STORMWATER MANAGEMENT REPORT

Unitil Kingston Solar Project

Tax Map R12, Lots 25 & 26
14 & 24 Towle Road
Kingston, NH 03848

Prepared On:
July 6, 2023
Revised September 1, 2023

Prepared for:
Unitil Energy Systems, Inc.
30 Energy Way
Exeter, NH

TFM Job Number:
20025-00

Prepared by:

TFM
Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
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Unitil Kingston Solar Project

Tax Map R12, Lots 25 & 26
14 & 24 Towle Road, Kingston, NH 03848
July 6, 2023
Revised September 1, 2023

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ALTERATION OF TERRAIN PERMIT APPLICATION

Water Division/ Alteration of Terrain Bureau/ Land Resources Management
Check the Status of your Application: www.des.nh.gov/onestop

RSA/ Rule: RSA 485-A:17, Env-Wq 1500

Administrative Use Only	Administrative Use Only	Administrative Use Only	File Number:
			Check No.
			Amount:
			Initials:

1. APPLICANT INFORMATION (INTENDED PERMIT HOLDER)		
Applicant Name: Unitil	Contact Name: Jacob Dusling, P.E.	
Email: dusling@unitil.com	Daytime Telephone: (603)-773-6529	
Mailing Address: 30 Energy Way		
Town/City: Exeter	State: NH	Zip Code: 03833
2. APPLICANT'S AGENT INFORMATION If none, check here: ☐		
Business Name: TFMoran, Inc.	Contact Name: Nicholas Golon, P.E.	
Email: ngolon@tfmoran.com	Daytime Telephone: 603-472-4488	
Address: 48 Constitution Drive		
Town/City: Bedford	State: NH	Zip Code: 03110
3. PROPERTY OWNER INFORMATION (IF DIFFERENT FROM APPLICANT)		
Applicant Name: 24 Towle Road Realty Trust & Richard Homan	Contact Name: Lynda Devast & Richard Homan	
Email:	Daytime Telephone:	
Mailing Address: 86 Rockingham Road & 14 Towle Road		
Town/City: Kinston	State: NH	Zip Code: 03848
4. PROPERTY OWNER'S AGENT INFORMATION If none, check here: ☐		
Business Name: TFMoran, Inc.	Contact Name: Nicholas Golon, P.E.	
Email: ngolon@tfmoran.com	Daytime Telephone: 603-472-4488	
Address: 48 Constitution Drive		
Town/City: Bedford	State: NH	Zip Code: 03110
5. CONSULTANT INFORMATION If none, check here: ☐		
Engineering Firm: TFMoran, Inc.	Contact Name: Nicholas Golon, P.E.	
Email: ngolon@tfmoran.com	Daytime Telephone: 603-472-4488	
Address: 48 Constitution Drive		
Town/City: Bedford	State: NH	Zip Code: 03110

6. PROJECT TYPE

☐ Excavation Only ☐ Residential ☐ Commercial ☐ Golf Course ☐ School ☐ Municipal
☐ Agricultural ☐ Land Conversion ☒ Other: Utility

7. PROJECT LOCATION INFORMATION

Project Name: Unitil Kingston Solar Facility

Street/Road Address: 14 & 24 Towle Road

Town/City: Kingston	County: Rockingham

Tax Map: R12	Block:	Lot Number: 25 & 26	Unit:

Location Coordinates: 1138452, 145792 ☐ Latitude/Longitude ☐ UTM ☒ State Plane

Post-development, will the proposed project withdraw from or directly discharge to any of the following? If yes, identify the purpose.

1. Stream or Wetland Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge
2. Man-made pond created by impounding a stream or wetland Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge
3. Unlined pond dug into the water table Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge

Post-development, will the proposed project discharge to:

- A surface water impaired for phosphorus and/or nitrogen? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen**
- A Class A surface water or Outstanding Resource Water? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen**
- A lake or pond not covered previously? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus in the lake or pond**

Is the project a High Load area? ☐ Yes ☒ No
If yes, specify the type of high load land use or activity: _____

Is the project within a Water Supply Intake Protection Area (WSIPA)? ☐ Yes ☒ No
Is the project within a Groundwater Protection Area (GPA)? ☐ Yes ☒ No
Will the well setbacks identified in Env-Wq 1508.02 be met? ☒ Yes ☐ No

Note: Guidance document titled "*Using NHDES's OneStop WebGIS to Locate Protection Areas*" is available online. For more details on the restrictions in these areas, read Chapter 3.1 in Volume 2 of the NH Stormwater Manual.

Is any part of the property within the 100-year floodplain? ☐ Yes ☒ No
If yes: Cut volume: _____ cubic feet within the 100-year floodplain
Fill volume: _____ cubic feet within the 100-year floodplain

☐ Project **IS** within **¼ mile of a designated river** Name of River:
☒ Project is **NOT** within ¼ mile of a designated river

☐ Project **IS** within **a Coastal/Great Bay Region community** - **include info required by Env-Wq 1503.08(l) if applicable**
☒ Project is **NOT** within a Coastal/Great Bay Region community

8. BRIEF PROJECT DESCRIPTION (PLEASE DO NOT REPLY "SEE ATTACHED")

Proposed Utility Photovoltaic Generating (PV) Facility with associated access and stormwater management areas

9. IF APPLICABLE, DESCRIBE ANY WORK STARTED PRIOR TO RECEIVING PERMIT

N/A

10. ADDITIONAL REQUIRED INFORMATION

A. Date a copy of the application was sent to the municipality as required by Env-Wq 1503.05(e)[1]: 07/13/2023.

(Attach proof of delivery)

B. Date a copy of the application was sent to the local river advisory committee if required by Env-Wq 1503.05(e)[2]: / / .

(Attach proof of delivery)

C. Type of plan required: ☐ Land Conversion ☒ Detailed Development ☐ Excavation, Grading & Reclamation ☐ Steep Slope

D. Additional plans required: ☒ Stormwater Drainage & Hydrologic Soil Groups ☐ Source Control ☐ Chloride Management

E. Total area of disturbance: 1,276,919 square feet

F. Additional impervious cover as a result of the project: 9,586 square feet (use the "-" symbol to indicate a net reduction in impervious coverage).

Total final impervious cover: 25,689 square feet

G. Total undisturbed cover: 298,310 square feet

H. Number of lots proposed: 1

I. Total length of roadway: 0 linear feet

J. Name(s) of receiving water(s): 0

K. Identify all other NHDES permits required for the project, and for each indicate whether an application has been filed and is pending, or if the required approval has been issued provide the permit number, registration date, or approval letter number, as applicable.

Type of Approval	Application Filed?	Status	
		Pending	If Issued:
1. Water Supply Approval	☐ Yes ☐ No ☒ N/A	☐	Permit number:
2. Wetlands Permit	☒ Yes ☐ No ☐ N/A	☒	Permit number:
3. Shoreland Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
4. UIC Registration	☐ Yes ☐ No ☒ N/A	☐	Registration date:
5. Large/Small Community Well Approval	☐ Yes ☐ No ☒ N/A	☐	Approval letter date:
6. Large Groundwater Withdrawal Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
7. Other:	☐ Yes ☒ No	☐	Permit number:

L. List all species identified by the Natural Heritage Bureau as threatened or endangered or of concern: Northern Black Racer, Blanding's Turtle, & Spotted Turtle

M. Using NHDES's Web GIS OneStop program (www2.des.state.nh.us/gis/onestop/), with the Surface Water Impairment layer turned on, list the impairments identified for each receiving water. If no pollutants are listed, enter "N/A." N/A

N. Did the applicant/applicant's agent have a pre-application meeting with AOT staff? ☐ Yes ☒ No

If yes, name of staff member:

O. Will blasting of bedrock be required? ☐ Yes ☒ No If yes, estimated quantity of blast rock: _____ cubic yards

If yes, standard blasting BMP notes must be placed on the plans, available at:
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-10-12.pdf

NOTE: If greater than 5,000 cubic yards of blast rock will be generated, a groundwater monitoring program must be developed and submitted to NHDES. Contact AOT staff for additional detail.

[1] Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the governing body of each municipality in which the project is proposed.

[2] Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the Local River Advisory Committee, if the project is within ¼ mile of a designated river.

11. CHECK ALL APPLICATION ATTACHMENTS THAT APPLY (SUBMIT WITH APPLICATION IN ORDER LISTED)

LOOSE:

- ☒ Signed application form: des.nh.gov/organization/divisions/water/aot/index.htm (with attached proof(s) of delivery)
- ☒ Check for the application fee: des.nh.gov/organization/divisions/water/aot/fees.htm
- ☒ Color copy of a USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ If Applicant is not the property owner, proof that the applicant will have a legal right to undertake the project on the property if a permit is issued to the applicant.

BIND IN A REPORT IN THE FOLLOWING ORDER:

- ☒ Copy of the signed application form & application checklist (des.nh.gov/organization/divisions/water/aot/index.htm)
- ☒ Copy of the check
- ☒ Copy of the USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ Narrative of the project with a summary table of the peak discharge rate for the off-site discharge points
- ☒ Web GIS printout with the "Surface Water Impairments" layer turned on - http://www4.des.state.nh.us/onestopdatamapper/onestopmapper.aspx
- ☒ Web GIS printouts with the AOT screening layers turned on - http://www4.des.state.nh.us/onestopdatamapper/onestopmapper.aspx
- ☒ NHB letter using DataCheck Tool – www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/
- ☒ The Web Soil Survey Map with project's watershed outlined – websoilsurvey.nrcs.usda.gov
- ☒ Aerial photograph (1" = 2,000' scale with the site boundaries outlined)
- ☒ Photographs representative of the site
- ☒ Groundwater Recharge Volume calculations (one worksheet for each permit application): des.nh.gov/organization/divisions/water/aot/documents/bmp_worksh.xls
- ☒ BMP worksheets (one worksheet for each treatment system): des.nh.gov/organization/divisions/water/aot/documents/bmp_worksh.xls
- ☒ Drainage analysis, stamped by a professional engineer (see Application Checklist for details)
- ☒ Riprap apron or other energy dissipation or stability calculations
- ☒ Site Specific Soil Survey report, stamped and with a certification note prepared by the soil scientist that the survey was done in accordance with the Site Specific Soil Mapping standards, *Site-Specific Soil Mapping Standards for NH & VT, SSSNNE Special Publication No. 3*.
- ☒ Infiltration Feasibility Report (example online) [Env-Wq 1503.08(f)(3)]
- ☐ Registration and Notification Form for Storm Water Infiltration to Groundwater (UIC Registration-for underground systems only, including drywells and trenches): (http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw_discharge)
- ☒ Inspection and maintenance manual with, if applicable, long term maintenance agreements [Env-Wq 1503.08(g)]
- ☐ Source control plan

PLANS:

- ☒ One set of design plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details)
- ☒ Pre & post-development color coded soil plans on 11" x 17" (see Application Checklist for details)
- ☒ Pre & post-development drainage area plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details)

100-YEAR FLOODPLAIN REPORT:

- ☐ All information required in Env-Wq 1503.09, submitted as a separate report.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

- ☐ See Checklist for Details

☒ **REVIEW APPLICATION FOR COMPLETENESS & CONFIRM INFORMATION LISTED ON THE APPLICATION IS INCLUDED WITH SUBMITTAL.**

12. REQUIRED SIGNATURES

NG By initialing here, I acknowledge that I am required by Env-Wq 1503.20(e) to submit a copy of all approved documents to the department in PDF format on a CD within one week after permit approval.

By signing below, I certify that:

- The information contained in or otherwise submitted with this application is true, complete, and not misleading to the best of my knowledge and belief;
- I understand that the submission of false, incomplete, or misleading information constitutes grounds for the department to deny the application, revoke any permit that is granted based on the information, and/or refer the matter to the board of professional engineers established by RSA 310-A:3 if I am a professional engineer; and
- I understand that I am subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641.

☐ **APPLICANT** ☒ **APPLICANT'S AGENT**:

Signature: _____ Date: 7/6/2023

Name (print or type): Nicholas Golon, PE/TFMoran, Inc. Title: Principal

☐ PROPERTY OWNER ☒ PROPERTY OWNER'S AGENT:

Signature: _____ Date: 7/6/2023

Name (print or type): Nicholas Golon, PE/TFMoran, Inc. Title: Principal

ATTACHMENT A:
ALTERATION OF TERRAIN PERMIT APPLICATION CHECKLIST

Check the box to indicate the item has been provided or provide an explanation why the item does not apply.

DESIGN PLANS

☒ Plans printed on 34 - 36" by 22 - 24" white paper

☒ PE stamp

☒ Wetland delineation

☒ Temporary erosion control measures

☒ Treatment for all stormwater runoff from impervious surfaces such as roadways (including gravel roadways), parking areas, and non-residential roof runoff. Guidance on treatment BMPs can be found in Volume 2, Chapter 4 of the NH Stormwater Management Manual.

☒ Pre-existing 2-foot contours

☒ Proposed 2-foot contours

☐ Drainage easements protecting the drainage/treatment structures

☒ Compliance with the Wetlands Bureau, RSA 482- A http://des.nh.gov/organization/divisions/water/wetlands/index.htm. Note that artificial detention in wetlands is not allowed.

☒ Compliance with the Comprehensive Shoreland Protection Act, RSA 483-B. http://des.nh.gov/organization/divisions/water/wetlands/cspa

☐ Benches. Benching is needed if you have more than 20 feet change in elevation on a 2:1 slope, 30 feet change in elevation on a 3:1 slope, 40 feet change in elevation on a 4:1 slope.

☒ Check to see if any proposed ponds need state Dam permits.
http://des.nh.gov/organization/divisions/water/dam/documents/damdef.pdf

DETAILS

☒ Typical roadway x-section

☒ Detention basin with inverts noted on the outlet structure

☒ Stone berm level spreader

☒ Outlet protection – riprap aprons

☒ A general installation detail for an erosion control blanket

☒ Silt fences or mulch berm

☒ Storm drain inlet protection. Note that since hay bales must be embedded 4 inches into the ground, they are not to be used on hard surfaces such as pavement.

☐ Hay bale barriers

☒ Stone check dams

☒ Gravel construction exit

☒ Temporary sediment trap

☒ The treatment BMP's proposed

☐ Any innovative BMP's proposed

CONSTRUCTION SEQUENCE/EROSION CONTROL

☒ Note that the project is to be managed in a manner that meets the requirements and intent of RSA 430:53 and Chapter Agr 3800 relative to invasive species.

☒ Note that perimeter controls shall be installed prior to earth moving operations.

☒ Note that temporary water diversion (swales, basins, etc) must be used as necessary until areas are stabilized.

☒ Note that ponds and swales shall be installed early on in the construction sequence (before rough grading the site).

☒ Note that all ditches and swales shall be stabilized prior to directing runoff to them.

☒ Note that all roadways and parking lots shall be stabilized within 72 hours of achieving finished grade.

☒ Note that all cut and fill slopes shall be seeded/loamed within 72 hours of achieving finished grade

☒ Note that all erosion controls shall be inspected weekly AND after every half-inch of rainfall.

☒ Note the limits on the open area allowed, see Env-Wq 1505.02 for detailed information.

Example note: The smallest practical area shall be disturbed during construction, but in no case shall exceed 5 acres at any one time before disturbed areas are stabilized.

☒ Note the definition of the word “stable”

Example note: An area shall be considered stable if one of the following has occurred:

- Base course gravels have been installed in areas to be paved.
- A minimum of 85 percent vegetated growth has been established.
- A minimum of 3 inches of non-erosive material such stone or riprap has been installed.
- Or, erosion control blankets have been properly installed.

☒ Note the limit of time an area may be exposed
Example note: All areas shall be stabilized within 45 days of initial disturbance.

☒ Provide temporary and permanent seeding specifications. (Reed canary grass is listed in the Green Book; however, this is a problematic species according to the Wetlands Bureau and therefore should not be specified)

☒ Provide winter construction notes that meet or exceed our standards.

Standard Winter Notes:

- All proposed vegetated areas that do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
- After October 15, incomplete road or parking surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel per NHDOT item 304.3.

☒ Note at the end of the construction sequence that “Lot disturbance, other than that shown on the approved plans, shall not commence until after the roadway has the base course to design elevation and the associated drainage is complete and stable.” – This note is applicable to single/duplex family subdivisions, when lot development is not part of the permit.

DRAINAGE ANALYSES

Please double-side 8 ½" × 11" sheets where possible but, **do not** reduce the text such that more than one page fits on one side.

☒ PE stamp

☒ Rainfall amount obtained from the Northeast Regional Climate Center- http://precip.eas.cornell.edu/. Include extreme precipitation table as obtained from the above referenced website.

☒ Drainage analyses, in the following order:

- Pre-development analysis: Drainage diagram.
- Pre-development analysis: Area Listing and Soil Listing.
- Pre-development analysis: Node listing 1-year (if applicable), 2-year, 10-year and 50-year.
- Pre-development analysis: Full summary of the 10-year storm.
- Post-development analysis: Drainage diagram.
- Post-development analysis: Area Listing and Soil Listing.
- Post-development analysis: Node listing for the 2-year, 10-year and 50-year.
- Post-development analysis: Full summary of the 10-year storm.

☒ Review the Area Listing and Soil Listing reports

- Hydrologic soil groups (HSG) match the HSGs on the soil maps provided.
- There is the same or less HSG A soil area after development (check for each HSG).
- There is the same or less "woods" cover in the post-development.
- Undeveloped land was assumed to be in "good" condition.
- The amount of impervious cover in the analyses is correct.

Note: A good check is to subtract the total impervious area used in the pre analysis from the total impervious area used in the post-analysis. For residential projects without demolition occurring, a good check is to take this change in impervious area, subtract out the roadway and divide the remaining by the number of houses/units proposed. Do these numbers make sense?

☒ Check the storage input used to model the ponds.

☒ Check to see if the artificial berms pass the 50-year storm, i.e., make sure the constructed berms on ponds are not overtopped.

☒ Check the outlet structure proposed and make sure it matches that modeled.

☒ Check to see if the total areas in the pre and post analyses are same.

☒ Confirm the correct NRCS storm type was modeled (Coos, Carroll & Grafton counties are Type II, all others Type III).

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PRE- AND POST-DEVELOPMENT DRAINAGE AREA PLANS

☒ Plans printed on 34 - 36" by 22 - 24" on white paper.

☒ Submit these plans separate from the soil plans.

☒ A north arrow.

☒ A scale.

☒ Labeled subcatchments, reaches and ponds.

☒ Tc lines.

☒ A clear delineation of the subcatchment boundaries.

☐ Roadway station numbers.

☒ Culverts and other conveyance structures.

PRE AND POST-DEVELOPMENT COLOR-CODED SOIL PLANS

☒ 11" × 17"sheets suitable, as long as it is readable.

☒ Submit these plans separate from the drainage area plans.

☒ A north arrow.

☒ A scale.

☒ Name of the soil scientist who performed the survey and date the soil survey took place.

☒ 2-foot contours (5-foot contours if application is for a gravel pit) as well as other surveyed features.

☒ Delineation of the soil boundaries and wetland boundaries.

☒ Delineation of the subcatchment boundaries.

☒ Soil series symbols (e.g., 26).

☒ A key or legend which identifies each soil series symbol and its associated soil series name (e.g., 26 = Windsor).

☒ The hydrologic soil group color coding (A = Green, B = yellow, C= orange, D=red, Water=blue, & Impervious = gray).

Please note that excavation projects (e.g., gravel pits) have similar requirements to that above, however the following are common exceptions/additions:

☐ Drainage report is not needed if site does not have off-site flow.

☐ 5 foot contours allowed rather than 2 foot.

☐ No PE stamp needed on the plans.

☐ Add a note to the plans that the applicant must submit to the Department of Environmental Services a written update of the project and revised plans documenting the project status every five years from the date of the Alteration of Terrain permit.

☐ Add reclamation notes.

See NRCS publication titled: *Vegetating New Hampshire Sand and Gravel Pits* for a good resource, it is posted online at: http://des.nh.gov/organization/divisions/water/aot/categories/publications.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

☐ If project will discharge stormwater to a surface water impaired for phosphorus and/or nitrogen, include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen.

☐ If project will discharge stormwater to a Class A surface water or Outstanding Resource Water, include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen.

☐ If project will discharge stormwater to a lake or pond not covered previously, include information to demonstrate that project will not cause net increase in phosphorus in the lake or pond.

☐ If project is within a Coastal/Great Bay Region community, include info required by Env-Wq 1503.08(l) if applicable.

24234

DATE	INVOICE NO.	COMMENT	AMOUNT	NET AMOUNT
07/14/2023	CkReq 071423	NHDES AoT Permit Application Fee		16,875.00
DATE 07/14/23		**VENDOR** TREASURER, STATE OF NEW HAMPSHIR	**TOTAL**	16,875.00

24234

Sixteen Thousand Eight Hundred Seventy Five and no/100

07/14/23 24234 $16,875.00

TREASURER, STATE OF NEW HAMPSHIRE

FILE COPY XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX FILE COPY

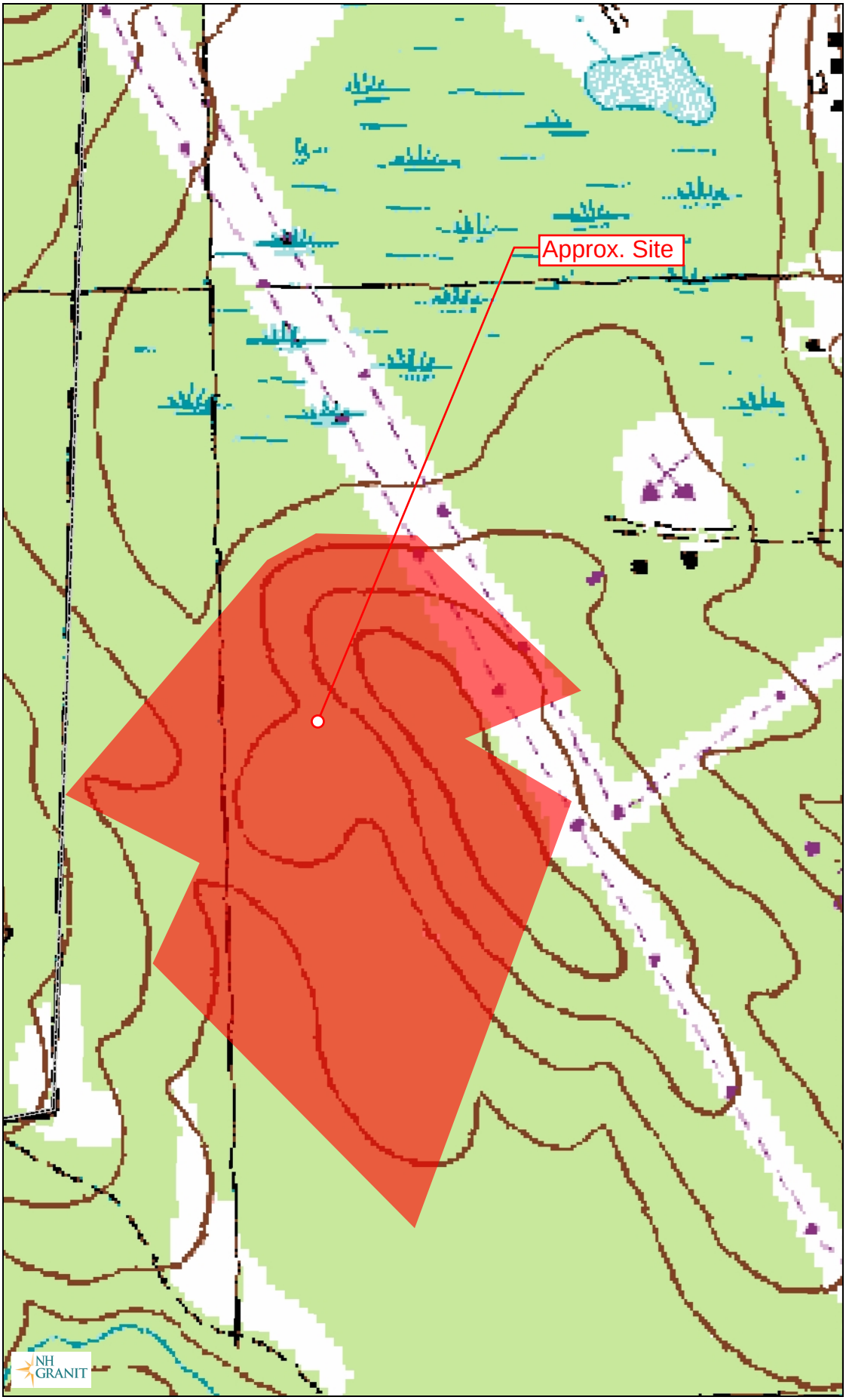
24234

DATE	INVOICE NO.	COMMENT	AMOUNT	NET AMOUNT
07/14/2023	CkReq 071423	NHDES AoT Permit Application Fee		16,875.00
DATE 07/14/23		**VENDOR** TREASURER, STATE OF NEW HAMPSHIR	**TOTAL**	16,875.00

TFMORAN INC. BEDFORD, NH		CHECK REQUEST FORM	
Requested By:	Jeremy Belanger	**Date**: 7/14/23	
Account Code:	20025-00	**Amount:** $16,875.00	
Payable To:	Treasurer State of New Hampshire		
Address:	PO Box 95		
City:	Concord	NH	03303-0095
Contact:	Ridgely Mauck, PE	**Phone:** (603) 271-2147	
Payable For:	NHDES AoT Permit Application Fee		
Required When:	ASAP	**Mail Check:** ☐ Yes	☒ No
Project Name:	Unitil Utility Scale PV	**Approved**:	**Date:** 7/14/23

ACCOUNTING USE ONLY			
Check Number:	**Issued By:**	**Date:**	**Acct No:**

USGS Map



Legend

- State
- County
- City/Town

Map Scale

1: 5,000

Map Generated: 5/15/2023

Notes

USGS Map
TFM Project No. 20025-00

Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Scientists

July 6, 2023

Town of Kingston
163 Main Street
Kingston, NH 03848

New Hampshire Department of Environmental Services
29 Hazen Drive
PO Box 95
Concord, New Hampshire 03301-0095

RE: Certification Statement
Unitil Kinston Solar Project
14 & 24 Towle Road, Kingston, NH 03848
Tax Map R12 Lots 25 & 26

To whom it may concern;

I hereby certify that the attached transmittal was delivered by hand and electronic format to the Town of Kingston.

Sincerely,

Jeremy Belanger

Jeremy Belanger, PE
TFMoran, Inc.

48 Constitution Drive
Bedford, NH 03110
Phone (603) 472-4488
Fax (603) 472-9747
www.tfmoran.com

PART 1

Executive Summary

Unitil views renewable energy as a valuable resource that provides benefits to the electric grid and the environment. Unitil Energy Systems is looking to expand into utility scale photovoltaic generating (PV) facilities within its electric service territory in New Hampshire. The proposed Photovoltaic (PV) Solar Array project is located at 14 & 24 Towle Road, in Kingston, NH Tax Map R-12, Lot 26 (approximately 32.9 +/- acres) and part of Lot 25 (approximately 3.7 +/-) located within the Rural Residential District. The site is abutted by the existing Eversource Peaslee and Unitil Kingston Substations to the east, residential properties to the north, south, and west. Towle Road (Class VI) encompasses the northwestern property line. An electric utility corridor traverses through the property, terminating at the existing substations. Access to the parcel is via the class IV portion of Towle Road.

An open and closed drainage system is proposed to capture runoff from the site for this phase of the project. One (1) proposed Bio- Retention Area with sediment forebay will be utilized to manage runoff and provide the pretreatment/treatment for a majority of the site. The northwest and southeast portions of the on the site will discharge though two (2) Vegetated Buffer Areas prior to entering wetland areas.

The systems have been designed to maintain peak flows during all storm conditions up to and including the 50-year storm event.

- Best Management Practices are proposed to manage stormwater from the development and provide treatment, groundwater recharge and maintain existing flow rates leaving the site.
    - One (1) Bio-Retention Area is proposed to maintain existing recharge rates to preserve groundwater levels and pollutant removal is achieved by the filtering media as well as biological uptake from the specified plantings. The sediment forebay provides pretreatment to allow sediment to settle out of the stormwater prior to entering the main cell of the basin. A volume of crushed stone is provided below the filtering media to provide additional storage for stormwater runoff as necessary.
    - Two (2) Vegetated Buffers are proposed to mitigate impact of the wetland buffer zone. The design ensures runoff enters the buffer as sheet flow without the aid of a level spreader for areas with limited areas of impervious surface.
- There is no increase in the peak rate of runoff at the discharge points from the project site and the volume of runoff recharged to the aquifer has been maintained for the total site.
- The Water Quality Volume (WQV) has been met by providing the required storage below the lowest outlet orifice of the stormwater management area.

Description of Project

The proposed project is to construct a utility scale photovoltaic generating (PV) facility along with associated amenities such as a gravel access drive, storage for equipment, a fence line, and stormwater management. The proposed area of work is located to at 14 & 24 Towle Road, west of the existing Eversource Peaslee and Unitil Kingston Substations within the Rural Residential District.

The site is wooded and undeveloped, except for signs of prior logging operations. The existing topography property consists of approximately 30 feet of grade change (200 feet to 170 feet), descending from the adjacent utility corridor in the northeast to the wetland complex in the southern portions of the property. Access to the parcel is via the class IV portion of Towle Road. Photos of existing features can be found in Section 2 of this Report.

The placement of the solar array was arranged to mitigate impacts on the valuable wetland located on the southern end of the site. The stormwater system was also designed to compensate for the three impacted wetlands.

Proposed and existing open and closed drainage systems will convey, attenuate, and provide treatment/groundwater recharge of stormwater associated with the development. The majority of the site will drain to the southeast of the site though one (1) proposed Bio-Retention Area, while the northwest and southeast portions of the on the site will discharge though two (2) Vegetated Buffer Areas.

A NHDES Alteration of Terrain, NHDES Major Wetlands Dredge and Fill, and Kingston Site Plan and Lot Line Adjustment Approvals will be required for the site development project.

The objectives for the post-development drainage design are to use best management practices to attenuate flows, provide pretreatment and treatment to collected stormwater runoff and maintain groundwater recharge.

The intent of this report is: 1) to analyze the rate of runoff from the site for the pre- and post-development conditions. The drainage system will be designed to maintain the current peak rate of runoff from the site, and 2) to provide stormwater treatment and groundwater recharge for the runoff from the site expansion in accordance with the requirements of the NHDES and Town of Kingston.

Storm Water Methodology

Pre-Development Conditions

Based on existing topography, five (5) sub catchments and seven (7) points of interest were identified.

Evaluation points have been defined by abutting parcels, with identifying HydroCAD Links as follows:

- The class IV road to the northwest, Towle Road has been denoted as POI-A;
- The northeastern abutting utility corridor has been denoted as POI-B;
- The northeastern abutting parcel (Tax Map R-12, Lot 24) has been denoted as POI-C;
- The eastern abutting parcels (Tax Map R-11, Lots 4a and 4B) have been denoted as POI-D;
- The eastern abutting (Tax Map R-11 14) has been denoted as POI-E;
- The eastern abutting parcel (Tax Map R-11, 13) has been denoted as POI-F;
- The southeastern abutting parcel (Tax Map R-11, 9), which is also owned by Unitil, denoted as POI-G; and
- The southwestern abutting parcel (Tax Map R-12, 27) denoted as POI-H.

Due to the existing and proposed site improvements, stormwater runoff from the property does not discharge to POI-E in pre-development conditions. Runoff from POI-D does discharge briefly onto the site and return back onto the same abutting property. POI-C overlaps with POI-B along the northeastern property line, due to a utility easement. These evaluation points have been included in the HydroCAD Analysis for informative purposes.

A SSSM Soils Report was generated by GAL Land Consultants for the subject property which resulted in hydrologic soils group (HSG) type B, C and D soils. Rainfall amounts were obtained from the Northeast Regional Climate Center and NRCS Storm Type-III was utilized for the HydroCAD Analysis. An Extreme Precipitation Table has been provided in Section 2 of this Report.

To model the site drainage, the HydroCAD Version 10.10-7a program has been used. The software is based on the SCS TR-20 technique used for modeling the hydrology and hydraulics of storm water runoff. The 2-year, 10-year, and 50-year storm-events are included per the requirements of the NHDES AoT and the Town of Kingston.

Post-Development Conditions

The proposed project will include a solar field, a fence line, an access drive, concrete equipment pads, and associated stormwater management systems. A majority of the site will be composed of grassland, solar panels, and a fence line surrounding the panels. The two (2) wetlands complexes to the west and south will remain undeveloped and be protected by two (2) Vegetated Buffer Areas. One (1) grassed waterway will direct a majority of site discharge through the one (1) Bio-retention Area to the south. Access to the site will be through a gravel drive that extends to the equipment pads on the west end of the site via Towle Road.

The proposed open and closed drainage system has been designed to collect, treat, and recharge stormwater runoff from the portions of the project, with an outlet structure connected to the existing municipal closed drainage system. There is no proposed increase in discharge from the site up to and including the 50-year storm event.

The post-development drainage model represents the site divided into multiple subcatchments based on the layout of the proposed stormwater collection systems.

The Groundwater Recharge Volume (GRV) has been met via the existing and prosed infiltration systems.

All pre-development evaluation points have been analyzed in post-development conditions.

Groundwater Recharge

The required GRV for the HSG B and C soils which has been replaced by impervious cover per AoT regulations has been provided within the proposed bioretention system. Supporting calculations have been provided on the GRV and Best Management Practices (BMP) Worksheet, Section 3 of this Report.

Stormwater Treatment

Best Management Practices are proposed to manage the stormwater from the development and provide treatment, groundwater recharge and maintain existing flow rates leaving the site.

Bio-Retention Areas are required to provide pre-treatment prior to stormwater entering the main cell of the basin. The sediment forebay allows particles to settle out of the stormwater. Bio-Retention Areas remove pollutants, reduce the peak rates of flow, and reduce flow volume by allowing evaporation and infiltration of the stormwater. Stormwater runoff pollutant removal is achieved as water percolated through the filtering media as well as biological uptake from the specified plantings. Infiltration also provides groundwater recharge.

Vegetated buffers are areas of natural or established vegetation allowed to grow with minimal to no maintenance. Natural, undisturbed buffers are particularly desirable along shorelines of waterbodies and wetlands, as well as along connecting habitat corridors. Buffers reduce the velocity of runoff, promote groundwater recharge, filter out sediments and provide shade to reduce the thermal impacts of runoff to receiving waters. Buffers also provide habitat for wildlife.

The Water Quality Volume (WQV) is fully detained within the proposed Bio-Retention Area and the Vegetated Buffer providing the storm water treatment.

Test pits and infiltration testing were performed as part of the project design. The rates and depth to seasonal high groundwater used in these calculations are based on those values obtained, with a factor of safety.

18-inches of filter media will be installed within the bottom of the bioretention area per NHDES AoT regulations. Specifications have been included on the Site Plan Detail Sheets.

The NRCS Web Soil Survey was utilized to determine the on-site soil characteristics, and the rates used in the calculations are based on the values obtained from the soil mapping, with factor of safety.

Erosion Control Measures

Erosion Control Measures are found on the Stormwater Management Plan within the plan set. The erosion control and construction sequence notes on the Notes Sheets contain specifications for stabilizing disturbed areas and limiting the length of time these areas are exposed.

Temporary Erosion Control Measures

Silt Sock or a stump grindings berm are proposed along the edges of down slope site work to prevent sediment from leaving the project area. A stabilized construction entrance is proposed at the driveway entrance to prevent sediment from being tracked onto the street during construction.

Temporary Swales and Sediment Basins

Temporary swales and sediment basins, to be utilized during construction, were sized to provide no discharge from basins during the 2-year, 24-hour storm event (see table below). Ground cover was modeled as, “Newly Graded Areas”, “Gravel”, and “Unconnected Impervious” for the HydroCAD Analysis.

The location of Vegetated Buffers #1 and #2 will be utilized for Temporary Sediment Basins #1 and #3, maintaining permanent finish grade elevations at the limits of work. Temporary Swale #1 will be located in the vicinity of the permanent vegetated swale along Towle Road and has been evaluated for peak depth and velocity during the 2-yr storm event. When the upstream areas are stabilized, the temporary basins will be regraded to finish grade, loamed and seeded in accordance with the Site Plans.

Bioretention Area #1 will be utilized for Temporary Sediment Basin #2 and Temporary Swale #2. The basin will be excavated to the bottom of the proposed bioretention area (elevation 167.0). When the project is stabilized, the bottom of the basin will be excavated to finish grade for installation of filter media.

Temporary Basins have been equipped with overflow spillways.

Temporary Sediment Basin	2-YR, 24-HR Inflow Volume (cf)	Volume of Storage (cf)*
#1	32,089	33,437
#2	144,644	143,454
#3	10,459	15,065

*below lowest outlet orifice

Permanent Erosion Control Measures

An open and closed drainage system is proposed on the site to capture the runoff from the project.

Flood Protection

Examination of the Flood Insurance Rate Map for Rockingham County New Hampshire (All Jurisdictions), Map Numbered 33015C0390E, Effective Date: May 17, 2005, indicates that the proposed work is not located within the floodplain.

Conclusion

Peak Rate Flows

There is no increase in the peak rate of runoff at discharge points and stormwater volume recharged to the aquifer has been maintained for the total site.

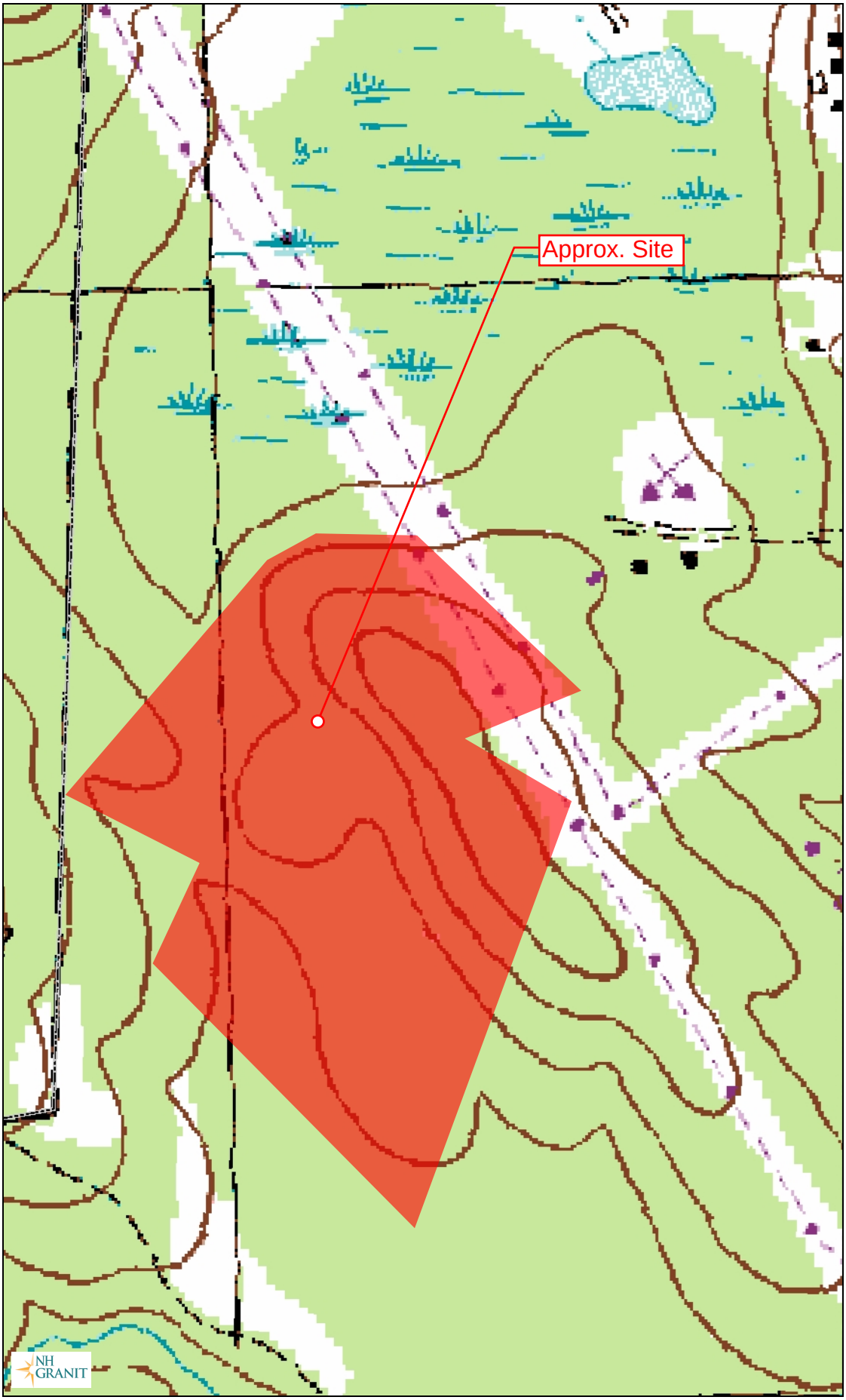
Flow (cfs)	2-YR		10-YR		50-YR	
	PRE	POST	PRE	POST	PRE	POST
POI-A	0.6	0.3	2.6	1.3	6.9	3.5
POI-B	0.1	0.1	0.8	0.3	2.7	0.8
POI-C	0.1	0.1	0.6	0.4	1.7	1.2
POI-D	0.1	0.1	0.3	0.3	1.0	0.7
POI-E	0.0	0.0	0.0	0.0	0.0	0.0
POI-F	0.0	0.0	0.0	0.0	0.0	0.0
POI-G	2.9	2.2	8.7	5.5	20.0	11.5
POI_H	6.0	5.1	17.6	12.8	39.3	38.0

Treatment

The proposed bioretention area and vegetated buffers have been designed to provide adequate treatment for stormwater runoff.

PART 2

USGS Map



Legend

- State
- County
- City/Town

Map Scale

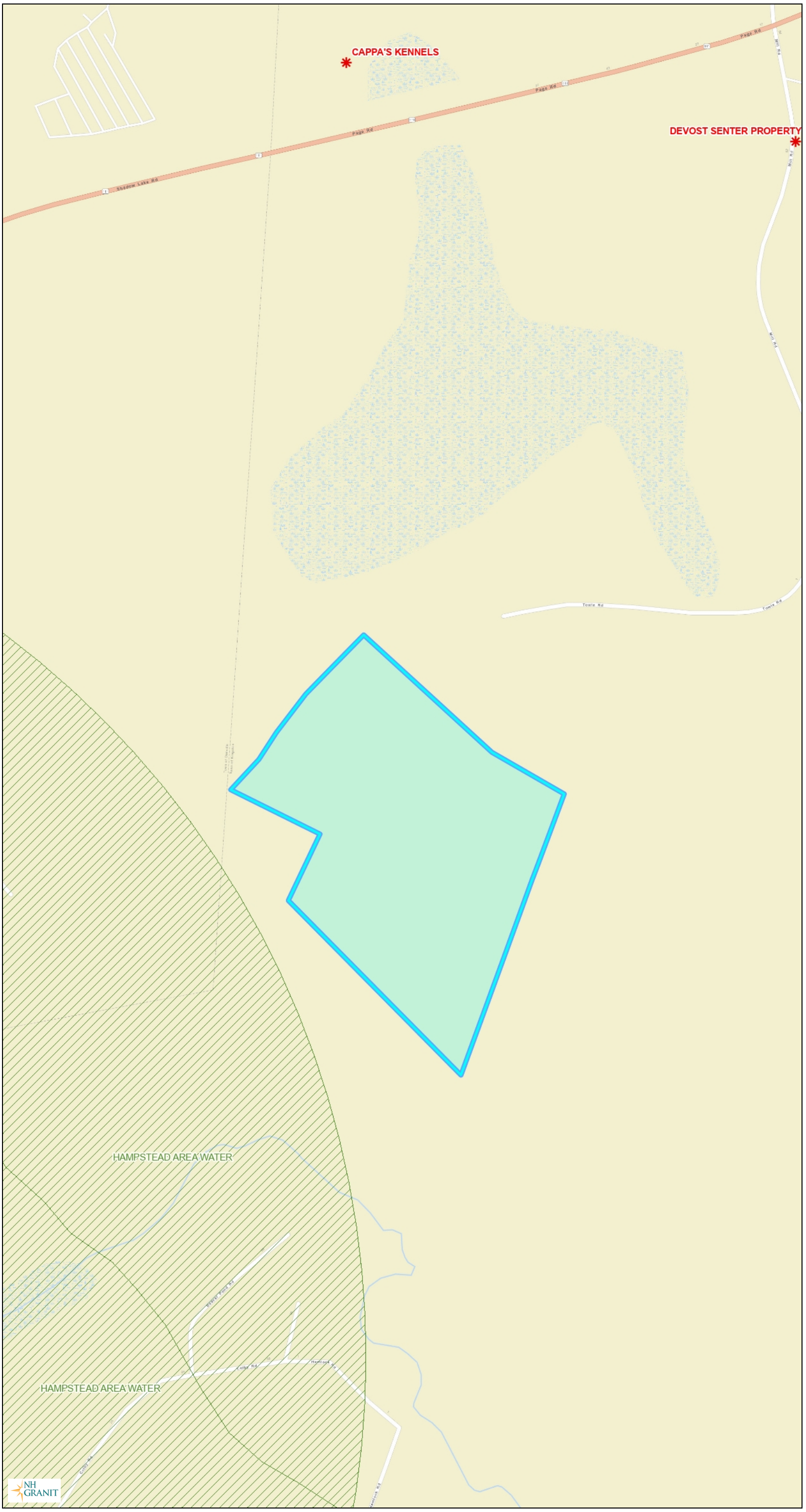
1: 5,000

Map Generated: 5/15/2023

Notes

USGS Map
TFM Project No. 20025-00

NHDES AoT Screening Layers



Legend

- Remediation Sites
- Coastal and Great Bay Regio Communities
- Public Water Supply Wells
- Groundwater Classification A GA1
- Groundwater Classification A GA2
- Water Supply Intake Protectic Areas
- Wellhead Protection Areas

Map Scale

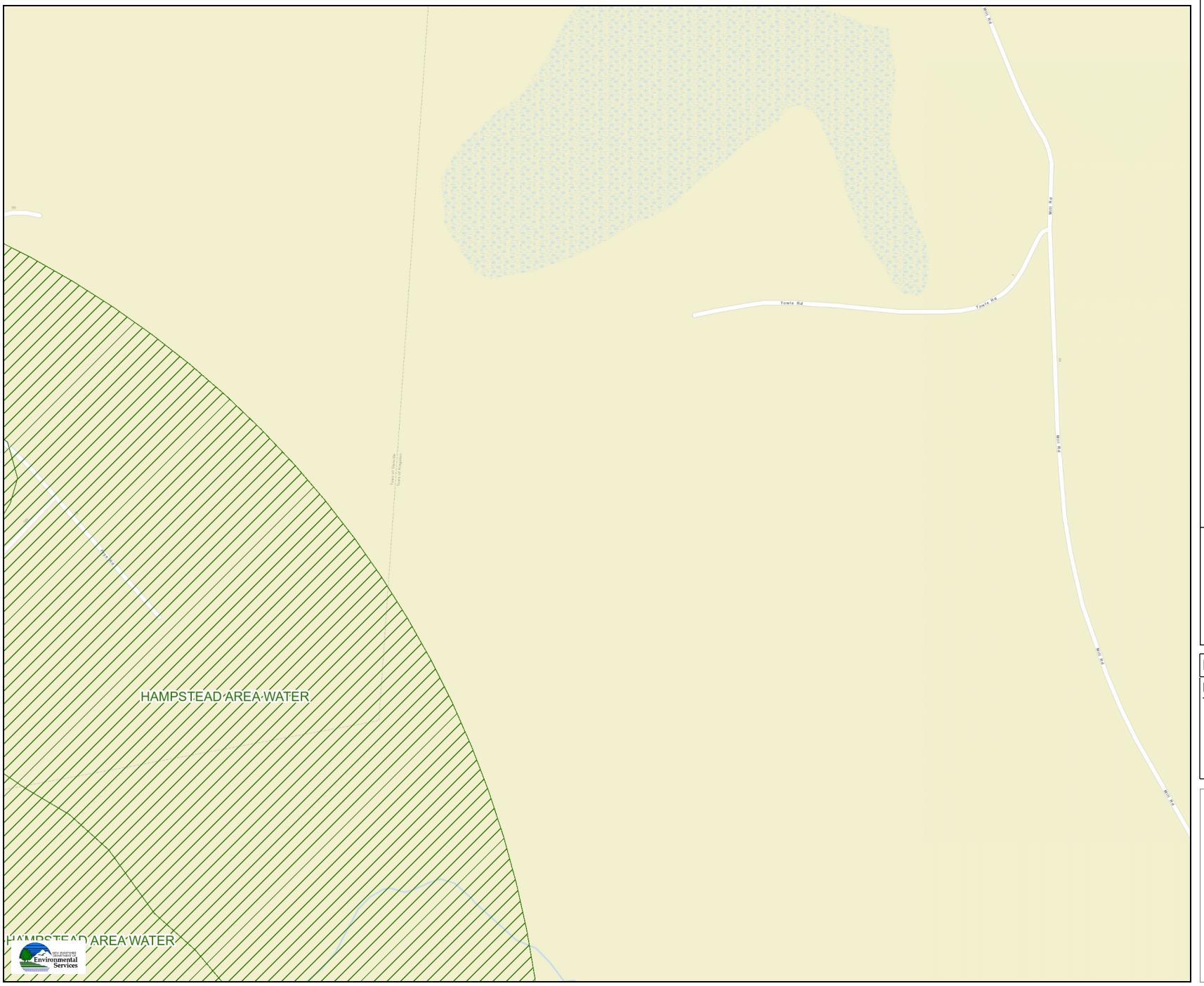
1: 5,000

Map Generated: 6/7/2023

Notes:

NHDES AoT Screening Layers
TFM Project No. 20025-00

Drinking & Groundwater Screening Layers



Legend

- Wellhead Protection Areas
- Hydrologic Areas of Concern
- High-Yield Stratified-Drift Aq

Map Scale

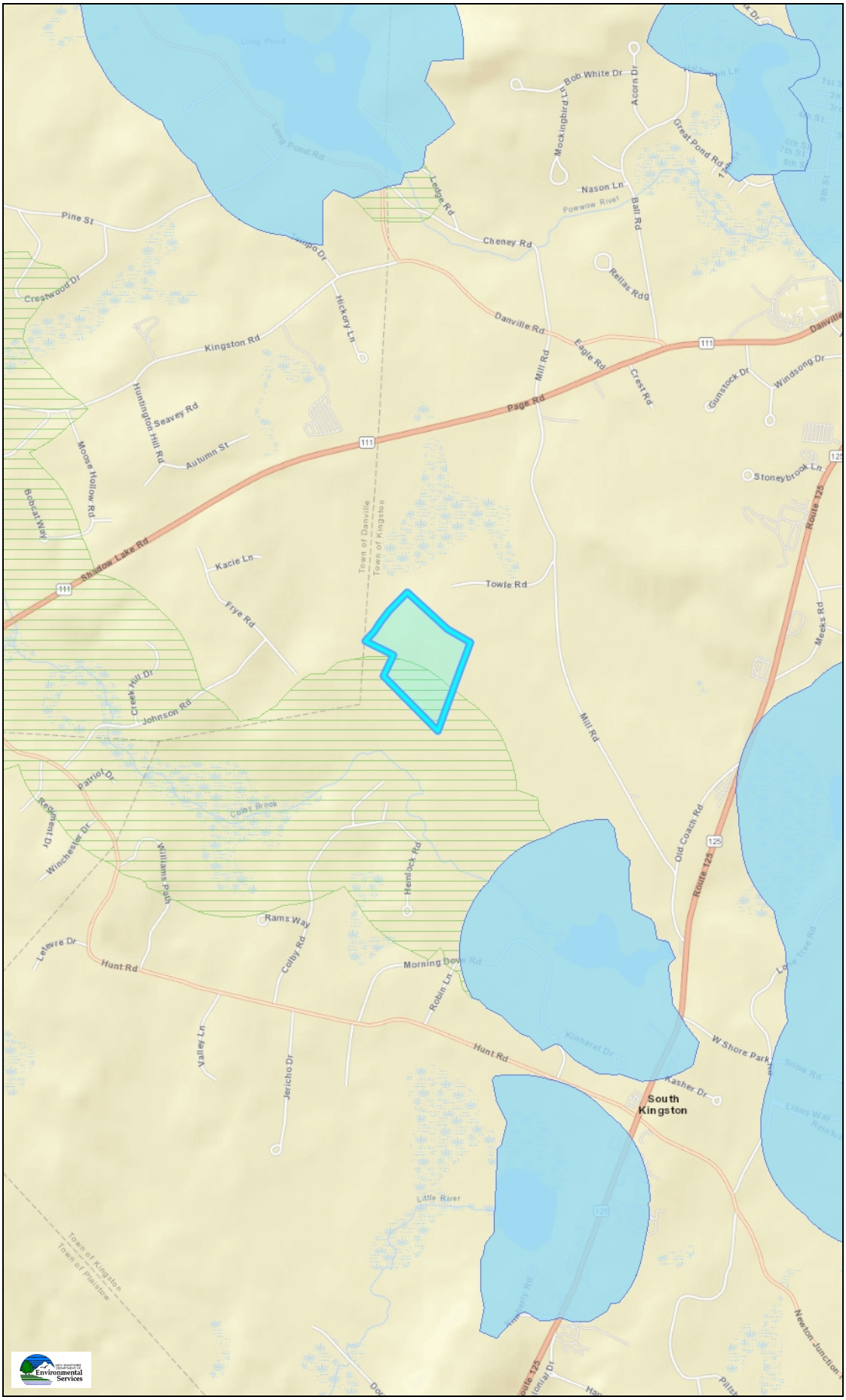
1: 6,494

Map Generated: 5/15/2023

Notes

Drinking & Groundwater Screening Layers
TFM Project No. 20025-00

NHDES Surface Water Impairments



Legend

- Class A Lakes with a Quarte Buffer
- Class A - All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Surface Waters with Impairn with Quarter Mile Buffer
- Watersheds with Chloride Impairments

Map Scale

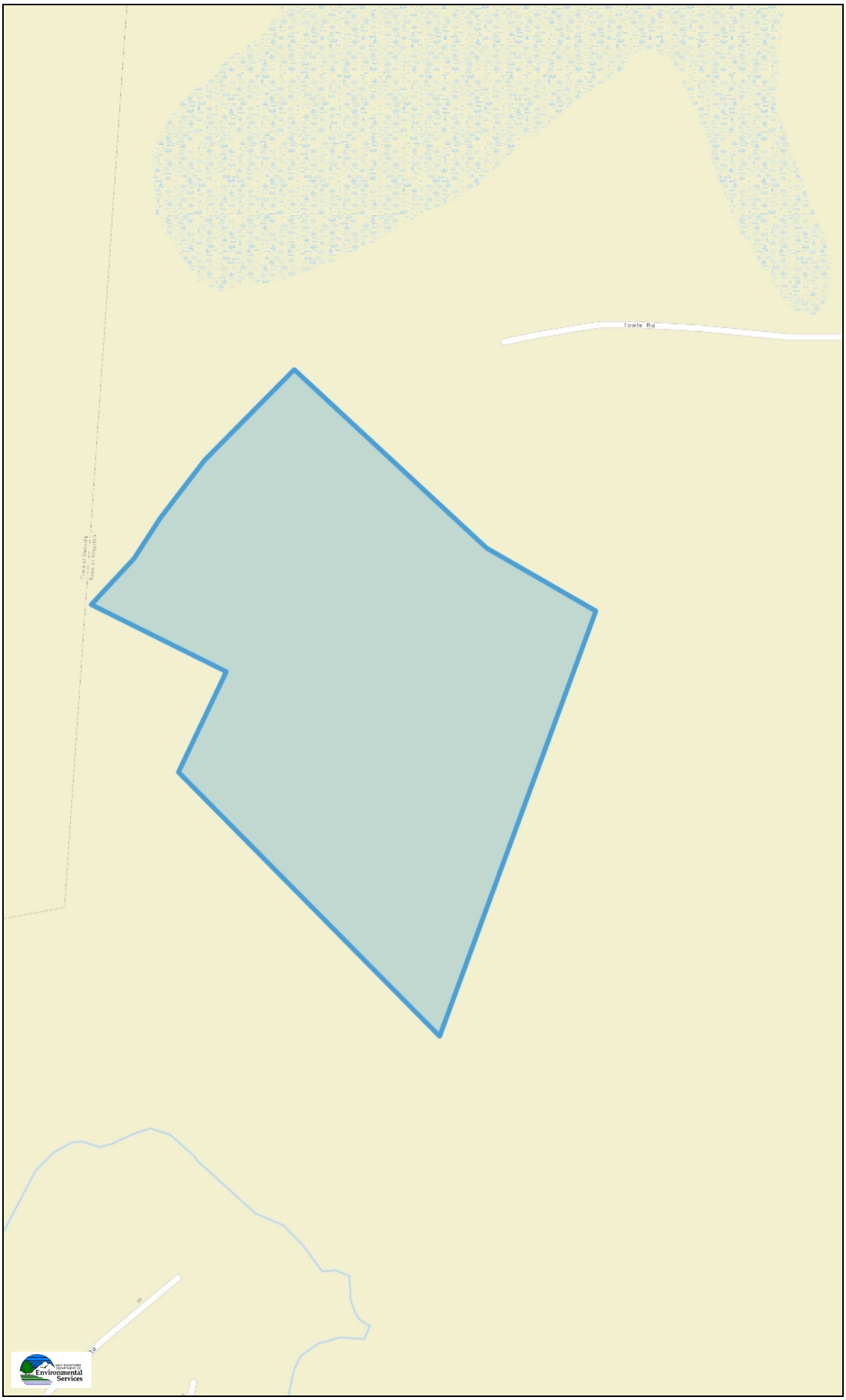
1: 24,000

Map Generated: 6/19/2023

Notes

NHDES Surface Water Impairments
TFM Project No. 20025-00

NHDES Designated Rivers Check



Legend

Designated Rivers Quarterm
Buffer

Map Scale

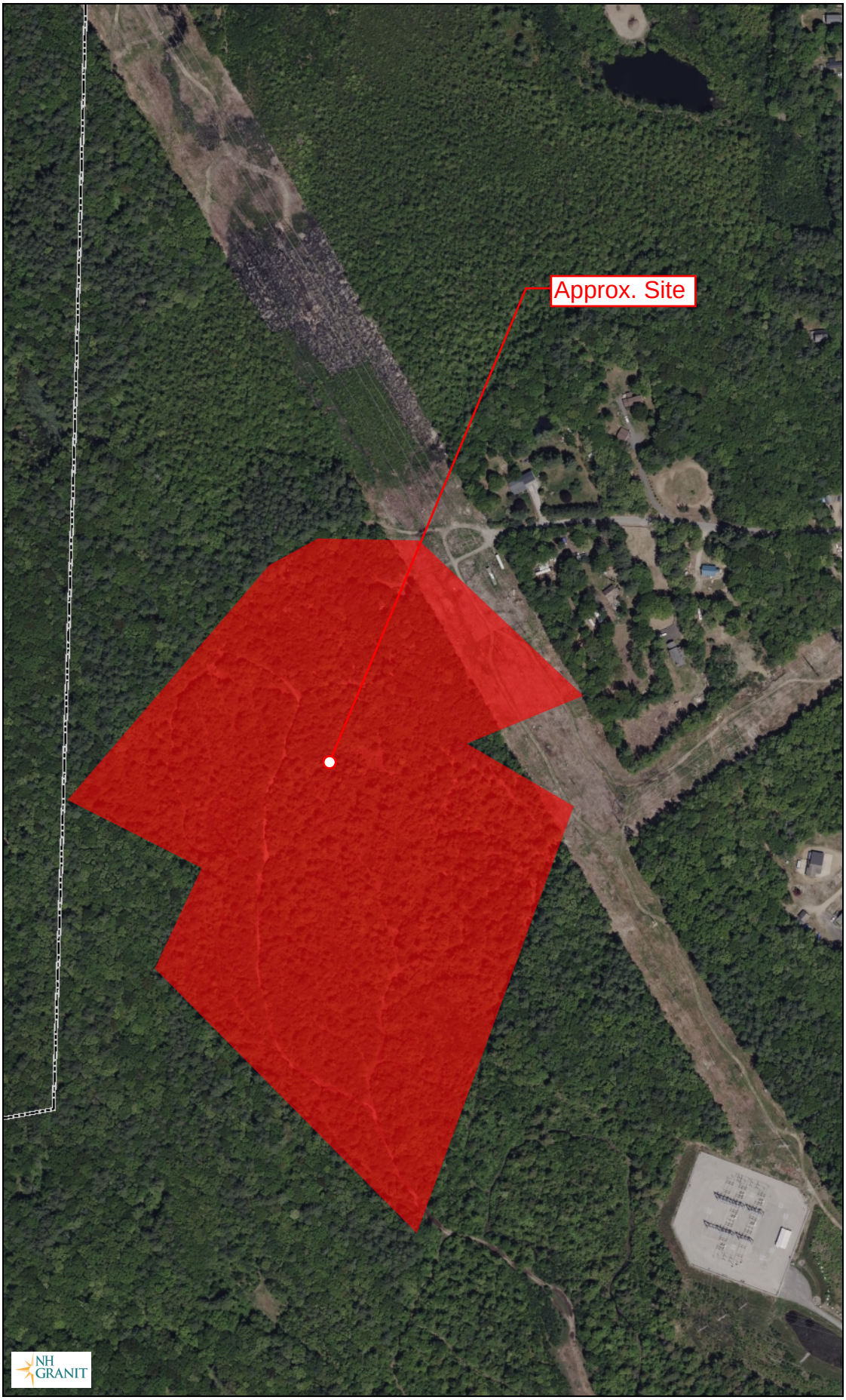
1: 5,000

Map Generated: 6/16/2023

Notes

NHDES Designated Rivers Check
TFM Project No. 20025-00

Aerial Map



Legend

- State
- County
- City/Town

Map Scale

1: 5,000

Map Generated: 5/15/2023

Notes

Aerial Map
TFM Project No. 20025-00

Memo

NH Natural Heritage Bureau
NHB DataCheck Results Letter

Please note: portions of this document are confidential.
Maps and NHB record pages are confidential and should be redacted from public documents.

To: Jeremy Belanger
48 Consitution Dr
Bedford, NH 03110

From: NHB Review, NH Natural Heritage Bureau
Date: 9/23/2022 (valid until 09/23/2023)
Re: Review by NH Natural Heritage Bureau
Permits: MUNICIPAL POR - Kingston, NHDES - Alteration of Terrain Permit, NHDES - Wetland Standard Dredge & Fill - Major, USACE - General Permit, USEPA - Stormwater Pollution Prevention

NHB ID: **NHB22-3062** Town: Kingston Location: 2 Mill Road & 24 Towle Road
Description: Proposed Utility Scale Photovoltaic Generating (PV) Facility with associated access and stormwater management areas.
cc: NHFG Review

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments **NHB: No comments at this time.**
F&G: Please refer to NHFG consultation requirements below.

Vertebrate species	**State[1]**	**Federal**	**Notes**
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).
Northern Black Racer (*Coluber constrictor constrictor*)	T	--	Contact the NH Fish & Game Dept (see below).
Spotted Turtle (*Clemmys guttata*)	T	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

For all animal reviews, refer to 'IMPORTANT: NHFG Consultation' section below.

Disclaimer: A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

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Maps and NHB record pages are confidential and should be redacted from public documents.

for certain species. An on-site survey would provide better information on what species and communities are indeed present.

IMPORTANT: NHFG Consultation

If this NHB Datacheck letter DOES NOT include ANY wildlife species records, then, based on the information submitted, no further consultation with the NH Fish and Game Department pursuant to Fis 1004 is required.

If this NHB Datacheck letter includes a record for a threatened (T) or endangered (E) wildlife species, consultation with the New Hampshire Fish and Game Department under Fis 1004 may be required. To review the Fis 1000 rules (effective February 3, 2022), please go to https://wildlife.state.nh.us/wildlife/environmental-review.html. All requests for consultation and submittals should be sent via email to NHFGreview@wildlife.nh.gov or can be sent by mail, and **must include the NHB Datacheck results letter number and "Fis 1004 consultation request" in the subject line.**

If the NHB DataCheck response letter does not include a threatened or endangered wildlife species but includes other wildlife species (e.g., Species of Special Concern), consultation under Fis 1004 is not required; however, some species are protected under other state laws or rules, so coordination with NH Fish & Game is highly recommended or may be required for certain permits. While some permitting processes are exempt from required consultation under Fis 1004 (e.g., *statutory permit by notification, permit by rule, permit by notification, routine roadway registration, docking structure registration, or conditional authorization by rule)*, coordination with NH Fish & Game may still be required under the rules governing those specific permitting processes, and it is recommended you contact the applicable permitting agency. For projects not requiring consultation under Fis 1004, but where additional coordination with NH Fish and Game is requested, please email: Kim Tuttle *kim.tuttle@wildlife.nh.gov* with a copy to NHFGreview@wildlife.nh.gov, and include the NHB Datacheck results letter number and "review request" in the email subject line.

Contact NH Fish & Game at (603) 271-0467 with questions.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

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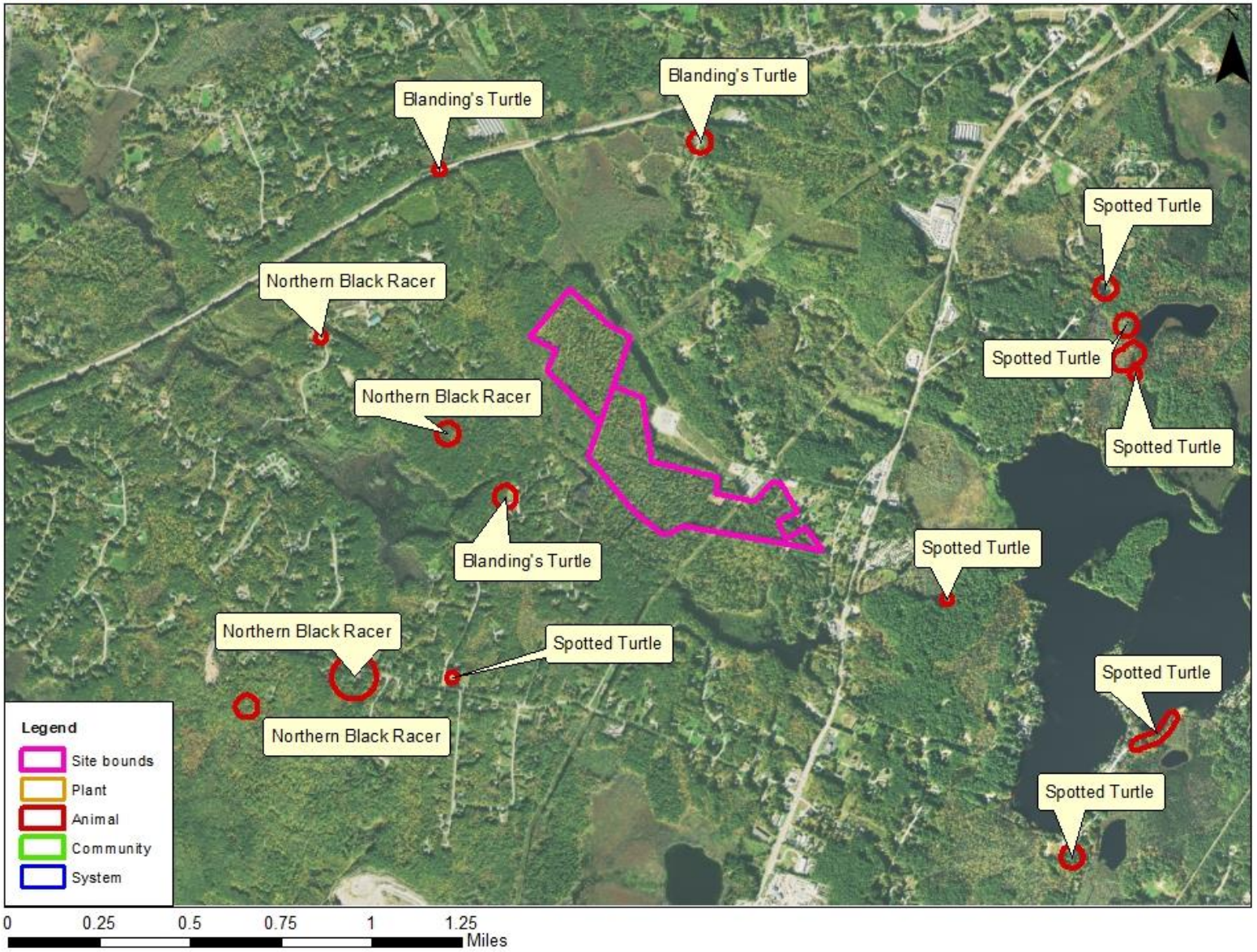
172 Pembroke Rd.
Concord, NH 03301

CONFIDENTIAL – NH Dept. of Environmental Services review

NHB22-3062



New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 2014: Area 13928: 1 adult observed, sex unknown.
General Area: 2014: Area 13928: Roadside. Shrub wetland with sunny, sandy banks on either side of the road.
General Comments: --
Management Comments: --

Location

Survey Site Name: Colby Brook
Managed By:

County: Rockingham
Town(s): Danville
Size: .4 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2014: Area 13928: Route 111, about 1 mile east of junction with Route 111A , Danville (42.90604, -71.10044).

Dates documented

First reported:	2014-07-21	Last reported:	2014-07-21

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 2010: Area 12835: 1 juvenile female observed, dead on road.
General Area: 2010: Area 12835: Roadside in mixed forest.
General Comments: --
Management Comments: --

Location

Survey Site Name: Colby Brook
Managed By:

County: Rockingham
Town(s): Kingston
Size: 1.9 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2010: Area 12835: 60 Mill Road, Kingston.

Dates documented

First reported: 2010-07-23 Last reported: 2010-07-23

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 2021: Area 14857: 1 adult female observed, laying eggs in compost pile.
General Area: 2021: Area 14857: Compost pile in residential yard near Colby Brook. Houses surrounded by wetlands and woods.
General Comments: --
Management Comments: --

Location

Survey Site Name: Colby Brook
Managed By:

County: Rockingham
Town(s): Kingston
Size: 1.9 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2021: Area 14857: 2 Beaver Pond Road, Kingston.

Dates documented

First reported: 2021-06-05 Last reported: 2021-06-05

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Northern Black Racer (*Coluber constrictor constrictor*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 2020: Area 14796: 1 adult observed, sex unknown. 2015: Area 14022: 1 adult observed, sex unknown.
General Area: 2020: Area 14796: Town forest with hiking trails. 2015: Area 14022: Roadside in cul-de-sac. Snake went into the woods to north towards horse farm.
General Comments: --
Management Comments: --

Location

Survey Site Name: Colby Brook
Managed By:

County: Rockingham
Town(s): Kingston
Size: 2.4 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2020: Area 14796: Along the White Trail in Frye Town Forest, Kingston. 2015: Area 14022: 38 Creek Hill Drive, Danville.

Dates documented

First reported: 2015-06-08 Last reported: 2020-07-20

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Northern Black Racer (*Coluber constrictor constrictor*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank: --

Detailed Description: 2017: Area 14372: 1 adult observed, sex unknown. Area 14374M: 1 adult observed, sex unknown on 8/26. 1 adult observed, sex unknown on 8/31.
General Area: 2017: Area 14372: Residential yard. Area 14374: Forest.
General Comments: --
Management Comments: --

Location

Survey Site Name: Colby Brook, south of
Managed By:

County: Rockingham
Town(s): Kingston
Size: 9.6 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2017: Area 14372: 66 Hunt Road, Kingston. Area 14374M: Hunt Road Town Forest.

Dates documented

First reported: 2017-06-24 Last reported: 2017-08-31

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Spotted Turtle (*Clemmys guttata*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank:	Fair quality, condition and/or landscape context ('C' on a scale of A-D).
Comments on Rank:	--
Detailed Description:	2015: Area 11751M: 1 adult female observed. Area 14090: 1 adult female observed. 2008: Area 11554: 1 adult female seen. Turtle was nesting. 2007: Area 11751M: 1 female seen. One hatchling emerged in fall from nest. Nest was partially dug up by observer later in fall when another hatchling was observed partially emerged from shell.
General Area:	2015: Area 11751M: Residential yard, in between driveway and pool fence. Area 14090: Residential yard, on the edge of the treeline. There is a small marshy area toward the back of the property, with cattails, sedges, and rushes. 2008: Area 11554: In yard at residence. 2007: Area 11751M: Yard at residence.
General Comments:	--
Management Comments:	--

Location

Survey Site Name:	Colby Brook, south of		
Managed By:			
County:	Rockingham		
Town(s):	Hampstead		
Size:	8.6 acres	Elevation:	

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2015: Area 14090: 1 Colby Road, Kingston. 2008: Area 11554: 3 Sean Drive, Hampstead. 2007: Area 11751M: 3 Sean Drive, Hampstead.

Dates documented

First reported:	2007-06-20	Last reported:	2015-06-25

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Spotted Turtle (*Clemmys guttata*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Demonstrably widespread, abundant, and secure
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank:	Fair quality, condition and/or landscape context ('C' on a scale of A-D).
Comments on Rank:	--
Detailed Description:	2019: 2019 Survey area: 1 female captured during trap survey. Area 14608: 1 adult observed, sex unknown. 2018: Area 14472: 2 individuals observed, sex unknown. 2017: Area 12739M: 1 adult observed, sex unknown. 2015: Area 14007: 1 adult observed, sex unknown. 2014: Area 13641M: 1 adult observed, sex unknown, on 6/7. 1 adult observed, sex unknown, on 8/24. Area 13680: 1 adult observed, sex unknown. 2012: Area 12739M: 1 adult and 2 juveniles observed. 2011: Area 12739M: 1 adult observed. Area 13103: 1 adult observed. 2010: Area 12739M: 1 adult observed. 1991: Area 6601: Seen.
General Area:	2019: Area 14608: Roadside. 2018: Area 14472: Basking on a log in small pond. 2014: Area 13641M: Forested wetland. Area 13680: Shrub wetland. 2011: Area 12739M: Cedar swamp and brushy marsh. Area 13103: Dirt road adjacent to stream. 1991: Area 6601: Pond.
General Comments:	1991: Area 6601: Student told James Taylor.
Management Comments:	--

Location

Survey Site Name:	Country Pond
Managed By:	Webster Wildlife + Natural Area
County:	Rockingham
Town(s):	Kingston
Size:	13.4 acres
Elevation:	
Precision:	Within (but not necessarily restricted to) the area indicated on the map.
Directions:	2019: Area 14608: Country Pond Road, Newton. 2018: Area 14472: Webster Wildlife and Natural Area. 2014: Area 13641M: Webster Wildlife and Natural Area. Area 13680: [Heath Street, Newton, near BandM railroad]. 2011: Area 13103: [Green Road north of Cedar Swamp Pond]. 2010: Area 12739M: Webster Wildlife and Natural Area. 1991: Area 6601: Ridge Road near Country Pond.

Dates documented

First reported:	1991	Last reported:	2019-06-04

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

United States Department of Agriculture

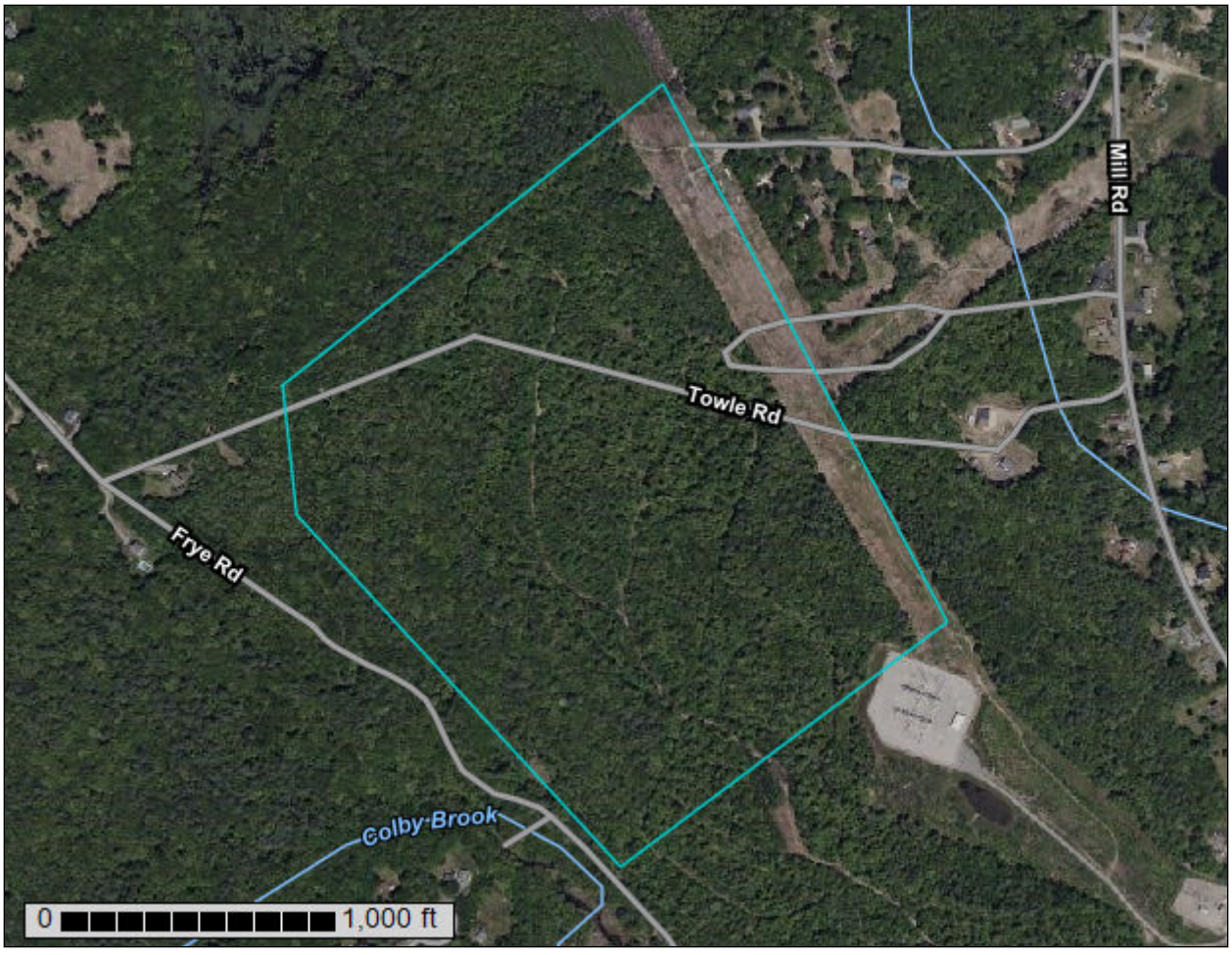
NRCS

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 Rockingham County, New Hampshire

Unitil Kingston Solar Project



May 11, 2023

Preface

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

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

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

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

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

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

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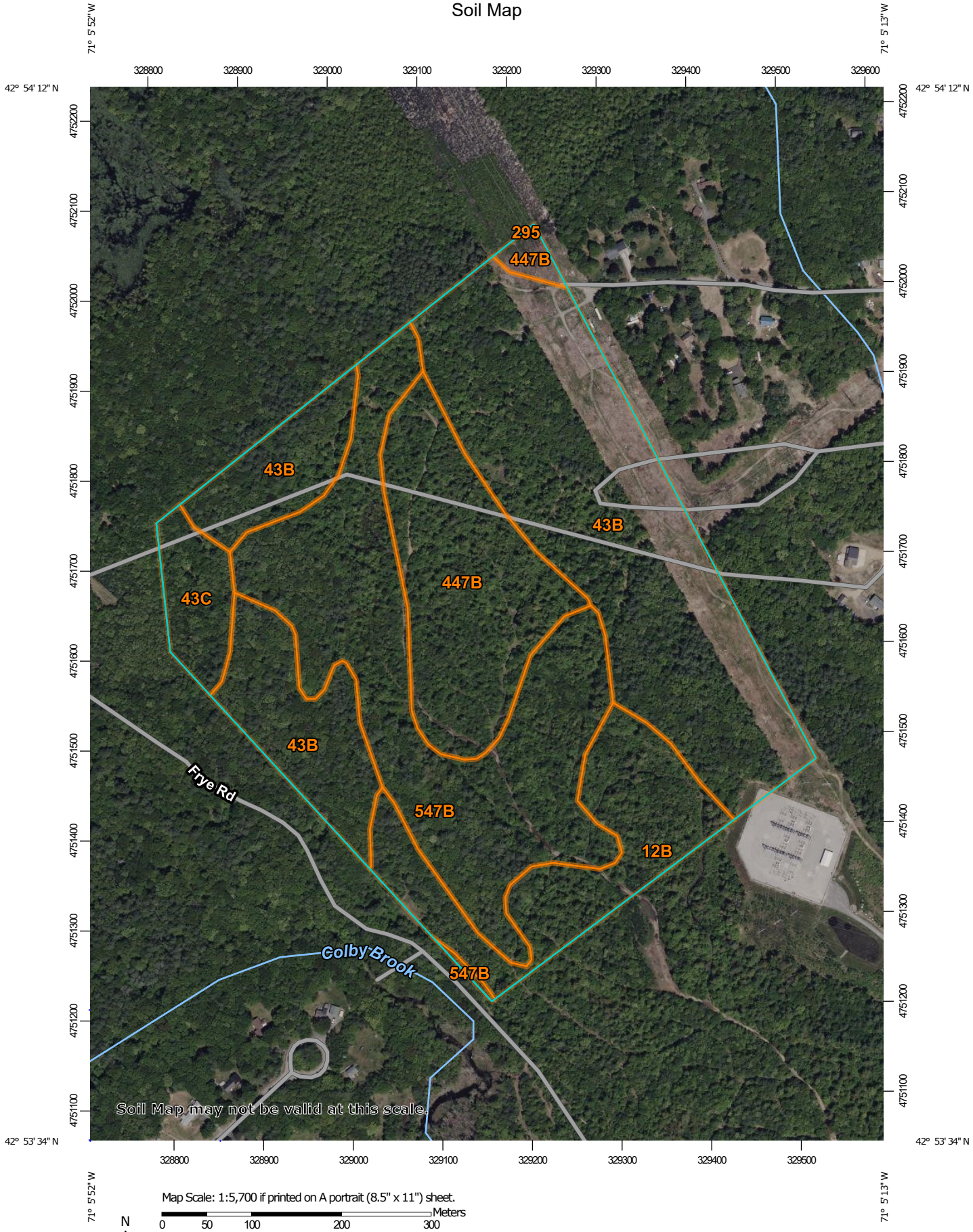
Contents

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:5,700 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 25, Sep 12, 2022

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12B	Hinckley loamy sand, 3 to 8 percent slopes	10.1	11.7%
43B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	36.7	42.7%
43C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	3.1	3.6%
295	Freetown mucky peat, 0 to 2 percent slopes	0.0	0.0%
447B	Scituate-Newfields complex, 3 to 8 percent slopes, very stony	13.2	15.3%
547B	Walpole very fine sandy loam, 3 to 8 percent slopes, very stony	23.0	26.7%
Totals for Area of Interest		**86.0**	**100.0%**

Map Unit Descriptions

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

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

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

components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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

Rockingham County, New Hampshire

12B—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svm8
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 53 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Hinckley

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

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

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

Minor Components

Windsor
Percent of map unit: 8 percent
Landform: Outwash deltas, outwash terraces, moraines, kames, outwash plains, kame terraces, eskers
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

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

Agawam
Percent of map unit: 2 percent
Landform: Outwash deltas, outwash terraces, moraines, kames, outwash plains, kame terraces, eskers
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, riser, tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

43B—Canton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting
National map unit symbol: 2w81l
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: Farmland of local importance

Map Unit Composition
Canton, very stony, and similar soils: 80 percent
Minor components: 20 percent

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

Description of Canton, Very Stony

Setting

Landform: Hills, ridges, moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
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
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate, very stony

Percent of map unit: 9 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, very stony

Percent of map unit: 5 percent
Landform: Recessionial moraines, hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope

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

Gloucester, very stony

Percent of map unit: 4 percent
Landform: Ridges, moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Bogs, swamps, marshes, kettles, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

43C—Canton fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w814
Elevation: 0 to 1,160 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

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

Description of Canton, Very Stony

Setting

Landform: Ridges, moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy 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
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Montauk, very stony

Percent of map unit: 6 percent
Landform: Recessionial moraines, hills, ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, very stony

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

Chatfield, very stony

Percent of map unit: 3 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Swamps, marshes, kettles, depressions, bogs

Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

295—Freetown mucky peat, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w68v
Elevation: 0 to 860 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

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

Description of Freetown

Setting

Landform: Marshes, kettles, swamps, depressions, bogs
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Moderately decomposed organic material

Typical profile

Oe1 - 0 to 2 inches: mucky peat
Oe2 - 2 to 79 inches: mucky peat

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 20.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 8 percent
Landform: Swamps, marshes, kettles, depressions, bogs
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Natchaug

Percent of map unit: 6 percent
Landform: Depressions, depressions, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 3 percent
Landform: Outwash deltas, outwash terraces, drainageways, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 1 percent
Landform: Hills, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

447B—Scituate-Newfields complex, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9cnr
Elevation: 0 to 1,000 feet
Mean annual precipitation: 35 to 56 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Scituate and similar soils: 50 percent
Newfields and similar soils: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scituate

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 32 inches: cobbly fine sandy loam
H3 - 32 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

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

Description of Newfields

Setting

Parent material: Till

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 35 inches: fine sandy loam
H3 - 35 to 64 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY008CT - Moist Till Uplands
Hydric soil rating: No

Minor Components

Walpole
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Ridgebury
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Canton
Percent of map unit: 5 percent
Hydric soil rating: No

Montauk
Percent of map unit: 5 percent
Hydric soil rating: No

Not named
Percent of map unit: 5 percent
Hydric soil rating: No

547B—Walpole very fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting
National map unit symbol: 9cpd
Elevation: 0 to 2,100 feet
Mean annual precipitation: 28 to 48 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 195 days
Farmland classification: Not prime farmland

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

Description of Walpole

Setting
Landform: Depressions

Typical profile
H1 - 0 to 7 inches: very fine sandy loam
H2 - 7 to 16 inches: sandy loam
H3 - 16 to 60 inches: gravelly loamy sand

Properties and qualities
Slope: 3 to 8 percent

Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A/D
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 10 percent
Landform: Depressions
Hydric soil rating: Yes

Newfields

Percent of map unit: 5 percent
Hydric soil rating: No

Squamscott

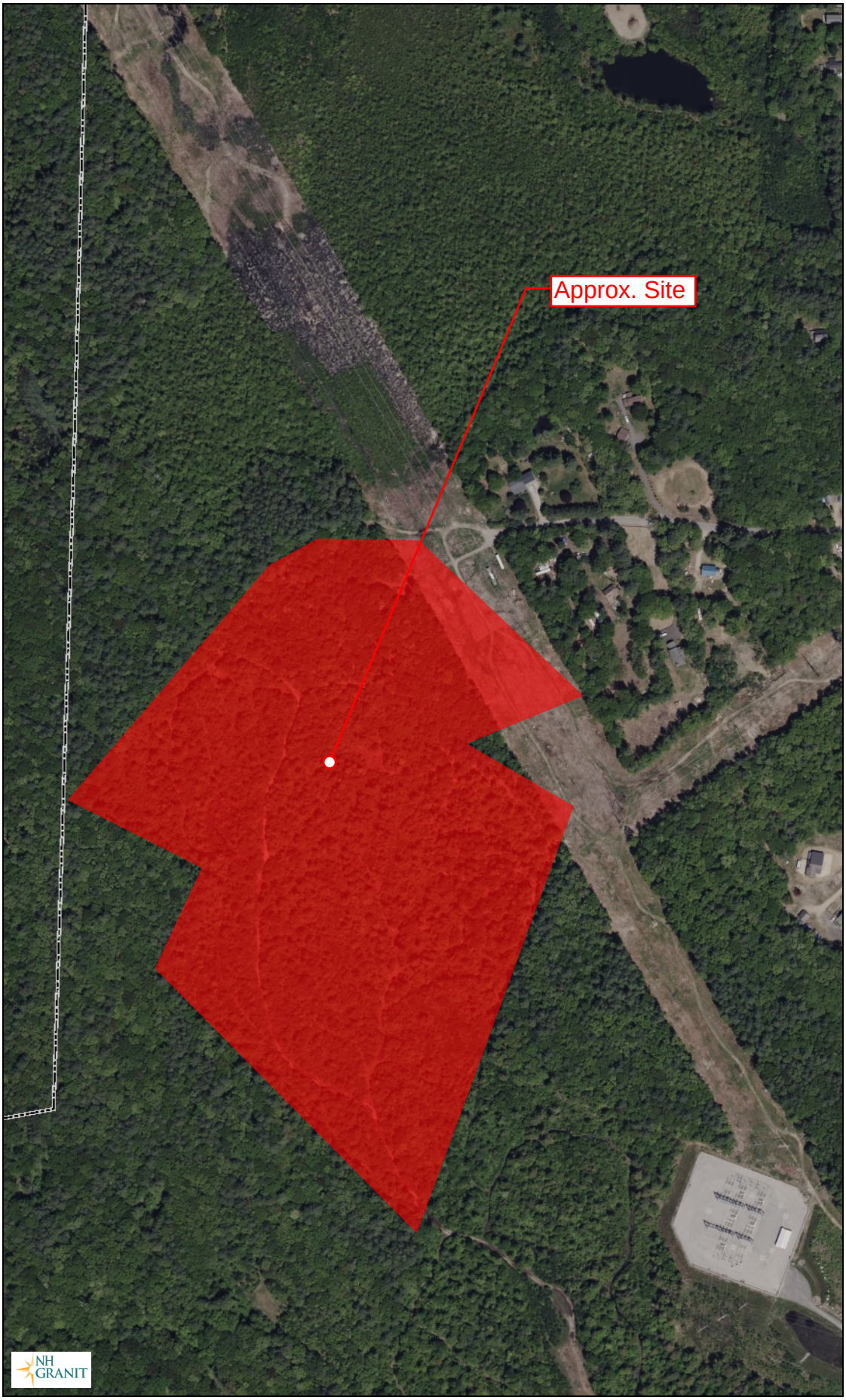
Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

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

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

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

Aerial Map



Legend

- State
- County
- City/Town

Map Scale

1: 5,000

Map Generated: 5/15/2023

Notes

Aerial Map
TFM Project No. 20025-00

National Flood Hazard Layer FIRMette

FEMA

71°5'56"W 42°54'8"N

71°5'18"W 42°53'41"N

Feet 1:6,000

0 250 500 1,000 1,500 2,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/15/2023 at 3:06 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Scientists

Project Title: Unitil Kingston Solar Project (20025-00)	
PHOTO LOG	
Photo #	NH DHR Inventory # and/or Locational Information
1	An image of the class VI Towel Road extension facing north
2	Image captures Towel Road and a rock wall facing northeast
3	Image captures the intersection between Towel Road and the access road facing southwest
4	The image captures Towle Road, facing southwest
5	The image captures the part of the northern wetland, facing north
6	The photograph captures the site around the center wetland, facing north
7	The image captures the part of the southern wetland, facing south
8	The image captures the southeastern wetland, facing northwest
9	The image captures the western wetland, facing northwest
10	The image captures the sightline of Towle Road and Mill Road Intersection, facing north
11	The image captures the sightline of Towle Road and Mill Road Intersection, facing south
12	The image captures the access into Towle Road, facing south

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Unitil Kingston Solar Project – Site Photographs

Photo 1

An image of the class VI Towel Road extension facing north (9/28/2022).

Photo 2

Image captures Towel Road and a rock wall facing northeast (9/28/2022).

Photo 3

Image captures the intersection between Towel Road and the access road facing southwest (9/28/2022).

Photo 4

The image captures Towle Road, facing southwest (9/28/2022).

Photo 5

The image captures the part of the northern wetland, facing north (1/3/2023).

Photo 6

The photograph captures the site around the center wetland, facing north (1/3/2023).

Photo 7

The image captures the part of the southern wetland, facing south (1/3/2023).

Photo 8

The image captures the southeastern wetland, facing northwest (1/3/2023).

Photo 9

The image captures the western wetland, facing northwest (1/11/2023).

Photo 10

The image captures the sightline of Towle Road and Mill Road Intersection, facing north (5/19/2023).

Photo 11

The image captures the sightline of Towle Road and Mill Road Intersection, facing south (5/19/2023).

Photo 12

The image captures the access into Towle Road, facing south (5/19/2023).

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Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point	
Smoothing	Yes
State	
Location	
Latitude	42.901 degrees North
Longitude	71.091 degrees West
Elevation	50 feet
Date/Time	Tue Jun 06 2023 10:04:24 GMT-0400 (Eastern Daylight Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.27	0.41	0.51	0.66	0.83	1.05	**1yr**	0.71	0.99	1.22	1.57	2.02	2.62	2.82	**1yr**	2.32	2.71	3.13	3.81	4.44	**1yr**
2yr	0.33	0.50	0.62	0.82	1.03	1.31	**2yr**	0.89	1.19	1.52	1.93	2.46	3.14	3.48	**2yr**	2.78	3.34	3.86	4.57	5.22	**2yr**
5yr	0.38	0.59	0.75	1.00	1.28	1.64	**5yr**	1.10	1.49	1.92	2.44	3.12	3.99	4.47	**5yr**	3.53	4.30	4.93	5.85	6.61	**5yr**
10yr	0.43	0.67	0.85	1.15	1.50	1.94	**10yr**	1.30	1.76	2.28	2.93	3.75	4.79	5.41	**10yr**	4.24	5.20	5.92	7.06	7.91	**10yr**
25yr	0.50	0.80	1.02	1.40	1.86	2.44	**25yr**	1.61	2.20	2.88	3.71	4.77	6.10	6.96	**25yr**	5.40	6.69	7.56	9.05	10.03	**25yr**
50yr	0.57	0.91	1.17	1.63	2.19	2.90	**50yr**	1.89	2.61	3.43	4.45	5.72	7.32	8.43	**50yr**	6.48	8.10	9.09	10.94	12.02	**50yr**
100yr	0.64	1.04	1.34	1.90	2.59	3.45	**100yr**	2.23	3.09	4.11	5.34	6.88	8.80	10.21	**100yr**	7.79	9.82	10.94	13.22	14.41	**100yr**
200yr	0.73	1.20	1.55	2.21	3.05	4.10	**200yr**	2.63	3.67	4.90	6.39	8.25	10.58	12.37	**200yr**	9.36	11.90	13.17	15.99	17.28	**200yr**
500yr	0.87	1.43	1.87	2.71	3.80	5.16	**500yr**	3.28	4.60	6.19	8.11	10.51	13.51	15.95	**500yr**	11.95	15.34	16.84	20.59	22.00	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.88	**1yr**	0.64	0.86	1.02	1.28	1.56	2.28	2.60	**1yr**	2.02	2.50	2.91	3.55	4.00	**1yr**
2yr	0.32	0.49	0.60	0.81	1.00	1.19	**2yr**	0.87	1.16	1.36	1.80	2.30	3.04	3.35	**2yr**	2.69	3.22	3.74	4.40	5.03	**2yr**
5yr	0.36	0.56	0.69	0.95	1.20	1.42	**5yr**	1.04	1.39	1.61	2.09	2.69	3.66	4.06	**5yr**	3.24	3.90	4.50	5.48	6.05	**5yr**
10yr	0.40	0.62	0.76	1.07	1.38	1.63	**10yr**	1.19	1.60	1.82	2.36	3.01	4.19	4.67	**10yr**	3.71	4.49	5.17	6.43	6.90	**10yr**
25yr	0.46	0.70	0.88	1.25	1.65	1.95	**25yr**	1.42	1.91	2.13	2.74	3.51	4.98	5.62	**25yr**	4.41	5.41	6.24	7.92	8.73	**25yr**
50yr	0.51	0.78	0.97	1.40	1.88	2.24	**50yr**	1.63	2.19	2.40	3.07	3.93	5.67	6.44	**50yr**	5.02	6.20	7.17	9.30	10.10	**50yr**
100yr	0.58	0.88	1.10	1.58	2.17	2.56	**100yr**	1.88	2.51	2.70	3.44	4.40	6.40	7.37	**100yr**	5.67	7.09	8.27	10.92	11.68	**100yr**
200yr	0.65	0.98	1.24	1.79	2.50	2.93	**200yr**	2.16	2.87	3.03	3.85	4.94	7.25	9.59	**200yr**	6.42	9.22	9.54	12.84	13.52	**200yr**
500yr	0.76	1.13	1.46	2.12	3.02	3.52	**500yr**	2.60	3.44	3.54	4.46	5.76	8.52	11.81	**500yr**	7.54	11.36	11.53	15.94	16.39	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.55	0.74	0.90	1.08	**1yr**	0.78	1.06	1.26	1.67	2.11	2.87	3.15	**1yr**	2.54	3.03	3.44	4.05	4.83	**1yr**
2yr	0.34	0.52	0.64	0.86	1.07	1.27	**2yr**	0.92	1.24	1.47	1.92	2.45	3.29	3.64	**2yr**	2.91	3.50	4.03	4.77	5.49	**2yr**
5yr	0.41	0.63	0.79	1.08	1.37	1.63	**5yr**	1.19	1.60	1.88	2.45	3.12	4.33	4.93	**5yr**	3.83	4.74	5.41	6.24	7.19	**5yr**
10yr	0.49	0.76	0.94	1.31	1.69	1.99	**10yr**	1.46	1.95	2.28	2.96	3.74	5.39	6.22	**10yr**	4.77	5.98	6.77	7.73	8.95	**10yr**
25yr	0.62	0.95	1.18	1.68	2.21	2.60	**25yr**	1.91	2.54	2.96	3.82	4.77	7.20	8.49	**25yr**	6.37	8.17	9.11	10.29	11.31	**25yr**
50yr	0.74	1.12	1.40	2.01	2.70	3.18	**50yr**	2.33	3.11	3.61	4.63	5.74	8.97	10.77	**50yr**	7.94	10.36	11.41	12.78	13.89	**50yr**
100yr	0.88	1.33	1.67	2.42	3.31	3.88	**100yr**	2.86	3.79	4.40	5.62	6.92	11.26	13.65	**100yr**	9.97	13.12	14.28	15.88	17.11	**100yr**
200yr	1.05	1.58	2.01	2.90	4.05	4.75	**200yr**	3.49	4.64	5.39	6.83	8.34	14.08	15.52	**200yr**	12.46	14.92	17.88	19.72	21.08	**200yr**
500yr	1.33	1.99	2.56	3.71	5.28	6.19	**500yr**	4.56	6.05	7.02	8.84	10.69	18.92	20.82	**500yr**	16.75	20.02	24.07	26.28	27.82	**500yr**

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Northeast Regional Climate Center

PART 3

GROUNDWATER RECHARGE VOLULME (GRV) CALCULATION (Env-Wq 1507.04)

-	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
0.03	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
0.19	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
-	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.12	inches	Rd = Weighted groundwater recharge depth	
0.0265	ac-in	GRV = AI * Rd	
96	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

Bio-Retention Area = 49,865 cf

Calculated by J. Belanger, PE 7/6/2023

Revised by J. Belanger, PE 9/1/2023

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.07)

Type/Node Name: **BIO-RETENTION AREA #1 (BIO#1)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

YES		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
19.80	ac	A = Area draining to the practice	
0.04	ac	A_I = Impervious area draining to the practice	
0.00	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.05	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
1.03	ac-in	WQV= 1" x Rv x A	
3,722	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
931	cf	25% x WQV (check calc for sediment forebay volume)	
2,792	cf	75% x WQV (check calc for surface sand filter volume)	
FOREBAY		Method of Pretreatment? (not required for clean or roof runoff)	
6,135	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	≥ 25%WQV
Calculate time to drain if system IS NOT underdrained:			
23,384	sf	A_{SA} = Surface area of the practice	
1.70	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
1.1	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	≤ 72-hrs
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	≤ 72-hrs
166.50	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
163.66	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
166.50	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	≥ 1'
166.50	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	≥ 1'
2.84	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	≥ 1'
170.15	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
170.50	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	← yes
If a surface sand filter or underground sand filter is proposed:			
NO	ac	Drainage Area check.	< 10 ac
	cf	V = Volume of storage[3] (attach a stage-storage table)	≥ 75%WQV
	inches	D_{FC} = Filter course thickness	18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:			
NO	ac	Drainage Area no larger than 5 ac?	**← yes**
49,865	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
18.0	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	**≥ 3:1**
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

ESHWT per TP #8

IT per IT #8

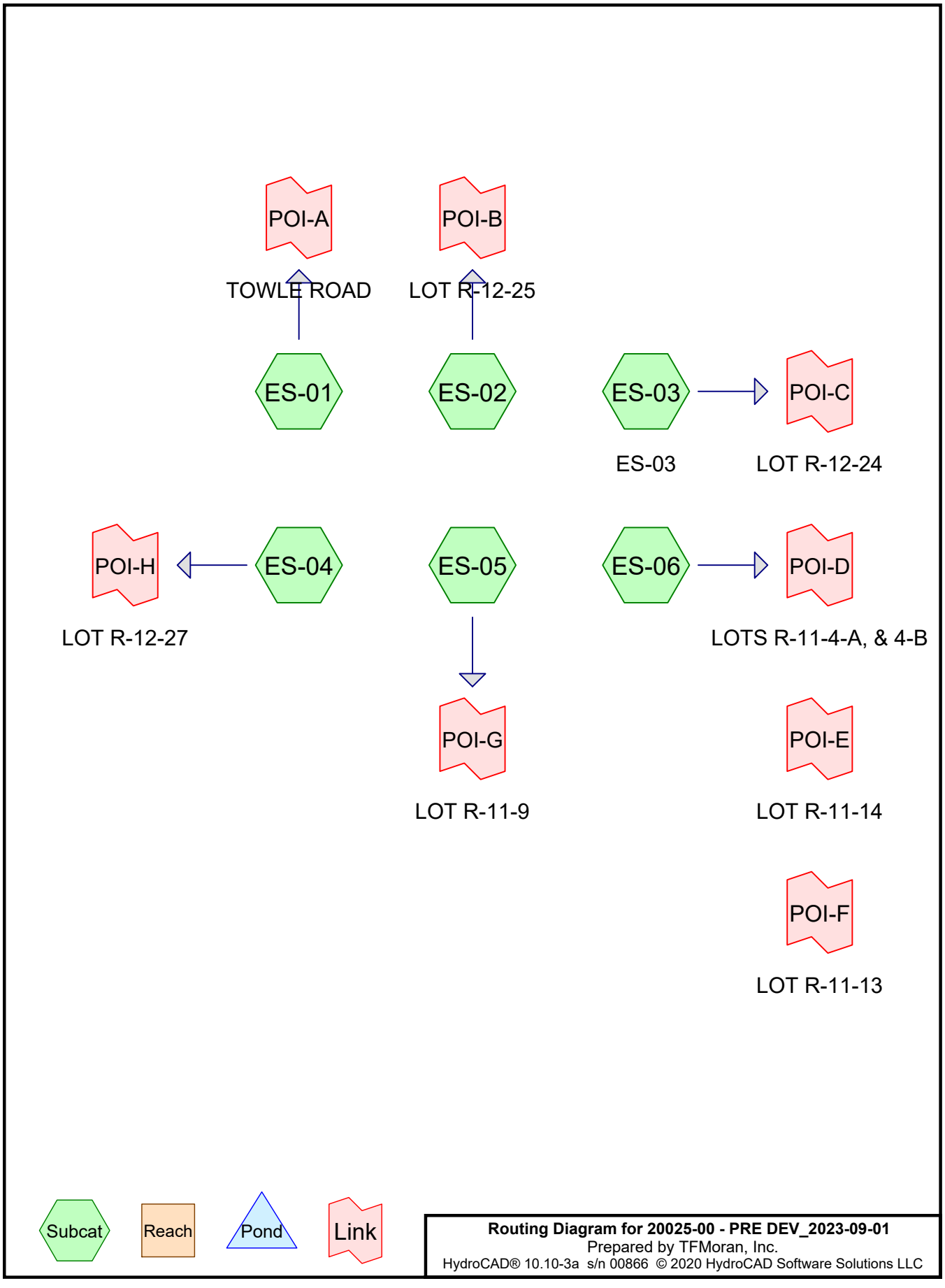
Calculated by J. Belanger, PE 7/6/2023

Revised by J. Belanger, PE 9/1/2023

Stage-Area-Storage for Pond BIO#1: BIO-RET AREA #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
166.50	23,384	0
166.55	23,384	468
166.60	23,384	935
166.65	23,384	1,403
166.70	23,384	1,871
166.75	23,384	2,338
166.80	23,384	2,806
166.85	23,384	3,274
166.90	23,384	3,741
166.95	23,384	4,209
167.00	23,384	4,677
167.05	23,384	5,144
167.10	23,384	5,612
167.15	23,384	6,080
167.20	23,384	6,548
167.25	23,384	7,015
167.30	23,384	8,184
167.35	23,384	9,354
167.40	23,384	10,523
167.45	23,384	11,692
167.50	23,384	12,861
167.55	23,384	14,030
167.60	23,384	15,200
167.65	23,384	16,369
167.70	23,384	17,538
167.75	23,384	18,707
167.80	23,384	19,876
167.85	23,384	21,046
167.90	23,384	22,215
167.95	23,384	23,384
168.00	23,384	24,553
168.05	23,577	25,727
168.10	23,769	26,911
168.15	23,962	28,104
168.20	24,155	29,307
168.25	24,348	30,520
168.30	24,541	31,742
168.35	24,733	32,974
168.40	24,926	34,215
168.45	25,119	35,466
168.50	25,312	36,727
168.55	25,504	37,997
168.60	25,697	39,277
168.65	25,890	40,567
168.70	26,082	41,866
168.75	26,275	43,175
168.80	26,468	44,494
168.85	26,661	45,822
168.90	26,854	47,160
168.95	27,046	48,508
169.00	27,239	49,865
169.05	33,846	51,517
169.10	34,208	53,218
169.15	34,570	54,938
169.20	34,932	56,675
169.25	35,294	58,431
169.30	35,656	60,205
169.35	36,018	61,996
169.40	36,380	63,806
169.45	36,741	65,634
169.50	37,103	67,480
169.55	37,465	69,345
169.60	37,827	71,227
169.65	38,189	73,127
169.70	38,551	75,046
169.75	38,913	76,982
169.80	39,275	78,937
169.85	39,636	80,910
169.90	39,998	82,901
169.95	40,360	84,910
170.00	40,722	86,937
170.05	81,099	89,982
170.10	121,475	95,047
170.15	161,852	102,130
170.20	202,229	111,232
170.25	242,606	122,353
170.30	282,982	135,492
170.35	323,359	150,651
170.40	363,736	167,828
170.45	404,112	187,025
170.50	**444,489**	**208,240**

PART 4



Routing Diagram for 20025-00 - PRE DEV_2023-09-01
Prepared by TFMoran, Inc.

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.380	96	Gravel surface, HSG C (ES-01, ES-04, ES-05)
12.658	55	Woods, Good, HSG B (ES-01, ES-02, ES-03, ES-04, ES-05, ES-06)
22.319	70	Woods, Good, HSG C (ES-01, ES-04, ES-05)
0.638	77	Woods, Good, HSG D (ES-04)
0.622	58	Woods/grass comb., Good, HSG B (ES-02, ES-03, ES-06)
36.617	**65**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
13.280	HSG B	ES-01, ES-02, ES-03, ES-04, ES-05, ES-06
22.700	HSG C	ES-01, ES-04, ES-05
0.638	HSG D	ES-04
0.000	Other	
36.617		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES-01: Runoff Area=167,420 sf 0.00% Impervious Runoff Depth>0.38"
Flow Length=594' Tc=31.0 min CN=60 Runoff=0.6 cfs 0.1 af

Subcatchment ES-02: Runoff Area=61,827 sf 0.00% Impervious Runoff Depth>0.23"
Flow Length=147' Tc=15.6 min CN=55 Runoff=0.1 cfs 0.0 af

Subcatchment ES-03: ES-03 Runoff Area=46,937 sf 0.00% Impervious Runoff Depth>0.26"
Flow Length=259' Tc=27.2 min CN=56 Runoff=0.1 cfs 0.0 af

Subcatchment ES-04: Runoff Area=704,555 sf 0.00% Impervious Runoff Depth>0.65"
Flow Length=805' Tc=27.7 min CN=67 Runoff=6.0 cfs 0.9 af

Subcatchment ES-05: Runoff Area=590,340 sf 0.00% Impervious Runoff Depth>0.60"
Flow Length=1,553' Tc=67.4 min CN=66 Runoff=2.9 cfs 0.7 af

Subcatchment ES-06: Runoff Area=23,977 sf 0.00% Impervious Runoff Depth>0.26"
Flow Length=179' Tc=22.3 min CN=56 Runoff=0.1 cfs 0.0 af

Link POI-A: TOWLE ROAD Inflow=0.6 cfs 0.1 af
Primary=0.6 cfs 0.1 af

Link POI-B: LOT R-12-25 Inflow=0.1 cfs 0.0 af
Primary=0.1 cfs 0.0 af

Link POI-C: LOT R-12-24 Inflow=0.1 cfs 0.0 af
Primary=0.1 cfs 0.0 af

Link POI-D: LOTS R-11-4-A, & 4-B Inflow=0.1 cfs 0.0 af
Primary=0.1 cfs 0.0 af

Link POI-E: LOT R-11-14
Primary=0.0 cfs 0.0 af

Link POI-F: LOT R-11-13
Primary=0.0 cfs 0.0 af

Link POI-G: LOT R-11-9 Inflow=2.9 cfs 0.7 af
Primary=2.9 cfs 0.7 af

Link POI-H: LOT R-12-27 Inflow=6.0 cfs 0.9 af
Primary=6.0 cfs 0.9 af

Total Runoff Area = 36.617 ac Runoff Volume = 1.7 af Average Runoff Depth = 0.57"
100.00% Pervious = 36.617 ac 0.00% Impervious = 0.000 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES-01: Runoff Area=167,420 sf 0.00% Impervious Runoff Depth>1.17"
Flow Length=594' Tc=31.0 min CN=60 Runoff=2.6 cfs 0.4 af

Subcatchment ES-02: Runoff Area=61,827 sf 0.00% Impervious Runoff Depth>0.87"
Flow Length=147' Tc=15.6 min CN=55 Runoff=0.8 cfs 0.1 af

Subcatchment ES-03: ES-03 Runoff Area=46,937 sf 0.00% Impervious Runoff Depth>0.93"
Flow Length=259' Tc=27.2 min CN=56 Runoff=0.6 cfs 0.1 af

Subcatchment ES-04: Runoff Area=704,555 sf 0.00% Impervious Runoff Depth>1.65"
Flow Length=805' Tc=27.7 min CN=67 Runoff=17.6 cfs 2.2 af

Subcatchment ES-05: Runoff Area=590,340 sf 0.00% Impervious Runoff Depth>1.56"
Flow Length=1,553' Tc=67.4 min CN=66 Runoff=8.7 cfs 1.8 af

Subcatchment ES-06: Runoff Area=23,977 sf 0.00% Impervious Runoff Depth>0.93"
Flow Length=179' Tc=22.3 min CN=56 Runoff=0.3 cfs 0.0 af

Link POI-A: TOWLE ROAD Inflow=2.6 cfs 0.4 af
Primary=2.6 cfs 0.4 af

Link POI-B: LOT R-12-25 Inflow=0.8 cfs 0.1 af
Primary=0.8 cfs 0.1 af

Link POI-C: LOT R-12-24 Inflow=0.6 cfs 0.1 af
Primary=0.6 cfs 0.1 af

Link POI-D: LOTS R-11-4-A, & 4-B Inflow=0.3 cfs 0.0 af
Primary=0.3 cfs 0.0 af

Link POI-E: LOT R-11-14
Primary=0.0 cfs 0.0 af

Link POI-F: LOT R-11-13
Primary=0.0 cfs 0.0 af

Link POI-G: LOT R-11-9 Inflow=8.7 cfs 1.8 af
Primary=8.7 cfs 1.8 af

Link POI-H: LOT R-12-27 Inflow=17.6 cfs 2.2 af
Primary=17.6 cfs 2.2 af

Total Runoff Area = 36.617 ac Runoff Volume = 4.6 af Average Runoff Depth = 1.50"
100.00% Pervious = 36.617 ac 0.00% Impervious = 0.000 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES-01: Runoff Area=167,420 sf 0.00% Impervious Runoff Depth>2.81"
Flow Length=594' Tc=31.0 min CN=60 Runoff=6.9 cfs 0.9 af

Subcatchment ES-02: Runoff Area=61,827 sf 0.00% Impervious Runoff Depth>2.32"
Flow Length=147' Tc=15.6 min CN=55 Runoff=2.7 cfs 0.3 af

Subcatchment ES-03: ES-03 Runoff Area=46,937 sf 0.00% Impervious Runoff Depth>2.41"
Flow Length=259' Tc=27.2 min CN=56 Runoff=1.7 cfs 0.2 af

Subcatchment ES-04: Runoff Area=704,555 sf 0.00% Impervious Runoff Depth>3.54"
Flow Length=805' Tc=27.7 min CN=67 Runoff=39.3 cfs 4.8 af

Subcatchment ES-05: Runoff Area=590,340 sf 0.00% Impervious Runoff Depth>3.40"
Flow Length=1,553' Tc=67.4 min CN=66 Runoff=20.0 cfs 3.8 af

Subcatchment ES-06: Runoff Area=23,977 sf 0.00% Impervious Runoff Depth>2.42"
Flow Length=179' Tc=22.3 min CN=56 Runoff=1.0 cfs 0.1 af

Link POI-A: TOWLE ROAD Inflow=6.9 cfs 0.9 af
Primary=6.9 cfs 0.9 af

Link POI-B: LOT R-12-25 Inflow=2.7 cfs 0.3 af
Primary=2.7 cfs 0.3 af

Link POI-C: LOT R-12-24 Inflow=1.7 cfs 0.2 af
Primary=1.7 cfs 0.2 af

Link POI-D: LOTS R-11-4-A, & 4-B Inflow=1.0 cfs 0.1 af
Primary=1.0 cfs 0.1 af

Link POI-E: LOT R-11-14
Primary=0.0 cfs 0.0 af

Link POI-F: LOT R-11-13
Primary=0.0 cfs 0.0 af

Link POI-G: LOT R-11-9 Inflow=20.0 cfs 3.8 af
Primary=20.0 cfs 3.8 af

Link POI-H: LOT R-12-27 Inflow=39.3 cfs 4.8 af
Primary=39.3 cfs 4.8 af

Total Runoff Area = 36.617 ac Runoff Volume = 10.1 af Average Runoff Depth = 3.32"
100.00% Pervious = 36.617 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment ES-01:

Runoff = 2.6 cfs @ 12.50 hrs, Volume= 0.4 af, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
108,870	55	Woods, Good, HSG B
58,008	70	Woods, Good, HSG C
542	96	Gravel surface, HSG C
167,420	60	Weighted Average
167,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	100	0.0200	0.08		**Sheet Flow, 1A** Woods: Light underbrush n= 0.400 P2= 3.14"
5.2	219	0.0200	0.71		**Shallow Concentrated Flow, 1B** Woodland Kv= 5.0 fps
3.2	195	0.0400	1.00		**Shallow Concentrated Flow, 1C** Woodland Kv= 5.0 fps
0.8	80	0.1000	1.58		**Shallow Concentrated Flow, 1D** Woodland Kv= 5.0 fps
31.0	594	Total			

Summary for Subcatchment ES-02:

Runoff = 0.8 cfs @ 12.27 hrs, Volume= 0.1 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
7,561	58	Woods/grass comb., Good, HSG B
54,266	55	Woods, Good, HSG B
61,827	55	Weighted Average
61,827		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0	100	0.0500	0.11		**Sheet Flow, 2A** Woods: Light underbrush n= 0.400 P2= 3.14"
0.6	47	0.0800	1.41		**Shallow Concentrated Flow, 2B** Woodland Kv= 5.0 fps
15.6	147	Total			

Summary for Subcatchment ES-03: ES-03

Runoff = 0.6 cfs @ 12.46 hrs, Volume= 0.1 af, Depth> 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
11,967	58	Woods/grass comb., Good, HSG B
34,970	55	Woods, Good, HSG B
46,937	56	Weighted Average
46,937		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	35	0.0100	0.05		**Sheet Flow, 3A** Woods: Light underbrush n= 0.400 P2= 3.14"
12.4	61	0.0300	0.08		**Sheet Flow, 3B** Woods: Light underbrush n= 0.400 P2= 3.14"
2.4	163	0.0500	1.12		**Shallow Concentrated Flow, 3C** Woodland Kv= 5.0 fps
27.2	259	Total			

Summary for Subcatchment ES-04:

Runoff = 17.6 cfs @ 12.42 hrs, Volume= 2.2 af, Depth> 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
159,244	55	Woods, Good, HSG B
15,562	96	Gravel surface, HSG C
501,978	70	Woods, Good, HSG C
27,771	77	Woods, Good, HSG D
704,555	67	Weighted Average
704,555		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	99	0.1000	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.14"
0.6	38	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	35	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	78	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	66	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	45	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	63	0.0100	0.50		**Shallow Concentrated Flow, Flow though Wetlands** Woodland Kv= 5.0 fps
3.1	94	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.2800	2.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	8	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.8	44	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	38	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.6	169	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
27.7	805	Total			

Summary for Subcatchment ES-05:

Runoff = 8.7 cfs @ 12.97 hrs, Volume= 1.8 af, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
177,624	55	Woods, Good, HSG B
465	96	Gravel surface, HSG C
412,251	70	Woods, Good, HSG C
590,340	66	Weighted Average
590,340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
25.4	86	0.0100	0.06		**Sheet Flow, 5A** Woods: Light underbrush n= 0.400 P2= 3.14"
2.2	198	0.0900	1.50		**Shallow Concentrated Flow, 5B** Woodland Kv= 5.0 fps
0.6	41	0.0500	1.12		**Shallow Concentrated Flow, 5C** Woodland Kv= 5.0 fps
2.3	98	0.0200	0.71		**Shallow Concentrated Flow, 5D** Woodland Kv= 5.0 fps
4.6	137	0.0100	0.50		**Shallow Concentrated Flow, 5E** Woodland Kv= 5.0 fps
1.9	81	0.0200	0.71		**Shallow Concentrated Flow, 5F** Woodland Kv= 5.0 fps
26.8	804	0.0100	0.50		**Shallow Concentrated Flow, 5G** Woodland Kv= 5.0 fps
3.6	108	0.0100	0.50		**Shallow Concentrated Flow, 5H** Woodland Kv= 5.0 fps
67.4	1,553	Total			

Summary for Subcatchment ES-06:

Runoff = 0.3 cfs @ 12.38 hrs, Volume= 0.0 af, Depth> 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
7,579	58	Woods/grass comb., Good, HSG B
16,398	55	Woods, Good, HSG B
23,977	56	Weighted Average
23,977		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, 6A** Woods: Light underbrush n= 0.400 P2= 3.14"
8.7	45	0.0400	0.09		**Sheet Flow, 6B** Woods: Light underbrush n= 0.400 P2= 3.14"
1.1	84	0.0600	1.22		**Shallow Concentrated Flow, 6C** Woodland Kv= 5.0 fps
22.3	179	Total			

Summary for Link POI-A: TOWLE ROAD

Inflow Area = 3.843 ac, 0.00% Impervious, Inflow Depth > 1.17" for 10-yr event
Inflow = 2.6 cfs @ 12.50 hrs, Volume= 0.4 af
Primary = 2.6 cfs @ 12.50 hrs, Volume= 0.4 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-B: LOT R-12-25

Inflow Area = 1.419 ac, 0.00% Impervious, Inflow Depth > 0.87" for 10-yr event
Inflow = 0.8 cfs @ 12.27 hrs, Volume= 0.1 af
Primary = 0.8 cfs @ 12.27 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-C: LOT R-12-24

Inflow Area = 1.078 ac, 0.00% Impervious, Inflow Depth > 0.93" for 10-yr event
Inflow = 0.6 cfs @ 12.46 hrs, Volume= 0.1 af
Primary = 0.6 cfs @ 12.46 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-D: LOTS R-11-4-A, & 4-B

Inflow Area = 0.550 ac, 0.00% Impervious, Inflow Depth > 0.93" for 10-yr event
Inflow = 0.3 cfs @ 12.38 hrs, Volume= 0.0 af
Primary = 0.3 cfs @ 12.38 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-E: LOT R-11-14

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-F: LOT R-11-13

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-G: LOT R-11-9

Inflow Area = 13.552 ac, 0.00% Impervious, Inflow Depth > 1.56" for 10-yr event
Inflow = 8.7 cfs @ 12.97 hrs, Volume= 1.8 af
Primary = 8.7 cfs @ 12.97 hrs, Volume= 1.8 af, Atten= 0%, Lag= 0.0 min

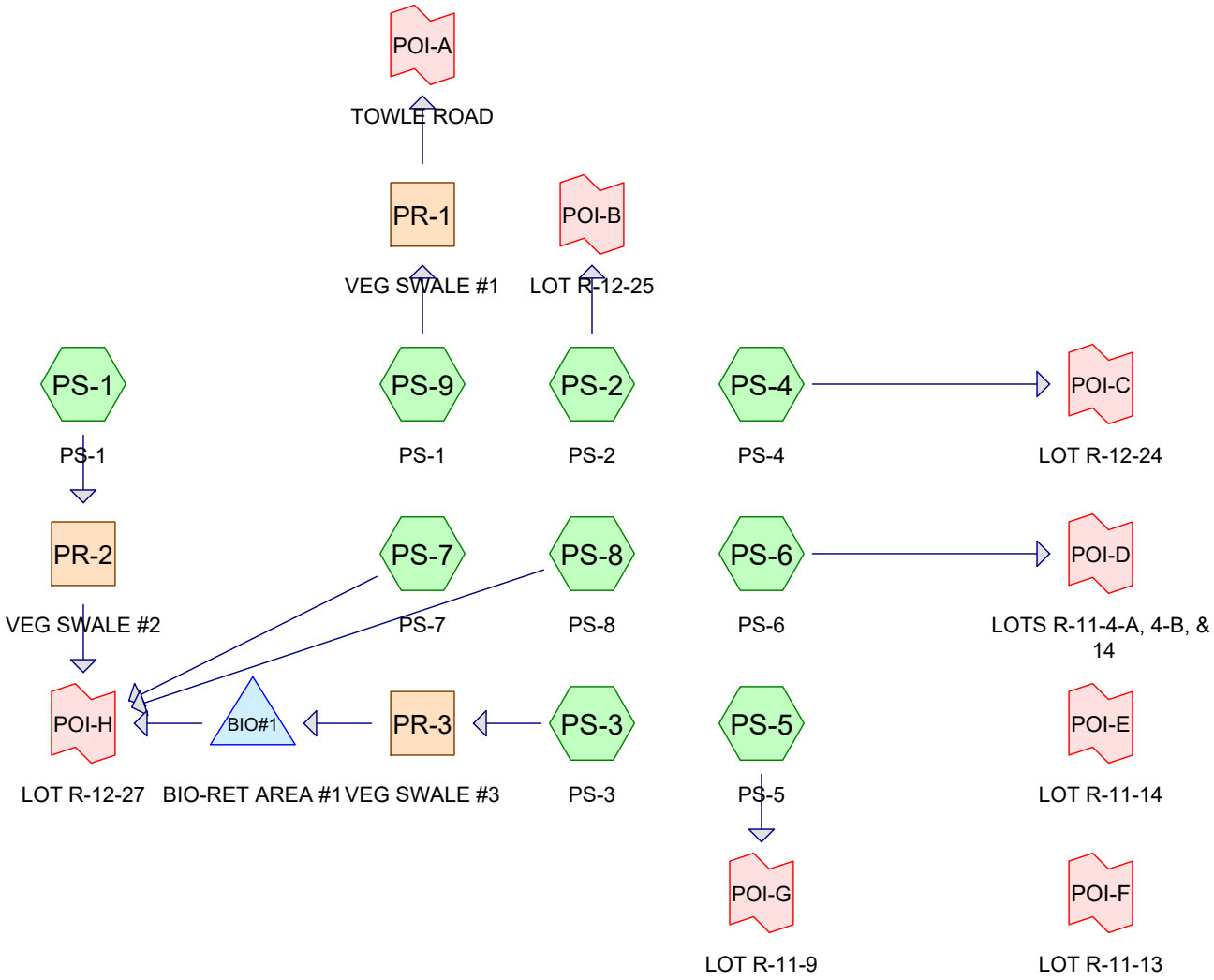
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-H: LOT R-12-27

Inflow Area = 16.174 ac, 0.00% Impervious, Inflow Depth > 1.65" for 10-yr event
Inflow = 17.6 cfs @ 12.42 hrs, Volume= 2.2 af
Primary = 17.6 cfs @ 12.42 hrs, Volume= 2.2 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

PART 5



Subcat Reach Pond Link

Routing Diagram for 20025-00 - POST DEV_2023-09-01
Prepared by TFMoran, Inc.

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.339	100	8% Slope, Good, HSG B (PS-3, PS-5, PS-9)
0.025	100	8% Slope, Good, HSG C (PS-3)
0.544	66	Adjusted CN w/ 30% Imp, Good, HSG B (PS-1, PS-3, PS-5, PS-8, PS-9)
0.100	78	Adjusted CN w/ 30% Imp, Good, HSG C (PS-1, PS-3)
0.005	96	Gravel surface, HSG B (PS-3)
0.444	96	Gravel surface, HSG C (PS-1, PS-3, PS-8)
12.238	61	Pasture/grassland/range, Good, HSG B (PS-1, PS-2, PS-3, PS-4, PS-5, PS-6, PS-7, PS-8, PS-9)
22.019	74	Pasture/grassland/range, Good, HSG C (PS-1, PS-3, PS-5, PS-7, PS-8)
0.638	80	Pasture/grassland/range, Good, HSG D (PS-7)
0.030	98	Paved parking, HSG B (PS-8)
0.111	98	Unconnected pavement, HSG C (PS-3)
0.124	55	Woods, Good, HSG B (PS-4)
36.617	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
13.280	HSG B	PS-1, PS-2, PS-3, PS-4, PS-5, PS-6, PS-7, PS-8, PS-9
22.700	HSG C	PS-1, PS-3, PS-5, PS-7, PS-8
0.638	HSG D	PS-7
0.000	Other	
36.617		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS-1: PS-1 Runoff Area=91,352 sf 0.00% Impervious Runoff Depth>0.57"
Flow Length=137' Slope=0.0500 '/' Tc=7.3 min CN=65 Runoff=1.0 cfs 0.1 af

Subcatchment PS-2: PS-2 Runoff Area=12,613 sf 0.00% Impervious Runoff Depth>0.42"
Flow Length=75' Slope=0.0100 '/' Tc=10.4 min CN=61 Runoff=0.1 cfs 0.0 af

Subcatchment PS-3: PS-3 Runoff Area=862,328 sf 2.18% Impervious Runoff Depth>0.84"
Flow Length=962' Tc=24.6 min CN=71 Runoff=10.9 cfs 1.4 af

Subcatchment PS-4: PS-4 Runoff Area=19,014 sf 0.00% Impervious Runoff Depth>0.35"
Flow Length=152' Tc=9.8 min CN=59 Runoff=0.1 cfs 0.0 af

Subcatchment PS-5: PS-5 Runoff Area=190,890 sf 0.95% Impervious Runoff Depth>0.83"
Flow Length=1,033' Tc=30.6 min CN=71 Runoff=2.2 cfs 0.3 af

Subcatchment PS-6: PS-6 Runoff Area=10,885 sf 0.00% Impervious Runoff Depth>0.42"
Flow Length=152' Tc=11.5 min CN=61 Runoff=0.1 cfs 0.0 af

Subcatchment PS-7: PS-7 Runoff Area=246,354 sf 0.00% Impervious Runoff Depth>0.94"
Flow Length=695' Slope=0.0100 '/' Tc=28.4 min CN=73 Runoff=3.4 cfs 0.4 af

Subcatchment PS-8: PS-8 Runoff Area=111,328 sf 1.16% Impervious Runoff Depth>0.70"
Flow Length=621' Tc=18.4 min CN=68 Runoff=1.2 cfs 0.1 af

Subcatchment PS-9: PS-1 Runoff Area=50,291 sf 0.20% Impervious Runoff Depth>0.42"
Flow Length=228' Tc=8.1 min CN=61 Runoff=0.3 cfs 0.0 af

Reach PR-1: VEG SWALE #1 Avg. Flow Depth=0.22' Max Vel=2.04 fps Inflow=0.3 cfs 0.0 af
n=0.030 L=454.0' S=0.0352 '/' Capacity=17.0 cfs Outflow=0.3 cfs 0.0 af

Reach PR-2: VEG SWALE #2 Avg. Flow Depth=0.25' Max Vel=2.02 fps Inflow=1.0 cfs 0.1 af
n=0.030 L=461.0' S=0.0174 '/' Capacity=17.4 cfs Outflow=0.9 cfs 0.1 af

Reach PR-3: VEG SWALE #3 Avg. Flow Depth=0.75' Max Vel=2.66 fps Inflow=10.9 cfs 1.4 af
n=0.030 L=710.0' S=0.0070 '/' Capacity=82.1 cfs Outflow=10.6 cfs 1.4 af

Pond BIO#1: BIO-RET AREA #1 Peak Elev=168.24' Storage=30,220 cf Inflow=10.6 cfs 1.4 af
Discarded=1.0 cfs 0.9 af Primary=0.0 cfs 0.0 af Outflow=1.0 cfs 0.9 af

Link POI-A: TOWLE ROAD Inflow=0.3 cfs 0.0 af
Primary=0.3 cfs 0.0 af

Link POI-B: LOT R-12-25 Inflow=0.1 cfs 0.0 af
Primary=0.1 cfs 0.0 af

Link POI-C: LOT R-12-24 Inflow=0.1 cfs 0.0 af
Primary=0.1 cfs 0.0 af

Link POI-D: LOTS R-11-4-A, 4-B, & 14 Inflow=0.1 cfs 0.0 af
Primary=0.1 cfs 0.0 af

Link POI-E: LOT R-11-14
Primary=0.0 cfs 0.0 af

Link POI-F: LOT R-11-13
Primary=0.0 cfs 0.0 af

Link POI-G: LOT R-11-9 Inflow=2.2 cfs 0.3 af
Primary=2.2 cfs 0.3 af

Link POI-H: LOT R-12-27 Inflow=5.1 cfs 0.7 af
Primary=5.1 cfs 0.7 af

Total Runoff Area = 36.617 ac Runoff Volume = 2.4 af Average Runoff Depth = 0.80"
98.62% Pervious = 36.112 ac 1.38% Impervious = 0.506 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS-1: PS-1 Runoff Area=91,352 sf 0.00% Impervious Runoff Depth>1.51"
Flow Length=137' Slope=0.0500 '/' Tc=7.3 min CN=65 Runoff=3.3 cfs 0.3 af

Subcatchment PS-2: PS-2 Runoff Area=12,613 sf 0.00% Impervious Runoff Depth>1.24"
Flow Length=75' Slope=0.0100 '/' Tc=10.4 min CN=61 Runoff=0.3 cfs 0.0 af

Subcatchment PS-3: PS-3 Runoff Area=862,328 sf 2.18% Impervious Runoff Depth>1.95"
Flow Length=962' Tc=24.6 min CN=71 Runoff=27.4 cfs 3.2 af

Subcatchment PS-4: PS-4 Runoff Area=19,014 sf 0.00% Impervious Runoff Depth>1.11"
Flow Length=152' Tc=9.8 min CN=59 Runoff=0.4 cfs 0.0 af

Subcatchment PS-5: PS-5 Runoff Area=190,890 sf 0.95% Impervious Runoff Depth>1.95"
Flow Length=1,033' Tc=30.6 min CN=71 Runoff=5.5 cfs 0.7 af

Subcatchment PS-6: PS-6 Runoff Area=10,885 sf 0.00% Impervious Runoff Depth>1.24"
Flow Length=152' Tc=11.5 min CN=61 Runoff=0.3 cfs 0.0 af

Subcatchment PS-7: PS-7 Runoff Area=246,354 sf 0.00% Impervious Runoff Depth>2.10"
Flow Length=695' Slope=0.0100 '/' Tc=28.4 min CN=73 Runoff=8.0 cfs 1.0 af

Subcatchment PS-8: PS-8 Runoff Area=111,328 sf 1.16% Impervious Runoff Depth>1.72"
Flow Length=621' Tc=18.4 min CN=68 Runoff=3.5 cfs 0.4 af

Subcatchment PS-9: PS-1 Runoff Area=50,291 sf 0.20% Impervious Runoff Depth>1.24"
Flow Length=228' Tc=8.1 min CN=61 Runoff=1.4 cfs 0.1 af

Reach PR-1: VEG SWALE #1 Avg. Flow Depth=0.38' Max Vel=2.97 fps Inflow=1.4 cfs 0.1 af
n=0.030 L=454.0' S=0.0352 '/' Capacity=17.0 cfs Outflow=1.3 cfs 0.1 af

Reach PR-2: VEG SWALE #2 Avg. Flow Depth=0.46' Max Vel=2.80 fps Inflow=3.3 cfs 0.3 af
n=0.030 L=461.0' S=0.0174 '/' Capacity=17.4 cfs Outflow=3.1 cfs 0.3 af

Reach PR-3: VEG SWALE #3 Avg. Flow Depth=1.20' Max Vel=3.42 fps Inflow=27.4 cfs 3.2 af
n=0.030 L=710.0' S=0.0070 '/' Capacity=82.1 cfs Outflow=27.0 cfs 3.2 af

Pond BIO#1: BIO-RET AREA #1 Peak Elev=169.38' Storage=62,921 cf Inflow=27.0 cfs 3.2 af
Discarded=1.4 cfs 1.3 af Primary=3.7 cfs 0.8 af Outflow=5.2 cfs 2.1 af

Link POI-A: TOWLE ROAD Inflow=1.3 cfs 0.1 af
Primary=1.3 cfs 0.1 af

Link POI-B: LOT R-12-25 Inflow=0.3 cfs 0.0 af
Primary=0.3 cfs 0.0 af

Link POI-C: LOT R-12-24 Inflow=0.4 cfs 0.0 af
Primary=0.4 cfs 0.0 af

Link POI-D: LOTS R-11-4-A, 4-B, & 14 Inflow=0.3 cfs 0.0 af
Primary=0.3 cfs 0.0 af

Link POI-E: LOT R-11-14
Primary=0.0 cfs 0.0 af

Link POI-F: LOT R-11-13
Primary=0.0 cfs 0.0 af

Link POI-G: LOT R-11-9 Inflow=5.5 cfs 0.7 af
Primary=5.5 cfs 0.7 af

Link POI-H: LOT R-12-27 Inflow=12.8 cfs 2.5 af
Primary=12.8 cfs 2.5 af

Total Runoff Area = 36.617 ac Runoff Volume = 5.8 af Average Runoff Depth = 1.89"
98.62% Pervious = 36.112 ac 1.38% Impervious = 0.506 ac

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS-1: PS-1 Runoff Area=91,352 sf 0.00% Impervious Runoff Depth>3.35"
Flow Length=137' Slope=0.0500 '/' Tc=7.3 min CN=65 Runoff=7.7 cfs 0.6 af

Subcatchment PS-2: PS-2 Runoff Area=12,613 sf 0.00% Impervious Runoff Depth>2.93"
Flow Length=75' Slope=0.0100 '/' Tc=10.4 min CN=61 Runoff=0.8 cfs 0.1 af

Subcatchment PS-3: PS-3 Runoff Area=862,328 sf 2.18% Impervious Runoff Depth>3.97"
Flow Length=962' Tc=24.6 min CN=71 Runoff=57.1 cfs 6.6 af

Subcatchment PS-4: PS-4 Runoff Area=19,014 sf 0.00% Impervious Runoff Depth>2.72"
Flow Length=152' Tc=9.8 min CN=59 Runoff=1.2 cfs 0.1 af

Subcatchment PS-5: PS-5 Runoff Area=190,890 sf 0.95% Impervious Runoff Depth>3.97"
Flow Length=1,033' Tc=30.6 min CN=71 Runoff=11.5 cfs 1.4 af

Subcatchment PS-6: PS-6 Runoff Area=10,885 sf 0.00% Impervious Runoff Depth>2.93"
Flow Length=152' Tc=11.5 min CN=61 Runoff=0.7 cfs 0.1 af

Subcatchment PS-7: PS-7 Runoff Area=246,354 sf 0.00% Impervious Runoff Depth>4.19"
Flow Length=695' Slope=0.0100 '/' Tc=28.4 min CN=73 Runoff=16.2 cfs 2.0 af

Subcatchment PS-8: PS-8 Runoff Area=111,328 sf 1.16% Impervious Runoff Depth>3.66"
Flow Length=621' Tc=18.4 min CN=68 Runoff=7.6 cfs 0.8 af

Subcatchment PS-9: PS-1 Runoff Area=50,291 sf 0.20% Impervious Runoff Depth>2.93"
Flow Length=228' Tc=8.1 min CN=61 Runoff=3.6 cfs 0.3 af

Reach PR-1: VEG SWALE #1 Avg. Flow Depth=0.55' Max Vel=3.80 fps Inflow=3.6 cfs 0.3 af
n=0.030 L=454.0' S=0.0352 '/' Capacity=17.0 cfs Outflow=3.5 cfs 0.3 af

Reach PR-2: VEG SWALE #2 Avg. Flow Depth=0.69' Max Vel=3.50 fps Inflow=7.7 cfs 0.6 af
n=0.030 L=461.0' S=0.0174 '/' Capacity=17.4 cfs Outflow=7.3 cfs 0.6 af

Reach PR-3: VEG SWALE #3 Avg. Flow Depth=1.69' Max Vel=4.14 fps Inflow=57.1 cfs 6.6 af
n=0.030 L=710.0' S=0.0070 '/' Capacity=82.1 cfs Outflow=56.4 cfs 6.5 af

Pond BIO#1: BIO-RET AREA #1 Peak Elev=170.15' Storage=101,934 cf Inflow=56.4 cfs 6.5 af
Discarded=6.3 cfs 1.8 af Primary=19.5 cfs 3.6 af Outflow=25.8 cfs 5.4 af

Link POI-A: TOWLE ROAD Inflow=3.5 cfs 0.3 af
Primary=3.5 cfs 0.3 af

Link POI-B: LOT R-12-25 Inflow=0.8 cfs 0.1 af
Primary=0.8 cfs 0.1 af

Link POI-C: LOT R-12-24 Inflow=1.2 cfs 0.1 af
Primary=1.2 cfs 0.1 af

Link POI-D: LOTS R-11-4-A, 4-B, & 14 Inflow=0.7 cfs 0.1 af
Primary=0.7 cfs 0.1 af

Link POI-E: LOT R-11-14
Primary=0.0 cfs 0.0 af

Link POI-F: LOT R-11-13
Primary=0.0 cfs 0.0 af

Link POI-G: LOT R-11-9 Inflow=11.5 cfs 1.4 af
Primary=11.5 cfs 1.4 af

Link POI-H: LOT R-12-27 Inflow=38.0 cfs 6.9 af
Primary=38.0 cfs 6.9 af

Total Runoff Area = 36.617 ac Runoff Volume = 11.9 af Average Runoff Depth = 3.89"
98.62% Pervious = 36.112 ac 1.38% Impervious = 0.506 ac

Summary for Subcatchment PS-1: PS-1

Runoff = 3.3 cfs @ 12.12 hrs, Volume= 0.3 af, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

	Area (sf)	CN	Description
	44,714	61	Pasture/grassland/range, Good, HSG B
	16,320	61	Pasture/grassland/range, Good, HSG B
*	8,293	66	Adjusted CN w/ 30% Imp, Good, HSG B
	18,016	74	Pasture/grassland/range, Good, HSG C
	997	74	Pasture/grassland/range, Good, HSG C
*	1,677	78	Adjusted CN w/ 30% Imp, Good, HSG C
	1,335	96	Gravel surface, HSG C
	91,352	65	Weighted Average
	91,352		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0500	0.24		**Sheet Flow, 1A** Grass: Short n= 0.150 P2= 3.14"
0.4	37	0.0500	1.57		**Shallow Concentrated Flow, 1B** Short Grass Pasture Kv= 7.0 fps
7.3	137	Total			

Summary for Subcatchment PS-2: PS-2

Runoff = 0.3 cfs @ 12.16 hrs, Volume= 0.0 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
12,613	61	Pasture/grassland/range, Good, HSG B
12,613		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	75	0.0100	0.12		**Sheet Flow, 2A** Grass: Short n= 0.150 P2= 3.14"

Summary for Subcatchment PS-3: PS-3

Runoff = 27.4 cfs @ 12.36 hrs, Volume= 3.2 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

	Area (sf)	CN	Description
	189,870	61	Pasture/grassland/range, Good, HSG B
	75,753	61	Pasture/grassland/range, Good, HSG B
*	8,687	66	Adjusted CN w/ 30% Imp, Good, HSG B
*	12,862	100	8% Slope, Good, HSG B
	214	96	Gravel surface, HSG B
	378,272	74	Pasture/grassland/range, Good, HSG C
	173,282	74	Pasture/grassland/range, Good, HSG C
*	2,697	78	Adjusted CN w/ 30% Imp, Good, HSG C
*	1,103	100	8% Slope, Good, HSG C
	4,848	98	Unconnected pavement, HSG C
	14,740	96	Gravel surface, HSG C
	862,328	71	Weighted Average
	843,515		97.82% Pervious Area
	18,813		2.18% Impervious Area
	4,848		25.77% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.0200	0.17		**Sheet Flow, 3A** Grass: Short n= 0.150 P2= 3.14"
0.8	47	0.0200	0.99		**Shallow Concentrated Flow, 3B** Short Grass Pasture Kv= 7.0 fps
1.3	120	0.0500	1.57		**Shallow Concentrated Flow, 3C** Short Grass Pasture Kv= 7.0 fps
0.6	92	0.1300	2.52		**Shallow Concentrated Flow, 3D** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.0800	1.98		**Shallow Concentrated Flow, 3E** Short Grass Pasture Kv= 7.0 fps
4.2	250	0.0200	0.99		**Shallow Concentrated Flow, 3F** Short Grass Pasture Kv= 7.0 fps
2.8	119	0.0100	0.70		**Shallow Concentrated Flow, 3G** Short Grass Pasture Kv= 7.0 fps
4.8	200	0.0100	0.70		**Shallow Concentrated Flow, 3H** Short Grass Pasture Kv= 7.0 fps
0.0	9	0.2700	3.64		**Shallow Concentrated Flow, 3I** Short Grass Pasture Kv= 7.0 fps
24.6	962	Total			

Summary for Subcatchment PS-4: PS-4

Runoff = 0.4 cfs @ 12.16 hrs, Volume= 0.0 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
12,600	61	Pasture/grassland/range, Good, HSG B
5,413	55	Woods, Good, HSG B
1,001	61	Pasture/grassland/range, Good, HSG B
19,014	59	Weighted Average
19,014		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	44	0.0200	0.14		**Sheet Flow, 4A** Grass: Short n= 0.150 P2= 3.14"
4.2	55	0.0500	0.22		**Sheet Flow, 4B** Grass: Short n= 0.150 P2= 3.14"
0.3	27	0.0600	1.71		**Shallow Concentrated Flow, 4C** Short Grass Pasture Kv= 7.0 fps
0.0	12	0.3300	4.02		**Shallow Concentrated Flow, 4D** Short Grass Pasture Kv= 7.0 fps
0.2	14	0.0400	1.40		**Shallow Concentrated Flow, 4E** Short Grass Pasture Kv= 7.0 fps
9.8	152	Total			

Summary for Subcatchment PS-5: PS-5

Runoff = 5.5 cfs @ 12.45 hrs, Volume= 0.7 af, Depth> 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

	Area (sf)	CN	Description
	37,608	61	Pasture/grassland/range, Good, HSG B
	2,705	61	Pasture/grassland/range, Good, HSG B
*	1,576	66	Adjusted CN w/ 30% Imp, Good, HSG B
*	1,815	100	8% Slope, Good, HSG B
	144,807	74	Pasture/grassland/range, Good, HSG C
	2,379	74	Pasture/grassland/range, Good, HSG C
	190,890	71	Weighted Average
	189,075		99.05% Pervious Area
	1,815		0.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	54	0.0200	0.15		**Sheet Flow, 5A** Grass: Short n= 0.150 P2= 3.14"
3.1	46	0.0800	0.25		**Sheet Flow, 5B** Grass: Short n= 0.150 P2= 3.14"
0.3	32	0.0800	1.98		**Shallow Concentrated Flow, 5C** Short Grass Pasture Kv= 7.0 fps
0.7	104	0.1300	2.52		**Shallow Concentrated Flow, 5D** Short Grass Pasture Kv= 7.0 fps
0.2	25	0.0800	1.98		**Shallow Concentrated Flow, 5E** Short Grass Pasture Kv= 7.0 fps
2.8	168	0.0200	0.99		**Shallow Concentrated Flow, 5F** Short Grass Pasture Kv= 7.0 fps
1.2	114	0.0500	1.57		**Shallow Concentrated Flow, 5G** Short Grass Pasture Kv= 7.0 fps
12.8	385	0.0100	0.50		**Shallow Concentrated Flow, 5H** Woodland Kv= 5.0 fps
3.5	105	0.0100	0.50		**Shallow Concentrated Flow, 5I** Woodland Kv= 5.0 fps
30.6	1,033	Total			

Summary for Subcatchment PS-6: PS-6

Runoff = 0.3 cfs @ 12.18 hrs, Volume= 0.0 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
10,885	61	Pasture/grassland/range, Good, HSG B
10,885		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	44	0.0100	0.11		**Sheet Flow, 6A** Grass: Short n= 0.150 P2= 3.14"
4.2	55	0.0500	0.22		**Sheet Flow, 6B** Grass: Short n= 0.150 P2= 3.14"
0.3	27	0.0600	1.71		**Shallow Concentrated Flow, 6C** Short Grass Pasture Kv= 7.0 fps
0.0	12	0.3330	4.04		**Shallow Concentrated Flow, 6D** Short Grass Pasture Kv= 7.0 fps
0.2	14	0.0400	1.40		**Shallow Concentrated Flow, 6E** Short Grass Pasture Kv= 7.0 fps
11.5	152	Total			

Summary for Subcatchment PS-7: PS-7

Runoff = 8.0 cfs @ 12.41 hrs, Volume= 1.0 af, Depth> 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

Area (sf)	CN	Description
22,760	61	Pasture/grassland/range, Good, HSG B
195,823	74	Pasture/grassland/range, Good, HSG C
27,771	80	Pasture/grassland/range, Good, HSG D
246,354	73	Weighted Average
246,354		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	13	0.0100	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.14"
11.5	85	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.14"
2.6	108	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	385	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	104	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
28.4	695	Total			

Summary for Subcatchment PS-8: PS-8

Runoff = 3.5 cfs @ 12.27 hrs, Volume= 0.4 af, Depth> 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

	Area (sf)	CN	Description
	34,023	61	Pasture/grassland/range, Good, HSG B
	13,406	61	Pasture/grassland/range, Good, HSG B
*	1,213	66	Adjusted CN w/ 30% Imp, Good, HSG B
	1,296	98	Paved parking, HSG B
	34,047	74	Pasture/grassland/range, Good, HSG C
	11,529	74	Pasture/grassland/range, Good, HSG C
	3,257	96	Gravel surface, HSG C
	12,557	61	Pasture/grassland/range, Good, HSG B
	111,328	68	Weighted Average
	110,032		98.84% Pervious Area
	1,296		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	48	0.0100	0.11		**Sheet Flow, 8A** Grass: Short n= 0.150 P2= 3.14"
3.9	50	0.0500	0.21		**Sheet Flow, 8B** Grass: Short n= 0.150 P2= 3.14"
4.0	376	0.0500	1.57		**Shallow Concentrated Flow, 8C** Short Grass Pasture Kv= 7.0 fps
0.1	16	0.0300	2.79		**Shallow Concentrated Flow, 8D** Unpaved Kv= 16.1 fps
3.1	131	0.0100	0.70		**Shallow Concentrated Flow, 8E** Short Grass Pasture Kv= 7.0 fps
18.4	621	Total			

Summary for Subcatchment PS-9: PS-1

Runoff = 1.4 cfs @ 12.13 hrs, Volume= 0.1 af, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.79"

	Area (sf)	CN	Description
	39,687	61	Pasture/grassland/range, Good, HSG B
	6,583	61	Pasture/grassland/range, Good, HSG B
*	3,922	66	Adjusted CN w/ 30% Imp, Good, HSG B
*	99	100	8% Slope, Good, HSG B
	50,291	61	Weighted Average
	50,192		99.80% Pervious Area
	99		0.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.0500	0.24		**Sheet Flow, 9A** Grass: Short n= 0.150 P2= 3.14"
1.0	95	0.0500	1.57		**Shallow Concentrated Flow, 9B** Short Grass Pasture Kv= 7.0 fps
0.1	14	0.1400	2.62		**Shallow Concentrated Flow, 9C** Short Grass Pasture Kv= 7.0 fps
0.1	19	0.1000	2.21		**Shallow Concentrated Flow, 9D** Short Grass Pasture Kv= 7.0 fps
8.1	228	Total			

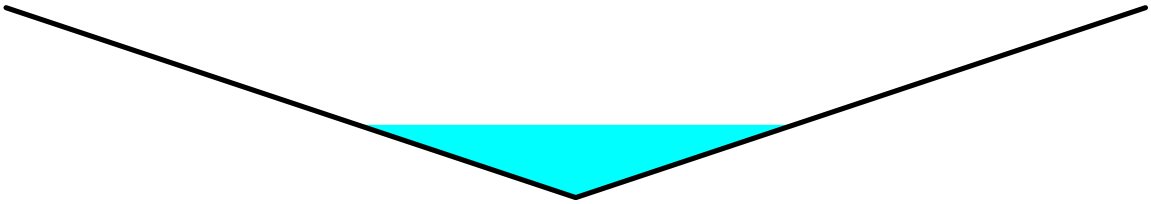
Summary for Reach PR-1: VEG SWALE #1

Inflow Area = 1.155 ac, 0.20% Impervious, Inflow Depth > 1.24" for 10-yr event
Inflow = 1.4 cfs @ 12.13 hrs, Volume= 0.1 af
Outflow = 1.3 cfs @ 12.17 hrs, Volume= 0.1 af, Atten= 4%, Lag= 2.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.97 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.45 fps, Avg. Travel Time= 5.2 min

Peak Storage= 200 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 2.30'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 17.0 cfs

0.00' x 1.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 454.0' Slope= 0.0352 '/'
Inlet Invert= 196.00', Outlet Invert= 180.00'



Summary for Reach PR-2: VEG SWALE #2

Inflow Area = 2.097 ac, 0.00% Impervious, Inflow Depth > 1.51" for 10-yr event
Inflow = 3.3 cfs @ 12.12 hrs, Volume= 0.3 af
Outflow = 3.1 cfs @ 12.16 hrs, Volume= 0.3 af, Atten= 6%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.80 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 6.5 min

Peak Storage= 510 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 3.78'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 17.4 cfs

1.00' x 1.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 3.0 '/' Top Width= 7.00'
Length= 461.0' Slope= 0.0174 '/'
Inlet Invert= 180.00', Outlet Invert= 172.00'

Summary for Reach PR-3: VEG SWALE #3

Inflow Area = 19.796 ac, 2.18% Impervious, Inflow Depth > 1.95" for 10-yr event
Inflow = 27.4 cfs @ 12.36 hrs, Volume= 3.2 af
Outflow = 27.0 cfs @ 12.41 hrs, Volume= 3.2 af, Atten= 2%, Lag= 2.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.42 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 7.8 min

Peak Storage= 5,598 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.20' , Surface Width= 10.18'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 82.1 cfs

3.00' x 2.00' deep channel, n= 0.030 Short grass
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 710.0' Slope= 0.0070 '/'
Inlet Invert= 174.00', Outlet Invert= 169.00'

‡

Summary for Pond BIO#1: BIO-RET AREA #1

[61] Hint: Exceeded Reach PR-3 outlet invert by 0.38' @ 13.40 hrs

Inflow Area = 19.796 ac, 2.18% Impervious, Inflow Depth > 1.94" for 10-yr event
Inflow = 27.0 cfs @ 12.41 hrs, Volume= 3.2 af
Outflow = 5.2 cfs @ 13.40 hrs, Volume= 2.1 af, Atten= 81%, Lag= 59.6 min
Discarded = 1.4 cfs @ 13.40 hrs, Volume= 1.3 af
Primary = 3.7 cfs @ 13.40 hrs, Volume= 0.8 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 169.38' @ 13.40 hrs Surf.Area= 36,203 sf Storage= 62,921 cf
Flood Elev= 170.50' Surf.Area= 444,489 sf Storage= 208,240 cf

Plug-Flow detention time= 215.8 min calculated for 2.1 af (67% of inflow)
Center-of-Mass det. time= 113.6 min (979.0 - 865.3)

Volume	Invert	Avail.Storage	Storage Description
#1	167.00'	0 cf	**FOREBAY #1 (0% VOIDS) (Prismatic)** Listed below (Recalc) -Impervious 6,135 cf Overall x 0.0% Voids
#2	166.50'	208,240 cf	**BIO-RETENTION AREA #1 (Prismatic)** Listed below (Recalc)
		208,240 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
167.00	855	0	0
168.00	3,025	1,940	1,940
169.00	5,365	4,195	6,135

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
166.50	23,384	0.0	0	0
167.25	23,384	40.0	7,015	7,015
168.00	23,384	100.0	17,538	24,553
169.00	27,239	100.0	25,312	49,865
169.01	33,557	100.0	304	50,169
170.00	40,722	100.0	36,768	86,937
170.50	444,489	100.0	121,303	208,240

Device	Routing	Invert	Outlet Devices
#1	Primary	169.00'	**6.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	166.50'	**1.700 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=1.4 cfs @ 13.40 hrs HW=169.38' (Free Discharge)
2=Exfiltration (Exfiltration Controls 1.4 cfs)

Primary OutFlow Max=3.7 cfs @ 13.40 hrs HW=169.38' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 3.7 cfs @ 1.65 fps)

Summary for Link POI-A: TOWLE ROAD

Inflow Area = 1.155 ac, 0.20% Impervious, Inflow Depth > 1.24" for 10-yr event
Inflow = 1.3 cfs @ 12.17 hrs, Volume= 0.1 af
Primary = 1.3 cfs @ 12.17 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-B: LOT R-12-25

Inflow Area = 0.290 ac, 0.00% Impervious, Inflow Depth > 1.24" for 10-yr event
Inflow = 0.3 cfs @ 12.16 hrs, Volume= 0.0 af
Primary = 0.3 cfs @ 12.16 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-C: LOT R-12-24

Inflow Area = 0.437 ac, 0.00% Impervious, Inflow Depth > 1.11" for 10-yr event
Inflow = 0.4 cfs @ 12.16 hrs, Volume= 0.0 af
Primary = 0.4 cfs @ 12.16 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-D: LOTS R-11-4-A, 4-B, & 14

Inflow Area = 0.250 ac, 0.00% Impervious, Inflow Depth > 1.24" for 10-yr event
Inflow = 0.3 cfs @ 12.18 hrs, Volume= 0.0 af
Primary = 0.3 cfs @ 12.18 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-E: LOT R-11-14

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-F: LOT R-11-13

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-G: LOT R-11-9

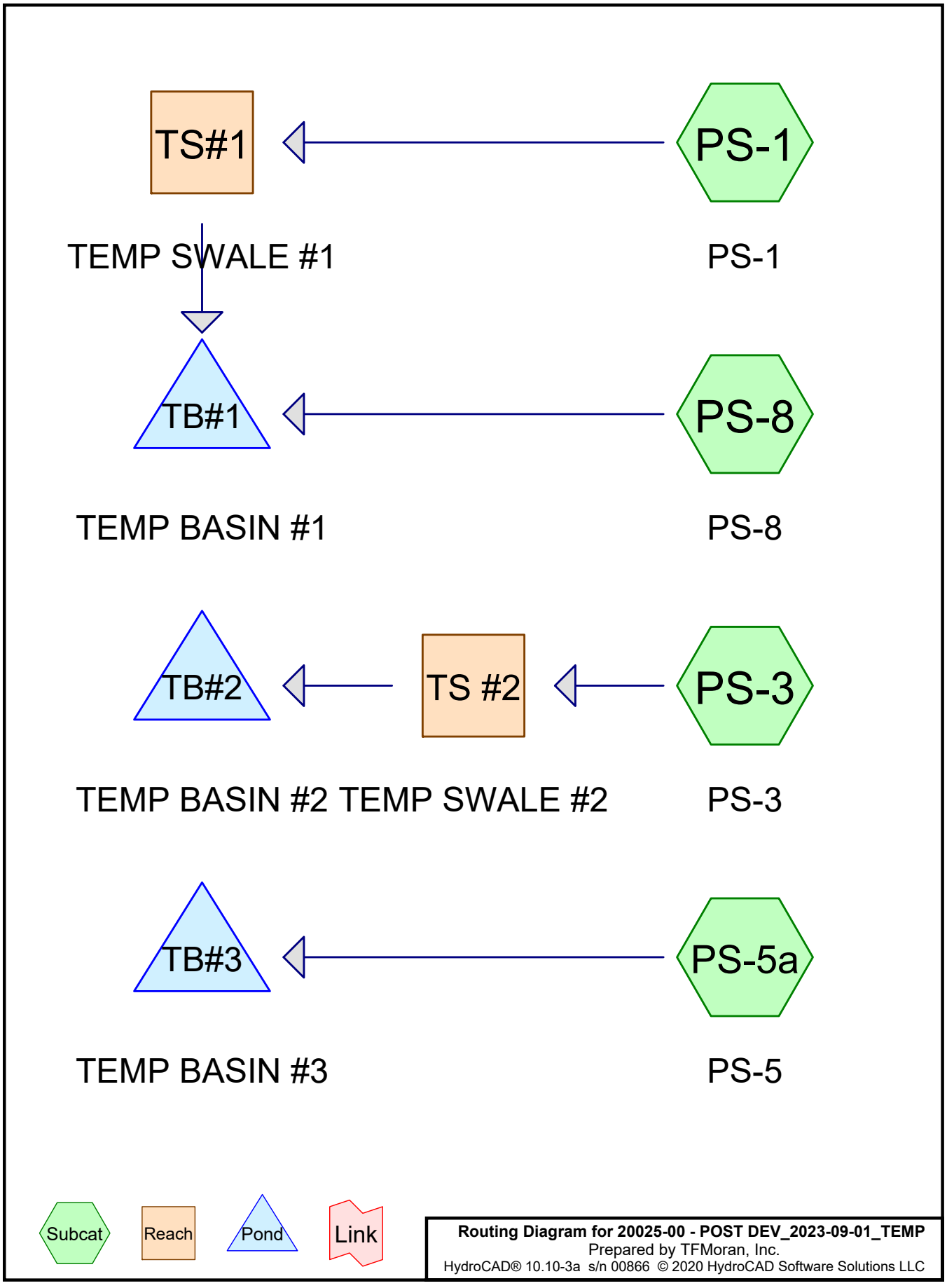
Inflow Area = 4.382 ac, 0.95% Impervious, Inflow Depth > 1.95" for 10-yr event
Inflow = 5.5 cfs @ 12.45 hrs, Volume= 0.7 af
Primary = 5.5 cfs @ 12.45 hrs, Volume= 0.7 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link POI-H: LOT R-12-27

Inflow Area = 30.105 ac, 1.53% Impervious, Inflow Depth > 0.98" for 10-yr event
Inflow = 12.8 cfs @ 12.34 hrs, Volume= 2.5 af
Primary = 12.8 cfs @ 12.34 hrs, Volume= 2.5 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs



Routing Diagram for 20025-00 - POST DEV_2023-09-01_TEMP
Prepared by TFMoran, Inc.

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.005	96	Gravel surface, HSG B (PS-3)
0.444	96	Gravel surface, HSG C (PS-1, PS-3, PS-8)
10.403	86	Newly graded area, HSG B (PS-1, PS-3, PS-5a, PS-8)
14.943	91	Newly graded area, HSG C (PS-1, PS-3, PS-5a, PS-8)
0.030	98	Paved parking, HSG B (PS-8)
0.111	98	Unconnected pavement, HSG C (PS-3)
25.936	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
10.437	HSG B	PS-1, PS-3, PS-5a, PS-8
15.498	HSG C	PS-1, PS-3, PS-5a, PS-8
0.000	HSG D	
0.000	Other	
25.936		**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS-1: PS-1 Runoff Area=91,352 sf 0.00% Impervious Runoff Depth>1.86"
Flow Length=503' Tc=12.3 min CN=87 Runoff=3.7 cfs 0.3 af

Subcatchment PS-3: PS-3 Runoff Area=862,328 sf 0.56% Impervious Runoff Depth>2.02"
Flow Length=1,006' Tc=25.6 min CN=89 Runoff=28.4 cfs 3.3 af

Subcatchment PS-5a: PS-5 Runoff Area=64,751 sf 0.00% Impervious Runoff Depth>1.94"
Flow Length=543' Tc=14.3 min CN=88 Runoff=2.6 cfs 0.2 af

Subcatchment PS-8: PS-8 Runoff Area=111,328 sf 1.16% Impervious Runoff Depth>1.94"
Flow Length=621' Tc=18.4 min CN=88 Runoff=4.0 cfs 0.4 af

Reach TS #2: TEMP SWALE #2 Avg. Flow Depth=1.10' Max Vel=4.02 fps Inflow=28.4 cfs 3.3 af
n=0.022 L=788.0' S=0.0057 '/' Capacity=100.9 cfs Outflow=28.0 cfs 3.3 af

Reach TS#1: TEMP SWALE #1 Avg. Flow Depth=0.43' Max Vel=3.67 fps Inflow=3.7 cfs 0.3 af
n=0.022 L=461.0' S=0.0174 '/' Capacity=23.8 cfs Outflow=3.6 cfs 0.3 af

Pond TB#1: TEMP BASIN #1 Peak Elev=171.44' Storage=32,079 cf Inflow=7.6 cfs 0.7 af
Outflow=0.0 cfs 0.0 af

Pond TB#2: TEMP BASIN #2 Peak Elev=170.02' Storage=144,558 cf Inflow=28.0 cfs 3.3 af
Outflow=0.0 cfs 0.0 af

Pond TB#3: TEMP BASIN #3 Peak Elev=173.08' Storage=10,456 cf Inflow=2.6 cfs 0.2 af
Outflow=0.0 cfs 0.0 af

Total Runoff Area = 25.936 ac Runoff Volume = 4.3 af Average Runoff Depth = 1.99"
99.46% Pervious = 25.795 ac 0.54% Impervious = 0.141 ac

Stage-Area-Storage for Pond TB#1: TEMP BASIN #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
170.00	20,729	0
170.02	20,771	415
170.04	20,812	831
170.06	20,854	1,247
170.08	20,895	1,665
170.10	20,937	2,083
170.12	20,978	2,502
170.14	21,020	2,922
170.16	21,061	3,343
170.18	21,103	3,765
170.20	21,144	4,187
170.22	21,186	4,611
170.24	21,227	5,035
170.26	21,269	5,460
170.28	21,310	5,885
170.30	21,352	6,312
170.32	21,393	6,740
170.34	21,435	7,168
170.36	21,476	7,597
170.38	21,518	8,027
170.40	21,559	8,458
170.42	21,601	8,889
170.44	21,642	9,322
170.46	21,684	9,755
170.48	21,725	10,189
170.50	21,767	10,624
170.52	21,809	11,060
170.54	21,850	11,496
170.56	21,892	11,934
170.58	21,933	12,372
170.60	21,975	12,811
170.62	22,016	13,251
170.64	22,058	13,692
170.66	22,099	14,133
170.68	22,141	14,576
170.70	22,182	15,019
170.72	22,224	15,463
170.74	22,265	15,908
170.76	22,307	16,354
170.78	22,348	16,800
170.80	22,390	17,248
170.82	22,431	17,696
170.84	22,473	18,145
170.86	22,514	18,595
170.88	22,556	19,045
170.90	22,597	19,497
170.92	22,639	19,949
170.94	22,680	20,402
170.96	22,722	20,856
170.98	22,763	21,311
171.00	22,805	21,767
171.02	22,848	22,224
171.04	22,891	22,681
171.06	22,934	23,139
171.08	22,976	23,598
171.10	23,019	24,058
171.12	23,062	24,519
171.14	23,105	24,981
171.16	23,148	25,443
171.18	23,191	25,907
171.20	23,233	26,371
171.22	23,276	26,836
171.24	23,319	27,302
171.26	23,362	27,769
171.28	23,405	28,236
171.30	23,448	28,705
171.32	23,490	29,174
171.34	23,533	29,645
171.36	23,576	30,116
171.38	23,619	30,588
171.40	23,662	31,060
171.42	23,705	31,534
171.44	23,747	32,009
171.46	23,790	32,484
171.48	23,833	32,960
171.50	23,876	33,437
171.52	23,919	33,915
171.54	23,962	34,394
171.56	24,005	34,874
171.58	24,047	35,354
171.60	24,090	35,836
171.62	24,133	36,318
171.64	24,176	36,801
171.66	24,219	37,285
171.68	24,262	37,770
171.70	24,304	38,255
171.72	24,347	38,742
171.74	24,390	39,229
171.76	24,433	39,717
171.78	24,476	40,206
171.80	24,519	40,696
171.82	24,561	41,187
171.84	24,604	41,679
171.86	24,647	42,171
171.88	24,690	42,665
171.90	24,733	43,159
171.92	24,776	43,654
171.94	24,818	44,150
171.96	24,861	44,647
171.98	24,904	45,144
172.00	**24,947**	**45,643**

Stage-Area-Storage for Pond TB#2: TEMP BASIN #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
167.00	38,052	0
167.05	38,407	1,911
167.10	38,761	3,841
167.15	39,116	5,788
167.20	39,471	7,752
167.25	39,826	9,735
167.30	40,181	11,735
167.35	40,535	13,753
167.40	40,890	15,788
167.45	41,245	17,842
167.50	41,600	19,913
167.55	41,954	22,002
167.60	42,309	24,108
167.65	42,664	26,233
167.70	43,018	28,375
167.75	43,373	30,534
167.80	43,728	32,712
167.85	44,083	34,907
167.90	44,438	37,120
167.95	44,792	39,351
168.00	45,147	41,600
168.05	45,435	43,864
168.10	45,723	46,143
168.15	46,011	48,436
168.20	46,300	50,744
168.25	46,588	53,066
168.30	46,876	55,403
168.35	47,164	57,754
168.40	47,452	60,119
168.45	47,740	62,499
168.50	48,029	64,893
168.55	48,317	67,302
168.60	48,605	69,725
168.65	48,893	72,162
168.70	49,181	74,614
168.75	49,469	77,081
168.80	49,757	79,561
168.85	50,046	82,056
168.90	50,334	84,566
168.95	50,622	87,090
169.00	50,910	89,628
169.05	51,202	92,181
169.10	51,493	94,748
169.15	51,785	97,330
169.20	52,076	99,927
169.25	52,368	102,538
169.30	52,660	105,163
169.35	52,951	107,804
169.40	53,243	110,459
169.45	53,534	113,128
169.50	53,826	115,812
169.55	54,118	118,511
169.60	54,409	121,224
169.65	54,701	123,952
169.70	54,992	126,694
169.75	55,284	129,451
169.80	55,576	132,222
169.85	55,867	135,008
169.90	56,159	137,809
169.95	56,450	140,624
170.00	56,742	143,454
170.05	57,037	146,298
170.10	57,331	149,158
170.15	57,626	152,032
170.20	57,920	154,920
170.25	58,215	157,824
170.30	58,509	160,742
170.35	58,803	163,674
170.40	59,098	166,622
170.45	59,392	169,584
170.50	**59,687**	**172,561**

Stage-Area-Storage for Pond TB#3: TEMP BASIN #3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
172.00	8,938	0
172.02	8,967	179
172.04	8,997	359
172.06	9,026	539
172.08	9,055	720
172.10	9,084	901
172.12	9,114	1,083
172.14	9,143	1,266
172.16	9,172	1,449
172.18	9,201	1,633
172.20	9,231	1,817
172.22	9,260	2,002
172.24	9,289	2,187
172.26	9,318	2,373
172.28	9,348	2,560
172.30	9,377	2,747
172.32	9,406	2,935
172.34	9,435	3,123
172.36	9,465	3,312
172.38	9,494	3,502
172.40	9,523	3,692
172.42	9,552	3,883
172.44	9,582	4,074
172.46	9,611	4,266
172.48	9,640	4,459
172.50	9,670	4,652
172.52	9,699	4,846
172.54	9,728	5,040
172.56	9,757	5,235
172.58	9,787	5,430
172.60	9,816	5,626
172.62	9,845	5,823
172.64	9,874	6,020
172.66	9,904	6,218
172.68	9,933	6,416
172.70	9,962	6,615
172.72	9,991	6,815
172.74	10,021	7,015
172.76	10,050	7,215
172.78	10,079	7,417
172.80	10,108	7,619
172.82	10,138	7,821
172.84	10,167	8,024
172.86	10,196	8,228
172.88	10,225	8,432
172.90	10,255	8,637
172.92	10,284	8,842
172.94	10,313	9,048
172.96	10,342	9,255
172.98	10,372	9,462
173.00	10,401	9,670
173.02	10,432	9,878
173.04	10,463	10,087
173.06	10,495	10,296
173.08	10,526	10,507
173.10	10,557	10,717
173.12	10,588	10,929
173.14	10,620	11,141
173.16	10,651	11,354
173.18	10,682	11,567
173.20	10,713	11,781
173.22	10,744	11,995
173.24	10,776	12,211
173.26	10,807	12,427
173.28	10,838	12,643
173.30	10,869	12,860
173.32	10,901	13,078
173.34	10,932	13,296
173.36	10,963	13,515
173.38	10,994	13,735
173.40	11,025	13,955
173.42	11,057	14,176
173.44	11,088	14,397
173.46	11,119	14,619
173.48	11,150	14,842
173.50	11,182	15,065
173.52	11,213	15,289
173.54	11,244	15,514
173.56	11,275	15,739
173.58	11,306	15,965
173.60	11,338	16,191
173.62	11,369	16,418
173.64	11,400	16,646
173.66	11,431	16,874
173.68	11,462	17,103
173.70	11,494	17,333
173.72	11,525	17,563
173.74	11,556	17,794
173.76	11,587	18,025
173.78	11,619	18,257
173.80	11,650	18,490
173.82	11,681	18,723
173.84	11,712	18,957
173.86	11,743	19,192
173.88	11,775	19,427
173.90	11,806	19,663
173.92	11,837	19,899
173.94	11,868	20,136
173.96	11,900	20,374
173.98	11,931	20,612
174.00	**11,962**	**20,851**

PART 6

RIPRAP CALCULATIONS

Unitil Kingston Solar Facility
14 & 24 Towle Road, Kingston, NH
Tax Map R-12 Lots 25 & 26
Date: July 6, 2023
Revised: September 1, 2023
Project No.: 20025-00

OUTLET	Do (ft.)	Q25 (cfs)	Tw (ft.)	La (ft.)	Wup (ft.)	Wdn (ft.)	d50 (in.)*
Bio-Ret. #1 Spillway	15.00	17.1	1.1	105.5	45.0	150.5	6.0

*Note:6"min.

Notes:

1 Use NHDOT Class C Stone
2 Depth of Stone to be 12" min. or 1.5 times d50 - which ever is larger
3 Actual riprap dimensions may vary from calculations. See Plans.

Calculations	
1. 'When Tw < 0.5Do at pipe outlet:	2. When Tw > or = 0.5Do at pipe outlet:
La = 1.8Q/Do^3/2 + 7Do	La = 3Q/Do^3/2 + 7Do
Wup = 3Do	Wup = 3Do
Wdn = 3Do + La	Wdn = 3Do + 0.4La
d50 = (0.02Q^4/3)/(TwDo)	d50 = (0.02Q^4/3)/(TwDo)

Where:
Tw is the tailwater depth at the outlet of the pipe or channel
Do is the diameter of the pipe or the width of channel
Q is the discharge from the pipe of channel
La is the length of apron
Wup is the upstream width of apron
Wdn is the downstream width of apron
d50 is the median stone diameter

PART 7

Infiltration Feasibility Report

Unitil Kingston Solar Project
Tax Map R12, Lots 25 & 26
14 & 24 Towle Road, Kingston, NH 03848
July 6, 2023
Revised: September 1, 2023

Table of Contents

(a) Location of Practice

The proposed Photovoltaic (PV) Solar Array project is located at 14 & 24 Towle Road, in Kingston, NH Tax Map R-12, Lot 26 (approximately 32.9 +/- acres) and part of Lot 25 (approximately 3.7 +/-) located within the Rural Residential District. The site is abutted by the existing Eversource Peaslee and Unitil Kingston Substations to the east, residential properties to the north, south, and west. Towle Road (Class VI) encompasses the northwestern property line. An electric utility corridor traverses through the property, terminating at the existing substations. Access to the parcel is via the class IV portion of Towle Road.

An open and closed drainage system is proposed to capture runoff from the site for this phase of the project. One (1) proposed Bio- Retention Area with sediment forebay will be utilized to manage runoff and provide the pretreatment/treatment for a majority of the site. The northwest and southeast portions of the on the site will discharge though two (2) Vegetated Buffer Areas prior to entering wetland areas.

(b) Existing Topography at Location of Practice

The proposed consolidated lot is a total of 36.5+/- acres and the entire will be disturbed as part of the proposed development due to clearing of the site. The site is relatively steep, with approximately 30 feet of grade change (200 feet to 170 feet). The highest elevations on the property are located in the northeast and the southern portion of the site is the lowest elevation.

(c) Test Pit Locations

Nine (9) test pits were performed by Matt Routhier, on April 13th & 18th, 2023. The test pit locations are shown on the Plan in Section (j).

(d) Seasonal High-Water Table and Bedrock Elevations

Test Pit #1:
Surface Elevation = 175.0
ESHWT: Below Grade @ 30” (172.5)
Water Table @ 50” (Elev. = 170.8)
Ledge/bottom of Test Pit @ 50” (Elev. = 170.8)

Test Pit #2:
Surface Elevation = 172.8
ESHWT: Below Grade @ 18” (171.3)
Water Table @ 37” (Elev. = 169.7)
Ledge/bottom of Test Pit @ 37” (Elev. = 169.7)

Test Pit #3:
Surface Elevation = 172.7
ESHWT: Below Grade @ 30” (170.2)
Water Table @ 50” (Elev. = 168.5)
Ledge/bottom of Test Pit @ 50” (Elev. = 168.5)

Test Pit #4:
Surface Elevation = 170.6
ESHWT: Below Grade @ 36” (167.6)
Water Table @ 43” (Elev. = 167.0)
Ledge/bottom of Test Pit @ 43” (Elev. = 167.0)

Test Pit #5:
Surface Elevation = 171.6
ESHWT: Below Grade @ 21” (169.9)
Water Table @ 22” (Elev. = 169.8)
Ledge/bottom of Test Pit @ 26” (Elev. = 169.4)

Test Pit #6:
Surface Elevation = 170.1
ESHWT: Below Grade @ 4” (169.8)
Water Table @ 6” (Elev. = 169.6)
Ledge/bottom of Test Pit @ 6” (Elev. = 169.6)

Test Pit #7:
Surface Elevation = 168.0
ESHWT: Below Grade @ 29” (165.6)
Water Table @ 42” (Elev. = 164.5)
Ledge/bottom of Test Pit @ 42” (Elev. = 164.5)

Test Pit #8:
Surface Elevation = 166.7
ESHWT: Below Grade @ 28” (164.4)
Water Table @ 36” (Elev. = 163.7)
Ledge/bottom of Test Pit @ 43” (Elev. = 163.7)

Test Pit #9:
Surface Elevation = 166.6
ESHWT: Below Grade @ 32” (163.9)
Water Table @ 40” (Elev. = 163.3)
Ledge/bottom of Test Pit @ 40” (Elev. = 163.3)

(e) Profile Descriptions

See the test pit logs in Section (j) showing the soil information.

(f) Soils in Area of Proposed Practice

The soil series in the area of the proposed practices are shown on the NRCS Soils Report found in Section (j).

(g) Number and Location of Test Locations

Infiltration testing was done in the area of the proposed infiltration practices. See memo and log in section (j)

(h) Date Data was collected:

Test Pits

Date:	April 13th & 18th, 2023
Performed by:	Paul H. O'Hanlon, Environmental Permitting Specialist
Town/State:	Kingston, NH
TFM Project Name:	Unitil Kingston Solar Project

Infiltration Test

Date:	April 13th & 18th, 2023
Performed by:	Paul H. O'Hanlon, Environmental Permitting Specialist
Town/State:	Kingston, NH
TFM Project Name:	Unitil Kingston Solar Project

(i) Summary of Design Infiltration Results

Infiltration tests were performed on site on April 13th, 2023, using an Amoozemeter. See the Field Data Sheets in section (j). The design infiltration rate used in the drainage model was calculated using measured infiltration rates with a factor of safety of 2.

(j) Attachments

(a) USDA NRCS Soils Report

(b) Test Pit Logs

(c) Infiltration Test Memos & Amoozemeter Field Data Sheets

(d) Plans of Proposed Practices

United States Department of Agriculture

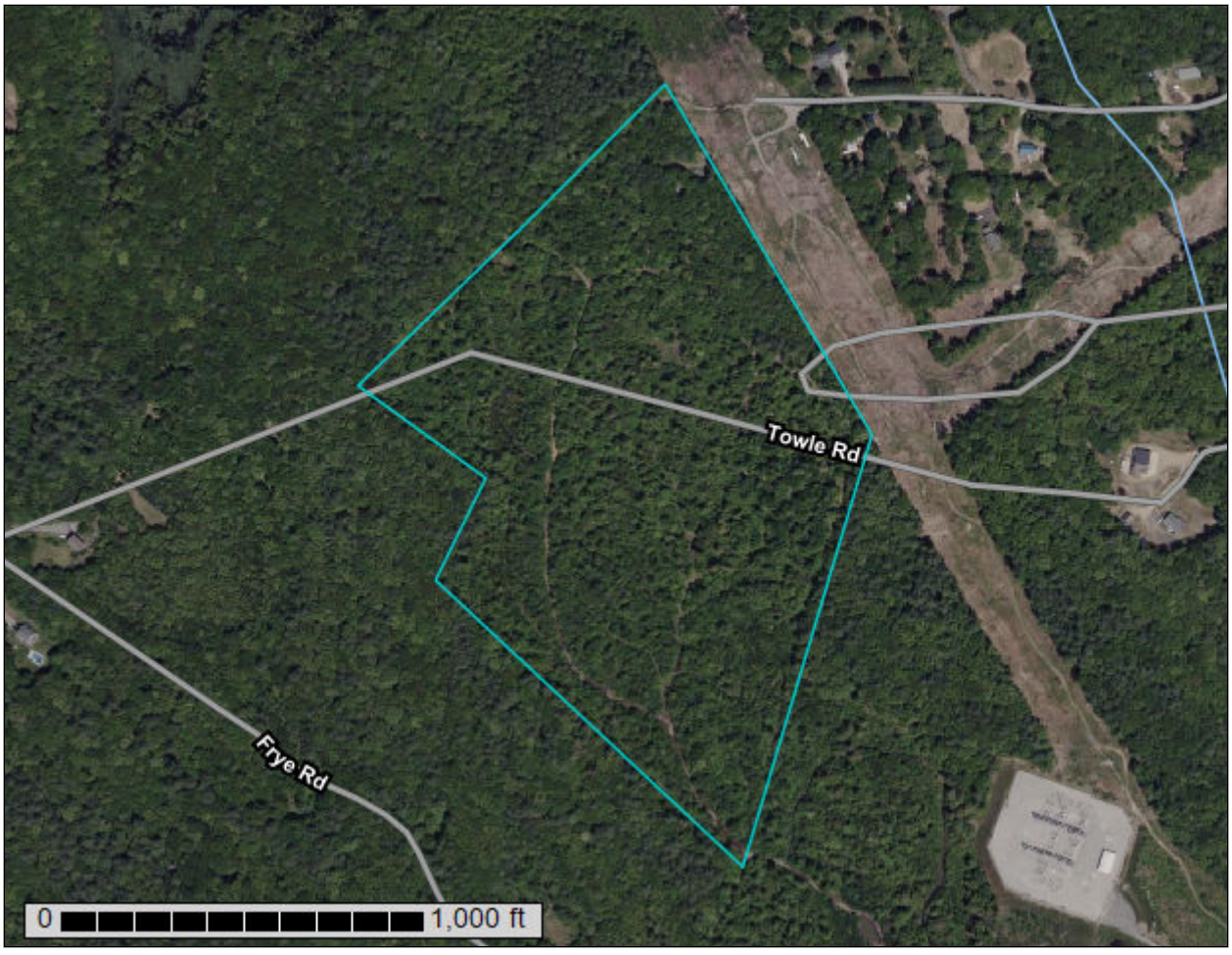
NRCS

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 Rockingham County, New Hampshire

Proposed Unitil Solar Field - 24 Towle Road, Kingston, NH 03848



May 17, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

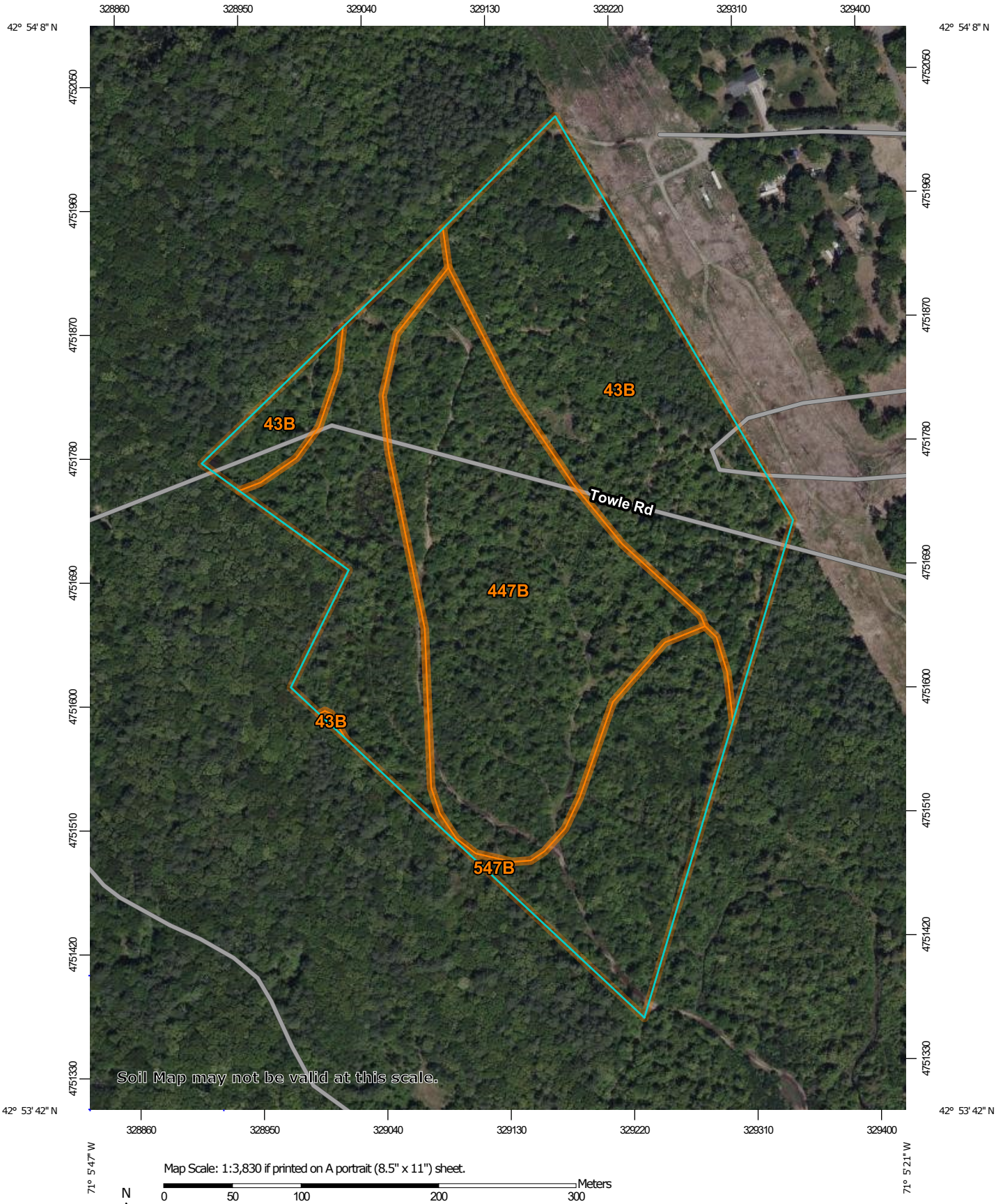
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,830 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 50, 100, 200, 300

Feet: 0, 150, 300, 600, 900

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Rockingham County, New Hampshire
Survey Area Data: Version 25, Sep 12, 2022

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
43B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	12.1	33.2%
447B	Scituate-Newfields complex, 3 to 8 percent slopes, very stony	12.5	34.4%
547B	Walpole very fine sandy loam, 3 to 8 percent slopes, very stony	11.8	32.4%
Totals for Area of Interest		**36.4**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Rockingham County, New Hampshire

43B—Canton fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w81l
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: Farmland of local importance

Map Unit Composition

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

Description of Canton, Very Stony

Setting

Landform: Hills, ridges, moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
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
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Minor Components

Scituate, very stony

Percent of map unit: 9 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, very stony

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

Gloucester, very stony

Percent of map unit: 4 percent
Landform: Ridges, moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 2 percent
Landform: Bogs, swamps, marshes, kettles, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

447B—Scituate-Newfields complex, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 9cnr
Elevation: 0 to 1,000 feet
Mean annual precipitation: 35 to 56 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Scituate and similar soils: 50 percent
Newfields and similar soils: 25 percent

Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scituate

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 32 inches: cobbly fine sandy loam
H3 - 32 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

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

Description of Newfields

Setting

Parent material: Till

Typical profile

H1 - 0 to 9 inches: fine sandy loam
H2 - 9 to 35 inches: fine sandy loam
H3 - 35 to 64 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 24 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Ecological site: F144AY008CT - Moist Till Uplands

Hydric soil rating: No

Minor Components

Walpole
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Ridgebury
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Canton
Percent of map unit: 5 percent
Hydric soil rating: No

Montauk
Percent of map unit: 5 percent
Hydric soil rating: No

Not named
Percent of map unit: 5 percent
Hydric soil rating: No

547B—Walpole very fine sandy loam, 3 to 8 percent slopes, very stony

Map Unit Setting
National map unit symbol: 9cpd
Elevation: 0 to 2,100 feet
Mean annual precipitation: 28 to 48 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 195 days
Farmland classification: Not prime farmland

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

Description of Walpole

Setting
Landform: Depressions

Typical profile
H1 - 0 to 7 inches: very fine sandy loam
H2 - 7 to 16 inches: sandy loam
H3 - 16 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 0.1 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A/D
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 10 percent
Landform: Depressions
Hydric soil rating: Yes

Newfields

Percent of map unit: 5 percent
Hydric soil rating: No

Squamscott

Percent of map unit: 5 percent
Landform: Marine terraces
Hydric soil rating: Yes

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

AOI Inventory

This folder contains a collection of tabular reports that present a variety of soil information. Included are various map unit description reports, special soil interpretation reports, and data summary reports.

Legend

This report presents general information about the map units in the selected area. It shows map unit symbols and names for each map unit.

Report—Legend

Legend–Rockingham County, New Hampshire	
Map unit symbol and name	**Map unit acres**
43B—Canton fine sandy loam, 0 to 8 percent slopes, very stony	9,274
447B—Scituate-Newfields complex, 3 to 8 percent slopes, very stony	15,406
547B—Walpole very fine sandy loam, 3 to 8 percent slopes, very stony	9,882

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Test Pit Report

For

Unitil Corporation

24 Towle Road,

Kingston, NH

Prepared For

Unitil Corporation

20025.00

PREPARED BY

TFMoran, Inc.

48 Constitution Drive

Bedford, NH 03110

April 20th, 2023

Test Pit # 1 April 13th, 2023

0 – 8” 10YR 3/3 Dark Brown, Sandy Loam, Massive, Friable, Homogenous, Organic Horizon

8 – 24” 10YR 5/6 Yellowish Brown, Fine Loamy Sand, Massive, Very Friable, Few Gravels

24 – 31” 10YR 6/6 Brownish Yellow, Fine Sand, Single Grained, Very Friable, Homogenous, Few Stones, Red**ox**imorphic Features Present (10R 4/6 Red)

31 – 50” 10YR 3/2 Very Dark Grayish Brown, Coarse Sand, Single Grained, Loose, Many Stones, Many Gravels, Heterogenous, Red**ox**imorphic Features Present (7.5R 3/6 Dark Red)

REDOX OBS: Common @ 30” Below Grade (10R 4/6 Red)

Soil Series: Scituate

OBSWT: 50” Below Grade

ESHWT: 30” Below Grade

Roots: Many 17” Below Grade

Ledge: 50” +

Test Pit # 2 April 13th, 2023

0 – 5” 10YR 2/1 Black, Loam, Massive, Friable, Many roots, Few Gravels, Organic Horizon

5 – 26” 10YR 5/6 Yellowish Brown, Sandy Loam, Massive, Friable, Many Stones, Many Gravels, Homogenous, Enriched in Iron (Fe), Saturated, Redoximorphic Features Present (10R 3/6 Dark Red)

26 – 37” 10YR 3/2 Very Dark Grayish Brown, Coarse Sand, Single Grained, Very Friable, Many Stones, Many Boulders, Heterogenous, Saturated, Red**ox**imorphic Features Present (7.5R 3/6 Dark Red)

REDOX OBS: Few @ 18” Below Grade (10R 3/6 Dark Red)

Soil Series: Scituate

OBSWT: 37” Below Grade

ESHWT: 18” Below Grade

Roots: Common 5” Below Grade

Ledge: 37” +

Test Pit # 3 April 13th, 2023

0 – 10” 10YR 3/4 Dark Yellowish Brown, Loam, Massive, Friable, Many Roots, Organic Horizon

10 – 26” 10YR 5/8 Yellowish Brown, Sandy Loam, Massive, Friable, Many Gravels, Many Stones

26 – 36” 10YR 4/6 Dark Yellowish Brown, Coarse Loamy Sand, Massive, Firm, Many Gravels, Many Stones

36 – 54” 10R 4/6 Dark Yellowish Brown, Coarse Sand, Single Grained, Loose, Many Stones, Many Gravels, Heterogenous, Saturated, Red**ox**imorphic Features Present (7.5R 3/6 Dark Red)

REDOX OBS: Common @ 36” Below Grade (7.5R 3/6 Dark Red)

Soil Series: Scituate

OBSWT: 54” Below Grade

ESHWT: 36” Below Grade

Roots: Many 19” Below Grade

Ledge: 54” +

Test Pit # 4 April 13th, 2023

0 –7” 10YR 3/3 Dark Brown, Loam, Massive, Very Friable, Many Fine Roots, Homogenous

7 – 25” 10YR 4/6 Dark Yellowish Brown, Sandy Loam, Massive, Friable, Common Rocks, Homogenous

25 – 29” 10YR 5/4 Yellowish Brown, Fine Sand, Single Grained, Very Friable, Homogenous

29 – 43” 10YR 4/6 Dark Yellowish Brown, Coarse Sand, Single Grained, Loose, Many Gravels, Common Stones, Saturated, Heterogenous, Redoximorphic Features Present (7.5R 3/6 Dark Red)

REDOX OBS: Many @ 36” Below Grade (7.5R 3/6 Dark Red)

Soil Series: Scituate

OBSWT: 43” Below Grade

ESHWT: 36” Below Grade

Roots: Many Fine 7” Below Grade

Ledge: 43” +

Test Pit # 5 April 18th, 2023

0 –6” 10YR 2/1 Black, Loam, Massive, Very Friable, Heavy Duff, Many Roots, Homogenous, Organic Horizon

6 – 13” 10YR 4/4 Dark Yellowish Brown, Sandy Loam, Massive, Friable, Enriched in Iron (Fe), Few Gravels, Few Stones, Homogenous

13 – 26” 10YR 4/6 Dark Yellowish Brown, Loamy Sand, Massive, Slightly Firm, Super Saturated, Many Stones, Redoximorphic Features Present (10R 4/6 Red)

REDOX OBS: Common @ 21” Below Grade (10R 4/6 Red)

Soil Series: Scituate

OBSWT: 22” Below Grade

ESHWT: 21” Below Grade

Roots: Many 13” Below Grade

Ledge: 26” +

Test Pit # 6 April 18th, 2023

0 –6” 10YR 2/1 Black, Muck, Massive, Friable, Super Saturated, **Red**oximorphic Features Present (10YR 7/8 Yellow), Odorless

REDOX OBS: Common @ 4” Below Grade (Yellow 10YR 7/8)

Soil Series: Walpole

OBSWT: 6” Below Grade

ESHWT: 4” Below Grade

Roots: Many 2” Below Grade

Ledge: 6” +

Test Pit # 7 April 13th, 2023

0 –9” 10YR 3/3 Dark Brown, Loam, Massive, Very Friable, Many Roots, Homogenous

9 – 20” 10YR 4/6 Dark Yellowish Brown, Sandy Loam, Massive, Friable, Few Stones, Homogenous

20 – 24” 10YR 4/6 Dark Yellowish Brown, Fine Sand, Single Grained, Friable, Few Gravels, Heterogenous

24 – 33” 10YR 3/6 Dark Yellowish Brown, Silt Loam Massive, Very Firm, Homogenous, Red**ox**imorphic Features Present (10R 4/6 Red)

33 – 42” 10YR 4/6 Dark Yellowish Brown, Coarse Sand, Single Grained, Loose, Many Gravels, Many Stones, Heterogenous, Saturated, Redoximorphic Features Present (7.5R 3/6 Dark Red)

REDOX OBS: Common @ 29” Below Grade (10R 4/6 Red)

Soil Series: Scituate

OBSWT: 42” Below Grade

ESHWT: 29” Below Grade

Roots: Common 15” Below Grade

Ledge: 42” +

Test Pit # 8 April 13th, 2023

0 –12” 10YR 2/2 Very Dark Brown, Loam, Massive, Friable, Few Roots, Homogenous

12 – 25” 10YR 3/6 Dark Yellowish Brown, Sandy Loam, Massive, Friable, Enriched in Iron (Fe), Many Gravels, Many Stones Homogenous

25 – 36” 10YR 4/6 Dark Yellowish Brown, Coarse Sand, Single Grained, Loose, Many Gravels, Very Few Stones, Saturated, Redoximorphic Features Present (7.5R 3/6 Dark Red)

REDOX OBS: Many @ 28” Below Grade 7.5R 3/6 Dark Red)

Soil Series: Scituate

OBSWT: 36” Below Grade

ESHWT: 28” Below Grade

Roots: Few 8” Below Grade

Ledge: 43” +

Test Pit # 9 April 13th, 2023

0 –9” 10YR 2/1 Black, Loam, Massive, Very Friable, High Organics Concentration, Homogenous

9 – 11” 10YR 3/3 Dark Brown, Sandy Loam, Massive, Friable, Homogenous

11 – 31” 10YR 5/8 Yellowish Brown, Fine Sand, Single Grained, Very Friable, Heterogenous

31 – 40” 10YR 4/6 Dark Yellowish Brown, Coarse Sand, Single Grained, Loose, Many Cobbles, Many Stones, Saturated, Redoximorphic Features Present (7.5R 3/6 Dark Red), Heterogenous

REDOX OBS: Many @ 32” Below Grade 7.5R 3/6 Dark Red)

Soil Series: Windsor

OBSWT: 40” Below Grade

ESHWT: 32” Below Grade

Roots: Few 6” Below Grade

Ledge: 40” +

NOTE: Material at depth greater than 40” was found to be Very Fine Sand 10YR 7/2. Start Point Unknown.

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Traffic Engineers
Land Surveyors
Landscape Architects
Scientists

Amoozemeter Field Data Sheet

DATE: April 13th, 2023	Project: 20025-00 Unitil Utility Scale PV		
LOCATION: 24 Towle Road, Kingston, NH 03848	AIR TEMPERATURE:	86°F	
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cpd (NRCS)	NOTES:		
HORIZON: B-Horizon (Native Material)	Test conducted at 20" below existing grade		
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	21.34 cm	24.38 cm	24.38 cm
H - DEPTH OF H20 IN HOLE	0 cm	0 cm	0 cm
Coefficient A	Too Fast to Measure	Too Fast to Measure	Too Fast to Measure

Table 1.

Sample Set 1 Coefficient A =			**#N/A**						
48.00		0.5	0.008333	105		604800		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A
Sample Set 2 Coefficient A =			**#N/A**						
48.00		0.5	0.008333	105		604800		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A
Sample Set 3 Coefficient A =			**#N/A**						
48.00		0.5	0.008333	105		604800		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
0.00		0.5	0.008333	105		0		#N/A	#N/A
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A

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Amoozemeter Field Data Sheet

DATE: April 13th, 2023	Project: 20025-00 Unitil Utility Scale PV		
LOCATION: 24 Towle Road, Kingston, NH 03848	AIR TEMPERATURE:	86°F	
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cpd (NRCS)	NOTES:		
HORIZON: B-Horizon (Native Material)	Test conducted at 12" below existing grade		
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	24.38 cm	24.38 cm	24.38 cm
H - DEPTH OF H20 IN HOLE	18.29 cm	18.29 cm	18.29 cm
Coefficient A	.000691	.000691	.000691

Table 1.

Sample Set 1	**Coefficient A =**		**0.000691**						
0.60		0.5	0.008333	105		7560		5.22571	2.05736644
0.80		0.5	0.008333	105		10080		6.96761	2.74315525
0.60		0.5	0.008333	105		7560		5.22571	2.05736644
0.70		0.5	0.008333	105		8820		6.09666	2.40026085
0.60		0.5	0.008333	105		7560		5.22571	2.05736644
							Average	**5.74828**	**2.26310**
							Stand Dev	0.779002966	0.30669408
Sample Set 2	**Coefficient A =**		**0.000691**						
0.80		0.5	0.008333	105		10080		6.96761	2.74315525
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
1.10		0.5	0.008333	105		13860		9.58047	3.77183847
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
1.10		0.5	0.008333	105		13860		9.58047	3.77183847
							Average	**8.70952**	**3.42894**
							Stand Dev	1.06669	0.41995817
Sample Set 3	**Coefficient A =**		**0.000691**						
1.20		0.5	0.008333	105		15120		10.45142	4.11473288
1.10		0.5	0.008333	105		13860		9.58047	3.77183847
0.90		0.5	0.008333	105		11340		7.83857	3.08604966
1.20		0.5	0.008333	105		15120		10.45142	4.11473288
1.20		0.5	0.008333	105		15120		10.45142	4.11473288
							Average	**9.75466**	**3.84042**
							Stand Dev	1.135582205	0.44707961

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Amoozemeter Field Data Sheet

DATE: April 13th, 2023		Project: 20025-00 Unitil Utility Scale PV	
LOCATION: 24 Towle Road, Kingston, NH 03848		AIR TEMPERATURE:	86°F
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cnr (NRCS)		NOTES:	
HORIZON: B-Horizon (Native Material)		Test conducted at 16" below existing grade	
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	24.38 cm	24.38 cm	24.38 cm
H - DEPTH OF H20 IN HOLE	18.29 cm	0 cm	0 cm
Coefficient A	.000691	Too Fast To Measure	Too Fast To Measure

Table 1.

Sample Set 1 Coefficient A =			**0.000691**						
13.50		0.5	0.008333	105		170100		117.57849	46.2907449
10.00		0.5	0.008333	105		126000		87.09518	34.2894407
9.00		0.5	0.008333	105		113400		78.38566	30.8604966
6.50		0.5	0.008333	105		81900		56.61187	22.2881364
8.30		0.5	0.008333	105		104580		72.28900	28.4602358
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A
Sample Set 2 Coefficient A =			**0.000000**						
48.00		0.5	0.008333	105		604800		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A
Sample Set 3 Coefficient A =			**0.000000**						
48.00		0.5	0.008333	105		604800		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
0.00		0.5	0.008333	105		0		0.00000	0
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A

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Amoozemeter Field Data Sheet

DATE: April 13th, 2023		Project: 20025-00 Unitil Utility Scale PV	
LOCATION: 24 Towle Road, Kingston, NH 03848		AIR TEMPERATURE:	86°F
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cnr (NRCS)		NOTES:	
HORIZON: B-Horizon (Native Material)		Test conducted at 18" below existing grade	
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	33.53 cm	33.53 cm	33.53 cm
H - DEPTH OF H20 IN HOLE	30.48 cm	30.48 cm	30.48 cm
Coefficient A	.000325	.000325	.000325

Table 1.

Sample Set 1	**Coefficient A =**		**0.000325**						
5.30		0.5	0.008333	105		66780		21.69307	8.54058064
7.70		0.5	0.008333	105		97020		31.51635	12.4080134
6.00		0.5	0.008333	105		75600		24.55820	9.66858186
4.00		0.5	0.008333	105		50400		16.37213	6.44572124
5.00		0.5	0.008333	105		63000		20.46516	8.05715155
							Average	**22.92098**	**9.02401**
							Stand Dev	5.634428236	2.21827883
Sample Set 2	**Coefficient A =**		**0.000325**						
3.90		0.5	0.008333	105		49140		15.96283	6.28457821
5.60		0.5	0.008333	105		70560		22.92098	9.02400973
4.80		0.5	0.008333	105		60480		19.64656	7.73486549
5.60		0.5	0.008333	105		70560		22.92098	9.02400973
3.80		0.5	0.008333	105		47880		15.55353	6.12343518
							Average	**19.40098**	**7.63818**
							Stand Dev	3.58695	1.41218677
Sample Set 3	**Coefficient A =**		**0.000325**						
2.80		0.5	0.008333	105		35280		11.46049	4.51200487
3.70		0.5	0.008333	105		46620		15.14422	5.96229214
3.10		0.5	0.008333	105		39060		12.68840	4.99543396
3.20		0.5	0.008333	105		40320		13.09771	5.15657699
2.80		0.5	0.008333	105		35280		11.46049	4.51200487
							Average	**12.77026**	**5.02766**
							Stand Dev	1.514975216	0.59644694

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Amoozemeter Field Data Sheet

DATE: April 18th, 2023		Project: 20025-00 Unitil Utility Scale PV	
LOCATION: 24 Towle Road, Kingston, NH 03848		AIR TEMPERATURE:	65°F
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 2w81l (NRCS)		NOTES:	
HORIZON: A-Horizon (Native Material)		Test conducted at grade	
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	30.48 cm	30.48 cm	30.48 cm
H - DEPTH OF H20 IN HOLE	24.38 cm	18.29 cm	18.29 cm
Coefficient A	.000454	.000691	.000691

Table 1.

Sample Set 1	**Coefficient A =**		**0.000454**						
3.00		0.5	0.008333	105		37800		17.17765	6.76285305
2.50		0.5	0.008333	105		31500		14.31471	5.63571088
1.80		0.5	0.008333	105		22680		10.30659	4.05771183
2.80		0.5	0.008333	105		35280		16.03247	6.31199618
2.40		0.5	0.008333	105		30240		13.74212	5.41028244
							Average	**14.31471**	**5.63571**
							Stand Dev	3.45139793	1.35881808
Sample Set 2	**Coefficient A =**		**0.000691**						
0.90		0.5	0.008333	105		11340		7.83857	3.08604966
0.80		0.5	0.008333	105		10080		6.96761	2.74315525
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
0.90		0.5	0.008333	105		11340		7.83857	3.08604966
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
							Average	**8.01276**	**3.15463**
							Stand Dev	0.00000	0
Sample Set 3	**Coefficient A =**		**0.000691**						
1.40		0.5	0.008333	105		17640		12.19333	4.80052169
1.20		0.5	0.008333	105		15120		10.45142	4.11473288
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
0.80		0.5	0.008333	105		10080		6.96761	2.74315525
1.20		0.5	0.008333	105		15120		10.45142	4.11473288
							Average	**9.75466**	**3.84042**
							Stand Dev	1.986075662	0.78191955

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Amoozemeter Field Data Sheet

DATE: April 18th, 2023		Project: 20025-00 Unitil Utility Scale PV	
LOCATION: 24 Towle Road, Kingston, NH 03848		AIR TEMPERATURE:	65°F
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 2w81l (NRCS)		NOTES:	
HORIZON: O-Horizon (Native Material)		Test was not conducted due to the elevation of the observed water table (6 inches below grade).	
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	N/A	N/A	N/A
H - DEPTH OF H20 IN HOLE	N/A	N/A	N/A
Coefficient A	N/A	N/A	N/A

Table 1.

Sample Set 1	**Coefficient A =**		**#N/A**						
48.00		0.5	0.008333	106		610560		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
							Average	**Observed @ 6" Below Grade**	
							Stand Dev	N/A	N/A
Sample Set 2	**Coefficient A =**		**#N/A**						
48.00		0.5	0.008333	106		610560		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
							Average	**Observed @ 6" Below Grade**	
							Stand Dev	N/A	N/A
Sample Set 3	**Coefficient A =**		**#N/A**						
48.00		0.5	0.008333	106		610560		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
							Average	**Observed @ 6" Below Grade**	
							Stand Dev	N/A	N/A

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Scientists

Amoozemeter Field Data Sheet

DATE: April 13th, 2023	Project: 20025-00 Unitil Utility Scale PV		
LOCATION: 24 Towle Road, Kingston, NH 03848	AIR TEMPERATURE:	65°F	
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cpd (NRCS)	NOTES:		
HORIZON: B-Horizon (Native Material)	Test conducted at 14" below existing grade		
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	21.34 cm	24.38 cm	21.34 cm
H - DEPTH OF H20 IN HOLE	18.29 cm	18.29 cm	18.29 cm
Coefficient A	0.000691	0.000691	0.000691

Table 1.

Sample Set 1	**Coefficient A =**		**0.000691**						
1.40		0.5	0.008333	105		17640		12.19333	4.80052169
1.20		0.5	0.008333	105		15120		10.45142	4.11473288
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
1.10		0.5	0.008333	105		13860		9.58047	3.77183847
1.10		0.5	0.008333	105		13860		9.58047	3.77183847
							Average	**10.10304**	**3.97758**
							Stand Dev	1.320863793	0.52002512
Sample Set 2	**Coefficient A =**		**0.000691**						
0.90		0.5	0.008333	105		11340		7.83857	3.08604966
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
1.00		0.5	0.008333	105		12600		8.70952	3.42894407
							Average	**8.53533**	**3.36037**
							Stand Dev	0.38950	0.15334704
Sample Set 3	**Coefficient A =**		**0.000691**						
0.80		0.5	0.008333	105		10080		6.96761	2.74315525
0.70		0.5	0.008333	105		8820		6.09666	2.40026085
0.90		0.5	0.008333	105		11340		7.83857	3.08604966
0.80		0.5	0.008333	105		10080		6.96761	2.74315525
0.90		0.5	0.008333	105		11340		7.83857	3.08604966
							Average	**7.14180**	**2.81173**
							Stand Dev	0.72869055	0.28688604

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Amoozemeter Field Data Sheet

DATE: April 13th, 2023	Project: 20025-00 Unitil Utility Scale PV		
LOCATION: 24 Towle Road, Kingston, NH 03848	AIR TEMPERATURE:	65°F	
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cpd (NRCS)	NOTES:		
HORIZON: B-Horizon (Native Material)	Test conducted at 13" below existing grade		
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	21.34 cm	21.34 cm	21.34 cm
H - DEPTH OF H20 IN HOLE	18.29 cm	18.29 cm	18.29 cm
Coefficient A	0.000691	0.000691	0.000691

Table 1.

Sample Set 1 Coefficient A =			**0.000691**						
0.50		0.5	0.008333	105		6300		4.35476	1.71447203
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
							Average	**3.65800**	**1.44016**
							Stand Dev	0.389501483	0.15334704
Sample Set 2 Coefficient A =			**0.000000**						
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
0.50		0.5	0.008333	105		6300		4.35476	1.71447203
0.40		0.5	0.008333	105		5040		3.48381	1.37157763
							Average	**3.65800**	**1.44016**
							Stand Dev	0.38950	0.15334704
Sample Set 3 Coefficient A =			**0.000691**						
0.20		0.5	0.008333	105		2520		1.74190	0.68578881
0.30		0.5	0.008333	105		3780		2.61286	1.02868322
0.60		0.5	0.008333	105		7560		5.22571	2.05736644
0.60		0.5	0.008333	105		7560		5.22571	2.05736644
0.60		0.5	0.008333	105		7560		5.22571	2.05736644
							Average	**4.00638**	**1.57731**
							Stand Dev	1.697797602	0.66842425

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Amoozemeter Field Data Sheet

DATE: April 13th, 2023		Project: 20025-00 Unitil Utility Scale PV	
LOCATION: 24 Towle Road, Kingston, NH 03848		AIR TEMPERATURE:	86°F
TEST BY: Paul H. O'Hanlon			
SOIL MAP Symbol: 9cpd (NRCS)		NOTES:	
HORIZON: B-Horizon (Native Material)		Test conducted at 12" below existing grade	
DISTURBED SITE: N/A Site in Native Condition			
SOIL LOG RECORDED: Natural Soils on Site			

SETUP CALCULATIONS	Sample Round 1		
D- Bottom of Hole to Ref line	21.34 cm	21.34 cm	21.34 cm
H - DEPTH OF H20 IN HOLE	0 cm	0 cm	0 cm
Coefficient A	Too Fast to Measure	Too Fast to Measure	Too Fast to Measure

Table 1.

Sample Set 1 Coefficient A =			**#N/A**						
48.00		0.5	0.008333	106		610560		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
0.00		0.5	0.008333	106		0		#N/A	#N/A
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A
Sample Set 2 Coefficient A =			**0.000000**						
48.00		0.5	0.008333	106		610560		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A
Sample Set 3 Coefficient A =			**0.000000**						
48.00		0.5	0.008333	106		610560		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
0.00		0.5	0.008333	106		0		0.00000	0
							Average	**Too Fast To Measure**	
							Stand Dev	N/A	N/A

NOTES

1. SEE GRADING NOTES ON SHEET C-02.
2. SEE UTILITY NOTES ON SHEET C-02.

INV.IN=172.0
40 LF. 12" RCP S=0.010 FT/FT
INV.OUT=171.6
OUTFALL TO CONNECT TO SITE STORMWATER SYSTEM
VEGETATED BUFFER STORMWATER TREATMENT AREA
TOWLE ROAD
TP-#1
IT-#1
TP-#2
IT-#2
APPROX. LIMITS OF WORK (TYP.)
79,495± S.F. OF 75' WETLAND BUFFER IMPACT
75' WETLAND BUFFER
175.0
174.5
196.4
196.5
3818/15
NE 119 138/9
MATCHLINE

HORIZONTAL SCALE 1"=60'
60 30 0 60

DIG SAFE
CALL BEFORE YOU DIG
CONTACT DIG SAFE 72 BUSINESS HOURS PRIOR TO CONSTRUCTION

REV	DATE	DESCRIPTION	DR	CK

Unitil

SITE DEVELOPMENT PLANS

TAX MAP R12 LOTS 25 & 26

GRADING, DRAINAGE & UTILITY PLAN

UNITIL KINGSTON SOLAR PROJECT
14 & 24 TOWLE ROAD
KINGSTON, NH 03848

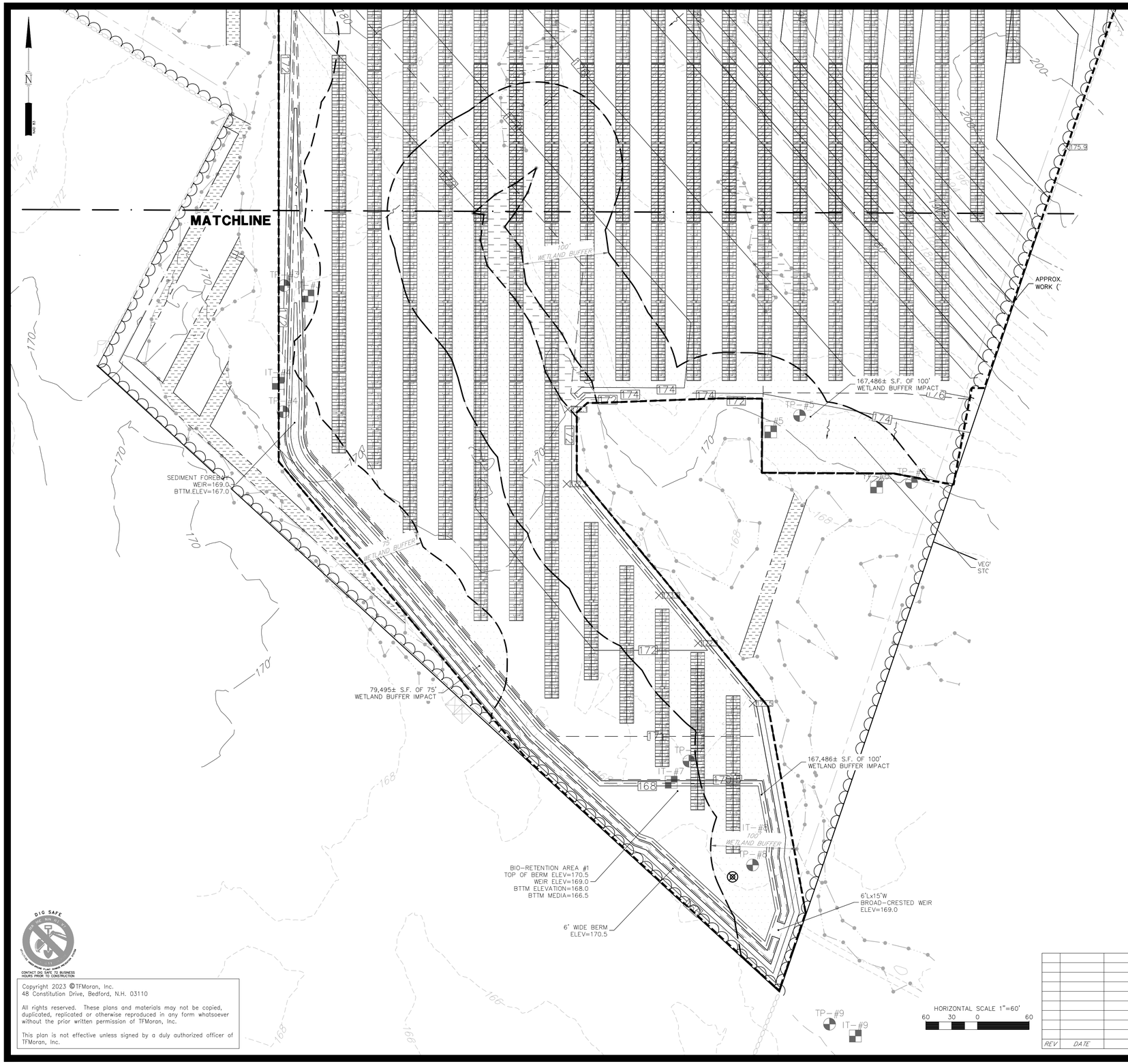
PREPARED FOR
UNITIL ENERGY SYSTEMS
30 ENERGY WAY
EXETER, NH 03833

SCALE: 1"=60' **JULY 6, 2023**

TFM
Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Scientists

48 Constitution Drive
Bedford, NH 03110
Phone (603) 472-4488
Fax (603) 472-9747
www.tfmoran.com

FILE	DR	JB	FB	–	
20025-00	CK	NG	CADFILE	20025-00 DESIGN_LAYOUT	C-09



NOTES

1. SEE GRADING NOTES ON SHEET C-02.
2. SEE UTILITY NOTES ON SHEET C-02.

SOIL LEGEND (PER SITE SPECIFIC SOIL SURVEY)		
SYMBOL	DESCRIPTION	HYDROLOGIC SOIL GROUP
42	CANTON WELL DRAINED	B
448	SCITUATE MODERATELY WELL DRAINED	C
921	NEWFIELDS SOMEWHAT POORLY DRAINED	B
546B/P	WALPPOLE POORLY DRAINED	C
115/VP	SCARBORO VERY POORLY DRAINED	D

Unitil

SITE DEVELOPMENT PLANS

TAX MAP R12 LOTS 25 & 26

GRADING, DRAINAGE & UTILITY PLAN

UNITIL KINGSTON SOLAR PROJECT

14 & 24 TOWLE ROAD
KINGSTON, NH 03848

PREPARED FOR

UNITIL ENERGY SYSTEMS
30 ENERGY WAY
EXETER, NH 03833

SCALE: 1"=60' **JULY 6, 2023**

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CALL NH 811
CONTACT DIG SAFE 72 BUSINESS HOURS PRIOR TO CONSTRUCTION

REV	DATE	DESCRIPTION	DR	CK

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FILE	DR	JB	FB	–	
20025-00	CK	NG	CADFILE	20025-00 DESIGN_LAYOUT	C-10

PART 8

Inspection & Maintenance Manual

Unitil Kingston Solar Project
Tax Map R12, Lots 25 & 26
14 & 24 Towle Road, Kingston, NH 03848
July 6, 2023
Revised: September 1, 2023

Table of Contents

Description of Project

The proposed project is to construct a utility scale photovoltaic generating (PV) facility along with associated amenities such as a gravel access drive, storage for equipment, a fence line, and stormwater management. The proposed area of work is located to at 14 & 24 Towle Road, west of the existing Eversource Peaslee and Unitil Kingston Substations within the Rural Residential District.

The site is wooded and undeveloped, except for signs of prior logging operations. The existing topography property consists of approximately 30 feet of grade change (200 feet to 170 feet), descending from the adjacent utility corridor in the northeast to the wetland complex in the southern portions of the property. Access to the parcel is via the class IV portion of Towle Road. Photos of existing features can be found in Section 2 of this Report.

The placement of the solar array was arranged to mitigate impacts on the valuable wetland located on the southern end of the site. The stormwater system was also designed to compensate for the three impacted wetlands.

Proposed and existing open and closed drainage systems will convey, attenuate, and provide treatment/groundwater recharge of stormwater associated with the development. The majority of the site will drain to the southeast of the site though one (1) proposed Bio-Retention Area, while the northwest and southeast portions of the on the site will discharge though two (2) Vegetated Buffer Areas.

All vegetation within limits of solar facility (within fencing) shall be maintain 85% coverage of vegetation in good condition and repair areas of erosion.

.

Responsible Party

Owner: Unitil Energy Systems, Inc. (c/o Jacob Dusling, P.E,)*

Address: 30 Energy Way, Exeter, NH 03833

Phone: (603) 773-6529

Email: dusling@unitil.com

*Responsibility shall be conveyed to any future owners, heirs, or assigns

Stormwater Practices – Schedule of Maintenance

The following practices shall be inspected twice annually, once following snowmelt (spring), and once following leaf-drop (fall):

- Bio-retention Area
- Sediment Forebays
- Vegetative Buffer

The following practices shall be inspected annually following snowmelt (spring):

- Grass Swale

Stormwater Practices – Maintenance Guidelines

Treatment Practices

(Inspected twice a year)

Bio-retention Area

Maintenance Requirements:

- Systems should be inspected at least twice a year, and following any rainfall event exceeding 2.5 inches in a 24-hour period, with maintenance or rehabilitation conducted as warranted by such inspection
- Pretreatment measures should be inspected at least twice annually, and cleaned of accumulated sediment as warranted by inspection, but no less than once annually.
- Trash and debris should be removed at each inspection.
- At least once annually, the system should be inspected for drawdown time. If a bio-retention system does not drain within 72-hours following a rainfall event, then a qualified professional should assess the condition of the facility to determine measures required to restore filtration function or infiltration function (as applicable), including but not limited to removal of accumulated sediments or reconstruction of the filter media.
- Vegetation should be inspected at least annually, and maintained in healthy condition, including pruning, removal, and replacement of dead or diseased vegetation, and removal of invasive species.

Vegetated Buffer (for a Small Pervious Area)

Maintenance Requirements:

- Inspect buffer at least annually for signs of erosion, sediment buildup, • or vegetation loss.
- If a meadow buffer, provide periodic mowing as needed to maintain a • healthy stand of herbaceous vegetation.
- If a forested buffer, then the buffer should be maintained in an • undisturbed condition, unless erosion occurs.
- If erosion of the buffer (forested or meadow) occurs, eroded areas • should be repaired and replanted with vegetation similar to the remaining buffer. Corrective action should include eliminating the source of the erosion problem and may require retrofit with a level spreader.
- Remove debris and accumulated sediment, based on inspection.

Pretreatment Practices

(Inspected twice a year)

Sediment Forebay

Maintenance Requirements:

- To be inspected at least twice annually, once following snowmelt, and once following leaf-drop and cleaned as indicated by inspection;
- Conduct periodic mowing of embankments (two times per year) to control grown of woody vegetation on embankments;
- Remove debris from outlet structure;
- Remove and dispose of accumulated sediment; and
- Install and maintain a staff gage or other measuring device to indicate depth of sediment accumulation and level at which clean-out is required. It shall be cleaned out when sediment fills half the sump depth (minimum sump depth is 2 feet when clear).

Conveyance Practices
(Inspections As Noted)

Grass Swale
Maintenance Requirements:

- Grassed channels should be inspected annually for sediment accumulation, erosion, and condition of surface lining.
- Repairs, including vegetation replacement, should be made based on inspection.
- Remove sediment and debris annually, or more frequently as warranted by inspection.
- Mow vegetated channels at least once a year to control establishment of woody vegetation. It is recommended to cut grass no shorter than 4 inches.

System Components
Invasive Species
Maintenance Requirements:

- If any invasive species grow on-site, they shall be killed using spray herbicide
- Responsible Party should contact a local nursery to determine the best alternative for removing the invasive species.

Control of Invasive Plans
During maintenance activities, check for the presence of invasive plants. If invasive plants are found, they shall be controlled and removed in a safe manner as described on the following pages.

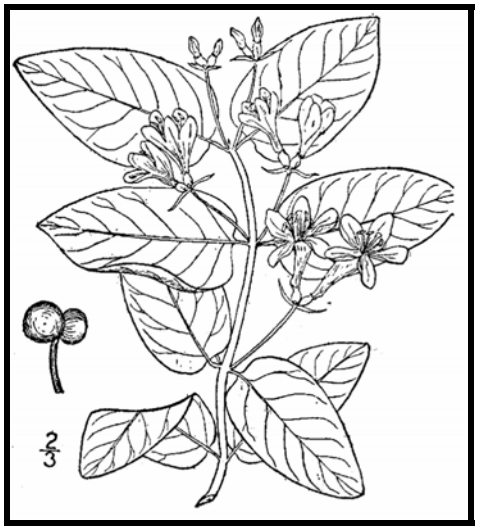
Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control or food crops. They also can arrive as “hitchhikers” among shipments of other plants, seeds, packing materials or fresh produce. Invasive plants can cause harm by:

- Becoming weedy and overgrown;
- Killing established shade trees;
- Obstructing pipes and drainage systems
- Forming dense beds in water
- Lowering water levels in lakes, streams, and wetlands
- Destroying natural communities
- Promoting erosion on stream banks and hillsides
- Resisting control except by hazardous chemicals.

UNIVERSITY of NEW HAMPSHIRE COOPERATIVE EXTENSION

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle
Lonicera tatarica
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

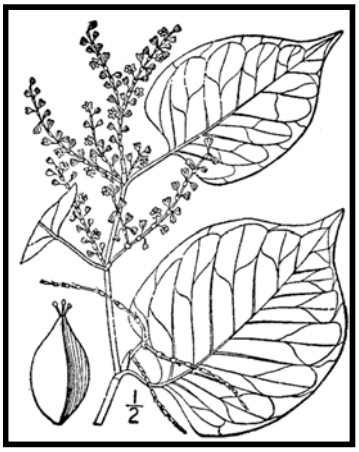
Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag "head first" at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.



Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.

Be diligent looking for seedlings for *years* in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

<table>
<tr><th>Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">Norway maple
(Acer platanoides)
European barberry
(Berberis vulgaris)
Japanese barberry
(Berberis thunbergii)
autumn olive
(Elaeagnus umbellata)
burning bush
(Euonymus alatus)
Morrow's honeysuckle
(Lonicera morrowii)
Tatarian honeysuckle
(Lonicera tatarica)
showy bush honeysuckle
(Lonicera x bella)
common buckthorn
(Rhamnus cathartica)
glossy buckthorn
(Frangula alnus)</td><td rowspan="2">Fruit and Seeds
  </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Use as firewood.
▪ Make a brush pile.
▪ Chip.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip once all fruit has dropped from branches.
▪ Leave resulting chips on site and monitor.</td></tr>
<tr><td rowspan="2">oriental bittersweet
(Celastrus orbiculatus)
multiflora rose
(Rosa multiflora)</td><td rowspan="2">Fruits, Seeds, Plant Fragments
  </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Make a brush pile.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.</td></tr>
</table>

<table>
<tr><th>Non-Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">garlic mustard
(Alliaria petiolata)
spotted knapweed
(Centaurea maculosa)
▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling.
black swallow-wort
(Cynanchum nigrum)
▪ May cause skin rash. Wear gloves and long sleeves when handling.
pale swallow-wort
(Cynanchum rossicum)
giant hogweed
(Heracleum mantegazzianum)
▪ Can cause major skin rash. Wear gloves and long sleeves when handling.
dame’s rocket
(Hesperis matronalis)
perennial pepperweed
(Lepidium latifolium)
purple loosestrife
(Lythrum salicaria)
Japanese stilt grass
(Microstegium vimineum)
mile-a-minute weed
(Polygonum perfoliatum)</td><td rowspan="2">Fruits and Seeds
  </td><td>Prior to flowering
Depends on scale of infestation
Small infestation
▪ Pull or cut plant and leave on site with roots exposed.

Large infestation
▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting).
▪ Monitor. Remove any re-sprouting material.</td></tr>
<tr><td>During and following flowering
Do nothing until the following year or remove flowering heads and bag and let rot.

Small infestation
▪ Pull or cut plant and leave on site with roots exposed.

Large infestation
▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting).
▪ Monitor. Remove any re-sprouting material.</td></tr>
<tr><td>common reed
(Phragmites australis)
Japanese knotweed
(Polygonum cuspidatum)
Bohemian knotweed
(Polygonum x bohemicum)</td><td>Fruits, Seeds, Plant Fragments
Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn’t materially influence disposal activities.</td><td>Small infestation
▪ Bag all plant material and let rot.
▪ Never pile and use resulting material as compost.
▪ Burn.

Large infestation
▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile.
▪ Monitor and remove any sprouting material.
▪ Pile, let dry, and burn.</td></tr>
</table>

January 2010

Inspection & Maintenance Log

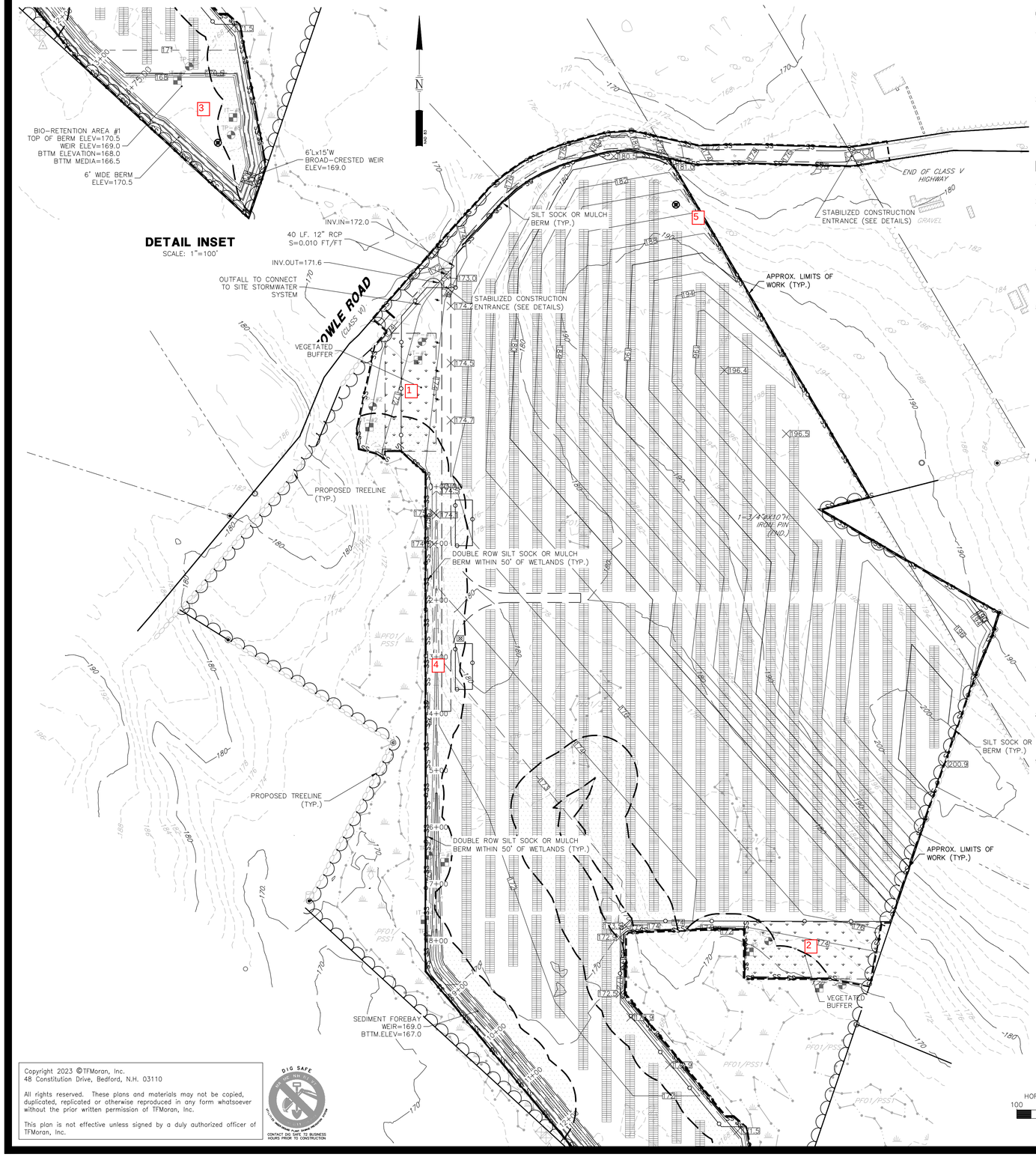
Date	Inspector	BMPs Inspected	Maintenance Required

Inspection Checklist

Date:	**Project Name:** Unitil Kingston Solar Project Kingston, NH
Inspector's Name/Title:	
Inspector's Contact Information:	
☐ 1st Yearly Inspection ☐ 2nd Yearly Inspection	BMP's to be inspected: All BMP's to be inspected: Treatment and Pretreatment Practices

BMP* Refer to following Inspection & Maintenance Plan for BMP location		Maintenance Required	Corrective Action Needed and Notes
1	NW Vegetated Buffer Area	☐ Yes ☐ No	
2	SE Vegetated Buffer Area	☐ Yes ☐ No	
3	Bio-Retention Area	☐ Yes ☐ No	
4	Grass Lined Swale	☐ Yes ☐ No	
5	Grass Lined Swale	☐ Yes ☐ No	
6		☐ Yes ☐ No	
7		☐ Yes ☐ No	
8		☐ Yes ☐ No	
9		☐ Yes ☐ No	
10		☐ Yes ☐ No	
11		☐ Yes ☐ No	
12		☐ Yes ☐ No	

*Best Management Practices
** Photographs of BMPs shall be included as part of the required Inspections
***Copies of Inspection & Maintenance Records shall be provided to NHDES AoT Bureau upon request



CONSTRUCTION GENERAL PERMIT

1. THE OWNER, IN CONJUNCTION WITH THE CONTRACTOR (OPERATORS), MUST OBTAIN A CONSTRUCTION GENERAL PERMIT (CGP) FOR LARGE CONSTRUCTION ACTIVITIES (FIVE OR MORE ACRES) OR SMALL CONSTRUCTION ACTIVITIES (GREATER THAN ONE ACRE BUT LESS THAN FIVE ACRES) FROM THE ENVIRONMENTAL PROTECTION AGENCY (EPA). AS PART OF THE CGP, A STORMWATER NOTICE OF INTENT (NOI) MUST BE SUBMITTED TO THE EPA AT LEAST 7 DAYS PRIOR TO COMMENCING CONSTRUCTION. THE NOI MUST BE SUBMITTED TO STORM WATER NOTICE OF INTENT (4203M), USEPA, 1200 PENNSYLVANIA AVE. NW, WASHINGTON, DC 20460.

2. THE CGP OUTLINES A SET OF PROVISIONS MANDATING THE OWNER AND CONTRACTOR TO COMPLY WITH THE REQUIREMENTS OF THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM (NPDES) STORM WATER REGULATIONS, INCLUDING, BUT NOT LIMITED TO, STORM WATER POLLUTION PREVENTION PLANS (SWPPP'S), IMPLEMENTATION OF EROSION AND SEDIMENTATION CONTROLS, EQUIPMENT MAINTENANCE GUIDELINES, ETC. PLEASE CONTACT USEPA OFFICE OF WASTEWATER MANAGEMENT AT 202-564-9545 OR AT WWW.EPA.GOV/NPDES/STORMWATER FOR ADDITIONAL INFORMATION. FOR FURTHER ASSISTANCE, CONTACT ABBY SWAINE OF NEW ENGLAND'S EPA REGION 1 AT 617-918-1841.

NOTES

1. IT IS BEING PROPOSED TO CONSTRUCT A SOLAR FACILITY ON THE SUBJECT PARCEL.

2. TOTAL SITE AREA: 35.6± AC
   TOTAL AREA OF DISTURBANCE: 29.3± AC

3. SOILS SHOWN ARE FROM THE SOIL SURVEY OF ROCKINGHAM COUNTY, NH, EASTERN PART, PREPARED BY USDA-SOIL CONSERVATION SERVICES.
   - 43B – CANTON FINE SANDY LOAM, 0-8% SLOPES, VERY STONY
   - 447B – SCITUATE-NEWFIELDS COMPLEX, 3-8% SLOPES, VERY STONY
   - 63B – WALPOLE VERY FINE SANDY LOAM, 3-8% SLOPES, VERY STONY

4. STORM WATER DRAINAGE SYSTEM IS SHOWN ON THE PLAN. SEE GRADING & DRAINAGE PLAN FOR RIM, INVERT, PIPE LENGTH, AND SLOPE INFORMATION.
   POST-CONSTRUCTION RUNOFF COEFFICIENT: C=0.31
   IMPERVIOUS SURFACE AREA: 0.59± AC

5. STABILIZATION PRACTICES FOR EROSION AND SEDIMENTATION CONTROLS:

   TEMPORARY STABILIZATION – TOPSOIL STOCKPILES AND DISTURBED AREAS OF THE CONSTRUCTION SITE THAT WILL NOT BE REDISTURBED FOR 14 DAYS OR MORE MUST BE STABILIZED BY THE 14TH DAY AFTER THE LAST DISTURBANCE. THE TEMPORARY SEED SHALL BE ANNUAL RYE APPLIED AT THE RATE OF 1.1 LBS PER 1,000 SF. PRIOR TO SEEDING, A MINIMUM OF 2 TONS PER ACRE OF AGRICULTURAL LIMESTONE AND 500 LBS PER ACRE OF 10-20-20 FERTILIZER SHALL BE APPLIED. AFTER SEEDING, EACH AREA SHALL BE MULCHED WITH 1.5 TONS PER ACRE OF HAY MULCH. MULCH TO BE ANCHORED IN PLACE WHERE NECESSARY. AREAS OF THE SITE THAT WILL BE PAVED WILL BE TEMPORARILY STABILIZED BY APPLYING GEOTEXTILES AND A STONE SUB-BASE UNTIL BITUMINOUS PAVEMENT CAN BE APPLIED. CALCIUM CHLORIDE SHALL BE USED FOR DUST CONTROL IF NEEDED.

   PERMANENT STABILIZATION – DISTURBED PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES PERMANENTLY CEASES SHALL BE STABILIZED WITH PERMANENT SEED NO LATER THAN 3 DAYS AFTER THE LAST CONSTRUCTION ACTIVITY. THE PERMANENT SEED MIX SHALL CONSIST OF 0.45 LBS/1,000 SF TALL FESCUE, 0.20 LBS/1,000 SF CREEPING RED FESCUE, AND 0.20 LBS/1,000 SF BIRDSFOOT TREFOIL. PRIOR TO SEEDING, A MINIMUM OF 2 TONS PER ACRE OF AGRICULTURAL LIMESTONE AND 500 LBS PER ACRE IF 10-20-20 FERTILIZER SHALL BE APPLIED. AFTER SEEDING, EACH AREA SHALL BE MULCHED WITH 1.5 TONS PER ACRE OF HAY MULCH. MULCH TO BE ANCHORED IN PLACE WHERE NECESSARY.

6. STRUCTURAL PRACTICES FOR EROSION AND SEDIMENTATION CONTROL

   SILT SOCK – WILL BE CONSTRUCTED AROUND THE PERIMETER OF THE DISTURBED AREAS AND WILL DELINEATE THE LIMITS OF WORK FOR THE PROPOSED CONSTRUCTION. THE SILT SOCK WILL BE INSTALLED BY OTHERS. POSTS SHALL BE USED WITH AT LEAST 6" OF THE POST BURIED BELOW THE GROUND SURFACE TO PREVENT THE SILT SOCK FROM FORMING GAPS NEAR THE GROUND SURFACE. RUNOFF WILL FLOW THROUGH THE OPENINGS IN THE SILT SOCK WHILE RETAINING THE SEDIMENT WITHIN THE CONSTRUCTION AREA.

   STABILIZED CONSTRUCTION ENTRANCE – WILL BE INSTALLED IN ACCORDANCE WITH THE DETAIL AT THE ENTRANCE TO THE CONSTRUCTION SITE TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS OFF THE SITE. THE STABILIZED ENTRANCE WILL BE 20'-WIDE AND FLARE AT THE ENTRANCE TO THE PAVED ROAD AND HAVE A DEPTH OF 12" OF STONE. THE STABILIZED ENTRANCE SHALL BE MAINTAINED UNTIL THE REMAINDER OF THE CONSTRUCTION SITE HAS BEEN FULLY STABILIZED. THE PAVED STREET ADJACENT TO THE SITE SHALL BE SWEPT ON A WEEKLY BASIS TO REMOVE EXCESS MUD AND DIRT FROM BEING TRACKED FROM THE SITE. TRUCKS HAULING MATERIAL TO AND/OR FROM THE SITE SHALL BE COVERED WITH A TARPAULIN.

   BLANKET SLOPE PROTECTION – SHALL BE INSTALLED ON ALL 2:1 SLOPES OR STEEPER ON SITE. ANCHOR THE TOP OF THE BLANKET BY ANCHORING THE BLANKET IN A 6" DEEP TRENCH. BACKFILL AND COMPACT TRENCH AFTER STAPLING. ROLL THE BLANKET IN THE DIRECTION OF STORM WATER FLOW. WHERE 2 OR MORE STRIPS OF BLANKET ARE REQUIRED, A MINIMUM OF 4" OF OVERLAP SHALL BE PROVIDED.

   STONE CHECK DAMS – WILL BE INSTALLED IN EXISTING AND PROPOSED GRASS SWALES TO REDUCE THE VELOCITY OF CONCENTRATED STORM WATER FLOWS AND PREVENT EROSION OF THE SWALE.

7. STORM WATER MANAGEMENT

   STORM WATER DRAINAGE FOR DEVELOPED AREAS WILL BE COLLECTED BY AN OPEN DRAINAGE SYSTEM. APPROXIMATELY 7.2± ACRES OF THE 36.5± ACRE SITE WILL REMAIN IN ITS CURRENT STATE. WHEN CONSTRUCTION IS COMPLETE THE MAJORITY OF THE SITE WILL DRAIN TO A BIO-RETENTION AREA.

8. ALL CONSTRUCTION DEBRIS AND WASTE MATERIALS SHALL BE COLLECTED AND STORED IN SECURE DUMPSTERS OR APPROVED ENCLOSURE AND REMOVED FROM THE SITE ON A WEEKLY BASIS. NO CONSTRUCTION WASTE SHALL BE BURIED ON SITE. PORTABLE TOILET SANITARY WASTE FACILITIES WILL BE PROVIDED DURING CONSTRUCTION AND MAINTAINED/DISPOSED OF ON A REGULAR BASIS IN ACCORDANCE WITH TOWN AND STATE REGULATIONS.

9. A LIST OF CONSTRUCTION ITEMS AND OTHER PRODUCTS USED ON THIS PROJECT SHALL BE KEPT ON RECORD WITH THIS PLAN ONSITE. ALL CHEMICALS, PETROLEUM PRODUCTS AND OTHER MATERIALS USED DURING CONSTRUCTION SHALL BE STORED IN A SECURE AREA, AND PRECAUTIONS USED TO PREVENT POTENTIAL SOURCES OF CONTAMINATION OR POLLUTION. ANY SPILL OF THESE TYPES OF SUBSTANCES SHALL BE CLEANED UP AND DISPOSED OF IN A LEGAL MANNER AS SPECIFIED BY STATE REGULATIONS AND THE MANUFACTURER. ANY SPILL IN AMOUNTS EQUAL TO OR EXCEEDING REPORTABLE QUANTITY AS DEFINED BY THE EPA SHALL TAKE THE FOLLOWING STEPS:
   - NOTIFY THE NATIONAL RESPONSE CENTER IMMEDIATELY AT (888) 424-8802; IN WASHINGTON, D.C., CALL (202) 426-2675.
   - WITHIN 14 DAYS, SUBMIT A WRITTEN DESCRIPTION OF THE RELEASE TO THE EPA REGIONAL OFFICE PROVIDING THE DATE AND CIRCUMSTANCES OF THE RELEASE AND THE STEPS TO BE TAKEN TO PREVENT ANOTHER RELEASE.
   - MODIFY THE POLLUTION PREVENTION PLAN TO INCLUDE THE INFORMATION LISTED ABOVE.

GOOD HOUSEKEEPING:
THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ONSITE DURING THE CONSTRUCTION PROJECT.
- AN EFFORT WILL BE MADE TO STORE ONLY ENOUGH PRODUCT REQUIRED TO DO THE JOB;
- ALL MATERIALS STORED ONSITE WILL BE STORED IN A NEAT, ORDERLY MANNER IN THEIR APPROPRIATE CONTAINERS AND, IF POSSIBLE, UNDER A ROOF OR OTHER ENCLOSURE;
- PRODUCTS WILL BE KEPT IN THEIR ORIGINAL CONTAINERS WITH THE ORIGINAL MANUFACTURER'S LABEL;
- SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER;
- WHENEVER POSSIBLE, ALL OF A PRODUCT WILL BE USED UP BEFORE DISPOSING OF THE CONTAINER;
- MANUFACTURERS' RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED;
- TRASH DUMPSTERS SHALL BE GASKETED OR HAVE A SECURE WATERTIGHT LID AND BE PLACED AWAY FROM STORMWATER CONVEYANCES AND DRAINS.
- THE SITE SUPERINTENDENT WILL INSPECT DAILY TO ENSURE PROPER USE AND DISPOSAL OF MATERIALS ONSITE.

HAZARDOUS PRODUCTS:
THESE PRACTICES ARE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS:
- PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS UNLESS THEY ARE NOT RESEALABLE;
- ORIGINAL LABELS AND MATERIAL SAFETY DATA WILL BE RETAINED; THEY CONTAIN IMPORTANT PRODUCT INFORMATION;
- IF SURPLUS PRODUCT MUST BE DISPOSED OF, MANUFACTURER'S OR LOCAL AND STATE RECOMMENDED METHODS FOR PROPER DISPOSAL WILL BE FOLLOWED.

PRODUCT SPECIFIC PRACTICES:
THE FOLLOWING PRODUCT SPECIFIC PRACTICES WILL BE FOLLOWED ON SITE:

PETROLEUM PRODUCTS:
ALL ONSITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. ANY ASPHALT SUBSTANCES USED ONSITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

FERTILIZERS:
FERTILIZERS USED WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORM WATER. STORAGE WILL BE IN A COVERED SHED. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER WILL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO AVOID SPILLS.

PAINTS:
ALL CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE. EXCESS PAINT WILL NOT BE DISCHARGED TO THE STORM SEWER BUT WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR STATE AND LOCAL REGULATIONS.

CONCRETE TRUCKS:
EXCESS CONCRETE SHALL BE USED IN AREAS DESIGNATED BY THE SITE CONTRACTOR. WASH WATER SHALL BE DISPOSED OF USING BEST MANAGEMENT PRACTICES. BUILDING CONTRACTOR IS RESPONSIBLE FOR REMOVAL OF ALL DRUM WASH WATER ASSOCIATED WITH CONCRETE FOR THE BUILDING PAD. SITE CONTRACTOR TO COORDINATE AND PROVIDE BUILDING CONTRACTOR WITH AN AREA FOR DRUM WASH WATER.

SPILL CONTROL PRACTICES:
IN ADDITION TO THE GOOD HOUSEKEEPING AND MATERIAL MANAGEMENT PRACTICES DISCUSSED IN THE PREVIOUS SECTIONS OF THIS PLAN, THE FOLLOWING PRACTICES WILL BE FOLLOWED FOR SPILL PREVENTION AND CLEANUP:
- MANUFACTURER'S RECOMMENDED METHODS FOR SPILL CLEANUP WILL BE CLEARLY POSTED AND SITE PERSONNEL WILL BE MADE AWARE OF THE PROCEDURES AND THE LOCATION OF THE INFORMATION AND CLEANUP SUPPLIES.
- MATERIALS AND EQUIPMENT NECESSARY FOR SPILL CLEANUP WILL BE KEPT IN THE MATERIAL STORAGE AREA ONSITE. EQUIPMENT AND MATERIALS WILL INCLUDE BUT NOT BE LIMITED TO BROOMS, DUST PANS, MOPS, RAGS, GLOVES, GOGGLES, KITTY LITTER, SAND, SAWDUST, AND PLASTIC AND METAL TRASH CONTAINERS SPECIFICALLY FOR THIS PURPOSE.
- ALL SPILLS WILL BE CLEANED UP IMMEDIATELY AFTER DISCOVERY.
- THE SPILL AREA WILL BE KEPT WELL VENTILATED AND PERSONNEL WILL WEAR APPROPRIATE PROTECTIVE CLOTHING TO PREVENT INJURY FROM CONTACT WITH A HAZARDOUS SUBSTANCE.
- SPILLS OF TOXIC OR HAZARDOUS MATERIAL WILL BE REPORTED TO THE APPROPRIATE STATE OR LOCAL GOVERNMENT AGENCY, REGARDLESS OF SIZE.
- THE SPILL PREVENTION PLAN WILL BE ADJUSTED TO INCLUDE MEASURES TO PREVENT THIS TYPE OF SPILL FROM REOCCURRING AND HOW TO CLEAN UP THE SPILL IF THERE IS ANOTHER ONE. A DESCRIPTION OF THE SPILL, WHAT CAUSED IT, AND THE CLEANUP MEASURES WILL ALSO BE INCLUDED.
- THE SITE SUPERINTENDENT RESPONSIBLE FOR THE DAY-TO-DAY SITE OPERATIONS, WILL BE THE SPILL PREVENTION AND CLEANUP COORDINATOR. THEY WILL DESIGNATE AT LEAST THREE OTHER SITE PERSONNEL WHO WILL EACH RECEIVE SPILL PREVENTION AND CLEANUP TRAINING. THESE INDIVIDUALS WILL EACH BECOME RESPONSIBLE FOR A PARTICULAR PHASE OF PREVENTION AND CLEANUP. THE NAMES OF RESPONSIBLE SPILL PERSONNEL WILL BE POSTED IN THE MATERIAL STORAGE AREA AND IN THE OFFICE TRAILER ONSITE.

11. THE CONTRACTOR IS RESPONSIBLE TO MAINTAIN RECORDS OF CONSTRUCTION ACTIVITIES, INCLUDING DATES OF MAJOR GRADING ACTIVITIES, DATES WHEN CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED ON A PORTION OF THE SITE, DATES WHEN WORK IS COMPLETED ON A PORTION OF THE SITE, AND DATES WHEN STABILIZATION MEASURES ARE INITIATED ONSITE.

12. THE CONTRACTOR SHALL PERFORM INSPECTIONS OR HAVE A CONSULTING ENGINEER PERFORM INSPECTIONS EVERY SEVEN (7) DAYS AND WITHIN 24 HOURS AFTER A STORM OF 0.5" OR GREATER. INSPECTIONS REPORTS ARE TO BE KEPT ON FILE AT THE SITE WITH THIS PLAN. MAINTENANCE OR MODIFICATION SHALL BE IMPLEMENTED AND ADDED TO THE PLAN AS RECOMMENDED BY THE QUALIFIED INSPECTOR.

Unitil

SITE DEVELOPMENT PLANS

TAX MAP R-11-9

STORMWATER MANAGEMENT PLAN

UNITIL KINGSTON SOLAR PROJECT

14 & 24 TOWLE ROAD
KINGSTON, NH 03848

PREPARED FOR

UNITIL ENERGY SYSTEMS
30 ENERGY WAY
EXETER, NH 03833

SCALE: 1"=100' **JULY 6, 2023**

REV	DATE	DESCRIPTION	DR	CK

TFM
Civil Engineers
Structural Engineers
Traffic Engineers
Land Surveyors
Landscape Architects
Scientists
48 Constitution Drive
Bedford, NH 03110
Phone (603) 472-4488
Fax (603) 472-9747
www.tfmoran.com

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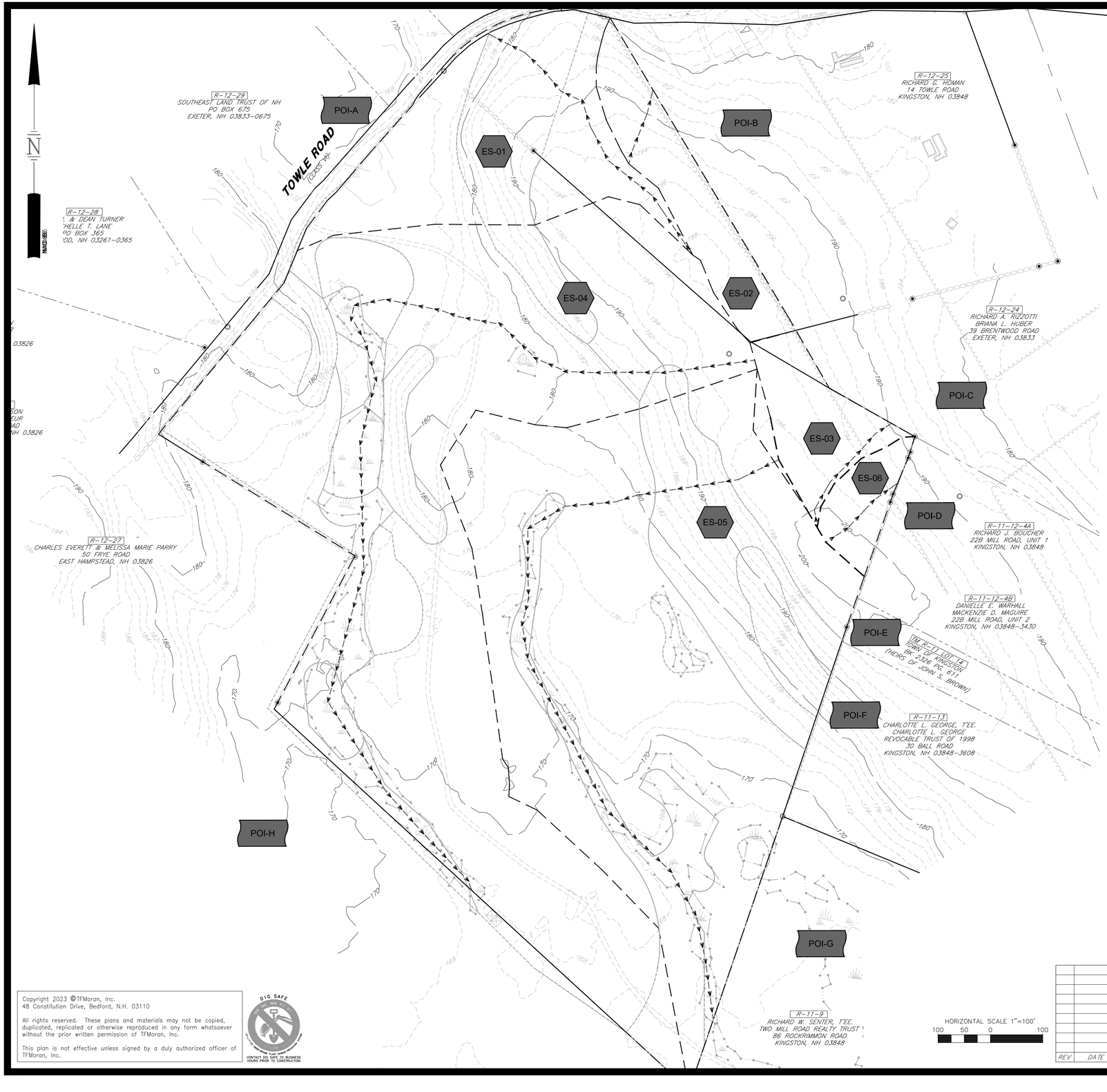
PART 9



LEGEND

- PROPERTY LINE
- LIMITS OF DRAINAGE SUBCATCHMENT
- XXX — SOIL GROUP BREAKLINE
- FLOW PATH (Tc LINE)
- REACH
- POI-1 — POINT OF INTEREST
- ES-1 — SUBCATCHMENT AREA
- EP-1 — POND, CULVERT, OR CATCH BASIN
- ER-1 — REACH

NOTES

1. THE SITE SPECIFIC SOIL MAP WAS PREPARED ON JUNE 4, 2023 BY BRUCE A. GILDAY, NH CSS NO. 012, OF BAG LAND CONSULTANTS.

SOIL PHASE LEGEND (PERCENT)

B	C	D	E
0–8%	9–15%	16–25%	>25%

SOIL LEGEND (PER SITE SPECIFIC SOIL SURVEY)

SYMBOL	DESCRIPTION	HYDROLOGIC SOIL GROUP	DRAINAGE CLASS
42	CANTON	B	WELL DRAINED
448	SCITUATE	C	MODERATELY WELL DRAINED
921	NEWFIELDS	B	SOMEWHAT POORLY DRAINED
546B/P	WALPOLE	C	POORLY DRAINED
115/VP	SCARBORO	D	VERY POORLY DRAINED

Unitil

SITE DEVELOPMENT PLANS

TAX MAP R12 LOTS 25 & 26

PRE-DEVELOPMENT DRAINAGE PLAN

UNITIL KINGSTON SOLAR PROJECT

14 & 24 TOWLE ROAD

KINGSTON, NH 03848

PREPARED FOR

UNITIL ENERGY SYSTEMS

30 ENERGY WAY

EXETER, NH 03833

SCALE: 1"=100' **JULY 7, 2023**

HORIZONTAL SCALE 1"=100'
100 50 0 100

REV	DATE	DESCRIPTION	DR	CK

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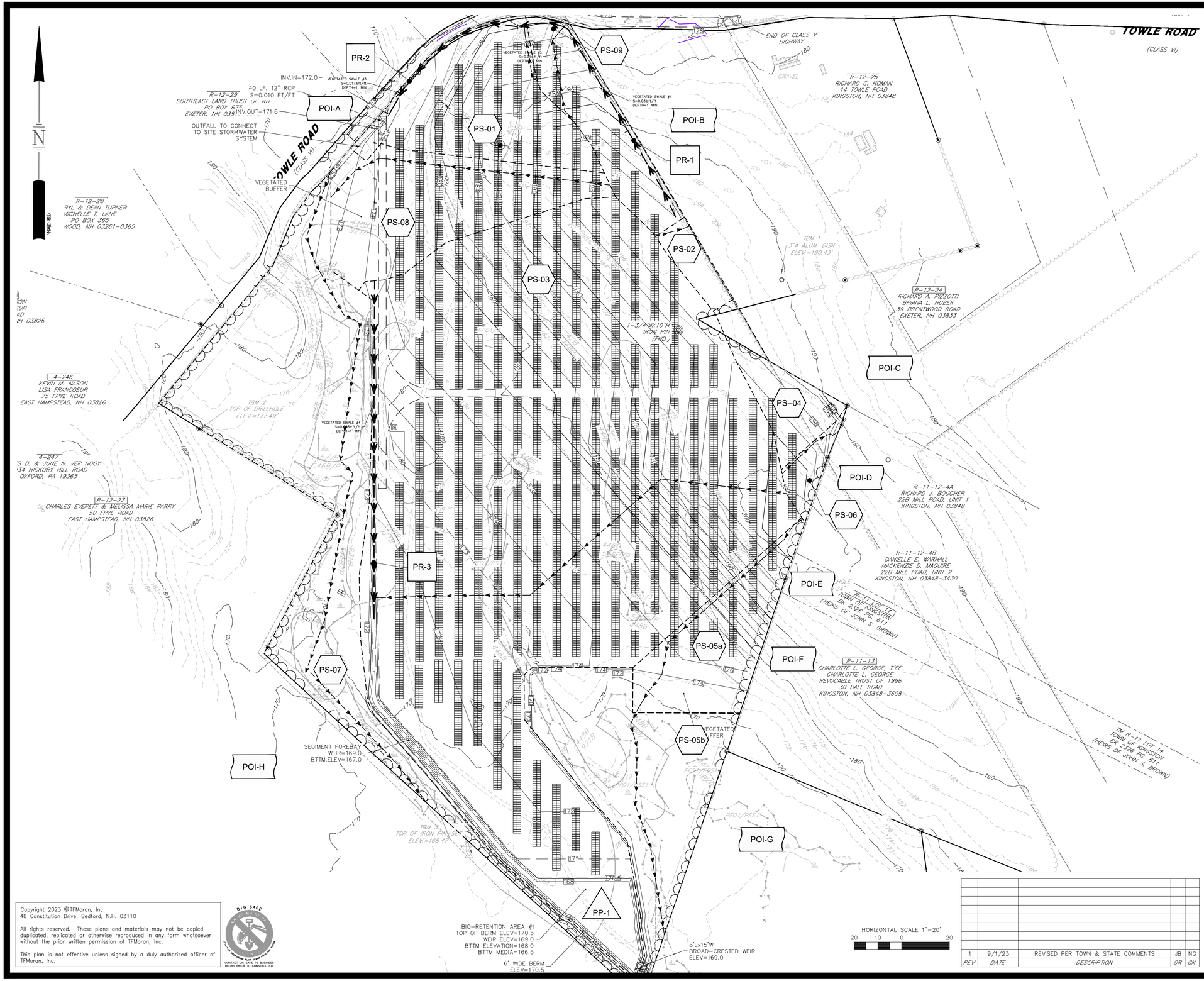

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Unitil

SITE DEVELOPMENT PLANS

TAX MAP R-11-9

POST-DEVELOPMENT DRAINAGE PLAN

UNITIL KINGSTON SOLAR PROJECT

14 & 24 TOWLE ROAD

KINGSTON, NH 03848

PREPARED FOR

UNITIL ENERGY SYSTEMS

30 ENERGY WAY

EXETER, NH 03833

SCALE: 1"=100' **JULY 6, 2023**

REV	DATE	DESCRIPTION	DR	CK
1	9/1/23	REVISED PER TOWN & STATE COMMENTS	JB	NG

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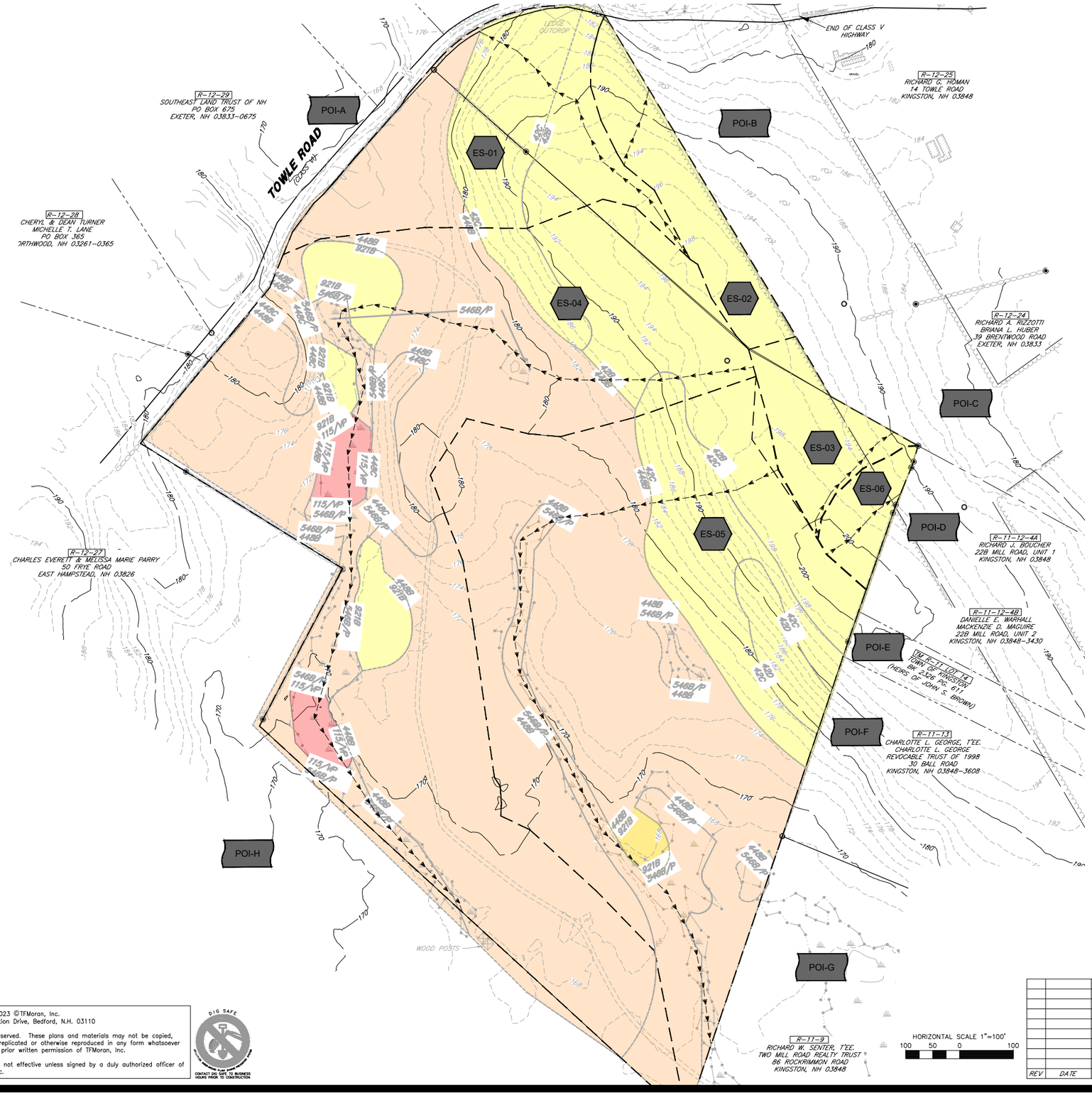

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LEGEND

- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP C
- HYDROLOGIC SOIL GROUP D
- IMPERVIOUS COVER

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Unitil

SITE DEVELOPMENT PLANS

TAX MAP R12 LOTS 25 & 26

PRE-DEVELOPMENT COLORED SOILS PLAN

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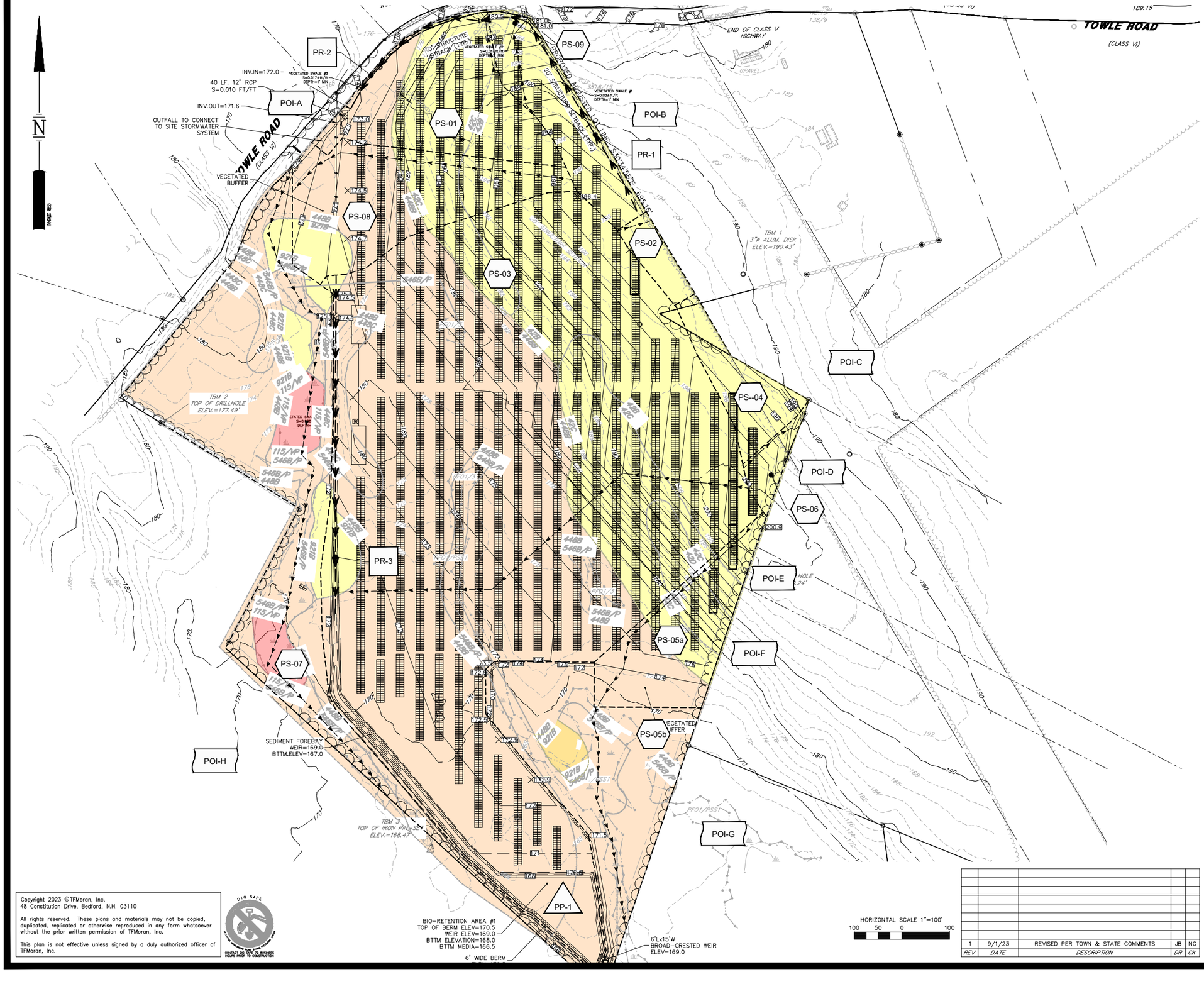
FILE		DR	MAL	FB	–	
20025-00		CK	NG	CADFILE	20025-00 DRAINAGE	HSG-01



HORIZONTAL SCALE 1"=100'

100 50 0 100

LEGEND

- PROPERTY LINE
- LIMITS OF DRAINAGE SUBCATCHMENT
- XXX — SOIL GROUP BREAKLINE
- FLOW PATH (Tc LINE)
- REACH
- POI-1 — POINT OF INTEREST
- PS-1 — SUBCATCHMENT AREA
- PP-1 — POND, CULVERT, OR CATCH BASIN
- PR-1 — REACH

LEGEND

- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP C
- HYDROLOGIC SOIL GROUP D
- IMPERVIOUS COVER

NOTES

1. THE SITE SPECIFIC SOIL MAP WAS PREPARED ON JUNE 4, 2023 BY BRUCE A. GILDAY, NH CSS NO. 012, OF BAG LAND CONSULTANTS.

SOIL PHASE LEGEND (PERCENT)

B	C	D	E
0–8%	9–15%	16–25%	>25%

SOIL LEGEND (PER SITE SPECIFIC SOIL SURVEY)

SYMBOL	DESCRIPTION	HYDROLOGIC SOIL GROUP	DRAINAGE CLASS
42	CANTON	B	WELL DRAINED
448	SCITUATE	C	MODERATELY WELL DRAINED
921	NEWFIELDS	B	SOMEWHAT POORLY DRAINED
546B/P	WALPOLE	C	POORLY DRAINED
115/VP	SCARBORO	D	VERY POORLY DRAINED

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SITE DEVELOPMENT PLANS

TAX MAP R-11-9

POST-DEVELOPMENT COLORED SOILS PLAN

UNITIL KINGSTON SOLAR PROJECT

14 & 24 TOWLE ROAD

KINGSTON, NH 03848

PREPARED FOR

UNITIL ENERGY SYSTEMS

30 ENERGY WAY

EXETER, NH 03833

SCALE: 1"=100' **JULY 6, 2023**

REV	DATE	DESCRIPTION	DR	CK
1	9/1/23	REVISED PER TOWN & STATE COMMENTS	JB	NG

DIG SAFE — CONTACT DIG SAFE 72 BUSINESS HOURS PRIOR TO CONSTRUCTION

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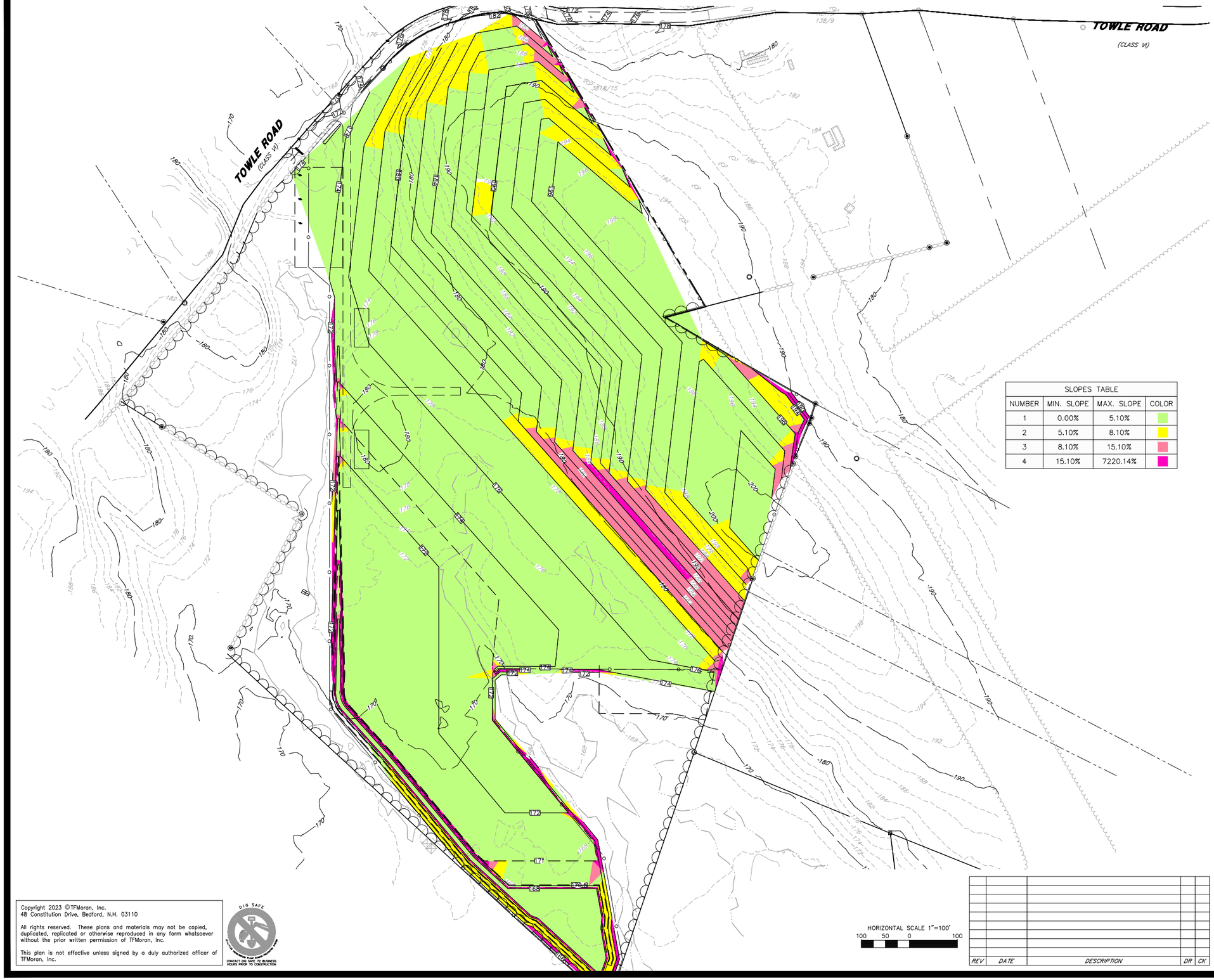
48 Constitution Drive
Bedford, NH 03110
Phone (603) 472-4488
Fax (603) 472-9747
www.tfmoran.com

FILE		DR	JB	FB	–	
20025–00		CK	NG	CADFILE	20025–00 DRAINAGE	HSG–02



SLOPES TABLE			
NUMBER	MIN. SLOPE	MAX. SLOPE	COLOR
1	0.00%	5.10%	
2	5.10%	8.10%	
3	8.10%	15.10%	
4	15.10%	7220.14%	

HORIZONTAL SCALE 1"=100'
100 50 0 100

DIG SAFE
CONTACT DIG SAFE 72 BUSINESS HOURS PRIOR TO CONSTRUCTION

REV	DATE	DESCRIPTION	DR	CK

Unitil

SITE DEVELOPMENT PLANS

TAX MAP R12 LOTS 25 & 26

SLOPE ANALYSIS PLAN

UNITIL KINGSTON SOLAR PROJECT

14 & 24 TOWLE ROAD
KINGSTON, NH 03848

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SCALE: 1"=100' **JULY 6, 2023**

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FILE	DR	JB	FB	–	
20025-00	CK	NG	CADFILE	20025-00 DRAINAGE	FIGURE-01