Direction: Unknown</p> <p>Description:</p> <p>Conditions observed at ephemeral drainage D-DJH-S1.</p>	
<p>Photograph: 2</p> <p>Date: 10/15/2019</p> <p>Direction: West</p> <p>Description:</p> <p>Conditions observed at intermittent stream S-DJH-S2 looking upstream.</p>	



<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 3</p> <p>Date: 10/16/2019</p> <p>Direction: East</p> <p>Description:</p> <p>Conditions observed at ephemeral stream S-GR-S1 looking upstream.</p>	 A photograph of a forest stream. The water is shallow and flows over rocks. The banks are covered with ferns and other vegetation. The trees are mostly deciduous with some green and some yellowing leaves, suggesting autumn.
<p>Photograph: 4</p> <p>Date: 10/16/2019</p> <p>Direction: East</p> <p>Description:</p> <p>Conditions observed at ephemeral stream S-GR-S2 looking downstream.</p>	 A photograph of a forest stream. The water is shallow and flows over a bed of fallen branches and leaves. The banks are covered with trees and vegetation. The trees are mostly deciduous with some green and some yellowing leaves, suggesting autumn.





<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 5</p> <p>Date: 10/18/2019</p> <p>Direction: South</p> <p>Description:</p> <p>Conditions observed at ephemeral drainage D-GR-S3 looking upstream.</p>	
<p>Photograph: 6</p> <p>Date: 11/13/2019</p> <p>Direction: Southwest</p> <p>Description:</p> <p>Conditions observed at intermittent stream S-GR-S4 looking upstream.</p>	



<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 7</p> <p>Date: 10/16/2019</p> <p>Direction: South</p> <p>Description:</p> <p>Conditions observed at upland data point GR-W1-UPL.</p>	 A photograph showing a forest floor with a mix of green and yellow leaves, indicating autumn. The ground is covered with fallen leaves and some green plants are still growing. The background shows several tree trunks.
<p>Photograph: 8</p> <p>Date: 10/22/2019</p> <p>Direction: South</p> <p>Description:</p> <p>Typical conditions observed at wetland data point GR-W1-PFO .</p>	 A photograph showing a forest floor with a mix of green and yellow leaves, indicating autumn. The ground is covered with fallen leaves and some green plants are still growing. The background shows several tree trunks.





<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 9</p> <p>Date: 10/16/2019</p> <p>Direction: West</p> <p>Description:</p> <p>Typical conditions observed at upland data point GR-W2-UPL.</p>	
<p>Photograph: 10</p> <p>Date: 10/16/2019</p> <p>Direction: South</p> <p>Description:</p> <p>Conditions observed at wetland W2 data point GR-W2-PFO.</p>	



<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 11</p> <p>Date: 10/16/2019</p> <p>Direction: North</p> <p>Description:</p> <p>Typical conditions observed at upland data point GR-W3-UPL1.</p>	
<p>Photograph: 12</p> <p>Date: 10/16/2019</p> <p>Direction: South</p> <p>Description:</p> <p>Conditions observed at wetland W3 data point GR-W3-PSS.</p>	





<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 13</p> <p>Date: 10/16/2019</p> <p>Direction: South</p> <p>Description:</p> <p>Typical conditions observed at upland data point GR-W3-UPL2.</p>	
<p>Photograph: 14</p> <p>Date: 10/16/2019</p> <p>Direction: East</p> <p>Description:</p> <p>Conditions observed at wetland W3 data point GR-W3-PFO.</p>	

<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 15</p> <p>Date: 10/16/2019</p> <p>Direction: North</p> <p>Description:</p> <p>Typical conditions observed at upland data point GR-W4-UPL.</p>	 A photograph showing a dense thicket of shrubs and trees in an upland area. The vegetation is a mix of green, yellow, and brown, suggesting autumn. Several white-barked trees, possibly birches, are visible in the background.
<p>Photograph: 16</p> <p>Date: 10/16/2019</p> <p>Direction: West</p> <p>Description:</p> <p>Conditions observed at wetland W4 data point GR-W4-PSS.</p>	 A photograph showing a dense thicket of shrubs and trees in a wetland area. The vegetation is a mix of green, yellow, and brown, suggesting autumn. The ground appears to be covered in low-lying plants and grasses.



<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 15</p> <p>Date: 10/18/2019</p> <p>Direction: North</p> <p>Description:</p> <p>Typical conditions observed at upland data point GR-W5-UPL.</p>	 A photograph showing a dense thicket of upland vegetation. The plants are mostly green and yellow, with some reddish-brown flowers or leaves visible. The background shows more trees and foliage.
<p>Photograph: 16</p> <p>Date: 10/18/2019</p> <p>Direction: East</p> <p>Description:</p> <p>Conditions observed at wetland W5 data point GR-W5-PSS.</p>	 A photograph showing a dense thicket of wetland vegetation. The plants are mostly green and yellow, with some white flowers or leaves visible. The background shows more trees and foliage.

<b>NATIONAL GRID</b> <b>STAFFORD STREET SUBSTATION, LEICESTER, MASSACHUSETTS</b>	
<p>Photograph: 18</p> <p>Date: 10/15/2019</p> <p>Direction: North</p> <p>Description:</p> <p>Typical conditions observed at upland data point DJH-W1-UPL.</p>	
<p>Photograph: 19</p> <p>Date: 10/15/2019</p> <p>Direction: West</p> <p>Description:</p> <p>Conditions observed at wetland W1 data point DJH-W1-PFO.</p>	



## **Appendix C: Wetland Determination Data Forms**

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W1-PFO  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Valley Local relief (concave, convex, none): Concave Slope (%): 2-5  
 Subregion (LRR or MLRA): LRR R Lat: 42.2278173734 Long: -71.8669553754 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 8 to 15 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If yes, optional Wetland Site ID: GR-W1
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is PFO. Area is wetland, all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input checked="" type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input checked="" type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input checked="" type="checkbox"/> Shallow Aquitard (D3)			
<input checked="" type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input checked="" type="checkbox"/> Microtopographic Relief (D4)			
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>0</u> (includes capillary fringe)			Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is met.					

Sampling Point: GR-W1-PFO

Tree Stratum (Plot size: 30 ft )				Dominance Test worksheet:			
	Absolute % Cover	Dominant Species?	Indicator Status	Number of Dominant Species That Are OBL, FACW, or FAC:			
1. <i>Acer rubrum</i>	40	Yes	FAC	5			(A)
2. <i>Betula alleghaniensis</i>	20	Yes	FAC	5			(B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:			100 (A/B)
4. _____	_____	_____	_____	Prevalence Index worksheet:			
5. _____	_____	_____	_____	Total % Cover of:		Multiply By:	
6. _____	_____	_____	_____	OBL species	0	x 1 =	0
7. _____	_____	_____	_____	FACW species	40	x 2 =	80
	60	= Total Cover		FAC species	85	x 3 =	255
Sapling/Shrub Stratum (Plot size: 15 ft )				FACU species	0	x 4 =	0
1. <i>Lindera benzoin</i>	30	Yes	FACW	UPL species	0	x 5 =	0
2. _____	_____	_____	_____	Column Totals	125	(A)	335 (B)
3. _____	_____	_____	_____	Prevalence Index = B/A = 2.7			
4. _____	_____	_____	_____	Hydrophytic Vegetation Indicators:			
5. _____	_____	_____	_____	1- Rapid Test for Hydrophytic Vegetation			
6. _____	_____	_____	_____	2 - Dominance Test is >50%			
7. _____	_____	_____	_____	3 - Prevalence Index is ≤ 3.0 <sup>1</sup>			
	30	= Total Cover		4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)			
Herb Stratum (Plot size: 5 ft )				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)			
1. <i>Toxicodendron radicans</i>	25	Yes	FAC	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic			
2. <i>Osmundastrum cinnamomeum</i>	10	Yes	FACW	Definitions of Vegetation Strata:			
3. _____	_____	_____	_____	Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.			
4. _____	_____	_____	_____	Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.			
5. _____	_____	_____	_____	Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.			
6. _____	_____	_____	_____	Woody vines – All woody vines greater than 3.28 ft in height.			
7. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes 2 No 3			
8. _____	_____	_____	_____				
9. _____	_____	_____	_____				
10. _____	_____	_____	_____				
11. _____	_____	_____	_____				
12. _____	_____	_____	_____				
	35	= Total Cover					
Woody Vine Stratum (Plot size: 30 ft )							
1. _____	_____	_____	_____				
2. _____	_____	_____	_____				
3. _____	_____	_____	_____				
4. _____	_____	_____	_____				
	0	= Total Cover					
Remarks: (Include photo numbers here or on a separate sheet.)							
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC)..							

## SOIL

Sampling Point: GR-W1-PFO

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W1-UPL  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Undulating Slope (%): 5-10  
 Subregion (LRR or MLRA): LRR R Lat: 42.227650364 Long: -71.8666996435 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Hydric Soil Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID:
<b>Remarks: (Explain alternative procedures here or in a separate report)</b> Covertypes is UPL. Area is upland, not all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b>					
Surface Water Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Water Table Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Saturation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
(includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
<b>Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:</b>					
<b>Remarks:</b> The criterion for wetland hydrology is not met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W1-UPL

Tree Stratum (Plot size: <u>30 ft</u> )	Absolute % Cover	Dominant Species?	Indicator Status
1. <i>Acer rubrum</i>	40	Yes	FAC
2. <i>Quercus rubra</i>	35	Yes	FACU
3. <i>Betula alleghaniensis</i>	15	No	FAC
4. <i>Fagus grandifolia</i>	5	No	FACU
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
	95 = Total Cover		
<b>Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )</b>			
1. <i>Kalmia latifolia</i>	40	Yes	FACU
2. <i>Hamamelis virginiana</i>	20	Yes	FACU
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
	60 = Total Cover		
<b>Herb Stratum (Plot size: <u>5 ft</u> )</b>			
1. <i>Dryopteris marginalis</i>	10	Yes	FACU
2. <i>Acer pensylvanicum</i>	5	Yes	FACU
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
	15 = Total Cover		
<b>Woody Vine Stratum (Plot size: <u>30 ft</u> )</b>			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
	0 = Total Cover		

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 16.7 (A/B)

**Prevalence Index worksheet:**

Total % Cover of:	Multiply By:
OBL species <u>0</u>	x 1 = <u>0</u>
FACW species <u>0</u>	x 2 = <u>0</u>
FAC species <u>55</u>	x 3 = <u>165</u>
FACU species <u>115</u>	x 4 = <u>460</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals <u>170</u>	(A) <u>625</u> (B)

Prevalence Index = B/A = 3.7

**Hydrophytic Vegetation Indicators:**

\_\_\_\_ 1- Rapid Test for Hydrophytic Vegetation

\_\_\_\_ 2 - Dominance Test is > 50%

\_\_\_\_ 3 - Prevalence Index is ≤ 3.0<sup>1</sup>

\_\_\_\_ 4 - Morphological Adaptations<sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)

\_\_\_\_ Problematic Hydrophytic Vegetation<sup>1</sup> (Explain)

<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes \_\_\_\_ No ✓

**Remarks: (Include photo numbers here or on a separate sheet.)**

No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FAC– or drier)..

## SOIL

Sampling Point: GR-W1-UPL

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W2-PFO  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2-5  
 Subregion (LRR or MLRA): LRR R Lat: 42.2290363117 Long: -71.8682658021 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 8 to 15 percent slopes, extremely stony NWI classification: PEM  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If yes, optional Wetland Site ID: GR-W2
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is PFO. Area is wetland, all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Surface Soil Cracks (B6)		
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)		<input type="checkbox"/> Drainage Patterns (B10)		
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)		<input checked="" type="checkbox"/> Moss Trim Lines (B16)		
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)		<input type="checkbox"/> Dry-Season Water Table (C2)		
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)		<input type="checkbox"/> Crayfish Burrows (C8)		
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)		<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)		
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)		<input type="checkbox"/> Stunted or Stressed Plants (D1)		
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)		<input type="checkbox"/> Geomorphic Position (D2)		
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)		<input type="checkbox"/> Shallow Aquitard (D3)		
<input checked="" type="checkbox"/> Sparsely Vegetated Concave Surface (B8)			<input checked="" type="checkbox"/> Microtopographic Relief (D4)		
			<input checked="" type="checkbox"/> FAC-Neutral Test (D5)		
<b>Field Observations:</b> Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>0</u> (includes capillary fringe)			Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is met.					



VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W2-PFO

Tree Stratum (Plot size: 30 ft )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. <i>Acer rubrum</i>	50	Yes	FAC	Number of Dominant Species That Are OBL, FACW, or FAC:	5 (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata:	5 (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:	100 (A/B)
4. _____	_____	_____	_____	<b>Prevalence Index worksheet:</b>	
5. _____	_____	_____	_____	<b>Total % Cover of:</b>	<b>Multiply By:</b>
6. _____	_____	_____	_____	OBL species	20 x 1 = 20
7. _____	_____	_____	_____	FACW species	60 x 2 = 120
	50 = Total Cover			FAC species	50 x 3 = 150
<b>Sapling/Shrub Stratum (Plot size: 15 ft )</b>				FACU species	0 x 4 = 0
1. <i>Vaccinium corymbosum</i>	40	Yes	FACW	UPL species	0 x 5 = 0
2. <i>Lindera benzoin</i>	20	Yes	FACW	Column Totals	130 (A) 290 (B)
3. _____	_____	_____	_____	Prevalence Index = B/A =	2.2
4. _____	_____	_____	_____	<b>Hydrophytic Vegetation Indicators:</b>	
5. _____	_____	_____	_____	____ 1- Rapid Test for Hydrophytic Vegetation	
6. _____	_____	_____	_____	<input checked="" type="checkbox"/> 2 - Dominance Test is >50%	
7. _____	_____	_____	_____	<input checked="" type="checkbox"/> 3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	60 = Total Cover			____ 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: 5 ft )</b>				____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Osmunda spectabilis</i>	15	Yes	OBL	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Carex lurida</i>	5	Yes	OBL	<b>Definitions of Vegetation Strata:</b>	
3. _____	_____	_____	_____	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4. _____	_____	_____	_____	<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5. _____	_____	_____	_____	<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6. _____	_____	_____	_____	<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
	20 = Total Cover				
<b>Woody Vine Stratum (Plot size: 30 ft )</b>					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
	0 = Total Cover				
<b>Remarks: (Include photo numbers here or on a separate sheet.)</b>					
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC)..					

## SOIL

Sampling Point: GR-W2-PFO

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W2-UPL  
 Investigator(s): Greg Russo, Matt Boscow Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5-10  
 Subregion (LRR or MLRA): LRR R Lat: 42.2292373516 Long: -71.8683931232 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 8 to 15 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Hydric Soil Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID:
<b>Remarks: (Explain alternative procedures here or in a separate report)</b> Covertypes is UPL. Area is upland, not all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b>					
Surface Water Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Water Table Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Saturation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
(includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
<b>Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:</b>					
<b>Remarks:</b> The criterion for wetland hydrology is not met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W2-UPL

Tree Stratum (Plot size: <u>30 ft</u> )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. <i>Acer saccharum</i>	40	Yes	FACU	Number of Dominant Species That Are OBL, FACW, or FAC:	3 (A)
2. <i>Acer rubrum</i>	30	Yes	FAC	Total Number of Dominant Species Across All Strata:	4 (B)
3. <i>Carya glabra</i>	15	No	FACU	Percent of Dominant Species That Are OBL, FACW, or FAC:	75 (A/B)
4.				<b>Prevalence Index worksheet:</b>	
5.				<b>Total % Cover of:</b>	<b>Multiply By:</b>
6.				OBL species	0 x 1 = 0
7.				FACW species	35 x 2 = 70
	85	= Total Cover		FAC species	95 x 3 = 285
<b>Sapling/Shrub Stratum (Plot size: <u>15 ft</u>)</b>				FACU species	55 x 4 = 220
1. <i>Lindera benzoin</i>	25	Yes	FACW	UPL species	0 x 5 = 0
2.				Column Totals	185 (A) 575 (B)
3.				Prevalence Index = B/A = <u>3.1</u>	
4.				<b>Hydrophytic Vegetation Indicators:</b>	
5.				___ 1- Rapid Test for Hydrophytic Vegetation	
6.				<input checked="" type="checkbox"/> 2 - Dominance Test is >50%	
7.				___ 3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	25	= Total Cover		___ 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: <u>5 ft</u>)</b>				___ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Amphicarpaea bracteata</i>	60	Yes	FAC	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Osmundastrum cinnamomeum</i>	10	No	FACW	<b>Definitions of Vegetation Strata:</b>	
3. <i>Parathelypteris noveboracensis</i>	5	No	FAC	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4.				<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5.				<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6.				<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7.				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No ___	
8.					
9.					
10.					
11.					
12.					
	75	= Total Cover			
<b>Woody Vine Stratum (Plot size: <u>30 ft</u>)</b>					
1.					
2.					
3.					
4.					
	0	= Total Cover			
<b>Remarks: (Include photo numbers here or on a separate sheet.)</b> The hydrophytic vegetation criterion has been met. However, due to the absence of wetland hydrology and/or hydric soils, this data point is within a non-wetland.					

## SOIL

Sampling Point: GR-W2-UPL

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W3-PFO  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 5-10  
 Subregion (LRR or MLRA): LRR R Lat: 42.2289590724 Long: -71.869829027 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If yes, optional Wetland Site ID: GR-W3
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is PFO. Area is wetland, all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input checked="" type="checkbox"/> Drainage Patterns (B10)			
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input checked="" type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input checked="" type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input checked="" type="checkbox"/> Microtopographic Relief (D4)			
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>          </u> Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): <u>          </u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>0</u> (includes capillary fringe)			Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W3-PFO

Tree Stratum (Plot size: <u>30 ft</u> )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. <i>Acer rubrum</i>	50	Yes	FAC	Number of Dominant Species That Are OBL, FACW, or FAC:	5 (A)
2. <i>Fraxinus pennsylvanica</i>	20	Yes	FACW	Total Number of Dominant Species Across All Strata:	5 (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:	100 (A/B)
4. _____	_____	_____	_____	<b>Prevalence Index worksheet:</b>	
5. _____	_____	_____	_____	<b>Total % Cover of:</b>	<b>Multiply By:</b>
6. _____	_____	_____	_____	OBL species	0 x 1 = 0
7. _____	_____	_____	_____	FACW species	85 x 2 = 170
	70	= Total Cover		FAC species	75 x 3 = 225
<b>Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )</b>				FACU species	0 x 4 = 0
1. <i>Lindera benzoin</i>	15	Yes	FACW	UPL species	0 x 5 = 0
2. _____	_____	_____	_____	Column Totals	160 (A) 395 (B)
3. _____	_____	_____	_____	Prevalence Index = B/A = <u>2.5</u>	
4. _____	_____	_____	_____	<b>Hydrophytic Vegetation Indicators:</b>	
5. _____	_____	_____	_____	____ 1- Rapid Test for Hydrophytic Vegetation	
6. _____	_____	_____	_____	<input checked="" type="checkbox"/> 2 - Dominance Test is >50%	
7. _____	_____	_____	_____	<input checked="" type="checkbox"/> 3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	15	= Total Cover		____ 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: <u>5 ft</u> )</b>				____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Thalictrum dasycarpum</i>	50	Yes	FACW	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Dryopteris intermedia</i>	25	Yes	FAC	<b>Definitions of Vegetation Strata:</b>	
3. _____	_____	_____	_____	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4. _____	_____	_____	_____	<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5. _____	_____	_____	_____	<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6. _____	_____	_____	_____	<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
	75	= Total Cover			
<b>Woody Vine Stratum (Plot size: <u>30 ft</u> )</b>					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
	0	= Total Cover			
<b>Remarks: (Include photo numbers here or on a separate sheet.)</b> A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC)..					



## SOIL

Sampling Point: GR-W3-PFO

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W3-PSS  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2-5  
 Subregion (LRR or MLRA): LRR R Lat: 42.2282387736 Long: -71.8701679912 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If yes, optional Wetland Site ID: GR-W3
Remarks: (Explain alternative procedures here or in a separate report) Covertypes is PSS. Area is wetland, all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input checked="" type="checkbox"/> Microtopographic Relief (D4)			
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>0</u> (includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W3-PSS

Tree Stratum (Plot size: <u>30 ft</u> )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC:	<u>3</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata:	<u>3</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:	<u>100</u> (A/B)
4. _____	_____	_____	_____	<b>Prevalence Index worksheet:</b>	
5. _____	_____	_____	_____	<b>Total % Cover of:</b>	<b>Multiply By:</b>
6. _____	_____	_____	_____	OBL species <u>70</u>	x 1 = <u>70</u>
7. _____	_____	_____	_____	FACW species <u>150</u>	x 2 = <u>300</u>
	<u>0</u>	= Total Cover		FAC species <u>0</u>	x 3 = <u>0</u>
<b>Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )</b>				FACU species <u>0</u>	x 4 = <u>0</u>
1. <i>Lyonia ligustrina</i>	<u>60</u>	Yes	FACW	UPL species <u>0</u>	x 5 = <u>0</u>
2. <i>Lindera benzoin</i>	<u>30</u>	Yes	FACW	Column Totals <u>220</u>	(A) <u>370</u> (B)
3. _____	_____	_____	_____	Prevalence Index = B/A = <u>1.7</u>	
4. _____	_____	_____	_____	<b>Hydrophytic Vegetation Indicators:</b>	
5. _____	_____	_____	_____	<input checked="" type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation	
6. _____	_____	_____	_____	<input checked="" type="checkbox"/> 2 - Dominance Test is >50%	
7. _____	_____	_____	_____	<input checked="" type="checkbox"/> 3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	<u>90</u>	= Total Cover		<input type="checkbox"/> 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: <u>5 ft</u> )</b>				<input type="checkbox"/> Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Persicaria sagittata</i>	<u>70</u>	Yes	OBL	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Eupatorium perfoliatum</i>	<u>25</u>	No	FACW	<b>Definitions of Vegetation Strata:</b>	
3. <i>Impatiens capensis</i>	<u>25</u>	No	FACW	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4. <i>Onoclea sensibilis</i>	<u>10</u>	No	FACW	<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5. _____	_____	_____	_____	<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6. _____	_____	_____	_____	<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
	<u>130</u>	= Total Cover			
<b>Woody Vine Stratum (Plot size: <u>30 ft</u> )</b>					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
	<u>0</u>	= Total Cover			
<b>Remarks: (Include photo numbers here or on a separate sheet.)</b>					
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC)..					

## SOIL

Sampling Point: GR-W3-PSS

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W3-UPL1  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5-10  
 Subregion (LRR or MLRA): LRR R Lat: 42.22827008 Long: -71.8703143392 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Hydric Soil Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID:
<b>Remarks: (Explain alternative procedures here or in a separate report)</b> Covertypes is UPL. Area is upland, not all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <u>Primary Indicators (minimum of one is required; check all that apply)</u>			<u>Secondary Indicators (minimum of two required)</u>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b>					
Surface Water Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Water Table Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Saturation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
(includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
<b>Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:</b>					
<b>Remarks:</b> The criterion for wetland hydrology is not met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W3-UPL1

Tree Stratum (Plot size: <u>30 ft</u> )		Absolute % Cover	Dominant Species?	Indicator Status
1.	<i>Quercus rubra</i>	50	Yes	FACU
2.	<i>Acer saccharum</i>	20	Yes	FACU
3.				
4.				
5.				
6.				
7.				
		70	= Total Cover	
Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )		Absolute % Cover	Dominant Species?	Indicator Status
1.	<i>Kalmia latifolia</i>	25	Yes	FACU
2.				
3.				
4.				
5.				
6.				
7.				
		25	= Total Cover	
Herb Stratum (Plot size: <u>5 ft</u> )		Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
		0	= Total Cover	
Woody Vine Stratum (Plot size: <u>30 ft</u> )		Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
		0	= Total Cover	

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

**Prevalence Index worksheet:**

Total % Cover of:		Multiply By:	
OBL species	<u>0</u>	x 1 =	<u>0</u>
FACW species	<u>0</u>	x 2 =	<u>0</u>
FAC species	<u>0</u>	x 3 =	<u>0</u>
FACU species	<u>95</u>	x 4 =	<u>380</u>
UPL species	<u>0</u>	x 5 =	<u>0</u>
Column Totals	<u>95</u>	(A)	<u>380</u> (B)
Prevalence Index = B/A = <u>4</u>			

**Hydrophytic Vegetation Indicators:**

     1- Rapid Test for Hydrophytic Vegetation

     2 - Dominance Test is > 50%

     3 - Prevalence Index is ≤ 3.0<sup>1</sup>

     4 - Morphological Adaptations<sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)

     Problematic Hydrophytic Vegetation<sup>1</sup> (Explain)

<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes      No ✓

**Remarks: (Include photo numbers here or on a separate sheet.)**

No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FAC– or drier)..

## SOIL

Sampling Point: GR-W3-UPL1

[illegible]



# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-16  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W3-UPL2  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 2-5  
 Subregion (LRR or MLRA): LRR R Lat: 42.2289142292 Long: -71.8698379957 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Hydric Soil Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID:
Remarks: (Explain alternative procedures here or in a separate report) Covertypes is UPL. Area is upland, not all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is not met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W3-UPL2

Tree Stratum (Plot size: <u>30 ft</u> )			Absolute % Cover	Dominant Species?	Indicator Status
1.	<i>Acer rubrum</i>		50	Yes	FAC
2.	<i>Carya glabra</i>		15	Yes	FACU
3.	<i>Fraxinus pennsylvanica</i>		10	No	FACW
4.					
5.					
6.					
7.					
			75	= Total Cover	
Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )					
1.					
2.					
3.					
4.					
5.					
6.					
7.					
			0	= Total Cover	
Herb Stratum (Plot size: <u>5 ft</u> )					
1.	<i>Dryopteris marginalis</i>		70	Yes	FACU
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
			70	= Total Cover	
Woody Vine Stratum (Plot size: <u>30 ft</u> )					
1.					
2.					
3.					
4.					
			0	= Total Cover	

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3 (A/B)

**Prevalence Index worksheet:**

Total % Cover of:		Multiply By:	
OBL species	<u>0</u>	x 1 =	<u>0</u>
FACW species	<u>10</u>	x 2 =	<u>20</u>
FAC species	<u>50</u>	x 3 =	<u>150</u>
FACU species	<u>85</u>	x 4 =	<u>340</u>
UPL species	<u>0</u>	x 5 =	<u>0</u>
Column Totals	<u>145</u>	(A)	<u>510</u> (B)
Prevalence Index = B/A = <u>3.5</u>			

**Hydrophytic Vegetation Indicators:**

     1- Rapid Test for Hydrophytic Vegetation

     2 - Dominance Test is > 50%

     3 - Prevalence Index is ≤ 3.0<sup>1</sup>

     4 - Morphological Adaptations<sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)

     Problematic Hydrophytic Vegetation<sup>1</sup> (Explain)

<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes      No ✓

**Remarks: (Include photo numbers here or on a separate sheet.)**

No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FAC– or drier)..

## SOIL

Sampling Point: GR-W3-UPL2

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-18  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W4-PSS  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2-5  
 Subregion (LRR or MLRA): LRR R Lat: 42.2270809813 Long: -71.8675241713 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	If yes, optional Wetland Site ID: GR-W4
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is PSS. Area is wetland, all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <b>Primary Indicators (minimum of one is required; check all that apply)</b>			<b>Secondary Indicators (minimum of two required)</b>		
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Surface Soil Cracks (B6)		
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)		<input type="checkbox"/> Drainage Patterns (B10)		
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)		<input checked="" type="checkbox"/> Moss Trim Lines (B16)		
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)		<input type="checkbox"/> Dry-Season Water Table (C2)		
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)		<input type="checkbox"/> Crayfish Burrows (C8)		
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)		<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)		
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)		<input type="checkbox"/> Stunted or Stressed Plants (D1)		
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)		<input type="checkbox"/> Geomorphic Position (D2)		
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)		<input type="checkbox"/> Shallow Aquitard (D3)		
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)			<input checked="" type="checkbox"/> Microtopographic Relief (D4)		
			<input checked="" type="checkbox"/> FAC-Neutral Test (D5)		
<b>Field Observations:</b> Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (inches): <u>0</u> (includes capillary fringe)			Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W4-PSS

Tree Stratum (Plot size: <u>30 ft</u> )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. _____	_____	_____	_____	Number of Dominant Species That Are OBL, FACW, or FAC:	<u>4</u> (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata:	<u>4</u> (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:	<u>100</u> (A/B)
4. _____	_____	_____	_____	<b>Prevalence Index worksheet:</b>	
5. _____	_____	_____	_____	<b>Total % Cover of:</b>	<b>Multiply By:</b>
6. _____	_____	_____	_____	OBL species	<u>0</u> x 1 = <u>0</u>
7. _____	_____	_____	_____	FACW species	<u>155</u> x 2 = <u>310</u>
	<u>0</u>	= Total Cover		FAC species	<u>65</u> x 3 = <u>195</u>
<b>Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )</b>				FACU species	<u>0</u> x 4 = <u>0</u>
1. <i>Spiraea latifolia</i>	<u>70</u>	Yes	FACW	UPL species	<u>0</u> x 5 = <u>0</u>
2. <i>Lyonia ligustrina</i>	<u>25</u>	Yes	FACW	Column Totals	<u>220</u> (A) <u>505</u> (B)
3. <i>Alnus incana</i>	<u>5</u>	No	FACW	Prevalence Index = B/A = <u>2.3</u>	
4. _____	_____	_____	_____	<b>Hydrophytic Vegetation Indicators:</b>	
5. _____	_____	_____	_____	____ 1- Rapid Test for Hydrophytic Vegetation	
6. _____	_____	_____	_____	<input checked="" type="checkbox"/> 2 - Dominance Test is >50%	
7. _____	_____	_____	_____	<input checked="" type="checkbox"/> 3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	<u>100</u>	= Total Cover		____ 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: <u>5 ft</u> )</b>				____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Toxicodendron radicans</i>	<u>60</u>	Yes	FAC	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Rubus hispidus</i>	<u>50</u>	Yes	FACW	<b>Definitions of Vegetation Strata:</b>	
3. <i>Solidago rugosa</i>	<u>5</u>	No	FAC	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4. <i>Onoclea sensibilis</i>	<u>5</u>	No	FACW	<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5. _____	_____	_____	_____	<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6. _____	_____	_____	_____	<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
	<u>120</u>	= Total Cover			
<b>Woody Vine Stratum (Plot size: <u>30 ft</u> )</b>					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
	<u>0</u>	= Total Cover			

**Remarks: (Include photo numbers here or on a separate sheet.)**

A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC)..



## SOIL

Sampling Point: GR-W4-PSS

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-18  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W4-UPL  
 Investigator(s): Greg Russo, Matt Boscow, Russo Section, Township, Range: Leicester  
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 5-10  
 Subregion (LRR or MLRA): LRR R Lat: 42.2270678217 Long: -71.8673402724 Datum: WGS84  
 Soil Map Unit Name: Canton fine sandy loam, 0 to 8 percent slopes, extremely stony NWI classification: None  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐  
 Are Vegetation ☐ Soil ☐ or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Hydric Soil Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID:
<b>Remarks: (Explain alternative procedures here or in a separate report)</b> Covertypes is UPL. Area is upland, not all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <u>Primary Indicators (minimum of one is required; check all that apply)</u>			<u>Secondary Indicators (minimum of two required)</u>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b>					
Surface Water Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Water Table Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
Saturation Present?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Depth (inches):			
(includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>		
<b>Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:</b>					
<b>Remarks:</b> The criterion for wetland hydrology is met.					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W4-UPL

Tree Stratum (Plot size: <u>30 ft</u> )	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
	0	= Total Cover		
<b>Sapling/Shrub Stratum</b> (Plot size: <u>15 ft</u> )				
1. <i>Kalmia latifolia</i>	50	Yes	FACU	
2. <i>Lyonia ligustrina</i>	10	No	FACW	
3. <i>Rubus allegheniensis</i>	10	No	FACU	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
	70	= Total Cover		
<b>Herb Stratum</b> (Plot size: <u>5 ft</u> )				
1. <i>Solidago rugosa</i>	10	Yes	FAC	
2. <i>Dryopteris intermedia</i>	5	Yes	FAC	
3. <i>Pteridium aquilinum</i>	5	Yes	FACU	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
	20	= Total Cover		
<b>Woody Vine Stratum</b> (Plot size: <u>30 ft</u> )				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
	0	= Total Cover		

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

**Prevalence Index worksheet:**

Total % Cover of:	Multiply By:
OBL species <span style="float: right;">0</span>	x 1 = <span style="float: right;">0</span>
FACW species <span style="float: right;">10</span>	x 2 = <span style="float: right;">20</span>
FAC species <span style="float: right;">15</span>	x 3 = <span style="float: right;">45</span>
FACU species <span style="float: right;">65</span>	x 4 = <span style="float: right;">260</span>
UPL species <span style="float: right;">0</span>	x 5 = <span style="float: right;">0</span>
Column Totals <span style="float: right;">90</span>	(A) <span style="float: right;">325</span> (B)

Prevalence Index = B/A = 3.6

**Hydrophytic Vegetation Indicators:**

\_\_\_\_ 1- Rapid Test for Hydrophytic Vegetation

\_\_\_\_ 2 - Dominance Test is > 50%

\_\_\_\_ 3 - Prevalence Index is ≤ 3.0<sup>1</sup>

\_\_\_\_ 4 - Morphological Adaptations<sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)

\_\_\_\_ Problematic Hydrophytic Vegetation<sup>1</sup> (Explain)

<sup>1</sup>Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes \_\_\_\_ No ✓

**Remarks: (Include photo numbers here or on a separate sheet.)**

No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FAC– or drier)..

## SOIL

Sampling Point: GR-W4-UPL

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: V174/C129 Shieldwire City/County: Cherry Valley, Worcester Sampling Date: 2019-Oct-18  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W5\_PSS-1  
 Investigator(s): Greg Russo, Matt Boscow Section, Township, Range: Millbury  
 Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2-5  
 Subregion (LRR or MLRA): LRR R Lat: 42.2260959819 Long: -71.8655128498 Datum: WGS84  
 Soil Map Unit Name: \_\_\_\_\_ NWI classification: \_\_\_\_\_

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No \_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_, Soil \_\_\_\_, or Hydrology \_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No \_\_\_\_  
 Are Vegetation \_\_\_\_, Soil \_\_\_\_, or Hydrology \_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No ____	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No ____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No ____
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No ____	If yes, optional Wetland Site ID: GR-W5
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is PSS. Area is wetland, all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <u>Primary Indicators (minimum of one is required; check all that apply)</u>			<u>Secondary Indicators (minimum of two required)</u>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input checked="" type="checkbox"/> Drainage Patterns (B10)			
<input checked="" type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input checked="" type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input checked="" type="checkbox"/> Microtopographic Relief (D4)			
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes ____ No ____ Depth (inches): _____ Water Table Present? Yes ____ No ____ Depth (inches): _____ Saturation Present? Yes <input checked="" type="checkbox"/> No ____ Depth (inches): <u>0</u> (includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input checked="" type="checkbox"/> No ____		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks: The criterion for wetland hydrology is met.					



VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W5\_PSS-1

Tree Stratum (Plot size: 30 ft )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1.				Number of Dominant Species That Are OBL, FACW, or FAC:	3 (A)
2.				Total Number of Dominant Species Across All Strata:	4 (B)
3.				Percent of Dominant Species That Are OBL, FACW, or FAC:	75 (A/B)
4.				<b>Prevalence Index worksheet:</b>	
5.				<b>Total % Cover of:</b>	<b>Multiply By:</b>
6.				OBL species	20 x 1 = 20
7.				FACW species	180 x 2 = 360
	0	= Total Cover		FAC species	0 x 3 = 0
<b>Sapling/Shrub Stratum (Plot size: 15 ft )</b>				FACU species	15 x 4 = 60
1. <i>Lyonia ligustrina</i>	40	Yes	FACW	UPL species	0 x 5 = 0
2. <i>Rosa multiflora</i>	15	Yes	FACU	Column Totals	215 (A) 440 (B)
3.				Prevalence Index = B/A = 2	
4.				<b>Hydrophytic Vegetation Indicators:</b>	
5.				1- Rapid Test for Hydrophytic Vegetation	
6.				2 - Dominance Test is >50%	
7.				3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	55	= Total Cover		4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: 5 ft )</b>				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Solidago gigantea</i>	70	Yes	FACW	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Impatiens capensis</i>	50	Yes	FACW	<b>Definitions of Vegetation Strata:</b>	
3. <i>Persicaria sagittata</i>	20	No	OBL	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4. <i>Onoclea sensibilis</i>	15	No	FACW	<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5. <i>Verbena hastata</i>	5	No	FACW	<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6.				<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7.				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
8.					
9.					
10.					
11.					
12.					
	160	= Total Cover			
<b>Woody Vine Stratum (Plot size: 30 ft )</b>					
1.					
2.					
3.					
4.					
	0	= Total Cover			
<b>Remarks: (Include photo numbers here or on a separate sheet.)</b>					
A positive indication of hydrophytic vegetation was observed (>50% of dominant species indexed as OBL, FACW, or FAC)..					

## SOIL

Sampling Point: GR-W5\_PSS-1

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: V174/C129 Shieldwire City/County: Auburn, Worcester Sampling Date: 2019-Oct-18  
 Applicant/Owner: NGRID State: MA Sampling Point: GR-W5\_UPL-1  
 Investigator(s): Greg Russo, Matt Boscow Section, Township, Range: Millbury  
 Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 1-10  
 Subregion (LRR or MLRA): LRR R Lat: 42.2259582254 Long: -71.8655638118 Datum: WGS84  
 Soil Map Unit Name: \_\_\_\_\_ NWI classification: \_\_\_\_\_

Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No \_\_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No \_\_\_\_\_  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes _____ No <input checked="" type="checkbox"/>	
Hydric Soil Present?	Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes _____ No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is UPL. Area is upland, not all three wetland parameters are present..		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <u>Primary Indicators (minimum of one is required; check all that apply)</u>			<u>Secondary Indicators (minimum of two required)</u>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes _____ No <input checked="" type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks:					

VEGETATION -- Use scientific names of plants.

Sampling Point: GR-W5 UPL-1

Tree Stratum (Plot size: 30 ft )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1.				Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
2.				Total Number of Dominant Species Across All Strata:	5 (B)
3.				Percent of Dominant Species That Are OBL, FACW, or FAC:	20 (A/B)
4.				<b>Prevalence Index worksheet:</b>	
5.				<b>Total % Cover of:</b>	<b>Multiply By:</b>
6.				OBL species	0 x 1 = 0
7.				FACW species	0 x 2 = 0
	0	= Total Cover		FAC species	15 x 3 = 45
<b>Sapling/Shrub Stratum (Plot size: 15 ft )</b>				FACU species	40 x 4 = 160
1. <i>Quercus rubra</i>	15	Yes	FACU	UPL species	0 x 5 = 0
2. <i>Rubus allegheniensis</i>	15	Yes	FACU	Column Totals	55 (A) 205 (B)
3. <i>Acer rubrum</i>	5	No	FAC	Prevalence Index = B/A = 3.7	
4.				<b>Hydrophytic Vegetation Indicators:</b>	
5.				1- Rapid Test for Hydrophytic Vegetation	
6.				2 - Dominance Test is > 50%	
7.				3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	35	= Total Cover		4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: 5 ft )</b>				Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Solidago rugosa</i>	10	Yes	FAC	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Pteridium aquilinum</i>	5	Yes	FACU	<b>Definitions of Vegetation Strata:</b>	
3. <i>Dendrolycopodium dendroideum</i>	5	Yes	FACU	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4.				<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5.				<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6.				<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7.				Hydrophytic Vegetation Present? Yes ___ No <input checked="" type="checkbox"/>	
8.					
9.					
10.					
11.					
12.					
	20	= Total Cover			
<b>Woody Vine Stratum (Plot size: 30 ft )</b>					
1.					
2.					
3.					
4.					
	0	= Total Cover			

**Remarks: (Include photo numbers here or on a separate sheet.)**  
 No positive indication of hydrophytic vegetation was observed (≥50% of dominant species indexed as FAC– or drier)..

## SOIL

Sampling Point: GR-W5 UPL-1

[illegible]



# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Leicester, Worcester County Sampling Date: 2019-Oct-15  
 Applicant/Owner: NGRID State: Massachusetts Sampling Point: DJH-W1-PFO  
 Investigator(s): Dan Herzlinger, Matt Boscow Section, Township, Range: \_\_\_\_\_  
 Landform (hillslope, terrace, etc.): Back slope Local relief (concave, convex, none): Concave Slope (%): 1-10  
 Subregion (LRR or MLRA): \_\_\_\_\_ Lat: 42.2306005 Long: -71.8693431 Datum: WGS84  
 Soil Map Unit Name: \_\_\_\_\_ NWI classification: \_\_\_\_\_  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No \_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_, Soil \_\_\_\_, or Hydrology \_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No \_\_\_\_  
 Are Vegetation \_\_\_\_, Soil \_\_\_\_, or Hydrology \_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes <input checked="" type="checkbox"/> No ____	
Hydric Soil Present?	Yes <input checked="" type="checkbox"/> No ____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No ____
Wetland Hydrology Present?	Yes <input checked="" type="checkbox"/> No ____	If yes, optional Wetland Site ID: W-DJH-01
Remarks: (Explain alternative procedures here or in a separate report) Coverttype is PFO.		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <u>Primary Indicators (minimum of one is required; check all that apply)</u>			<u>Secondary Indicators (minimum of two required)</u>		
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Surface Soil Cracks (B6)		
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)		<input checked="" type="checkbox"/> Drainage Patterns (B10)		
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)		<input type="checkbox"/> Moss Trim Lines (B16)		
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)		<input type="checkbox"/> Dry-Season Water Table (C2)		
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)		<input type="checkbox"/> Crayfish Burrows (C8)		
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)		<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)		
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)		<input type="checkbox"/> Stunted or Stressed Plants (D1)		
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)		<input checked="" type="checkbox"/> Geomorphic Position (D2)		
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)		<input type="checkbox"/> Shallow Aquitard (D3)		
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)			<input checked="" type="checkbox"/> Microtopographic Relief (D4)		
			<input checked="" type="checkbox"/> FAC-Neutral Test (D5)		
<b>Field Observations:</b> Surface Water Present? Yes ____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes ____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes ____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes <input checked="" type="checkbox"/> No ____		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks:					

VEGETATION -- Use scientific names of plants.

Sampling Point: DJH-W1-PFO

Tree Stratum (Plot size: <u>30 ft</u> )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. <i>Acer rubrum</i>	80	Yes	FAC	Number of Dominant Species That Are OBL, FACW, or FAC:	6 (A)
2. _____	_____	_____	_____	Total Number of Dominant Species Across All Strata:	6 (B)
3. _____	_____	_____	_____	Percent of Dominant Species That Are OBL, FACW, or FAC:	100 (A/B)
4. _____	_____	_____	_____	<b>Prevalence Index worksheet:</b>	
5. _____	_____	_____	_____	<b>Total % Cover of:</b>	<b>Multiply By:</b>
6. _____	_____	_____	_____	OBL species	0 x 1 = 0
7. _____	_____	_____	_____	FACW species	140 x 2 = 280
	80 = Total Cover			FAC species	80 x 3 = 240
<b>Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )</b>				FACU species	0 x 4 = 0
1. <i>Ilex verticillata</i>	40	Yes	FACW	UPL species	0 x 5 = 0
2. <i>Lindera benzoin</i>	30	Yes	FACW	Column Totals	220 (A) 520 (B)
3. <i>Vaccinium corymbosum</i>	30	Yes	FACW	Prevalence Index = B/A = <u>2.4</u>	
4. _____	_____	_____	_____	<b>Hydrophytic Vegetation Indicators:</b>	
5. _____	_____	_____	_____	____ 1- Rapid Test for Hydrophytic Vegetation	
6. _____	_____	_____	_____	<input checked="" type="checkbox"/> 2 - Dominance Test is >50%	
7. _____	_____	_____	_____	<input checked="" type="checkbox"/> 3 - Prevalence Index is ≤ 3.0 <sup>1</sup>	
	100 = Total Cover			____ 4 - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet)	
<b>Herb Stratum (Plot size: <u>5 ft</u> )</b>				____ Problematic Hydrophytic Vegetation <sup>1</sup> (Explain)	
1. <i>Onoclea sensibilis</i>	20	Yes	FACW	<sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
2. <i>Ilex verticillata</i>	20	Yes	FACW	<b>Definitions of Vegetation Strata:</b>	
3. _____	_____	_____	_____	<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.	
4. _____	_____	_____	_____	<b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.	
5. _____	_____	_____	_____	<b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.	
6. _____	_____	_____	_____	<b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
7. _____	_____	_____	_____	Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____	
8. _____	_____	_____	_____		
9. _____	_____	_____	_____		
10. _____	_____	_____	_____		
11. _____	_____	_____	_____		
12. _____	_____	_____	_____		
	40 = Total Cover				
<b>Woody Vine Stratum (Plot size: <u>30 ft</u> )</b>					
1. _____	_____	_____	_____		
2. _____	_____	_____	_____		
3. _____	_____	_____	_____		
4. _____	_____	_____	_____		
	0 = Total Cover				
Remarks: (Include photo numbers here or on a separate sheet.)					

## SOIL

Sampling Point: DJH-W1-PFO

[illegible]

# **WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region**

Project/Site: Stafford St. Substation City/County: Leicester, Worcester County Sampling Date: 2019-Oct-15  
 Applicant/Owner: NGRID State: Massachusetts Sampling Point: DJH-W1-UPL  
 Investigator(s): Dan Herzlinger, Matt Boscow Section, Township, Range: \_\_\_\_\_  
 Landform (hillslope, terrace, etc.): Back slope Local relief (concave, convex, none): Convex Slope (%): 1-10  
 Subregion (LRR or MLRA): \_\_\_\_\_ Lat: 42.2306769 Long: -71.8691202 Datum: WGS84  
 Soil Map Unit Name: \_\_\_\_\_ NWI classification: \_\_\_\_\_  
 Are climatic/hydrologic conditions on the site typical for this time of year? Yes ☒ No \_\_\_\_\_ (If no, explain in Remarks.)  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No \_\_\_\_\_  
 Are Vegetation \_\_\_\_\_, Soil \_\_\_\_\_, or Hydrology \_\_\_\_\_ naturally problematic? (If needed, explain any answers in Remarks.)

## **SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.**

Hydrophytic Vegetation Present?	Yes _____ No <input checked="" type="checkbox"/>	
Hydric Soil Present?	Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes _____ No <input checked="" type="checkbox"/>
Wetland Hydrology Present?	Yes _____ No <input checked="" type="checkbox"/>	If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report) Covertypes is UPL.		

## **HYDROLOGY**

<b>Wetland Hydrology Indicators:</b> <u>Primary Indicators (minimum of one is required; check all that apply)</u>			<u>Secondary Indicators (minimum of two required)</u>		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> Water-Stained Leaves (B9)	<input type="checkbox"/> Surface Soil Cracks (B6)			
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Aquatic Fauna (B13)	<input type="checkbox"/> Drainage Patterns (B10)			
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Marl Deposits (B15)	<input type="checkbox"/> Moss Trim Lines (B16)			
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Dry-Season Water Table (C2)			
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input type="checkbox"/> Crayfish Burrows (C8)			
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)			
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Stunted or Stressed Plants (D1)			
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Geomorphic Position (D2)			
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Shallow Aquitard (D3)			
<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)		<input type="checkbox"/> Microtopographic Relief (D4)			
		<input type="checkbox"/> FAC-Neutral Test (D5)			
<b>Field Observations:</b> Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)			<b>Wetland Hydrology Present?</b> Yes _____ No <input checked="" type="checkbox"/>		
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:					
Remarks:					

VEGETATION -- Use scientific names of plants.

Sampling Point: DJH-W1-UPL

Tree Stratum (Plot size: <u>30 ft</u> )				Dominance Test worksheet:	
	Absolute % Cover	Dominant Species?	Indicator Status		
1. <i>Acer rubrum</i>	40	Yes	FAC	Number of Dominant Species That Are OBL, FACW, or FAC:	1 (A)
2. <i>Carya ovata</i>	30	Yes	FACU	Total Number of Dominant Species Across All Strata:	6 (B)
3. <i>Quercus rubra</i>	20	Yes	FACU	Percent of Dominant Species That Are OBL, FACW, or FAC:	16.7 (A/B)
4. <i>Hamamelis virginiana</i>	10	No	FACU		
5. _____					
6. _____					
7. _____					
	100	= Total Cover		Prevalence Index worksheet:	
Sapling/Shrub Stratum (Plot size: <u>15 ft</u> )				<b>Total % Cover of:</b> <b>Multiply By:</b>	
1. <i>Hamamelis virginiana</i>	70	Yes	FACU	OBL species	0 x 1 = 0
2. <i>Kalmia latifolia</i>	40	Yes	FACU	FACW species	0 x 2 = 0
3. _____				FAC species	40 x 3 = 120
4. _____				FACU species	200 x 4 = 800
5. _____				UPL species	0 x 5 = 0
6. _____				Column Totals	240 (A) 920 (B)
7. _____				Prevalence Index = B/A = <u>3.8</u>	
	110	= Total Cover		Hydrophytic Vegetation Indicators:	
Herb Stratum (Plot size: <u>5 ft</u> )				<u>1</u> - Rapid Test for Hydrophytic Vegetation <u>2</u> - Dominance Test is > 50% <u>3</u> - Prevalence Index is ≤ 3.0 <sup>1</sup> <u>4</u> - Morphological Adaptations <sup>1</sup> (Provide supporting data in Remarks or on a separate sheet) <u>  </u> Problematic Hydrophytic Vegetation <sup>1</sup> (Explain) <sup>1</sup> Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic	
1. <i>Kalmia latifolia</i>	30	Yes	FACU	Definitions of Vegetation Strata:	
2. _____				<b>Tree</b> – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. <b>Sapling/shrub</b> – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. <b>Herb</b> – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. <b>Woody vines</b> – All woody vines greater than 3.28 ft in height.	
3. _____				Hydrophytic Vegetation Present? Yes <u>  </u> No <u>✓</u>	
4. _____					
5. _____					
6. _____					
7. _____					
8. _____					
9. _____					
10. _____					
11. _____					
12. _____					
	30	= Total Cover			
Woody Vine Stratum (Plot size: <u>30 ft</u> )					
1. _____					
2. _____					
3. _____					
4. _____					
	0	= Total Cover			
Remarks: (Include photo numbers here or on a separate sheet.)					

## SOIL

Sampling Point: DJH-W1-UPL

[illegible]



## **Appendix D: NRCS Soil Report**



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 Worcester County, Massachusetts, Southern Part

## Stafford St Substation



January 10, 2020

# Preface

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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](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

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

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

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

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# How Soil Surveys Are Made

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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

## Custom Soil Resource Report

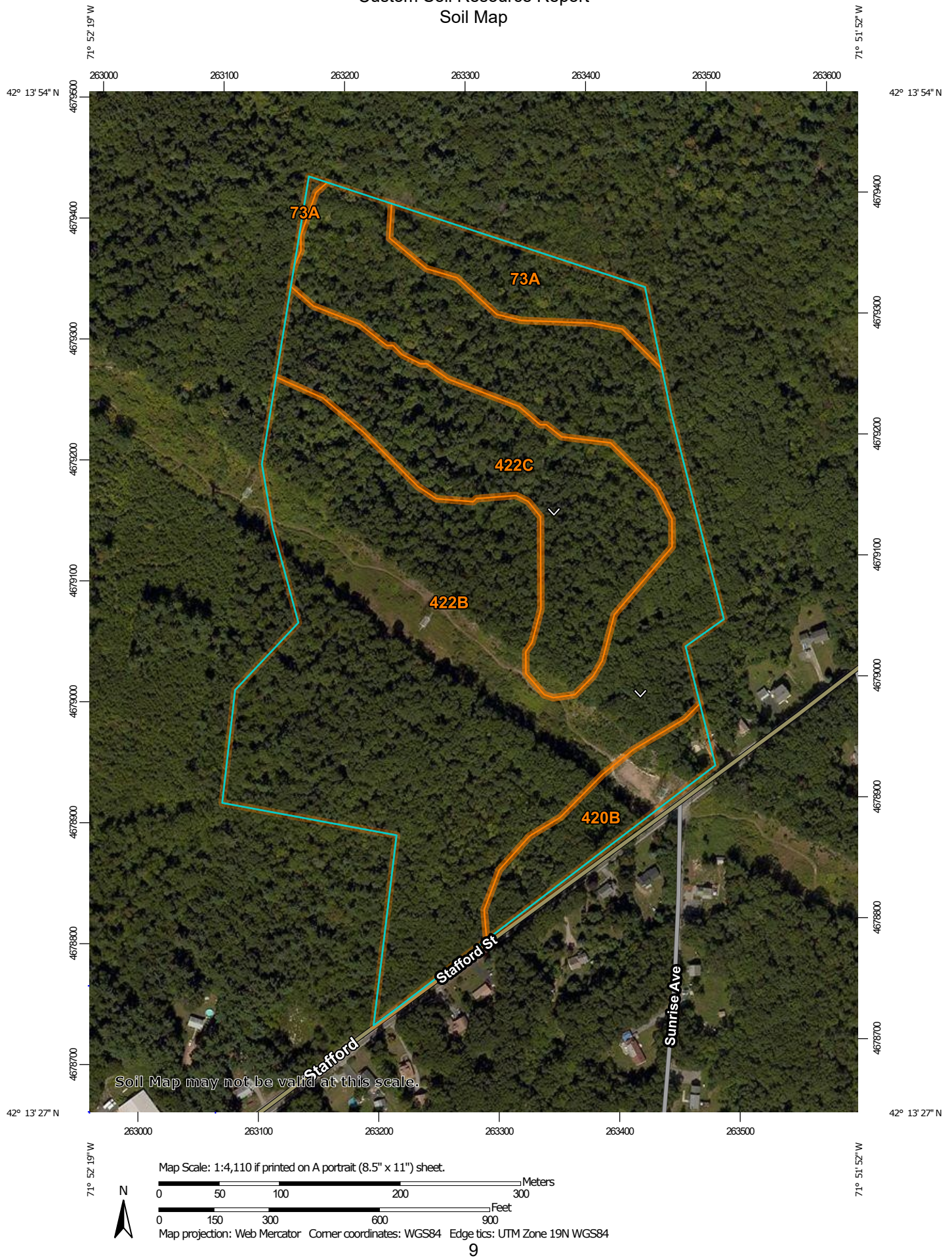
identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

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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



# Custom Soil Resource Report


## 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 1:25,000.

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: Worcester County, Massachusetts, Southern Part  
Survey Area Data: Version 12, Sep 12, 2019

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

## MAP LEGEND

## MAP INFORMATION

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
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	2.7	5.9%
420B	Canton fine sandy loam, 3 to 8 percent slopes	2.7	5.8%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	31.9	69.2%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	8.8	19.1%
<b>Totals for Area of Interest</b>		<b>46.0</b>	<b>100.0%</b>

## 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.

## Worcester County, Massachusetts, Southern Part

### 73A—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

#### Map Unit Setting

*National map unit symbol:* 2w695

*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

*Whitman, extremely stony, and similar soils:* 81 percent

*Minor components:* 19 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Whitman, Extremely Stony

##### Setting

*Landform:* Drainageways, ground moraines, drumlins, hills, depressions

*Landform position (two-dimensional):* Toeslope

*Landform position (three-dimensional):* Base slope

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

##### Typical profile

*Oi - 0 to 1 inches:* peat

*A - 1 to 10 inches:* fine sandy loam

*Bg - 10 to 17 inches:* gravelly fine sandy loam

*Cdg - 17 to 61 inches:* fine sandy loam

##### Properties and qualities

*Slope:* 0 to 3 percent

*Percent of area covered with surface fragments:* 9.0 percent

*Depth to restrictive feature:* 7 to 38 inches to densic material

*Natural drainage class:* Very poorly drained

*Runoff class:* Negligible

*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 0 to 6 inches

*Frequency of flooding:* None

*Frequency of ponding:* Frequent

*Salinity, maximum in profile:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water storage in profile:* Low (about 3.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 7s

*Hydrologic Soil Group:* D

*Hydric soil rating:* Yes

## Minor Components

### **Ridgebury, extremely stony**

*Percent of map unit:* 10 percent

*Landform:* Drainageways, hills, ground moraines, drumlins, depressions

*Landform position (two-dimensional):* Toeslope, footslope

*Landform position (three-dimensional):* Base slope, head slope

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

### **Scarboro**

*Percent of map unit:* 5 percent

*Landform:* Outwash deltas, depressions, drainageways, outwash terraces

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

### **Swansea**

*Percent of map unit:* 3 percent

*Landform:* Marshes, swamps, bogs

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

### **Woodbridge, extremely stony**

*Percent of map unit:* 1 percent

*Landform:* Drumlins, ground moraines, hills

*Landform position (two-dimensional):* Backslope, footslope, summit

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Concave

*Across-slope shape:* Linear

*Hydric soil rating:* No

## **420B—Canton fine sandy loam, 3 to 8 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 2w81b

*Elevation:* 0 to 1,180 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**

*Canton and similar soils:* 80 percent

*Minor components:* 20 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

## Description of Canton

### Setting

*Landform:* Hills, ridges, moraines

*Landform position (two-dimensional):* Backslope, shoulder, summit

*Landform position (three-dimensional):* Side slope, crest, nose slope

*Down-slope shape:* Linear, convex

*Across-slope shape:* Convex

*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

### Typical profile

*Ap - 0 to 7 inches:* fine sandy loam

*Bw1 - 7 to 15 inches:* fine sandy loam

*Bw2 - 15 to 26 inches:* gravelly fine sandy loam

*2C - 26 to 65 inches:* gravelly loamy sand

### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification

*Natural 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

*Available water storage in profile:* Very low (about 2.7 inches)

### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 2s

*Hydrologic Soil Group:* B

*Hydric soil rating:* No

## Minor Components

### Scituate

*Percent of map unit:* 10 percent

*Landform:* Ground moraines, drumlins, hills

*Landform position (two-dimensional):* Backslope, footslope, summit

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Linear, convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

### Montauk

*Percent of map unit:* 5 percent

*Landform:* Hills, drumlins, ground moraines, moraines

*Landform position (two-dimensional):* Backslope, shoulder, summit

*Landform position (three-dimensional):* Side slope, crest

*Down-slope shape:* Linear, convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

**Charlton**

*Percent of map unit:* 4 percent  
*Landform:* Ground moraines, ridges, hills  
*Landform position (two-dimensional):* Backslope, shoulder, summit  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

**Swansea**

*Percent of map unit:* 1 percent  
*Landform:* Kettles, bogs, depressions, marshes, swamps  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

**422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony**

**Map Unit Setting**

*National map unit symbol:* 2w818  
*Elevation:* 0 to 1,180 feet  
*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 145 to 240 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

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

**Description of Canton, Extremely Stony**

**Setting**

*Landform:* Hills, moraines, ridges  
*Landform position (two-dimensional):* Summit, shoulder, backslope  
*Landform position (three-dimensional):* Side slope, crest, nose slope  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex  
*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

**Typical profile**

*Oi - 0 to 2 inches:* slightly decomposed plant material  
*A - 2 to 5 inches:* fine sandy loam  
*Bw1 - 5 to 16 inches:* fine sandy loam  
*Bw2 - 16 to 22 inches:* gravelly fine sandy loam  
*2C - 22 to 67 inches:* gravelly loamy sand



**Properties and qualities**

*Slope:* 0 to 8 percent  
*Percent of area covered with surface fragments:* 9.0 percent  
*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification  
*Natural 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  
*Salinity, maximum in profile:* Nonsaline (0.0 to 1.9 mmhos/cm)  
*Available water storage in profile:* Low (about 3.4 inches)

**Interpretive groups**

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

**Minor Components**

**Scituate, extremely stony**

*Percent of map unit:* 6 percent  
*Landform:* Ground moraines, hills, drumlins  
*Landform position (two-dimensional):* Footslope, backslope, summit  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

**Charlton, extremely stony**

*Percent of map unit:* 6 percent  
*Landform:* Ground moraines, ridges, hills  
*Landform position (two-dimensional):* Backslope, shoulder, summit  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

**Swansea**

*Percent of map unit:* 4 percent  
*Landform:* Marshes, swamps, kettles, bogs, depressions  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

**Montauk, extremely stony**

*Percent of map unit:* 4 percent  
*Landform:* Recessional moraines, hills, drumlins, ground moraines  
*Landform position (two-dimensional):* Backslope, shoulder, summit  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

## **422C—Canton fine sandy loam, 8 to 15 percent slopes, extremely stony**

### **Map Unit Setting**

*National map unit symbol:* 2w815

*Elevation:* 0 to 1,310 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 145 to 240 days

*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Canton, extremely stony, and similar soils:* 80 percent

*Minor components:* 20 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Canton, Extremely Stony**

#### **Setting**

*Landform:* Hills, moraines, ridges

*Landform position (two-dimensional):* Summit, shoulder, backslope

*Landform position (three-dimensional):* Side slope, crest, nose slope

*Down-slope shape:* Linear, convex

*Across-slope shape:* Convex

*Parent material:* Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

#### **Typical profile**

*Oi - 0 to 2 inches:* slightly decomposed plant material

*A - 2 to 5 inches:* fine sandy loam

*Bw1 - 5 to 16 inches:* fine sandy loam

*Bw2 - 16 to 22 inches:* gravelly fine sandy loam

*2C - 22 to 67 inches:* gravelly loamy sand

#### **Properties and qualities**

*Slope:* 8 to 15 percent

*Percent of area covered with surface fragments:* 9.0 percent

*Depth to restrictive feature:* 19 to 39 inches to strongly contrasting textural stratification

*Natural 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

*Salinity, maximum in profile:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water storage in profile:* Low (about 3.4 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified

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*Land capability classification (nonirrigated): 7s*  
*Hydrologic Soil Group: B*  
*Hydric soil rating: No*

### Minor Components

#### **Scituate, extremely stony**

*Percent of map unit: 6 percent*  
*Landform: Ground moraines, drumlins, hills*  
*Landform position (two-dimensional): Footslope, backslope*  
*Landform position (three-dimensional): Side slope*  
*Down-slope shape: Linear, convex*  
*Across-slope shape: Convex*  
*Hydric soil rating: No*

#### **Charlton, extremely stony**

*Percent of map unit: 5 percent*  
*Landform: Hills, ground moraines, ridges*  
*Landform position (two-dimensional): Backslope*  
*Landform position (three-dimensional): Side slope*  
*Down-slope shape: Linear, convex*  
*Across-slope shape: Convex*  
*Hydric soil rating: No*

#### **Montauk, extremely stony**

*Percent of map unit: 5 percent*  
*Landform: Ground moraines, recessional moraines, hills, drumlins*  
*Landform position (two-dimensional): Backslope*  
*Landform position (three-dimensional): Side slope*  
*Down-slope shape: Linear, convex*  
*Across-slope shape: Convex*  
*Hydric soil rating: No*

#### **Hollis, extremely stony**

*Percent of map unit: 4 percent*  
*Landform: Ridges, hills*  
*Landform position (two-dimensional): Backslope, shoulder, summit*  
*Landform position (three-dimensional): Crest, side slope, nose slope*  
*Down-slope shape: Convex*  
*Across-slope shape: Linear, convex*  
*Hydric soil rating: No*

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- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2\\_053374](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374)
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelpdb1043084>

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)

## **Appendix E: USGS StreamStats Report**

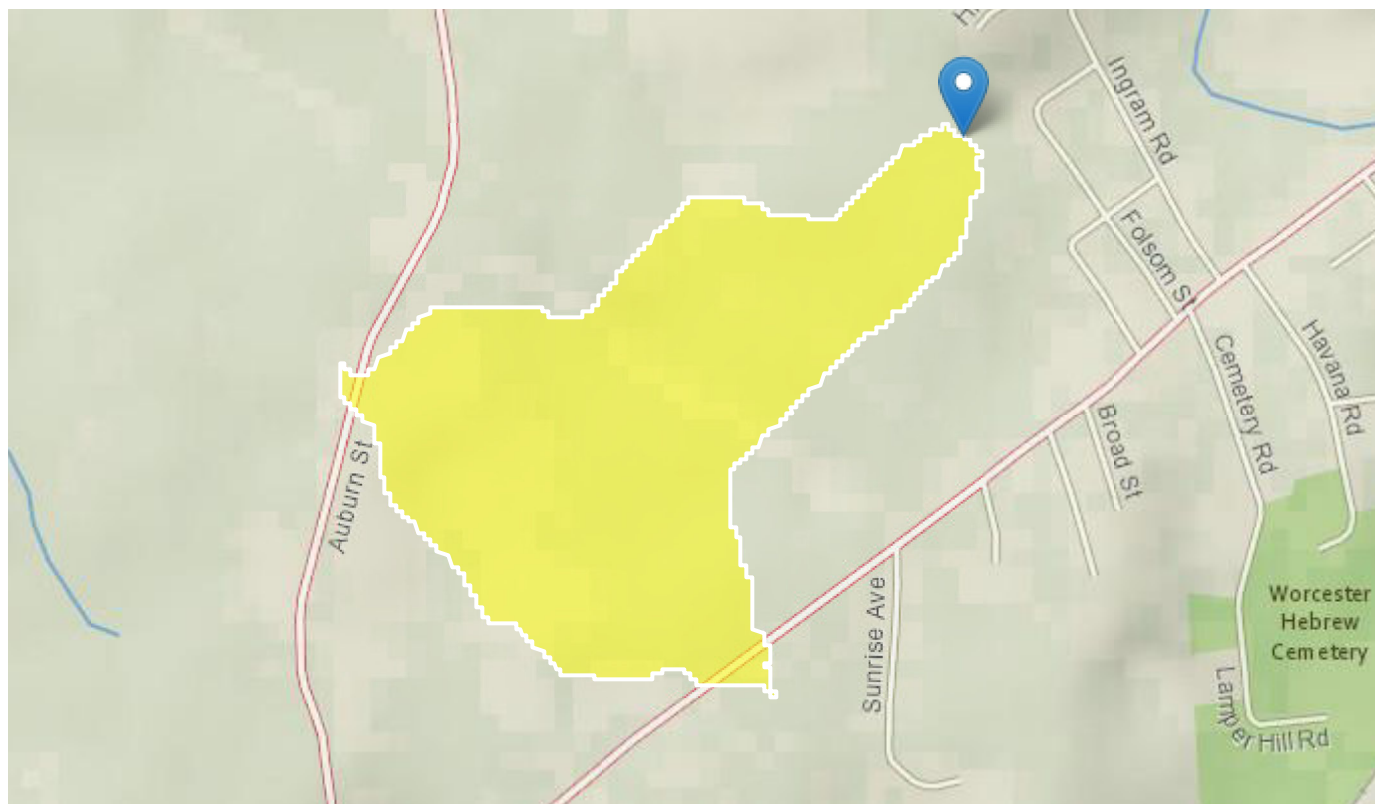
# Stafford Street Sub StreamStats Report

Region ID: MA

Workspace ID: MA20200115172321674000

Clicked Point (Latitude, Longitude): 42.23293, -71.86483

Time: 2020-01-15 12:23:38 -0500



## Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.2	square miles
DRFTPERSTR	Area of stratified drift per unit of stream length	0	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.221	percent
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	0	percent



Parameter Code	Parameter Description	Value	Unit
FOREST	Percentage of area covered by forest	68.17	percent
BSLDEM10M	Mean basin slope computed from 10 m DEM	7.552	percent
ELEV	Mean Basin Elevation	834	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	2.22	percent
ACRSDF	Area underlain by stratified drift	0	square miles
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	169324.7	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	886514	meters
CRSDF	Percentage of area of coarse-grained stratified drift	0	percent
LAKEAREA	Percentage of Lakes and Ponds	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	2.7	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	0.62	percent
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	13.9	feet per mi
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	169885	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	887005	feet
PRECPRIS00	Basin average mean annual precipitation for 1971 to 2000 from PRISM	48.6	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	0.9	miles
WETLAND	Percentage of Wetlands	4.69	percent

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

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
----------------	----------------	-------	-------	-----------	-----------

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	4.221	percent	0.32	24.6

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

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

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

Statistic	Value	Unit
50 Percent Duration	0.185	ft^3/s
60 Percent Duration	0.106	ft^3/s
70 Percent Duration	0.0477	ft^3/s
75 Percent Duration	0.0331	ft^3/s
80 Percent Duration	0.0246	ft^3/s
85 Percent Duration	0.0166	ft^3/s
90 Percent Duration	0.0106	ft^3/s
95 Percent Duration	0.00546	ft^3/s
98 Percent Duration	0.00318	ft^3/s
99 Percent Duration	0.00209	ft^3/s

Flow-Duration Statistics Citations

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

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

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.221	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

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

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

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

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00576	ft^3/s
7 Day 10 Year Low Flow	0.00169	ft^3/s

Low-Flow Statistics Citations

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

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

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.221	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

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

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

### August Flow-Duration Statistics Flow Report<sup>[Statewide Low Flow WRIR00 4135]</sup>

Statistic	Value	Unit
August 50 Percent Duration	0.017	ft <sup>3</sup> /s

#### *August Flow-Duration Statistics Citations*

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

### Probability Statistics Parameters<sup>[Perennial Flow Probability]</sup>

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	0	percent	0	100
FOREST	Percent Forest	68.17	percent	0	100
MAREGION	Massachusetts Region	0	dimensionless	0	1

### Probability Statistics Flow Report<sup>[Perennial Flow Probability]</sup>

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

Statistic	Value	Unit	PC
Probability Stream Flowing Perennially	0.408	dim	71

#### *Probability Statistics Citations*

**Bent, G.C., and Steeves, P.A., 2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006-5031, 107 p. ([http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR\\_2006-5031rev.pdf](http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf))**

### Bankfull Statistics Parameters<sup>[Bankfull Statewide SIR2013 5155]</sup>

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	7.552	percent	2.2	23.9

Bankfull Statistics Disclaimers[Bankfull Statewide SIR2013 5155]

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

Bankfull Statistics Flow Report[Bankfull Statewide SIR2013 5155]

Statistic	Value	Unit
Bankfull Width	8.07	ft
Bankfull Depth	0.602	ft
Bankfull Area	4.78	ft^2
Bankfull Streamflow	11.5	ft^3/s

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (<http://pubs.usgs.gov/sir/2013/5155/>)

Peak-Flow Statistics Parameters[Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.2	square miles	0.16	512
ELEV	Mean Basin Elevation	834	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	2.22	percent	0	32.3

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

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

Statistic	Value	Unit	PII	Plu	SEp
2 Year Peak Flood	15.7	ft <sup>3</sup> /s	7.78	31.6	42.3
5 Year Peak Flood	27.4	ft <sup>3</sup> /s	13.4	56.1	43.4
10 Year Peak Flood	37.2	ft <sup>3</sup> /s	17.7	78.3	44.7
25 Year Peak Flood	52.1	ft <sup>3</sup> /s	23.8	114	47.1
50 Year Peak Flood	64.7	ft <sup>3</sup> /s	28.6	147	49.4
100 Year Peak Flood	78.6	ft <sup>3</sup> /s	33.6	184	51.8
200 Year Peak Flood	94	ft <sup>3</sup> /s	38.8	227	54.1
500 Year Peak Flood	117	ft <sup>3</sup> /s	45.8	297	57.6

#### *Peak-Flow Statistics Citations*

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

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Application Version: 4.3.11

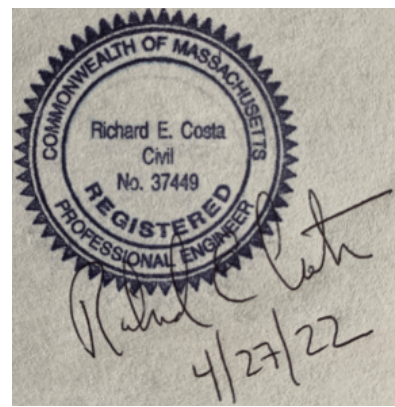
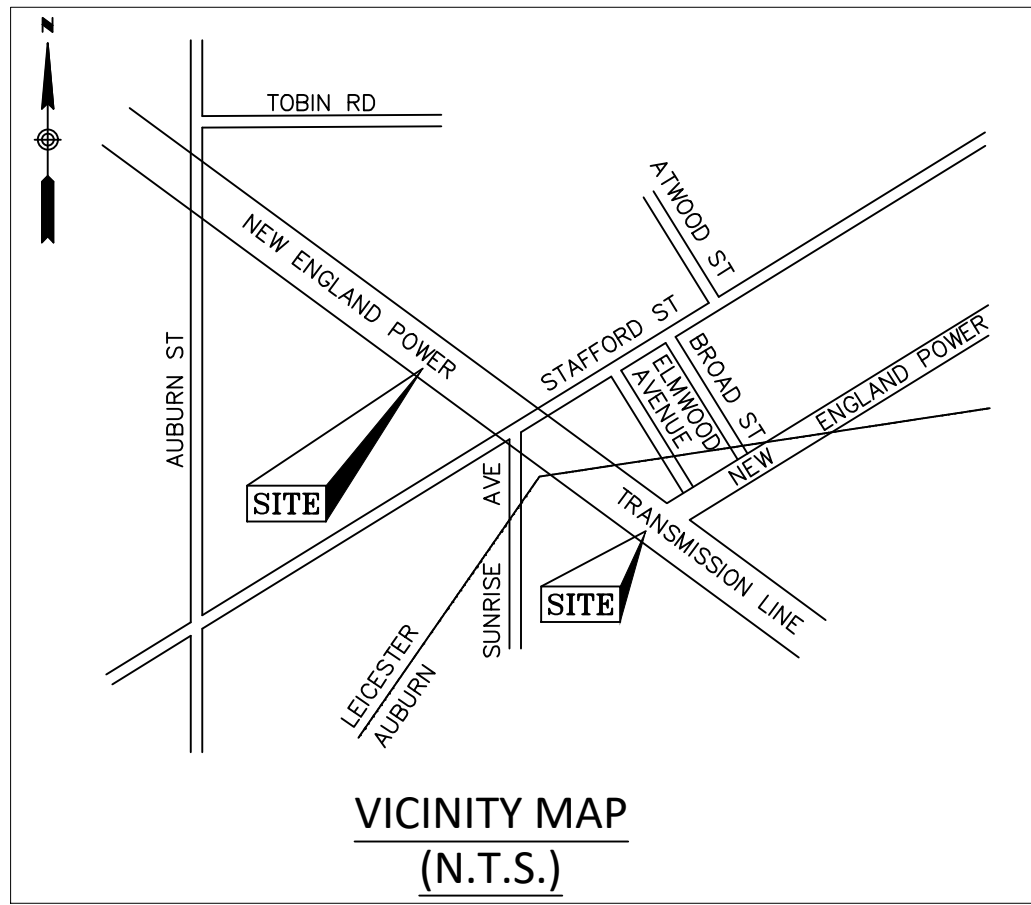
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## **ATTACHMENT D – Substation Site Plans**

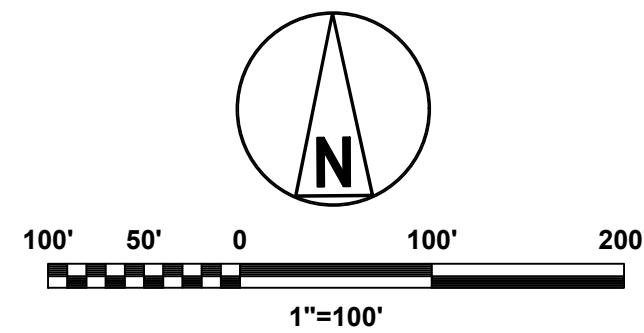


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INCHES ON ORIGINAL

## NOTES

- TOPOGRAPHIC SURVEY PERFORMED BY WSP USA, INC. DATED 02/07/2020. HORIZONTAL DATUM - NAD 83 MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAINLAND ZONE, U.S. SURVEY FEET. VERTICAL DATUM NAVD 88, U.S. SURVEY FEET.
- CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION BY CONTACTING 811.

## LEGEND

- CBDH CONCRETE BOUND W/ DRILL HOLE  
CB CONCRETE BOUND  
DHF DRILL HOLE FOUND  
IPF IRON PIPE FOUND  
 UTILITY POLE  
 UTILITY POLE WITH LIGHT  
 POST  
 SPOT ELEVATION  
 DECIDUOUS TREE  
 CONIFER TREE  
 SHRUB  
  
DI DROP INLET ELEVATION  
INV PIPE INVERT ELEVATION  
NPV NO PIPED VISIBLE  
 TEMP. BENCHMARK  
 LANDSCAPE BOULDER  
 WATER WELL  
 CATCH BASIN  
 CATCH BASIN DROP INLET  
 CULVERT  
 LIGHT POLE  
BC BITUMINOUS CURBING  
BIT BITUMINOUS PAVEMENT  
CB CATCH BASIN  
CLF CHAIN LINK FENCE  
CM CORRUGATED METAL PIPE  
CNO COULD NOT OPEN

- GUARDRAIL LINES  
 ROADWAY CENTERLINES  
 ROADWAYS AND PARKING LINES  
 SECURITY FENCE AND GATE LINES  
 EXISTING MAJOR CONTOUR LINES  
 EXISTING MINOR CONTOUR LINES  
 FINISH GRADE CONTOUR LINES  
 EXISTING VEGETATION  
 EXISTING WETLANDS

ISSUED FOR PERMITTING

## SHEET REFERENCE

- H121391 - EXISTING CONDITIONS  
H121392 - PROPOSED SITE PLAN  
H121393 - GRADING & DRAINAGE PLAN  
H121394 - SURFACE & FENCING PLAN  
H121395 - ACCESS ROAD PLAN & PROFILE  
H121396 - GRADING AND DRAINAGE DETAILS  
H121397 - EROSION CONTROL FENCE  
H121398 - CONSTRUCTION DETAILS  
H122297 - LANDSCAPING PLAN  
H122298 - SITE PAD CROSS-SECTIONS

STAFFORD STREET SUBSTATION

EXISTING CONDITIONS

nationalgrid

REVIEWED BY: JME/BV	SCALE: 1" = 100'-0"	INDEX
APPROVED BY: JME/BV		
REVIEWED BY: JME/BV		
REVIEWED BY: JME/BV		

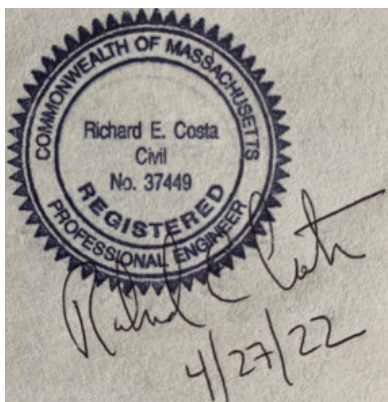
REVISION	DATE	DESCRIPTION
1	11/15/21	ISSUED FOR CLIENT REVIEW
2	02/25/22	ISSUE FOR PERMITTING
3	04/27/22	ISSUED FOR PERMITTING
4		
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3



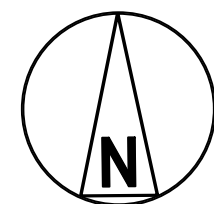
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H121392



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100' 50' 0 100' 200'  
1"=100'



INCHES ON ORIGINAL

## NOTES

1. THE INTENT OF THIS PLAN IS TO SHOW THE LAND AND EASEMENTS OWNED BY NEW ENGLAND POWER COMPANY.
2. TOPOGRAPHY AND PHOTOGRAMMETRY SHOWN ON THIS PLAN WERE COMPILED FROM AERIAL PHOTOS DATED APRIL 17TH, 2017.
3. PROPERTY BOUNDARY AND WETLAND FLAG LOCATIONS SHOWN ON THIS PLAN WERE PREPARED FROM AN ACTUAL ON THE GROUND FIELD SURVEY CONDUCTED BY WSP BETWEEN JANUARY 9TH, 2015 AND JANUARY 26TH, 2020.
4. THE HORIZONTAL DATUM SHOWN HEREON IS BASED UPON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM. MAINLAND ZONE, NORTH AMERICAN DATUM OF 1983.
5. THE VERTICAL DATUM SHOWN HEREON REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1988.
6. WETLANDS WERE DELINEATED BY TRC IN NOVEMBER 2019. WETLAND FLAGS WERE LOCATED WITH SUB-METER ACCURATE GPS.

## LEGEND

- CBDH CONCRETE BOUND W/ DRILL HOLE  
CB CONCRETE BOUND  
DHF DRILL HOLE FOUND  
IPF IRON PIPE FOUND  
 UTILITY POLE  
 UTILITY POLE WITH LIGHT  
 POST  
 SPOT ELEVATION  
 DECIDUOUS TREE  
 CONIFER TREE  
 SHRUB  
  
DI DROP INLET ELEVATION  
INV PIPE INVERT ELEVATION  
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 TEMP. BENCHMARK  
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 CULVERT  
 LIGHT POLE  
BC BITUMINOUS CURBING  
BIT BITUMINOUS PAVEMENT  
CB CATCH BASIN  
CLF CHAIN LINK FENCE  
CM CORRUGATED METAL PIPE  
CNO COULD NOT OPEN

- GUARDRAIL LINES  
 ROADWAY CENTERLINES  
 ROADWAYS AND PARKING LINES  
 SECURITY FENCE AND GATE LINES  
 EXISTING MAJOR CONTOUR LINES  
 EXISTING MINOR CONTOUR LINES  
 FINISH GRADE CONTOUR LINES  
 EXISTING VEGETATION  
 EXISTING WETLANDS

ISSUED FOR  
PERMITTING

## SHEET REFERENCE

- H121391 - EXISTING CONDITIONS  
H121392 - PROPOSED SITE PLAN  
H121393 - GRADING & DRAINAGE PLAN  
H121394 - SURFACE & FENCING PLAN  
H121395 - ACCESS ROAD PLAN & PROFILE  
H121396 - GRADING AND DRAINAGE DETAILS  
H121397 - EROSION CONTROL FENCE  
H121398 - CONSTRUCTION DETAILS  
H122297 - LANDSCAPING PLAN  
H122298 - SITE PAD CROSS-SECTIONS

STAFFORD STREET SUBSTATION

PROPOSED SITE PLAN

nationalgrid

REVIEWED BY DATE  
1 11/15/21 ISSUED FOR CLIENT REVIEW  
2 02/25/22 ISSUED FOR PERMITTING  
3 04/27/22 ISSUED FOR PERMITTING  
4 07/07/22

VERSION DESCRIPTION

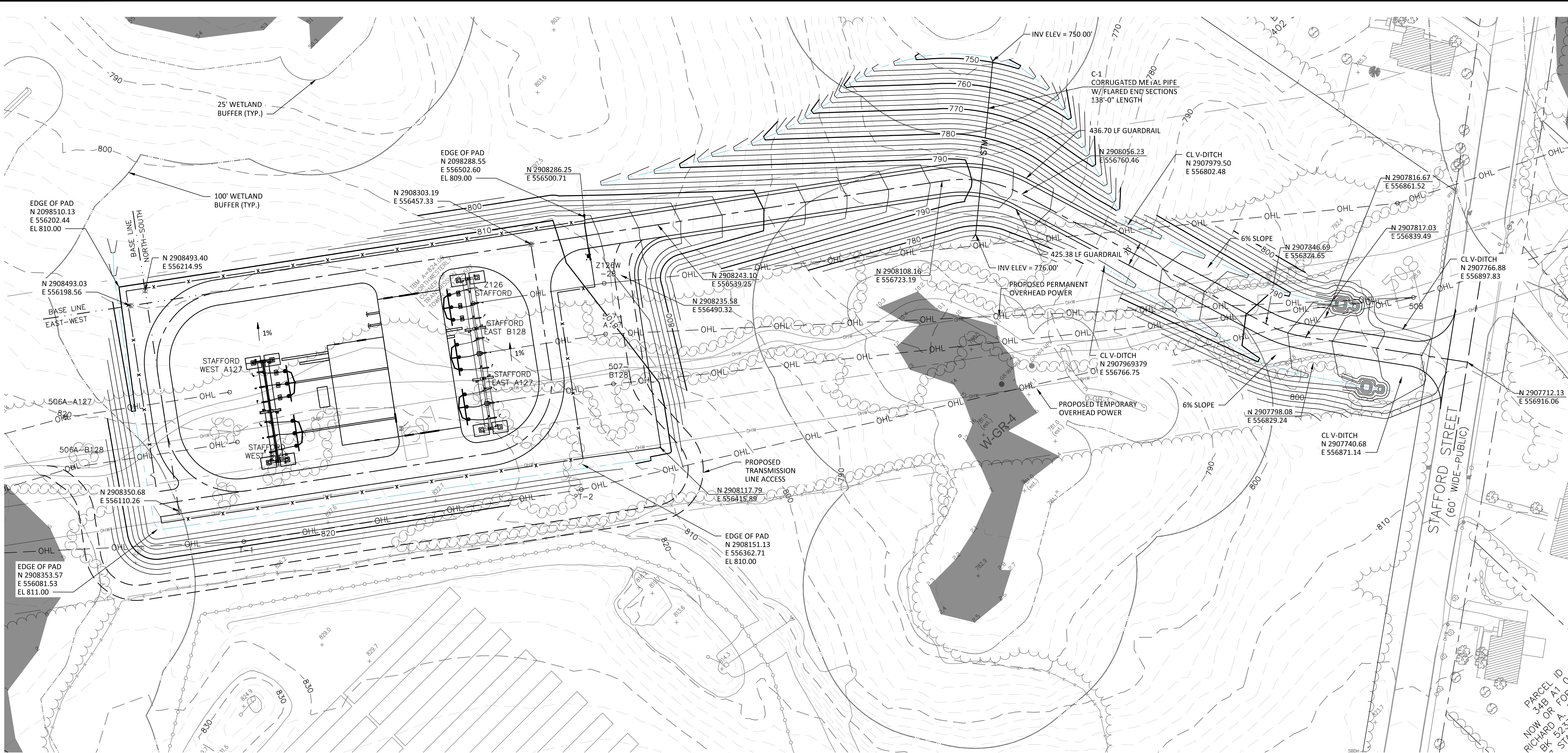
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VERSION



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H121393



INLET AND OUTLET PROTECTION RIP RAP TABLE

CULVERT NO.	INLET L	OUTLET L	INLET T	OUTLET T	INLET W	OUTLET W	INLET D50	OUTLET D50	REMARKS
C-1	15'-0"	15'-0"	1'-6"	1'-6"	9'-0"	9'-0"	-	-	SEE NOTE 5 ON H121394

NOTES:

- TOPOGRAPHIC SURVEY PERFORMED BY WSP USA, INC. DATED 02/07/2020. HORIZONTAL DATUM - NAD 83 MASSACHUSETTS STATE PLANE COORDINATE SYSTEM MAINLAND ZONE, U.S. SURVEY FEET. VERTICAL DATUM - NAVD 88, U.S. SURVEY FEET.
- CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION BY CONTACTING 811.
- ALL SIDE SLOPES SHALL BE 2(H): 1(V) OR FLATTER.
- CONTOURS AND SPOT ELEVATIONS SHOWN ARE TOP OF FINISHED GRADE. SUBTRACT MATERIAL THICKNESS TO OBTAIN SUBGRADE ELEVATIONS.
- SUBGRADE SHALL BE COMPACTED TO 95% MODIFIED PROCTOR MAXIMUM DRY DENSITY PER ASTM D1557 AT A MAXIMUM OF +/- 3% OPTIMUM MOISTURE CONTENT. FILL MATERIAL SHALL BE CONSISTENT WITH ONSITE SOILS CONSISTING OF A MIX OF SAND AND GRAVEL.
- GUARD RAIL SHALL BE TL-2 GUARD RAIL SYSTEM. SEE MASSACHUSETTS DOT DRAWINGS 400.1.0, 400.1.2, 400.1.3, 400.1.4, AND 400.1.5 FOR GUARD RAIL DETAIL. 826.08 TOTAL LF GUARDRAIL.
- ALL LOOSE SOIL, TOPSOIL, PEAT, AND FOREST SHALL BE REMOVED FROM FILL AREAS BEFORE PLACING FILL. THICKNESS OF REMOVAL LAYER IS EXPECTED TO BE IN THE RANGE OF 3 TO 6 INCHES.

LEGEND

- GUARDRAIL LINES
- ROADWAY CENTERLINES
- ROADWAYS AND PARKING LINES
- SECURITY FENCE AND GATE LINES
- EXISTING MAJOR CONTOUR LINES
- EXISTING MINOR CONTOUR LINES
- FINISH GRADE CONTOUR LINES
- EXISTING VEGETATION
- EXISTING WETLANDS

Volume Summary

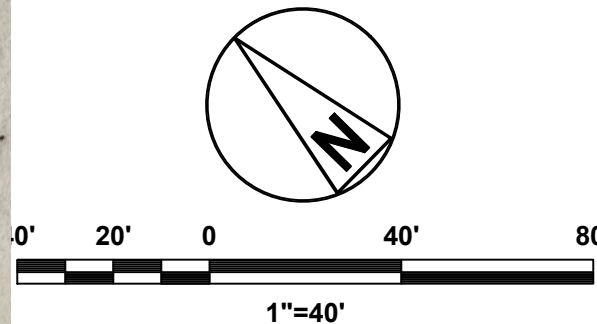
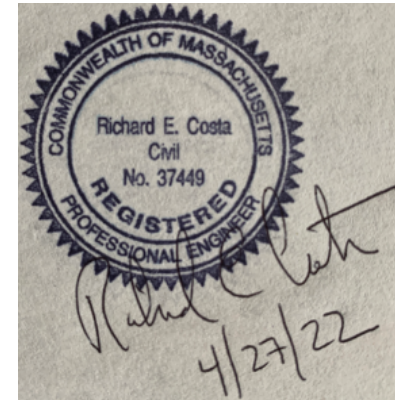
Name	Type	Cut Factor	Fill Factor	2d Area (Sq. Ft.)	Cut (Cu. Yd.)	Fill (Cu. Yd.)	Net (Cu. Yd.)
AR-1 (Vols)	full	1.0000	1.0000	175660.4004	25066.8864	29940.3027	4873.4164<Fill>

CULVERT TABLE

CULVERT NO.	CENTERLINE COORDINATES				LENGTH (FT)	INLET INV ELEVATION	OUTLET INV ELEVATION	END TYPE	PIPE DIAMETER	NUMBER OF BARRELS	PIPE MATERIAL	REMARKS
	INLET END		OUTLET END									
	NORTH	EAST	NORTH	EAST								
C-1	2,908,059.45	556,712.11	2,908,147.02	556,818.77	138'-0"	776.00	750.00	PROJECTING	36"	1	CMP	-

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SHEET REFERENCE

- H121391 - PROPOSED SITE PLAN
- H121392 - EXISTING CONDITIONS
- H121393 - GRADING & DRAINAGE PLAN
- H121394 - SURFACE & FENCING PLAN
- H121395 - ACCESS ROAD PLAN & PROFILE
- H121396 - GRADING AND DRAINAGE DETAILS
- H121397 - EROSION CONTROL FENCE
- H121398 - CONSTRUCTION DETAILS
- H122297 - LANDSCAPING PLAN
- H122298 - SITE PAD CROSS-SECTIONS

STAFFORD STREET SUBSTATION

GRADING & DRAINAGE PLAN

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VERSION DESCRIPTION

REV	DATE	DESCRIPTION
1	11/15/22	ISSUED FOR CLIENT REVIEW
2	02/25/23	ISSUED FOR PERMITTING
3	04/27/23	ISSUED FOR PERMITTING
4		
5		

REV	DATE	DESCRIPTION
1	11/15/22	ISSUED FOR CLIENT REVIEW
2	02/25/23	ISSUED FOR PERMITTING
3	04/27/23	ISSUED FOR PERMITTING
4		
5		

3

VERSION

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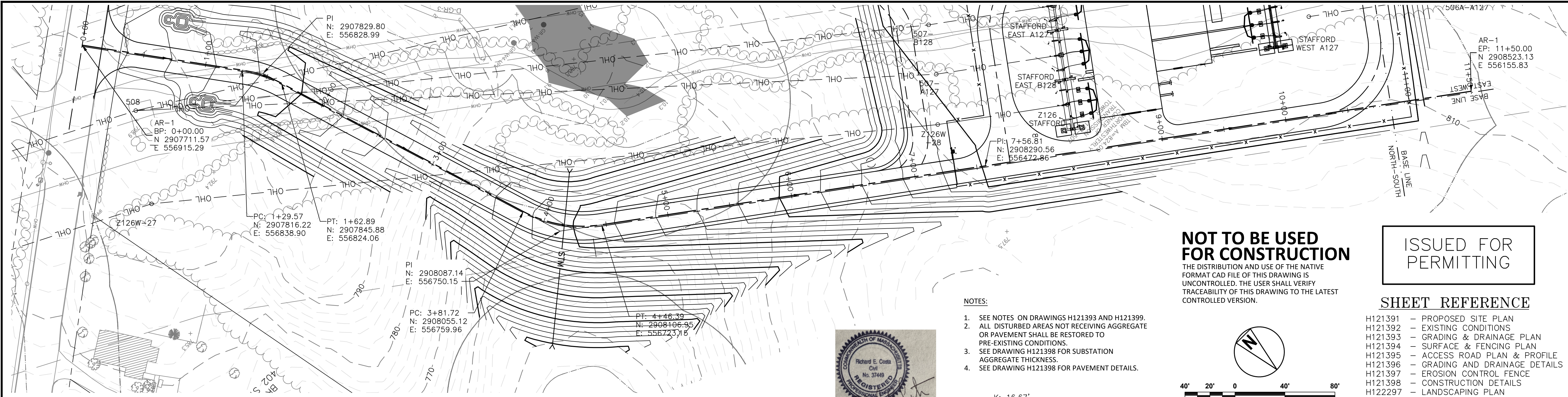
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H121393



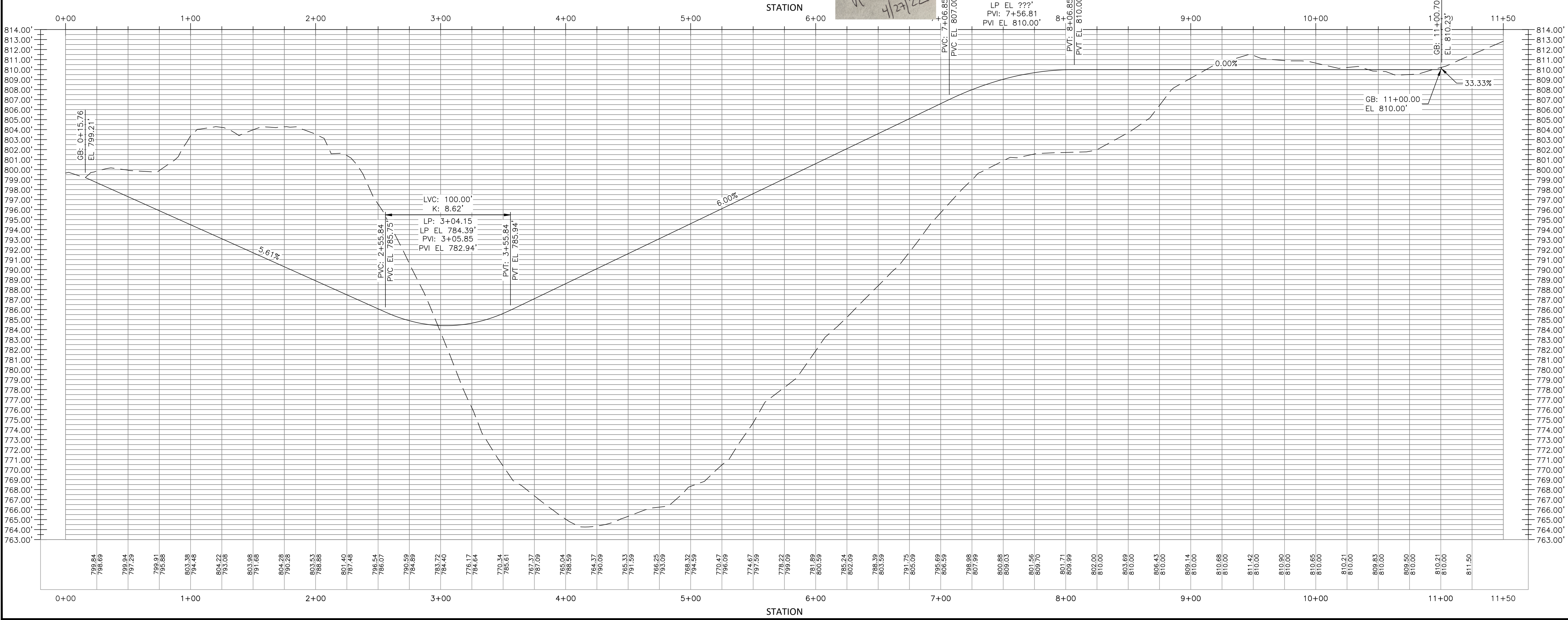
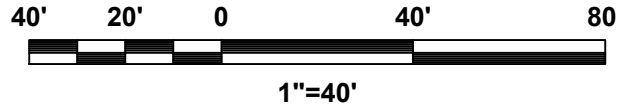
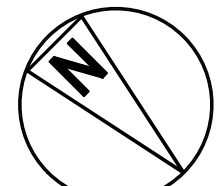
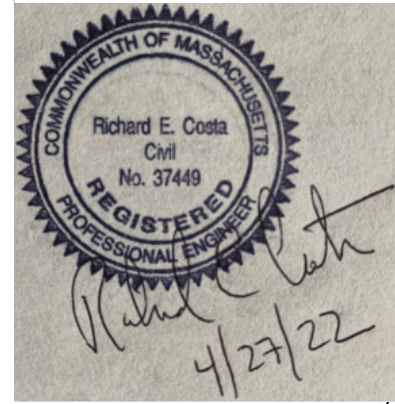
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H121395



NOTES:

- SEE NOTES ON DRAWINGS H121393 AND H121399.
- ALL DISTURBED AREAS NOT RECEIVING AGGREGATE OR PAVEMENT SHALL BE RESTORED TO PRE-EXISTING CONDITIONS.
- SEE DRAWING H121398 FOR SUBSTATION AGGREGATE THICKNESS.
- SEE DRAWING H121398 FOR PAVEMENT DETAILS.



H121395

STAFFORD STREET SUBSTATION

ACCESS ROAD PLAN & PROFILE

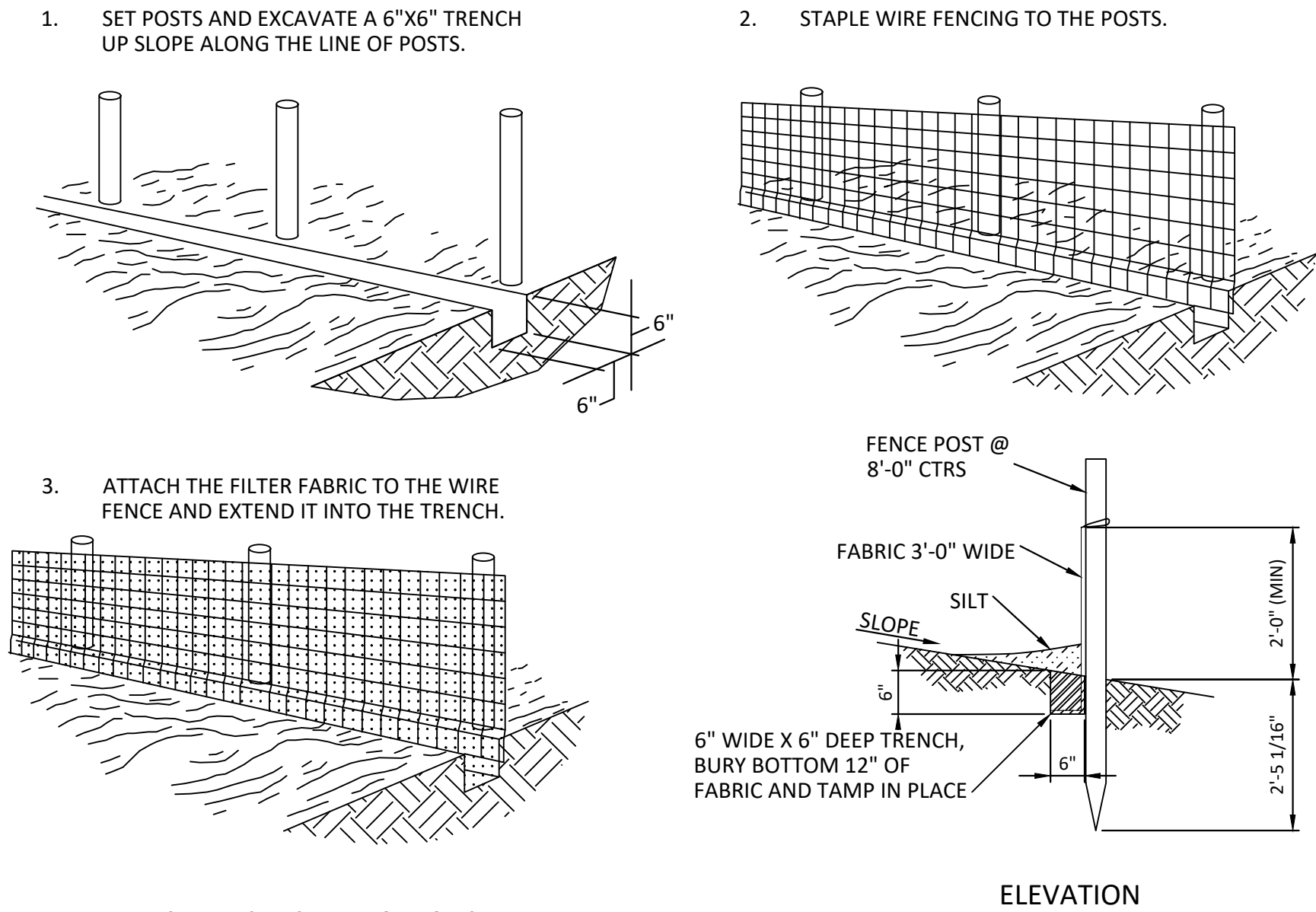
nationalgrid

REVIEWED BY: JME/RY	DATE: 11/15/21
APPROVED BY: JME/RY	DATE: 11/15/21
SCALE: 1" = 40'-0"	SHEET: 5 OF 10
INDEX:	

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3	04/27/22	ISSUED FOR PERMITTING
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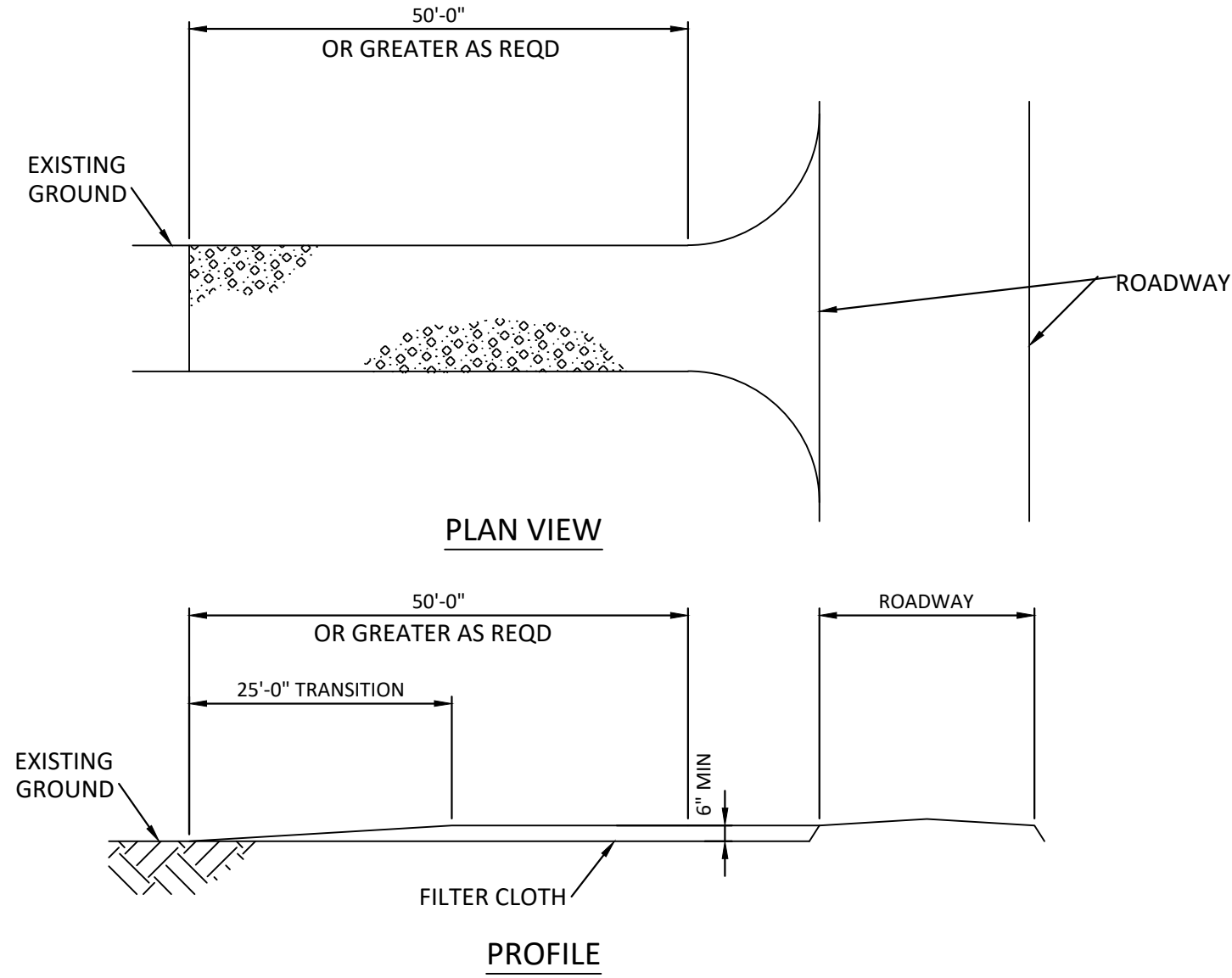
VERSION: 3





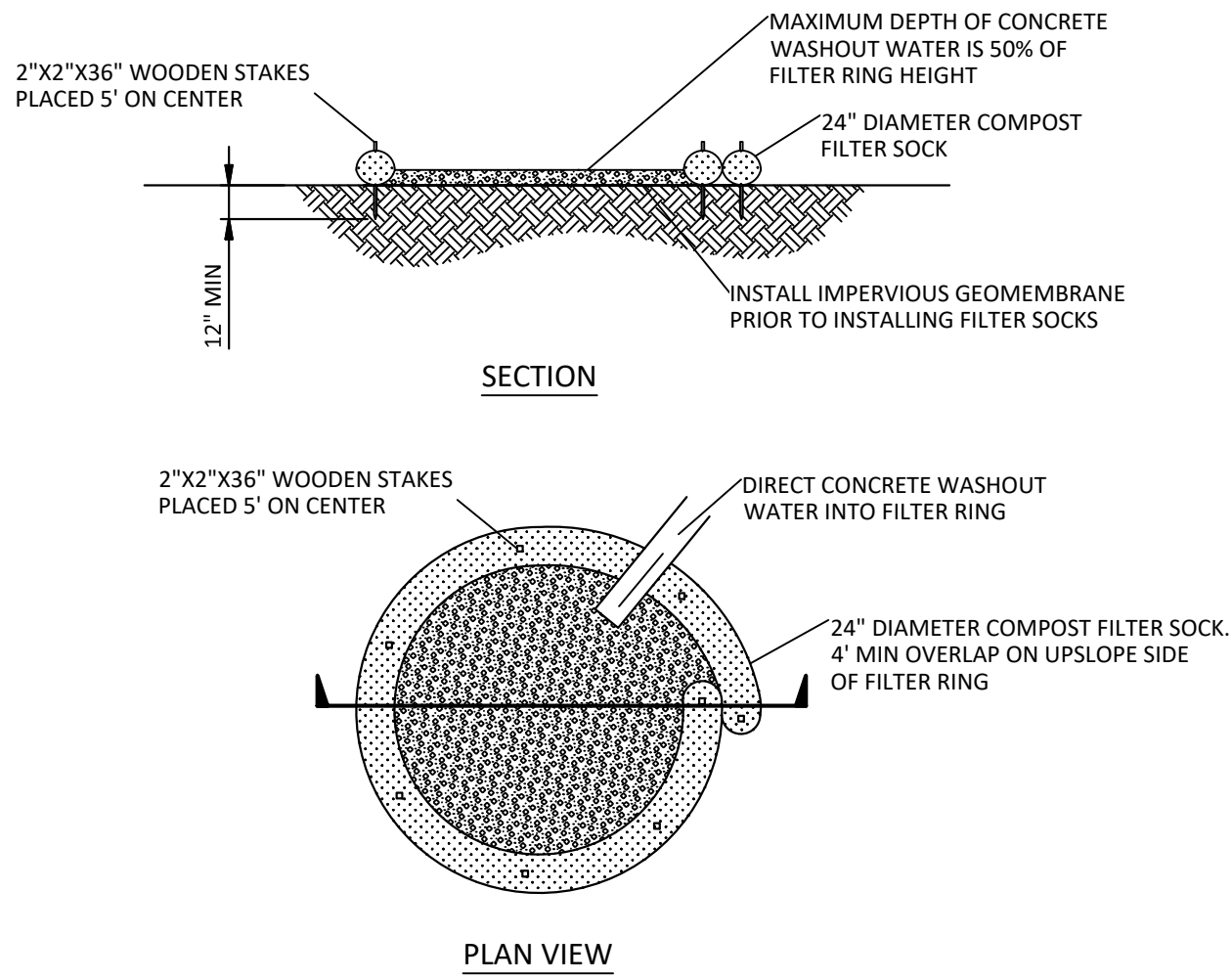
- SILT FENCE INSTALLATION NOTES:
1. SILT FENCE SHALL BE INSTALLED WHERE INDICATED ON THE PLAN DRAWINGS.
  2. FILTER FABRIC SHALL BE SECURELY ANCHORED AT THE TOP OF A THREE FOOT (3') HIGH FENCE AND BURIED A MINIMUM OF SIX INCHES (6") TO THE SOIL. SEAMS BETWEEN SECTIONS OF FILTER FABRIC SHALL OVERLAP A MINIMUM OF THREE FEET (3').
- SILT FENCE MAINTENANCE NOTES:
1. ALL SILT FENCE SHALL BE MAINTAINED UNTIL ADJACENT AREAS ARE STABILIZED.
  2. INSPECTION SHALL BE FREQUENT (AT MINIMUM WEEKLY AND BEFORE AND AFTER ANY RAINFALL THAT EXCEEDS 1/2") AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
  3. SILT FENCE SHALL BE REMOVED WHEN IT HAS SERVED ITS USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORMWATER FLOW OR DRAINAGE.

LIGHT DUTY SILT FENCE DETAIL  
NO SCALE



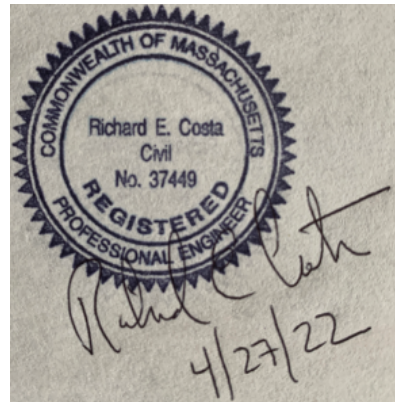
- NOTES
1. PROVIDE APPROPRIATE TRANSITION BETWEEN STABILIZED CONSTRUCTION ENTRANCE AND PUBLIC R.O.W.
  2. DESIGN CRITERIA FOR STABILIZED CONSTRUCTION ENTRANCE.
- A. STONE SIZE - USE ASTM C-33, SIZE NO. 2 OR 3, USE CRUSHED STONE.  
B. THICKNESS - NOT LESS THAN 8 INCHES.  
C. WIDTH - NOT LESS THAN FULL WIDTH OF POINTS OF INGRESS OR EGRESS.  
D. LENGTH - 50 FEET MINIMUM WHERE THE SOILS ARE SANDS OR GRAVEL OR 100 FEET MINIMUM WHERE SOILS ARE CLAYS OR SILTS, EXCEPT WHERE THE TRAVELED LENGTH IS LESS THAN 50 OR 100 FEET RESPECTIVELY. THESE LENGTHS MAY BE INCREASED WHERE FIELD CONDITIONS DICTATE.  
E. FILTER CLOTH - WILL BE PLACED OVER ENTIRE AREA PRIOR TO PLACING OF STONE.  
F. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ON TO PUBLIC RIGHT-OF-WAY THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.

TYPICAL STABILIZED CONSTRUCTION ENTRANCE  
NO SCALE



- NOTES:
1. INSTALL IMPERVIOUS GEOMEMBRANE PRIOR TO INSTALLING FILTER SOCKS.
  2. INSTALL ON FLAT GRADE FOR OPTIMAL PERFORMANCE.
  3. 18" DIAMETER FILTER SOCK MAY BE STACKED ONTO DOUBLE 24" DIAMETER SOCKS IN PYRAMIDAL CONFIGURATION FOR ADDED HEIGHT.

COMPOST SOCK WASHOUT INSTALLATION DETAIL  
NO SCALE



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PERMITTING

**NOT TO BE USED  
FOR CONSTRUCTION**  
THE DISTRIBUTION AND USE OF THE NATIVE  
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CONTROLLED VERSION.

SHEET REFERENCE

- |         |   |                            |
|---------|---|----------------------------|
| H121391 | — | PROPOSED SITE PLAN         |
| H121392 | — | EXISTING CONDITIONS        |
| H121393 | — | GRADING & DRAINAGE PLAN    |
| H121394 | — | SURFACE & FENCING PLAN     |
| H121395 | — | ACCESS ROAD PLAN & PROFILE |
| H121396 | — | GRADING & DRAINAGE DETAILS |
| H121397 | — | EROSION CONTROL FENCE      |
| H121398 | — | CONSTRUCTION DETAILS       |
| H122297 | — | LANDSCAPING PLAN           |
| H122298 | — | SITE PAD CROSS-SECTIONS    |

STAFFORD STREET SUBSTATION

GRADING & DRAINAGE DETAILS

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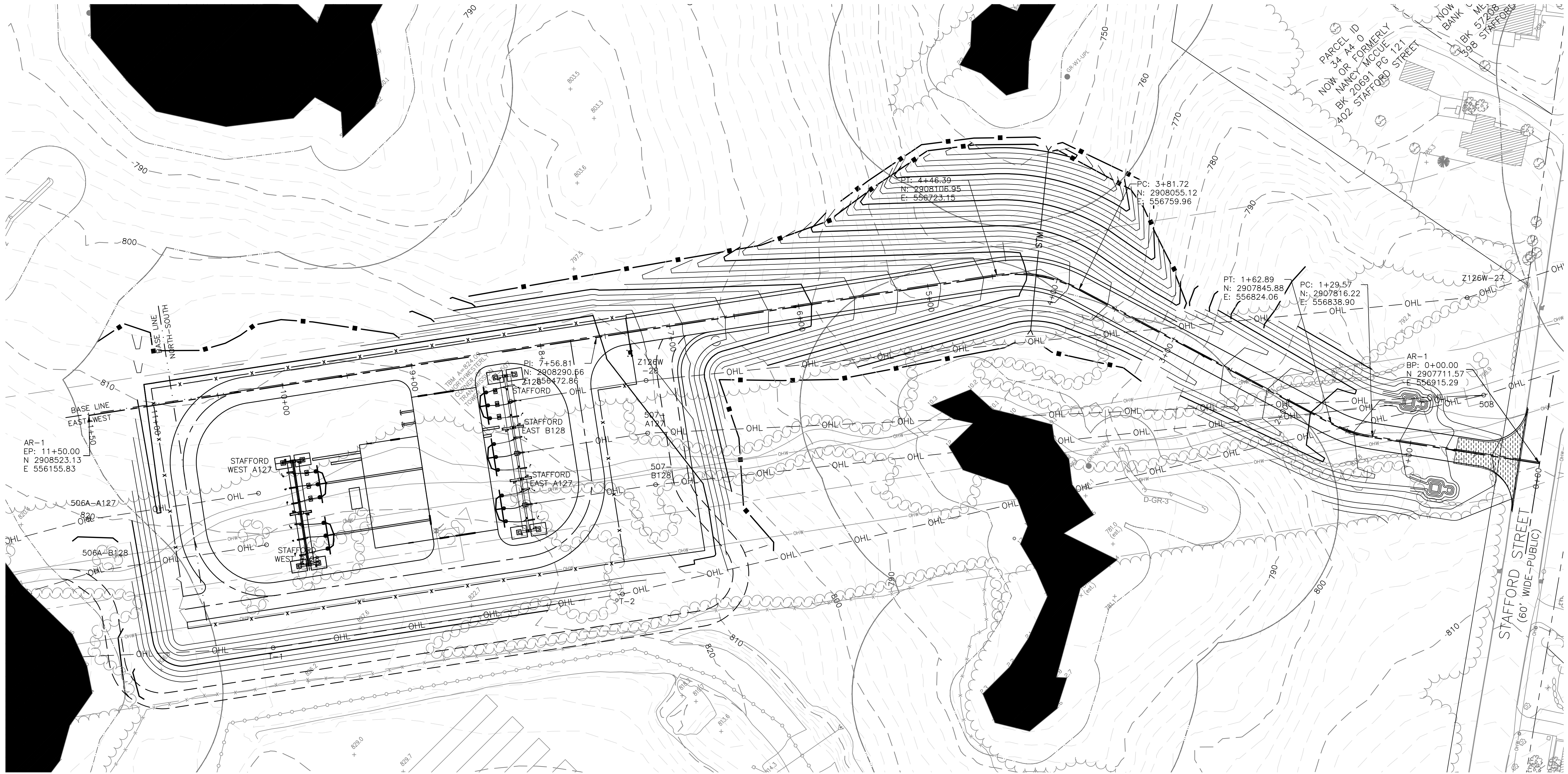
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VERSION
3



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H121397



NOTES:

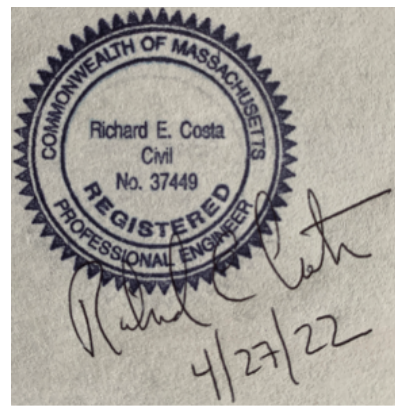
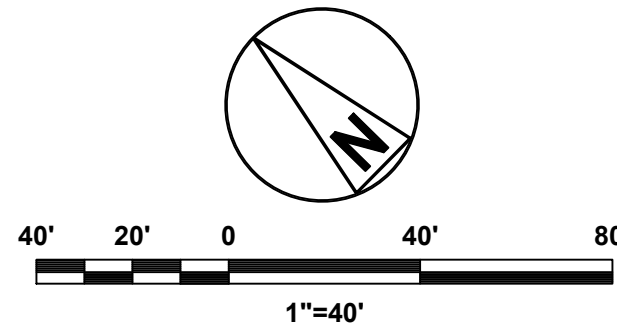
- SEE NOTES ON DRAWINGS H121393 AND H121399.
- SEE DRAWING H121396 FOR EROSION CONTROL DETAILS.
- SILT FENCE SHALL BE INSTALLED PER MASSDOT SPECIFICATIONS ON DOWNSLOPE SIDE OF ALL EARTH DISTURBING ACTIVITIES.

LEGEND

	GUARDRAIL LINES
	ROADWAY CENTERLINES
	ROADWAY CURB LINES
	SECURITY FENCE AND GATE LINES
	EXISTING MAJOR CONTOUR LINES
	EXISTING MINOR CONTOUR LINES
	FINISH GRADE CONTOUR LINES
	EXISTING VEGETATION
	EXISTING WETLANDS
	SILT FENCE
	STABILIZED CONSTRUCTION ENTRANCE

NOT TO BE USED  
FOR CONSTRUCTION

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ISSUED FOR  
PERMITTING

SHEET REFERENCE

- |         |                              |
|---------|------------------------------|
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| H121392 | EXISTING CONDITIONS          |
| H121393 | GRADING & DRAINAGE PLAN      |
| H121394 | SURFACE & FENCING PLAN       |
| H121395 | ACCESS ROAD PLAN & PROFILE   |
| H121396 | GRADING AND DRAINAGE DETAILS |
| H121397 | EROSION CONTROL FENCE        |
| H121398 | CONSTRUCTION DETAILS         |
| H122297 | LANDSCAPING PLAN             |
| H122298 | SITE PAD CROSS-SECTIONS      |

STAFFORD STREET SUBSTATION

EROSION CONTROL FENCE

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VERSION DESCRIPTION

REV	DATE	DESCRIPTION
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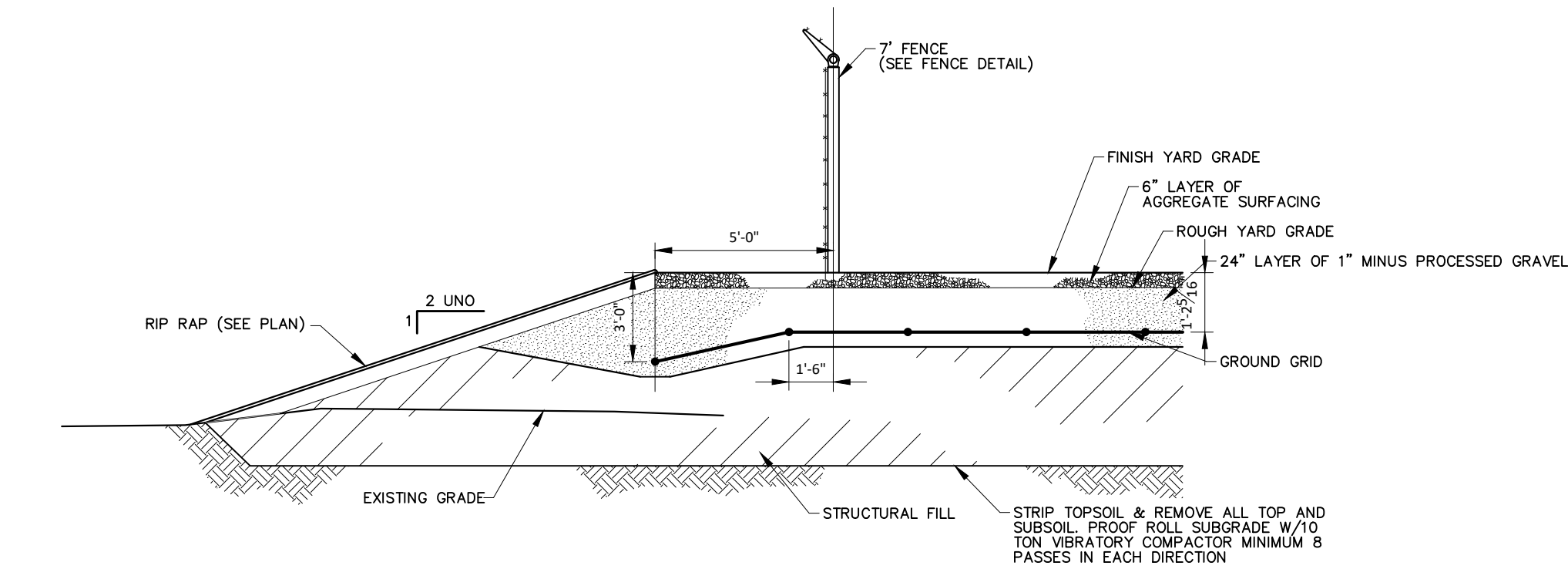
APPROVED BY

DESIGNED BY	DAW/RY	DAW/RY	RC/NS
CHECKED BY	DAW/RY	DAW/RY	RC/NS
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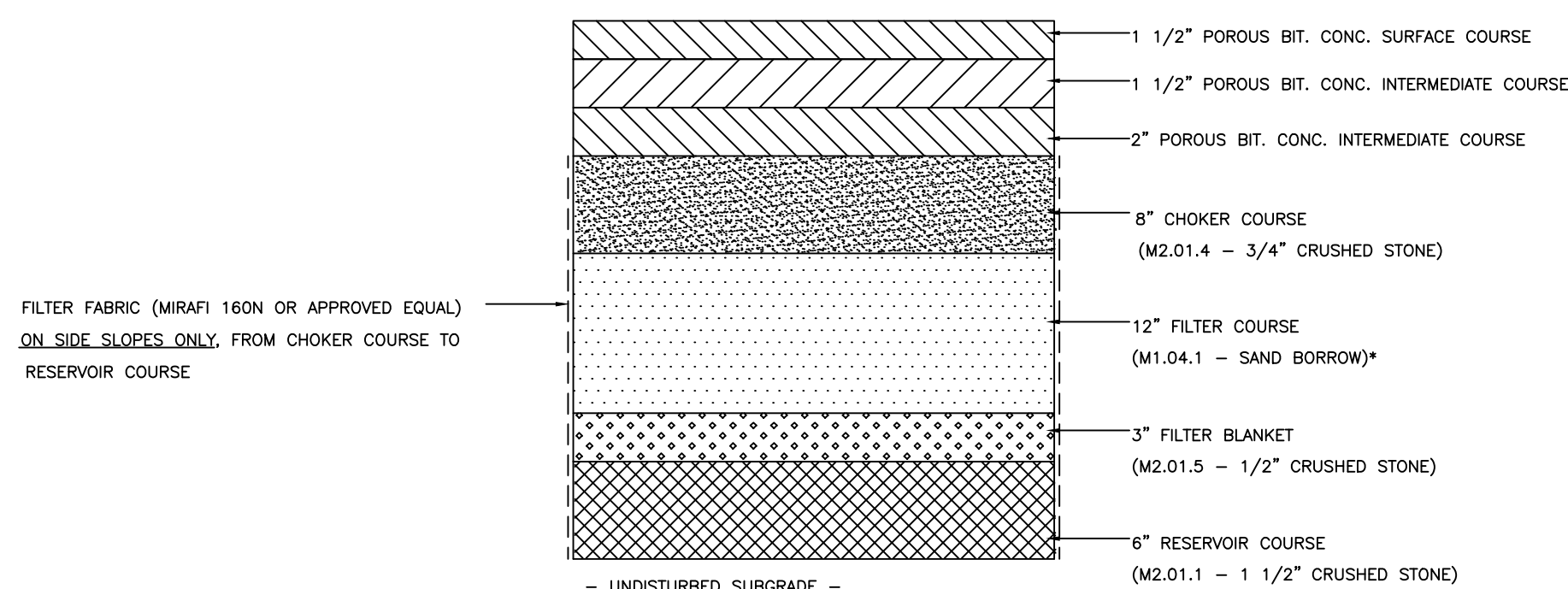
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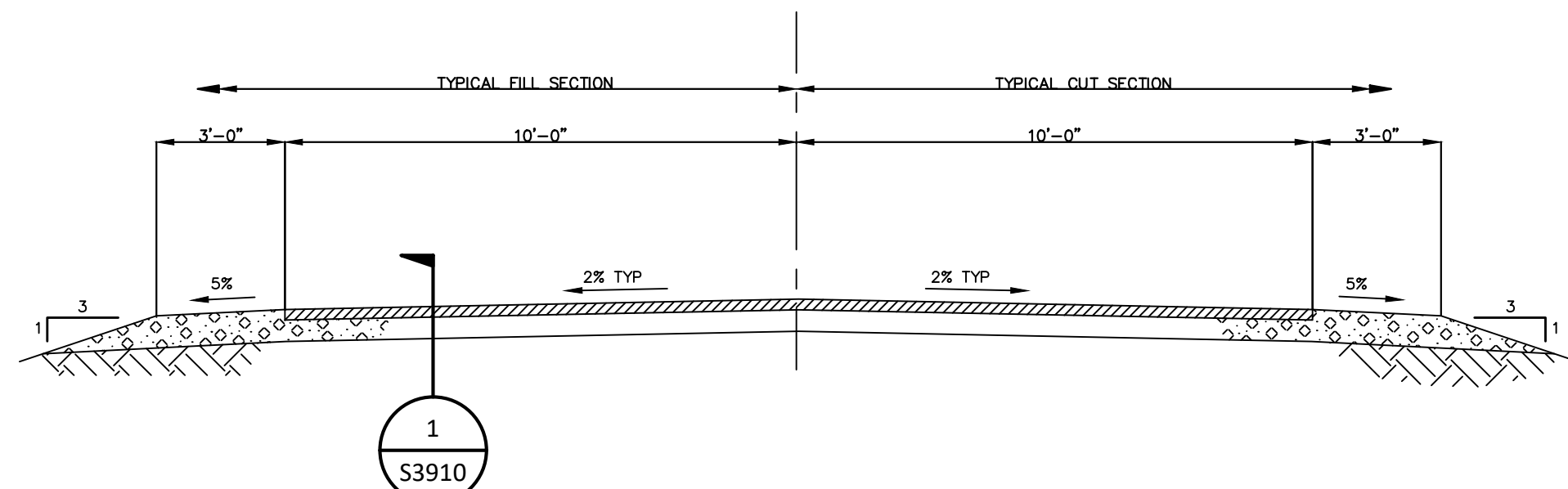


TYPICAL NEW YARD SECTION  
NTS

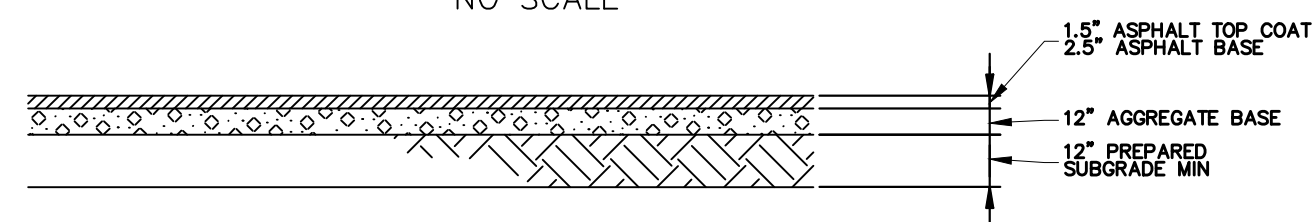


\*MAX. 5% OF SAND FRACTION (FINER THAN NO. 4 SIEVE) PASSING NO. 200 SIEVE

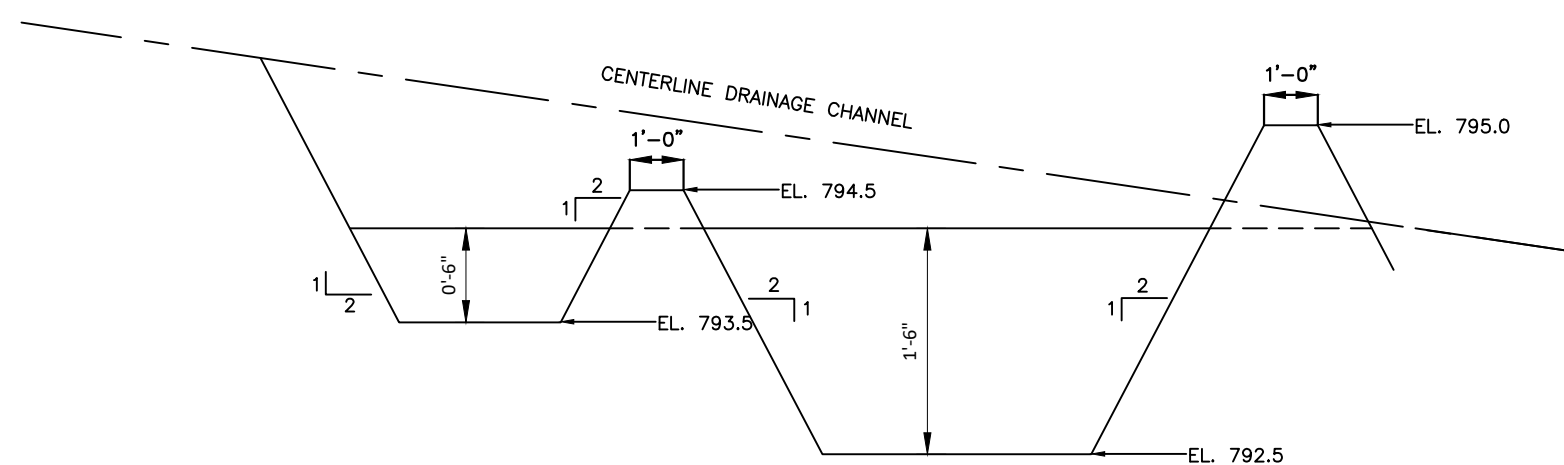
TYPICAL SECTION  
BITUMINOUS CONCRETE POROUS PAVEMENT  
NTS



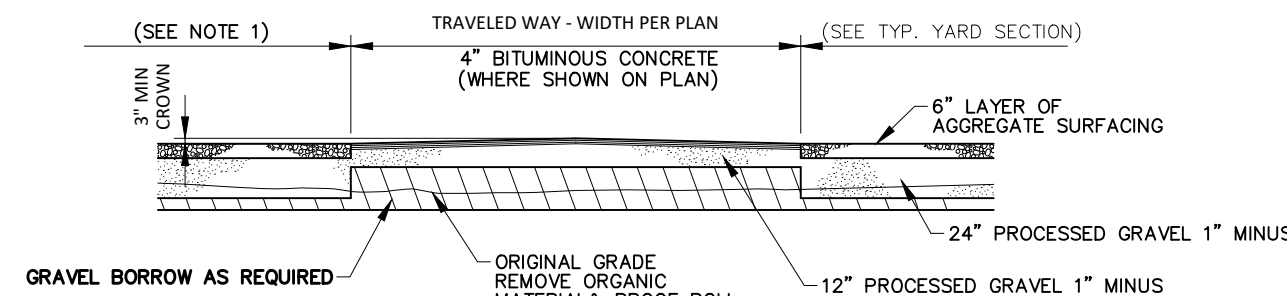
TYPICAL ASPHALT SURFACE ROAD SECTION  
NO SCALE



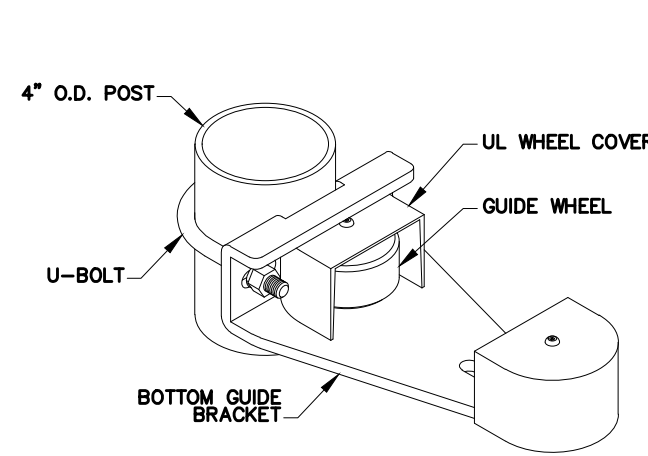
SECTION 1  
SEE THIS DWG  
NO SCALE



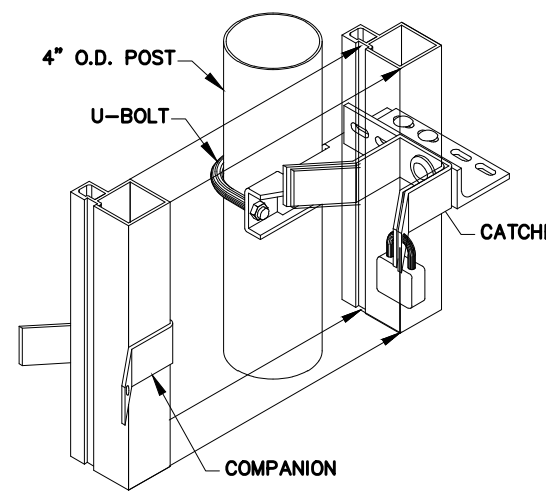
INFILTRATION BASIN PROFILE  
LOOKING FROM OUTSIDE  
(N.T.S.)



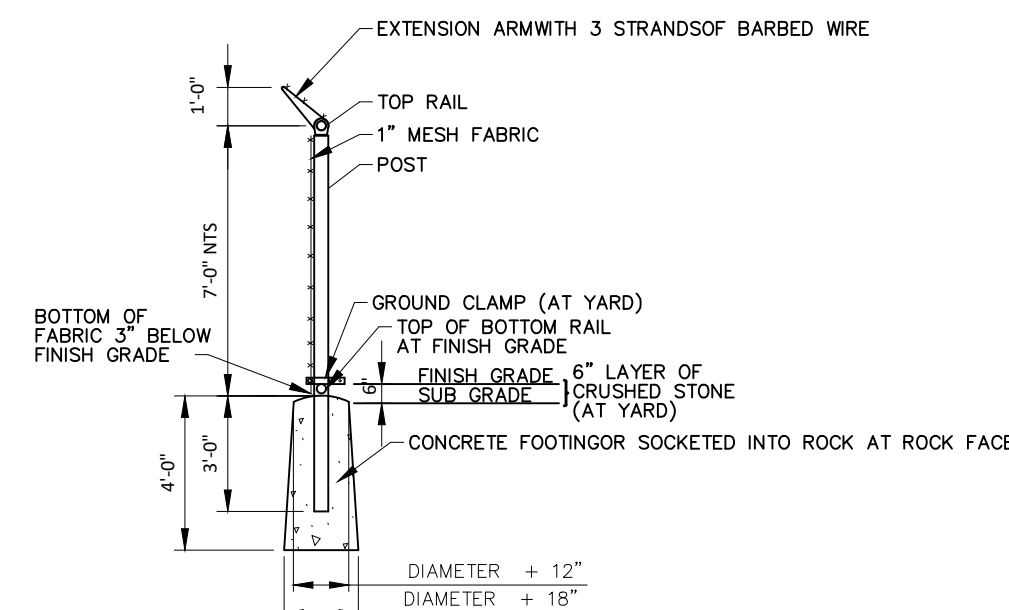
TYPICAL DRIVEWAY SECTION  
NTS



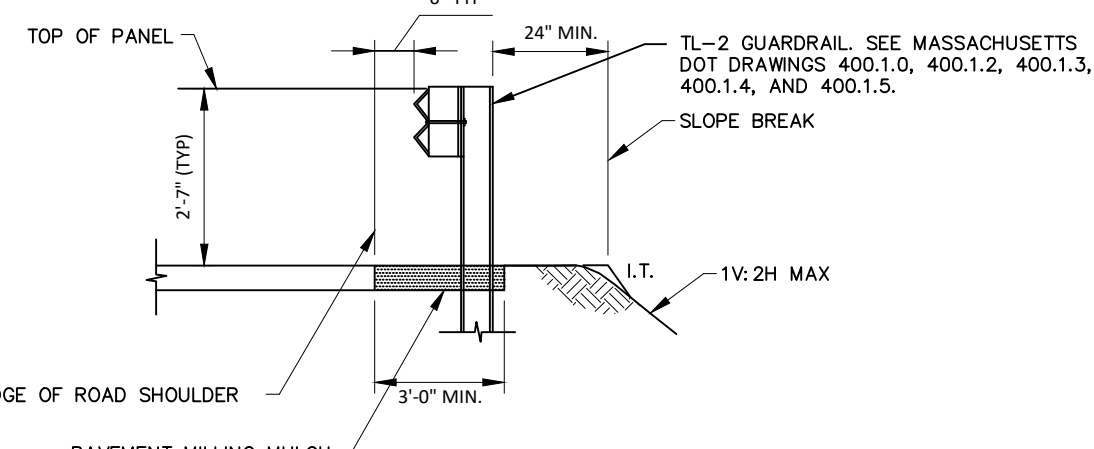
BOTTOM GUIDE  
(N.T.S.)



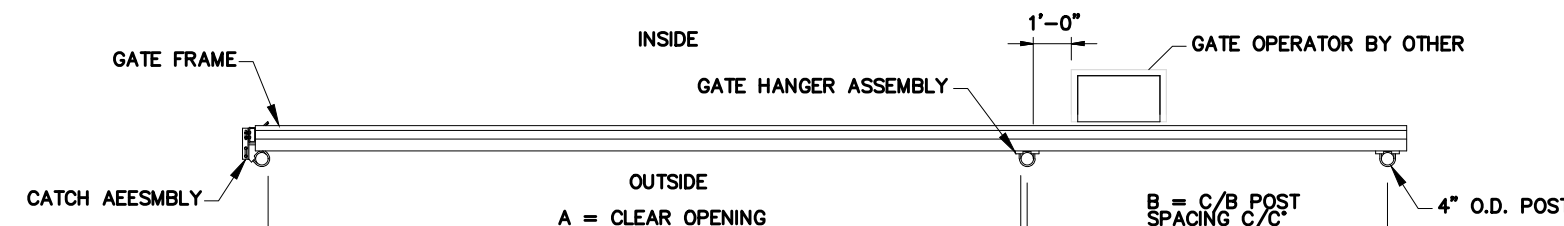
CATCH ASSEMBLY  
(N.T.S.)



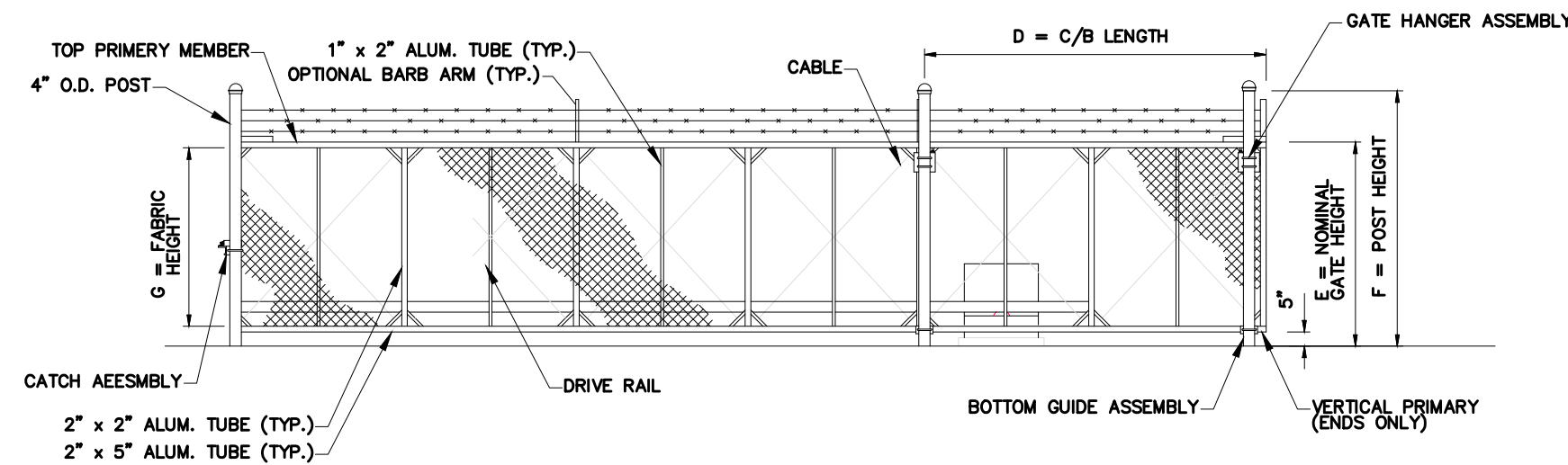
YARD FENCE DETAIL  
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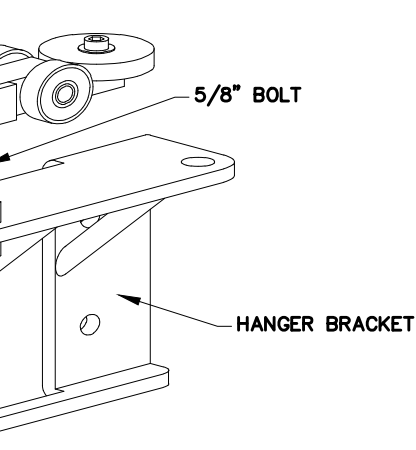
GUARDRAIL  
NTS



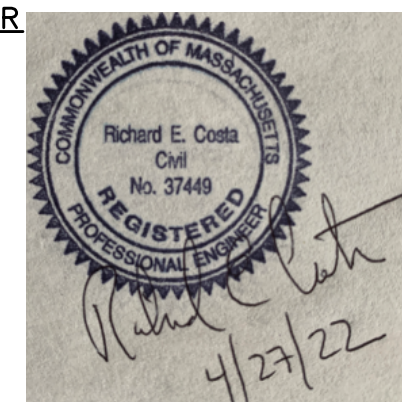
PLAN VIEW  
BUILDING GATE PLAN VIEW  
(N.T.S.)



ASSEMBLY SECTION  
(N.T.S.)




GATE HANGER  
(N.T.S.)



## NOTES

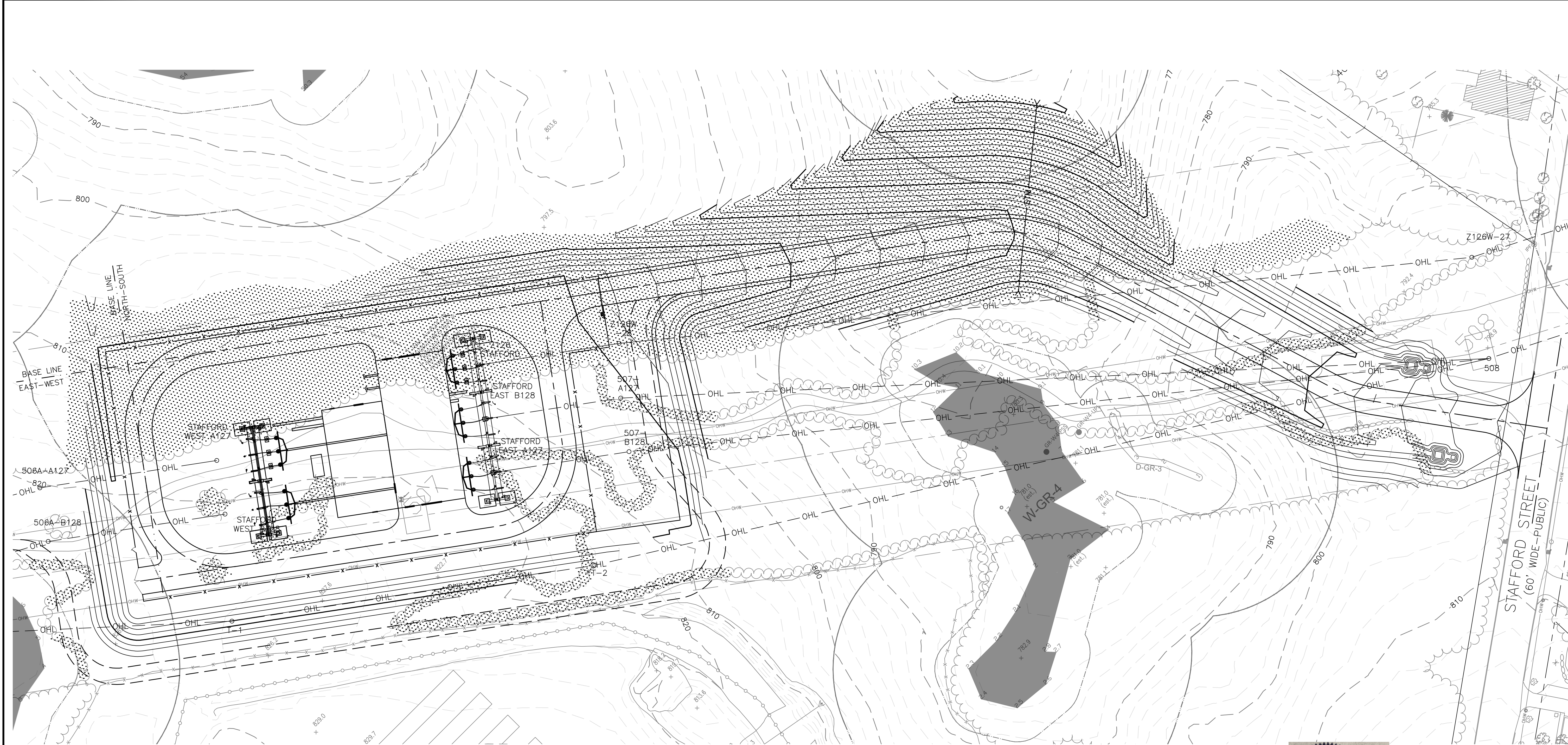
1. POROUS PAVEMENT IS SPECIFIED FOR USE TO MEET STORMWATER QUALITY STANDARDS FOR THE PROJECT BY PROVIDING THE REQUISITE GROUNDWATER RECHARGE AND WATER QUALITY TREATMENT PURSUANT TO THE MASSDEP STORMWATER MANAGEMENT STANDARDS (SMS). ADDITIONALLY, THE POROUS PAVEMENT SHOWN HEREON IS INTENDED TO MEET THE HYDRAULIC AND HYDROLOGIC REQUIREMENTS FOR SMS. THE FINAL POROUS PAVEMENT DESIGN SHOULD BE PROVIDED BY THE ENGINEER TO ALSO MEET THE PROJECT PAVEMENT STRUCTURAL AND SERVICEABILITY REQUIREMENTS BASED ON PLANNED SERVICE LIFE, TRAFFIC LOADING, AND ENVIRONMENTAL CONDITIONS. SEE THE CIVIL DRAWINGS FOR FINAL PAVEMENT DESIGN INCLUDING BITUMINOUS CONCRETE THICKNESS AND MATERIAL REQUIREMENTS.
2. POROUS PAVEMENT DESIGN AND CONSTRUCTION SHOULD BE IN ACCORDANCE WITH:
  - a. NATIONAL GRID CONSTRUCTION SPECIFICATIONS, SP.08.00.001, FEB 2020 (NGRID SPECIFICATIONS);
  - b. MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, 2022 EDITION (MASSDOT SPECIFICATIONS);
  - c. AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (AASHTO SPECIFICATIONS);
  - d. UNH STORMWATER CENTER DESIGN SPECIFICATIONS FOR POROUS ASPHALT PAVEMENT AND INFILTRATION BEDS, REVISED SEPTEMBER 2016 (UNHSC SPECIFICATIONS);
  - e. WHERE CONFLICTS EXIST, THE UNHSC SPECIFICATIONS SHOULD GOVERN WITH RESPECT TO THE STORMWATER MANAGEMENT ASPECTS OF THE POROUS PAVEMENT SECTION.
3. MATERIALS PROPOSED FOR USE IN THE POROUS PAVEMENT SECTION (I.E., BITUMINOUS CONCRETE MIX DESIGN, CHOKER COURSE, FILTER COURSE, FILTER BLANKET, AND RESERVOIR COURSE) INCLUDING TEST RESULTS SHOULD BE SUBMITTED TO THE OWNER AND ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PURCHASE OR DELIVERY TO THE SITE.
4. POROUS PAVEMENT SHOULD BE DESIGNED TO MEET THE MINIMUM STRUCTURAL NUMBER REQUIRED BY THE ENGINEER. THE BITUMINOUS BINDER SHOULD BE POST-BLENDED PG 76-28 MODIFIED WITH STYRENE BUTADIENE RUBBER (SBR) OR STYRENE BUTADIENE STYRENE (SBS) AND BE A BITUMINOUS ANTI-STRIPPING MIX ADDITIVE. THE AGGREGATE SHOULD MEET THE ANGULARITY, HARDNESS, AND SOUNDNESS REQUIREMENTS PER MASSDOT SPECIFICATIONS. THE MIX DESIGN GRADATION, BINDER CONTENT, AIR VOID CONTENT, DRAINDOWN, AND TENSILE AND ABRASION CRITERIA SHOULD MEET TABLE 5 OF THE 2016 UNHSC SPECIFICATIONS. THE COMPACTED BITUMINOUS COURSES SHOULD HAVE A MINIMUM INFILTRATION RATE OF 10 IN/HR.
5. CHOKER COURSE SHOULD BE A HARD, DURABLE, OPEN-GRADED, NOMINAL CRUSHED STONE PER MASSDOT M2.01.4 – 3/4" CRUSHED STONE, OR AASHTO #57, THAT REMAINS STABLE AND NOT SUBJECT TO RUTTING UNDER LOADED TRUCK AND PAVEMENT WHEEL LOADS. COMPLIANCE WITH THE GRADATION REQUIREMENT DOES NOT PRECLUDE MEETING THE RUTTING REQUIREMENT.
6. FILTER COURSE SHOULD BE A SAND-GRAVEL MIXTURE MEETING THE REQUIREMENTS OF MASSDOT M1.04.1 – SAND BORROW FOR SUBGRADE. THE MATERIAL SHOULD HAVE A TESTED MINIMUM COMPACTED INFILTRATION RATE OF 10 FT/DAY (5 IN/HR) AT 95% OF MODIFIED PROCTOR MAXIMUM DRY DENSITY.
7. COMPACTION: CHOKER COURSE, FILTER BLANKET, AND RESERVOIR COURSE SHOULD BE COMPACTED USING MINIMUM 5-TON STEEL DRUM ROLLERS WITHOUT VIBRATORY COMPACTION. FILTER COURSE SHOULD BE COMPACTED TO 95% MODIFIED PROCTOR MAXIMUM DRY DENSITY PROVIDED THE MINIMUM TESTED HYDRAULIC CONDUCTIVITY IS ACHIEVED. THE MATERIAL AND STRUCTURAL FILT SUBGRADE BENEATH THE RESERVOIR COURSE SHOULD BE COMPACTED TO A MINIMUM OF 95% MAXIMUM DRY DENSITY PROVIDED A MINIMUM INFILTRATION RATE OF 1 IN/HR CAN BE ACHIEVED AT THAT COMPACTION. A REDUCED DEGREE OF COMPACTION REQUIRES APPROVAL BY THE ENGINEER, AND IN NO CASE SHOULD THE DEGREE OF SUBGRADE COMPACTION BE LESS THAN 92% OF MODIFIED PROCTOR MAXIMUM DRY DENSITY.
8. TOLERANCES: ALL POROUS PAVEMENT SECTION THICKNESSES ARE MINIMUM VALUES.
9. OPERATIONS AND MAINTENANCE: THE POROUS PAVEMENT SHOULD BE INSPECTED NO LESS THAN QUARTERLY FOR EVIDENCE OF SEDIMENT ACCUMULATION, PONDING, OR OTHER INDICATIONS OF INSUFFICIENT INFILTRATION. EXCESSIVE SEDIMENT FROM VEHICLE TRACKING, RUN-ON, ETC., SHOULD BE REMOVED AS NEEDED USING PAVEMENT VACUUM METHODS. ANNUALLY, IN THE SPRING FOLLOWING LAST SNOW MELT, EXCESSIVE LEAVES SHOULD BE REMOVED BY VACUUM OR BLOWERS ANNUALLY IN THE FALL FOLLOWING LEAF DROP AND PRIOR TO THE FIRST SIGNIFICANT SNOW FALL AND LONG-DURATION FREEZING. SNOW SHOULD NOT BE STOCKPILED ON POROUS PAVEMENT. ROAD SALT SHOULD BE APPLIED FOR TRACTION CONTROL. IN WINTER MONTHS IN LIEU OF SAND, SAND OR OTHER NON-SOLUBLE TRACTION ENHANCEMENT MATERIALS SHOULD NOT BE APPLIED TO THE AREAS OF POROUS PAVEMENT.

STAFFORD STREET SUBSTATION	PREPARED BY	NEV/BA	<div></div>	<table><tr><th>VER</th><th>DATE</th><th>DESCRIPTION</th><th>PREPARED BY</th><th>CHECKED BY</th><th>APPROVED BY</th><th>VERSION</th></tr><tr><td>1</td><td>11/15/21</td><td>ISSUED FOR CLIENT REVIEW</td><td>NEV/BA</td><td>BAW/BA</td><td>BAW/BA</td><td rowspan="7">3</td></tr><tr><td>2</td><td>23/25/22</td><td>ISSUED FOR PERMITTING</td><td>NEV/BA</td><td>BAW/BA</td><td>BAW/BA</td></tr><tr><td>3</td><td>24/27/22</td><td>ISSUED FOR PERMITTING</td><td>NEV/BA</td><td>BAW/BA</td><td>BAW/BA</td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>7</td><td></td><td></td><td></td><td></td><td></td></tr></table>	VER	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY	VERSION	1	11/15/21	ISSUED FOR CLIENT REVIEW	NEV/BA	BAW/BA	BAW/BA	3	2	23/25/22	ISSUED FOR PERMITTING	NEV/BA	BAW/BA	BAW/BA	3	24/27/22	ISSUED FOR PERMITTING	NEV/BA	BAW/BA	BAW/BA	4						5						6						7					
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H122297



TREE CLEARING (SQ. FT.)
106,122.57

LANDSCAPE NOTES:

- CONTRACTOR SHALL VERIFY LOCATIONS OF ALL UTILITIES AND NOTIFY OWNERS REPRESENTATIVE OF CONFLICTS.
- NO PLANT MATERIALS SHALL BE INSTALLED UNTIL ALL GRADING AND CONSTRUCTION HAS BEEN COMPLETED IN THE IMMEDIATE AREA.
- ALL PLANT MATERIALS SHALL BE GUARANTEED FOR ONE YEAR FOLLOWING DATE OF FINAL ACCEPTANCE.
- AREAS DESIGNATED "LOAM & SEED" SHALL RECEIVE 6" OF LOAM AND SPECIFIED SEED MIX. LAWNS OVER 2:1 SLOPE SHALL BE PROTECTED WITH EROSION CONTROL FABRIC.
- LOAM AND SEED ALL AREAS NOT OTHERWISE TREATED.
- THIS PLAN IS INTENDED FOR LANDSCAPING PURPOSES ONLY. REFER TO SITE/CIVIL DRAWINGS FOR ALL OTHER SITE CONSTRUCTION INFORMATION.

PLANT MAINTENANCE NOTES:

- CONTRACTOR SHALL PROVIDE COMPLETE MAINTENANCE OF THE PLANTINGS. NO IRRIGATION IS PROPOSED FOR THIS SITE THE CONTRACTOR SHALL SUPPLY SUPPLEMENTAL WATERING FOR NEW LAWNS AND PLANTINGS DURING THE ONE YEAR PLANT GUARANTEE PERIOD.
- CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR, AND EQUIPMENT FOR THE COMPLETE LANDSCAPE MAINTENANCE WORK. WATER SHALL BE PROVIDED BY THE OWNER.
- WATERING SHALL BE REQUIRED DURING THE GROWING SEASON.
- WATER SHALL BE APPLIED IN SUFFICIENT QUANTITY TO THOROUGHLY SATURATE THE SOIL IN THE ROOT ZONE OF EACH PLANT.
- CONTRACTOR SHALL REPLACE DEAD OR DYING PLANTS AT THE END OF THE ONE YEAR GUARANTEE PERIOD. CONTRACTOR SHALL TURN OVER MAINTENANCE TO THE FACILITY MAINTENANCE STAFF AT THAT TIME.

TREE PROTECTION NOTES:

- EXISTING TREES TO REMAIN SHALL BE PROTECTED WITH TEMPORARY CONSTRUCTION FENCE. ERECT FENCE AT EDGE OF THE TREE DRIP LINES OR AS INDICATED ON THE PLAN PRIOR TO TREE CLEARING.
- CONTRACTOR SHALL NOT OPERATE VEHICLES WITHIN THE TREE PROTECTION AREA. CONTRACTOR SHALL NOT STORE VEHICLES OR MATERIALS, OR DISPOSE OF ANY WASTE MATERIALS, WITHIN THE TREE PROTECTION AREA.
- DAMAGE TO EXISTING TREES CAUSED BY THE CONTRACTOR SHALL BE REPAIRED BY A CERTIFIED ARBORIST AT THE CONTRACTOR'S EXPENSE.

INVASIVE SPECIES REMOVAL NOTES:

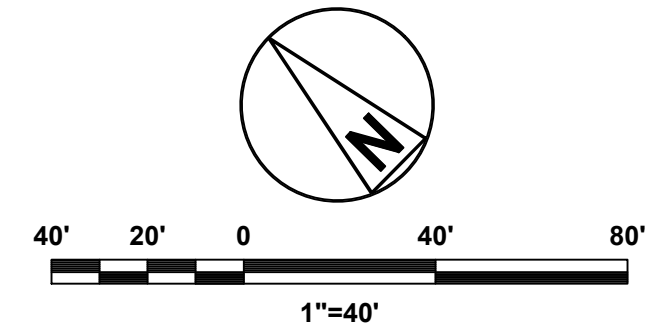
- CONTRACTOR SHALL CUT AND REMOVE INVASIVE VINE AND SHRUB SPECIES.
- CONTRACTOR SHALL APPLY HERBICIDE TO FRESHLY CUT STUMPS OF WOODY AND HERBACEOUS INVASIVE PLANTS. HERBICIDE APPLICATION SHALL BE PERFORMED BY A LICENSED HERBICIDE APPLICATOR. THE CONTRACTOR SHALL PROTECT NEARBY EXISTING PLANTS TO REMAIN AND NEWLY PLANTED LANDSCAPE PLANTS FROM OVERSPRAY.
- REMOVE DEAD VEGETATION FROM THE SITE AND PROPERLY DISPOSE OF OFF SITE.

LEGEND

	GUARDRAIL LINES
	ROADWAY CENTERLINES
	ROADWAY CURB LINES
	SECURITY FENCE AND GATE LINES
	EXISTING MAJOR CONTOUR LINES
	EXISTING MINOR CONTOUR LINES
	FINISH GRADE CONTOUR LINES
	EXISTING VEGETATION
	EXISTING WETLANDS
	LIMITS OF TREE CLEARING

NOT TO BE USED  
FOR CONSTRUCTION

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ISSUED FOR  
PERMITTING

SHEET REFERENCE

- |         |                                |
|---------|--------------------------------|
| H121391 | - PROPOSED SITE PLAN           |
| H121392 | - EXISTING CONDITIONS          |
| H121393 | - GRADING & DRAINAGE PLAN      |
| H121394 | - SURFACE & FENCING PLAN       |
| H121395 | - ACCESS ROAD PLAN & PROFILE   |
| H121396 | - GRADING AND DRAINAGE DETAILS |
| H121397 | - EROSION CONTROL FENCE        |
| H121398 | - CONSTRUCTION DETAILS         |
| H122297 | - LANDSCAPING PLAN             |
| H122298 | - SITE PAD CROSS-SECTIONS      |

STAFFORD STREET SUBSTATION

LANDSCAPING PLAN

nationalgrid

VERSION DESCRIPTION

REV	DATE	DESCRIPTION
1	11/25/21	ISSUED FOR CLIENT REVIEW
2	02/25/22	ISSUED FOR PERMITTING
3	04/27/22	ISSUED FOR PERMITTING
4		
5		
6		
7		

APPROVED BY	DATE	REVIEWED BY	DATE
DAW/BN	DAW/BN	DAW/BN	DAW/BN
RC/NS	RC/NS	RC/NS	RC/NS
NS/BN	NS/BN	NS/BN	NS/BN

VERSION  
3

H122297

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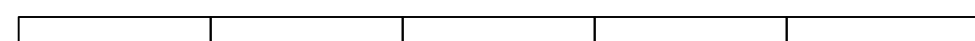
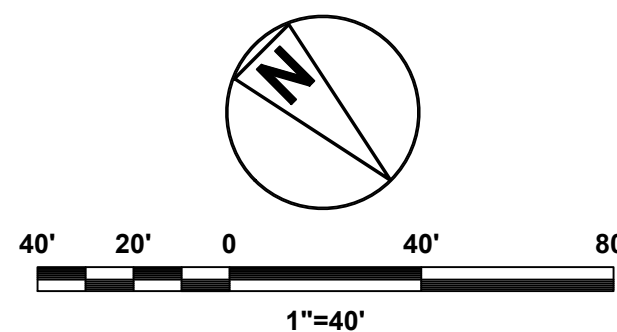
NOTES:

1. SEE NOTES ON DRAWINGS H121393 AND H121399.
2. ALL DISTURBED AREAS NOT RECEIVING AGGREGATE OR PAVEMENT SHALL BE RESTORED TO PRE-EXISTING CONDITIONS.
3. SEE DRAWING H121398 FOR SUBSTATION AGGREGATE THICKNESS.
4. SEE DRAWING H121398 FOR PAVEMENT DETAILS.

40' 20' 0 40' 80'

1"=40'

1. SEE NOTES ON DRAWINGS H121393 AND H121399.
2. ALL DISTURBED AREAS NOT RECEIVING AGGREGATE OR PAVEMENT SHALL BE RESTORED TO PRE-EXISTING CONDITIONS.
3. SEE DRAWING H121398 FOR SUBSTATION AGGREGATE THICKNESS.
4. SEE DRAWING H121398 FOR PAVEMENT DETAILS.



SHEET REFERENCE

- H121391 – PROPOSED SITE PLAN  
H121392 – EXISTING CONDITIONS  
H121393 – GRADING & DRAINAGE PLAN  
H121394 – SURFACE & FENCING PLAN  
H121395 – ACCESS ROAD PLAN & PROFILE  
H121396 – GRADING AND DRAINAGE DETAILS  
H121397 – EROSION CONTROL FENCE  
H121398 – CONSTRUCTION DETAILS  
H122297 – LANDSCAPING PLAN  
H122298 – SITE PAD CROSS-SECTIONS

SITE PAD CROSS-SECTIONS

**nationalgrid**

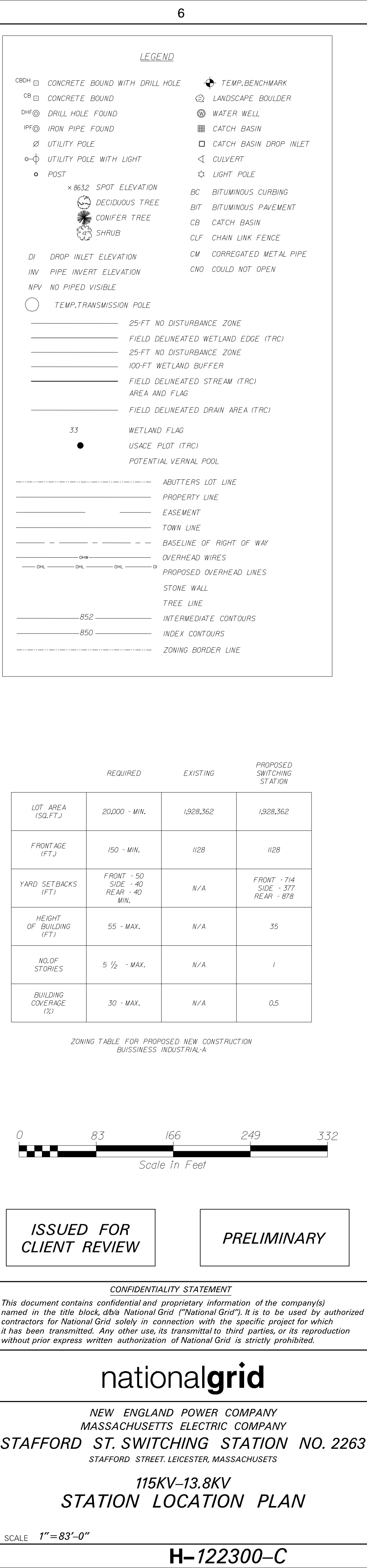
PREPARED BY	NER/BV	
REVIEWED BY	DUK/BV	
APPROVED BY	RC/NG	
SCALE	1" = 40'-0"	
SHEET	10 OF 10	
INDEX		

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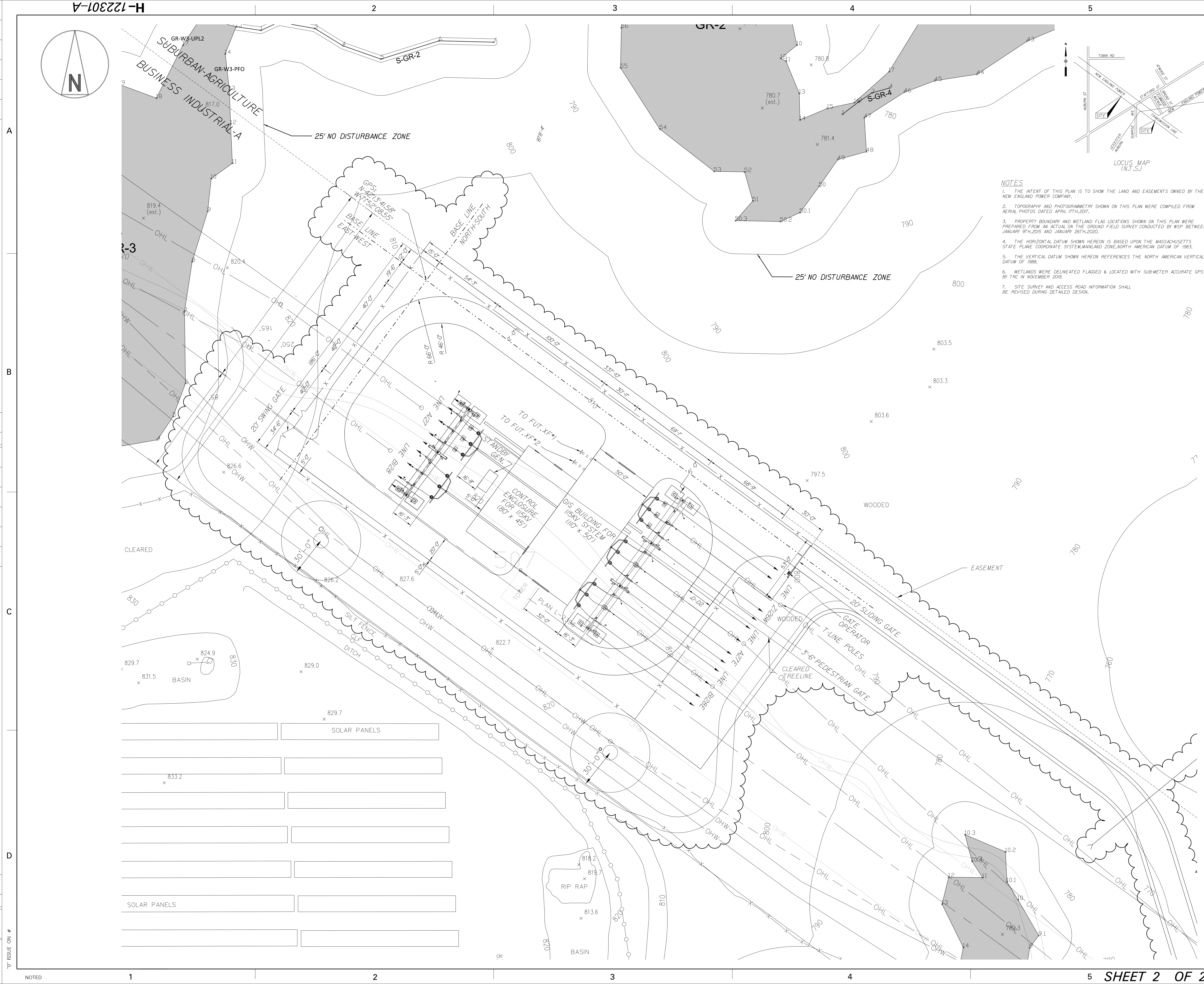


"0" ISSUE ON #
A
B
C
D



REVISIONS									
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2							6		
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REVISIONS									
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3							7		
4							8		



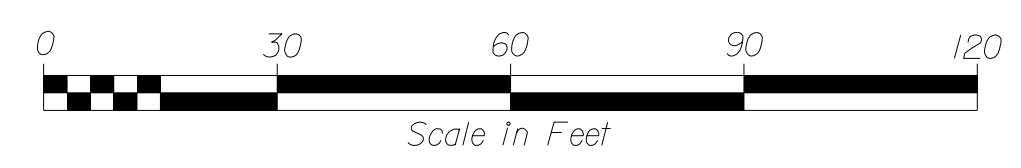
**LEGEND**

CBH □ CONCRETE BOUND WITH DRILL HOLE	TEMP. BENCHMARK
CB □ CONCRETE BOUND	LANDSCAPE BOULDER
DHF □ DRILL HOLE FOUND	WATER WELL
IPF □ IRON PIPE FOUND	CATCH BASIN
□ UTILITY POLE	CATCH BASIN DROP INLET
□ UTILITY POLE WITH LIGHT	CULVERT
□ POST	LIGHT POLE
× 8632 SPOT ELEVATION	BC BITUMINOUS CURBING
□ DECIDUOUS TREE	BIT BITUMINOUS PAVEMENT
□ CONIFER TREE	CB CATCH BASIN
□ SHRUB	CLF CHAIN LINK FENCE
DI DROP INLET ELEVATION	CM CORRUGATED METAL PIPE
INW PIPE INVERT ELEVATION	CNO COULD NOT OPEN
NPV NO PIPED VISIBLE	
○ TEMP. TRANSMISSION POLE	

25-FT NO DISTURBANCE ZONE  
FIELD DELINEATED WETLAND EDGE (TRC)  
25-FT NO DISTURBANCE ZONE  
100-FT WETLAND BUFFER  
FIELD DELINEATED STREAM (TRC)  
AREA AND FLAG  
FIELD DELINEATED DRAIN AREA (TRC)

33 WETLAND FLAG  
USACE PLOT (TRC)  
POTENTIAL VERNAL POOL

ABUTTERS LOT LINE  
PROPERTY LINE  
EASEMENT  
TOWN LINE  
BASELINE OF RIGHT OF WAY  
OVERHEAD WIRES  
PROPOSED OVERHEAD LINES  
STONE WALL  
TREE LINE  
INTERMEDIATE CONTOURS  
INDEX CONTOURS  
ZONING BORDER LINE



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PRELIMINARY

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**nationalgrid**

NEW ENGLAND POWER COMPANY  
MASSACHUSETTS ELECTRIC COMPANY  
STAFFORD ST. SWITCHING STATION NO. 2263  
STAFFORD STREET, LEICESTER, MASSACHUSETTS

115KV-13.8KV  
STATION LOCATION PLAN

SCALE 1"=30'-0"

**NOTES**

1. THE INTENT OF THIS PLAN IS TO SHOW THE LAND AND EASEMENTS OWNED BY THE NEW ENGLAND POWER COMPANY.

2. TOPOGRAPHY AND PHOTOGRAMMETRY SHOWN ON THIS PLAN WERE COMPILED FROM AERIAL PHOTOS DATED APRIL 17TH, 2017.

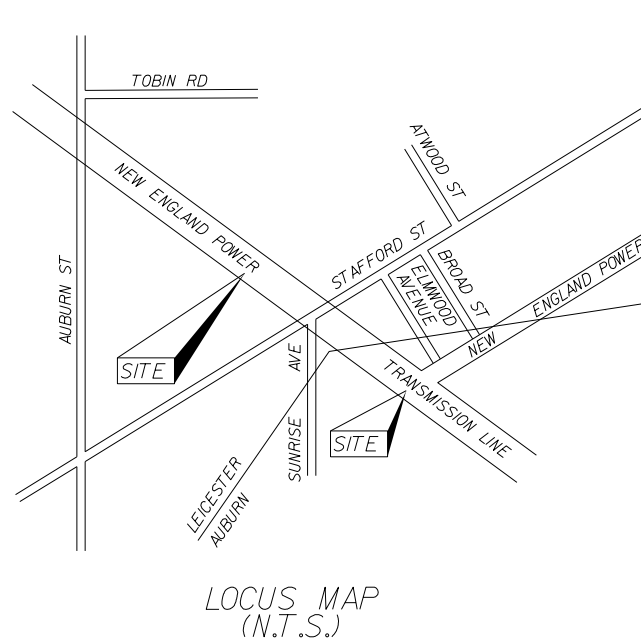
3. PROPERTY BOUNDARY AND WETLAND FLAG LOCATIONS SHOWN ON THIS PLAN WERE PREPARED FROM AN ACTUAL ON THE GROUND FIELD SURVEY CONDUCTED BY WSP BETWEEN JANUARY 9TH, 2015 AND JANUARY 26TH, 2020.

4. THE HORIZONTAL DATUM SHOWN HEREON IS BASED UPON THE MASSACHUSETTS STATE PLANE COORDINATE SYSTEM, MARLAND ZONE, NORTH AMERICAN DATUM OF 1983.

5. THE VERTICAL DATUM SHOWN HEREON REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1988.

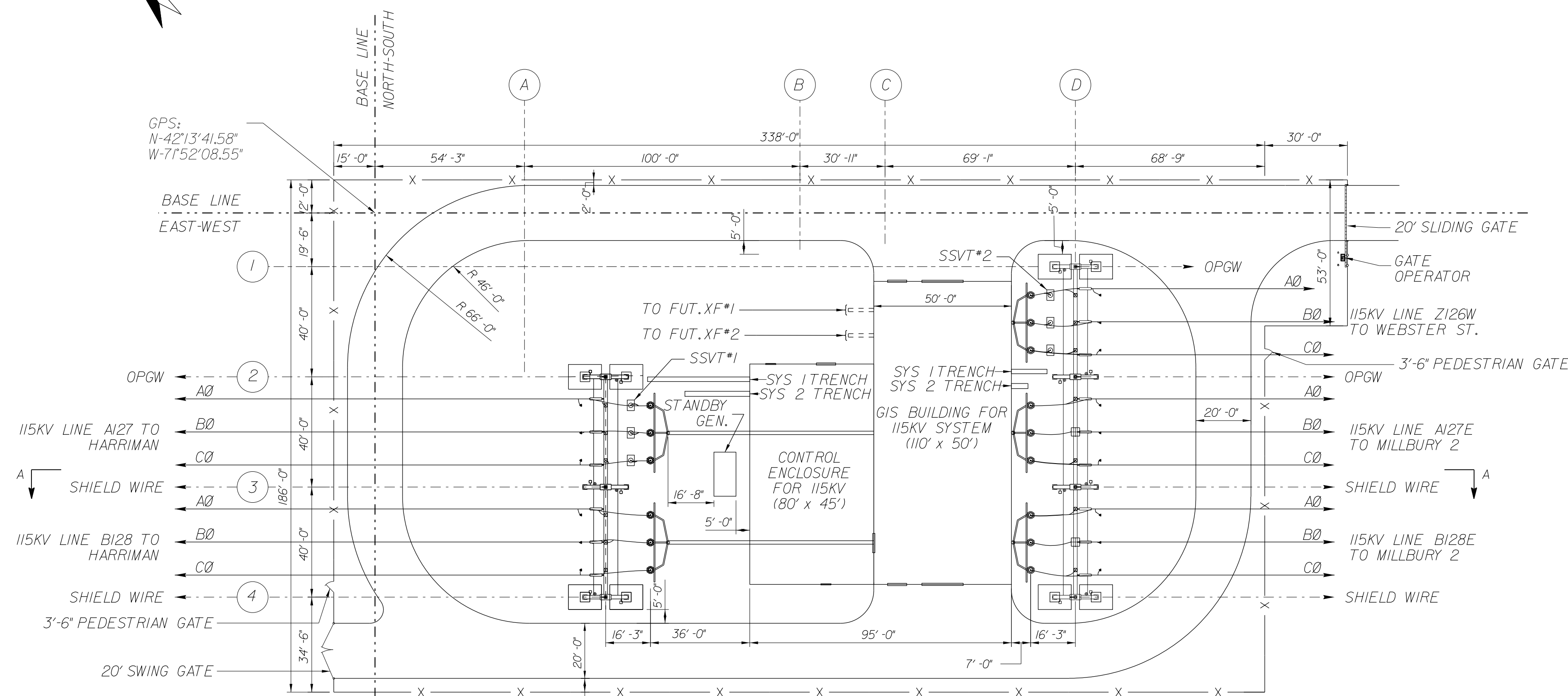
6. WETLANDS WERE DELINEATED FLAGGED & LOCATED WITH SUB-METER ACCURATE GPS BY TRC IN NOVEMBER 2018.

7. SITE SURVEY AND ACCESS ROAD INFORMATION SHALL BE REVISED DURING DETAILED DESIGN.

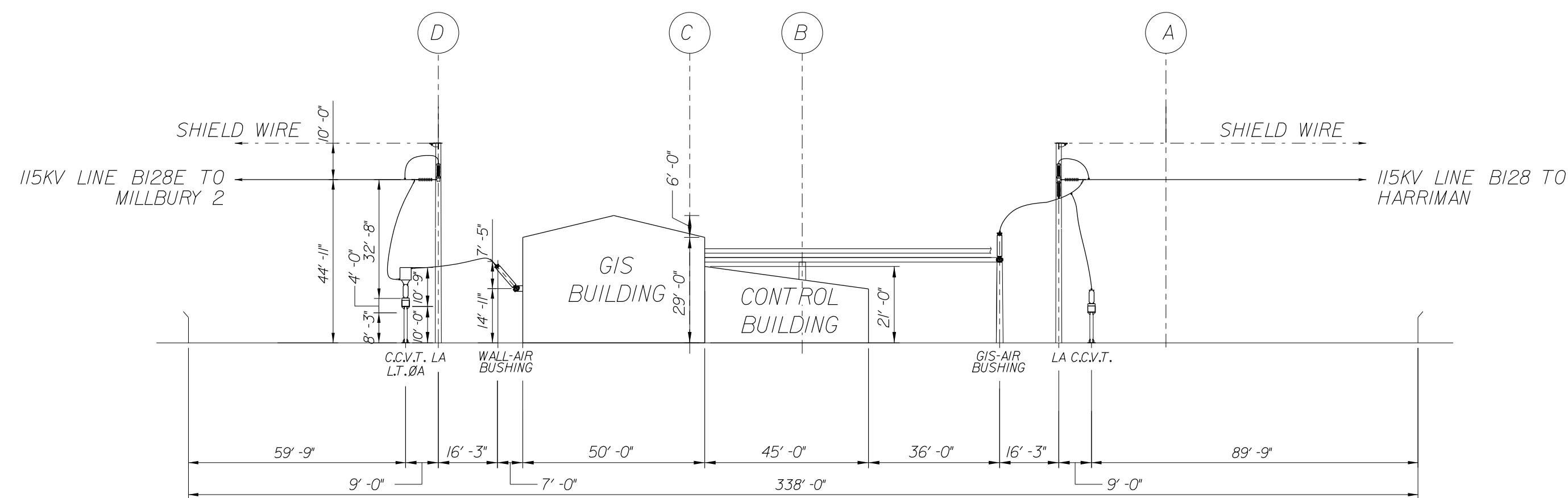




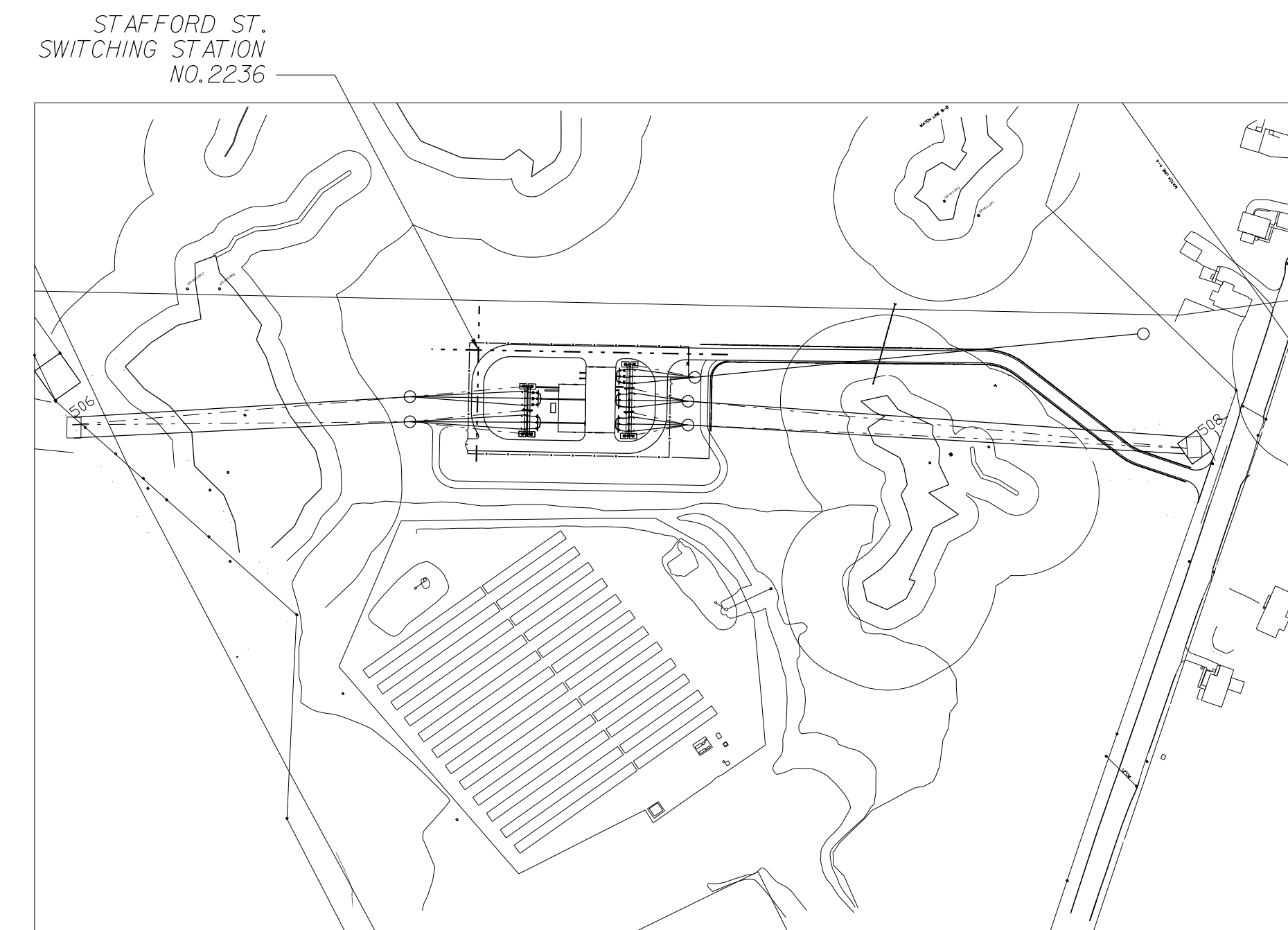
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DRAWN	AP/B&V		RP / PB / B&V	CBK / B&V																	
DESIGNED	PB/B&V	A	ISSUED FOR CLIENT REVIEW				5410-C082924-90000200959	E	08/12/22	ISSUED FOR CLIENT REVIEW											
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INSPECTED																					
REVIEWED																					
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APPROVED	DLB/B&V	D	ISSUED FOR CLIENT REVIEW	JHW / B&V			5410-C082924-90000200959	8													



PLAN



SECTION A-A



LOCATION MAP  
NOT TO SCALE

NOTES

I. STATION SERVICE SUPPLY WILL BE FED FROM LOCAL DISTRIBUTION NETWORK.

REFERENCE DRAWING

GRADING & DRAINAGE H-12/393

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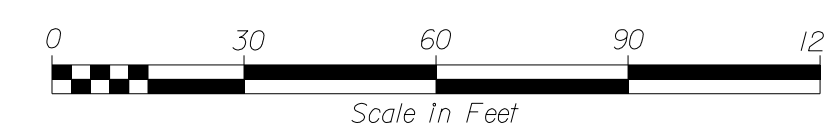
NEW ENGLAND POWER COMPANY  
MASSACHUSETTS ELECTRIC COMPANY  
**STAFFORD ST. SWITCHING STATION NO. 2236**  
STAFFORD ST, LEICESTER, MASSACHUSETT

115KV  
ULTIMATE LAYOUT

SCALE: 1"=30'-0"

*PRELIMINARY*

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**ATTACHMENT E – Applicable Best Management Practices (BMPs) from National  
Grid Environmental Guidance Document (EG-303NE)**

## SUBJECT

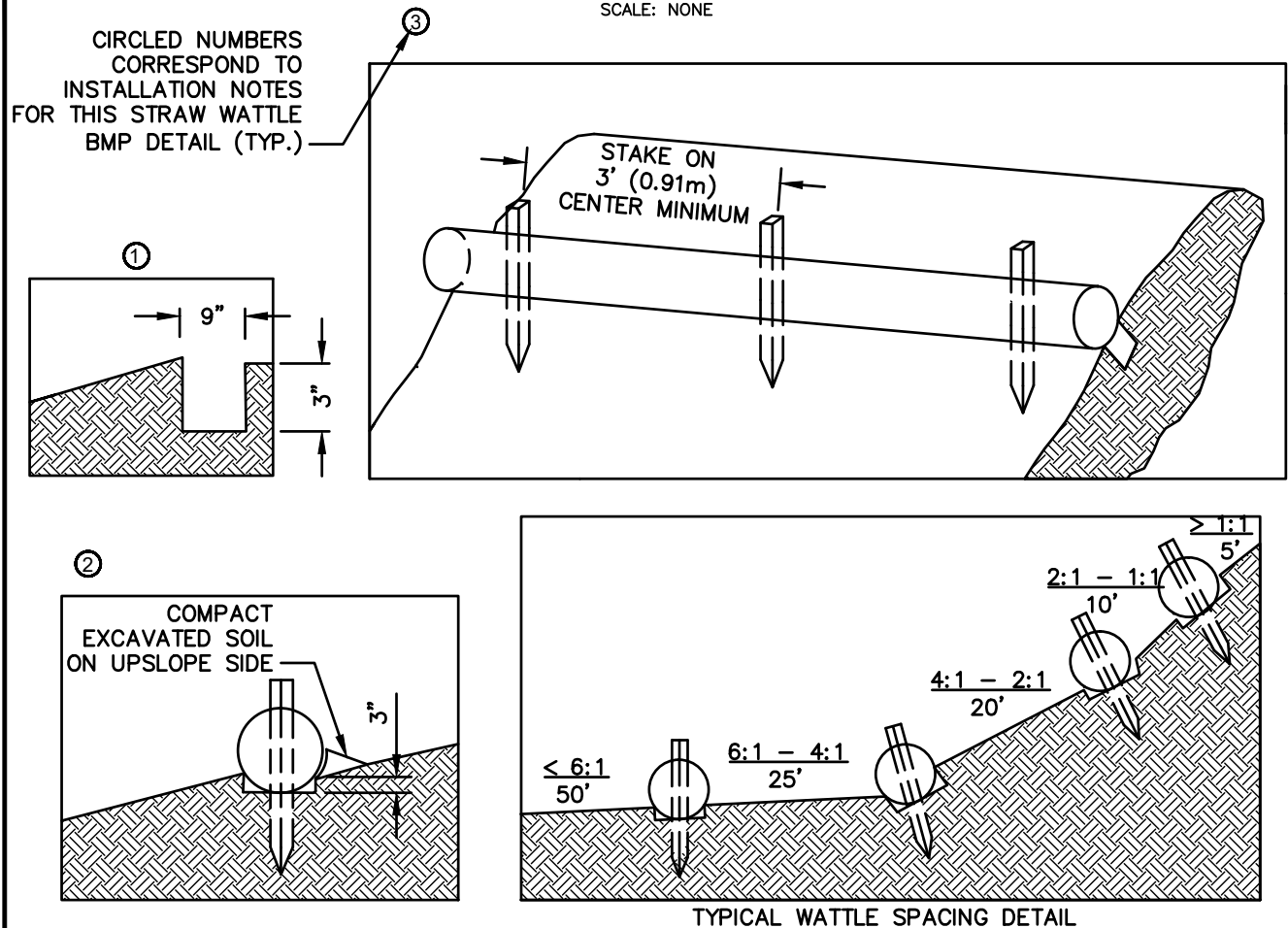
Access, Maintenance and Construction  
Best Management Practices

## Reference

EP No. 3 - Natural Resource  
Protection (Chapter 6)

**BMP DETAIL**

SCALE: NONE

**NOTES:**

1. PRODUCT TO BE TENSAR NORTH AMERICAN GREEN STRAW WATTLE OR APPROVED EQUAL BY NATIONAL GRID ENVIRONMENTAL SCIENTIST.
2. TYPICAL WATTLE SPACING BASED ON SLOPE GRADIENT. COORDINATE SPACING AND LOCATION WITH NATIONAL GRID ENVIRONMENTAL SCIENTIST.
3. MINIMUM 12" DIAMETER WATTLES SHOULD BE USED FOR HIGHLY DISTURBED AREAS (I.E., HEAVILY USED ACCESS ROAD WITH ADJACENT WETLAND) AND MINIMUM 9-10" WATTLES SHOULD BE USED FOR LESS DISTURBED SOILS.

**INSTALLATION NOTES:**

1. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" DEEP X 9" WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UPSLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ABUT.
3. SECURE THE WATTLE WITH 18-24" HARDWOOD STAKES EVERY 3-4' AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLE LEAVING AT LEAST 2-3" OF STAKE EXTENDING ABOVE THE WATTLE. STAKES SHOULD BE DRIVEN PERPENDICULAR TO THE SLOPE FACE.

\* DETAIL AND PICTURE PROVIDED BY TENSAR NORTH AMERICAN GREEN  
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VERSION PLEASE REFER TO THE NATIONAL GRID ENVIRONMENTAL INFONET SITE.

SEC-5  
STRAW WATTLE \* (1 OF 2)



## SUBJECT

Access, Maintenance and Construction  
Best Management Practices

## Reference

EP No. 3 - Natural Resource  
Protection (Chapter 6)

BMP PICTURE

STRAW WATTLE – SHALLOW SLOPE ( $\leq 4:1$ )  
(ALTERNATE STAKING)

ALTERNATE STAKING INSTALLATION NOTES:

1. ON SHALLOW SLOPES ( $\leq 4:1$ ), STRAW WATTLE MAY BE SECURED WITH 18–24" HARDWOOD STAKES DRIVEN AGAINST THE SIDES OF THE WATTLE INSTEAD OF THROUGH. STAKES SHALL ALTERNATE SIDES, AND BE SPACED 3–4' MAX.
2. TWINE SHALL BE TIED FROM STAKE TO STAKE, CRISS-CROSSING THE STRAW WATTLE. TIE TWINE TO STAKES BELOW THE HEIGHT OF THE WATTLE.

## SUBJECT

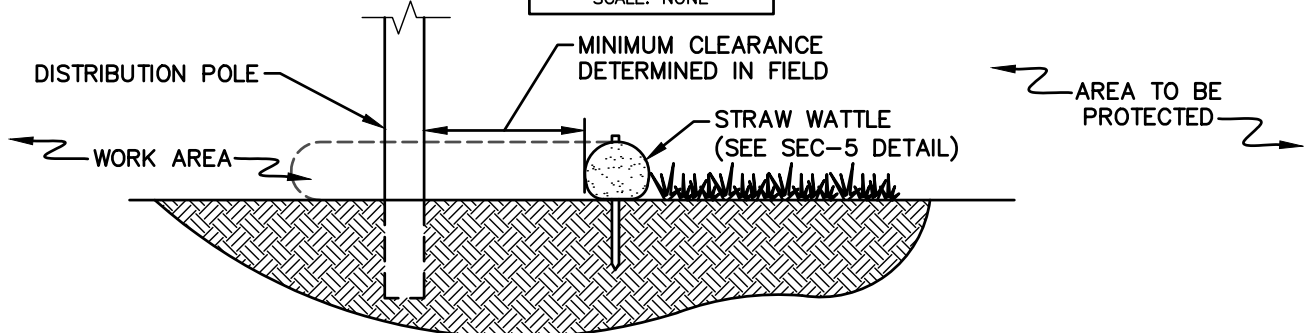
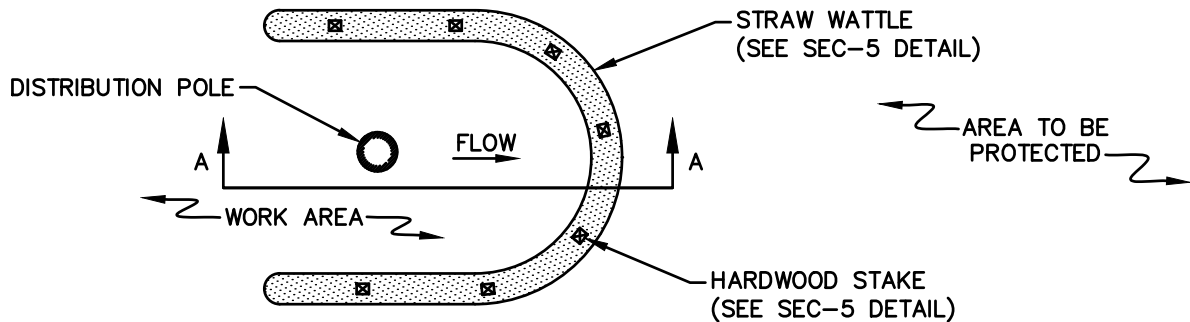
Access, Maintenance and Construction  
Best Management Practices

## Reference

EP No. 3 - Natural Resource  
Protection (Chapter 6)

**BMP DETAIL**

SCALE: NONE

SECTION A-APLANNOTES

1. PRODUCT TO BE STRAW WATTLE OR APPROVED EQUAL BY NATIONAL GRID ENVIRONMENTAL SCIENTIST (SEE SEC-5 BMP DETAIL).
2. STRAW BALE BARRIER PER SEC-1 BMP DETAIL TO BE AN AVAILABLE ALTERNATE DEPENDING ON SITE CONDITIONS AT THE DIRECTION OF NATIONAL GRID ENVIRONMENTAL SCIENTIST (SEE FIGURE 2).
3. MINIMUM CLEARANCE BETWEEN POLE AND EROSION CONTROL TO BE DETERMINED BY CONDITIONS OF POLE INSTALLATION/REPLACEMENT WORK AND ASSOCIATED DISTURBANCE.

BMP PICTURE

FIGURE 1: TYP. STRAW WATTLE APPLICATION



FIGURE 2: ALT. STRAW BALE APPLICATION

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SEC-12  
DISTRIBUTION POLE  
SEDIMENT CONTROL

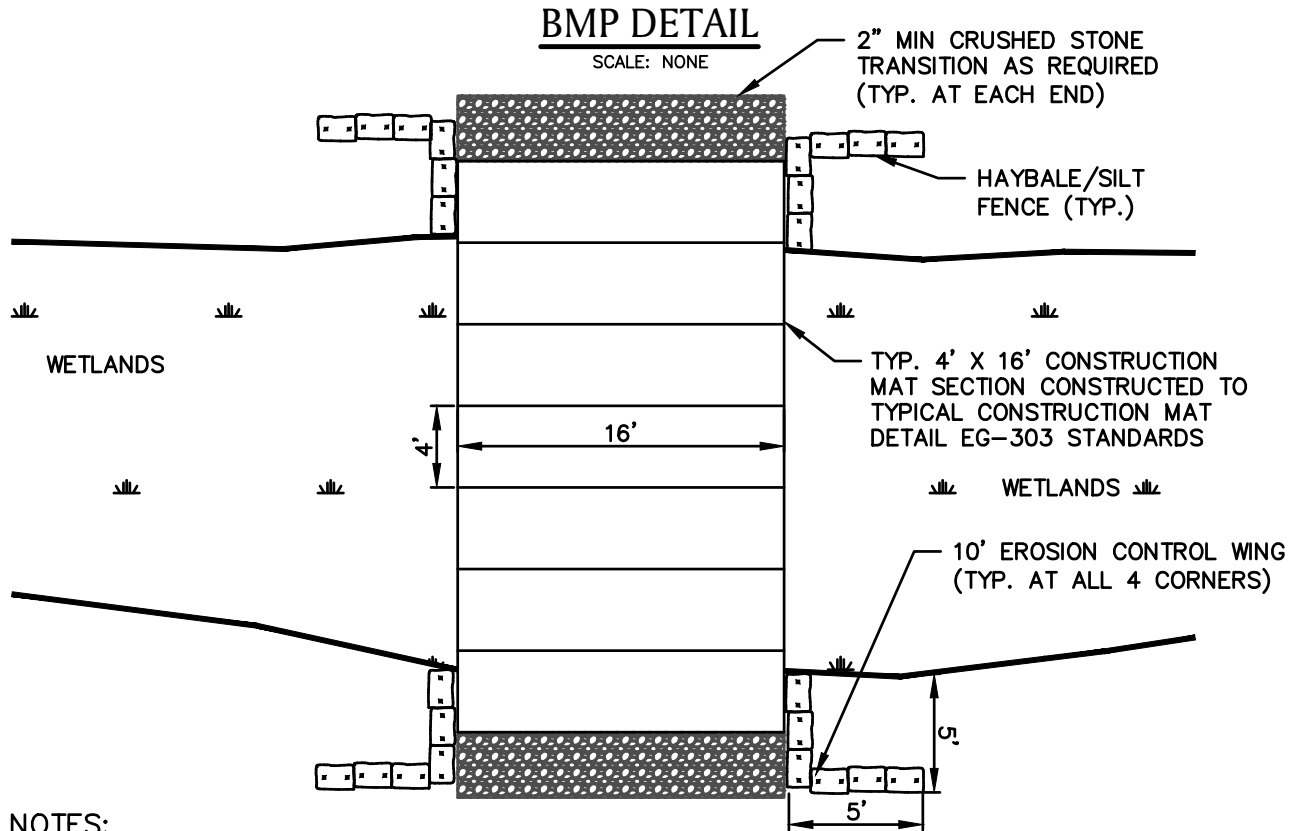


**SUBJECT**

Access, Maintenance and Construction  
Best Management Practices

**Reference**

EP No. 3 - Natural Resource  
Protection (Chapter 6)



**NOTES:**

1. ADD FILTER FABRIC AS NEEDED UNDER STONE TRANSITION RAMPS.
2. ALL MEASUREMENTS AND LOCATIONS ARE APPROXIMATE.

**BMP PICTURE**



**CM-4**

CONSTRUCTION MAT LAYOUT  
(WITH TRANSITION AND BMPs)

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## **ATTACHMENT F – Stormwater Report and Plan**



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# STORMWATER MANAGEMENT REPORT

## Stafford Street Substation

### Leicester, MA

March 10, 2022, Rev. 1  
File No. 15.0166857.00



PREPARED FOR:

**nationalgrid**

**GZA GeoEnvironmental, Inc.**

1350 Main Street, Suite 1400 | Springfield, MA 01103  
413-726-2100

[www.gza.com](http://www.gza.com)



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APPENDIX G	CHECKLIST FOR STORMWATER REPORT





## 1.0 INTRODUCTION

### 1.1 PROJECT DESCRIPTION

National Grid (NGRID) is proposing to construct a new electrical substation at 408 Stafford Street, Leicester, MA (Site), a 45-acre parcel located northwest of the intersection of Stafford Street and Sunrise Avenue (See Figure 1: Locus Map). The Site is partially developed, with a ground-mounted photovoltaic system in the southwest quadrant, and a 250-ft wide maintained electrical transmission right-of-way bisecting the Site.

The proposed work includes construction of a new 750-foot-long access road leading to a 1.45-acre fenced substation yard located within an existing National Grid transmission line right-of-way. The access road will be paved along with a circular drive aisle within the substation yard. The proposed access and circulation drives will include areas of impervious bituminous pavement and porous bituminous pavement. The remainder of the substation yard surface will be crushed stone, except for the proposed control building and exterior electrical equipment. Proposed cut and fill slopes will be rip-rap covered or vegetated.

The proposed stormwater management design mitigates potential increases in stormwater runoff by lengthening times of concentration. Water quality treatment and groundwater recharge are provided via the proposed porous pavement, the crushed stone yard, and two infiltration basins proposed downstream of the paved driveway apron. Stormwater runoff from unaltered upgradient areas will be routed around the proposed substation yard via perimeter drainage swales, and beneath the new access road via a new culvert.

### 1.2 EXISTING LAND USES, TOPOGRAPHY, HYDROLOGY, AND SOILS

The area proposed for the new electrical substation and associated access driveway is currently maintained by National Grid as an electrical transmission right-of-way. Ground cover is a mix of grasses and shrubs, coupled with an existing unpaved access drive. Existing grade along the proposed alignment of the access driveway varies from Elev. 800 at Stafford Street (Sta 0+00), down to Elev. 762 at approximately STA 4+25, then up again to Elev. 824 at approximately STA 12+25. The subject area generally drains to the northeast to two existing wetland systems. The average slope of the Site (as previously defined) is approximately eight percent (8%), and there is approximately one-hundred twenty-eight feet (128') of vertical relief between the Site apex and the low-lying wetlands.

The following subsurface information was obtained from GZA's October 8, 2021 "Geotechnical Engineering Report" for the proposed access road:

- Surficial Materials to a depth of approximately 0 to 2 feet consisted of very loose to loose relative density, surficial Forest Mat, Topsoil, and/or Subsoil predominantly sand with varying silt, gravel, and organic content (USCS: SM, OL).
- Sand and Gravel glacial deposits immediately beneath the surficial materials consisting of medium to very dense relative density, fine to coarse Sand with 10% to 50+% gravel, and 5% to 30% Silt (USCS: SM, SP-SM, SW-SM, GM) with cobbles and/or boulders. Based on gradation testing, the D10 of the tested Sand and Gravel samples varied between approximately 0.01 and 0.06 mm.
- Bedrock or possible bedrock immediately beneath the Sand and Gravel at depths ranging from 7.5 to 33 feet bgs.

Based on a review of the United States Department of Agriculture (USDA) Soil Survey of Worcester County, Massachusetts (Southern Part), on-site soils are Whitman fine sandy loam (73A) and Canton fine sandy loam (420 B, 422B, 422C). The USDA defines groups of soils into Hydrologic Soil Groups (HSG) according to their runoff-producing characteristics. Soils are assigned to four groups (A, B, C, and D). Group A soils have a high rate of infiltration and therefore a low runoff potential. They typically



are deep, well drained, and sandy or gravelly. In Group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They may have a hardpan or clay layer at or near the surface, or have a permanent high water table, or are shallow over nearly impervious bedrock or other nearly impervious material. The on-site soils have an HSG classification of:

- Whitman fine sandy loam (73A) D
- Canton fine sandy loam (420B, 422B, 422C) B

See Figure 2: Soils Map

## 2.0 STORMWATER MANAGEMENT STANDARDS

### 2.1 STANDARD #1 NO NEW UNTREATED DISCHARGES

The Massachusetts Department of Environmental Protection's Stormwater Management Standards (SMS) state that "No new Stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth." Stormwater is considered to be treated when Standards 2 through 9 are met. The project complies with standards 2 through 9 and will not discharge untreated stormwater.

### 2.2 STANDARD #2 PEAK RATE ATTENUATION

To meet Standard #2, stormwater controls must be developed for the 2-year and 10-year 24-hour storm events. In addition, the 100-year 24-hour storm must be evaluated, and the applicant must demonstrate that there will be no increased flooding impact offsite. The potential stormwater impacts of this project were evaluated for the 2-year, 10-year, and 100-year 24-hour storm events. Peak stormwater flows for the indicated recurrence intervals were computed using HydroCAD® (a proprietary stormwater modeling program) for each of the sub-catchment areas within the proposed Project Site under both pre- and post-development conditions. The resulting calculations demonstrate that the subject Project does not increase peak flow rates for the 2-year, 10-year, and 100-year 24-hour storm events (Ref. Appendix A, Appendix B, and Table 7).

To determine the peak flow rates, the following information provided in Tables 1 & 2, and the hydrologic parameters of each subcatchment under pre- and post-development conditions are required:

**Table 1: 24-hour Rainfall Depths**

24-Hour Rainfall (in)			
Design Storm / Recurrence Interval	2-Year	10-Year	100-Year
Precipitation (inches)	3.15	4.90	7.67

Rainfall depths were derived from Atlas 14 published by the National Oceanographic and Atmospheric Administration (NOAA).



**Table 2: Pre- and Post-Development Runoff Curve Numbers (RCN)**

Land Use	Hydrologic Soil Group	RCN
>75% Grass Cover, Good	B	61
Brush, Fair	B	56
Crushed Stone	B	62
Gravel surface	B	96
Meadow, non-grazed	B	58
Paved parking	B	98
Porous Pavement	B	55
Riprap	B	50
Roofs	B	98
Woods, Good	B	55
Woods, Good	D	77

The computation of the runoff curve number is based on a combination of soil type and land use. The land use categories and corresponding RCNs listed in Table 2 were identified for use in computing the pre- and post-development runoff from the Site.

#### 2.2.1 Pre-Development Conditions

The existing conditions (pre-development) stormwater evaluation separates the subject property into three (3) subcatchments totaling approximately 26.8 acres, each draining to one of two (2) Design Points (see Figure 3: Existing Conditions Drainage Map). The locations of the Design Points are as follows:

- DP-1: The existing wetland east of the transmission right-of-way (Wetland W-GR-1).
- DP-2: The existing wetland north of the transmission right-of way (Wetland W-GR-2).

Subcatchment E-1 is comprised of a section of the existing transmission right-of-way and represents the portion of the Site draining directly to Wetland W-GR-1. Subcatchment E-2 is located to the north and west of Subcatchment E-1, and includes portions of the transmission right-of-way, and a section of the existing photovoltaic facility. This subcatchment drains to the northeast to Wetland W-GR-2. Subcatchment E-3 represents the western portion of the Site and is a combination of the photovoltaic facility with associated access drive, and the wooded area surrounding the photovoltaic facility. This subcatchment drains to Wetland W-GR-4 before continuing to drain overland to Design Point DP-1.

The times of concentration were determined based on a variety of flow paths. In general, typical flow paths consisted of sheet flow, followed by shallow concentrated flow, and channelized flow discharging to the Design Point. The aforementioned flow path is the longest hydrologic path within the subcatchment. The times of concentration calculations are provided in the attached drainage computations (Ref. Appendix A).

The results of the stormwater management pre-development analysis are summarized in the following Tables 3 and 4:



**Table 3: Pre-Development Hydrologic Parameters**

Design Area	Drainage Areas, Square Feet	Weighted Runoff Curve No.	Time of Concentration, Min.
Subcatchment E-1	294,990	56	15.3
Subcatchment E-2	372,115	59	12.9
Subcatchment E-3	501,975	57	18.7
Total	1,169,080		

Ref. Appendix A and Figure 3: Existing Conditions Drainage Map

**Table 4: Pre-Development Peak Flow Rates per Storm Event**

Design Point	Peak Flow Rates: 24-hour Storm Event (cfs)		
	2-Year	10-Year	100-Year
DP-1	2.04	12.54	39.06
DP-2	1.50	8.11	23.01

Ref. Appendix A

## 2.2.2 Post-Development Conditions

The proposed (post-development) watershed is approximately 27.4 acres and drains to the same two Design Points used in the pre-development analysis. As in the pre-development analysis, the contributing watershed was divided into three (3) subcatchments draining to one of the two (2) Design Points as described in pre-development analysis.

Subcatchment P-1 drains to Design Point DP-1 and includes 780 linear feet of the proposed 20-ft wide paved access driveway from Stafford Street to the proposed substation. Additionally, Subcatchment P-1 includes the riprap-armored slopes adjacent to the access driveway, and the grassed area southwest of the substation's fenced enclosure. Subcatchment P-2 is comprised of the proposed substation yard, 9,100 SF control building, and proposed loop access/circulation drive. Subcatchment P-2 drains to Design Point DP-2. Lastly, Subcatchment P-3 remains largely unchanged from pre-development conditions apart from a slight reduction (2,675 SF) in drainage area due to proposed grading. Subcatchment P-3 drains to Wetland W-GR-4 before draining through the proposed 36-inch diameter CMP culvert beneath the proposed access drive and continuing to drain to Design Point DP-1.

The times of concentration for the proposed subcatchments were determined based on a variety of flow paths. In general, the typical flow path was similar, and in some cases identical, to that used in the existing conditions analysis (i.e., sheet flow followed by shallow concentrated flow, and then channelized flow). Time of concentration calculations are provided in the attached drainage computations (Ref. Appendix B).

The results of the stormwater management post-development analysis are summarized in the following Tables 5 and 6:



**Table 5: Post-Development Hydrologic Parameters**

Design Area	Drainage Areas, Square Feet	Weighted Runoff Curve No.	Time of Concentration, Min.
Subcatchment P-1	319,875	56	22.1
Subcatchment P-2	376,155	60	25.3
Subcatchment P-3	499,300	57	18.7
Total	1,195,330		

Ref. Appendix B and Figure 4: Proposed Conditions Drainage Map

**Table 6: Post-Development Peak Flow Rates per Storm Event**

Design Point	Peak Flow Rates: 24-hour Storm Event (cfs)		
	2-Year	10-Year	100-Year
DP-1	2.03	12.41	38.49
DP-2	1.50	6.80	18.62

Ref. Appendix B

The following Table 7 summarizes the Pre- and Post-Development conditions for the proposed project.

**Table 7: Summary of Peak Flow Rates (cfs) per Storm Event**

Storm Event	DP-1		DP-2	
	Pre-	Post-	Pre-	Post-
2-Year	2.04	2.03	1.50	1.50
10-Year	12.54	12.41	8.11	6.80
100-Year	39.06	38.49	23.01	18.62

## 2.3 STANDARD #3 GROUNDWATER RECHARGE

In accordance with the MassDEP Stormwater Management Standards (SMS), the Required Recharge Volume for infiltration to groundwater must be provided for the HSG "A", "B", "C", and "D" type soils equal to 0.60", 0.35", 0.25" and 0.10" of runoff, respectively, over the total impervious area of the proposed development. In other terms, the SMS require a volume of stormwater to be recharged as a function of impervious area.

**Table 8: Recharge to Groundwater**

Required Recharge to Groundwater (C.F.)	Proposed Recharge to Groundwater (C.F.)
1,310	8,930

Refer to Appendix C for calculations and test boring logs.



The proposed recharge volume is provided in the reservoir course of the proposed porous pavement, the storage volume of the crushed stone yard, and in the storage volume of the proposed infiltration basins.

## 2.4 STANDARD #4 WATER QUALITY

The MassDEP SMS require the applicant to remove at least 80% of the total suspended solids (TSS) contained in the stormwater runoff draining from the proposed site to wetland resource areas. The BMPs proposed for this Project are two small infiltration basins and porous pavement (see Appendix D for TSS Removal Worksheets). These BMPs are sized based on a water quality volume determined by multiplying 1 inch of runoff by the total impervious area of the post-development Project Site (Ref. Appendix D).

## 2.5 STANDARD #5 LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLS)

The proposed Stafford Street Substation is not subject to this requirement, as an electrical substation is not a land use with higher potential pollutant loads, as defined by the MassDEP Stormwater Management Standards.

## 2.6 STANDARD #6 CRITICAL AREAS

The MassDEP SMS require the applicant to treat 1.0 inches of runoff for projects that are located within a "Critical Area," a term that includes Outstanding Resource Waters (ORWs), shellfish beds, swimming beaches, cold water fisheries, or a recharge area for public water supplies. It is our understanding that the Site and its immediate environs do not include any "Critical Areas" as described under the MassDEP Stormwater Management Standards.

## 2.7 STANDARD #7 REDEVELOPMENT

This Project is not being treated as a redevelopment project; therefore, all the stormwater management standards apply.

## 2.8 STANDARD #8 CONSTRUCTION PERIOD SEDIMENT AND EROSION CONTROL

A Sediment and Erosion Control Plan has been prepared for this Project and is included in the Project plans attached. The Project is likely to disturb 1 acre or greater of land; thus, will be subject to the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities (CGP). A Stormwater Pollution Prevention Plan (SWPPP) in accordance with the requirements of the NPDES CGP will be prepared for this Project as needed and will be submitted to the Leicester Conservation Commission prior to the initiation of land disturbance associated with construction of the stormwater management system.

The Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan information provided below includes the minimum requirements for satisfying Standard #8 and will be incorporated into the SWPPP.

Parties Responsible for Implementing the Construction Period Sediment and Erosion Control Plan:

- National Grid



The construction phase of the proposed project requires the installation of erosion and sediment controls and their maintenance. During the construction phase the following major activities and their sequence in the construction phase will be as follows:

1. Mobilization.
2. Installation of construction entrance.
3. Installation of temporary erosion control measures.
4. Removal and stockpiling of topsoil.
5. Rough grading per construction plans.
6. Installation of storm drainage features.
7. Final grading followed by loam and seeding with general landscaping.
8. Removal of temporary erosion controls upon final stabilization of disturbed areas.

In the following practices, the specified activities and controls are minimums only. They should be increased as needed to ensure proper functioning and that their intent to control erosion and sedimentation is met.

Specific controls and practices include:

1. Erosion Control Barrier and inlet protection.
2. Temporary Stabilization - Soil stockpiles which remain in place for at least 6 months shall be stabilized with temporary seed and mulch no later than 30 days from the last construction activity in that area.
3. Construction Entrance - A stabilized construction entrance shall be installed at all points of access to the site utilized by construction related traffic to help reduce vehicle tracking of sediments onto adjacent streets. Paved streets adjacent to the site entrance(s) will be swept weekly to remove any excess mud, dirt, or rock tracked from the site.
4. Permanent Stabilization - Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seeding no later than 14 days after the last construction activity. The permanent seed mix shall be in accordance with the design plans.
5. Trench Dewatering Activities and Line Flushing Discharge Analysis Points – All water discharges shall be directed into fiber mats, netting, rip rap or naturally occurring ground cover to minimize erosion.

Miscellaneous other Controls:

1. Waste Materials - All waste will be collected and stored in a securely covered metal dumpster as provided from a licensed solid waste management company. The dumpster shall meet all local and state regulations. The dumpster will be emptied as necessary. No construction waste materials shall be buried on-site.
2. Hazardous Waste - All hazardous waste materials will be disposed of in a manner specified by local or state regulations or by the manufacturer.
3. Sanitary Waste - All sanitary waste will be collected from the portable units as required by local regulation.

Maintenance and Inspections during Construction:

The following are the minimum requirements for maintenance and inspection of the above controls to ensure they are functioning as intended and to ensure that additional measures are installed, if and when the need arises.

1. All control measures will be inspected at least once each week and following any storm event of 0.5 inches or greater.
2. All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report. Sufficient stockpiles of erosion control material shall be kept on-site in reserve in the event that immediate repair is required.





3. Accumulated sediment will be removed from perimeter erosion controls when it has reached one-third the height of the control.
4. Perimeter erosion controls will be inspected for depth of sediment, tears, gaps, etc., to see if the controls are secure and properly installed.
5. Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth until fully established.

## 2.9 STANDARD #9 OPERATION AND MAINTENANCE PLAN

The operation and maintenance plan (O&M Plan) that follows is to ensure that the criteria of the MassDEP Stormwater Management Standards are met after construction is completed.

The Party Responsible for Inspection and Maintenance: National Grid

### 2.9.1 Sediment Forebays

The sediment forebays will be inspected monthly, and the accumulated sediment removed as necessary.

### 2.9.2 Infiltration Basin

The infiltration basin will be inspected at least twice per year. The inspection will include looking for signs of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, and sediment accumulation. Accumulated trash will be removed from the basin during inspection. Sediment will be removed from the basin as necessary, using light equipment when the basin bottom is thoroughly dry, so as not to compact the underlying soil.

### 2.9.3 Porous Pavement

Signs identifying porous pavement areas will be posted. The porous pavement will be inspected no less than quarterly for evidence of sediment accumulation, ponding, or other indications of insufficient infiltration. Excessive sediment from vehicle tracking, run-on, etc., will be removed as needed using pavement vacuum methods annually in the spring following the last snow melt. Excessive leaves will be removed by vacuum or blower annually in the fall following leaf drop and prior to the first significant snow fall and long duration freezing. Snow will not be stockpiled on porous pavement. Road salt will be applied for traction control in winter months in lieu of sand. Sand or other non-soluble traction enhancement materials will not be applied to the areas of porous pavement. Adjacent landscaped areas will be kept well maintained to prevent soil from being transported onto the pavement. The paving surface will be monitored regularly to confirm it drains properly during and after storms. The porous pavement will never be resealed or repaved with impermeable materials. The surface will be inspected annually for deterioration or spalling.

## 2.10 STANDARD #10 ILLICIT DISCHARGES

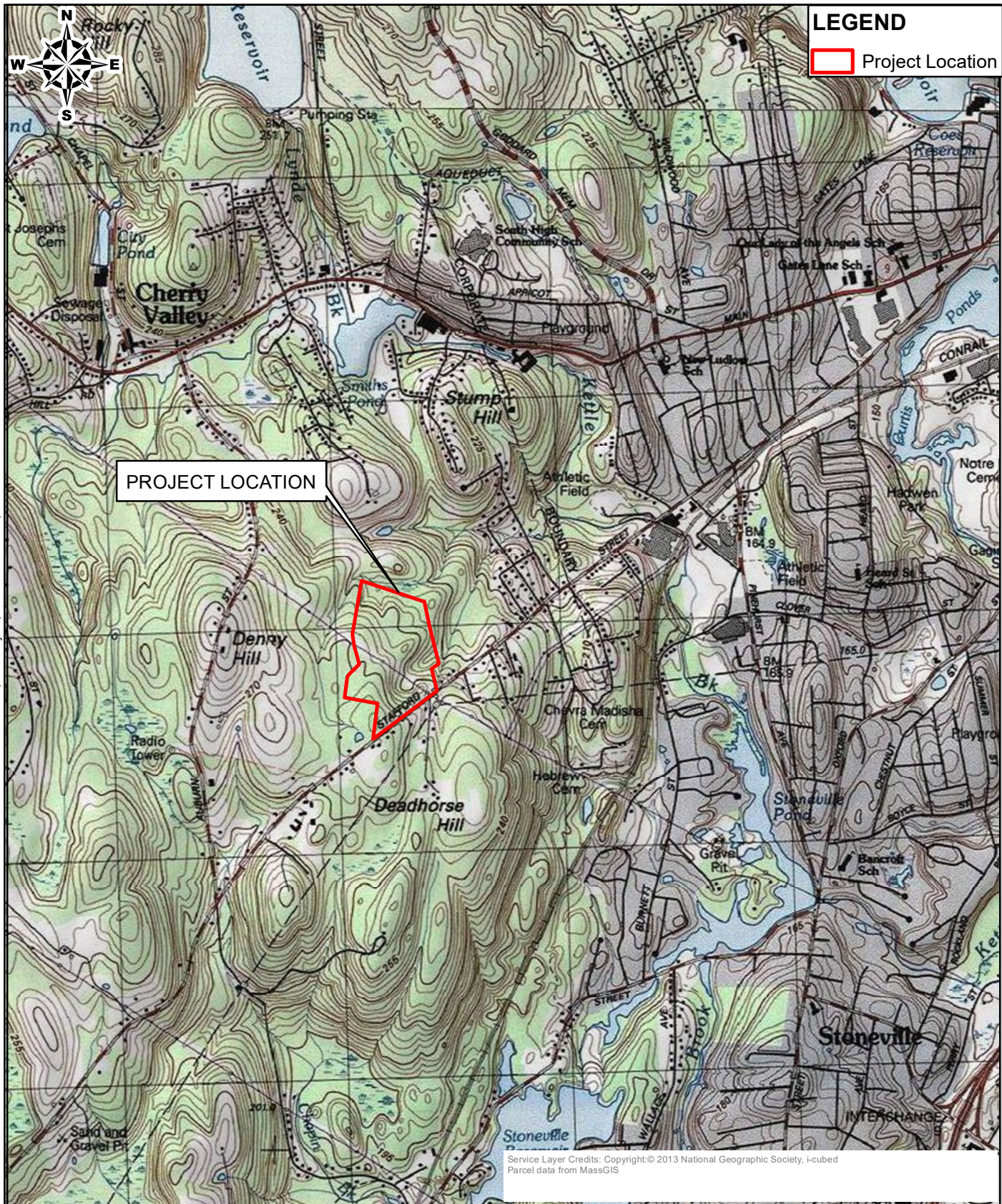
No Illicit Discharge Compliance Statement is attached; however, one will be submitted to the Leicester Conservation Commission prior to the discharge of any stormwater to post-development best management practices. Once provided, the Illicit Discharge Compliance Statement can be inserted into this document under Appendix F.



## Figures



© 2022 - GZA GeoEnvironmental, Inc. J:\0 166800 - 0 166899\15.0166857 00 NGRID Stafford Street Substation\GIS\mxd\857.00 Locus.mxd, February 23, 2022 - 9:16:28 AM, Cora Ottaviani



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**NGRID STAFFORD STREET SUBSTATION**  
408 STAFFORD ST  
LEICESTER, MA 01611

**LOCUS MAP**

PREPARED BY:



**GZA GeoEnvironmental, Inc.**  
Engineers and Scientists  
[www.gza.com](http://www.gza.com)

PREPARED FOR:

**NATIONAL GRID**  
40 SYLVAN RD  
WALTHAM, MA 02451

PROJ MGR:

STD

REVIEWED BY:

GRM

CHECKED BY:

TEJ

**FIGURE**

DESIGNED BY:

CCO

DRAWN BY:

CCO

SCALE:

1 in = 2,000 ft

**1**

DATE:

02/23/2022

PROJECT NO:

15.0166857.00

REVISION NO:





## LEGEND

- Project Location
- Soil Map Units

PROJECT LOCATION

73A

73A

422C

422B

420B

Soil Map Unit	Soil Name
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony
420B	Canton fine sandy loam, 3 to 8 percent slopes

Service Layer Credits:  
Soils data from U.S. Department of Agriculture, Natural Resources Conservation Service  
Parcel data from MassGIS

0 150 300 600

SCALE IN FEET

NGRID STAFFORD STREET SUBSTATION  
408 STAFFORD ST  
LEICESTER, MA 01611

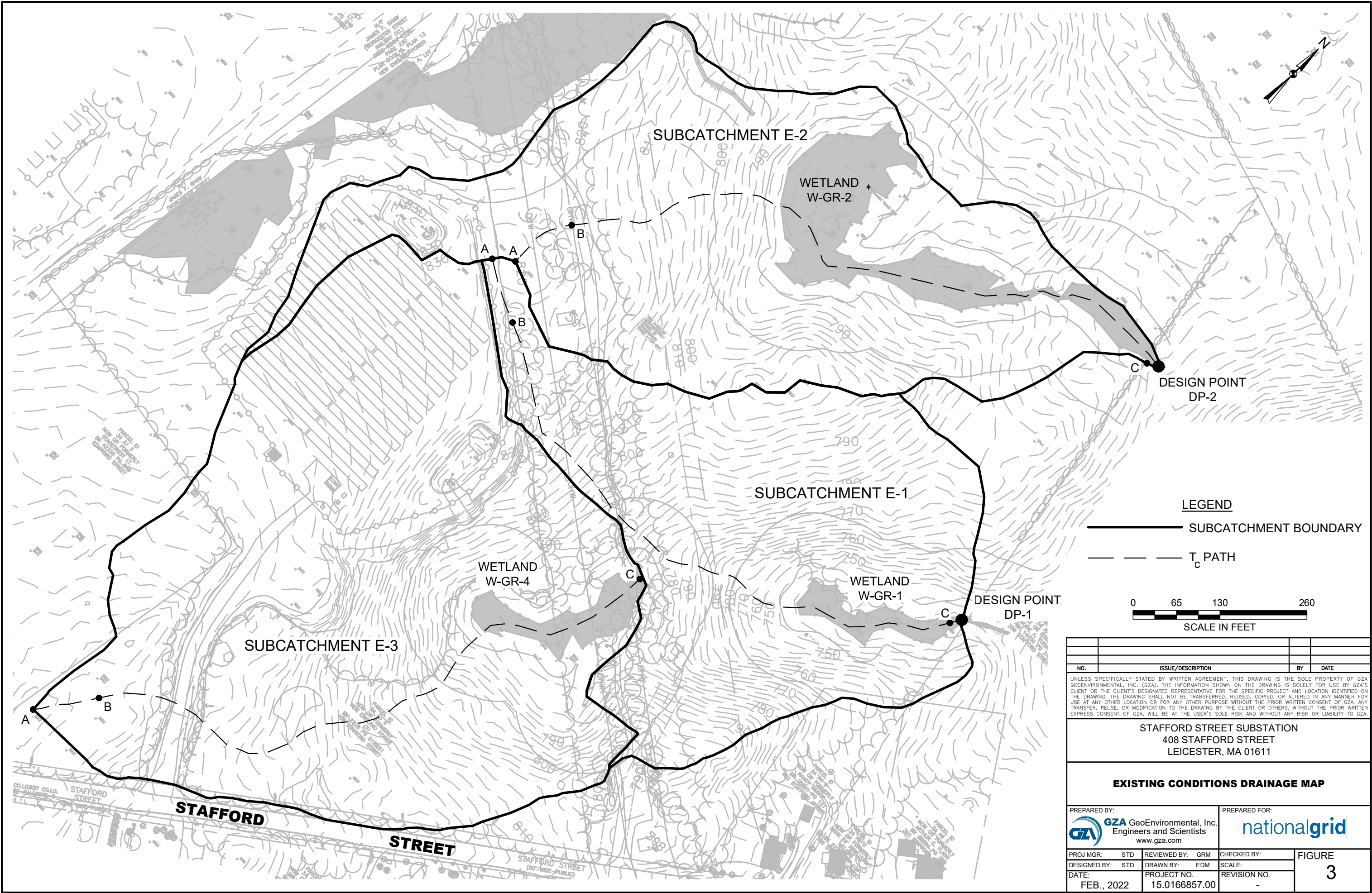
PREPARED BY:  
 **GZA GeoEnvironmental, Inc.**  
Engineers and Scientists  
[www.gza.com](http://www.gza.com)

PREPARED FOR:  
NATIONAL GRID  
40 SYLVAN RD  
WALTHAM, MA 02451

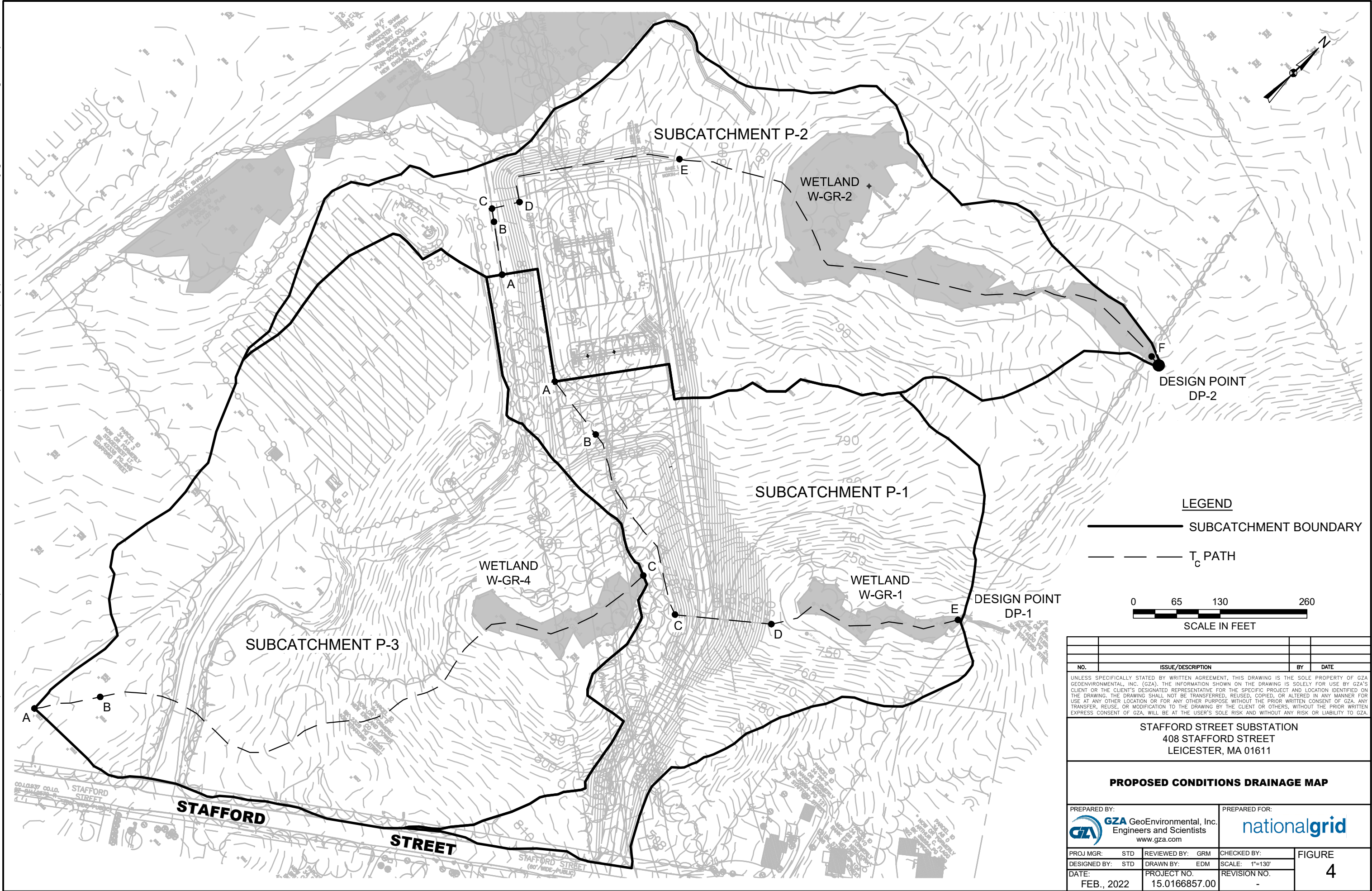
## SOILS MAP

PROJ MGR: STD	REVIEWED BY: GRM	CHECKED BY: TEJ	FIGURE <b>2</b>
DESIGNED BY: CCO	DRAWN BY: CCO	SCALE: 1 in = 300 ft	
DATE: 02/23/2022	PROJECT NO: 15.0166857.00	REVISION NO:	

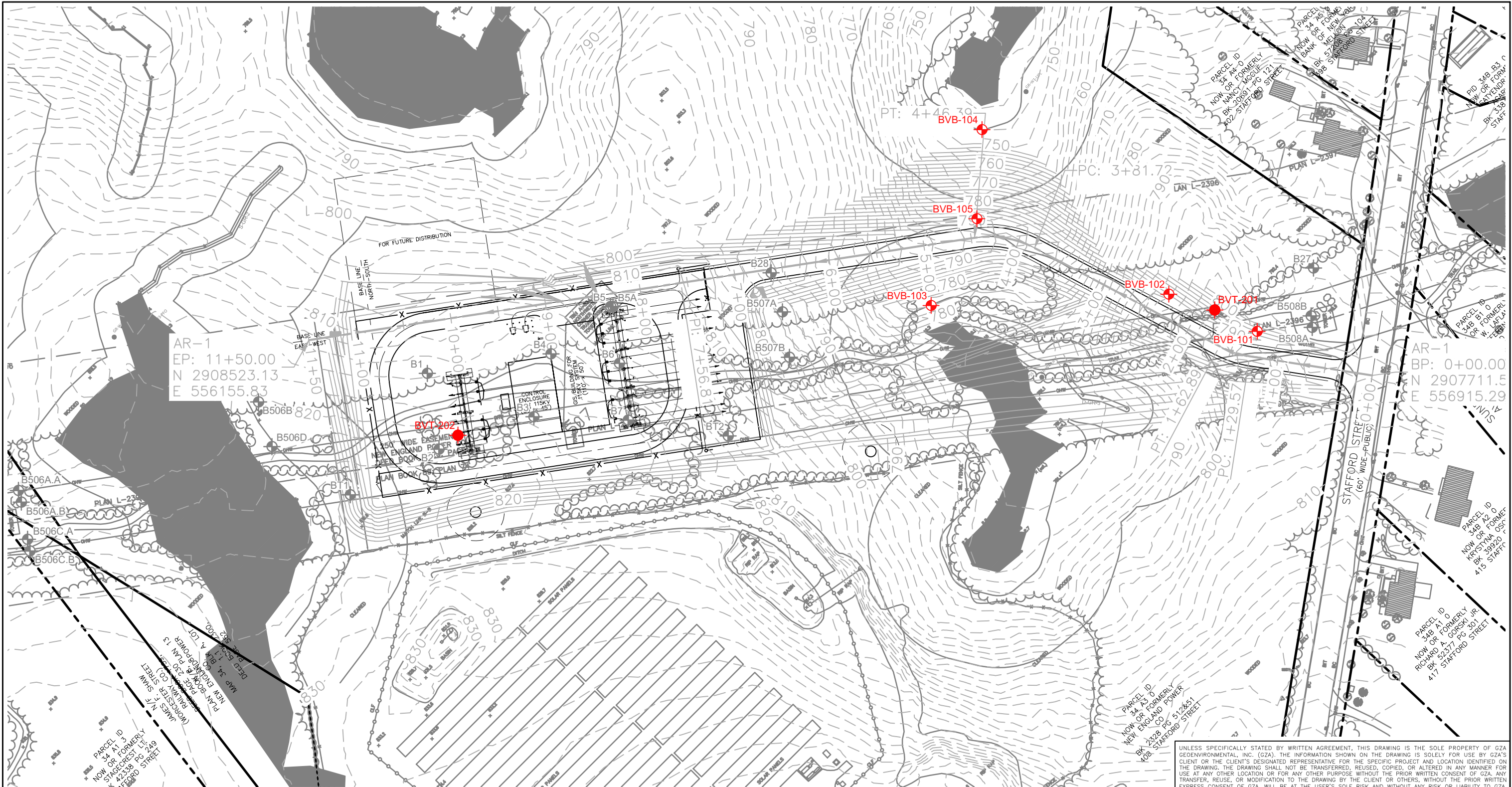












## LEGEND

- BVB-101** APPROXIMATE GZA BORING LOCATIONS AND DESIGNATION.
- BVT-201** APPROXIMATE GZA PROBE LOCATIONS AND DESIGNATION.
- B1** APPROXIMATE CDM SMITH BORING LOCATIONS AND DESIGNATION.

## SOURCE:

1. THE BASE PLAN WAS DEVELOPED FROM AUTOCAD ELECTRONIC BASE PLAN "GRADING & DRAINING PLAN" PROVIDED BY NATIONAL GRID DATED 2/7/19.
2. B AND BT SERIES BORINGS WERE PERFORMED BY CRAWFORD DRILLING SERVICES, LLC OF GARDNER, MASSACHUSETTS DURING THE PERIOD FROM FEBRUARY 3, 2021 TO APRIL 22, 2021 AND WERE OBSERVED AND LOGGED BY CDM SMITH.
3. BORINGS BVB-101 THROUGH BVB-105 AND PROBES BVT-201 THROUGH BVT-202 WERE

PERFORMED BY DRILEX ENVIRONMENTAL OF AUBURN, MASSACHUSETTS DURING THE PERIOD FROM AUGUST 30, 2021 TO SEPTEMBER 1, 2021 AND WERE OBSERVED AND LOGGED BY GZA.

4. GZA BORING LOCATIONS WERE STAKED IN THE FIELD BY TAUPER SURVEY AS NOTED ON "BORING STACKING, A-127 & B-128 LINES, LEICESTER TO AUBURN, MASSACHUSETTS", DATED JUNE 17, 2021. TEST BORINGS WERE COMPLETED WITHIN APPROXIMATELY 1-FOOT OF THE STAKED LOCATIONS.





0 50 100 200  
SCALE IN FEET

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NATIONAL GRID  
STAFFORD STREET SUBSTATION ACCESS ROAD  
408 STAFFORD STREET, LEICESTER, MASSACHUSETTS

## EXPLORATION LOCATION PLAN

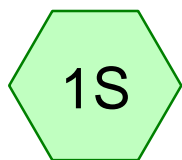
PREPARED BY:  <b>GZA</b> GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: 	
PROJ MGR: JTS	REVIEWED BY: JTS	CHECKED BY: GRM	FIGURE  5
DESIGNED BY: JYS	DRAWN BY: AJP	SCALE: AS SHOWN	
DATE: SEPTEMBER 2021	PROJECT NO. 04.0191281.00	REVISION NO. -	



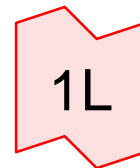


## **Appendix A**

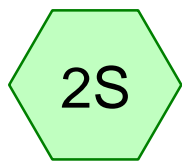
### **Pre-Development 2-, 10-, & 100-Year 24-Hour Storm Event Calculations**



SUBCATCHMENT E-1



DESIGN POINT 1



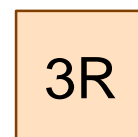
SUBCATCHMENT E-2



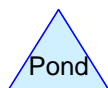
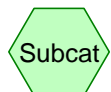
DESIGN POINT 2



SUBCATCHMENT E-3



HYDRAULIC  
CONNECTION



**Routing Diagram for NGRID - Stafford St (Pre-Development)**

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## **NGRID - Stafford St (Pre-Development)**

Prepared by GZA, Inc.

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Page 2

### **Project Notes**

Rainfall events imported from "Atlas-14-Rain.txt" for 6691 MD Worcester South

Rainfall events imported from "Atlas-14-Rain.txt" for 6682 MA Worcester South

## NGRID - Stafford St (Pre-Development)

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Page 3

### Rainfall Events Listing

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	3.15	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.90	2
3	100-Year	Type III 24-hr		Default	24.00	1	7.67	2

## NGRID - Stafford St (Pre-Development)

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Page 4

### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.258	56	Brush, Fair, HSG B (1S, 2S, 3S)
0.496	96	Gravel surface, HSG B (1S, 2S, 3S)
3.477	58	Meadow, non-grazed, HSG B (2S, 3S)
16.109	55	Woods, Good, HSG B (1S, 2S, 3S)
1.499	77	Woods, Good, HSG D (1S, 2S, 3S)
<b>26.838</b>	<b>58</b>	<b>TOTAL AREA</b>

## NGRID - Stafford St (Pre-Development)

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Page 5

### Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
25.339	HSG B	1S, 2S, 3S
0.000	HSG C	
1.499	HSG D	1S, 2S, 3S
0.000	Other	
<b>26.838</b>		<b>TOTAL AREA</b>

**NGRID - Stafford St (Pre-Development)**

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Page 6

**Ground Covers (all nodes)**

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	5.258	0.000	0.000	0.000	5.258	Brush, Fair	1S, 2S, 3S
0.000	0.496	0.000	0.000	0.000	0.496	Gravel surface	1S, 2S, 3S
0.000	3.477	0.000	0.000	0.000	3.477	Meadow, non-grazed	2S, 3S
0.000	16.109	0.000	1.499	0.000	17.609	Woods, Good	1S, 2S, 3S
<b>0.000</b>	<b>25.339</b>	<b>0.000</b>	<b>1.499</b>	<b>0.000</b>	<b>26.838</b>	<b>TOTAL AREA</b>	



**NGRID - Stafford St (Pre-Development)**

Type III 24-hr 2-Year Rainfall=3.15"

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Page 7

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: SUBCATCHMENT E-1** Runoff Area=294,990 sf 0.00% Impervious Runoff Depth>0.22"  
Flow Length=1,010' Tc=15.3 min CN=56 Runoff=0.70 cfs 0.125 af

**Subcatchment 2S: SUBCATCHMENT E-2** Runoff Area=372,115 sf 0.00% Impervious Runoff Depth>0.31"  
Flow Length=1,100' Tc=12.9 min CN=59 Runoff=1.50 cfs 0.217 af

**Subcatchment 3S: SUBCATCHMENT E-3** Runoff Area=501,975 sf 0.00% Impervious Runoff Depth>0.25"  
Flow Length=1,140' Tc=18.7 min CN=57 Runoff=1.37 cfs 0.237 af

**Reach 3R: HYDRAULIC CONNECTION** Avg. Flow Depth=0.06' Max Vel=2.28 fps Inflow=1.37 cfs 0.237 af  
n=0.035 L=240.0' S=0.1292 '/' Capacity=170.43 cfs Outflow=1.36 cfs 0.236 af

**Link 1L: DESIGN POINT 1** Inflow=2.04 cfs 0.361 af  
Primary=2.04 cfs 0.361 af

**Link 2L: DESIGN POINT 2** Inflow=1.50 cfs 0.217 af  
Primary=1.50 cfs 0.217 af

**Total Runoff Area = 26.838 ac Runoff Volume = 0.580 af Average Runoff Depth = 0.26"**  
**100.00% Pervious = 26.838 ac 0.00% Impervious = 0.000 ac**

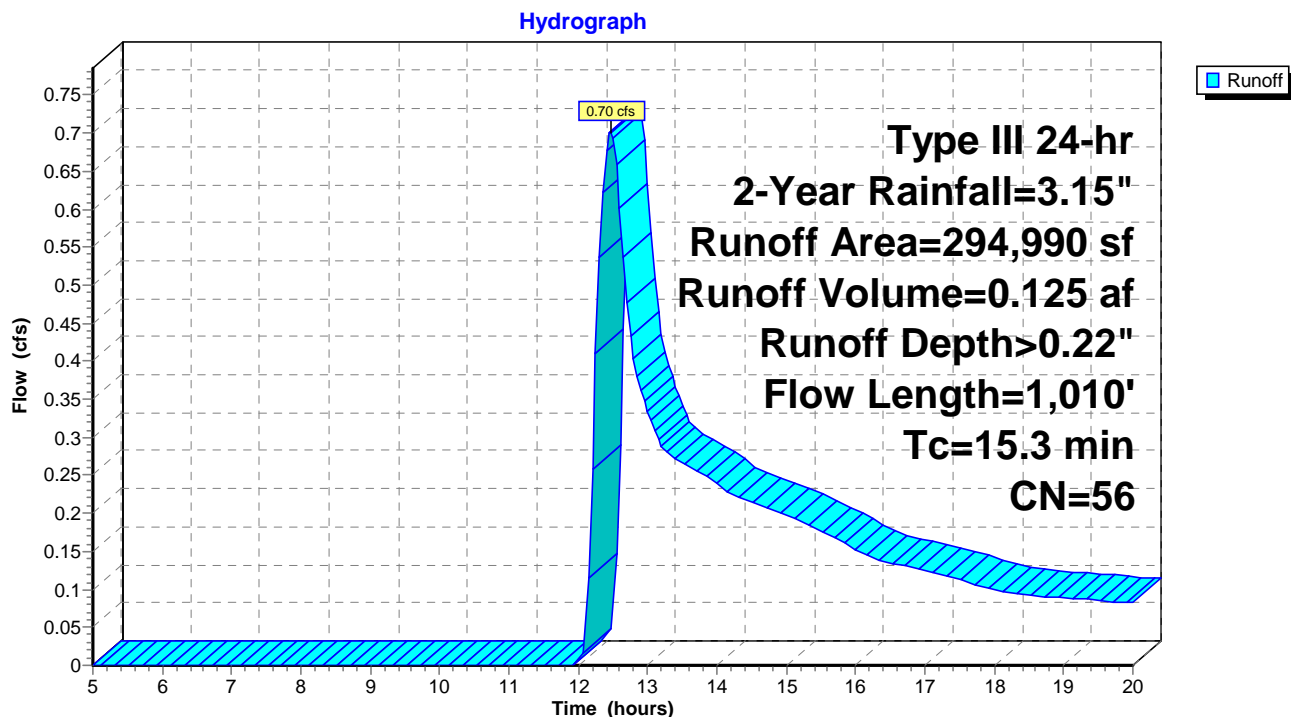
**Summary for Subcatchment 1S: SUBCATCHMENT E-1**

Runoff = 0.70 cfs @ 12.46 hrs, Volume= 0.125 af, Depth&gt; 0.22"

 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
174,595	55	Woods, Good, HSG B
108,745	56	Brush, Fair, HSG B
8,290	77	Woods, Good, HSG D
3,360	96	Gravel surface, HSG B
294,990	56	Weighted Average
294,990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	100	0.0300	0.14		<b>Sheet Flow, Segment AB</b>
					Grass: Dense n= 0.240 P2= 3.15"
3.1	910	0.0900	4.83		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
15.3	1,010	Total			

**Subcatchment 1S: SUBCATCHMENT E-1**


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Type III 24-hr 2-Year Rainfall=3.15"

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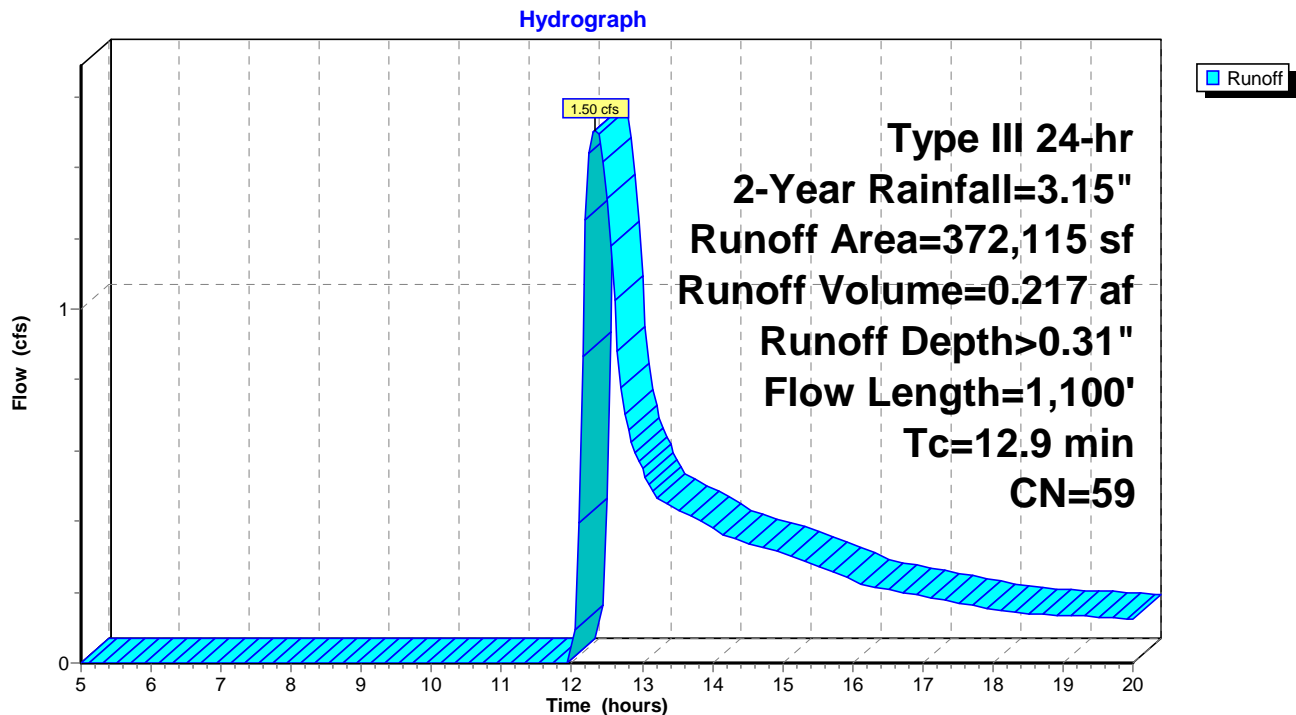
**Summary for Subcatchment 2S: SUBCATCHMENT E-2**

Runoff = 1.50 cfs @ 12.34 hrs, Volume= 0.217 af, Depth&gt; 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
209,885	55	Woods, Good, HSG B
85,305	56	Brush, Fair, HSG B
45,030	77	Woods, Good, HSG D
27,210	58	Meadow, non-grazed, HSG B
4,685	96	Gravel surface, HSG B
372,115	59	Weighted Average
372,115		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0700	0.19		<b>Sheet Flow, Segment AB</b>
					Grass: Dense n= 0.240 P2= 3.15"
4.2	1,000	0.0620	4.01		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
12.9	1,100	Total			

**Subcatchment 2S: SUBCATCHMENT E-2**

**NGRID - Stafford St (Pre-Development)**

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Type III 24-hr 2-Year Rainfall=3.15"

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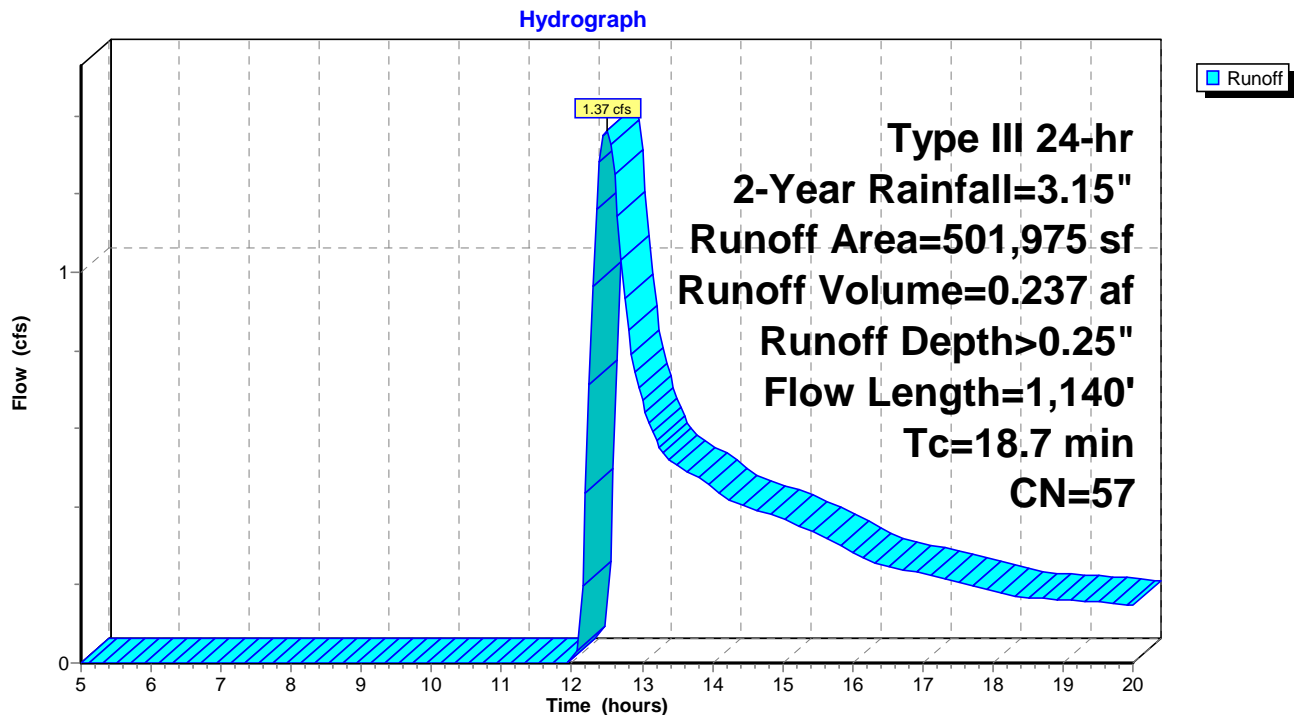
**Summary for Subcatchment 3S: SUBCATCHMENT E-3**

Runoff = 1.37 cfs @ 12.49 hrs, Volume= 0.237 af, Depth&gt; 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
317,240	55	Woods, Good, HSG B
34,970	56	Brush, Fair, HSG B
11,990	77	Woods, Good, HSG D
124,235	58	Meadow, non-grazed, HSG B
13,540	96	Gravel surface, HSG B
501,975	57	Weighted Average
501,975		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		<b>Sheet Flow, Segment AB</b>
					Woods: Light underbrush n= 0.400 P2= 3.15"
3.7	1,040	0.0830	4.64		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
18.7	1,140	Total			

**Subcatchment 3S: SUBCATCHMENT E-3**

### Summary for Reach 3R: HYDRAULIC CONNECTION

Inflow Area = 11.524 ac, 0.00% Impervious, Inflow Depth > 0.25" for 2-Year event  
 Inflow = 1.37 cfs @ 12.49 hrs, Volume= 0.237 af  
 Outflow = 1.36 cfs @ 12.54 hrs, Volume= 0.236 af, Atten= 1%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.28 fps, Min. Travel Time= 1.8 min

Avg. Velocity= 1.30 fps, Avg. Travel Time= 3.1 min

Peak Storage= 143 cf @ 12.51 hrs

Average Depth at Peak Storage= 0.06' , Surface Width= 10.35'

Bank-Full Depth= 1.00' Flow Area= 13.0 sf, Capacity= 170.43 cfs

10.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 3.0 '/' Top Width= 16.00'

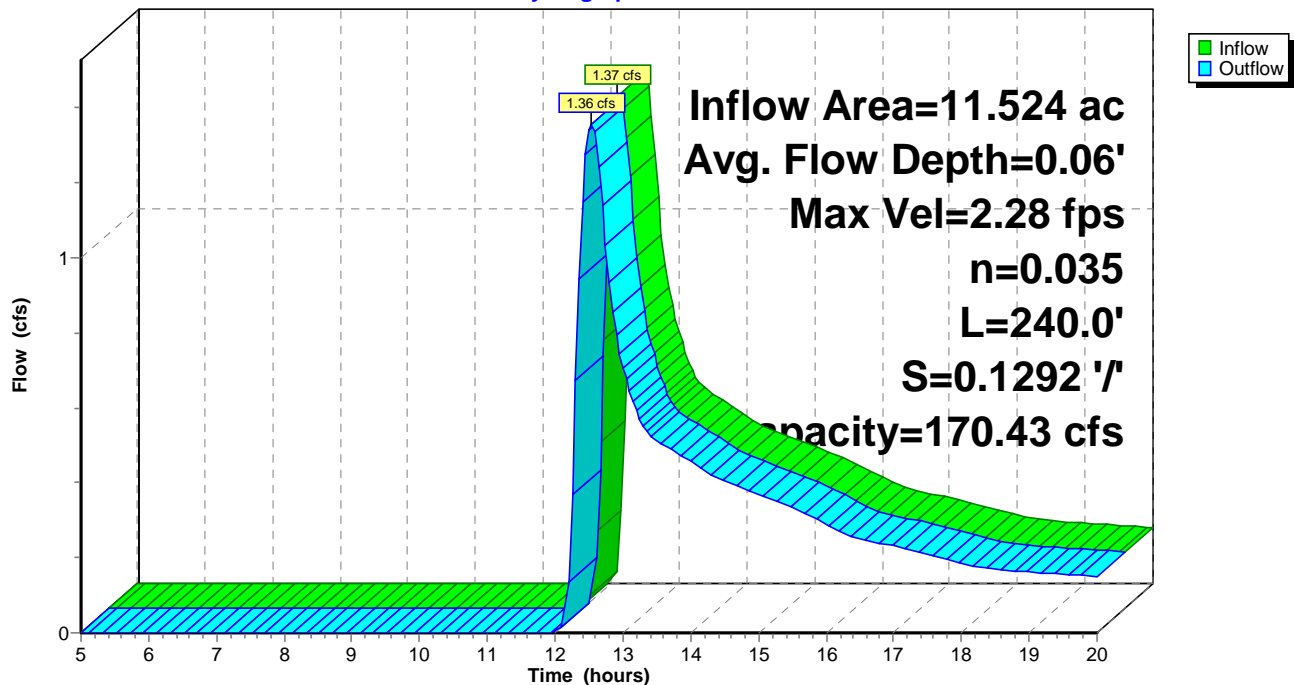
Length= 240.0' Slope= 0.1292 '/'

Inlet Invert= 777.00', Outlet Invert= 746.00'



### Reach 3R: HYDRAULIC CONNECTION

Hydrograph

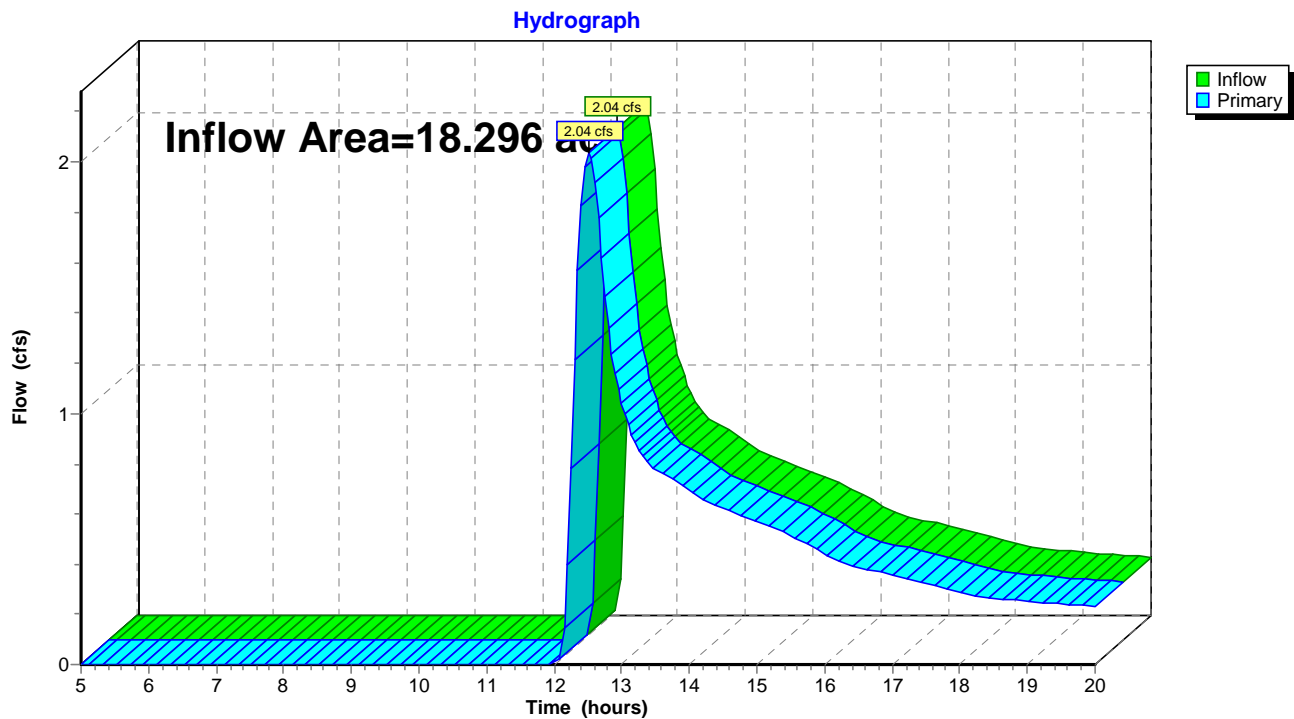


### Summary for Link 1L: DESIGN POINT 1

Inflow Area = 18.296 ac, 0.00% Impervious, Inflow Depth > 0.24" for 2-Year event  
 Inflow = 2.04 cfs @ 12.51 hrs, Volume= 0.361 af  
 Primary = 2.04 cfs @ 12.51 hrs, Volume= 0.361 af, Atten= 0%, Lag= 0.0 min

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

### Link 1L: DESIGN POINT 1

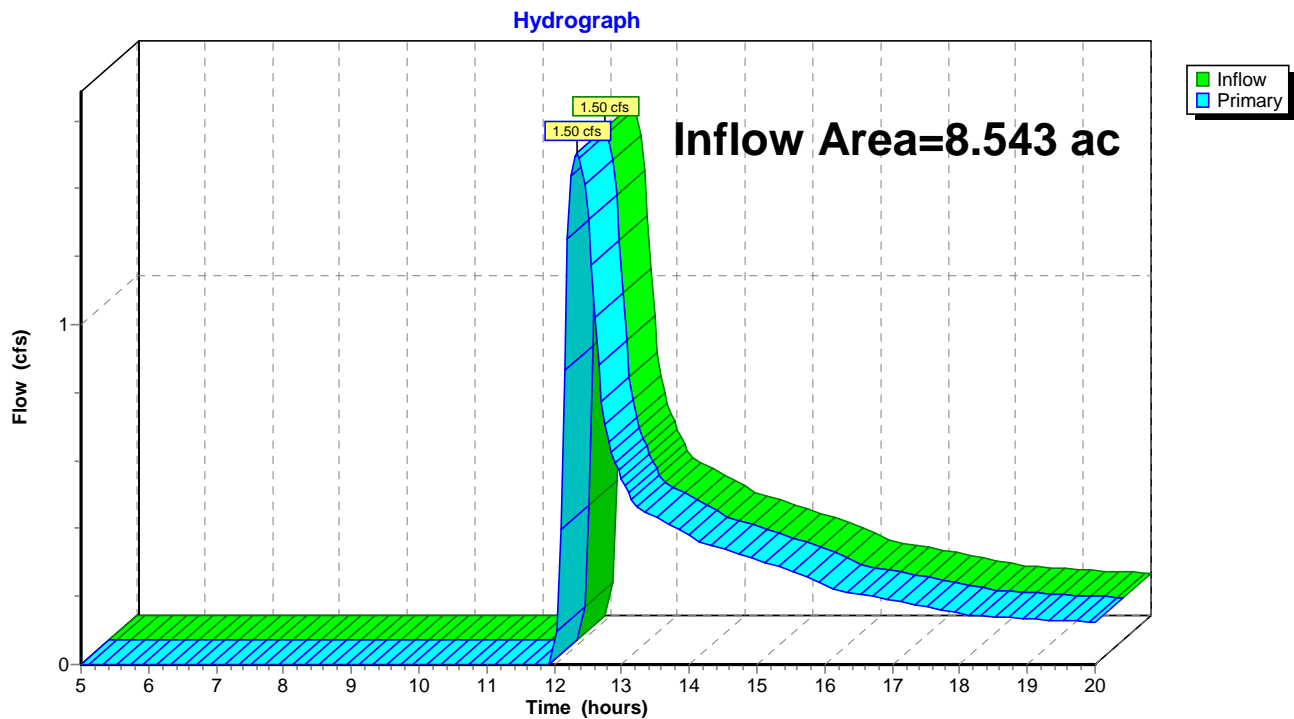


## Summary for Link 2L: DESIGN POINT 2

Inflow Area = 8.543 ac, 0.00% Impervious, Inflow Depth > 0.31" for 2-Year event  
 Inflow = 1.50 cfs @ 12.34 hrs, Volume= 0.217 af  
 Primary = 1.50 cfs @ 12.34 hrs, Volume= 0.217 af, Atten= 0%, Lag= 0.0 min

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

## Link 2L: DESIGN POINT 2





**NGRID - Stafford St (Pre-Development)**

Type III 24-hr 10-Year Rainfall=4.90"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: SUBCATCHMENT E-1** Runoff Area=294,990 sf 0.00% Impervious Runoff Depth>0.88"  
Flow Length=1,010' Tc=15.3 min CN=56 Runoff=4.71 cfs 0.496 af

**Subcatchment 2S: SUBCATCHMENT E-2** Runoff Area=372,115 sf 0.00% Impervious Runoff Depth>1.06"  
Flow Length=1,100' Tc=12.9 min CN=59 Runoff=8.11 cfs 0.752 af

**Subcatchment 3S: SUBCATCHMENT E-3** Runoff Area=501,975 sf 0.00% Impervious Runoff Depth>0.93"  
Flow Length=1,140' Tc=18.7 min CN=57 Runoff=8.13 cfs 0.898 af

**Reach 3R: HYDRAULIC CONNECTION** Avg. Flow Depth=0.17' Max Vel=4.53 fps Inflow=8.13 cfs 0.898 af  
n=0.035 L=240.0' S=0.1292 '/' Capacity=170.43 cfs Outflow=8.06 cfs 0.896 af

**Link 1L: DESIGN POINT 1**

Inflow=12.54 cfs 1.392 af  
Primary=12.54 cfs 1.392 af

**Link 2L: DESIGN POINT 2**

Inflow=8.11 cfs 0.752 af  
Primary=8.11 cfs 0.752 af

**Total Runoff Area = 26.838 ac Runoff Volume = 2.145 af Average Runoff Depth = 0.96"**  
**100.00% Pervious = 26.838 ac 0.00% Impervious = 0.000 ac**

### Summary for Subcatchment 1S: SUBCATCHMENT E-1

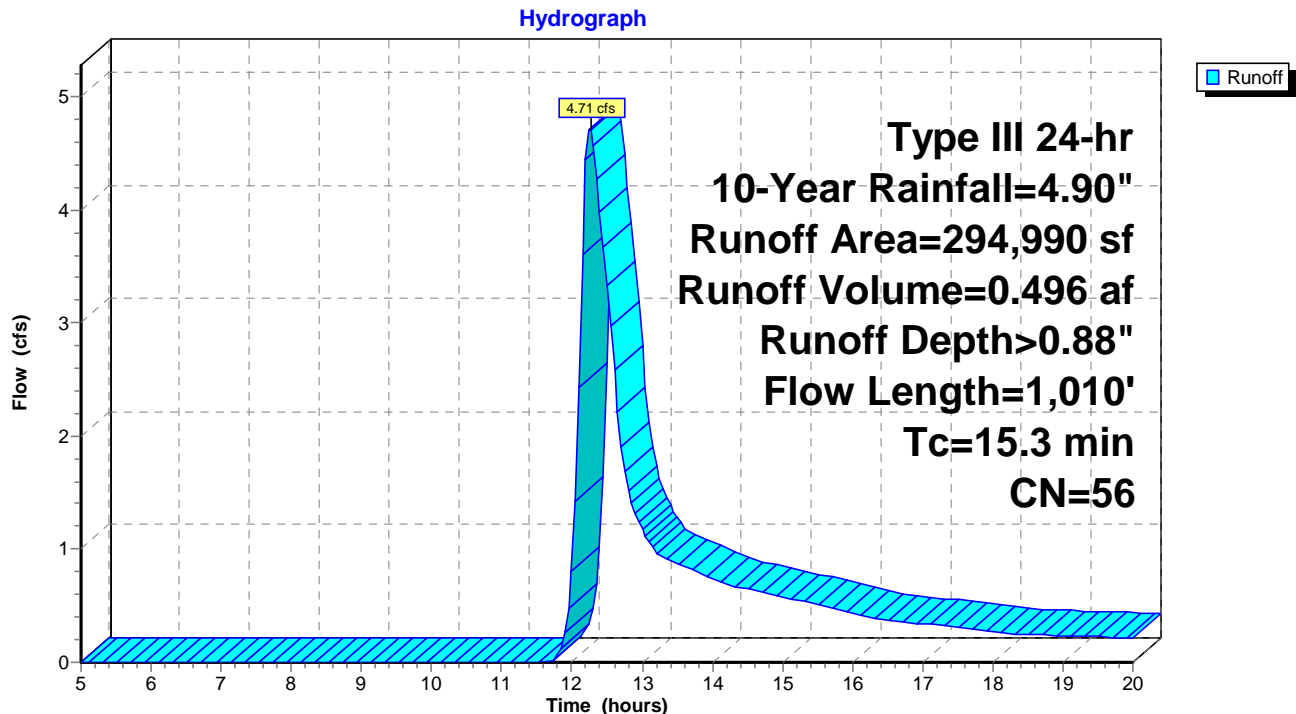
Runoff = 4.71 cfs @ 12.26 hrs, Volume= 0.496 af, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
174,595	55	Woods, Good, HSG B
108,745	56	Brush, Fair, HSG B
8,290	77	Woods, Good, HSG D
3,360	96	Gravel surface, HSG B
294,990	56	Weighted Average
294,990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	100	0.0300	0.14		<b>Sheet Flow, Segment AB</b>
					Grass: Dense n= 0.240 P2= 3.15"
3.1	910	0.0900	4.83		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
15.3	1,010	Total			

### Subcatchment 1S: SUBCATCHMENT E-1



**NGRID - Stafford St (Pre-Development)**

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Type III 24-hr 10-Year Rainfall=4.90"

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**Summary for Subcatchment 2S: SUBCATCHMENT E-2**

Runoff = 8.11 cfs @ 12.21 hrs, Volume= 0.752 af, Depth&gt; 1.06"

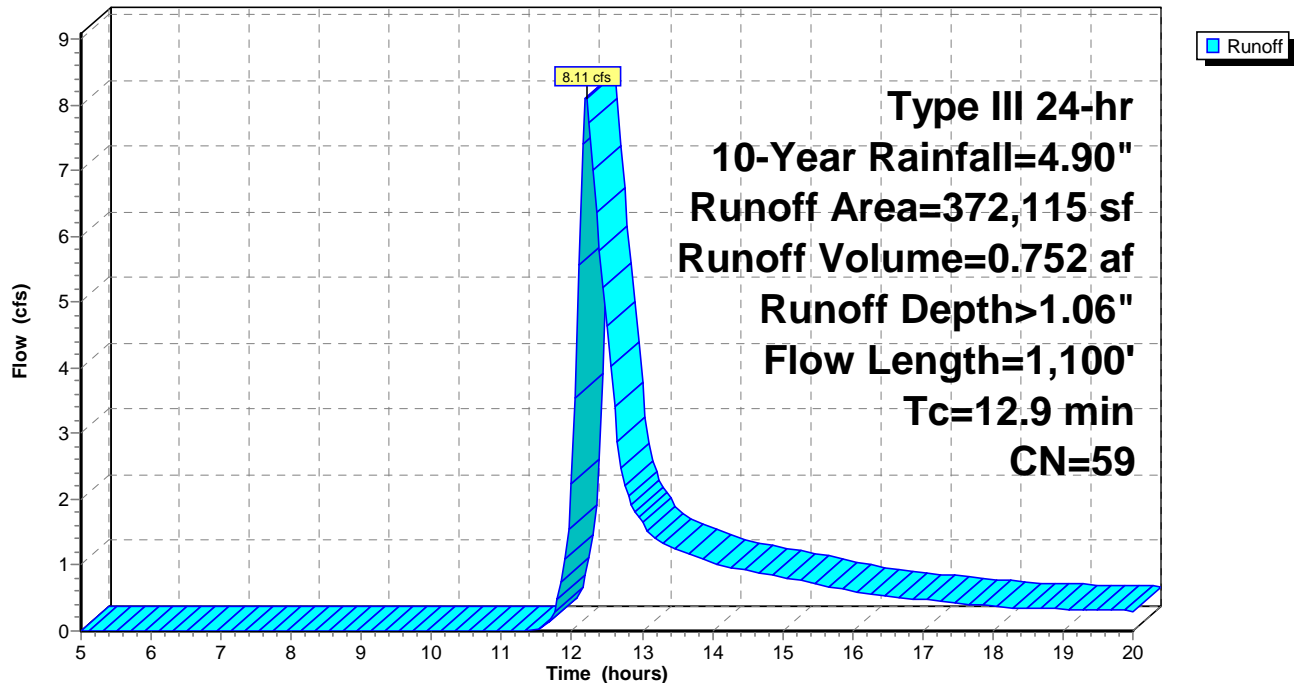
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
209,885	55	Woods, Good, HSG B
85,305	56	Brush, Fair, HSG B
45,030	77	Woods, Good, HSG D
27,210	58	Meadow, non-grazed, HSG B
4,685	96	Gravel surface, HSG B
372,115	59	Weighted Average
372,115		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0700	0.19		<b>Sheet Flow, Segment AB</b>
					Grass: Dense n= 0.240 P2= 3.15"
4.2	1,000	0.0620	4.01		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
12.9	1,100	Total			

**Subcatchment 2S: SUBCATCHMENT E-2**

Hydrograph



**NGRID - Stafford St (Pre-Development)**

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Type III 24-hr 10-Year Rainfall=4.90"

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**Summary for Subcatchment 3S: SUBCATCHMENT E-3**

Runoff = 8.13 cfs @ 12.31 hrs, Volume= 0.898 af, Depth&gt; 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

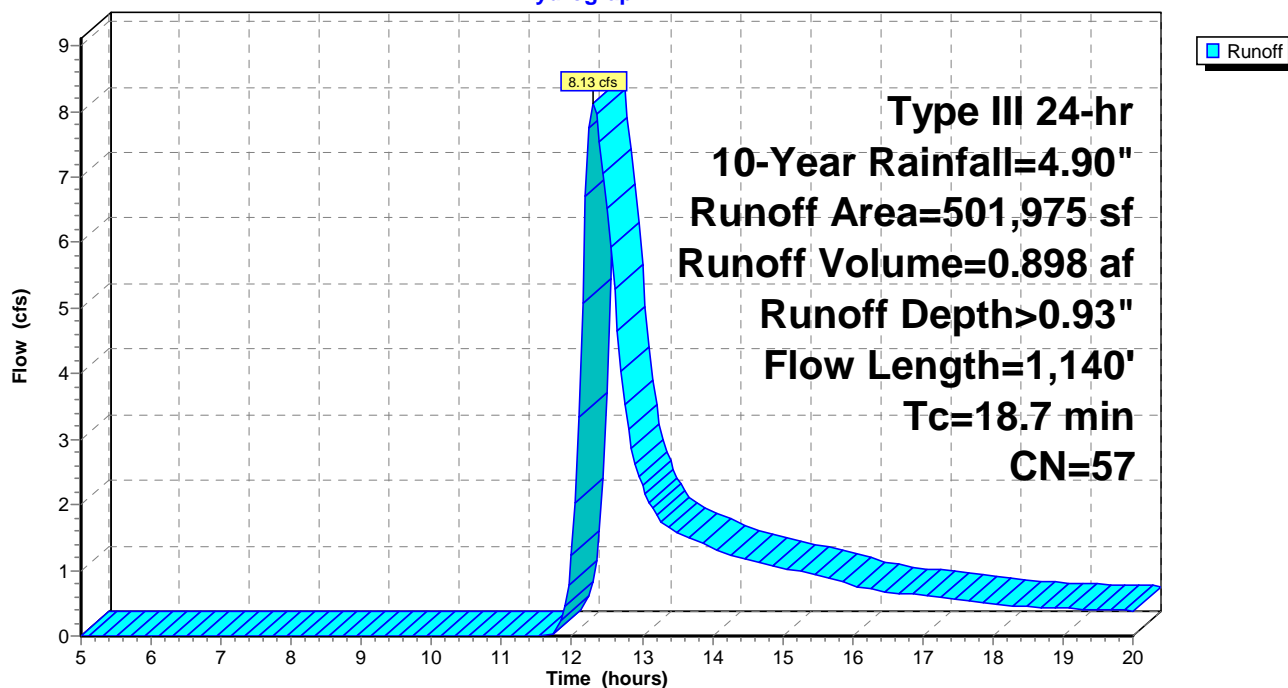
Area (sf)	CN	Description
317,240	55	Woods, Good, HSG B
34,970	56	Brush, Fair, HSG B
11,990	77	Woods, Good, HSG D
124,235	58	Meadow, non-grazed, HSG B
13,540	96	Gravel surface, HSG B
501,975	57	Weighted Average
501,975		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		<b>Sheet Flow, Segment AB</b>
					Woods: Light underbrush n= 0.400 P2= 3.15"
3.7	1,040	0.0830	4.64		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
18.7	1,140	Total			

**Subcatchment 3S: SUBCATCHMENT E-3**

Hydrograph



### Summary for Reach 3R: HYDRAULIC CONNECTION

Inflow Area = 11.524 ac, 0.00% Impervious, Inflow Depth > 0.93" for 10-Year event  
 Inflow = 8.13 cfs @ 12.31 hrs, Volume= 0.898 af  
 Outflow = 8.06 cfs @ 12.34 hrs, Volume= 0.896 af, Atten= 1%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.53 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 2.01 fps, Avg. Travel Time= 2.0 min

Peak Storage= 431 cf @ 12.32 hrs

Average Depth at Peak Storage= 0.17' , Surface Width= 11.02'

Bank-Full Depth= 1.00' Flow Area= 13.0 sf, Capacity= 170.43 cfs

10.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 3.0 '/' Top Width= 16.00'

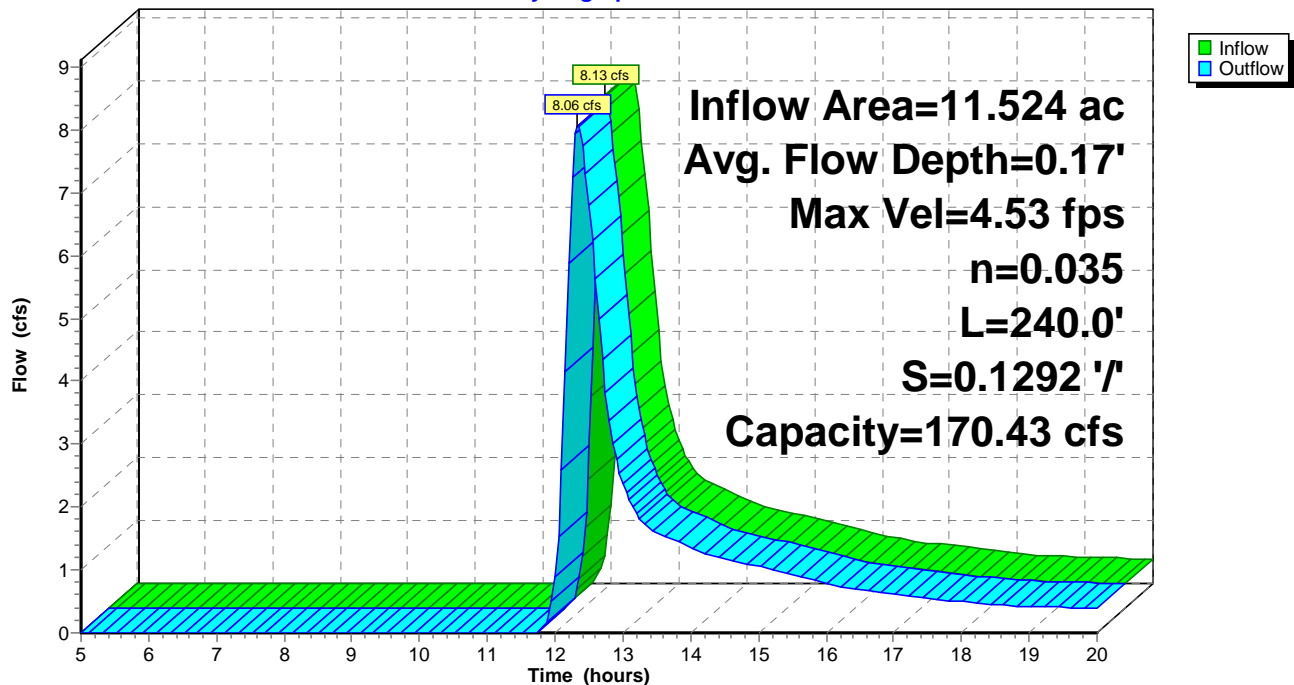
Length= 240.0' Slope= 0.1292 '/'

Inlet Invert= 777.00', Outlet Invert= 746.00'



### Reach 3R: HYDRAULIC CONNECTION

Hydrograph

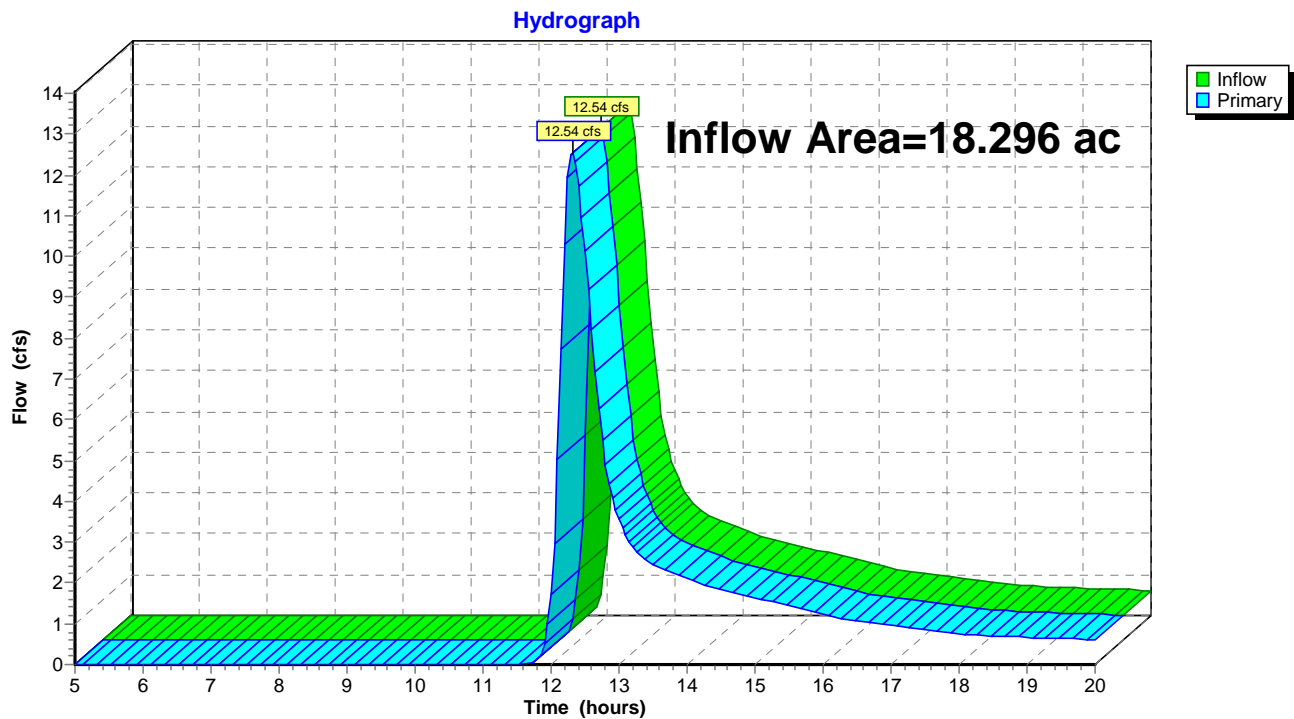


### Summary for Link 1L: DESIGN POINT 1

Inflow Area = 18.296 ac, 0.00% Impervious, Inflow Depth > 0.91" for 10-Year event  
 Inflow = 12.54 cfs @ 12.31 hrs, Volume= 1.392 af  
 Primary = 12.54 cfs @ 12.31 hrs, Volume= 1.392 af, Atten= 0%, Lag= 0.0 min

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

### Link 1L: DESIGN POINT 1



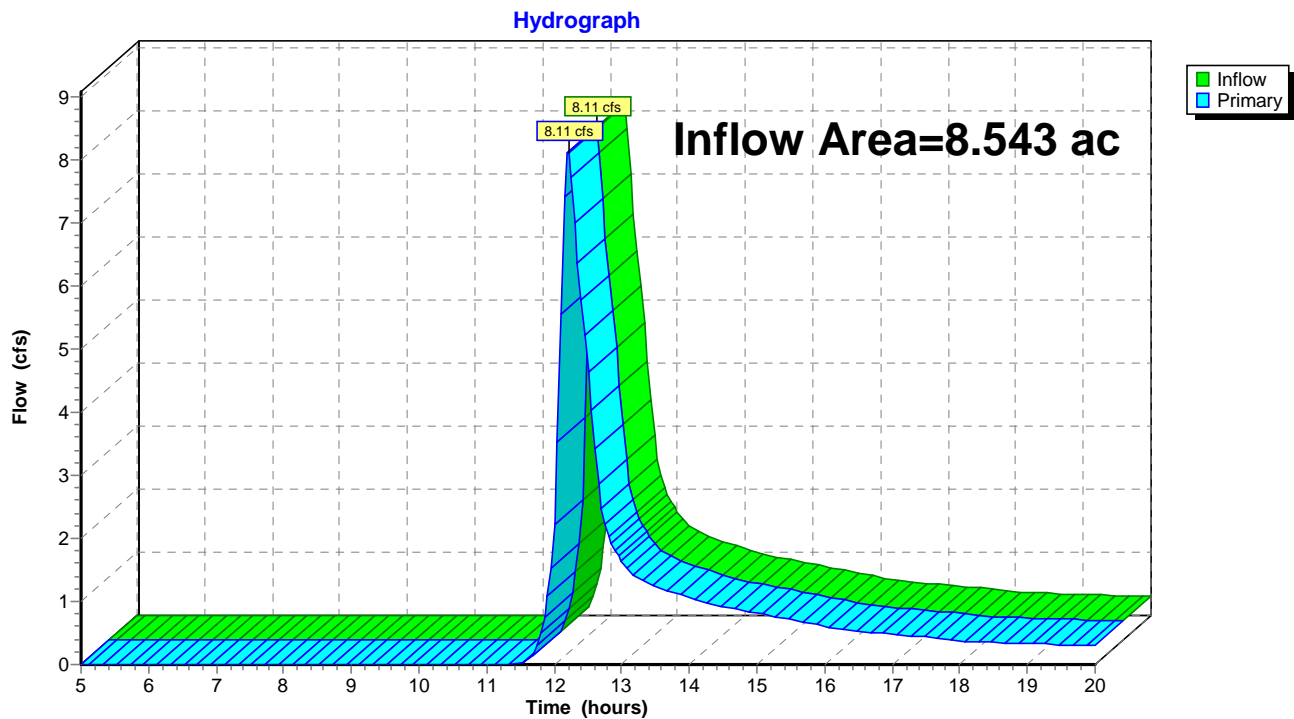


## Summary for Link 2L: DESIGN POINT 2

Inflow Area = 8.543 ac, 0.00% Impervious, Inflow Depth > 1.06" for 10-Year event  
 Inflow = 8.11 cfs @ 12.21 hrs, Volume= 0.752 af  
 Primary = 8.11 cfs @ 12.21 hrs, Volume= 0.752 af, Atten= 0%, Lag= 0.0 min

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

## Link 2L: DESIGN POINT 2



**NGRID - Stafford St (Pre-Development)**

Type III 24-hr 100-Year Rainfall=7.67"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: SUBCATCHMENT E-1** Runoff Area=294,990 sf 0.00% Impervious Runoff Depth>2.43"  
Flow Length=1,010' Tc=15.3 min CN=56 Runoff=15.01 cfs 1.370 af

**Subcatchment 2S: SUBCATCHMENT E-2** Runoff Area=372,115 sf 0.00% Impervious Runoff Depth>2.73"  
Flow Length=1,100' Tc=12.9 min CN=59 Runoff=23.01 cfs 1.945 af

**Subcatchment 3S: SUBCATCHMENT E-3** Runoff Area=501,975 sf 0.00% Impervious Runoff Depth>2.52"  
Flow Length=1,140' Tc=18.7 min CN=57 Runoff=24.85 cfs 2.424 af

**Reach 3R: HYDRAULIC CONNECTION** Avg. Flow Depth=0.33' Max Vel=6.83 fps Inflow=24.85 cfs 2.424 af  
n=0.035 L=240.0' S=0.1292 '/' Capacity=170.43 cfs Outflow=24.64 cfs 2.421 af

**Link 1L: DESIGN POINT 1** Inflow=39.06 cfs 3.791 af  
Primary=39.06 cfs 3.791 af

**Link 2L: DESIGN POINT 2** Inflow=23.01 cfs 1.945 af  
Primary=23.01 cfs 1.945 af

**Total Runoff Area = 26.838 ac Runoff Volume = 5.739 af Average Runoff Depth = 2.57"**  
**100.00% Pervious = 26.838 ac 0.00% Impervious = 0.000 ac**

### Summary for Subcatchment 1S: SUBCATCHMENT E-1

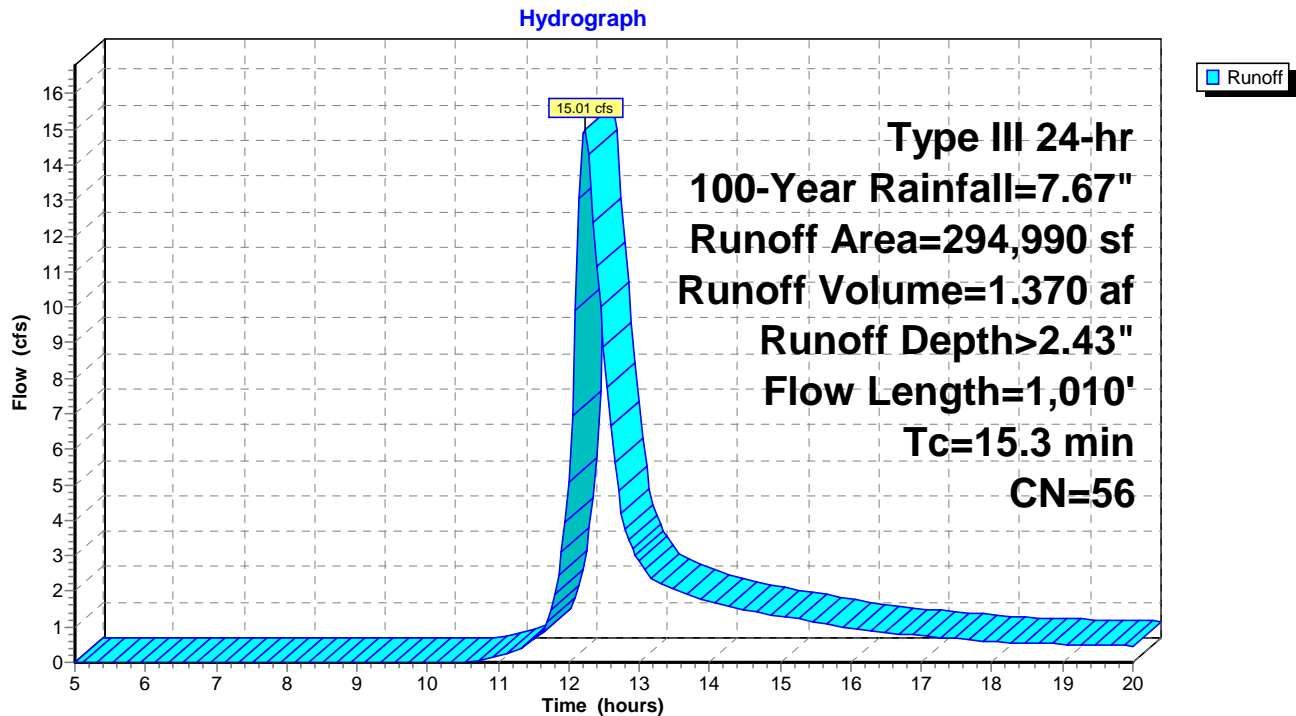
Runoff = 15.01 cfs @ 12.23 hrs, Volume= 1.370 af, Depth> 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=7.67"

Area (sf)	CN	Description
174,595	55	Woods, Good, HSG B
108,745	56	Brush, Fair, HSG B
8,290	77	Woods, Good, HSG D
3,360	96	Gravel surface, HSG B
294,990	56	Weighted Average
294,990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	100	0.0300	0.14		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
3.1	910	0.0900	4.83		<b>Shallow Concentrated Flow, Segment BC</b> Unpaved Kv= 16.1 fps
15.3	1,010	Total			

### Subcatchment 1S: SUBCATCHMENT E-1



### Summary for Subcatchment 2S: SUBCATCHMENT E-2

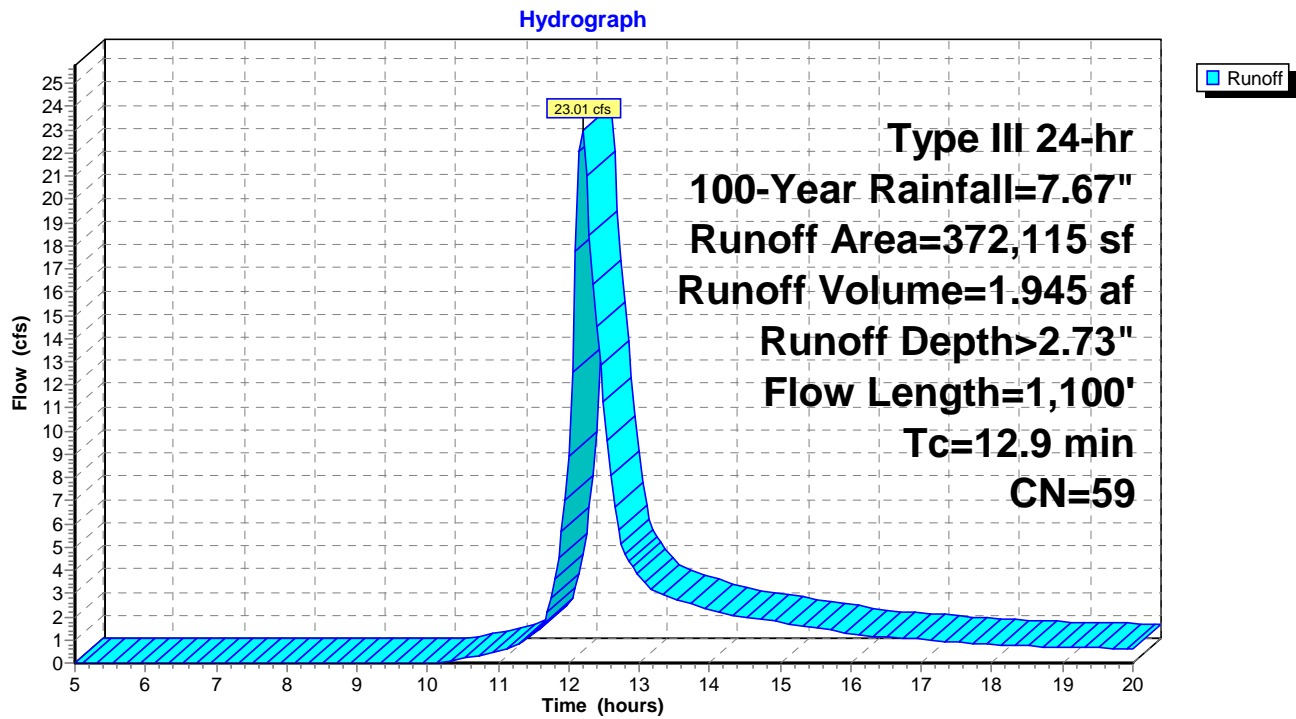
Runoff = 23.01 cfs @ 12.19 hrs, Volume= 1.945 af, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=7.67"

Area (sf)	CN	Description
209,885	55	Woods, Good, HSG B
85,305	56	Brush, Fair, HSG B
45,030	77	Woods, Good, HSG D
27,210	58	Meadow, non-grazed, HSG B
4,685	96	Gravel surface, HSG B
372,115	59	Weighted Average
372,115		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	100	0.0700	0.19		<b>Sheet Flow, Segment AB</b>
					Grass: Dense n= 0.240 P2= 3.15"
4.2	1,000	0.0620	4.01		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
12.9	1,100	Total			

### Subcatchment 2S: SUBCATCHMENT E-2



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Type III 24-hr 100-Year Rainfall=7.67"

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**Summary for Subcatchment 3S: SUBCATCHMENT E-3**

Runoff = 24.85 cfs @ 12.27 hrs, Volume= 2.424 af, Depth&gt; 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=7.67"

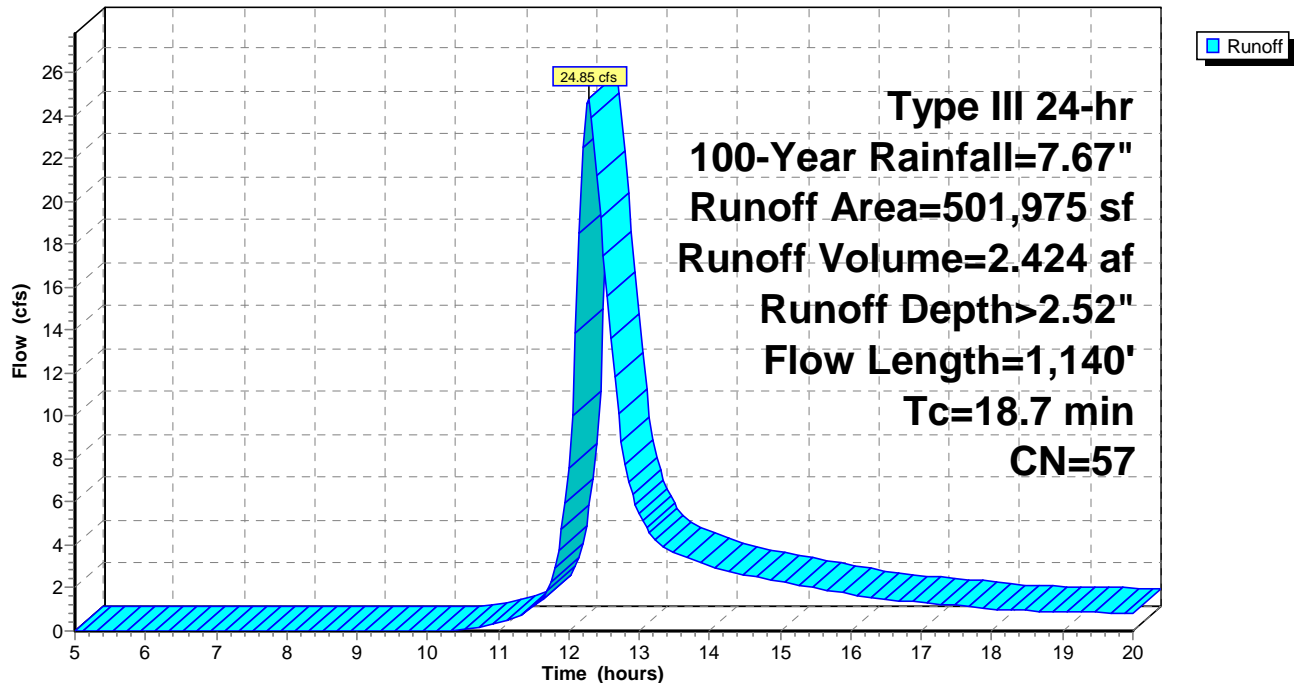
Area (sf)	CN	Description
317,240	55	Woods, Good, HSG B
34,970	56	Brush, Fair, HSG B
11,990	77	Woods, Good, HSG D
124,235	58	Meadow, non-grazed, HSG B
13,540	96	Gravel surface, HSG B
501,975	57	Weighted Average
501,975		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		<b>Sheet Flow, Segment AB</b>
					Woods: Light underbrush n= 0.400 P2= 3.15"
3.7	1,040	0.0830	4.64		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
18.7	1,140	Total			

**Subcatchment 3S: SUBCATCHMENT E-3**

Hydrograph





**Summary for Reach 3R: HYDRAULIC CONNECTION**

Inflow Area = 11.524 ac, 0.00% Impervious, Inflow Depth > 2.52" for 100-Year event  
Inflow = 24.85 cfs @ 12.27 hrs, Volume= 2.424 af  
Outflow = 24.64 cfs @ 12.29 hrs, Volume= 2.421 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.83 fps, Min. Travel Time= 0.6 min

Avg. Velocity= 2.65 fps, Avg. Travel Time= 1.5 min

Peak Storage= 870 cf @ 12.28 hrs

Average Depth at Peak Storage= 0.33' , Surface Width= 11.98'

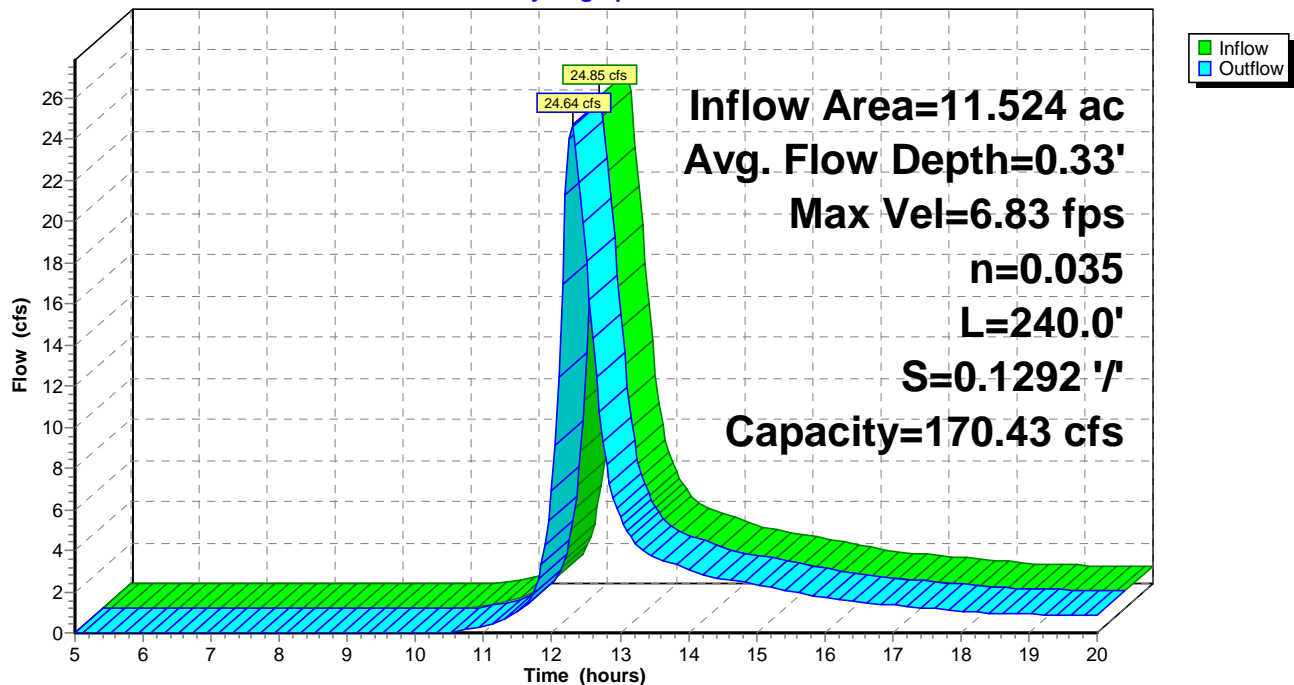
Bank-Full Depth= 1.00' Flow Area= 13.0 sf, Capacity= 170.43 cfs

10.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds

Side Slope Z-value= 3.0 '/' Top Width= 16.00'

Length= 240.0' Slope= 0.1292 '/'

Inlet Invert= 777.00', Outlet Invert= 746.00'

**Reach 3R: HYDRAULIC CONNECTION****Hydrograph**

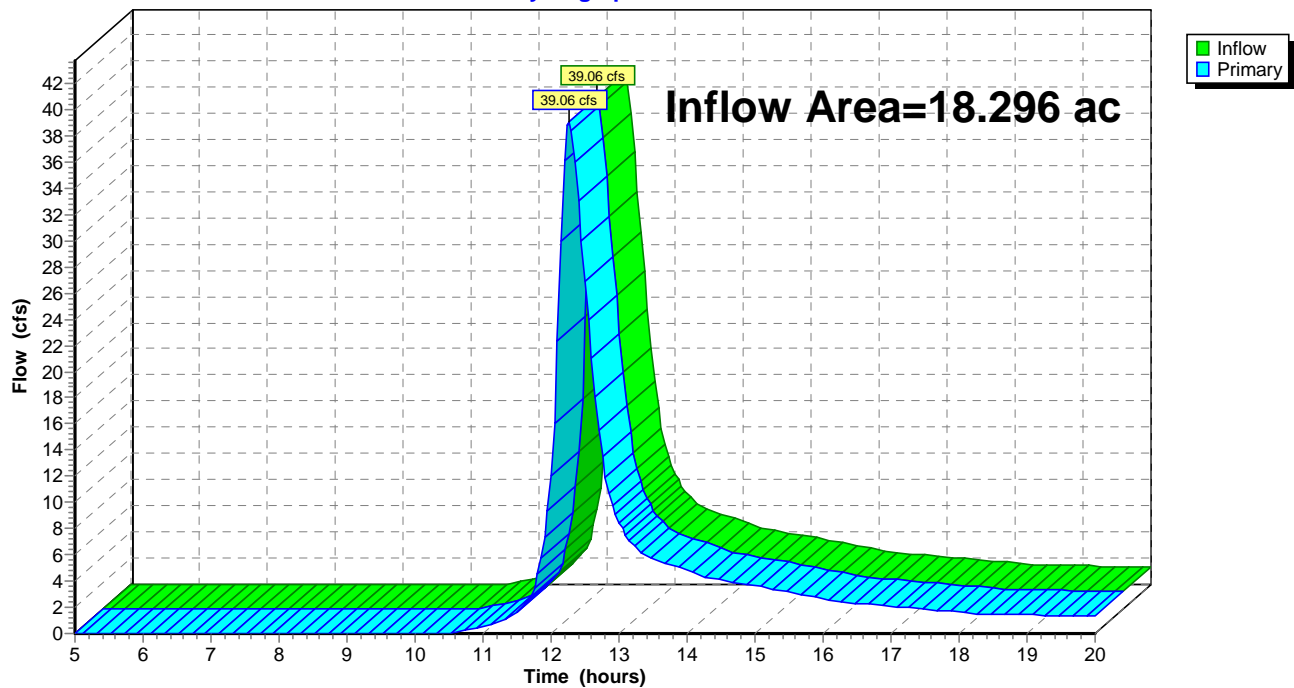
### Summary for Link 1L: DESIGN POINT 1

Inflow Area = 18.296 ac, 0.00% Impervious, Inflow Depth > 2.49" for 100-Year event  
 Inflow = 39.06 cfs @ 12.27 hrs, Volume= 3.791 af  
 Primary = 39.06 cfs @ 12.27 hrs, Volume= 3.791 af, Atten= 0%, Lag= 0.0 min

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

### Link 1L: DESIGN POINT 1

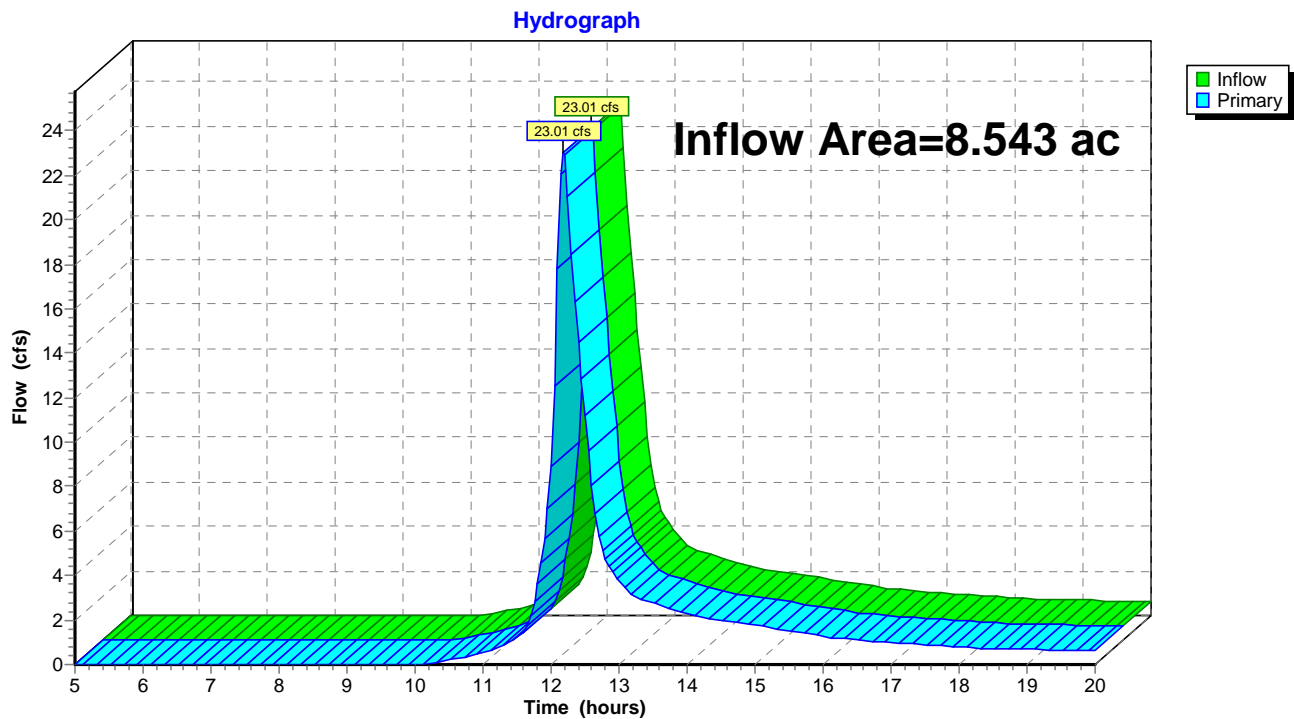
Hydrograph



**Summary for Link 2L: DESIGN POINT 2**

Inflow Area = 8.543 ac, 0.00% Impervious, Inflow Depth > 2.73" for 100-Year event  
Inflow = 23.01 cfs @ 12.19 hrs, Volume= 1.945 af  
Primary = 23.01 cfs @ 12.19 hrs, Volume= 1.945 af, Atten= 0%, Lag= 0.0 min

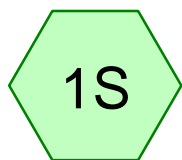
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 2L: DESIGN POINT 2**

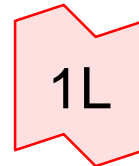


## **Appendix B**

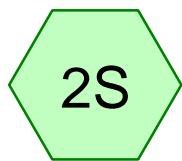
### **Post-Development 2-, 10-, & 100-Year 24-Hour Storm Event Calculations**



SUBCATCHMENT P-1



DESIGN POINT 1



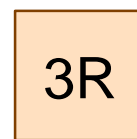
SUBCATCHMENT P-2



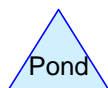
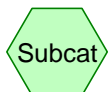
DESIGN POINT 2



SUBCATCHMENT P-3



HYDRAULIC  
CONNECTION



**Routing Diagram for NGRID - Stafford St (Post-Development)**  
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## **NGRID - Stafford St (Post-Development)**

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### **Project Notes**

Rainfall events imported from "Atlas-14-Rain.txt" for 6691 MD Worcester South

Rainfall events imported from "Atlas-14-Rain.txt" for 6682 MA Worcester South

## NGRID - Stafford St (Post-Development)

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### Rainfall Events Listing

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	3.15	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.90	2
3	100-Year	Type III 24-hr		Default	24.00	1	7.67	2

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### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.197	61	>75% Grass cover, Good, HSG B (1S)
2.178	56	Brush, Fair, HSG B (1S, 2S, 3S)
0.920	62	Crushed Stone, HSG B (1S, 2S)
0.320	96	Gravel surface, HSG B (2S, 3S)
3.477	58	Meadow, non-grazed, HSG B (2S, 3S)
0.308	98	Paved parking, HSG B (1S, 2S)
0.510	55	Porous Pavement, HSG B (1S, 2S)
1.712	50	Riprap, HSG B (1S, 2S)
0.209	98	Roofs, HSG B (2S)
16.110	55	Woods, Good, HSG B (1S, 2S, 3S)
1.499	77	Woods, Good, HSG D (1S, 2S, 3S)
<b>27.441</b>	<b>58</b>	<b>TOTAL AREA</b>

## NGRID - Stafford St (Post-Development)

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### Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
25.942	HSG B	1S, 2S, 3S
0.000	HSG C	
1.499	HSG D	1S, 2S, 3S
0.000	Other	
<b>27.441</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.197	0.000	0.000	0.000	0.197	>75% Grass cover, Good	1S
0.000	2.178	0.000	0.000	0.000	2.178	Brush, Fair	1S, 2S, 3S
0.000	0.920	0.000	0.000	0.000	0.920	Crushed Stone	1S, 2S
0.000	0.320	0.000	0.000	0.000	0.320	Gravel surface	2S, 3S
0.000	3.477	0.000	0.000	0.000	3.477	Meadow, non-grazed	2S, 3S
0.000	0.308	0.000	0.000	0.000	0.308	Paved parking	1S, 2S
0.000	0.510	0.000	0.000	0.000	0.510	Porous Pavement	1S, 2S
0.000	1.712	0.000	0.000	0.000	1.712	Riprap	1S, 2S
0.000	0.209	0.000	0.000	0.000	0.209	Roofs	2S
0.000	16.110	0.000	1.499	0.000	17.610	Woods, Good	1S, 2S, 3S
<b>0.000</b>	<b>25.942</b>	<b>0.000</b>	<b>1.499</b>	<b>0.000</b>	<b>27.441</b>	<b>TOTAL AREA</b>	



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### Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1S	0.00	0.00	138.0	0.1880	0.025	36.0	0.0	0.0
2	3R	776.00	750.00	138.0	0.1884	0.025	36.0	0.0	0.0

**NGRID - Stafford St (Post-Development)**

Type III 24-hr 2-Year Rainfall=3.15"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: SUBCATCHMENT P-1** Runoff Area=319,875 sf 1.38% Impervious Runoff Depth>0.22"  
Flow Length=848' Tc=22.1 min CN=56 Runoff=0.69 cfs 0.135 af

**Subcatchment 2S: SUBCATCHMENT P-2** Runoff Area=376,155 sf 4.82% Impervious Runoff Depth>0.33"  
Flow Length=1,275' Tc=25.3 min CN=60 Runoff=1.50 cfs 0.240 af

**Subcatchment 3S: SUBCATCHMENT P-3** Runoff Area=499,300 sf 0.00% Impervious Runoff Depth>0.25"  
Flow Length=1,140' Tc=18.7 min CN=57 Runoff=1.36 cfs 0.236 af

**Reach 3R: HYDRAULIC CONNECTION** Avg. Flow Depth=0.20' Max Vel=6.64 fps Inflow=1.36 cfs 0.236 af  
36.0" Round Pipe n=0.025 L=138.0' S=0.1884 ' /' Capacity=150.54 cfs Outflow=1.36 cfs 0.236 af

**Link 1L: DESIGN POINT 1**

Inflow=2.03 cfs 0.371 af  
Primary=2.03 cfs 0.371 af

**Link 2L: DESIGN POINT 2**

Inflow=1.50 cfs 0.240 af  
Primary=1.50 cfs 0.240 af

**Total Runoff Area = 27.441 ac Runoff Volume = 0.610 af Average Runoff Depth = 0.27"**  
**98.11% Pervious = 26.924 ac 1.89% Impervious = 0.517 ac**

**NGRID - Stafford St (Post-Development)**

Type III 24-hr 2-Year Rainfall=3.15"

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**Summary for Subcatchment 1S: SUBCATCHMENT P-1**

Runoff = 0.69 cfs @ 12.56 hrs, Volume= 0.135 af, Depth&gt; 0.22"

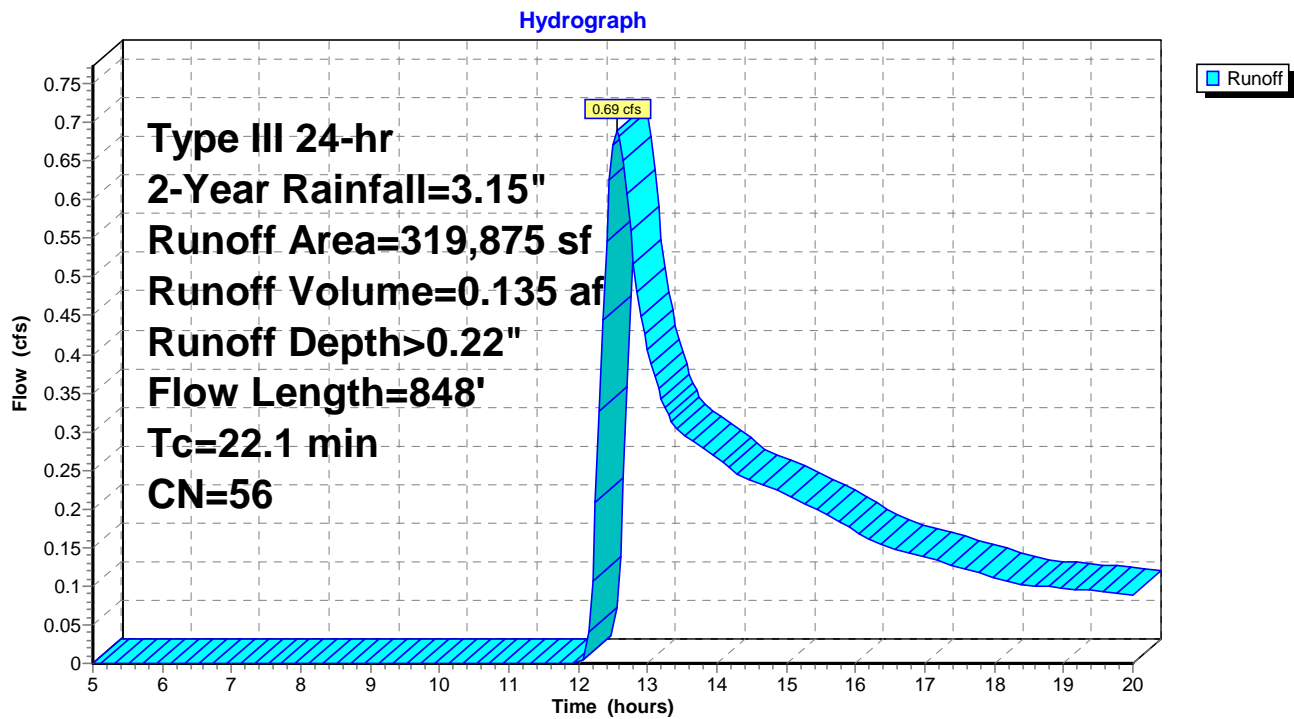
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
177,595	55	Woods, Good, HSG B
42,815	56	Brush, Fair, HSG B
8,290	77	Woods, Good, HSG D
* 57,765	50	Riprap, HSG B
* 5,915	62	Crushed Stone, HSG B
8,580	61	>75% Grass cover, Good, HSG B
* 14,510	55	Porous Pavement, HSG B
* 4,405	98	Paved parking, HSG B
319,875	56	Weighted Average
315,470		98.62% Pervious Area
4,405		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	100	0.0100	0.09		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
0.9	300	0.1130	5.41		<b>Shallow Concentrated Flow, Segment BC</b> Unpaved Kv= 16.1 fps
0.1	138	0.1880	21.27	150.38	<b>Pipe Channel, Segment CD</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
2.1	310	0.0226	2.42		<b>Shallow Concentrated Flow, Segment DE</b> Unpaved Kv= 16.1 fps
22.1	848	Total			

Subcatchment 1S: SUBCATCHMENT P-1



**NGRID - Stafford St (Post-Development)**

Type III 24-hr 2-Year Rainfall=3.15"

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**Summary for Subcatchment 2S: SUBCATCHMENT P-2**

Runoff = 1.50 cfs @ 12.52 hrs, Volume= 0.240 af, Depth&gt; 0.33"

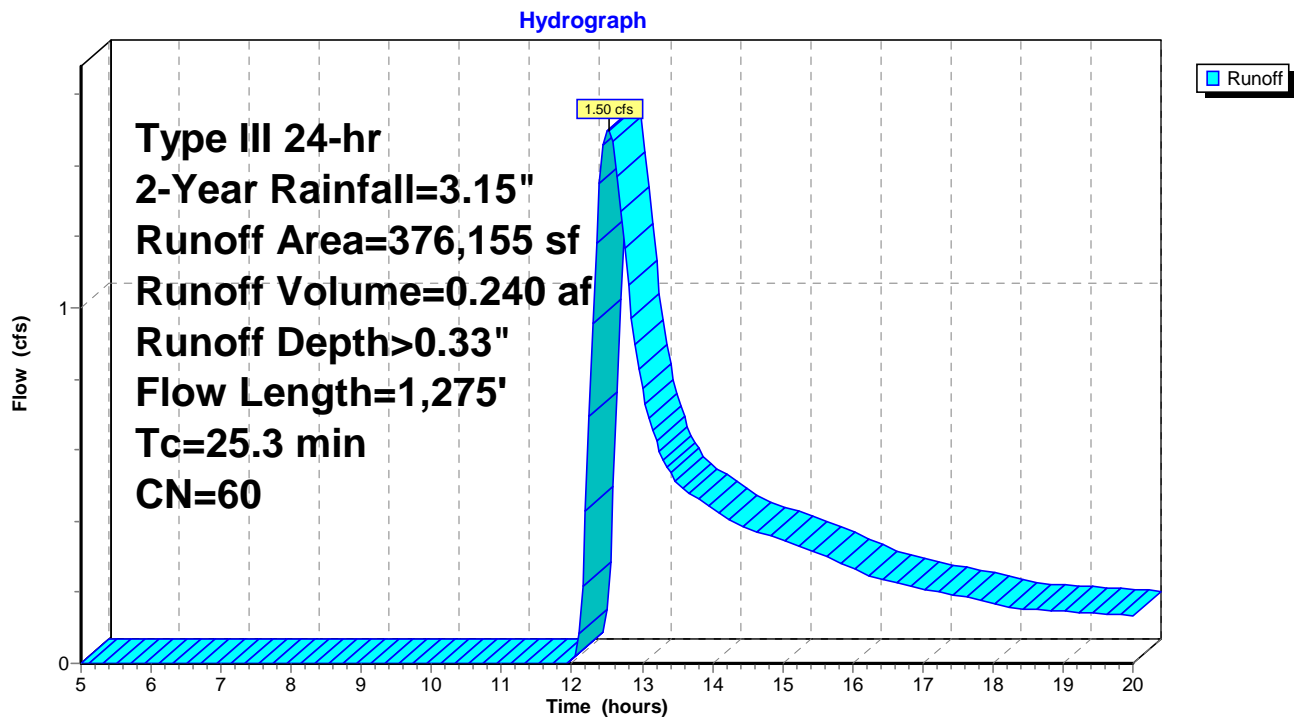
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
209,605	55	Woods, Good, HSG B
17,080	56	Brush, Fair, HSG B
45,030	77	Woods, Good, HSG D
27,210	58	Meadow, non-grazed, HSG B
415	96	Gravel surface, HSG B
* 16,795	50	Riprap, HSG B
* 34,170	62	Crushed Stone, HSG B
9,030	98	Paved parking, HSG B
9,100	98	Roofs, HSG B
* 7,720	55	Porous Pavement, HSG B
376,155	60	Weighted Average
358,025		95.18% Pervious Area
18,130		4.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.7	80	0.0088	0.08		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
2.8	20	0.0500	0.12		<b>Sheet Flow, Segment BC</b> Grass: Dense n= 0.240 P2= 3.15"
0.1	45	0.3488	9.51		<b>Shallow Concentrated Flow, Segment CD</b> Unpaved Kv= 16.1 fps
1.9	275	0.0145	2.44	29.27	<b>Trap/Vee/Rect Channel Flow, Segment DE</b> Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.078 Riprap, 12-inch
3.8	855	0.0550	3.78		<b>Shallow Concentrated Flow, Segment EF</b> Unpaved Kv= 16.1 fps
25.3	1,275	Total			



Subcatchment 2S: SUBCATCHMENT P-2



**NGRID - Stafford St (Post-Development)**

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Type III 24-hr 2-Year Rainfall=3.15"

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**Summary for Subcatchment 3S: SUBCATCHMENT P-3**

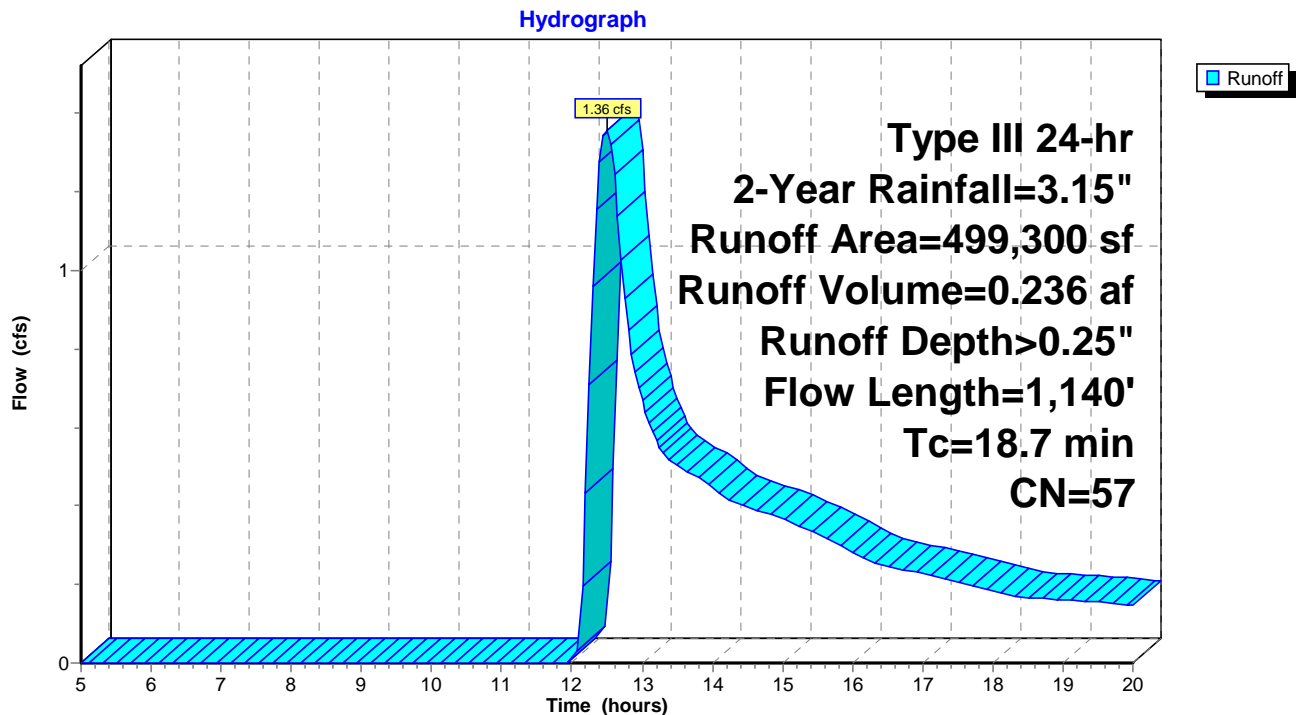
Runoff = 1.36 cfs @ 12.49 hrs, Volume= 0.236 af, Depth&gt; 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.15"

Area (sf)	CN	Description
314,565	55	Woods, Good, HSG B
34,970	56	Brush, Fair, HSG B
11,990	77	Woods, Good, HSG D
124,235	58	Meadow, non-grazed, HSG B
13,540	96	Gravel surface, HSG B
499,300	57	Weighted Average
499,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		<b>Sheet Flow, Segment AB</b>
					Woods: Light underbrush n= 0.400 P2= 3.15"
3.7	1,040	0.0830	4.64		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
18.7	1,140	Total			

**Subcatchment 3S: SUBCATCHMENT P-3**

**Summary for Reach 3R: HYDRAULIC CONNECTION**

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 11.462 ac, 0.00% Impervious, Inflow Depth > 0.25" for 2-Year event  
Inflow = 1.36 cfs @ 12.49 hrs, Volume= 0.236 af  
Outflow = 1.36 cfs @ 12.50 hrs, Volume= 0.236 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.64 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 4.26 fps, Avg. Travel Time= 0.5 min

Peak Storage= 28 cf @ 12.49 hrs

Average Depth at Peak Storage= 0.20' , Surface Width= 1.50'

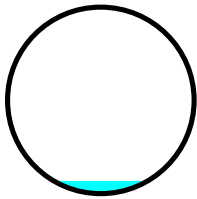
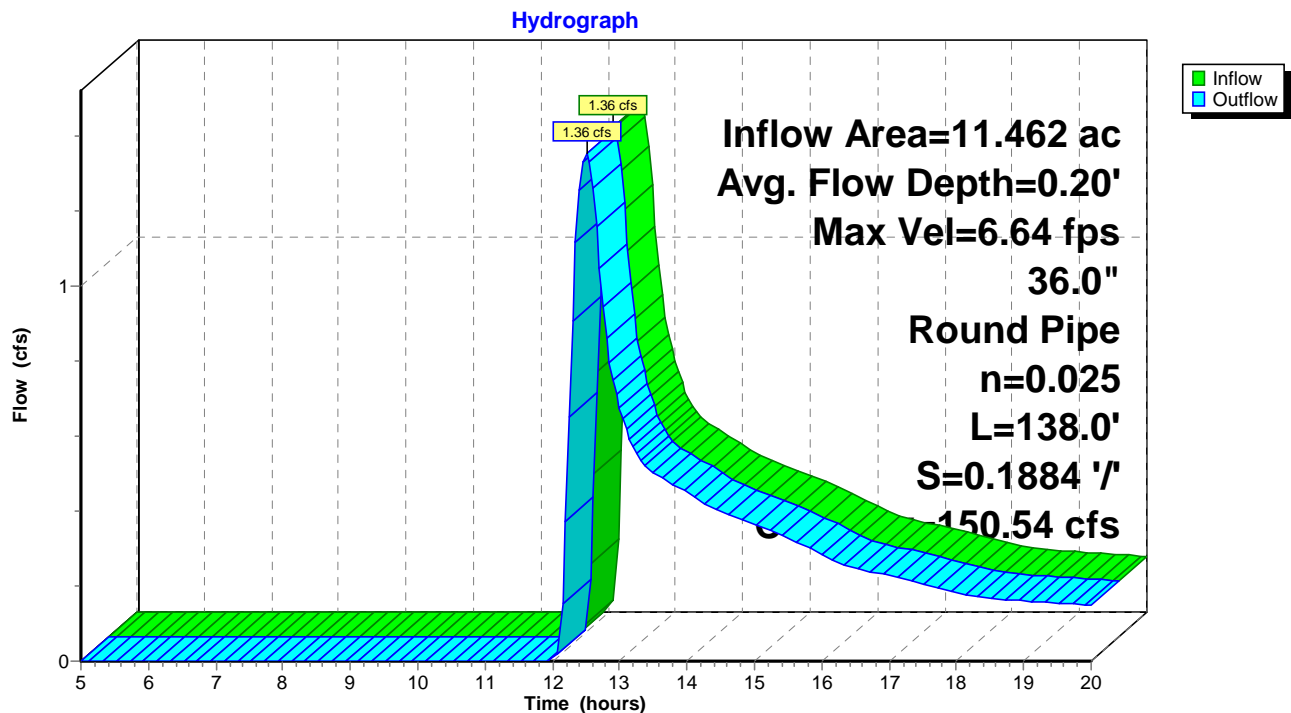
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 150.54 cfs

36.0" Round Pipe

n= 0.025 Corrugated metal

Length= 138.0' Slope= 0.1884 '/'

Inlet Invert= 776.00', Outlet Invert= 750.00'

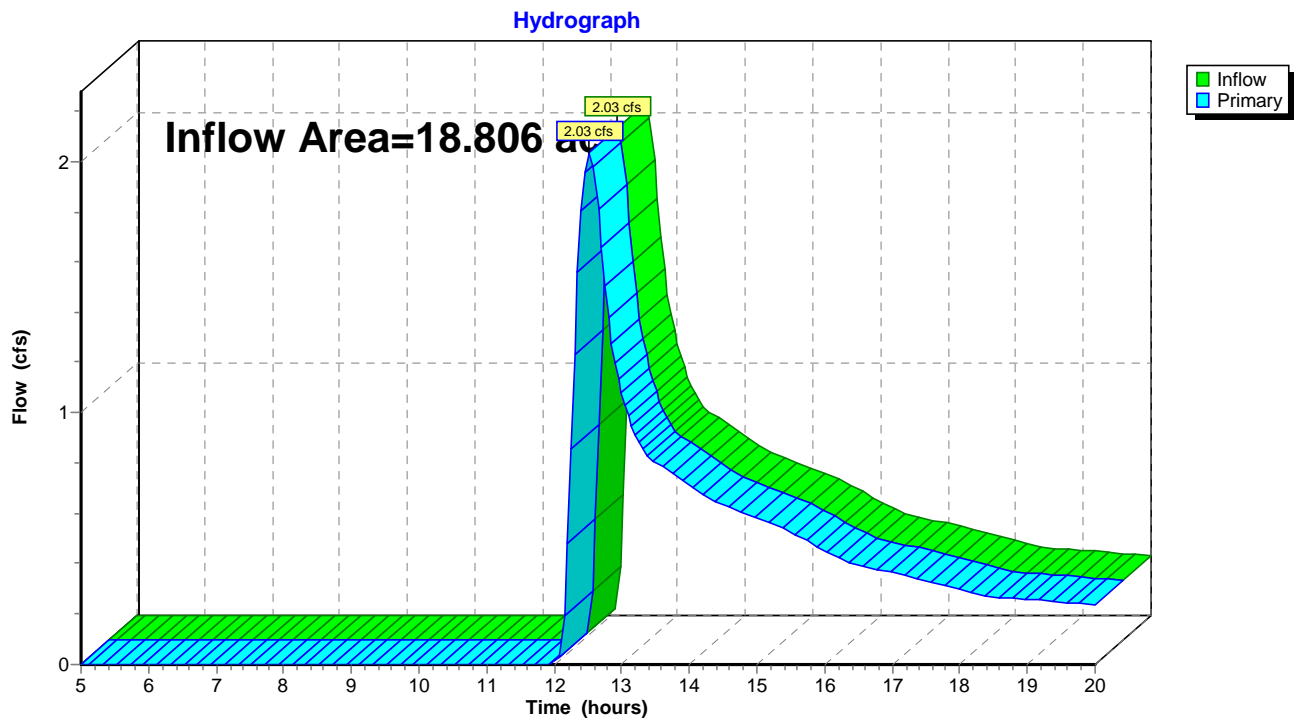
**Reach 3R: HYDRAULIC CONNECTION**

### Summary for Link 1L: DESIGN POINT 1

Inflow Area = 18.806 ac, 0.54% Impervious, Inflow Depth > 0.24" for 2-Year event  
 Inflow = 2.03 cfs @ 12.52 hrs, Volume= 0.371 af  
 Primary = 2.03 cfs @ 12.52 hrs, Volume= 0.371 af, Atten= 0%, Lag= 0.0 min

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

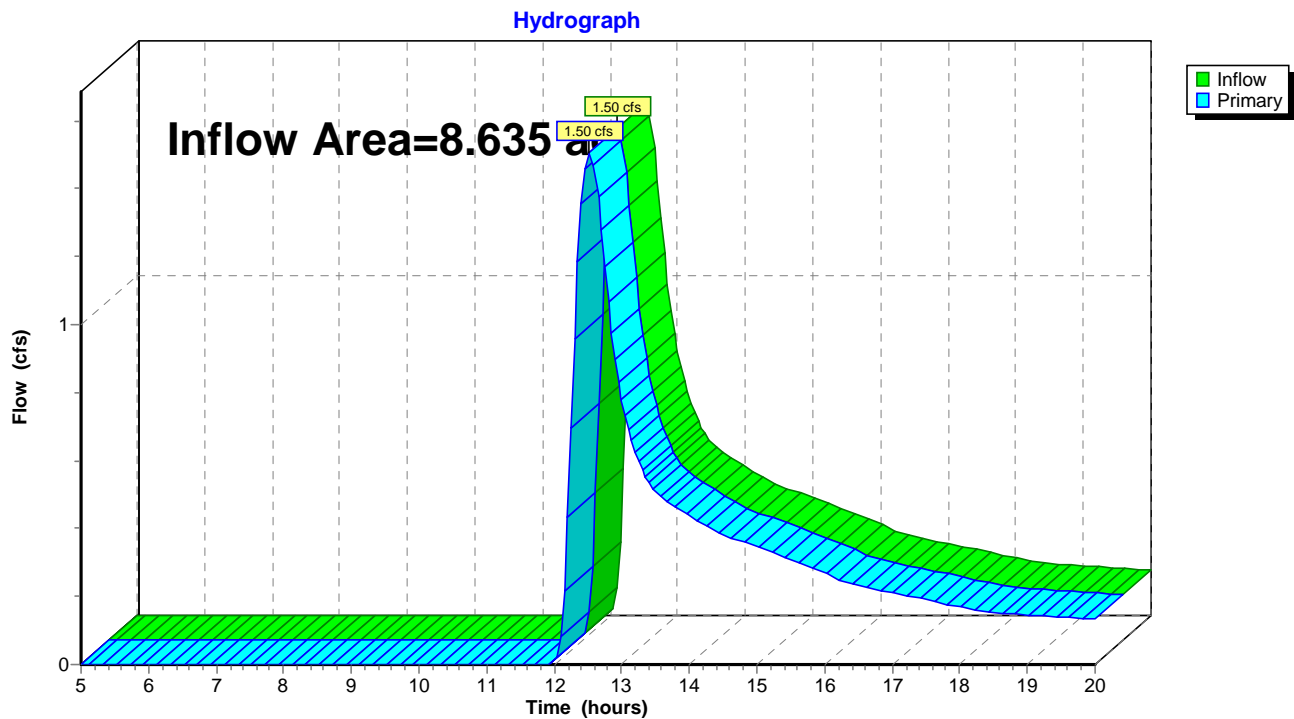
### Link 1L: DESIGN POINT 1



**Summary for Link 2L: DESIGN POINT 2**

Inflow Area = 8.635 ac, 4.82% Impervious, Inflow Depth > 0.33" for 2-Year event  
Inflow = 1.50 cfs @ 12.52 hrs, Volume= 0.240 af  
Primary = 1.50 cfs @ 12.52 hrs, Volume= 0.240 af, Atten= 0%, Lag= 0.0 min

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

**Link 2L: DESIGN POINT 2**



**NGRID - Stafford St (Post-Development)**

Type III 24-hr 10-Year Rainfall=4.90"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: SUBCATCHMENT P-1** Runoff Area=319,875 sf 1.38% Impervious Runoff Depth>0.88"  
Flow Length=848' Tc=22.1 min CN=56 Runoff=4.47 cfs 0.536 af

**Subcatchment 2S: SUBCATCHMENT P-2** Runoff Area=376,155 sf 4.82% Impervious Runoff Depth>1.11"  
Flow Length=1,275' Tc=25.3 min CN=60 Runoff=6.80 cfs 0.799 af

**Subcatchment 3S: SUBCATCHMENT P-3** Runoff Area=499,300 sf 0.00% Impervious Runoff Depth>0.93"  
Flow Length=1,140' Tc=18.7 min CN=57 Runoff=8.09 cfs 0.893 af

**Reach 3R: HYDRAULIC CONNECTION** Avg. Flow Depth=0.47' Max Vel=11.34 fps Inflow=8.09 cfs 0.893 af  
36.0" Round Pipe n=0.025 L=138.0' S=0.1884 ' /' Capacity=150.54 cfs Outflow=8.08 cfs 0.892 af

**Link 1L: DESIGN POINT 1**

Inflow=12.41 cfs 1.428 af  
Primary=12.41 cfs 1.428 af

**Link 2L: DESIGN POINT 2**

Inflow=6.80 cfs 0.799 af  
Primary=6.80 cfs 0.799 af

**Total Runoff Area = 27.441 ac Runoff Volume = 2.228 af Average Runoff Depth = 0.97"**  
**98.11% Pervious = 26.924 ac 1.89% Impervious = 0.517 ac**

**NGRID - Stafford St (Post-Development)**

Type III 24-hr 10-Year Rainfall=4.90"

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**Summary for Subcatchment 1S: SUBCATCHMENT P-1**

Runoff = 4.47 cfs @ 12.37 hrs, Volume= 0.536 af, Depth&gt; 0.88"

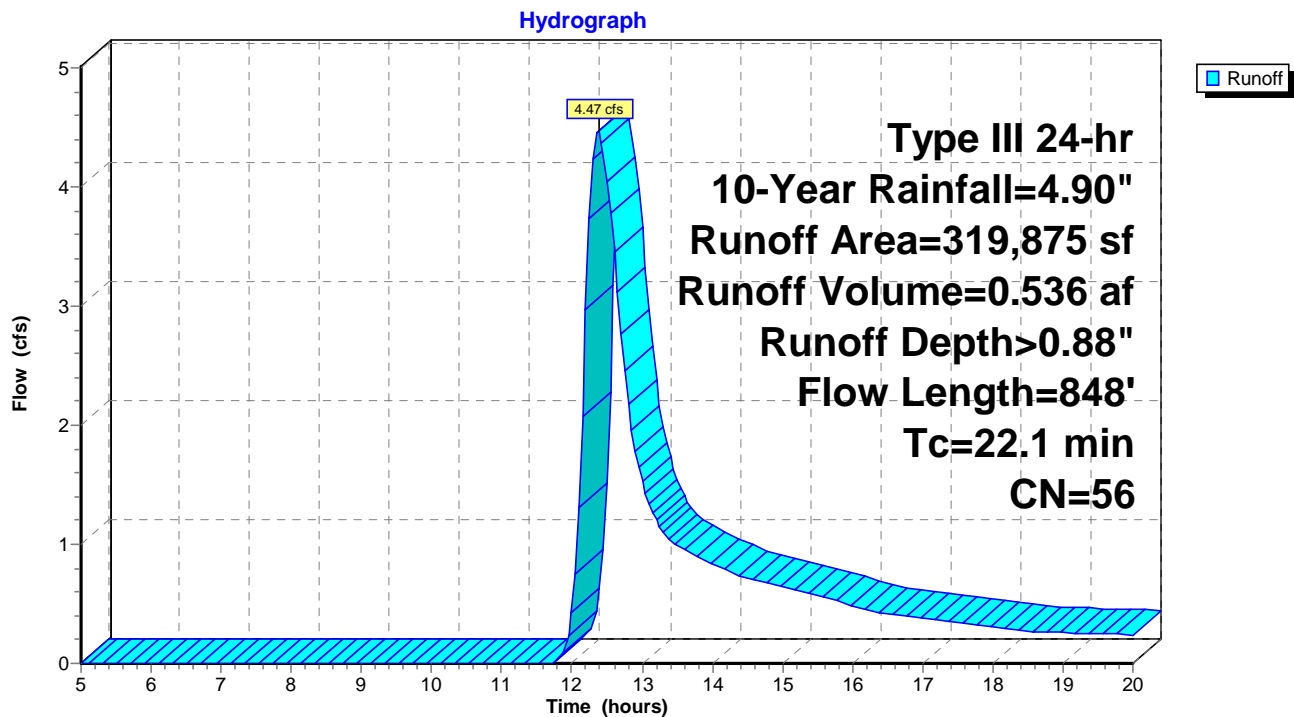
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
177,595	55	Woods, Good, HSG B
42,815	56	Brush, Fair, HSG B
8,290	77	Woods, Good, HSG D
* 57,765	50	Riprap, HSG B
* 5,915	62	Crushed Stone, HSG B
8,580	61	>75% Grass cover, Good, HSG B
* 14,510	55	Porous Pavement, HSG B
* 4,405	98	Paved parking, HSG B
319,875	56	Weighted Average
315,470		98.62% Pervious Area
4,405		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	100	0.0100	0.09		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
0.9	300	0.1130	5.41		<b>Shallow Concentrated Flow, Segment BC</b> Unpaved Kv= 16.1 fps
0.1	138	0.1880	21.27	150.38	<b>Pipe Channel, Segment CD</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
2.1	310	0.0226	2.42		<b>Shallow Concentrated Flow, Segment DE</b> Unpaved Kv= 16.1 fps
22.1	848	Total			

**Subcatchment 1S: SUBCATCHMENT P-1**



**NGRID - Stafford St (Post-Development)**

Type III 24-hr 10-Year Rainfall=4.90"

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**Summary for Subcatchment 2S: SUBCATCHMENT P-2**

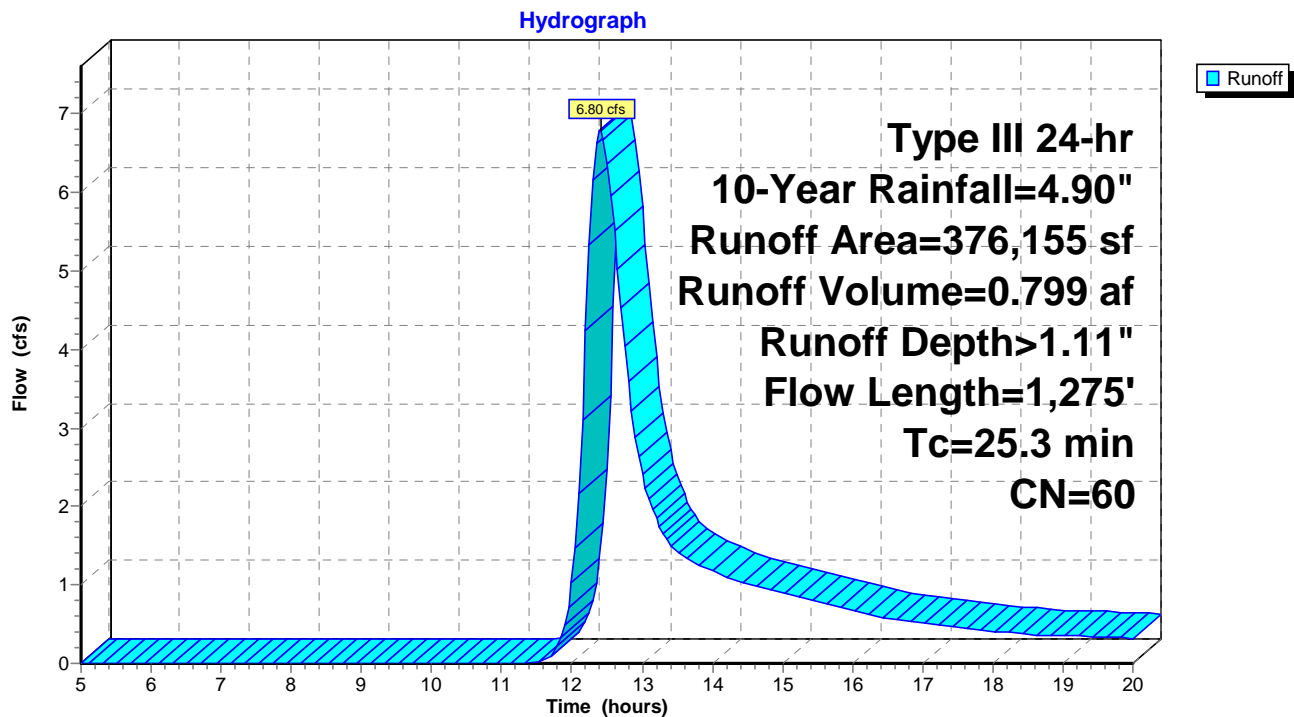
Runoff = 6.80 cfs @ 12.40 hrs, Volume= 0.799 af, Depth&gt; 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
209,605	55	Woods, Good, HSG B
17,080	56	Brush, Fair, HSG B
45,030	77	Woods, Good, HSG D
27,210	58	Meadow, non-grazed, HSG B
415	96	Gravel surface, HSG B
* 16,795	50	Riprap, HSG B
* 34,170	62	Crushed Stone, HSG B
9,030	98	Paved parking, HSG B
9,100	98	Roofs, HSG B
* 7,720	55	Porous Pavement, HSG B
376,155	60	Weighted Average
358,025		95.18% Pervious Area
18,130		4.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.7	80	0.0088	0.08		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
2.8	20	0.0500	0.12		<b>Sheet Flow, Segment BC</b> Grass: Dense n= 0.240 P2= 3.15"
0.1	45	0.3488	9.51		<b>Shallow Concentrated Flow, Segment CD</b> Unpaved Kv= 16.1 fps
1.9	275	0.0145	2.44	29.27	<b>Trap/Vee/Rect Channel Flow, Segment DE</b> Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.078 Riprap, 12-inch
3.8	855	0.0550	3.78		<b>Shallow Concentrated Flow, Segment EF</b> Unpaved Kv= 16.1 fps
25.3	1,275	Total			

**Subcatchment 2S: SUBCATCHMENT P-2**





**NGRID - Stafford St (Post-Development)**

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Type III 24-hr 10-Year Rainfall=4.90"

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**Summary for Subcatchment 3S: SUBCATCHMENT P-3**

Runoff = 8.09 cfs @ 12.31 hrs, Volume= 0.893 af, Depth&gt; 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

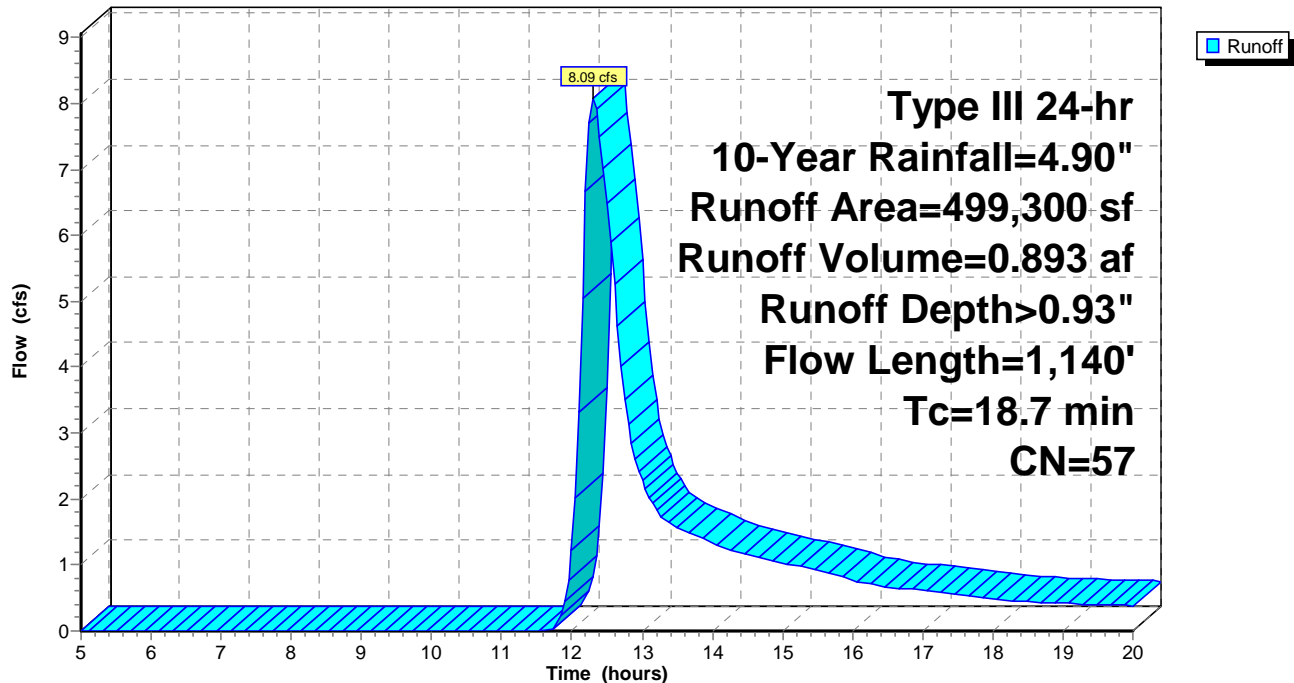
Area (sf)	CN	Description
314,565	55	Woods, Good, HSG B
34,970	56	Brush, Fair, HSG B
11,990	77	Woods, Good, HSG D
124,235	58	Meadow, non-grazed, HSG B
13,540	96	Gravel surface, HSG B
499,300	57	Weighted Average
499,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		<b>Sheet Flow, Segment AB</b>
					Woods: Light underbrush n= 0.400 P2= 3.15"
3.7	1,040	0.0830	4.64		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
18.7	1,140	Total			

**Subcatchment 3S: SUBCATCHMENT P-3**

Hydrograph



**Summary for Reach 3R: HYDRAULIC CONNECTION**

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 11.462 ac, 0.00% Impervious, Inflow Depth > 0.93" for 10-Year event  
Inflow = 8.09 cfs @ 12.31 hrs, Volume= 0.893 af  
Outflow = 8.08 cfs @ 12.32 hrs, Volume= 0.892 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 11.34 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 5.95 fps, Avg. Travel Time= 0.4 min

Peak Storage= 98 cf @ 12.31 hrs

Average Depth at Peak Storage= 0.47' , Surface Width= 2.19'

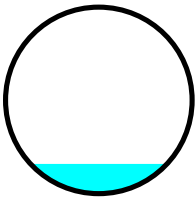
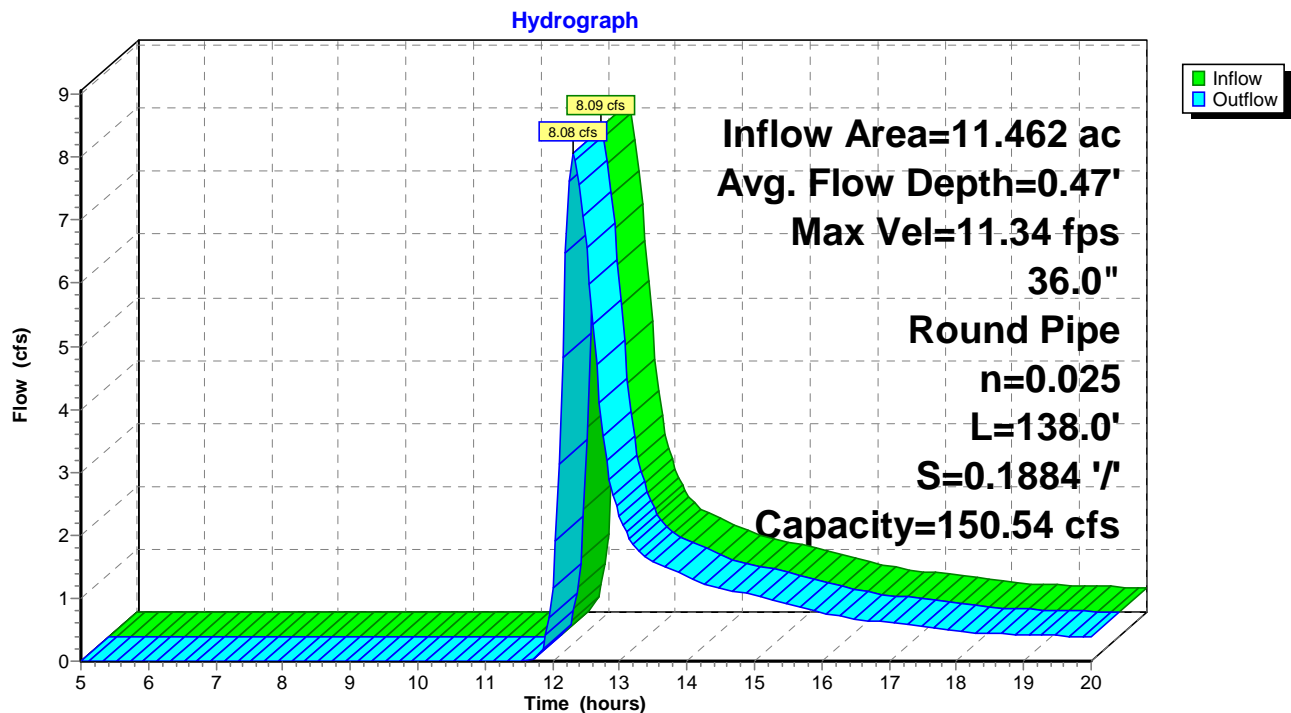
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 150.54 cfs

36.0" Round Pipe

n= 0.025 Corrugated metal

Length= 138.0' Slope= 0.1884 '/'

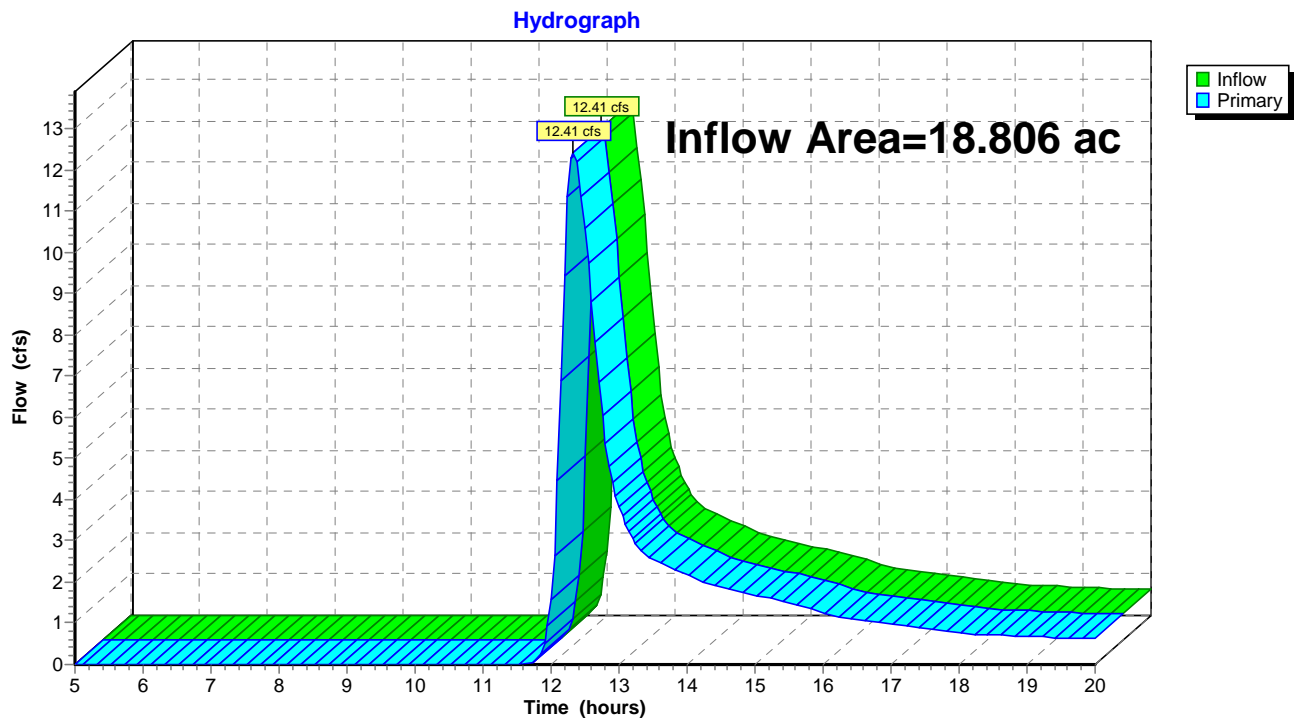
Inlet Invert= 776.00', Outlet Invert= 750.00'

**Reach 3R: HYDRAULIC CONNECTION**

**Summary for Link 1L: DESIGN POINT 1**

Inflow Area = 18.806 ac, 0.54% Impervious, Inflow Depth > 0.91" for 10-Year event  
Inflow = 12.41 cfs @ 12.34 hrs, Volume= 1.428 af  
Primary = 12.41 cfs @ 12.34 hrs, Volume= 1.428 af, Atten= 0%, Lag= 0.0 min

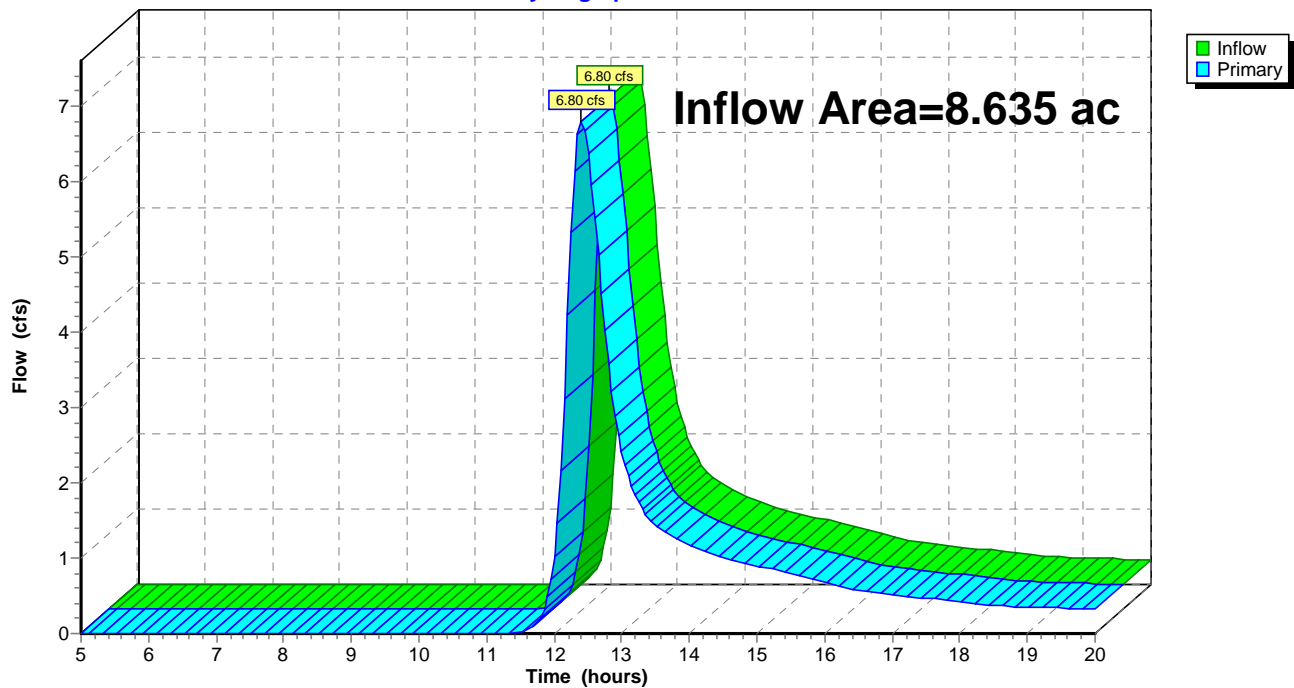
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 1L: DESIGN POINT 1**

**Summary for Link 2L: DESIGN POINT 2**

Inflow Area = 8.635 ac, 4.82% Impervious, Inflow Depth > 1.11" for 10-Year event  
Inflow = 6.80 cfs @ 12.40 hrs, Volume= 0.799 af  
Primary = 6.80 cfs @ 12.40 hrs, Volume= 0.799 af, Atten= 0%, Lag= 0.0 min

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

**Link 2L: DESIGN POINT 2****Hydrograph**

**NGRID - Stafford St (Post-Development)***Type III 24-hr 100-Year Rainfall=7.67"*

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment 1S: SUBCATCHMENT P-1** Runoff Area=319,875 sf 1.38% Impervious Runoff Depth>2.42"  
Flow Length=848' Tc=22.1 min CN=56 Runoff=14.11 cfs 1.481 af

**Subcatchment 2S: SUBCATCHMENT P-2** Runoff Area=376,155 sf 4.82% Impervious Runoff Depth>2.82"  
Flow Length=1,275' Tc=25.3 min CN=60 Runoff=18.62 cfs 2.029 af

**Subcatchment 3S: SUBCATCHMENT P-3** Runoff Area=499,300 sf 0.00% Impervious Runoff Depth>2.52"  
Flow Length=1,140' Tc=18.7 min CN=57 Runoff=24.72 cfs 2.411 af

**Reach 3R: HYDRAULIC CONNECTION** Avg. Flow Depth=0.82' Max Vel=15.68 fps Inflow=24.72 cfs 2.411 af  
36.0" Round Pipe n=0.025 L=138.0' S=0.1884 1' Capacity=150.54 cfs Outflow=24.60 cfs 2.410 af

**Link 1L: DESIGN POINT 1**

Inflow=38.49 cfs 3.892 af  
Primary=38.49 cfs 3.892 af

**Link 2L: DESIGN POINT 2**

Inflow=18.62 cfs 2.029 af  
Primary=18.62 cfs 2.029 af

**Total Runoff Area = 27.441 ac Runoff Volume = 5.922 af Average Runoff Depth = 2.59"**  
**98.11% Pervious = 26.924 ac 1.89% Impervious = 0.517 ac**



**Summary for Subcatchment 1S: SUBCATCHMENT P-1**

Runoff = 14.11 cfs @ 12.33 hrs, Volume= 1.481 af, Depth&gt; 2.42"

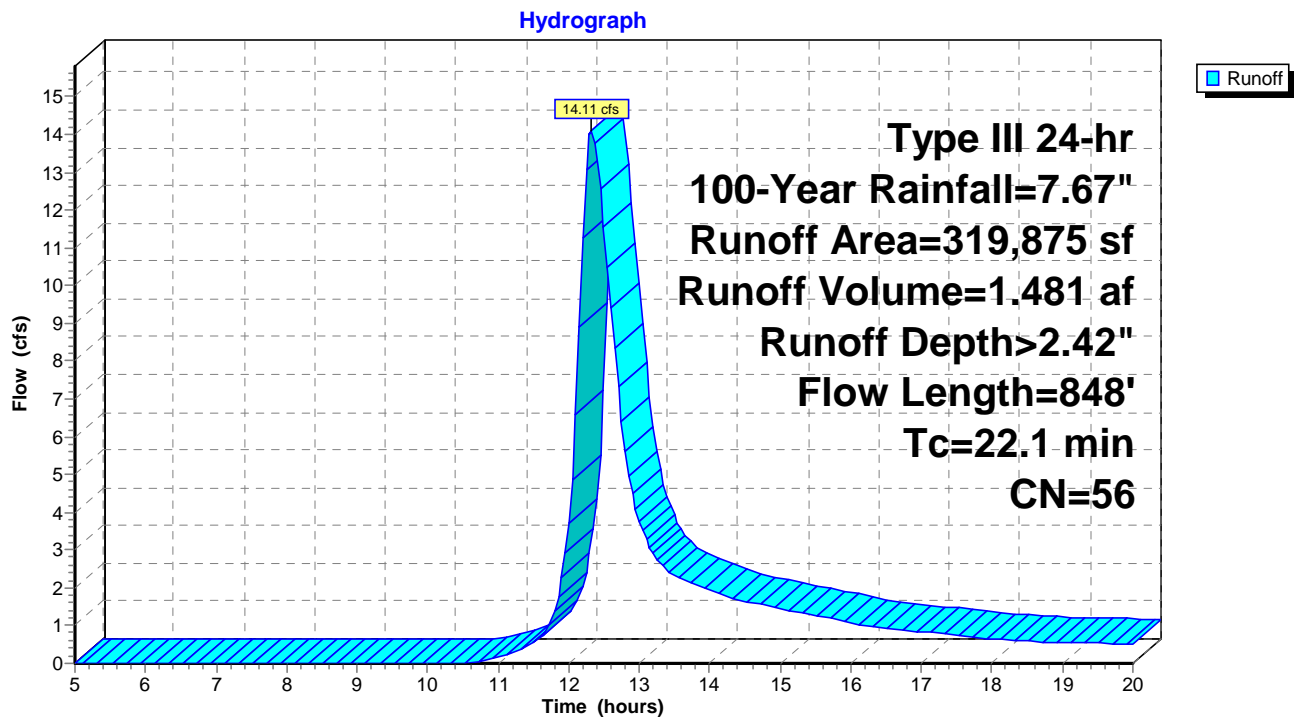
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-Year Rainfall=7.67"

Area (sf)	CN	Description
177,595	55	Woods, Good, HSG B
42,815	56	Brush, Fair, HSG B
8,290	77	Woods, Good, HSG D
* 57,765	50	Riprap, HSG B
* 5,915	62	Crushed Stone, HSG B
8,580	61	>75% Grass cover, Good, HSG B
* 14,510	55	Porous Pavement, HSG B
* 4,405	98	Paved parking, HSG B
319,875	56	Weighted Average
315,470		98.62% Pervious Area
4,405		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	100	0.0100	0.09		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
0.9	300	0.1130	5.41		<b>Shallow Concentrated Flow, Segment BC</b> Unpaved Kv= 16.1 fps
0.1	138	0.1880	21.27	150.38	<b>Pipe Channel, Segment CD</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
2.1	310	0.0226	2.42		<b>Shallow Concentrated Flow, Segment DE</b> Unpaved Kv= 16.1 fps
22.1	848	Total			

**Subcatchment 1S: SUBCATCHMENT P-1**



**Summary for Subcatchment 2S: SUBCATCHMENT P-2**

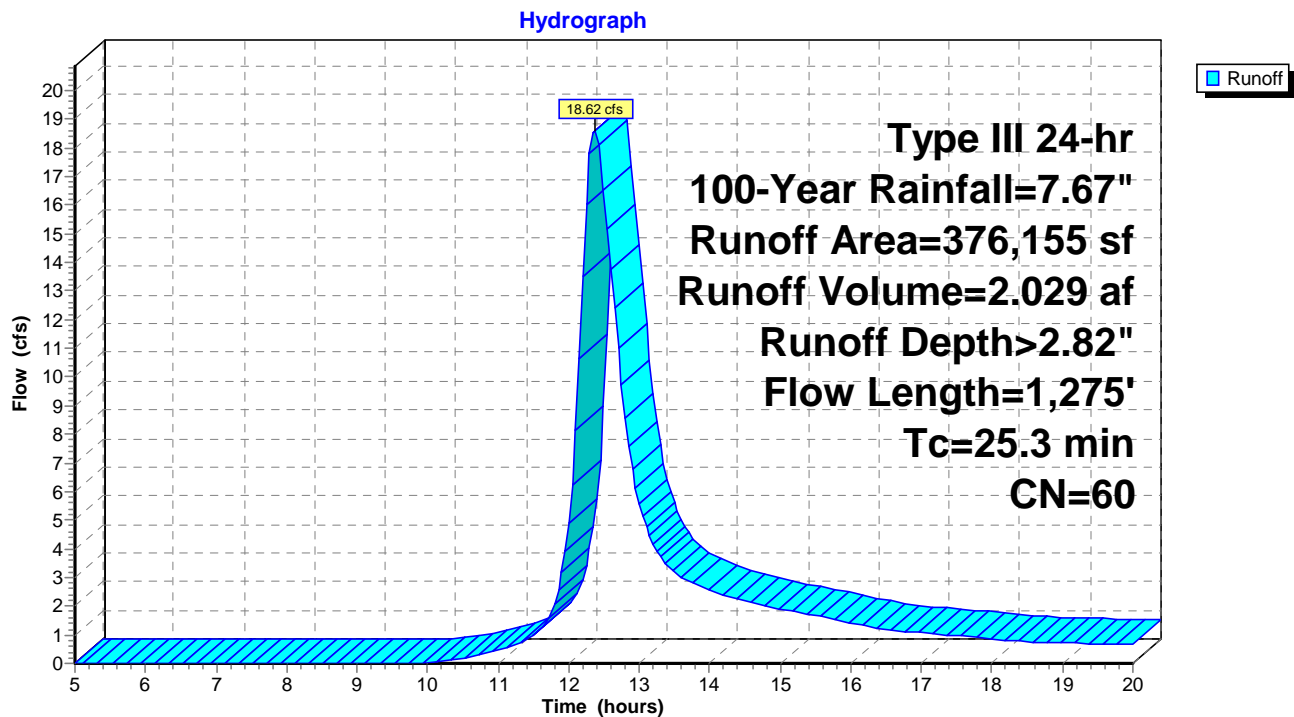
Runoff = 18.62 cfs @ 12.37 hrs, Volume= 2.029 af, Depth&gt; 2.82"

 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 100-Year Rainfall=7.67"

Area (sf)	CN	Description
209,605	55	Woods, Good, HSG B
17,080	56	Brush, Fair, HSG B
45,030	77	Woods, Good, HSG D
27,210	58	Meadow, non-grazed, HSG B
415	96	Gravel surface, HSG B
* 16,795	50	Riprap, HSG B
* 34,170	62	Crushed Stone, HSG B
9,030	98	Paved parking, HSG B
9,100	98	Roofs, HSG B
* 7,720	55	Porous Pavement, HSG B
376,155	60	Weighted Average
358,025		95.18% Pervious Area
18,130		4.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.7	80	0.0088	0.08		<b>Sheet Flow, Segment AB</b> Grass: Dense n= 0.240 P2= 3.15"
2.8	20	0.0500	0.12		<b>Sheet Flow, Segment BC</b> Grass: Dense n= 0.240 P2= 3.15"
0.1	45	0.3488	9.51		<b>Shallow Concentrated Flow, Segment CD</b> Unpaved Kv= 16.1 fps
1.9	275	0.0145	2.44	29.27	<b>Trap/Vee/Rect Channel Flow, Segment DE</b> Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.078 Riprap, 12-inch
3.8	855	0.0550	3.78		<b>Shallow Concentrated Flow, Segment EF</b> Unpaved Kv= 16.1 fps
25.3	1,275	Total			

Subcatchment 2S: SUBCATCHMENT P-2



**NGRID - Stafford St (Post-Development)**

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Type III 24-hr 100-Year Rainfall=7.67"

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**Summary for Subcatchment 3S: SUBCATCHMENT P-3**

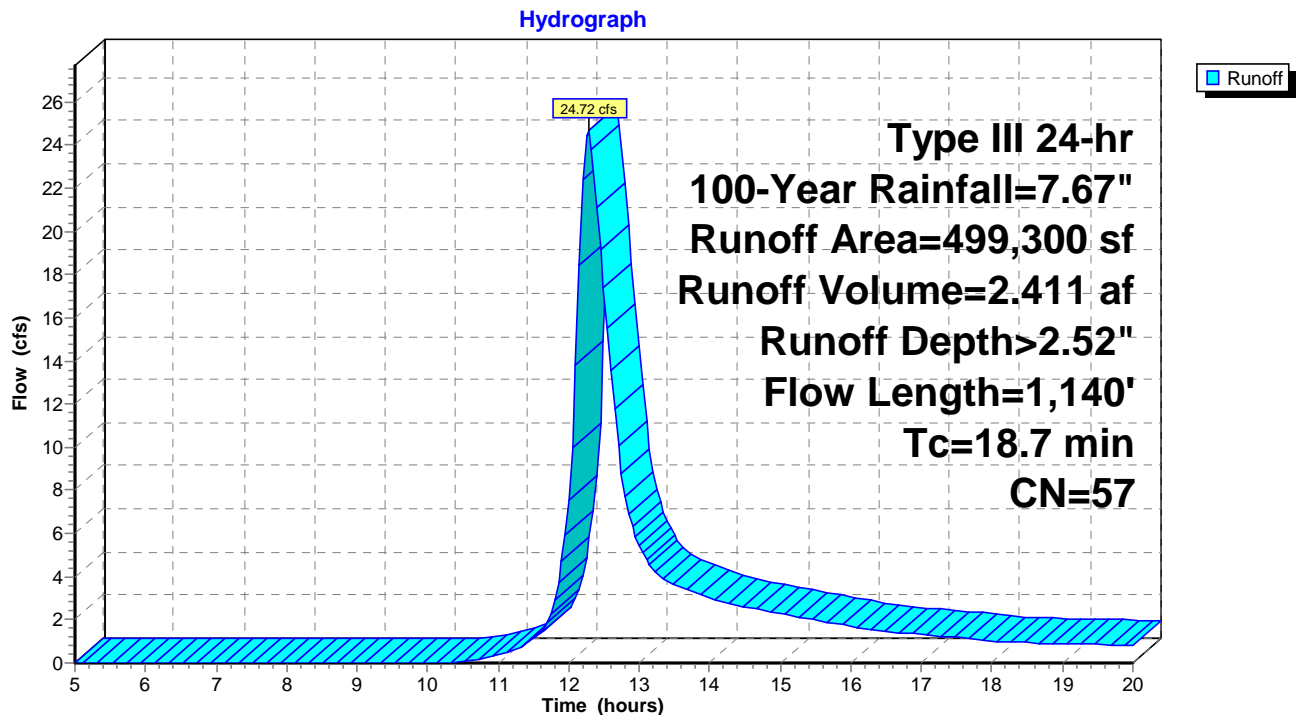
Runoff = 24.72 cfs @ 12.27 hrs, Volume= 2.411 af, Depth&gt; 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=7.67"

Area (sf)	CN	Description
314,565	55	Woods, Good, HSG B
34,970	56	Brush, Fair, HSG B
11,990	77	Woods, Good, HSG D
124,235	58	Meadow, non-grazed, HSG B
13,540	96	Gravel surface, HSG B
499,300	57	Weighted Average
499,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		<b>Sheet Flow, Segment AB</b>
					Woods: Light underbrush n= 0.400 P2= 3.15"
3.7	1,040	0.0830	4.64		<b>Shallow Concentrated Flow, Segment BC</b>
					Unpaved Kv= 16.1 fps
18.7	1,140	Total			

**Subcatchment 3S: SUBCATCHMENT P-3**



**Summary for Reach 3R: HYDRAULIC CONNECTION**

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 11.462 ac, 0.00% Impervious, Inflow Depth > 2.52" for 100-Year event  
Inflow = 24.72 cfs @ 12.27 hrs, Volume= 2.411 af  
Outflow = 24.60 cfs @ 12.28 hrs, Volume= 2.410 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Max. Velocity= 15.68 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 7.32 fps, Avg. Travel Time= 0.3 min

Peak Storage= 216 cf @ 12.28 hrs

Average Depth at Peak Storage= 0.82' , Surface Width= 2.67'

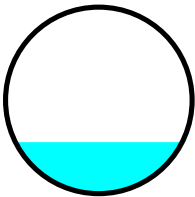
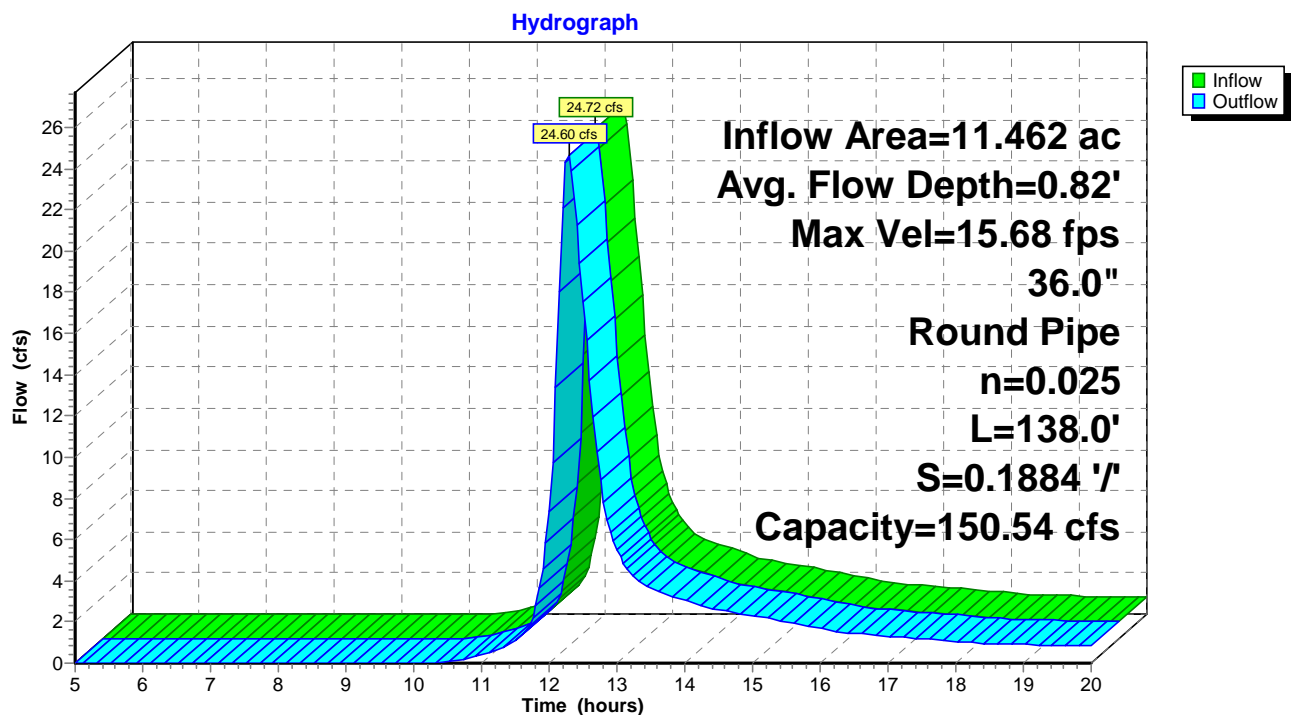
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 150.54 cfs

36.0" Round Pipe

n= 0.025 Corrugated metal

Length= 138.0' Slope= 0.1884 '/'

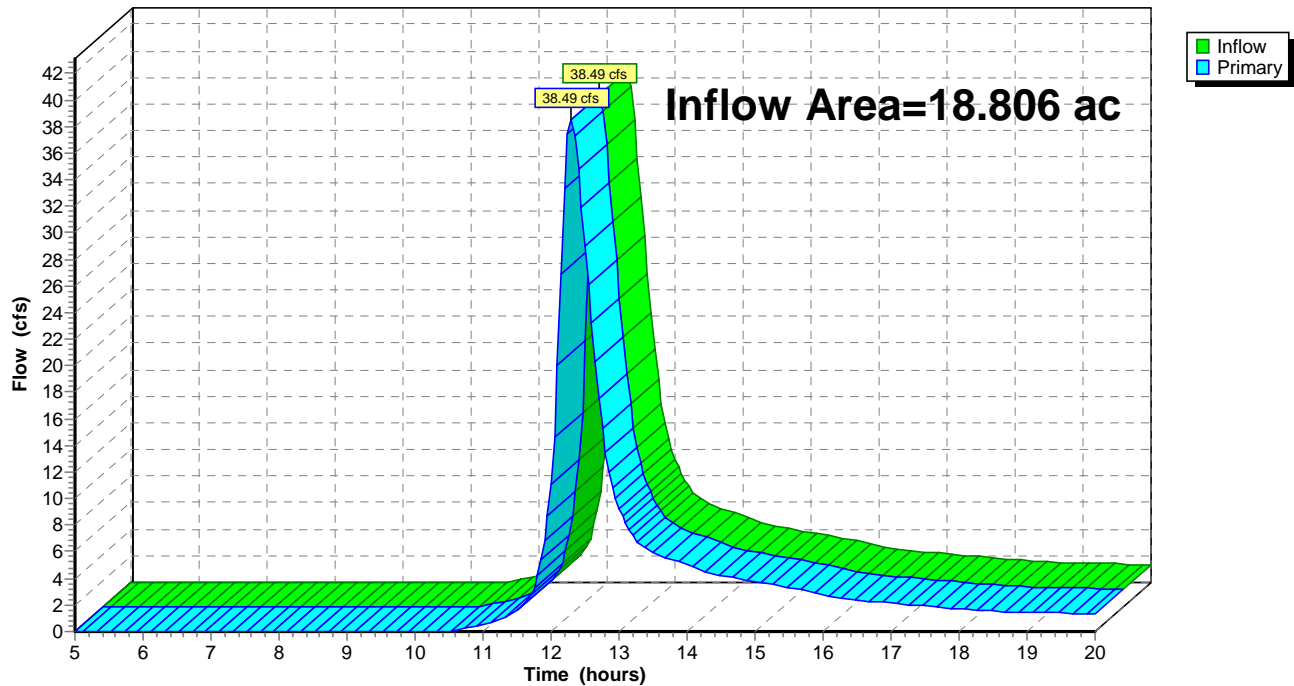
Inlet Invert= 776.00', Outlet Invert= 750.00'

**Reach 3R: HYDRAULIC CONNECTION**

**Summary for Link 1L: DESIGN POINT 1**

Inflow Area = 18.806 ac, 0.54% Impervious, Inflow Depth > 2.48" for 100-Year event  
Inflow = 38.49 cfs @ 12.30 hrs, Volume= 3.892 af  
Primary = 38.49 cfs @ 12.30 hrs, Volume= 3.892 af, Atten= 0%, Lag= 0.0 min

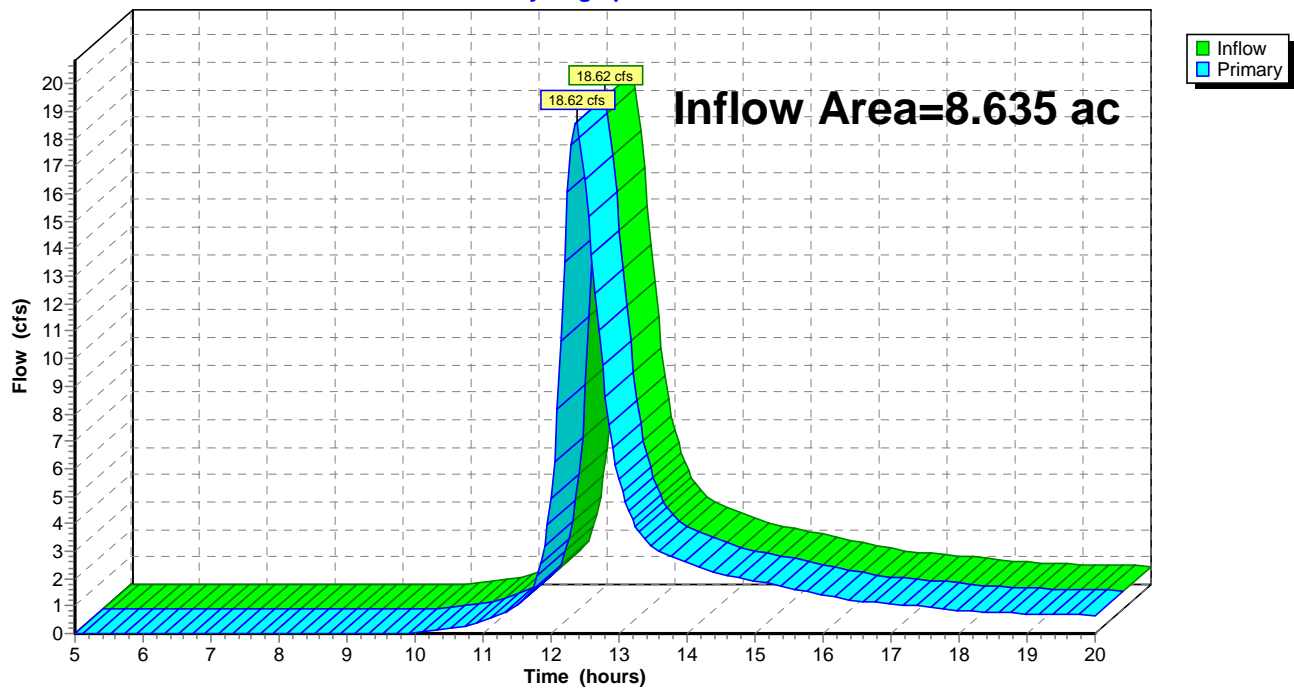
Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

**Link 1L: DESIGN POINT 1****Hydrograph**

**Summary for Link 2L: DESIGN POINT 2**

Inflow Area = 8.635 ac, 4.82% Impervious, Inflow Depth > 2.82" for 100-Year event  
Inflow = 18.62 cfs @ 12.37 hrs, Volume= 2.029 af  
Primary = 18.62 cfs @ 12.37 hrs, Volume= 2.029 af, Atten= 0%, Lag= 0.0 min

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

**Link 2L: DESIGN POINT 2****Hydrograph**



## **Appendix C**

### **Recharge to Groundwater Calculations & Test Boring Logs**



GZA  
GeoEnvironmental, Inc.  
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Springfield, MA 01103  
(413) 726-2100  
Fax (413) 732-1249  
<http://www.gza.com>

Engineers and  
Scientists

JOB 15.0166857.00 STAFFORD ST.

SHEET NO. 1 OF 1

CALCULATED BY STD DATE 3/10/22

CHECKED BY DATE

SCALE

### REQUIRED RECHARGE VOLUME CALCULATIONS

PROPOSED IMPERVIOUS COVER = 44,765 ft<sup>2</sup>

PROPOSED IMPERVIOUS COVER DIRECTED TO RECHARGE BMPs = 44,765 ft<sup>2</sup>

HYDROLOGIC SOIL GROUP = B ⇒ TARGET DEPTH FACTOR = 0.35 IN

$$\begin{aligned}\text{REQUIRED RECHARGE VOLUME \#1 (RV}_1\text{)} &= (0.35 \text{ IN})(22,230 \text{ ft}^2 + 12,445 \text{ ft}^2)(\frac{1 \text{ FT}}{12 \text{ IN}}) \\ &= 1015 \text{ ft}^3\end{aligned}$$

VOLUME PROVIDED IN RESERVOIR COURSE OF POROUS PAVEMENT = 3,665 ft<sup>3</sup>

$$3,665 \text{ ft}^3 > 1,015 \text{ ft}^3 \quad \checkmark$$

$$RV_2 = (0.35 \text{ IN})(990 \text{ ft}^2)(\frac{1 \text{ FT}}{12 \text{ IN}}) = 30 \text{ ft}^3$$

VOLUME PROVIDED IN PROPOSED INFILTRATION BASINS = 133.5 ft<sup>3</sup>

$$133.5 \text{ ft}^3 > 30 \text{ ft}^3 \quad \checkmark$$

$$RV_3 = (0.35 \text{ IN})(9,100 \text{ ft}^2)(\frac{1 \text{ FT}}{12 \text{ IN}}) = 265 \text{ ft}^3$$

VOLUME PROVIDED IN CRUSHED STONE YARD = 5,135 ft<sup>3</sup>

$$5,135 \text{ ft}^3 > 265 \text{ ft}^3$$

SUMMARY: TOTAL REQUIRED RECHARGE VOLUME = 1,310 ft<sup>3</sup>  
TOTAL VOLUME PROVIDED FOR RECHARGE = 8,930 ft<sup>3</sup>

$$8,930 \text{ ft}^3 > 1,310 \text{ ft}^3 \quad \checkmark$$





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JOB 15.0166857.00 STAFFORD ST.

SHEET NO. 1 OF 1

CALCULATED BY STD DATE 3/10/22

CHECKED BY DATE

SCALE

### INFILTRATION BMP DRAWDOWN TIME

$$TIME_{DRAWDOWN} = \frac{RV}{(K)(BOTTOM\ AREA)}$$

WHERE: RV = STORAGE VOLUME

K = SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATES)

BOTTOM AREA = BOTTOM AREA OF RECHARGE PRACTICE

#### POROUS PAVEMENT:

$$RV = 3,665\ ft^3$$

$$K = 0.52\ in/hr\ (RAWLS\ RATE\ FOR\ HSG\ B\ "LOAM")$$

$$BOTTOM\ AREA = 22,230\ ft^2$$

$$TIME_{DRAWDOWN} = \frac{3,665\ ft^3}{(0.52\ in/hr)(22,230\ ft^2)(\frac{1\ ft}{12\ in})} = 3.8\ HRS$$

$$3.8\ HRS < 72\ HRS \quad \checkmark$$

#### INFILTRATION BASIN:

$$RV = 66.75\ ft^3$$

$$K = 0.52\ in/hr$$

$$BOTTOM\ AREA = 25\ ft^2$$

$$TIME_{DRAWDOWN} = \frac{66.75\ ft^3}{(0.52\ in/hr)(25\ ft^2)(\frac{1\ ft}{12\ in})} = 61.6\ HRS$$

$$61.6\ HRS < 72\ HRS \quad \checkmark$$

#### CRUSHED STONE:

$$RV = 5,135\ ft^3$$

$$K = 0.52\ in/hr$$

$$BOTTOM\ AREA = 31,130\ ft^2$$

$$TIME_{DRAWDOWN} = \frac{5,135\ ft^3}{(0.52\ in/hr)(31,130\ ft^2)(\frac{1\ ft}{12\ in})} = 3.8\ HRS$$

$$3.8\ HRS < 72\ HRS \quad \checkmark$$

**TABLE 1 - SUMMARY OF SUBSURFACE CONDITIONS****Stafford Street Access Road****Leicester, Massachusetts****GZA Project No. 04.0191281.00**

Test Boring	Station (Approx.)	Northing (ft)	Easting (ft)	Approximate Existing Ground Surface Elevation (2)	Soil and Groundwater Conditions (1, 3, 4)						Bottom of Exploration (ft)	
					Bottom of Topsoil / Subsoil (ft)		Top of Bedrock (ft)		Groundwater (ft)			
					Depth BGS	ELEV	Depth BGS	ELEV	Depth BGS	ELEV	BGS	ELEV
BVB-101	150	2907829	556868	801	NE	NE	20.1	781	18.2	783	20.1	781
BVB-102	240	2907917	556829	798	2.0	796	17.6	780	NE	NE	17.6	780
BVB-103	510	2908085	556648	774	1.5	773	10.0	764	0.1	774	10.0	764
BVB-104	440	2908181	556812	748	0.3	748	12.5	736	0.4	748	12.5	736
BVB-105	450	2908110	556730	763	0.6	762	7.5	756	5.7	757	7.5	756
BVT-201	190	2907870	556847	805	0.5	805	12.9	792	NE	NE	12.9	792
BVT-202	1010	2908320	556202	824	0.5	824	17.0	807	NE	NE	17.0	807
B5	830	2908325	556404	802	1.5	801	19.1	783	13.9	788	29.1	773
B28	670	2908231	556547	789	0.7	788	14.0	775	11.7	777	24.0	765
B507A	660	2908194	556527	793	2.0	791	20.0	773	20.2	773	29.5	764
B507B	650	2908155	556498	795	0.7	794	18.0	777	15.4	780	33.0	762
B508.A	50	2907791	556906	798	0.6	797	20.7	777	13.8	784	30.7	767
B508.B	60	2907801	556914	798	1.7	796	19.5	779	15.7	782	29.5	769

**NOTES:**

- 1 All depths are measured in feet below ground surface (bgs). Depths were estimated to the nearest 0.1 feet during drilling as presented on the boring logs. The accuracy of these values depends on drilling conditions and sample recovery and is on the order of ±1 foot. Elevations are rounded to the nearest 1 foot.
- 2 Coordinates and ground surface elevation at GZA boring locations were surveyed by Tauper Land Survey referencing NAD83 and NAVD88. Coordinates and ground surface elevation at CDM boring locations were obtained from CDM Report.
- 3 "NE" indicates stratum or groundwater not encountered in exploration, "NM" indicates groundwater not measured.
- 4 See test boring logs in Appendix B for additional information.



# Boring Number: B5

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA **Project Number:** 257372**Drilling Contractor/Driller:** Crawford Drilling Services, LLC/J. Martinelli/E. Ainsorth**Surface Elevation (ft):** 802.4**Drilling Method/Bore Hole Diameter:** Drive and Wash/4 in.**Total Depth (ft):** 29.1**Hammer Style/Weight/Drop Height/Spoon Size:** Automatic/140 lb/30 in./2 in.**Depth to Initial Water Level (ft):****Bore Hole Location:**

N: 2908325.13

E: 556403.55

Depth	Date	Time
13.9	4/2/2021	9:05

**Abandonment Method:** Backfilled with cement grout and soil cuttings.**Drilling Date: Start:** 3/31/2021 **End:** 4/2/2021**Logged By:** Hamza Al-Qudah

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
0		SS	S-1	12	6 20	5	>20		SUBSOIL	Top 2": Moist, dark brown, FOREST MAT, some silt, (roots and leaves). Bottom 2": Moist, dark brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt, (GP).	Sample S-1 terminated early due to angle of penetration. Drill rig chattering between 1 and 3.4 ft bgs. Possible boulder.
798.0	5	SS	S-2	24	24 53 53 40	13	106		SAND AND GRAVEL	Moist, very dense, light brown, fine to coarse SAND and fine to coarse GRAVEL, little silt, (SM).	
793.0	10	SS	S-3	24	42 27 26 35	8	53			Moist to wet, very dense, light brown, fine to coarse SAND and fine to coarse GRAVEL, some silt, (SM).	
788.0		SS	S-4	18	15 20 60 50/0"	9	80			Moist to wet, very dense, light brown, fine to coarse SAND, some fine to coarse gravel, some silt, (SM).	Drill rig chattering between 12 and 12.8 ft bgs.

Sample Types		Consistency vs Blowcount/Foot						Burmister Classification	
AS - Auger/Grab Sample	HP - Hydro Punch	Granular (Sand):				Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2		Stiff: 8-15	some	20-35%	
NQ - 1.9" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4		V. Stiff: 15-30	little	10-20%	
NX - 2.2" Rock Core	WS - Wash Sample	M. Dense: 10-30		M. Stiff: 4-8		Hard: >30	trace	<10%	
	GP - Geoprobe						moisture, density, color		
Reviewed by: A. Smith				Date: 4/19/2021		Boring Number: B5			

**Boring Number:**  
**B5**

**Client:** National Grid

**Project Name:** A127/B128 & Z126 - Stafford Street

<b>Project Location:</b>	Leicester, Worcester, and Auburn, MA
--------------------------	---

**Project Number:** 257372

Auburn, MA											
Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
	15										



# Boring Number: B5

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
	15										See previous page for soil material descriptions.	
783.0	20	NX	C-1	60	100	51	3.1	NR		SCHIST	moderately hard, slightly weathered, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: low angle, partly open, smooth, planar, fresh, open; secondary joint set: moderately dipping, open, rough, planar, discolored, open.	
							4.9	NR				
							3.0	NR				
							3.9	NR				
778.0	25	NX	C-2	60	90	68	3.0	NR		GRANITE	very hard, fresh, slightly fractured, light grey, coarse grained GRANITE; primary joint set: low angle, partly open, rough, undulating, fresh, open.	
							2.0	NR		SCHIST	moderately hard, slightly weathered, extremely fractured to moderately fractured, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: moderately dipping, open, smooth, planar, discolored, open.	
							2.0	NR				
							3.8	NR			moderately hard, slightly weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, partly open, smooth, planar, fresh, open.	
							1.5	NR				
							1.9	NR				
773.0	30										Test boring terminated at 29.1 feet bgs.	
768.0												

**Boring Number: B5**



**Boring Number:**  
**B28**

**Client:** National Grid

**Project Name:** A127/B128 & Z126 - Stafford Street

**Project Location:** Leicester, Worcester, and Auburn, MA **Project Number:** 257372

**Drilling Contractor/Driller:** Crawford Drilling Services, LLC/J. Martinelli/E. Ainsorth/J. Thibault **Surface Elevation (ft):** 788.7

**Drilling Method/Bore Hole Diameter:** Drive and Wash/4 in.

**Total Depth (ft):** 24.0

**Hammer Style/Weight/Drop Height/Spoon Size:** Automatic/140 lb/30 in./2 in.

**Depth to Initial Water Level (ft):**

**Bore Hole Location:**

Depth	Date	Time
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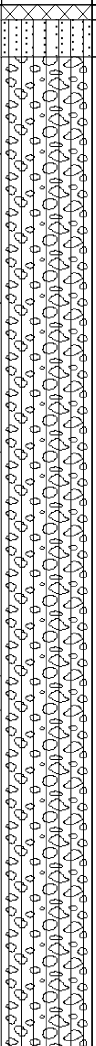

N: 2908231.48

E: 556546.94

11.7	3/5/2021	9:10
<b>Abandonment Method:</b>		Backfilled with cement grout and soil cuttings.

**Drilling Date: Start:** 3/4/2021 **End:** 3/5/2021

**Logged By:** Hamza Al-Qudah

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
784.0	0	SS	S-1	24	1 13 23 16	12	36		SAND AND GRAVEL	<p>Top 2": Moist, dense, dark brown, ORGANIC SILT and fine to medium SAND, (leaves), (OL).</p> <p>Middle 5": Moist, dense, orangish brown, SILT and fine SAND, little fine gravel, trace organics, (roots), (ML).</p> <p>Bottom 5": Moist, dense, light brown, fine to coarse GRAVEL, little fine to medium sand, trace silt, (GP).</p> <p>Dry, very dense, light brown, fine to coarse GRAVEL, some fine to coarse sand, trace silt, (GP).</p> <p>Moist, very dense, light brown, fine to coarse SAND and fine GRAVEL, little silt, (SM).</p>	
		SS	S-2	24	20 32 46 44	13	78				
	5	SS	S-3	24	14 40 56 51	12	96				
		SS	S-4	6	83/5.5"	2	>83				
779.0	10									Moist, very dense, light brown, fine to coarse GRAVEL and fine to medium SAND, little silt, (GM).	
774.0										See next page for rock material descriptions.	

Sample Types		Consistency vs Blowcount/Foot						Burmister Classification	
AS - Auger/Grab Sample	HP - Hydro Punch	Granular (Sand):				Fine Grained (Clay):		and	35-50%
CS - California Sampler	SS - Split Spoon							some	20-35%
NQ - 1.9" Rock Core	ST - Shelby Tube	V. Loose:	0-4	Dense:	30-50	V. Soft:	<2	Stiff:	8-15
NX - 2.2" Rock Core	WS - Wash Sample	Loose:	4-10	V. Dense:	>50	Soft:	2-4	V. Stiff:	15-30
	GP - Geoprobe	M. Dense:	10-30			M. Stiff:	4-8	Hard:	>30
									trace
									<10%
									moisture density color

Reviewed by: A. Smith

Date: 4/19/2021

**Boring Number: B28**



# Boring Number: B28

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
	0										See previous page for soil material descriptions.	
784.0	5											
779.0	10											
774.0	15	NX	C-1	60	87	82	4.6	NR		SCHIST	moderately hard, fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight, smooth, planar, fresh, tight.	Quartz intrusion at approximately 14.6 ft bgs.
							2.7	NR				
							1.9	NR				
							1.5	NR				
							1.3	NR				
769.0	20						2.2	NR			moderately hard, fresh, slightly fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight to partly open, smooth, planar, fresh, open.	

**Boring Number: B28**

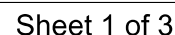


# Boring Number: B28

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
		NX	C-2	60	92	87	1.9	NR		SCHIST	moderately hard, fresh, slightly fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight to partly open, smooth, planar, fresh, open.	
							2.0	NR				
							1.5	NR				
							1.3	NR				
764.0	25										Test boring terminated at 24.0 feet bgs.	
759.0	30											
754.0	35											
749.0	40											

**Boring Number: B28**



**Boring Number:**  
**B507A**

**Client:** National Grid

**Project Name:** A127/B128 & Z126 - Stafford Street

**Project Location:** Leicester, Worcester, and Auburn, MA **Project Number:** 257372

**Drilling Contractor/Driller:** Crawford Drilling Services, LLC/J. Martinelli/E. Ainsorth/ M. Martinelli

**Surface Elevation (ft):** 793.2

**Drilling Method/Bore Hole Diameter:** Drive and Wash/4 in.

**Total Depth (ft):** 29.5

**Hammer Style/Weight/Drop Height/Spoon Size:** Automatic/140 lb/30 in./2 in.

**Depth to Initial Water Level (ft):**

**Bore Hole Location:**

Depth	Date	Time
-------	------	------

N: 2908194.18

E: 556526.50

20.2 3/9/2021 8:25  
**Abandonment Method:** Backfilled with cement grout  
 and soil cuttings.

**Drilling Date: Start:** 3/5/2021 **End:** 3/9/2021

**Logged By:** Hamza Al-Qudah

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
789.0	0	SS	S-1	24	2 2 2 2	6	4		SUBSOIL	Top 1": Moist, loose, dark brown, SILT, little fine sand, (frozen and roots), (ML). Bottom 5": Moist, loose, orangish brown, SILT, some fine to medium sand, trace organics, (roots), (ML).	
789.0	5	SS	S-2	24	5 5 28 35	4	33		SAND AND GRAVEL	Moist, medium dense, brown, fine to coarse GRAVEL and fine to medium SAND, little silt, (GM).	
789.0	5	SS	S-3	24	23 45 63 42	13	108			Moist to wet, very dense, light brown, fine to coarse GRAVEL, some fine to coarse sand, little silt, (roots), (GM).	
784.0	10										Drill rig chattering between 7 and 8 ft bgs.
779.0											Driller indicated possible rock at 9 ft bgs. Observed rock cuttings in wash. Boulder encountered and cored between 10 feet and 15 feet bgs. Approximate diameter 1..8 ft bgs.

[illegible]

Reviewed by: A. Smith



Date: 4/19/2021

**Boring Number: B507A**



# Boring Number: B507A

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and  
Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
15		SS	S-4	24	15 43 58 77	10	101		SAND AND GRAVEL	Moist to wet, very dense, light brown, fine to coarse SAND, some fine to coarse gravel, some silt, (SM).	
774.0	20									See next page for rock material descriptions.	
769.0	25										
764.0	30										
759.0											

**Boring Number: B507A**





# Boring Number: B507A

**Client:** National Grid

**Project Name:** A127/B128 & Z126 - Stafford Street

**Project Location:** Leicester, Worcester, and Auburn, MA

**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
774.0	15										See previous page for soil material descriptions.	
769.0	20	NX	C-1	54	81	48	3.5	NR		GRANITE	very hard, moderately weathered, moderately fractured, light grey with black (mottled), coarse grained GRANITE; primary joint set: moderately dipping, wide, rough, undulating, discolored, open.	Quartz intrusion between approximately 21.5 and 21.75 ft. bgs.
764.0	25	NX	C-2	60	92	84	2.0	NR		SCHIST	moderately hard, highly weathered to slightly weathered, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight, smooth, planar, disintegrated to fresh; secondary joint set: moderately dipping, partly open to wide, smooth, planar, disintegrated to decomposed, open. moderately hard, slightly weathered to fresh, moderately fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight to partly open, smooth, planar, discolored to fresh.	Granite intrusion between approximately 27.3 and 27.9 ft. bgs.
759.0	30										Test boring terminated at 29.5 feet bgs.	

**Boring Number: B507A**



# Boring Number: B507B

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA **Project Number:** 257372**Drilling Contractor/Driller:** Crawford Drilling Services, LLC/J. Martinelli / M. Martinelli**Surface Elevation (ft):** 795.3**Drilling Method/Bore Hole Diameter:** Drive and Wash/4 in.**Total Depth (ft):** 33.0**Hammer Style/Weight/Drop Height/Spoon Size:** Automatic/140 lb/30 in./2 in.**Depth to Initial Water Level (ft):****Bore Hole Location:**

N: 2908155.45

E: 556498.15

Depth	Date	Time
15.4	3/11/2021	9:04

**Abandonment Method:** Backfilled with cement grout and soil cuttings.**Drilling Date: Start:** 3/10/2021 **End:** 3/11/2021**Logged By:** Hamza Al-Qudah

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
	0										
		SS	S-1	24	5 6 4 5	10	10			Top 3": Moist, medium dense, dark brown, fine to medium SAND and ORGANIC SILT, (roots), (SM). Middle 4": Moist, medium dense, orangish brown, fine to medium SAND, some silt, little fine gravel, trace organics, (roots), (SM). Bottom 3": Moist, medium dense, light brown, fine to coarse SAND, some fine gravel, some silt, (roots), (SM). Moist, very dense, light brown, fine to coarse SAND and fine to coarse GRAVEL, little silt, (SM). Moist to wet, very dense, light brown, fine to coarse GRAVEL and fine to coarse SAND, little silt, (GM).	
		SS	S-2	24	4 36 28 33	16	64				
791.0											
	5	SS	S-3	24	27 48 56 45	16	104				
786.0											
	10	SS	S-4	24	21 29 41 41	9	70			Wet, very dense, light brown, fine to coarse GRAVEL, some fine to coarse sand, little silt, (GM).	Drill rig chattering between approximately 7 and 8.5 ft bgs.
781.0		SS	S-5	12	13 13 50/0"	6	>63			Top 3": Moist, very dense, light brown, fine to medium SAND, trace silt, (SP-SM). Bottom 3": Moist, very dense, grey to light brown, SILT, some fine sand, (ML).	Drill rig chattering between approximately 11 and 12 ft bgs.

Sample Types		Consistency vs Blowcount/Foot		Burmister Classification	
AS - Auger/Grab Sample	HP - Hydro Punch	Granular (Sand):		and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4 Dense: 30-50		some	20-35%
NQ - 1.9" Rock Core	ST - Shelby Tube	Loose: 4-10 V. Dense: >50		little	10-20%
NX - 2.2" Rock Core	WS - Wash Sample	M. Dense: 10-30		trace	<10%
	GP - Geoprobe			moisture, density, color	
		Fine Grained (Clay):			
		V. Soft: <2 Stiff: 8-15			
		Soft: 2-4 V. Stiff: 15-30			
		M. Stiff: 4-8 Hard: >30			

**Reviewed by:** A. Smith**Date:** 4/19/2021**Boring Number:** B507B





# Boring Number: B507B

**Client:** National Grid

**Project Name:** A127/B128 & Z126 - Stafford Street

**Project Location:** Leicester, Worcester, and Auburn, MA

**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
	15										See previous page for soil material descriptions.	
	776.0						2.8	NR		GRANITE	very hard, moderately weathered to slightly weathered, extremely fractured to sound, light grey with black, coarse grained GRANITE; primary joint set: low angle, wide, rough, undulating, discolored, open.	
	20	NX	C-1	60	100	67	2.7	NR		SCHIST	moderately hard, slightly weathered, moderately fractured to slightly fractured, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, open, smooth, planar, discolored, open.	Losing water at approximately 20.7 ft bgs.
							3.6	NR		GRANITE	moderately hard, slightly weathered, moderately fractured to slightly fractured, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, open, smooth, planar, discolored, open.	
							2.5	NR		SCHIST	very hard, slightly weathered, extremely fractured to sound, light grey with black, coarse grained GRANITE; primary joint set: horizontal, moderately wide, rough, undulating, discolored to fresh, open; secondary joint set: moderately dipping, wide, rough, undulating, fresh, open.	
	771.0						2.3	NR		SCHIST	moderately hard, slightly weathered, slightly fractured, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: vertical, very tight, smooth, planar, fresh, tight; secondary joint set: horizontal, tight, smooth, planar, fresh, tight.	
	25	NX	C-2	60	98	60	2.0	NR		SCHIST	very hard, slightly weathered, sound, light grey with black (mottled), coarse grained GRANITE.	Quartz intrusion between 28.6 and 28.9 ft bgs.
							2.9	NR		SCHIST	moderately hard, moderately weathered to highly weathered, extremely fractured, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: vertical, tight to very wide, smooth, planar, decomposed, open; secondary joint set: horizontal, wide, smooth, undulating, fresh, open.	Quartz intrusion between 29.6 and 29.8 ft bgs.
							1.7	NR		SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	Quartz intrusion between 30.75 and 31 ft bgs.
							1.9	NR		SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	Quartz intrusion between 31.2 and 31.4 ft bgs.
	766.0						1.5	NR		SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	Quartz intrusion at 31.5 ft bgs.
	30	NX	C-3	60	100	82	1.5	NR		SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	
							1.5	NR		SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	
							1.7	NR		SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	
	761.0									SCHIST	moderately hard, moderately weathered to fresh, extremely fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, wide, smooth, planar, decomposed, open; secondary joint set: moderately dipping, open, smooth, planar, decomposed, open.	
Test boring terminated at 33.0 feet bgs.												

**Boring Number: B507B**



# Boring Number: B508.A

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA **Project Number:** 257372**Drilling Contractor/Driller:** Crawford Drilling Services, LLC/J. Martinelli/E. Ainsworth**Surface Elevation (ft):** 798.3**Drilling Method/Bore Hole Diameter:** Drive and Wash/4 in.**Total Depth (ft):** 30.7**Hammer Style/Weight/Drop Height/Spoon Size:** Automatic/140 lb/30 in./2 in.**Depth to Initial Water Level (ft):****Bore Hole Location:**

N: 2907791.33

E: 556906.39

**Depth**      **Date**      **Time**

13.8      3/1/2021      11:59

**Abandonment Method:** Backfilled with cement grout and soil cuttings.**Drilling Date: Start:** 2/26/2021 **End:** 3/1/2021**Logged By:** Hamza Al-Qudah

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
	0	SS	S-1	7	28 100/1"	2	>100		TOP SOIL	Moist to wet, very dense, dark brown, fine to coarse SAND and coarse GRAVEL, little organic silt, (frozen, roots and leaves), (SM).	Rock in tip of spoon. Drill rig chattering between 0.7 and 3 ft bgs. possible boulder.
794.0		SS	S-2	24	7 12 11 13	5	23		SAND AND GRAVEL	Moist to wet, medium dense, light brown, fine to coarse GRAVEL, some fine to coarse sand, little silt, (GM).	
789.0	5										
	10	SS	S-3	24	18 18 20 36	5	38			Moist, dense, light brown, fine to coarse SAND, some fine to coarse gravel, little silt, (SM).	
784.0		SS	S-4	16	16 29 100/4"	4	>129			Wet, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, little silt, (GM).	Drill rig chattering between 11.5 and 13.5 ft bgs. Possible boulder.

Sample Types				Consistency vs Blowcount/Foot				Burmister Classification	
AS - Auger/Grab Sample	HP - Hydro Punch	Granular (Sand):		Fine Grained (Clay):		and	35-50%		
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4		V. Soft: <2		some	20-35%		
NQ - 1.9" Rock Core	ST - Shelby Tube	Loose: 4-10		Soft: 2-4		little	10-20%		
NX - 2.2" Rock Core	WS - Wash Sample	M. Dense: 10-30		V. Dense: >50		trace	<10%		
	GP - Geoprobe					moisture, density, color			

**Reviewed by:** A. Smith**Date:** 4/19/2021**Boring Number:** B508.A





# Boring Number: B508.A

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and  
Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
15										Wet, very dense, brown, fine to coarse GRAVEL and fine to coarse SAND, little silt, (GM).	
											Drill rig chattering between 17 and 19 ft bgs.
779.0		SS	S-5	8	52 100/2"	4	>100		SAND AND GRAVEL	Moist, very dense, light brown, fine to coarse SAND, some fine to coarse gravel. some silt, (SM).	
20											
										See next page for rock material descriptions.	
774.0											
25											
769.0											
30											
764.0											

**Boring Number: B508.A**



# Boring Number: B508.A

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
779.0	15										See previous page for soil material descriptions.	
774.0	20	NX	C-1	60	97	94	3.0	NR		GRANITE	very hard, slightly weathered to fresh, extremely fractured to sound, light grey with black (mottled), coarse grained GRANITE; primary joint set: horizontal, tight to partly open, rough, undulating, fresh, tight to open.	
769.0	25						2.1	NR		SCHIST	moderately hard, fresh, moderately fractured to sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, moderately wide, smooth, planar, fresh, open.	
769.0	25						3.3	NR		GRANITE	very hard, fresh, sound, light grey with black, coarse grained GRANITE.	
769.0	25						1.5	NR		SCHIST	very hard, slightly weathered to fresh, moderately fractured to slightly fractured, light grey with black (mottled), coarse grained GRANITE; primary joint set: low angle, tight, rough, undulating, fresh, tight.	
769.0	25	NX	C-2	60	100	94	1.8	NR		GRANITE	medium hard to moderately hard, slightly weathered, extremely fractured to sound, dark grey to light grey, medium grained SCHIST; foliation low angle; primary joint set: low angle, tight, smooth, planar, fresh, tight.	
769.0	25						2.5	NR		GRANITE	very hard, slightly weathered to fresh, extremely fractured to sound, light grey with black (mottled), coarse grained GRANITE; primary joint set: horizontal, partly open to open, rough, undulating, fresh, open.	
769.0	25						2.0	NR		SCHIST	moderately hard, fresh, sound, dark grey, medium grained SCHIST; foliation horizontal;	
764.0	30											

Test boring terminated at 30.7 feet bgs.

**Boring Number: B508.A**



# Boring Number: B508.B

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and Auburn, MA **Project Number:** 257372**Drilling Contractor/Driller:** Crawford Drilling Services, LLC/J. Martinelli/E. Ainsworth/J. Thibault**Surface Elevation (ft):** 798.2**Drilling Method/Bore Hole Diameter:** Drive and Wash/4 in.**Total Depth (ft):** 29.5**Hammer Style/Weight/Drop Height/Spoon Size:** Automatic/140 lb/30 in./2 in.**Depth to Initial Water Level (ft):****Bore Hole Location:**

N: 2907800.74

E: 556914.12

**Depth**      **Date**      **Time**

15.7      2/25/2021      13:27

**Abandonment Method:** Backfilled with cement grout and soil cuttings.**Drilling Date: Start:** 2/25/2021 **End:** 2/25/2021**Logged By:** Hamza Al-Qudah

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
	0										
		SS	S-1	24	4 5 5 8	3	10		TOPSOIL	Wet, medium dense, dark brown, coarse GRAVEL, little fine to coarse sand, trace silt, trace organics, (GP).	
		SS	S-2	8	45 100/2"	7	>100		SUBS OIL	Wet, very dense, orangish brown, fine to coarse SAND, some silt, little fine gravel, (roots), (SM).	
	794.0										
	5	SS	S-3	24	10 10 9 10	3	19			Wet, medium dense, light brown, fine to coarse GRAVEL, little fine to coarse sand, trace silt, (GP).	
		SS	S-4	24	9 14 16 12	9	30			Wet, dense, light brown, fine to coarse GRAVEL, some fine to coarse sand, little silt, (GP-GM).	
	789.0										
	10	SS	S-5	24	9 10 13 25	7	23			Moist, medium dense, light brown, fine to coarse SAND, some fine to coarse gravel, little silt, (SM).	
	784.0									Moist, very dense, light brown, fine to coarse GRAVEL and fine to coarse SAND, little silt, (GM).	Drill rig chattering between 12 and 14 ft bgs.

Sample Types		Consistency vs Blowcount/Foot						Burmister Classification	
AS - Auger/Grab Sample	HP - Hydro Punch	Granular (Sand):			Fine Grained (Clay):			and	35-50%
CS - California Sampler	SS - Split Spoon	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15		some	20-35%	
NQ - 1.9" Rock Core	ST - Shelby Tube	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30		little	10-20%	
NX - 2.2" Rock Core	WS - Wash Sample	M. Dense: 10-30		M. Stiff: 4-8	Hard: >30		trace	<10%	
	GP - Geoprobe						moisture, density, color		
Reviewed by: A. Smith				Date: 4/16/2021		Boring Number: B508.B			



# Boring Number: B508.B

**Client:** National Grid**Project Name:** A127/B128 & Z126 - Stafford Street**Project Location:** Leicester, Worcester, and  
Auburn, MA**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Blows per 6 inches	Sample Recovery (in)	N-Value	Graphic Log	Strata	Material Description	Remarks
15	▼	SS	S-6	24	17 37 86 67	13	123		SAND AND GRAVEL	Moist, very dense, light brown, fine to coarse GRAVEL and fine to coarse SAND, little silt, (GM).	
779.0											
20										See next page for rock material descriptions.	
774.0											
25											
769.0											
30											
764.0											

**Boring Number: B508.B**



# Boring Number: B508.B

**Client:** National Grid

**Project Name:** A127/B128 & Z126 - Stafford Street

**Project Location:** Leicester, Worcester, and Auburn, MA

**Project Number:** 257372

Elev. (ft)	Depth (ft)	Sample Type	Sample Number	Sample Length (in)	Recovery (%)	RQD (%)	Drill Rate (min/ft)	Down Press. (psi)	Graphic Log	Strata	Material Description	Remarks
779.0	15										See previous page for soil material descriptions.	
	20	NX	C-1	60	98		5.1	NR		GRANITE	very hard, slightly weathered, extremely fractured to sound, light grey with black (mottled), coarse grained GRANITE; primary joint set: horizontal, open, rough, undulating, fresh, open.	Quartz intrusion between 21.2 and 21.6 ft bgs.
						81	3.7	NR		SCHIST	moderately hard, fresh, sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, very tight, smooth, planar, fresh, open.	
774.0							5.0	NR		GRANITE	very hard, fresh, sound, light grey with black (mottled), coarse grained GRANITE; primary joint set: horizontal, partly open, rough, undulating, fresh, tight.	
							5.8	NR			very hard, fresh, sound, light grey with black (mottled), coarse grained GRANITE; primary joint set: horizontal, partly open, rough, undulating, fresh, tight.	
	25	NX	C-2	60	95	91	2.5	NR		SCHIST	very hard, fresh, slightly fractured to sound, light grey with black (mottled), coarse grained GRANITE; primary joint set: horizontal, partly open, rough, undulating, fresh, open.	Granite intrusion between 26.8 and 27 ft bgs.
							1.5	NR			moderately hard, fresh, sound, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight, smooth, planar, fresh.	
769.0							1.0	NR		GRANITE	very hard, fresh, sound, light grey with black (mottled), coarse grained GRANITE.	
							1.8	NR			very hard, fresh, sound, light grey with black (mottled), coarse grained GRANITE.	
	30						1.5	NR		SCHIST	moderately hard, slightly weathered, extremely fractured, dark grey, medium grained SCHIST; foliation horizontal; primary joint set: horizontal, tight, smooth, planar, fresh, tight.	Test boring terminated at 29.5 feet bgs.
764.0												

**Boring Number: B508.B**



# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

EXPLORATION NO.: BVB-101  
SHEET: 1 of 1  
PROJECT NO: 04.0191281.00  
REVIEWED BY: J. Szmyt

Logged By: Dylan Shaffer  
Drilling Co.: Drilex Environmental  
Foreman: Jamie Hastings

Type of Rig: CME55LC  
Rig Model: ATV  
Drilling Method: HSA

Boring Location: See Plan  
Ground Surface Elev. (ft.): 801  
Final Boring Depth (ft.): 20.1  
Date Start - Finish: 8/30/2021 - 8/30/2021

H. Datum: NAD83  
V. Datum: NAVD88

Hammer Type: Automatic  
Hammer Weight (lb.): 140 lbs  
Hammer Fall (in.): 30"  
Auger or Casing O.D./I.D Dia (in.): 4.25"

Sampler Type: Split Spoon  
Sampler O.D. (in.): 2"  
Sampler Length (in.): 24"  
Rock Core Size: NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/30/21	11:24	18.20 ft.	15 min.

Depth (ft.)	Casing Blows/ Core Rate	Sample No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
5		S-1	0-2	24	10	15 13 17 21	30	S-1: Dense, brown, fine to coarse SAND, some Gravel, little Silt, trace Roots, moist. (SM)					
		S-2	2-4	24	17	26 31 41 38	72	S-2: Very dense, light brown/gray, GRAVEL, some fine to medium Sand, little Silt, dry. (GM)	1				
		S-3	5-7	24	13	32 34 23 27	57	S-3: Very dense, light brown/gray, fine to coarse SAND, and Gravel, little Silt, dry. (SM)					
		S-4	7-9	24	12	61 34 32 58	66	S-4: Very dense, light brown/gray, GRAVEL and fine to coarse Sand, little Silt, dry. (GM)					
10		S-5	10-12	24	12	9 18 24 37	42	S-5: Dense, brown, fine to coarse SAND, and Gravel, little Silt, moist. (SM-GM)					
15		S-6	15-17	24	15	5 41 27 15	68	S-6: Very dense, brown with gray, GRAVEL, some fine Sand, little Silt, moist. (GM)					
20		S-7	20-20.1	1	1	25/1"	R	S-7: Very dense, brown, GRAVEL, some fine to coarse Sand, some Silt, wet. Potential cuttings. (GM)	2		20.1	BOULDER OR BEDROCK	780.9
								End of exploration at 20.1 feet.	3				
									4				

## REMARKS

- 1 - Very difficult drilling at 2 feet below ground surface (bgs).
- 2 - Auger refusal at approximately 20 feet bgs on probable bedrock or boulder.
- 3 - Split spoon refusal at approximately 20.1 feet bgs on boulder or bedrock.
- 4 - Test boring backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:  
**BVB-101**

# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

EXPLORATION NO.: BVB-102  
SHEET: 1 of 1  
PROJECT NO: 04.0191281.00  
REVIEWED BY: J. Szmyt

**Logged By:** Dylan Shaffer  
**Drilling Co.:** Drilex Environmental  
**Foreman:** Jamie Hastings

**Type of Rig:** CME55LC  
**Rig Model:** ATV  
**Drilling Method:** HSA

**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 798  
**Final Boring Depth (ft.):** 17.6  
**Date Start - Finish:** 8/31/2021 - 8/31/2021

**H. Datum:** NAD83  
**V. Datum:** NAVD88

**Hammer Type:** Automatic  
**Hammer Weight (lb.):** 140 lbs  
**Hammer Fall (in.):** 30"  
**Auger or Casing O.D./I.D Dia (in.):** 4.25"

**Sampler Type:** Split Spoon  
**Sampler O.D. (in.):** 2"  
**Sampler Length (in.):** 24"  
**Rock Core Size:** NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/31/21	9:25	Dry	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample						SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)								
5		S-1	0-2	24	10	1 2 1 4		3	S-1: Top 3": Very loose, dark brown, fine to medium SAND, some Silt, little Roots, little Gravel, moist. (SM) Bottom 7": Very loose, orange/brown, fine to medium SAND, some Silt, little Gravel, trace Roots, moist. (SM)	1		0.2	TOPSOIL	797.8
		S-2	2-4	24	15	32 33 31 41		64	S-2: Very dense, brown/gray, fine to coarse SAND, and GRAVEL, little Silt, trace Roots, moist. (SM-GM)					
		S-3	5-7	24	16	26 26 24 27		50	S-3: Very dense, brown/gray, fine to coarse SAND, and GRAVEL, little Silt, moist. (SM-GM)					
		S-4	7-9	24	18	30 38 46 48		84	S-4: Very dense, brown/gray, fine to coarse SAND, and GRAVEL, little Silt, moist. (SM-GM)					
10		S-5	10-10.4	11	6	8 60/5"		R	S-5: Very dense, brown, fine to coarse SAND, some Silt, little Gravel, moist. (SM)	2				
15		S-6	15-16.2	15	10	38 24 50/3"		R	S-6: Very dense, light brown/gray, fine to coarse SAND, and GRAVEL, some Silt, moist. (SM-GM)	3				
									End of exploration at 17.6 feet.	4		17.6		780.4
20										5			BOULDER OR BEDROCK	

- REMARKS**
- 1 - Very difficult drilling at 2 feet below ground surface (bgs).
  - 2 - Split spoon refusal at approximately 10.9 feet bgs.
  - 3 - Split spoon refusal at approximately 16.2 feet bgs.
  - 4 - Auger refusal at approximately 17.6 feet bgs on boulder or bedrock.
  - 5 - Test boring backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Exploration No.:**  
**BVB-102**

# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

EXPLORATION NO.: BVB-103  
SHEET: 1 of 1  
PROJECT NO: 04.0191281.00  
REVIEWED BY: J. Szmyt

Logged By: Dylan Shaffer  
Drilling Co.: Drilex Environmental  
Foreman: Jamie Hastings

Type of Rig: CME55LC  
Rig Model: ATV  
Drilling Method: HSA

Boring Location: See Plan  
Ground Surface Elev. (ft.): 774  
Final Boring Depth (ft.): 10  
Date Start - Finish: 9/1/2021 - 9/1/2021

H. Datum: NAD83  
V. Datum: NAVD88

Hammer Type: Automatic  
Hammer Weight (lb.): 140 lbs  
Hammer Fall (in.): 30"  
Auger or Casing O.D./I.D Dia (in.): 4.25"

Sampler Type: Split Spoon  
Sampler O.D. (in.): 2"  
Sampler Length (in.): 24"  
Rock Core Size: NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
09/01/21	12:00	0.1 ft.	30 min.

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0-1.9	23	7	WOH 1 3 60/5"	4	S-1: Top 3": Very loose, dark brown/black, SILT, some Organics, little Wood/Roots, trace fine to coarse Sand, wet. (OL) Bottom 4": Very loose, brown, GRAVEL, little fine to coarse Sand, little Silt, wet. (GM)	1		0.2	PEAT	773.8
		S-2	4-6	24	18	8 20 30 23	50	S-2: Very dense, brown, fine to coarse SAND, some Gravel, some Silt, moist, with 2.5-inch-thick layer of predominantly Gravel. (SM)	2		10	SAND AND GRAVEL	764.0
		S-3	6-8	24	13	49 35 52 72	87	S-3: Very dense, brown, fine to coarse SAND, and GRAVEL, some Silt, moist. (SM-GM)	3				
		S-4	8-9.7	21	12	38 24 48 50/3"	72	S-4: Top 11": Very dense, brown, fine to coarse SAND, some Gravel, some Silt, moist. (SM) Bottom 1": Very dense, gray, GRAVEL, some fine to coarse SAND, little Silt, moist. (GM)	4				
10								End of exploration at 10 feet.	5				
									6			BOULDER OR BEDROCK	

## REMARKS

- 1 - Split spoon refusal at approximately 1.9 feet below ground surface (bgs).
- 2 - Very difficult drilling at approximately 1 foot bgs.
- 3 - Split spoon refusal at approximately 9.7 feet bgs.
- 4 - Auger refusal at approximately 10 feet bgs on boulder or bedrock.
- 5 - Driller noted numerous cobbles throughout length of boring.
- 6 - Test boring backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:  
**BVB-103**

# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

EXPLORATION NO.: BVB-104  
SHEET: 1 of 1  
PROJECT NO: 04.0191281.00  
REVIEWED BY: J. Szmyt

Logged By: Dylan Shaffer  
Drilling Co.: Drilex Environmental  
Foreman: Jamie Hastings

Type of Rig: CME55LC  
Rig Model: ATV  
Drilling Method: HSA

Boring Location: See Plan  
Ground Surface Elev. (ft.): 748  
Final Boring Depth (ft.): 12.5  
Date Start - Finish: 8/31/2021 - 9/1/2021

H. Datum: NAD83  
V. Datum: NAVD88

Hammer Type: Automatic  
Hammer Weight (lb.): 140 lbs  
Hammer Fall (in.): 30"  
Auger or Casing O.D./I.D Dia (in.): 4.25"

Sampler Type: Split Spoon  
Sampler O.D. (in.): 2"  
Sampler Length (in.): 24"  
Rock Core Size: NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/1/21	7:45	0.4 ft.	15 hrs.

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0-0.9	11	6	4 50/5"	R	S-1: Top 3": Very dense, dark brown/black, SILT, some Organics, little Roots, trace fine to medium Sand, trace Gravel, wet. (OL) Bottom 3": Very dense, light brown/gray, GRAVEL, little fine to coarse Sand, little Silt, wet. (GM)	1		0.3	TOPSOIL	747.7
		S-2	4-6	24	19	7 8 17 20	25	S-2: Medium dense, gray/orange, fine to medium SAND, and SILT, trace Gravel, moist. (SM) Medium dense, orange/brown, fine to coarse SAND, some Gravel, some Silt, moist. (SM)	2			SAND AND GRAVEL	
		S-3	6-8	24	17	14 16 35 37	51	S-3: Very dense, brown, fine to coarse SAND, some Gravel, some Silt, moist. (SM)					
		S-4	8-10	24	15	18 40 58 52	98	S-4: Very dense, brown with white/gray, GRAVEL, some fine to coarse Sand, little Silt, wet. (GM)			8		740.0
		S-5	10-11.9	23	14	21 56 70 60/5"	>100	S-5: Very dense, brown with white/gray, GRAVEL, some fine to coarse Sand, little Silt, wet. (GM)	3			WEATHERED ROCK	
10									4				
								End of exploration at 12.5 feet.	5		12.5	BOULDER OR BEDROCK	735.5
15									6				
20													

## REMARKS

- 1 - Split spoon refusal at approximately 0.9 feet below ground surface (bgs).
- 2 - Difficult drilling at approximately 1 foot bgs.
- 3 - Split spoon refusal at approximately 11.9 feet bgs.
- 4 - Auger refusal at approximately 12.5 feet bgs on boulder or bedrock.
- 5 - Driller noted numerous cobbles throughout length of boring.
- 6 - Test boring backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:  
**BVB-104**

# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

**EXPLORATION NO.:** BVB-105  
**SHEET:** 1 of 1  
**PROJECT NO:** 04.0191281.00  
**REVIEWED BY:** J. Szmyt

**Logged By:** Dylan Shaffer  
**Drilling Co.:** Drilex Environmental  
**Foreman:** Jamie Hastings

**Type of Rig:** CME55LC  
**Rig Model:** ATV  
**Drilling Method:** HSA

**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 763  
**Final Boring Depth (ft.):** 7.5  
**Date Start - Finish:** 9/1/2021 - 9/1/2021

**H. Datum:** NAD83  
**V. Datum:** NAVD88

**Hammer Type:** Automatic  
**Hammer Weight (lb.):** 140 lbs  
**Hammer Fall (in.):** 30"  
**Auger or Casing O.D./I.D Dia (in.):** 4.25"

**Sampler Type:** Split Spoon  
**Sampler O.D. (in.):** 2"  
**Sampler Length (in.):** 24"  
**Rock Core Size:** NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
9/1/21	9:52	5.7 ft.	30 min.

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value						
5		S-1	0-2	24	7	2 5 4 7	9	S-1: Top 2": Loose, dark brown, fine SAND, some Silt, little Roots, trace Gravel, moist. (SM) Bottom 5": Loose, dark brown/orange, fine to medium SAND, some Silt, trace Roots, trace Gravel, moist. (SM)			0.1	FOREST MAT	762.9
		S-2	2-2.8	10	10	12 50/4"	R	S-2: Very dense, brown, fine to coarse SAND, some Gravel, little Silt, moist. (SM)	1				
		S-3	5-5.8	10	4.5	10 50/4"	R	S-3: Very dense, white/gray with brown, fine to coarse SAND, and Gravel, little Silt, moist. (SM)	2				
		S-4	7.1-7.5	4	3	25/4"	R	S-4: No Sample, cuttings consisted of: GRAVEL, little fine to coarse Sand, little Silt, wet. (GM)	3		7.5		755.5
10								End of exploration at 7.5 feet.	4			BOULDER OR BEDROCK	
									5				
15													
20													

## REMARKS

- 1 - Difficult drilling at approximately 3 feet below ground surface (bgs).
- 2 - Very difficult drilling at approximately 5 feet bgs.
- 3 - Auger refusal at approximately 7.5 ft bgs on boulder or bedrock.
- 4 - Driller noted numerous cobbles throughout length of boring.
- 5 - Test boring backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Exploration No.:**  
**BVB-105**



# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

EXPLORATION NO.: BVT-201  
SHEET: 1 of 1  
PROJECT NO: 04.0191281.00  
REVIEWED BY: J. Szmyt

**Logged By:** Dylan Shaffer  
**Drilling Co.:** Drilex Environmental  
**Foreman:** Jamie Hastings

**Type of Rig:** CME55LC  
**Rig Model:** ATV  
**Drilling Method:** HSA

**Boring Location:** See Plan  
**Ground Surface Elev. (ft.):** 805  
**Final Boring Depth (ft.):** 12.9  
**Date Start - Finish:** 8/30/2021 - 8/30/2021

**H. Datum:** NAD83  
**V. Datum:** NAVD88

**Hammer Type:** Automatic  
**Hammer Weight (lb.):** 140 lbs  
**Hammer Fall (in.):** 30"  
**Auger or Casing O.D./I.D Dia (in.):** 4.25"

**Sampler Type:** Split Spoon  
**Sampler O.D. (in.):** 2"  
**Sampler Length (in.):** 24"  
**Rock Core Size:** NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/30/21	13:45	Dry	30 min.

Depth (ft)	Casing Blows/ Core Rate	Sample					SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)							
5		S-1	0-0.5					S-1: Orange/dark brown, fine SAND, little Silt, little Roots/Organics, trace Gravel, moist. (SM)	1		0.5	TOPSOIL	804.5
		S-2	5-8					S-2: Brown, GRAVEL, some coarse Sand, little Silt, moist. (GM)	2			SAND AND GRAVEL	
		S-3	8-11					S-3: Brown, GRAVEL, some fine to coarse Sand, little Silt, moist. (GM)	3				
15								End of exploration at 12.9 feet.	4		12.9	BOULDER OR BEDROCK	792.1
									5				

## REMARKS

- 1 - Boulder observed on sidewall of probe at approximately 0.5 feet below ground surface (bgs).
- 2 - Difficult drilling encountered at approximately 1 foot bgs.
- 3 - Auger refusal at approximately 12.9 bgs on boulder or bedrock.
- 4 - Boring was a probe, SPT sampling not performed. Samples from soil cuttings obtained from the approximate depth interval noted.
- 5 - Test probe backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

**Exploration No.:**  
**BVT-201**

# TEST BORING LOG



**GZA**  
**GeoEnvironmental, Inc.**  
*Engineers and Scientists*

National Grid  
Stafford Street Access Road  
Leicester, Massachusetts

EXPLORATION NO.: BVT-202  
SHEET: 1 of 1  
PROJECT NO: 04.0191281.00  
REVIEWED BY: J. Szymt

Logged By: Dylan Shaffer  
Drilling Co.: Drilex Environmental  
Foreman: Jamie Hastings

Type of Rig: CME55LC  
Rig Model: ATV  
Drilling Method: HSA

Boring Location: See Plan  
Ground Surface Elev. (ft.): 824  
Final Boring Depth (ft.): 17  
Date Start - Finish: 8/30/2021 - 8/30/2021

H. Datum: NAD83  
V. Datum: NAVD88

Hammer Type: Automatic  
Hammer Weight (lb.): 140 lbs  
Hammer Fall (in.): 30"  
Auger or Casing O.D./I.D Dia (in.): 4.25"

Sampler Type: Split Spoon  
Sampler O.D. (in.): 2"  
Sampler Length (in.): 24"  
Rock Core Size: NA

## Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
8/30/21	11:30	Dry (Collapse)	15 min.

Depth (ft)	Casing Blows/ Core Rate	Sample						Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	Stratum Description	Elev. (ft.)
		No.	Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value						
5		S-1	1-2					S-1: Brown/orange, fine to medium SAND, some Silt, little Gravel, trace Roots/Organics, moist. (SM)			0.5	TOPSOIL	823.5
		S-2	3-5					S-2: Brown, fine to coarse SAND, some Gravel, some Silt, moist. (SM)	1		2.5	SAND	821.5
		S-3	7-9					S-3: Brown, GRAVEL, some fine to coarse Sand, little Silt, moist. (GM)					
		S-4	11-14					S-4: Brown, fine to coarse SAND, some Silt, some Gravel, moist. (SM)	2 3 4				
10													
15													
								End of exploration at 17 feet.	5 6		17	BOULDER OR BEDROCK	807.0
20													

## REMARKS

- 1 - Difficult drilling at 4 feet below ground surface (bgs).
- 2 - Borehole collapse at approximately 10.5 feet bgs during HSA removal.
- 3 - Driller noted evidence of water on auger flights at approximately 16.5 feet bgs.
- 4 - Auger refusal at approximately 17 feet bgs on boulder or bedrock.
- 5 - Boring was a probe, SPT sampling not performed. Samples from soil cuttings obtained from the approximate depth interval noted.
- 6 - Test probe backfilled to ground surface with drill spoils.

See Log Key for explanation of sample description and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Exploration No.:  
**BVT-202**



## **Appendix D**

### **TSS Removal Worksheets & Water Quality Calculations**

## INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: Pretreatment - Stafford Street Substation

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Sediment Forebay	0.25	1.00	0.25	0.75
		0.00	0.75	0.00	0.75
		0.00	0.75	0.00	0.75
		0.00	0.75	0.00	0.75
		0.00	0.75	0.00	0.75

Total TSS Removal =

25%

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

Project: 15.0166857.00  
 Prepared By: S.D'Ambrosio (GZA)  
 Date: 2/23/2022

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

## INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: 

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Infiltration Basin	0.80	1.00	0.80	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20

Total TSS Removal =

80%

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

Project:   
 Prepared By:   
 Date:

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



## INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: 

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Porous Pavement	0.80	1.00	0.80	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20

Total TSS Removal =

80%

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

Project:   
 Prepared By:   
 Date:

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



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<http://www.gza.com>

Engineers and  
Scientists

JOB 15.0166857.00 STAFFORD ST.

SHEET NO. 1 OF 3

CALCULATED BY STD DATE 3/10/22

CHECKED BY DATE

SCALE

### WATER QUALITY VOLUME CALCULATIONS

$$WQV = (1.0 \text{ INCH})(\text{TOTAL IMPERVIOUS AREA})$$

$$\text{AREA OF PROPOSED POROUS BIT. CONC. PAVEMENT} = 22,230 \text{ ft}^2$$

AREA OF PROPOSED BIT. CONC. PAVEMENT

$$\text{UPGRADIENT OF PROPOSED POROUS BIT. CONC. PAVEMENT} = 12,445 \text{ ft}^2$$

$$\text{AREA OF PROPOSED BIT. CONC. DRIVEWAY APRON @ STAFFORD ST.} = 990 \text{ ft}^2$$

$$\text{AREA OF PROPOSED CONTROL BUILDING} = 9,100 \text{ ft}^2$$

$$\begin{aligned} WQV_1 &= (1.0 \text{ IN})(22,230 \text{ ft}^2 + 12,445 \text{ ft}^2)(1 \text{ FT}/12 \text{ IN}) \\ &= 2890 \text{ ft}^3 \end{aligned}$$

$$\begin{aligned} WQV_2 &= (1.0 \text{ IN})(990 \text{ ft}^2)(1 \text{ FT}/12 \text{ IN}) \\ &= 82.5 \text{ ft}^3 \end{aligned}$$

$$\begin{aligned} WQV_3 &= (1.0 \text{ IN})(9,100 \text{ ft}^2)(1 \text{ FT}/12 \text{ IN}) \\ &= 760 \text{ ft}^3 \end{aligned}$$

### SIZE RESERVOIR LAYER BENEATH POROUS PAVEMENT TO TREAT WQV<sub>1</sub>

$$\text{POROSITY OF RESERVOIR LAYER} = 0.33$$

$$\begin{aligned} \text{DEPTH OF RESERVOIR LAYER} &= WQV_1 / (\text{AREA OF POROUS PAVEMENT} \times 0.33) \\ &= (2,890 \text{ ft}^3) / [(22,230 \text{ ft}^2)(0.33)] \\ &= 0.4 \text{ ft} \\ &= 4.8 \text{ IN} \end{aligned}$$

SET RESERVOIR DEPTH TO 6 IN. TO ACCOUNT FOR DRIVEWAY SLOPES  
BEING SLIGHTLY STEEPER THAN THE SUGGESTED 5% MAXIMUM.

$$\text{RESULTANT WQV PROVIDED} = (22,230 \text{ ft}^2)(0.5 \text{ ft})(0.33) = 3665 \text{ ft}^3 > 2890 \text{ ft}^3 \checkmark$$



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JOB 15.0166857.00 STAFFORD ST.

SHEET NO. 2 OF 3

CALCULATED BY STD DATE 3/10/22

CHECKED BY DATE

SCALE

## WATER QUALITY VOLUME CALCULATIONS (CONT.)

### SIZE INFILTRATION BASINS TO TREAT WQV<sub>2</sub>

#### SEDIMENT FOREBAY

SEDIMENT FOREBAY MUST STORE A VOLUME =  
(0.1 IN)(CONTRIBUTING IMPERVIOUS AREA)

$$\begin{aligned}\text{CONTRIBUTING IMPERVIOUS AREA} &= \frac{1}{2} \text{ THE DRIVEWAY APRON} \\ &= \frac{1}{2} (990 \text{ ft}^2) \\ &= 495 \text{ ft}^2\end{aligned}$$

$$\text{REQUIRED FOREBAY VOLUME} = (0.1 \text{ IN})(495 \text{ ft}^2)\left(\frac{1 \text{ FT}}{12 \text{ IN}}\right) = 4.1 \text{ ft}^3$$

$$\begin{aligned}\text{PROPOSED FOREBAY VOLUME} &= 3 \text{ FT} \times 3 \text{ FT BOTTOM, 0.5 FT DEEP} \\ &\quad \text{w/ 2:1 SIDE SLOPES} \\ &= 6.25 \text{ ft}^3\end{aligned}$$

$$6.25 \text{ ft}^3 > 4.1 \text{ ft}^3 \quad \checkmark$$

#### INFILTRATION BASIN

$$\text{SIZE EACH BASIN TO TREAT } \frac{1}{2} \text{ WQV}_2 = \frac{1}{2} (82.5 \text{ ft}^3) = 41.25 \text{ ft}^3$$

$$\begin{aligned}\text{PROPOSED INFILTRATION BASIN VOLUME} &= 5 \text{ FT} \times 5 \text{ FT BOTTOM, 1.5 FT DEEP} \\ &\quad \text{w/ 2:1 SIDE SLOPES} \\ &= 66.75 \text{ ft}^3\end{aligned}$$

$$66.75 \text{ ft}^3 > 41.25 \text{ ft}^3 \quad \checkmark$$



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Engineers and  
Scientists

JOB 15.0166857.00 STAFFORD ST.

SHEET NO. 3 OF 3

CALCULATED BY STD DATE 3/10/22

CHECKED BY DATE

SCALE

### WATER QUALITY VOLUME CALCULATIONS (CONT.)

#### USE CRUSHED STONE YARD TO TREAT WQV<sub>3</sub>

ASSUME 2,745 ft<sup>2</sup> OF CONTROL BUILDING DRAINS TO  
CRUSHED STONE YARD #1 (SE OF CONTROL BUILDING)

ASSUME 6,355 ft<sup>2</sup> OF CONTROL BUILDING DRAINS TO  
CRUSHED STONE YARD #2 (NW OF CONTROL BUILDING)

$$WQV_{3A} = (1.0 \text{ IN})(2,745 \text{ ft}^2)(\frac{1 \text{ FT}}{12 \text{ IN}}) = 230 \text{ ft}^3$$

$$\text{YARD \#1 AREA} = 8330 \text{ ft}^2$$

$$\text{DEPTH OF CRUSHED STONE} = 0.5 \text{ ft}$$

$$\text{POROSITY OF CRUSHED STONE} = 0.33$$

$$\text{STORAGE VOLUME} = (8330 \text{ ft}^2)(0.5 \text{ ft})(0.33) = 1,375 \text{ ft}^3$$

$$1,375 \text{ ft}^3 > 230 \text{ ft}^3 \quad \checkmark$$

$$WQV_{3B} = (1.0 \text{ IN})(6,355 \text{ ft}^2)(\frac{1 \text{ FT}}{12 \text{ IN}}) = 530 \text{ ft}^3$$

$$\text{YARD \#2 AREA} = 22,800 \text{ ft}^2$$

$$\text{DEPTH OF CRUSHED STONE} = 0.5 \text{ ft}$$

$$\text{POROSITY OF CRUSHED STONE} = 0.33$$

$$\text{STORAGE VOLUME} = (22,800 \text{ ft}^2)(0.5 \text{ ft})(0.33) = 3,760 \text{ ft}^3$$

$$3,760 \text{ ft}^3 > 530 \text{ ft}^3 \quad \checkmark$$

#### SUMMARY :

$$\text{TOTAL TARGET WQV} = 3,735 \text{ ft}^3$$

$$\text{TOTAL VOLUME PROVIDED FOR WQ} = 8,930 \text{ ft}^3$$

$$8,930 \text{ ft}^3 > 3,735 \text{ ft}^3 \quad \checkmark$$



## **Appendix E**

### **Long Term Pollution Prevention Plan**





## **Long-Term Pollution Prevention Plan: Stafford Street Substation, Leicester, MA**

The Long-Term Pollution Prevention Plan that follows is a guideline for source control and pollution prevention to help maintain stormwater quality:

### **1.1 STORING MATERIALS AND WASTE PRODUCTS INSIDE OR UNDER COVER**

#### **1.1.1 Waste Materials**

All waste materials shall be collected and stored in a manner that will prevent materials from entering watercourses, wetlands, or other offsite areas. Material shall be regularly collected and disposed of offsite in a manner consistent with all federal, state and local regulations.

#### **1.1.2 Hazardous Waste:**

All hazardous waste materials shall be disposed of in a manner specified by State and Federal regulations and/or in accordance with the manufacturer's recommendations.

#### **1.1.3 Sanitary Waste:**

The proposed substation will not have sanitary facilities. The Project as proposed will not generate sanitary waste.

### **1.2 VEHICLE WASHING**

Not applicable—no vehicle washing will take place at the facility.

### **1.3 ROUTINE INSPECTIONS AND MAINTENANCE OF STORMWATER BMPS**

Please refer to the Operation and Maintenance Plan.

### **1.4 SPILL PREVENTION AND RESPONSE PLAN**

The following good housekeeping and material management practices shall be followed to reduce the risk of spills or other accidental exposure of hazardous materials to stormwater runoff:



- Store quantities of materials required for the project and not more,
- Store materials onsite in a neat, orderly manner in appropriate labeled containers,
- Store materials indoors or under cover,
- Follow manufacturers' recommendations for proper use and disposal of excess or used materials.

If an emergency spill or release occurs, the Leicester Department of Public Works, Leicester Fire Department, and the Leicester Local Emergency Planning Committee should be contacted immediately.

#### 1.5 MAINTENANCE OF LAWNS, GARDENS, & OTHER LANDSCAPED AREAS

Nearly all of the developed space will consist of either paved areas, areas surfaced by crushed stone, or areas surfaced by riprap. As such, turfed areas requiring maintenance at the Site will be minimal. Regardless, areas maintained as lawn or otherwise vegetated shall be kept free of bare spots or erosion with proper mulching and seeding.

#### 1.6 STORAGE AND USE OF FERTILIZERS, HERBICIDES, AND PESTICIDES

Nearly all of the developed Site will consist of either paved areas, areas surfaced by crushed stone, or areas surfaced by riprap. As such, vegetated areas at the Site requiring maintenance will be minimal. Occasional use of herbicides and pesticides may be required with regard to invasive plant species or dangerous pests such as wasps and hornets. To the extent they may be required, fertilizers, herbicides, and pesticides shall be used in accordance with manufacturer's requirements and in accordance with all applicable regulations. Such materials shall be stored indoors or under cover. Partially used bags of fertilizers should be stored in sealable plastic bins.

#### 1.7 PET WASTE MANAGEMENT

Not applicable.

#### 1.8 PROPER MANAGEMENT OF DEICING CHEMICALS AND SNOW

The Site is not within a water supply protection area; however, the following best management practices for salt storage shall be adhered to the maximum extent practical:

- Salt and deicing chemicals shall be stored on an impervious surface and under cover, and



- Runoff from salt/deicing chemical storage piles shall be collected and contained.

#### 1.9 PROVISIONS FOR PREVENTION OF ILLICIT DISCHARGES TO THE STORMWATER MANAGEMENT SYSTEM

No chemicals, litter, trash or other illicit materials shall be dumped into or otherwise allowed to enter the stormwater drainage system. Only stormwater and the following non-stormwater discharges may enter the storm drainage system. (Note: This comprehensive listing was sourced from the federal NPDES program and generally applies to all site and all discharges to stormwater drainage systems. The listing is provided here in its entirety, although the subject Site is likely to encounter few, if any, of these.)

##### Allowable Non-Stormwater Discharges:

- a. Water line flushing,
- b. Landscape irrigation,
- c. Diverted stream flows,
- d. Rising ground water,
- e. Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)),
- f. Uncontaminated pumped ground water,
- g. Discharge from potable water sources,
- h. Foundation drains,
- i. Air conditioning condensation,
- j. Irrigation water, springs,
- k. Water from crawl space pumps,
- l. Footing drains,
- m. Lawn watering,
- n. Flow from riparian habitats and wetlands,
- o. Street wash waters,
- p. Residential building wash waters without detergents

#### 1.10 CONTACT INFORMATION

- National Grid

Richard Costa  
(781) 907-3149  
Richard.Costa@nationalgrid.com



## **Appendix F**

### **Illicit Discharge Compliance Statement**



## **Appendix G**

### **Checklist for Stormwater Report**

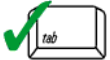




# Checklist for Stormwater Report

## 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.<sup>1</sup> 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<sup>2</sup>
- 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.

<sup>1</sup> 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.

<sup>2</sup> 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.



# 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



*Steven T. D'Ambrosio* 03/10/22  
Signature and Date

## 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

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## 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): Porous Pavement

## 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

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## 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<sup>1</sup>
- ☐ 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.

---

<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## 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

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## 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

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## 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

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## 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.



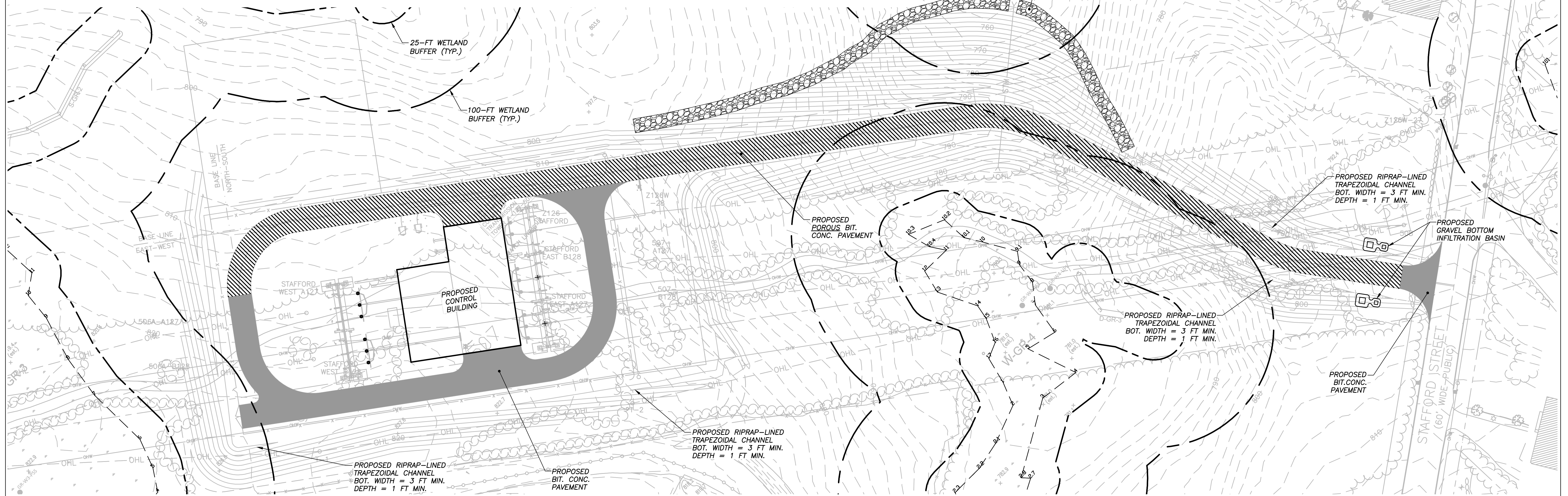
GZA GeoEnvironmental, Inc.



1. POROUS PAVEMENT IS SPECIFIED FOR USE TO MEET STORMWATER QUALITY STANDARDS FOR THE PROJECT BY PROVIDING THE REQUISITE GROUNDWATER RECHARGE AND WATER QUALITY TREATMENT PURSUANT TO THE MASSEEP STORMWATER MANAGEMENT STANDARDS (SMS). ADDITIONALLY, THE POROUS PAVEMENT SHOWN HEREON IS INTENDED TO MEET THE HYDRAULIC AND HYDROLOGIC REQUIREMENTS OF THE SMS. THE FINAL POROUS PAVEMENT DESIGN SHOULD BE PROVIDED BY THE ENGINEER TO ALSO MEET THE PROJECT PAVEMENT STRUCTURAL AND SERVICEABILITY REQUIREMENTS BASED ON PLANNED SERVICE LIFE, TRAFFIC LOADING, AND ENVIRONMENTAL CONDITIONS. SEE THE CIVIL DRAWINGS FOR FINAL PAVEMENT DESIGN INCLUDING BITUMINOUS CONCRETE THICKNESS AND MATERIAL REQUIREMENTS.
2. POROUS PAVEMENT DESIGN AND CONSTRUCTION SHOULD BE IN ACCORDANCE WITH:
  - a. NATIONAL GRID CONSTRUCTION SPECIFICATIONS, SP.08.00.001, FEB 2020 (NGRID SPECIFICATIONS);
  - b. MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, 2022 EDITION (MASSDOT SPECIFICATIONS);
  - c. AMERICAN ASSOCIATION OF STATE HIGHWAY TRANSPORTATION OFFICIALS (AASHTO SPECIFICATIONS);
  - d. UNH STORMWATER CENTER DESIGN SPECIFICATIONS FOR POROUS ASPHALT PAVEMENT AND INFILTRATION BEDS, REVISED SEPTEMBER 2016 (UNHSC SPECIFICATIONS.)
  - e. WHERE CONFLICTS EXIST, THE UNHSC SPECIFICATIONS SHOULD GOVERN WITH RESPECT TO THE STORMWATER MANAGEMENT ASPECTS OF THE POROUS PAVEMENT SECTION.

3. MATERIALS PROPOSED FOR USE IN THE POROUS PAVEMENT SECTION (I.E., BITUMINOUS CONCRETE MIX DESIGN, CHOKER COURSE, FILTER COURSE, FILTER BLANKET, AND RESERVOIR COURSE) INCLUDING TEST RESULTS SHOULD BE SUBMITTED TO THE OWNER AND ENGINEER FOR REVIEW AND APPROVAL PRIOR TO PURCHASE OR DELIVERY TO THE SITE.
4. POROUS PAVEMENT SHOULD BE DESIGNED TO MEET THE MINIMUM STRUCTURAL NUMBER REQUIRED BY THE ENGINEER. THE BITUMINOUS BINDER SHOULD BE POST-BLENDED PG 76-28 MODIFIED WITH STYRENE BUTADIENE RUBBER (SBR) OR STYRENE BUTADIENE STYRENE (SBS) AND BE PROVIDED AN ANTI-STRIPPING MIX ADDITIVE. THE AGGREGATE SHOULD MEET THE ANGULARITY, HARDNESS, AND SOUNDNESS REQUIREMENTS PER MASSDOT SPECIFICATIONS. THE MIX DESIGN GRADATION, BINDER CONTENT, AIR CONTENT, DRY WEIGHT, AND TENSILE AND ABRASION CRITERIA SHOULD MEET TABLE 5 OF THE 2016 UNHSC SPECIFICATIONS. THE COMPACTED BITUMINOUS COURSES SHOULD HAVE A MINIMUM INFILTRATION RATE OF 10 IN/HR.
5. CHOKER COURSE SHOULD BE A HARD, DURABLE, OPEN-GRADED, NOMINAL CRUSHED STONE PER MASSDOT M2.01.4 - 3/4" CRUSHED STONE, OR AASHTO #57, THAT REMAINS STABLE AND NOT SUBJECT TO RUTTING UNDER LOADED TRUCK AND PAYER WHEEL LOADS. COMPLIANCE WITH THE GRADATION REQUIREMENT DOES NOT PRECLUDE MEETING THE RUTTING REQUIREMENT.
6. FILTER COURSE SHOULD BE A SAND-GRAVEL MIXTURE MEETING THE REQUIREMENTS OF MASSDOT M1.04.1 - SAND BORROW FOR SUBDRAINS. THE MATERIAL SHOULD HAVE A TESTED MINIMUM COMPACTED INFILTRATION RATE OF 10 FT/DAY (5 IN/HR) AT 95% OF MODIFIED PROCTOR MAXIMUM DRY DENSITY.
7. COMPACTION: CHOKER COURSE, FILTER BLANKET, AND RESERVOIR COURSE SHOULD BE COMPACTED USING MINIMUM 5-TON STEEL DRUM ROLLERS WITHOUT VIBRATORY COMPACTION. FILTER COURSE SHOULD BE COMPACTED TO 95% MODIFIED PROCTOR MAXIMUM DRY DENSITY PROVIDED THE MINIMUM TESTED HYDRAULIC CONDUCTIVITY IS ACHIEVED. NATURAL SUBGRADE AND STRUCTURAL FILL SUBGRADE BENEATH THE RESERVOIR COURSE SHOULD BE COMPACTED TO A MINIMUM OF 95% MAXIMUM DRY DENSITY PROVIDED A MINIMUM INFILTRATION RATE OF 1 IN/HR CAN BE ACHIEVED AT THAT COMPACTION. A REDUCED DEGREE OF COMPACTION REQUIRES APPROVAL BY THE ENGINEER, AND IN NO CASE SHOULD THE DEGREE OF SUBGRADE COMPACTION BE LESS THAN 92% OF MODIFIED PROCTOR MAXIMUM DRY DENSITY.
8. TOLERANCES: ALL POROUS PAVEMENT SECTION THICKNESSES ARE MINIMUM VALUES.
9. OPERATIONS AND MAINTENANCE: THE POROUS PAVEMENT SHOULD BE INSPECTED NO LESS THAN QUARTERLY FOR EVIDENCE OF SEDIMENT ACCUMULATION, PONDING, OR OTHER INDICATIONS OF INSUFFICIENT INFILTRATION. EXCESSIVE SEDIMENT FROM VEHICLE TRACKING, RUN-ON, ETC., SHOULD BE REMOVED AS NEEDED USING PAVEMENT VACUUM METHODS ANNUALLY IN THE SPRING FOLLOWING LAST SNOW MELT. EXCESSIVE LEAVES SHOULD BE REMOVED BY VACUUM OR BLOWERS ANNUALLY IN THE FALL FOLLOWING LEAF DROP AND PRIOR TO THE FIRST SIGNIFICANT SNOW FALL AND LONG-DURATION FREEZING. ROAD SALT SHOULD NOT BE STOCKPILED ON POROUS PAVEMENT. ROAD SALT SHOULD BE APPLIED FOR TRACTION CONTROL IN WINTER MONTHS IN LIEU OF SAND. SAND OR OTHER NON-SOLUBLE TRACTION ENHANCEMENT MATERIALS SHOULD NOT BE APPLIED TO THE AREAS OF POROUS PAVEMENT.

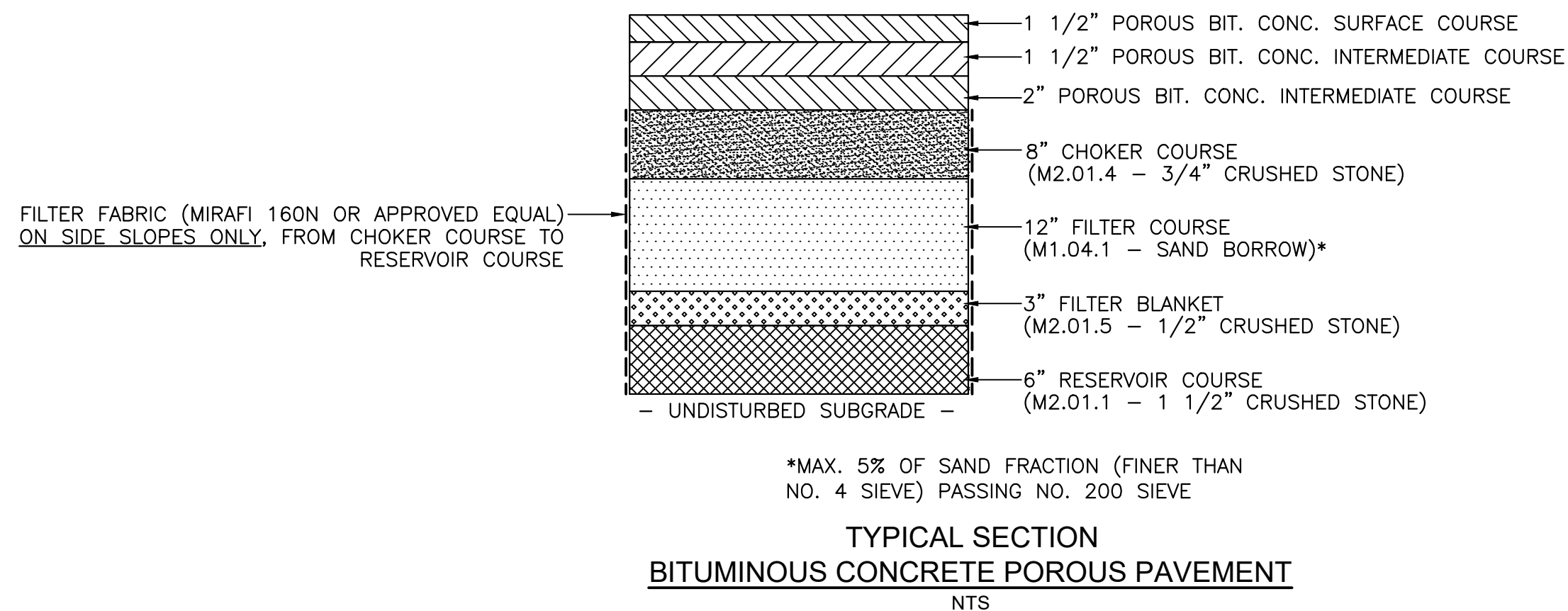
9. OPERATIONS AND MAINTENANCE: THE POROUS PAVEMENT SHOULD BE INSPECTED NO LESS THAN QUARTERLY FOR EVIDENCE OF SEDIMENT ACCUMULATION, PONDING, OR OTHER INDICATIONS OF INSUFFICIENT INFILTRATION. EXCESSIVE SEDIMENT FROM VEHICLE TRACKING, RUN-ON, ETC., SHOULD BE REMOVED AS NEEDED USING PAVEMENT VACUUM METHODS ANNUALLY IN THE SPRING FOLLOWING LAST SNOW MELT. EXCESSIVE LEAVES SHOULD BE REMOVED BY VACUUM OR BLOWERS ANNUALLY IN THE FALL FOLLOWING LEAF DROP AND PRIOR TO THE FIRST SIGNIFICANT SNOW FALL AND LONG-DURATION FREEZING. SNOW SHOULD NOT BE STOCKPILED ON POROUS PAVEMENT. ROAD SALT SHOULD BE APPLIED FOR TRACTION CONTROL IN WINTER MONTHS IN LIEU OF SAND. SAND OR OTHER NON-SOLUBLE TRACTION ENHANCEMENT MATERIALS SHOULD NOT BE APPLIED TO THE AREAS OF POROUS PAVEMENT.



0 20 40 80  
SCALE IN FEET

1. BASE PLAN INFORMATION COMPILED FROM THE FOLLOWING DRAWINGS PROVIDED BY BLACK & VEATCH VIA EMAIL ON NOVEMBER 15, 2021:

- 1.1. H121391 – PROPOSED SITE PLAN
  - 1.2. H121392 – EXISTING CONDITIONS PLAN
  - 1.3. H121393 – GRADING & DRAINAGE PLAN
  - 1.4. H121394 – SURFACE & FENCING PLAN
  - 1.5. H121395 – ACCESS ROAD PLAN & PROFILE
  - 1.6. H121396 – GRADING AND DRAINAGE DETAILS
  - 1.7. H121397 – EROSION CONTROL FENCE
  - 1.8. H121398 – CONSTRUCTION DETAILS
  - 1.9. H122297 – LANDSCAPING PLAN
  - 1.10. H122298 – SITE PAD CROSS-SECTIONS
2. UNLESS OTHERWISE NOTED, ALL WORK SHALL COMPLY WITH APPLICABLE SECTIONS 2.05 OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES," AS AMENDED, AND SECTION 3, INSTALLATION OF "UNHSC DESIGN SPECIFICATIONS FOR POROUS ASPHALT PAVEMENT AND INFILTRATION BEDS," REVISED SEPTEMBER 2016.
3. UNLESS OTHERWISE NOTED, ALL MATERIALS SHALL COMPLY WITH SECTION M: MATERIALS OF THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION'S "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES," AS AMENDED.
4. BITUMINOUS PAVEMENT THICKNESS TO BE CONFIRMED BY CIVIL ENGINEER BASED ON DESIGN TRAFFIC LOADING.



NOT TO BE USED  
FOR CONSTRUCTION

THE DISTRIBUTION AND USE OF THE NATIVE FORMAT CAD  
FILE OF THIS DRAWING IS UNCONTROLLED. THE USER  
SHALL VERIFY TRACEABILITY OF THIS DRAWING TO THE  
LATEST CONTROLLED VERSION.

NO.		ISSUE/DESCRIPTION		BY	DATE
UNLESS SPECIFICALLY STATED BY WRITTEN AGREEMENT, THIS DRAWING IS THE SOLE PROPERTY OF GZA GEODENVIRONMENTAL, INC. (GZA). THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY GZA'S CLIENT OR THE CLIENT'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY THE USER EXPRESS OR IMPLIED WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA.					
<b>STAFFORD STREET SUBSTATION 408 STAFFORD STREET LEICESTER, MA 01611</b>					
<b>STORMWATER MANAGEMENT PLAN</b>					
PREPARED BY:  <b>GZA GeoEnvironmental, Inc.</b> www.gza.com			PREPARED FOR: 		
PROJ MGR: STD		REVIEWED BY: GRM		CHECKED BY: TEJ	SHEET
DESIGNED BY: STD		DRAWN BY: EDM		SCALE: 1"=40'	<b>C-1</b>
DATE: MARCH 10, 2021		PROJECT NO. 15.0166857.00		REVISION NO. 0	



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## **ATTACHMENT G – Abutter Information**



# Town of Auburn, Massachusetts

Julie A. Jacobson  
Town Manager

Seth Woolard  
Chief Assessor



May 19, 2022

## Conservation Commission List of "Parties in Interest"

A "Party in Interest" is defined as any person, whose property line touches the petitioner's property, including property directly opposite on public or private street or way, and owners of land within 100 feet of the property line as they appear on the most recent tax maps and list in the town of Auburn.

**Due to the proximity to the town line there may be additional abutters in TOWN OF LEICESTER. Attached list is for town of AUBURN ONLY.**

Map: 2 Parcel: 3

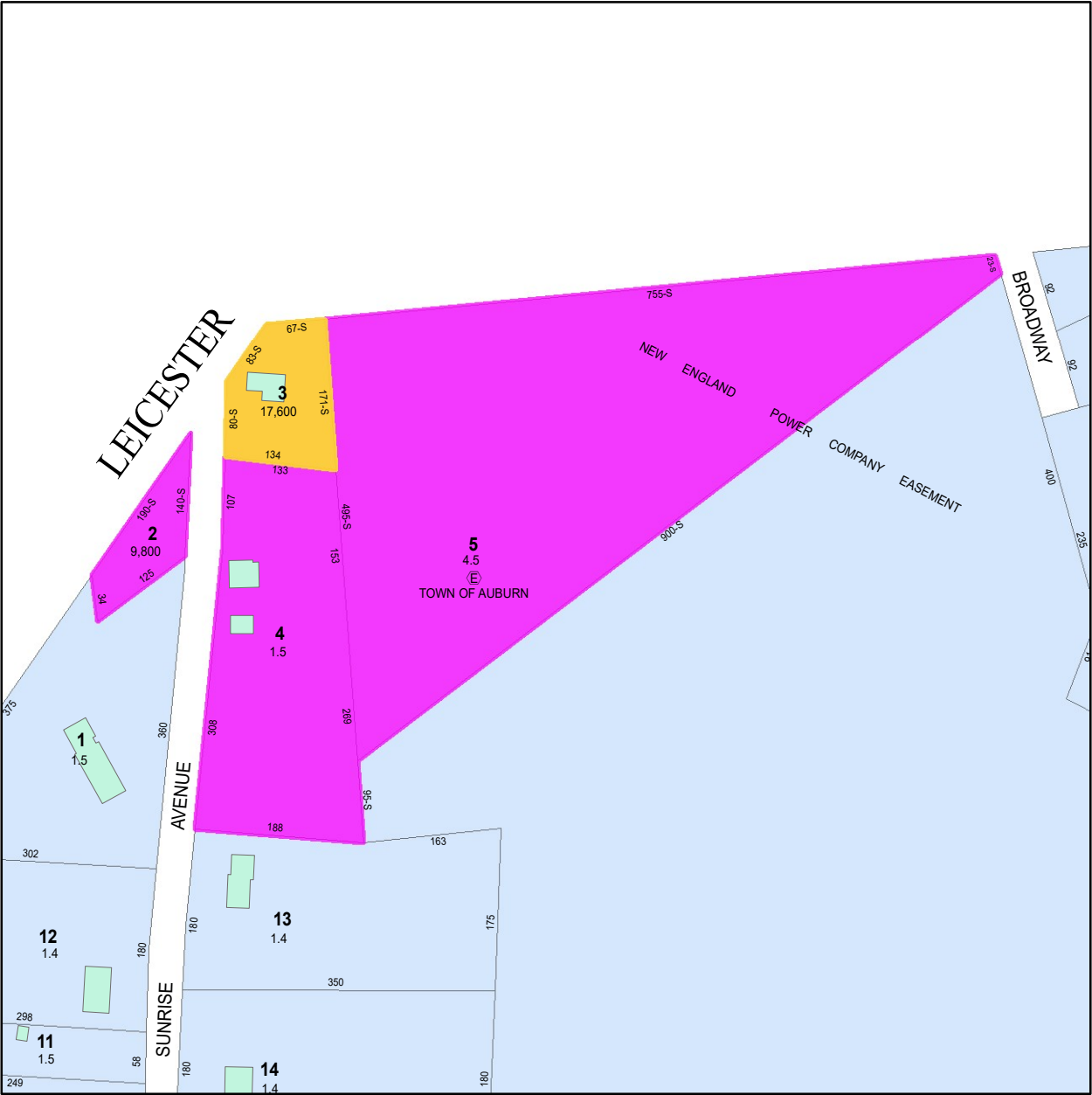
Property: 3 SUNRISE AVE, AUBURN, MA 01501

Owner: RONALD W & KATHLEEN LAFLAMME  
PO BOX 276  
ROCHDALE, MA 01542-0276

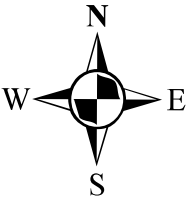
Signature: LISA M TARGONSKI Date: 4/11/2022

104 Central Street  
Auburn, MA 01501  
Telephone: (508) 832-7708  
Fax: (508) 832-4259  
Email: [swoolard@town.auburn.ma.us](mailto:swoolard@town.auburn.ma.us)  
Web site: [www.auburnguide.com](http://www.auburnguide.com)

3 SUNRISE AVE, AUBURN (MAP 2 PARCEL 3)



TOWN OF LEICESTER  
AUBURN ABUTTERS ONLY



2/ 2/ / /  
OSOWSKA KRYSTYNA  
172 PERRY AVE  
WORCESTER, MA 01610

2/ 3/ / /  
LAFLAMME RONALD W  
LAFLAMME KATHLEEN  
P O BOX 276  
ROCHDALE , MA 01542-0276

2/ 4/ / /  
BOROWY QUINN  
5 SUNRISE AVE  
AUBURN, MA 01501

2/ 5/ / /  
AUBURN TOWN OF  
104 CENTRAL ST  
AUBURN, MA 01501

# Town of Auburn, Massachusetts

Julie A. Jacobson  
Town Manager

Seth Woolard  
Chief Assessor



May 19, 2022

## Conservation Commission List of "Parties in Interest"

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**Due to the proximity to the town line there may be additional abutters in TOWN OF LEICESTER. Attached list is for town of AUBURN ONLY.**

Map: 2 Parcel: 5

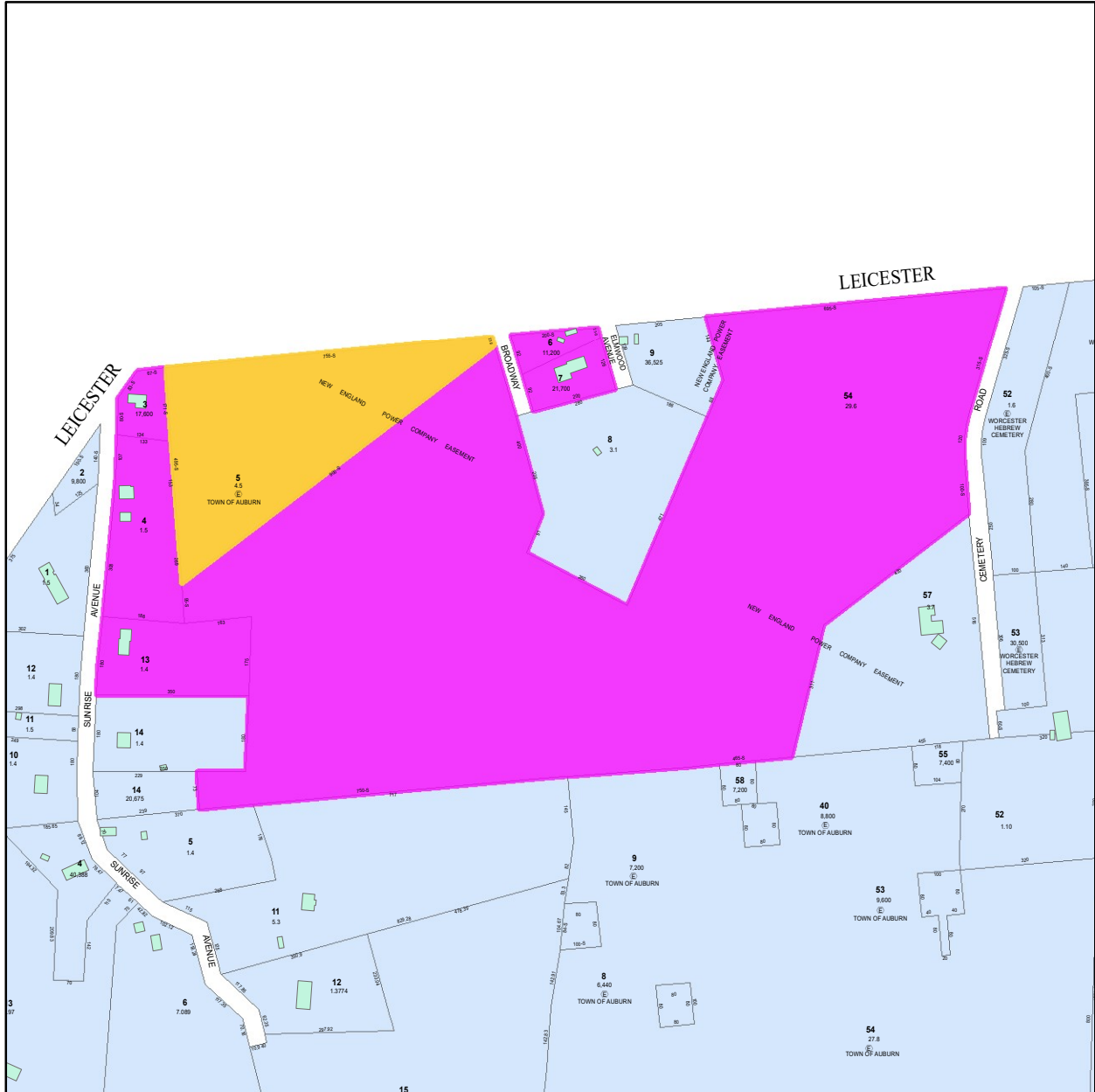
Property: SUMMER ST, AUBURN, MA 01501

Owner: TOWN OF AUBURN  
104 CENTRAL ST  
AUBURN, MA 01501

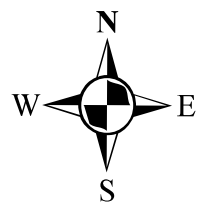
Signature: LISA M TARGONSKI Date: 4/11/2022

104 Central Street  
Auburn, MA 01501  
Telephone: (508) 832-7708  
Fax: (508) 832-4259  
Email: [swoolard@town.auburn.ma.us](mailto:swoolard@town.auburn.ma.us)  
Web site: [www.auburnguide.com](http://www.auburnguide.com)

# SUMMER ST, AUBURN, MA (MAP 2 PARCEL 5)



TOWN OF LEICESTER  
AUBURN ABUTTERS ONLY



2/ 3/ / /  
LAFLAMME RONALD W  
LAFLAMME KATHLEEN  
P O BOX 276  
ROCHDALE , MA 01542-0276

2/ 4/ / /  
BOROWY QUINN  
5 SUNRISE AVE  
AUBURN, MA 01501

2/ 5/ / /  
AUBURN TOWN OF  
104 CENTRAL ST  
AUBURN, MA 01501

2/ 6/ / /  
ABU ADEDAMOLA M  
WHITE JEWELL  
26 ELMWOOD AVE  
CHERRY VALLEY, MA 01611

2/ 7/ / /  
HEBERT MICHAEL P  
BARBER SUSAN L  
28 ELMWOOD AVE  
CHERRY VALLEY, MA 01611

3/ 54/ / /  
TAHIR SYED M  
55 COREY LN  
MILTON, MA 02186

2/ 13/ / /  
KOSSAK PHYLLIS M  
7 SUNRISE AVE  
AUBURN, MA 01501





# 300 foot Abutters List Report

Leicester, MA

April 12, 2022

## Subject Property:

Parcel Number: 34-A3-0  
CAMA Number: 34-A3-0  
Property Address: 408 STAFFORD ST

Mailing Address: NEW ENGLAND POWER CO ATTN:  
PROPERTY TAX DEPT.  
40 SYLVAN ROAD  
WALTHAM, MA 02451

---

## Abutters:

Parcel Number: 33-A5-0  
CAMA Number: 33-A5-0  
Property Address: 221 AUBURN ST

Mailing Address: PETKIEWICZ JOSEPH P MILLETTE  
MARIE  
221 AUBURN ST  
CHERRY VALLEY, MA 01611

Parcel Number: 33B-C7-0  
CAMA Number: 33B-C7-0  
Property Address: 30 TOBIN RD

Mailing Address: BERGIN FRANCIS A TRUSTEE F A  
BERGIN INVESTMENT TRUST  
30 TOBIN RD  
CHERRY VALLEY, MA 01611

Parcel Number: 34-A1.1-0  
CAMA Number: 34-A1.1-0  
Property Address: STAFFORD ST

Mailing Address: NEW ENGLAND POWER CO ATTN:  
PROPERTY TAX DEPT.  
40 SYLVAN ROAD  
WALTHAM, MA 02451

Parcel Number: 34-A1.11-0  
CAMA Number: 34-A1.11-0  
Property Address: AUBURN ST

Mailing Address: MARTIROS MICHAEL J  
12 SHELTER RIDGE RD  
LEICESTER, MA 01524

Parcel Number: 34-A1.3-0  
CAMA Number: 34-A1.3-0  
Property Address: 466 STAFFORD ST

Mailing Address: MARTIROS MICHAEL J  
12 SHELTER RIDGE RD  
LEICESTER, MA 01524

Parcel Number: 34-A2-0  
CAMA Number: 34-A2-0  
Property Address: 462 STAFFORD ST

Mailing Address: MARENGO JOHN MARENGO JEAN A  
462 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-A4-0  
CAMA Number: 34-A4-0  
Property Address: 402 STAFFORD ST

Mailing Address: MCCUE NANCY M  
402 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-A5-0  
CAMA Number: 34-A5-0  
Property Address: 398 STAFFORD ST

Mailing Address: HOURGLASS PROPERTY SOLUTIONS  
3 BERT DR STE 7A  
WEST BRIDGEWATER, MA 02379

Parcel Number: 34-A6-0  
CAMA Number: 34-A6-0  
Property Address: 392 STAFFORD ST

Mailing Address: CHARPENTIER JOSEPH  
PO BOX 60453  
WORCESTER, MA 01606

Parcel Number: 34-A7-0  
CAMA Number: 34-A7-0  
Property Address: 386 STAFFORD ST

Mailing Address: TUISKULA WAYNE A TUISKULA AMY B  
386 STAFFORD STREET  
CHERRY VALLEY, MA 01611



# 300 foot Abutters List Report

Leicester, MA

April 12, 2022

Parcel Number: 34-B10-0  
CAMA Number: 34-B10-0  
Property Address: 451 STAFFORD ST

Mailing Address: LOLA GARY R LOLA TARA L  
451 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-B11-0  
CAMA Number: 34-B11-0  
Property Address: 447 STAFFORD ST

Mailing Address: REPEKTA DEBORAH S REPEKTA  
MICHAEL  
447 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-B12-0  
CAMA Number: 34-B12-0  
Property Address: 441 STAFFORD ST

Mailing Address: DUSSAULT LAWRENCE M MANTHA  
BARRY J  
441 STAFFORD STREET  
CHERRY VALLEY, MA 01611-3308

Parcel Number: 34-B13-0  
CAMA Number: 34-B13-0  
Property Address: 439 STAFFORD ST

Mailing Address: KELLEY CHRISTINE E  
439 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-B14-0  
CAMA Number: 34-B14-0  
Property Address: 425 STAFFORD ST

Mailing Address: FOLEY BRUCE M FOLEY ELIZABETH M  
425 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-B8-0  
CAMA Number: 34-B8-0  
Property Address: STAFFORD ST

Mailing Address: BERTEL STEVEN P BERTEL TRINA A  
465 STAFFORD STREET  
CHERRY VALLEY, MA 01611

Parcel Number: 34-B9-0  
CAMA Number: 34-B9-0  
Property Address: STAFFORD ST

Mailing Address: STAFFORD STREET PROPERTIES LLC  
83 KEYSTONE DR  
LEOMINSTER, MA 01453

Parcel Number: 34B-A1-0  
CAMA Number: 34B-A1-0  
Property Address: 417 STAFFORD ST

Mailing Address: GITAU DAVIES M LABOSSIÈRE  
ASHLEIGH A  
417 STAFFORD STREET  
CHERRY VALLEY, MA 01611

Parcel Number: 34B-A2-0  
CAMA Number: 34B-A2-0  
Property Address: 415 STAFFORD ST

Mailing Address: OSOWSKA KRYSTYNA  
172 PERRY AVE  
WORCESTER, MA 01610

Parcel Number: 34B-B1-0  
CAMA Number: 34B-B1-0  
Property Address: STAFFORD ST

Mailing Address: LAFLAMME RONALD W LAFLAMME  
KATHLEEN  
PO BOX 276  
ROCHDALE, MA 01542-0276

Parcel Number: 34B-B10-0  
CAMA Number: 34B-B10-0  
Property Address: STAFFORD ST

Mailing Address: DRAZEK JOHN P  
PO BOX 49  
REHOBOTH, MA 02769

Parcel Number: 34B-B3-0  
CAMA Number: 34B-B3-0  
Property Address: 387 STAFFORD ST

Mailing Address: AGARWAL SATYENDRA K AGARWAL  
BRAHM K  
11928 B DARNESTOWN ROAD  
N POTOMAC, MD 20878



# 300 foot Abutters List Report

Leicester, MA  
April 12, 2022

Parcel Number: 34B-B4-0  
CAMA Number: 34B-B4-0  
Property Address: STAFFORD ST

Mailing Address: TOWN OF LEICESTER TOWN HALL  
3 WASHBURN SQUARE  
LEICESTER, MA 01524

Parcel Number: 34B-B5-0  
CAMA Number: 34B-B5-0  
Property Address: STAFFORD ST

Mailing Address: ARELLO ROBERT ARELLO PHILIP  
157 SOUTHBRIDGE RD #1142  
N OXFORD, MA 01537



# 300 foot Abutters List Report

Leicester, MA

April 12, 2022

## Subject Property:

Parcel Number: 34B-B1-0  
CAMA Number: 34B-B1-0  
Property Address: STAFFORD ST

Mailing Address: LAFLAMME RONALD W LAFLAMME  
KATHLEEN  
PO BOX 276  
ROCHDALE, MA 01542-0276

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## Abutters:

Parcel Number: 34-A3-0  
CAMA Number: 34-A3-0  
Property Address: 408 STAFFORD ST

Mailing Address: NEW ENGLAND POWER CO ATTN:  
PROPERTY TAX DEPT.  
40 SYLVAN ROAD  
WALTHAM, MA 02451

Parcel Number: 34-A4-0  
CAMA Number: 34-A4-0  
Property Address: 402 STAFFORD ST

Mailing Address: MCCUE NANCY M  
402 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-A5-0  
CAMA Number: 34-A5-0  
Property Address: 398 STAFFORD ST

Mailing Address: HOURGLASS PROPERTY SOLUTIONS  
3 BERT DR STE 7A  
WEST BRIDGEWATER, MA 02379

Parcel Number: 34-A6-0  
CAMA Number: 34-A6-0  
Property Address: 392 STAFFORD ST

Mailing Address: CHARPENTIER JOSEPH  
PO BOX 60453  
WORCESTER, MA 01606

Parcel Number: 34-B14-0  
CAMA Number: 34-B14-0  
Property Address: 425 STAFFORD ST

Mailing Address: FOLEY BRUCE M FOLEY ELIZABETH M  
425 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34B-A1-0  
CAMA Number: 34B-A1-0  
Property Address: 417 STAFFORD ST

Mailing Address: GITAU DAVIES M LABOSSIERE  
ASHLEIGH A  
417 STAFFORD STREET  
CHERRY VALLEY, MA 01611

Parcel Number: 34B-A2-0  
CAMA Number: 34B-A2-0  
Property Address: 415 STAFFORD ST

Mailing Address: OSOWSKA KRYSTYNA  
172 PERRY AVE  
WORCESTER, MA 01610

Parcel Number: 34B-B10-0  
CAMA Number: 34B-B10-0  
Property Address: STAFFORD ST

Mailing Address: DRAZEK JOHN P  
PO BOX 49  
REHOBOTH, MA 02769

Parcel Number: 34B-B3-0  
CAMA Number: 34B-B3-0  
Property Address: 387 STAFFORD ST

Mailing Address: AGARWAL SATYENDRA K AGARWAL  
BRAHM K  
11928 B DARNESTOWN ROAD  
N POTOMAC, MD 20878

Parcel Number: 34B-B4-0  
CAMA Number: 34B-B4-0  
Property Address: STAFFORD ST

Mailing Address: TOWN OF LEICESTER TOWN HALL  
3 WASHBURN SQUARE  
LEICESTER, MA 01524



# 300 foot Abutters List Report

Leicester, MA

April 12, 2022

Parcel Number: 34B-B5-0  
CAMA Number: 34B-B5-0  
Property Address: STAFFORD ST

Mailing Address: ARELLO ROBERT ARELLO PHILIP  
157 SOUTHBRIDGE RD #1142  
N OXFORD, MA 01537

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# 300 foot Abutters List Report

Leicester, MA

April 12, 2022

## Subject Property:

Parcel Number: 34B-B2-0  
CAMA Number: 34B-B2-0  
Property Address: STAFFORD ST

Mailing Address: LAFLAMME RONALD W LAFLAMME  
KATHLEEN  
PO BOX 276  
ROCHDALE, MA 01542-0276

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## Abutters:

Parcel Number: 34-A3-0  
CAMA Number: 34-A3-0  
Property Address: 408 STAFFORD ST

Mailing Address: NEW ENGLAND POWER CO ATTN:  
PROPERTY TAX DEPT.  
40 SYLVAN ROAD  
WALTHAM, MA 02451

Parcel Number: 34-A4-0  
CAMA Number: 34-A4-0  
Property Address: 402 STAFFORD ST

Mailing Address: MCCUE NANCY M  
402 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34-A5-0  
CAMA Number: 34-A5-0  
Property Address: 398 STAFFORD ST

Mailing Address: HOURGLASS PROPERTY SOLUTIONS  
3 BERT DR STE 7A  
WEST BRIDGEWATER, MA 02379

Parcel Number: 34-A6-0  
CAMA Number: 34-A6-0  
Property Address: 392 STAFFORD ST

Mailing Address: CHARPENTIER JOSEPH  
PO BOX 60453  
WORCESTER, MA 01606

Parcel Number: 34-A7-0  
CAMA Number: 34-A7-0  
Property Address: 386 STAFFORD ST

Mailing Address: TUISKULA WAYNE A TUISKULA AMY B  
386 STAFFORD STREET  
CHERRY VALLEY, MA 01611

Parcel Number: 34-B14-0  
CAMA Number: 34-B14-0  
Property Address: 425 STAFFORD ST

Mailing Address: FOLEY BRUCE M FOLEY ELIZABETH M  
425 STAFFORD ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34B-A1-0  
CAMA Number: 34B-A1-0  
Property Address: 417 STAFFORD ST

Mailing Address: GITAU DAVIES M LABOSSIÈRE  
ASHLEIGH A  
417 STAFFORD STREET  
CHERRY VALLEY, MA 01611

Parcel Number: 34B-A2-0  
CAMA Number: 34B-A2-0  
Property Address: 415 STAFFORD ST

Mailing Address: OSOWSKA KRYSTYNA  
172 PERRY AVE  
WORCESTER, MA 01610

Parcel Number: 34B-B10-0  
CAMA Number: 34B-B10-0  
Property Address: STAFFORD ST

Mailing Address: DRAZEK JOHN P  
PO BOX 49  
REHOBOTH, MA 02769

Parcel Number: 34B-B3-0  
CAMA Number: 34B-B3-0  
Property Address: 387 STAFFORD ST

Mailing Address: AGARWAL SATYENDRA K AGARWAL  
BRAHM K  
11928 B DARNESTOWN ROAD  
N POTOMAC, MD 20878





# 400 foot Abutters List Report

Leicester, MA

April 12, 2022

Parcel Number: 34B-B4-0  
CAMA Number: 34B-B4-0  
Property Address: STAFFORD ST

Mailing Address: TOWN OF LEICESTER TOWN HALL  
3 WASHBURN SQUARE  
LEICESTER, MA 01524

Parcel Number: 34B-B5-0  
CAMA Number: 34B-B5-0  
Property Address: STAFFORD ST

Mailing Address: ARELLO ROBERT ARELLO PHILIP  
157 SOUTHBRIDGE RD #1142  
N OXFORD, MA 01537

Parcel Number: 34B-B6-0  
CAMA Number: 34B-B6-0  
Property Address: STAFFORD ST

Mailing Address: GABRILA LEONARD S  
51 PINE ST  
LEICESTER, MA 01524

Parcel Number: 34B-B7-0  
CAMA Number: 34B-B7-0  
Property Address: 6 WESTMINSTER ST

Mailing Address: MANCUSO ANTHONY S MANCUSO  
SHEENA R  
6 WESTMINSTER ST  
CHERRY VALLEY, MA 01611

Parcel Number: 34B-B8-0  
CAMA Number: 34B-B8-0  
Property Address: WESTMINSTER ST

Mailing Address: MANCUSO ANTHONY S MANCUSO  
SHEENA R  
6 WESTMINSTER ST  
LEICESTER, MA 01524

Parcel Number: 34B-B9-0  
CAMA Number: 34B-B9-0  
Property Address: 10 WESTMINSTER ST

Mailing Address: DUNKERLY JAY TRUSTEE DUNKERLY  
JEAN TRUSTEE  
10 WESTMINSTER STREET  
CHERRY VALLEY, MA 01611