Public Service Company of New Hampshire
Seacoast Reliability Project

Madbury, Durham, Newington & Portsmouth, NH

New Hampshire Department of Environmental Services
Wetlands Permit Application

Prepared For:
Public Service Company of New Hampshire
d/b/a Eversource Energy
780 North Commercial Street
Manchester, NH 03101

Submitted:
April 12, 2016

Prepared By:
Normandeau Associates, Inc.
25 Nashua Rd
Bedford, NH 03110

www.normandeau.com

~~PSNH DBA EVERSOURCE ENERGY~~ 51-44/119

~~Check No.~~ ~~Date~~ ~~Payment Amt~~
0000317328 02/11/16 $128,671.60 USD

PAY ***********128,671.60** DOLLAR

TO THE ORDER OF
STATE OF NEW HAMPSHIRE TREASURER
NH DEPT OF ENVIRONMENTAL SVCS
WETLANDS BUREAU
29 HAZEN DR PO BOX 95
CONCORD NH 03302-0095

Authorized Signature

BankofAmerica

THIS CHECK HAS A PRISMATIC BLUE, RED, BLUE BACKGROUND VOID AFTER 6 MONTHS

⑈317328⑈ ⑆011900445⑆ 000000070681⑈

AD6266-8 REV. 2-15 ATTACHED CHECK ISSUED AS FULL PAYMENT OF ITEMS BELOW. PLEASE DETACH STUB AND DEPOSIT CHECK PROMPTLY.

Vendor ID	Personnel ID	Check No.	Date
SONH	45	0000317328	02/11/16

Payor: PSNH DBA EVERSOURCE ENERGY

Date	Invoice No.	PO/Cntrct	Rel	Payment Amount	Cur
02/05/16	02082016B			$128,671.60	USD

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Note: Items are numbered according to the NH DES "Wetlands Permit Application Required Information" document Revised 1-2016[1]

1-3 NH DES Wetlands Permit Application Form

[1] http://des.nh.gov/organization/divisions/water/wetlands/categories/forms.htm

NHDES-W-06-012

WETLANDS PERMIT APPLICATION

Water Division/ Wetlands Bureau
Land Resources Management

Check the status of your application: www.des.nh.gov/onestop

RSA/Rule: RSA 482-A/ Env-Wt 100-900

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

1. REVIEW TIME:
Indicate your Review Time below. Refer to Guidance Document A for instructions.

☒ Standard Review (Minimum, Minor or Major Impact) ☐ Expedited Review (Minimum Impact only)

2. PROJECT LOCATION:
Separate applications must be filed with each municipality that jurisdictional impacts will occur in.

ADDRESS: **Multiple - Linear Transmission Line ROW - See USGS Map(s)** TOWN/CITY: **Multiple - See Maps**

TAX MAP: **Multiple - See Att.** BLOCK: LOT: UNIT:

USGS TOPO MAP WATERBODY NAME: **Multiple - See Mapping** ☐ NA STREAM WATERSHED SIZE: **Various** ☐ NA

LOCATION COORDINATES (If known): **43 6'29.33" N, 70 52'35.96" W** ☒ Latitude/Longitude ☐ UTM ☐ State Plane

3. PROJECT DESCRIPTION:
Provide a brief description of the project outlining the scope of work. Attach additional sheets as needed to provide a detailed explanation of your project. DO NOT reply "See Attached" in the space provided below.

The Seacoast Reliability Project (SRP) will include construction of a new 12.9 mile long 115-kilovolt (kV) transmission line within an existing distribution line ROW between the existing PSNH Madbury and Portsmouth substations. The project includes new overhead and underground/submarine segments in Madbury, Durham, Newington and Portsmouth. The SRP will enhance the reliability of PSNH's delivery system for the seacoast area.

4. SHORELINE FRONTAGE

☐ NA This lot has no shoreline frontage. SHORELINE FRONTAGE: **240 LF within ROW**

Shoreline frontage is calculated by determining the average of the distances of the actual natural navigable shoreline frontage and a straight line drawn between the property lines, both of which are measured at the normal high water line.

5. RELATED PERMITS, ENFORCEMENT, EMERGENCY AUTHORIZATION, SHORELAND, ALTERATION OF TERRAIN, ETC…

SEC App. for Cert. of Site and Facility, NHDES Shoreland, 401, AoT, & others. See SEC App for list.

6. NATURAL HERITAGE BUREAU & DESIGNATED RIVERS:
See the Instructions & Required Attachments document for instructions to complete a & b below.

a. Natural Heritage Bureau File ID: NHB **15** - **3561** .

b. ☒ Designated River the project is in ¼ miles of: **Oyster River & Lamprey River Watershed** ; and date a copy of the application was sent to the Local River Management Advisory Committee: Month: __ Day: __ Year: ____
☐ NA

7. APPLICANT INFORMATION (Desired permit holder)			
LAST NAME, FIRST NAME, M.I.: **Nelson, Kurt I.**			
TRUST / COMPANY NAME: **Public Service Company of New Hampshire d/b/a Eversource Energy, Inc.**	MAILING ADDRESS: **13 Legends Drive**		
TOWN/CITY: **Hooksett**		STATE: **NH**	ZIP CODE: **03106**
EMAIL or FAX: **kurt.nelson@eversource.com**	PHONE: **603-634-3256**		
ELECTRONIC COMMUNICATION: By initialing here: **KIN**, I hereby authorize NHDES to communicate all matters relative to this application electronically			

8. PROPERTY OWNER INFORMATION (If different than applicant)			
LAST NAME, FIRST NAME, M.I.:			
TRUST / COMPANY NAME:	MAILING ADDRESS:		
TOWN/CITY:		STATE:	ZIP CODE:
EMAIL or FAX:	PHONE:		
ELECTRONIC COMMUNICATION: By initialing here ________, I hereby authorize NHDES to communicate all matters relative to this application electronically			

9. AUTHORIZED AGENT INFORMATION			
LAST NAME, FIRST NAME, M.I.: **Allen, Sarah**	COMPANY NAME: **Normandeau Associates, Inc.**		
MAILING ADDRESS: **25 Nashua Road**			
TOWN/CITY: **Bedford**		STATE: **NH**	ZIP CODE: **03110**
EMAIL or FAX: **sallen@normandeau.com**	PHONE: **603-637-1158**		
ELECTRONIC COMMUNICATION: By initialing here **SA**, I hereby authorize NHDES to communicate all matters relative to this application electronically			

10. PROPERTY OWNER SIGNATURE:

See the Instructions & Required Attachments document for clarification of the below statements

By signing the application, I am certifying that:

1. I authorize the applicant and/or agent indicated on this form to act in my behalf in the processing of this application, and to furnish upon request, supplemental information in support of this permit application.
2. I have reviewed and submitted information & attachments outlined in the Instructions and Required Attachment document.
3. All abutters have been identified in accordance with RSA 482-A:3, I and Env-Wt 100-900.
4. I have read and provided the required information outlined in Env-Wt 302.04 for the applicable project type.
5. I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative.
6. Any structure that I am proposing to repair/replace was either previously permitted by the Wetlands Bureau or would be considered grandfathered per Env-Wt 101.47.
7. I have submitted a Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) to the NH State Historic Preservation Officer (SHPO) at the NH Division of Historical Resources to be reviewed for the presence of historical/ archeological resources.
8. I authorize NHDES and the municipal conservation commission to inspect the site of the proposed project.
9. I have reviewed the information being submitted and that to the best of my knowledge the information is true and accurate.
10. I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action.
11. I am aware that the work I am proposing may require additional state, local or federal permits which I am responsible for obtaining.
12. The mailing addresses I have provided are up to date and appropriate for receipt of NHDES correspondence. NHDES will not forward returned mail.

⇨ [signature] Property Owner Signature	KURT I. NELSON Print name legibly	4/5/2016 Date

MUNICIPAL SIGNATURES

11. CONSERVATION COMMISSION SIGNATURE

The signature below certifies that the municipal conservation commission has reviewed this application, and:

1. Waives its right to intervene per RSA 482-A:11;
2. Believes that the application and submitted plans accurately represent the proposed project; and
3. Has no objection to permitting the proposed work.

⇨	Print name legibly	Date

DIRECTIONS FOR CONSERVATION COMMISSION

1. Expedited review ONLY requires that the conservation commission's signature is obtained in the space above.
2. Expedited review requires the Conservation Commission signature be obtained **prior** to the submittal of the original application to the Town/City Clerk for signature.
3. The Conservation Commission may refuse to sign. If the Conservation Commission does not sign this statement for any reason, the application is not eligible for expedited review and the application will reviewed in the standard review time frame.

12. TOWN / CITY CLERK SIGNATURE

As required by Chapter 482-A:3 (amended 2014), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

⇨ Katherine K Cornwell	Katherine K Cornwell	Marlborough	04/11/2016
Town/City Clerk Signature	Print name legibly	Town/City	Date

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

1. For applications where "Expedited Review" is checked on page 1, if the Conservation Commission signature is not present, NHDES will accept the permit application, but it will NOT receive the expedited review time.
2. IMMEDIATELY sign the original application form and four copies in the signature space provided above;
3. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
4. IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board; and
5. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

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⇨ Barbara Landgraf	BARBARA LANDGRAF	Durham	4/11/16
Town/City Clerk Signature	Print name legibly	Town/City	Date

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

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⇨ Ann Beebe Deputy Town/City Clerk Signature	Ann Beebe Print name legibly	Newington Town/City	4/12/16 Date

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

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Kelli L Barnaby Town/City Clerk Signature	Kelli L. Barnaby Print name legibly	Portsmouth Town/City	4-11-16 Date

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13. IMPACT AREA:

For each jurisdictional area that will be/has been impacted, provide square feet and, if applicable, linear feet of impact

Permanent: impacts that will remain after the project is complete.

Temporary: impacts not intended to remain (and will be restored to pre-construction conditions) after the project is complete.

JURISDICTIONAL AREA	PERMANENT Sq. Ft. / Lin. Ft.		TEMPORARY Sq. Ft. / Lin. Ft.	
Forested wetland	23	☐ ATF	4517	☐ ATF
Scrub-shrub wetland	503	☐ ATF	229944	☐ ATF
Emergent wetland	205	☐ ATF	48661	☐ ATF
Wet meadow	61	☐ ATF	19811	☐ ATF
Intermittent stream	0	☐ ATF	0	☐ ATF
Perennial Stream / River	0 / 0	☐ ATF	166 / 59	☐ ATF
Lake / Pond	0 / 0	☐ ATF	1120 / 0	☐ ATF
Bank - Intermittent stream	0 / 0	☐ ATF	0 / 0	☐ ATF
Bank - Perennial stream / River	0 / 0	☐ ATF	see above / 118	☐ ATF
Bank - Lake / Pond	0 / 0	☐ ATF	see above / 70	☐ ATF
Tidal water	5336 / n/a	☐ ATF	271984 / n/a	☐ ATF
Salt marsh	0	☐ ATF	1222	☐ ATF
Sand dune	0	☐ ATF	0	☐ ATF
Prime wetland	31	☐ ATF	38597	☐ ATF
Prime wetland buffer	n/a	☐ ATF	n/a	☐ ATF
Undeveloped Tidal Buffer Zone (TBZ)	0	☐ ATF	0	☐ ATF
Previously-developed upland in TBZ	11	☐ ATF	21166	☐ ATF
Docking - Lake / Pond	n/a	☐ ATF	n/a	☐ ATF
Docking - River	n/a	☐ ATF	n/a	☐ ATF
Docking - Tidal Water	n/a	☐ ATF	n/a	☐ ATF
TOTAL	6170 / 0		637188 / 247	

14. APPLICATION FEE: See the Instructions & Required Attachments document for further instruction

☐ Minimum Impact Fee: Flat fee of $ 200

☒ Minor or Major Impact Fee: Calculate using the below table below

Permanent and Temporary (non-docking) **643,358** sq. ft. X $0.20 = $ **128,671.60**

Temporary (seasonal) docking structure: ______ sq. ft. X $1.00 = $ ______

Permanent docking structure: ______ sq. ft. X $2.00 = $ ______

Projects proposing shoreline structures (including docks) add $200 = $ **n/a**

Total = $ **128,671.60**

The Application Fee is the above calculated Total or $200, whichever is greater = $ **128,671.60**

4 Pre-Application Notes

A list and copy of the relevant pre-application correspondence and meeting minutes is included below.

This includes minutes from the following eight meetings, and an email exchange:

1. Pre-application Meeting (NH DES, Corps, US EPA, US FWS, NMFS, NH F&G, DRED-NHB) – 1/6/15
2. Pre-application Meeting (NH DES Wetlands) – 3/4/15
3. Pre-application Meeting with Marine Agencies (NMFS, US EPA, NH DES, Corps) – 3/4/15
4. Pre-application Meeting NH F&G (NH F&G) – 5/7/15
5. Pre-application Meeting Corps/NHDES (NH DES, Corps) – 6/12/15
6. Pre-application Meeting NHNHB (NHNHB – 8/12/15
7. Aquaculture Meeting (Oyster farmers, NHF&G) – 9/18/15
8. Pre-application Meeting (NHDES, NHNHB, USACE, NOAA, USEPA, USFWS) – 1/12/16
9. Emails introducing project to NHDES Shellfish Program and Coastal Oil Spill Response operations, and others at Portsmouth Regional Office (2/19/16)

In addition, as requested in Block 5 of the Wetlands Permit Application form (see above), a list of the related permits and other authorizations required on behalf of the Project is also included. More detailed information is also included as a part of the NH SEC Application.

1. Joint NHDES/USACE Wetlands Permit Application
2. NH DES Section 401 Water Quality Certification Request
3. NH DES Shoreland Permit Application
4. NH DES Alteration of Terrain Permit Application
5. NH Department of Transportation Applications
    a. Use and Occupancy Agreement(s)
    b. Aerial utility permit application(s)
    c. Excavation (trench) permit application(s)
    d. Turnpike encroachment agreement application(s)
6. Request for the Site Evaluation Committee to Grant Approvals for Overhead Municipal Road Crossings and to Excavate in Municipal Roads

7. NH PUC Water Crossing License Applications[1]
    a. Construct and Maintain Electric Lines, Static Wires and Fiber Optic Cable Over and Across The Oyster River and Pickering Brook and under Little Bay in the Towns of Durham and Newington, New Hampshire

[1] Along with the Application for a Certificate of Site and Facility, the Applicant will contemporaneously submit two petitions for licenses with the New Hampshire Public Utilities Commission, namely, for approval to construct and maintain electric transmission lines, static wires, and fiber optic cables over and across public waters and lands of the State.

CONFIDENTIAL

January 12, 2015

TO: Seacoast Reliability Project Team
FROM: Sarah Allen
SUBJECT: Summary of Agency Pre-Application Meeting

Meeting Location & Date: DES, Concord, NH, January 6, 2015

Attendees: Dave Keddell (Corps), Mark Kern (EPA), Maria Tur (FWS), Sue Tuxbury (NMFS), Ridgely Mauck (DES AoT), Collis Adams (DES Wetlands), Chris Williams (DES Coastal Program), Tim Drew (DES Info/SEC), Cheri Patterson (NHF&G), Melissa Coppola (DRED-NHB), Michael Pacy, Joe Sperry, Laura Games (all PSNH), Ann Pembroke and Sarah Allen (Normandeau, recording)

Sarah and Ann gave an overview of the project using the attached slides.

Comments/questions about land-based discussions

1. Melissa – is this project under the 5 year maintenance (clearing) plan? *Response:* we described the existing narrow (60') corridor clearing and that the remainder of the ROW will be cleared to 100' or limit of easement, if less than 100'.
2. Maria – northern long-eared bat is currently being evaluated for ESA listing with a decision likely in April. This species is thought to be more abundant along the coast. Tree clearing is a potential concern for this species. She wants to know the extent of upland and wetland tree clearing. *Response*: the project will provide in permit application.
3. Melissa – the slide described some vegetation communities as "not confirmed" – is that because they were outside the corridor? *Response*: a search did not find them in the corridor.
    a. When were surveys done for the plants? *Response:* surveys for most species were conducted during the season when the plants were in identifiable condition; we missed the appropriate season for small

whorled pogonia and will be going back out in 2015. Melissa recommended that we search for it in late May-early June.

b. How did the project eliminate habitat potential for various plants? Department considers that if habitat is identified in one spot, the potential is there for the habitat to occur in nearby locations. *Response*: Normandeau will clarify with botanist and describe in report.

4. Maria – will we be able to provide total acreages of clearing, etc.? Is it all within the ROW? *Response:* Yes to both.
5. Cheri – can the project leave thermal buffers for perennial streams? *Response*: PSNH can leave tall shrubs along stream banks, but no trees within cleared corridor
6. Maria – monarch butterfly is currently a species of interest for habitat enhancement along utility ROWs. FWS could be interested in partnering with the project on this. *Response:* the project team will discuss but sounds reasonable.
7. Collis – vernal pool survey – it seems unusual for the length of the project to have no vernal pools. Are you confident in your survey? *Response*: yes.
8. Collis – conversion of forested to open land is probably a good candidate for in-lieu fee mitigation. Response: Yes, except that the towns of Durham and Newington (largest impacts) may want to pursue local mitigation. Collis agreed.

Comments/questions regarding Oyster River crossing

1. Dave – is the Oyster River crossing overhead? *Response*: the wires will cross the Oyster River, but the project is also proposing a construction crossing that will consist of timber mats on the banks and as pilings in the shallow river. Explained RR crossing constraints and that the Oyster River crossing is a secondary plan should the RR deny crossing rights.
2. Cheri – time of year for construction will make a difference in NHF&G opinion. Probably prefer fall so the timber mats aren't placed in the river after reptiles & amphibians have burrowed into the mud for the winter. She will confer with inland and non-game staff. The inland fisheries staff may want to conduct some site surveys (electrofishing).

Comments/questions regarding Little Bay crossing

1. Several regulators asked how many cables will there be. How many active cables are there now? What is the spacing between cables? *Response*: 6 new cables, 3″ diameter, spaced 30′ apart. Joe explained the 30′ spacing was necessary protection during installation. Laura described 1990′s removal effort of old cables, and I explained that marine divers examined the old cables this year and found them to be sound enough for removal.
2. Cheri – what contaminants are associated with the old cables? Are they buried? *Response*: Lead wrap with paper and mineral oil insulation. They are mostly visible on the surface.
3. Sue – plan to survey for eelgrass within the corridor during peak growth in the season of construction
4. Cheri – should include sea lamprey among the diadromous fishes. She will check records to make sure that is appropriate.
5. Cheri – western tidal flat is feeding and spawning habitat for horseshoe crabs. *Response:* Ann concurred, and later said that the fall timing of the cable installation will protect the crabs and eggs from impacts.
6. Maria - should we be considering red knot (recently listed)? She will check in the office for its potential presence in the project area.
7. General interest in jet plow process – Ann described the process and the RPA-ASA water quality modeling.
8. Collis – what types of debris need to be removed from Little Bay? *Response:* minimal, video and diver surveys indicated most was related to the cables and debris (trees, anchors) caught on the cable.
9. Collis – would like a link to a jet plow video. *Response:* the project team will locate one.
10. Melissa – will any of the trenches be permanent? *Response*: No, all impacts will be temporary.
11. Cheri – concerned about timing of jet plow relative to tide – feels that plowing at high tide would create the largest plume. *Response*: the project team will evaluate, but reminded her of the work limitations due to shallow water in the tidal flats.
12. Ridgely – how wide are the trenches? *Response:* 4′ at the surface.
13. Tim – do we know that we won't run into ledge with the jet plow? Response: yes, the subbottom profiling indicates no ledge at the proposed depths.

14. Dave – jet plow generally considered to be temporary impacts.
15. Cheri, Sue – why was jet plow chosen over HDD? *Response:* PSNH team described the general constraints of HDD for this project – length and risk of drilling, need for large staging areas on both sides of bay, equipment transport on small roads, risk of frac out.
16. Cheri – have we interacted with the aquaculture lease? *Response*: we recognize that will be necessary.
17. Melissa – will there be monitoring to look at recovery of benthic community after jet plowing? *Response*: Probably, the benthic samples were collected with post-construction monitoring in mind.
18. Sarah –suggestions for mitigation for jet plowing
19. Mark – suggests that marine specialists get together and discuss magnitude of temporary impacts in Little Bay and whether mitigation should be provided. Perhaps Phil Colarusso, Ed Reiner, state folks, NMFS; Great Bay Partnership should be included
20. Cheri – water quality modeling should evaluate whether jet plowing on neap tides would be better than on spring tides. Suggests trying to avoid the most dramatic tides. *Response:* the project will evaluate the feasibility of this approach but the necessary duration of the installation process will make this difficult.
21. Cheri – from where is the water withdrawn for the jet plow? What measures are taken to minimize entrainment? What is the inflow rate? *Response:* Joe described the process. The report will describe the specifics of the operation where possible. Joe emphasized that different contractors have different equipment specifications.
22. Dave stated Corps may not require mitigation because impacts are temporary. He will talk with Ruth Ladd (mitigation specialist at Corps).

Comments/questions regarding permitting approach

1. Dave – need to check on the Section 10 areas/activities to determine if Corps permit will be an IP or a GP
2. Mark – will there be a 401 Certificate regardless of whether the Corps permit is IP or GP? The general regulatory response was yes, that it would be evaluated by either the State or the Corps.
3. Collis – can’t really discuss Water Quality Cert without having a good idea of full extent of the impacts.

4. Ridgely – may not trigger AoT if the land-based work does not reach the ground disturbance threshold for an AoT. The Little Bay impacts will be covered by Wetlands, therefore would be redundant in AoT.
5. Collis – Wetland department will probably take the lead in permitting with AOT providing comments
6. Chris (after the general meeting) – coastal zone consistency requirements will depend on status of federal review. If the Corps permit is an IP, then a consistency review will be necessary. If the Corps goes GP, DES has the prerogative to still require it, but typically does not. May confer with NOAA.

General Wrap Up Actions

1. Cheri – circulate the meeting summary so the agencies can review and annotate if needed
2. Sue requested the slide presentation, and was seconded by most other agencies.
3. Cheri – requested a detail slide of the Oyster River crossing for internal discussion.
4. I will talk to Lori Sommer to bring her up to speed regarding mitigation.

CONFIDENTIAL

March 4, 2015

TO: Dori Wiggin, Seacoast Reliability Project Team
FROM: Sarah Allen
SUBJECT: Summary of Pre-Application Meeting with Dori Wiggin, DES Project Manager

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Meeting Location & Date: DES, Portsmouth, NH, February 25, 2015

Attendees: Dori Wiggin (DES Wetlands), Sarah Allen (Normandeau, recording)

Sarah gave an overview of the project using the attached slides.

Dori was interested in the context of the project. She suggested we provide a solid rationale for the project, including information about the ISO review process. She asked if this project would benefit the other utilities in the seacoast region – can they use it?

Dori focused on **Little Bay crossing**, with questions about:

- Details of cable installation, including how a jet plow worked and hand jetting process
- Sediment quality. I referenced the National Coastal Condition Assessment sampling results that indicated sediment quality was good based on low contaminant loads, low toxicity, and low TOC. She requested a copy of the paper (attached).
- Extent of turbidity plume: we looked at modeling results from RPS ASA and discussed the temporary nature of the plume (worst case is that it dissipates in less than 9 hours). She asked if the summary model that shows area and time for the entire crossing is expressing time for an individual point or the entire plume . This question refers to Figure 3-5. Plan view of maximum time integrated excess SS concentration over the entire jet plowing operation due to jetting speed of 90 m/hr (5 ft/min). This figure represents the maximum extent of the plume as the jet plow passes each point while the cable is being installed. That means that the plume on the west side heading north is doing so while the jet plow is passing that area; the extent of this plume recedes with time after the plow has moved forward as indicated in the accompanying table giving durations by plume

concentration. Figure 3-5 represents about 16 hours of plowing at a rate of 90 m/hr. Assuming that the jet plow moves forward continuously, by the time it reaches the channel, the tide will have turned and the prominent plume on the west side of the bay will have dissipated to concentrations of 10 mg/L or less.

- Have we contacted the owner of the oyster farm to discuss the project and its potential impact on his business
- Cable removal. She requested the permit number for the 1996 cable removal effort. When the Pease office opened, she brought all paper files for the seacoast over. She may have more detail on the decision to leave the cables in place.

Terrestrial: I described the existing narrow (60′) corridor clearing and that the remainder of the ROW will be cleared to 100′ or limit of easement, if less than 100′.

- She's permitted other transmission projects and is familiar with the types and extent of impacts.
- Asked if we'd consulted with DHR – I said preliminary work is complete and we are meeting with DHR shortly.
- Asked about rare species – I described review and known issues as shown in slide.

Permitting:

- She had spoken to Chris Williams re coastal zone consistency, and agreed it would not be likely.
- She was glad to hear we were meeting with marine agency staff next week, but is unable to attend.

The SEC and public review process: she may ask that we have a DES public meeting at Pease separate from the SEC public meetings for the purpose of giving interested parties a less intimidating opportunity to ask questions and express concerns.

She thinks this will have to go to the Governor and Executive Council for signature after the 30-day appeal process for a Wetlands Permit is up. The trigger is a major project impacting State Waters. She is not sure how the SEC process could affect this review.

CONFIDENTIAL

March 4, 2015

TO: Seacoast Reliability Project Team
FROM: Sarah Allen
SUBJECT: Summary of Pre-Application Meeting with marine-focused agencies

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Meeting Location & Date: Normandeau Associates, Portsmouth, NH, March 3, 2015

Attendees: Sue Tuxbury (National Marine Fisheries Service), Phil Colarusso (US Environmental Protection Agency), Owen David (DES Watershed), Dave Keddell (US Army Corps of Engineers), Laura Games (Eversource), and Ann Pembroke and Sarah Allen (Normandeau, recording)

Laura, Ann and Sarah gave an overview of the project using the attached slides.

The discussion centered on the **Little Bay crossing**:

- Eelgrass: Phil concurred with our findings that the cable crossing area has not supported a long-term eelgrass bed since 2010. He dove on the site in 2011 and found only seedlings, which did not persist through the growing season. All agreed the project should inspect the site again just prior to installation.
- Cable installation: Dave asked what portion of the tide cycle would the hand jetting occur in, with the goal of minimizing turbidity. [Normandeau has since asked the installer and the answer was hand jetting could occur during high tide only for safety and water supply reasons]. The discussion of silt curtains resulted in concurrence that they would not be effective along the jet plow corridor because of currents, the fine texture of the material and the potential for their own disturbance. [The installer has since indicated that silt curtains will be effective for the hand jetting]. Some consideration will be given to using silt curtains to deflect the plume from the nearby oyster farm.
- Ledge – Sue asked how shallow ledge areas would be crossed if encountered. The project is still talking to the marine installer, who had mentioned the use of concrete mattresses if ledge was unavoidable.
- Oyster farms – show on a plan. Be sure to talk to Great Bay Oyster Co ahead of project.

- Water quality: Phil asked what the typical ambient turbidity in Great Bay is. Ann said that there isn't much data (one buoy in Great Bay below Adams Point) and that the results were highly variable. She will attempt to provide more information.
- The agencies agree that deposition of less than 0.5 mm would not be detrimental to winter flounder eggs, because of depth and time of year (eggs are not present).
- Sediment quality. Ann referenced the National Coastal Condition Assessment sampling results that indicated sediment quality was good based on low contaminant loads, low toxicity, and low TOC.
- Extent of turbidity plume: we looked at preliminary modeling results from RPS ASA and discussed the temporary nature of the plume (worst case is that it dissipates in less than 12 hours). We explained that installation plans are still evolving and that modeling used some conservative assumptions (e.g., assumed wider trench than likely to occur; did not take into account the fact that higher pressure would go through lower jet) that likely overestimated volume of sediments that would be dispersed into the water column.
- Mitigation measures will include restoration of saltmarsh, time-of-year restrictions, and any permanent impacts resulting from concrete mattresses

Terrestrial: I described the existing narrow (60') corridor clearing and that the remainder of the ROW will be cleared to 100' or limit of easement, if less than 100'.

Permitting:

- Dave pointed out that any protective mattresses for shallow cable would be considered permanent fill. Ok to restore salt marsh and rocky habitats.
- Sue asked if the project is planning on post-construction surveys to monitor the recovery of bottom contours.
- Sue asked to review the Corps General Permit when it arrived.
- Owen said that he and Gregg Comstock had decided the project would not need separate public notice for the 401.

May 7, 2015

TO: Seacoast Reliability Project Team
FROM: Sarah Allen
SUBJECT: Summary of Meeting with NH Fish & Game (NHFG) Environmental Review Team

Meeting Location & Date: NH Fish & Game, Concord, NH, May 7, 2015

Attendees: Carol Henderson, Mike Marchand, Evan Mulholland, Glenn Normandeau, Scott Decker, John Magee, Kim Tuttle, and one more (NHFG), Laura Games (Eversource), and Ann Pembroke and Sarah Allen (Normandeau)

Ann and Sarah gave an overview of the project using the attached slides. Lots of discussion was interspersed throughout the presentation, with the key comments and issues listed below.

General Project Design and Construction

1. What kind of legal land use vehicle does PSNH have for crossing Little Bay within the Cable Area? We could not answer – we should find out and get back to them.
2. Carol and others were very interested in HDD considerations, having been involved with permitting the gas line under the Gen. Sullivan bridge. We described land-based impacts, equipment and road constraints on west side, geologic fault in middle of Little Bay increasing risk of frac-out, long length and hard rock challenges of boring, length of time required and reluctance of Corps.
3. What are the new structure dimensions and materials, and fate of existing structures.

Underwater cable installation

4. Questions on understanding installation process and duration: size of cables and barge (180'x54'), sequence and duration of hand jetting and jet plow, time of year. Glenn Normandeau has a background in marine construction so understands the construction constraints.

5. How will the old cables be dealt with? Ann described the removal of sections of cable within the jet plow route that would be removed by the marine contractors using grapnel hooks, and lifted to the surface for on-shore disposal.
6. What is the duration of the work? The work will occur in the fall and will last 2-3 months. Each of the 3 cables will take approximately 1 week to lay, although the jet plow activity will be completed in 1 pass taking 12 -16 hours.
7. The question was raised whether we were being asked to do the Little Bay installation during the NH dredge window (November 15-April 15). We responded that had not been raised by DES. Glenn Normandeau concurred this activity is "not dredging."
8. When will the work be done, high or low tide? The intertidal work will occur by boat during high tide. The jet plowing will be timed to maximize a tidal cycle.
9. Where is project relative to oyster farmers? We described the majority of them lie north of the cable area, but for Bay Point Oyster Co, which straddles it. We also said the cable area was closed to shellfish harvesting.
10. They asked about permanent and temporary impacts in the bay. We described that most were temp impacts, and got into some detail on why and where permanent impacts from the concrete mattresses might occur.
11. Ann responded to many questions regarding the water quality modeling using the draft results coming in from RPS ASA.
12. How long does the plume last? Based on a preliminary model run, the sediment plume dispersed after 10 hours.
13. Where are the eelgrass beds? Ann described the mapped eelgrass beds (historically it has been present in the corridor but none since 2012). Project-specific surveys in 2013 detected no eelgrass.
14. What type of benthic monitoring was done and what were the results. Ann described the benthic communities as robust and typical of a healthy site, and that the sampling was done systematically to facilitate post-construction monitoring.
15. Was the sediment quality studied? The project relied on National Coastal Condition Assessment reports that indicated sediment quality was not a concern in Little Bay.
16. Glenn Normandeau commented that silt curtains in the deeper portions of the east shore handjetting area will be difficult to maintain. Discuss moving to shallow shelf with Caldwell.

<u>Terrestrial Wildlife</u>

17. Mike Marchand requested construction monitoring for snakes and turtles to clear area prior to work. Move individual animals, look for nesting activity and potential habitat.

18. Asked that the project cut distribution poles at the ground rather than remove them in areas where black racers could hibernate or aestivate. Kim Tuttle described sides of rail corridors as frequent habitat for molting snakes, especially among cast-off rail ties (several tie piles occur along SRP corridor).
19. Mike Marchand asked for detail maps of Crommett Creek area and Oyster River crossing to better understand location relative to known resources. Rachel Stevens (attended GBRPP meeting) knows the area best. I will send Monday.
20. Not much discussion on NE cottontail. All seem to agree that habitat management within ROW is important but no direct discussion. I will follow up with Mike to see if we should take that further.
21. Requested that the project avoid welded plastic in erosion control techniques to minimize risk to turtles and snakes.
22. Evaluate risk to osprey attempting to nest on structures based on proximity to suitable habitat. Consider erecting osprey platforms in ROW adjacent to new structures as mitigation. PSNH has done it elsewhere.
23. Mitigation – we described outreach efforts to towns and NGOs and the reluctance of Durham and Newington to be viewed as teaming with us. In-lieu-fee is the preferred option right now, but that may change in SEC process if towns express a preference. They seemed to agree that contributing to oyster reef construction may be a good option for Little Bay impacts.

NORMANDEAU ASSOCIATES
Environmental Consultants

June 12, 2015

Who: Dori Wiggin (NH Department of Environmental Services), David Keddell (US Army Corps of Engineers), Laura Games (Eversource Energy), Ann Pembroke (Normandeau) and Sarah Allen (Normandeau, recording)

DES Coastal office, Pease International Tradeport

Purpose: Follow-up Pre-application Meeting

June 10, 2015

Normandeau gave a brief summary of the principal changes that affected natural resource issues: the re-route of the cable on the east shore, the potential for needing concrete mattresses, more specifics on the water quality analysis, small whorled pogonia plans

Dave said he had met with Newington on June 8, specifically mentioning Dennis Hebert. Two issues for Newington were the historic district and route alternatives. Newington asked to have consulting status, so they are included on communications among the Corps, NH Division of Historic Resources (DHR) and the Newington Historical Commission. Dave later reiterated that it would be in the Project best interest to remind the SEC of the Corps' statutory authority. It is a federal statute and DHR is advisory. The alternative analysis should also address historic resources and be strong in the Project's defense.

Newington also gave Dave a sketch of several alternatives they were recommending. The primary one was underground along Arboretum Drive with overhead going cross country near the landfill at the east end. This shortens the line by approximately one-half mile.

Dave asked if he could attend the municipal meetings. I will ask the question.

Dorin asked for a comparison of safety and repair rates for overhead vs underground. She wants it during her evaluation of impacts.

Ray Konisky approached Dori about a new oyster reef. She can get the location. Dave mentioned his concern that oyster reef restoration is not typically a good match for soft sediment impacts. Also that no in-water mitigation is necessary because impacts are temporary.

Dori asked about NH Fish & Game dredge windows. Ann said Glenn Normandeau (NHFG commissioner) does not consider jet plowing to be dredging. Dori said that "it" is a rule and she may have to request a waiver. She recommended we build a case for the waiver.

Dori requested the PPT for her files. She will get back to us with guidance for submittal needs.

CONFIDENTIAL

August 12, 2015

TO: Amy Lamb, Seacoast Reliability Project Team
FROM: Sarah Allen
SUBJECT: Summary of Pre-Application Meeting with Amy Lamb, NH Natural Heritage Program, Reviewer

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Meeting Location & Date: NH NHB, Concord, NH

Attendees: Amy Lamb (NHB), Sarah Allen (Normandeau, recording)

Sarah gave an overview of the project, including our consultation with NHNHB since 2013, rare plant survey methods, and results. We reviewed the draft Environmental Maps showing the locations of the one rare plant identified (*Carex cristatella*) and the limits of impacts to salt marsh. We agreed that the rare plant locations should be broadly indicated on the plan set and combined with archeologic Phase 1a resources as "Sensitive Resource Areas" as call-outs for construction contractors. Bill Nichols has tentatively confirmed Normandeau's identification of *C. cristella*, pending a few more details of the description.

We discussed in detail the location and type of salt marsh fringing Little Bay. Amy will check her records to confirm whether both High Salt Marsh (shallow peat variant) and Salt marsh system exemplary communities are mapped in this location. I described the restoration plan for salvaging the salt marsh peat from the work area, maintaining it for the duration of the work and then restoring the peat with rebar and coir logs to secure it through the winter.

Two of the four *C.cristella* locations will not be impacted by the proposed work. The remaining two will be temporarily impacted by the tree removal effort. This work will occur quickly over the course of a few days and will be performed from timber mats. Amy concurs with doing the tree clearing work between September 30 and April 15 to avoid impacts to potential habitat for the northern long-eared bat, as that time frame is also when the plant is senescing or dormant. She would prefer the work be done in this location between November 1 and March 30. I agreed that we can move the access road to the very edge of the SRP corridor to further minimize impacts to this open-growing species.

I will send Amy a project locus, and our 1-page summaries of the general project description with locus, and environmental impacts.

NORMANDEAU ASSOCIATES
Environmental Consultants

Date: September 18, 2015

Oyster farmer meeting

Attendees: *Oyster farmers*: Ralph Jimenez, Chris Simmers, (one more from Joe King), Jay Baker, Ray Grizzle, 3 others I couldn't identify, *NHFG:* Doug Grout, Robert Eckhart, Renee Zobel and one other, *Eversource:* Jim Jiottis, Kevin McCune, Martin Murray, Sarah Allen, Ann Pembroke

Location & Date: NH Fish & Game, Durham, June 17, 2015

Ann and Sarah presented a Little Bay-focused slide show of the project, including two videos showing the sediment plume and deposition modeled for the jet plow.

Questions and concerns from the farmers:
Monitoring and Contingency plans: Ray Grizzle (also UNH faculty at Jackson Lab) asked about Eversource's plans for these plans. We described that we were still early in the process and that a monitoring and contingency plan would be part of the negotiation/review process with the state and federal agencies. Jim was pointedly asked for the worst-case scenarios for the installation. Jim listed the jet plow breaking down, and cables flawed in the center of a reel.

Ray stated the burden is on Eversource to protect the farmers or be prepared to mitigate. Bay Point was not present at the meeting, but we need to give them particular assurance as they are located directly adjacent to the cable crossing.

Sediment testing: Ray pointed out that the EPA's NCCA testing is superficial and probably not representative of the entire profile. He suggested sampling a minimum of 3-4 feet deep. He said that the primary known source of contaminants in Great Bay is Pease AFB. Several farmers emphasized the importance of perception on the quality of their product, so real or perceived sediment or pollutant contamination is a serious threat to their harvest.

Deposition: Several farmers are doing cage-free, bottom farming – faster growth, thicker shells. Sediment deposition is a threat – ¼ inch is too much. We pointed out the modelling does not indicate any deposition reaching any of the aquaculture sites and that most of it is <0.5 mm. They accepted the information but appeared to remain skeptical.

Installation: Concerned about bay closures limiting access to their farms during installation – at least Joe King moors their work barge off Adams Point so crosses the Cable Area en route to their site. We described the anticipated closure of the immediate work area in Little Bay across the full width for a day for each cable lay. Communication will be key.

Time of year: September-October is their busiest harvest period (although it starts around Memorial Day). Fat Dog asked if we could begin our work in November. We described the work constraints (too cold in winter, recreation in summer, sensitive fish and eelgrass).

We learned a lot about the industry. They have to get permission from DES to harvest due to E.coli levels. It takes 2-3 days for oysters to purge ingested E.coli. Probably similar for excess sediments, but average sediment loads are filtered by gills and are not ingested. Not certain about other pollutants. It takes about 3 years in NH to get an oyster to marketable size. There are no depuration facilities in NH but DES can arrange for access to Maine or Massachusetts depuration sites. However, since shellfish that have been depurated have to be labeled as such for sale, oyster farmers are reluctant to do so. Fat Dog generally raises their harvested oysters higher in the water column for a few days to self-cleanse. Oyster farming is a young, evolving, rapidly expanding industry. Fat Dog was one of the earlier farms, and started in 2011.

SRP Interagency meeting

January 12, 2016

Attendees:

Dave Price, NHDES Proj Mgr	Dave Keddell, USACE	Jim Jiottis, Eversource Site Eng
Lori Sommer, NHDES Mit	Rick Kristoff, USACE	Joe Sperry, Eversource Line Eng
Ridgely Mauk, NHDES AoT	Mike Johnson, NOAA	Kurt Nelson, Eversource Environ.
Owen David, NHDES 401	Phil Colarusso, USEPA	Ann Pembroke, Normandeau, Marine (recording)
Amy Lamb, NHNHB	Mark Kerns, USEPA	Sarah Allen, Normandeau, PM, Terrestrial
	Maria Tur, USFWS	

Sarah Allen (SA) and Ann Pembroke (AP) provided a power point presentation summarizing the project including recent revisions on locations of buried sections, status of agreements with towns and landowners, water quality modeling results, updated resource impact areas, status of mitigation discussions, and revised filing schedule.

Ensuing discussions covered these topics:

Alternatives

- Mike Johnson (MJ) asked whether the Little Bay crossing could be done using HDD. SA and Jim Jiottis (JJ) provided an explanation of why the project determined this was infeasible (length of bore at upper limit of technology; would require a 42" bore; subsurface entirely bedrock (hard and slow) and there are several faults in the middle of Little Bay increasing risk of "frac out"; both ends are in neighborhoods; installation would take about 10 months, with 24 hr/day activity; lay down area would be about 1 mile long; access for heavy equipment challenging with existing roadways in Durham)

- MJ asked whether the project considered crossing at Adams Point (through Furber Strait) where the crossing would be much shorter. SA and JJ pointed to the fact that there is no existing utility corridor in this area so that would require construction in a virgin corridor, something that Eversource tries to avoid.
- Maria Tur (MT) asked if we were able to avoid the wildlife refuge on Pease. Response was yes.

Installation

- Mark Kern (MK) asked if on-shore burial of the cable is an issue. JJ responded that Eversource rights are for overhead facilities so (at least in some cases) they will have to acquire the underground rights in order to bury the cable
- MJ asked for further explanation of the jet plow process, specifically whether the cable is laid during the passage of the plow or if an additional pass is required. Ap and SA provided more detail on the process. Installation of cable is simultaneous with jet plow passage.
- MJ asked whether we would need to go back to rework the sediment to restore bathymetry after installation. AP responded that we did not expect to have to do so. Experience has shown that the

opening created by the jet plow substantially fills back in immediately. While there may be a depression over the cable initially, the water quality model results suggest that there will not be mounds of sediment adjacent to the cables. It is also expected that Eversource will require the marine contractor to demonstrate that they have achieved the required burial depth.

- Dave Price (DP) asked if the marine contractor we've been working with is going to be the contractor actually doing the work? How much experience do they have? JJ & SA responded that the contracting process at Eversource probably doesn't allow them to hire this contractor without competitive bid (not stated, but it is likely that Eversource will contract the production of the cable and it is the cable manufacturer who will hire the installer). The marine contractor we've been consulting does have substantial experience installing cables using jet plows in many different environmental conditions (sediment types, current velocities, environmentally sensitive areas).

Impacts

- MK asked that we provide maps of forested wetland clearing within the ROW. SA said they are included in our mapping.
- MJ noted that the impacts table had about 273,000 sq ft of tidal impact and asked if that included all the burial in Little Bay. Does it include the side-cast area? Is it cumulative for the three cables, including a total width of about 100 ft (accounting for the 30-ft separation between cables)? SA responded that the number is cumulative taking all these factors into account.
- MJ asked how does the aquaculture lease on the eastern end of the cable route feel about the project? AP responded that we have had discussions with him and he has not raised any objections. We tried to make very clear that the expected sediment plume behavior in the vicinity of his project is based on a model and may not be completely accurate.
- AL asked how the Project will avoid the *Carex* habitat during construction. SAndicated that the project would actually "touch" the edge of only one area of *Carex* habitat. It may actually allow the habitat to expand as this species prefers open areas.

Resources

- Phil Colarusso confirmed that there was no eelgrass observed in Little Bay during the 2015 PREP survey.
- AL asked whether there will be a pre-installation survey for eelgrass. We responded that Eversource plans to survey the project area in summer 2017 prior to in-water installation.
- MT asked about small whorled pogonia surveys. SA responded that the known site is about ½ mile north of the SRP. We coordinated with Susi von Oettingen (FWS) to screen for potential habitat and found 2 sites that met the criteria. Field surveys in late June indicated marginal habitat and no small whorled pogonia.

Mitigation

- Lori Sommer (LS) - were the in-lieu fee amounts calculated based on a percentage of secondary impacts? SA confirmed the project used 15%.
- LS asked what Durham is proposing to do in the Wagon Hill Farm shoreline restoration proposal. How much money are they looking for? SA explained that Durham would like to stabilize the shoreline,

restore salt marsh and a small amount of freshwater habitat, and create barriers to human and dog access. SA said that the project would require additional engineering study to identify and solve the shoreline erosion.

- LS commented that the Aquatic Resources Conservation Fund has recently provided funding to the Powder Major project in Durham. Would Eversource consider contributing to that project? She acknowledged that the timing of the SRP may not coincide with the funding campaign. Other thoughts include an oyster restoration grant in Greenland and the Spruce Woods forest in Durham (New England cottontail habitat restoration).

Permits

- MK asked whether there has been a decision regarding need for a 401 Water Quality Certificate; Owen David said that since this project is going to the SEC and there is not an individual Corps permit, there will not be a stand-alone Water Quality Certificate. However, he will be providing conditions to be included in the overall permit for the project.

Monitoring

- Salt marsh
    - MJ asked how long we proposed to monitor salt marsh recovery – 3 to 5 years?; usually requires a 3 year minimum
    - LS said the state would allow cessation of monitoring after 3 years if it has been demonstrated that there are no issues
- Water quality
    - DP asked whether we would do turbidity monitoring and establish threshold exceedances
    - MJ recommended there be a discussion of turbidity monitoring. He felt it may or may not involve a stop work clause but there is value to having data confirming how well the model works. AP said that the model was run on suspended sediments, not turbidity, which cannot be measured directly in the field so that complicates trying to validate the model in the field. AP also indicated that including a stop work clause for a specific cable run would be onerous because stopping the jet plow in the middle of a run is technically very difficult. AP also said that Eversource can put conditions in their contract with the installer controlling aspects of their operations (e.g., jet plow advancement rate as the model showed that a substantially faster rate results in higher plume concentrations, although for a shorter duration). The consensus of the agencies was that Eversource should propose water quality monitoring for the filing.
    - Ridge Mauck suggested that since Eversource is installing three cables about a week apart that the Project should look at a process where the results from water quality monitoring of a single cable could be evaluated prior to the next installation and used to make adjustments for the subsequent installations.

- Re-deposition
  - MJ made the point that SSFATE was not really developed to predict deposition of sediments and doesn't necessarily function very well for that. Can we do something to validate those predictions? This will be addressed in the monitoring program.
  - AL – will we be monitoring bathymetry after installation? AP – in general, the marine contractor will likely be required to do that.
  - AL – since we will be affecting "exemplary habitats" in Little Bay, will we be doing any monitoring to confirm impacts are as predicted (not worse)?

Other

- MK asked how controversial the project is. SA indicated that there is certainly local interest and that project is meeting regularly with all municipalities and interested residents. Newington is still withholding support and trying to find alternative routes.
- Consensus that the confidential data for NHB, USFWS and other resources should be summarized in the public portion of the application, with locations and other details provided under separate cover.

Follow-up

- Develop proposed Little Bay water quality monitoring program and follow up with agency discussion.
- Develop proposed post-construction bathymetric surveys and follow up with agency discussion.
- Develop post-construction monitoring program for *Carex cristatella* impact area.

From:	Price, David
To:	Brown, Carroll
Cc:	Domke, Jason; Sarah Allen
Subject:	FW: SRP meeting
Date:	Friday, February 19, 2016 11:55:51 AM
Attachments:	SRP Env Fact Sheet 021816.docx

Carroll,
Jason mentioned to me that you should be aware of this project and to coordinate how this may affect the DES Oil Spill Response. Attached is a narrative that describes the project. In particular, take a look at the second page which describes work within the Piscataqua River. Eversource may need to limit/restrict river traffic during this portion of work. I've cc'd Sarah Allen, Normandeau Associates, with this e-mail because they are the consultants working on the project for Eversource. Sarah may be able to provide additional information about timing and coordination of work to minimize interfering with the DES Oil Spill Response operations.
Thanks and let me know if you have any questions.
Dave

David Price
DES Land Resources Management
Pease Office - 222 International Dr. - Ste. 175
Portsmouth NH 03801
(603) 559-1514

From: Sarah Allen [mailto:sallen@normandeau.com]
Sent: Thursday, February 18, 2016 5:52 PM
To: Price, David; Hilton, Scott; Sandin, Peter; Nash, Chris; Domke, Jason
Cc: kurt.nelson@eversource.com; dena.champy@eversource.com
Subject: RE: SRP meeting

Hello All,
Dave Price suggested I follow up with you all to provide additional information on the Seacoast Reliability Project. I've attached their 1-page project description just for reference and would be happy to meet with you to discuss the project and any concerns you may have.
Sarah

From: Price, David [mailto:David.Price@des.nh.gov]
Sent: Friday, January 15, 2016 2:04 PM
To: Sarah Allen
Cc: Hilton, Scott; Sandin, Peter; Nash, Chris; Domke, Jason
Subject: FW: SRP meeting

Hi Sarah,
Thanks for the meeting minutes and the Powerpoint presentation. I discussed the project with a few other folks here at DES, cc'd on this e-mail, after the meeting and some questions came up.

1. Have the sediments in the river where work is proposed been analyzed for contaminants? If so, what are the results?
2. There was a concern of possible elevated bacteria levels from the proposed work within the

river. It was suggested that monitoring of the bacteria levels be conducted during construction. Is this a possibility?

3. You mentioned that the river would be closed to boat traffic during construction. This may affect the operations of the DES Oil Spill Response and Complaint Investigation Section. Have you coordinated with DES regarding this issue? If not, you may want to discuss with Jason Domke copied on this e-mail.
4. Is there work proposed on the Pease Tradeport property? If so, have you coordinated with the Pease Development Authority?
5. Do you think there would be a need for dewatering work areas that are either on Pease Tradeport property or nearby?

Scott, Peter, Chris and Jason, anything to add?

Thanks again and let me know if you have questions or need anything clarified.
Dave

David Price
DES Land Resources Management
Pease Office - 222 International Dr. - Ste. 175
Portsmouth NH 03801
(603) 559-1514

From: Sarah Allen [mailto:sallen@normandeau.com]
Sent: Friday, January 15, 2016 10:45 AM
To: colarusso.phil@epa.gov; Patterson, Cheri; kern.mark@epamail.epa.gov; david.m.keddell@usace.army.mil; joseph.sperry@eversource.com; Lamb, Amy; Mike R Johnson - NOAA Federal (mike.r.johnson@noaa.gov); Kristoff, Richard C NAE (Richard.C.Kristoff@usace.army.mil); Mauck, Ridge; David, Owen; Wiggin, Dori; Sommer, Lori; Maria_Tur@fws.gov; Forst, Darlene; Comstock, Gregg; bill_peterson@fws.gov; Price, David; Kristoff, Richard C NAE (Richard.C.Kristoff@usace.army.mil)
Cc: Ann Pembroke; kurt.nelson@eversource.com; dena.champy@eversource.com; sandra.gagnon@eversource.com; joseph.sperry@eversource.com; James J. Jiottis/NUS (jiottjj@nu.com)
Subject: RE: SRP meeting

Hello All,

Thank you for your time and input on Tuesday during the Seacoast Reliability Project review. It was very constructive from our perspective. Please find attached our meeting notes and a copy of the presentation. Let me know if you have any comments or further questions.

Sarah

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EVERSOURCE ENERGY

Environmental Fact Sheet

The Seacoast Reliability Project (SRP) is a new 115kV transmission line that will traverse portions of the towns of Madbury, Durham, Newington and the City of Portsmouth. The Project will be primarily located within existing electric utility and railroad corridors. The new line will be approximately 13 miles long and will include a combination of overhead and underground design.

Eversource has designed the SRP to avoid or minimize environmental impacts while strengthening the existing electrical infrastructure in the Seacoast area. Extensive environmental studies were conducted by an experienced team in consultation with state and federal regulatory agencies. The results of these studies have been incorporated into the siting, design and construction aspects of the Project. The majority of the environmental impact of the Project is temporary and limited to the construction phase of the Project

Eversource will follow best management practices (BMPs) during construction to minimize disturbance to wetland and water resources. Measures include current erosion control techniques, matting to minimize disturbance to wetlands, cable installation in Little Bay during the fall to minimize impacts to fisheries and recreation, and water quality monitoring during cable laying to ensure compliance with state and federal water quality requirements. Eversource will utilize an environmental specialist to routinely meet with contractors, inspect work areas for BMP and regulatory compliance, and ensure any temporary impacts due to construction are stabilized or restored as quickly as possible.

Project Right-of-Way

Terrestrial and water resources have been avoided where possible, resulting in less than 1,000 square feet of permanent fill in freshwater wetlands. Temporary impacts to wetlands and streams consist almost entirely from timber mats for work pads, access roads and tree clearing routes. There are no vernal pools present in the proposed Project work area.

The grassland/shrubland within the existing corridor provides habitat resources to species such as white-tailed deer, red fox, striped skunk, garter snake, wild turkey, blue jay, grey catbird, and goldfinch. Portions of the corridor provide habitat for state-listed rare wildlife species, including the New England cottontail, northern long-eared bat, black racer, Blandings turtle, spotted turtle, and ringed boghaunter, among others. Some of these species will benefit by the increase in shrub habitat, and none is expected to be adversely affected by the Project.

Photo courtesy of Mike Marchand/NHFG

The New England cottontail is dependent on shrub and grasslands. Populations are declining in the Seacoast area as these habitats mature or are developed. Eversource works with NH Fish and Game to manage transmission corridors to benefit the New England cottontail. While none of these rabbits are currently known to occur in the Project area, the SRP right-of-way will have the potential to provide a connective route for the New England cottontail to disperse to other suitable habitats.

Little Bay Crossing

Specialized marine cable will cross Little Bay within a "Cable Area" charted by the National Oceanic and Atmospheric Administration. Cable installation methods include a combination of jet plow in deeper waters and hand burial in shallow waters, designed to minimize turbidity plumes and redeposition in the area. The jet plow is considered to be the Best Available Technology for this type of installation for several reasons: the direct disturbance footprint is limited to slightly wider than the width of the plow blade (about 1 foot); the blade extends into the sediment slightly below the required burial depth for the cable; water pressure to the jets can be controlled to reduce the amount of sediment likely to be suspended in the water column; the cable can be laid simultaneously with jetting so only one pass of the jet plow is required per cable; ans no open trench remains after installation (although there will likely be a shallow depression over the cut). Duration of jet plowing is expected to be about 13 hours per cable.

Little Bay, including the Cable Area, provides habitat for shellfish, benthic infauna, lobsters and horseshoe crabs, and fish. The only permanent impacts will be limited to concrete mattresses used in locations near the shorelines if shallow bedrock prohibits cable burial to its full depth. Temporary impacts to the area include alteration of benthic habitat and brief increased levels of suspended sediments. The jet plow's water system uses approximately 0.2 percent of the total volume of water in upper Little Bay; early life stages of certain marine species will be entrained, but given the statistically insignificant volume of water, adverse effects to marine species will be minimal. During operation, any magnetic fields emitted from the cables are unlikely to be detectable by these species.

No eelgrass beds occur within the proposed cable area. The cable installation will not affect eelgrass production elsewhere in Little Bay because of the brief timeframe expected for suspended solids in the water column (maximum of 6 hours in any given location) and the time of year proposed for the work, beginning in September when eelgrass is at the end of its season.

Temporary impacts to diadromous fish such as adult American eel, juvenile alewife, blueback herring, American shad, and rainbow smelt will be minimized because of the short duration of the jet plow installation and corresponding limited water quality effects.

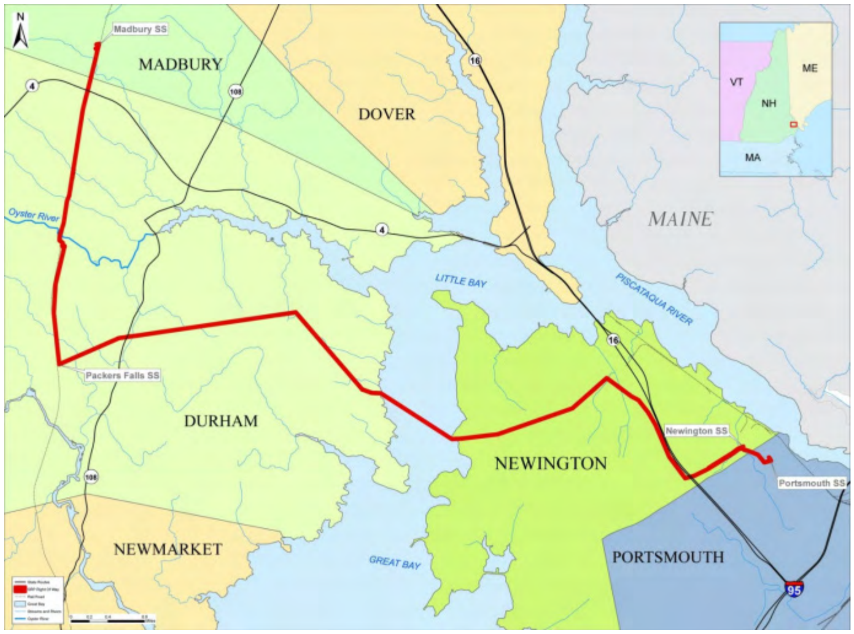
There will be no permanent impact to tidal wetlands. Several areas of fringing salt marsh will be crossed as the cable comes ashore. The salt marsh peat and vegetation will be salvaged prior to cable burial and replaced at grade after completion of the cable laying.

Construction of the Project may result in minor, short-term localized effects on air quality, primarily from fugitive dust (resulting from ground disturbance at work sites and vehicular movements on access roads along the ROWs) and from vehicular emissions associated with operating construction equipment, but both of these impacts will be controlled through the utilization of dust suppression methods (primarily watering) and/or restrictions on idling No long-term effects on air quality will result from the operation of the proposed transmission lines.

The Seacoast Reliability Project will increase the dependability of electric infrastructure. By locating the project within an existing utility corridor, potential environmental impacts will be avoided or minimized.

An Eversource project representative can be reached by

email: transmissioninfo@eversource.com, by phone: 1-888-926-5334, or at the website WWW.Eversource.COM (click Transmission, Project Information for Customers, Seacoast Reliability Project).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Newington SS
NEWINGTON
Portsmouth SS
NEWMARKET
GREAT BAY
PORTSMOUTH
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5 Statements in Response to the 20 Questions (Env-Wt 302.04)

WETLANDS PERMIT APPLICATION – ATTACHMENT A MINOR AND MAJOR - 20 QUESTIONS

Water Division/ Wetlands Bureau/ Land Resources Management

Check the Status of your application: www.des.nh.gov/onestop

RSA/ Rule: RSA 482-A, Env-Wt 100-900

Env-Wt 302.04 Requirements for Application Evaluation - For any major or minor project, the applicant shall demonstrate by plan and example that the following factors have been considered in the project's design in assessing the impact of the proposed project to areas and environments under the department's jurisdiction. Respond with statements demonstrating:
1. The need for the proposed impact.
The PSNH Seacoast Reliability Project (SRP, or Project) is proposed as a part of PSNH's continued effort to provide high-quality service to the customers of New Hampshire and to meet reliability and other applicable benchmarks. It has been approved by ISO-NE as part of PSNH's Seacoast Reliability Solution. It is one of seven projects in the Solution; the other six are relatively minor in nature, including line upgrades, line uprates, and substation improvements. The SRP is a reliability project. The purpose of SRP is to provide a parallel path to enhance the existing 115 kV loop between the Deerfield and Scobie Pond Substations in order to address reliability concerns in the New Hampshire Seacoast Region, which have previously been identified by the Independent System Operator – New England ("ISO-NE"). PSNH, working with ISO-NE, conducted a needs assessment study which concluded that the New Hampshire Seacoast Region requires additional transmission capacity to support the reliable delivery of electric power to meet the Region's current demand and future increased demand. **Additional information is included in the permit application narrative and associated NH SEC application materials.**
2. That the alternative proposed by the applicant is the one with the least impact to wetlands or surface waters on site.
Beginning in 2008, a working group led by ISO-NE conducted a Needs Assessment, which led to a determination that the New Hampshire Seacoast area ("Seacoast Area") requires additional generation resources and/or transmission capacity. The Needs Assessment found that there are violations of the transmission system criteria in the Seacoast Area under certain potential system operating conditions. As a result, the working group also conducted a Solution Study to identify potential solutions to correct these violations. The Solutions Study led to the development of four solution alternatives, each comprised of a separate suite of projects, one of which included the Madbury to Portsmouth Project. After reviewing each suite of projects, the solution set that included the Madbury to Portsmouth project was selected by ISO-NE on January 12, 2012 as the preferred solution, consistent with regional transmission planning standards as the lowest cost and best overall option. **Detailed natural resource studies were not conducted for all the alternatives as that level of detail is not required; however the benefits of the preferred alternative related to wetland and surface water impacts include utilizing an existing cable crossing area in Little Bay, utilizing existing ROW areas including wetland and other areas that are periodically disturbed for maintenance and vegetation management, and fewer impacts to prime wetlands. See narrative for additional detail on the various alternative routes studied.** **Additional information is included in the permit application narrative and associated NH SEC application materials.**

shoreland@des.nh.gov or (603) 271-2147
NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095
www.des.nh.gov

3. The type and classification of the wetlands involved.

The majority (49%) of terrestrial wetlands associated with the Project corridor are combinations of palustrine scrub-shrub (PSS) and emergent (PEM) with primarily emergent wetlands comprising 17%. Other combinations of PSS, PEM, PFO, and PUB wetland make up the remaining systems. Estuarine wetlands associated with the Project are predominantly intertidal flats (E2US), and subtidal areas (E1UB), with smaller areas of salt marsh(E2EM) and rocky shore (E2RS). The majority of the estuarine areas are E2US and E1UB systems. Permanent impacts are proposed for E2US, PSS, PEM and E2RS wetland types, the majority of which are associated with concrete mattresses that may be required to protect portions of the submarine cables in Little Bay. The majority of temporary impacts are proposed for PSS and E2US/RS, E2EM and E1UB wetland areas. No permanent impacts are proposed to any streams, with limited temporary impacts for both perennial and intermittent streams. No vernal pool impacts are proposed.

4. The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters.

Nearby, off-site freshwater wetlands and surface waters will not be affected by the proposed project. The wetlands within the existing transmission ROW vary in size, value, function and development. Several are small isolated wetland pockets that exist due to the unique regional combination of topography and soils, while others have been affected by, or created by, human activities in the corridor. Small wetlands were avoided during the planning stage of the project to reduce overall project impacts. Other wetlands are larger and extend outside the project corridor, or are crossed by the ROW and exist as part of a larger wetland system. Due to their size and shape, these wetlands were unable to be avoided; however impacts were minimized to the extent practicable.

The submarine and underground portions of the project were sited to avoid and minimize impacts where possible while still accommodating the required access points and other fixed engineering parameters. Installation technology including jetplow and others were chosen to minimize collateral impacts on adjacent wetland and water resource areas. Sediment dispersion modelling indicates short-term temporary sediment suspension and redeposition in Little Bay, with permanent impacts limited to the potential use of small concrete mattresses

5. The rarity of the wetland, surface water, sand dunes, or tidal buffer zone area.

None of the terrestrial wetlands within the SRP corridor are rare wetland types. Four exemplary communities occur in Little Bay. One rare plant species was located during field investigations. The majority of streams will be crossed using temporary bridges, thus limiting impacts. Impacts within the 100-foot tidal buffer zones (TBZ) associated with Little Bay have been avoided and minimized wherever practicable and have been restricted to previously developed/disturbed areas within the TBZ, including those associated with the existing ROW, electrical distribution line and structures, and existing residential development and associated driveways. A total of 11 SF of permanent and 21,166 SF of temporary impacts are proposed within the TBZ. The submarine portions of the project have been sited within an existing cable crossing area. Permanent impacts are not proposed to salt marshes and will be limited to areas where concrete mattresses are needed to protect the buried cables. The remaining impacts to the tidal areas are temporary.

Additional information is included in the permit application narrative and associated NH SEC application materials.

6. The surface area of the wetlands that will be impacted.

A total of 6,128 SF (0.14 acres) of permanent wetland impacts are proposed as a part of the Project; these impacts are unavoidable and have been minimized as much as possible. A total of 577,259 SF (13.25 acres) of wetlands are proposed to be temporarily impacted during clearing and construction activities. Permanent impacts are associated with the installation of new transmission line structures in terrestrial areas and the potential need for concrete mattresses for cable protection in estuarine areas. Temporary impacts are associated with timber matting along access roads and for work pads and for impacts associated with installation of the marine cables using jetplow and hand-jetting technology.

7. The impact on plants, fish and wildlife including, but not limited to: a. Rare, special concern species; b. State and federally listed threatened and endangered species; c. Species at the extremities of their ranges; d. Migratory fish and wildlife; e. Exemplary natural communities identified by the DRED-NHB; and f. Vernal pools.
According to data Normandeau received from NHNHB in 2013, 2014 and 2015 (Appendix A), NHB identified 9 plants, 6 exemplary communities, 1 invertebrate, 5 fish populations, 4 reptiles, 9 bird species, and 2 mammals that have occurred or currently occur within the vicinity of the project area. The results of field surveys and desktop analyses indicate that the Project corridor may provide habitat for 4 natural communities (Sparsely vegetated intertidal system and Subtidal system, High salt marsh, Salt marsh system), 1 invertebrate (Ringed boghaunter), 5 fish (Shortnose Sturgeon, Atlantic Sturgeon, American Eel, Banded Sunfish, Swamp Darter), 4 reptiles (Eastern Hog-nose Snake, Northern Black Racer, Blandings and Spotted Turtles), 2 birds (Bald Eagle, Osprey) and 2 mammals (Northern Long-eared bat, New England Cottontail). One plant species, crested sedge, was found in Durham. **In general, impacts to protected species will be managed through best management practices during construction. Examples include pre-construction surveys to ensure the absence of nesting bald eagles and osprey (if either species is breeding within or near the ROW, time-of-year restrictions may apply); surveys during construction to clear the work area of turtles and snakes; handcutting in the vicinity of the ringed boghaunter habitat in the unlikely case that larvae use the marginal habitat in the ROW; and minimization of clearing preferred shrubby areas in high priority New England cottontail habitat. Impacts to northern long-eared bats, assumed to occur in the project corridor, will be small and inconsequential to local and regional populations . Approximately 0.02 acres of unavoidable temporary impacts to the fringing salt marsh will be restored following burial of the cable. Restoration techniques will include salvaging the intact peat prior to trenching for replacement after the cables are buried. No vernal pools were identified within the ROW.**
8. The impact of the proposed project on public commerce, navigation and recreation.
The proposed project will not permanently impact public commerce, navigation or recreation. Temporary disruptions to recreation via the use of the existing corridor access trails for hiking, ATV/ORV use, snowmobile use, or cross country skiing may be temporarily affected during construction periods, depending on the season. Brief, temporary disruptions to navigation may also occur during construction activities within Little Bay; however applicable safety and best management guidelines will be followed at road and waterway crossings as well as the proposed crossing of Little Bay. Coordination with the appropriate authorities and advance notification of potential disruptions will further minimize the extent to the anticipated temporary distruptions.
9. The extent to which a project interferes with the aesthetic interests of the general public. For example, where an applicant proposes the construction of a retaining wall on the bank of a lake, the applicant shall be required to indicate the type of material to be used and the effect of the construction of the wall on the view of other users of the lake.
The Visual Assessment (“VA”) prepared for the SRP concluded that the Project will not have an unreasonable adverse effect on aesthetics. Before filing its application, PSNH held multiple local meetings with each host community as well as representatives of the University of New Hampshire. As a result, PSNH incorporated, and is continuing to incorporate, design elements that reduce visual impacts, including: relocating distribution lines, where possible, in order to reduce transmission line structure heights including the replacement of the 90-115-foot double circuit monopoles in Newington with H-Frame structures that range between 60 and 70 feet by removing the existing 34.5 kV distribution line from the proposed underbuild, and working with individual property owners to shift structure locations, where possible. The co-location of the Project within an existing electric corridor significantly reduces the visual impact associated with Project development as these areas are already disturbed. The use of the existing corridor will help to reduce the disruption to land uses and minimizes the amount of new clearing required. The lack of highly sensitive areas, coupled with the existing development patterns, limits the impact of the SRP to visual resources.

10. The extent to which a project interferes with or obstructs public rights of passage or access. For example, where the applicant proposes to construct a dock in a narrow channel, the applicant shall be required to document the extent to which the dock would block or interfere with the passage through this area.
The public rights of passage or access will not be permanently impacted as a result of the Project. The new transmission line will be located within an existing ROW and consist primarily of overhead structures. The marine portion of the Project will be installed underground and underwater, thereby eliminating any permanent obstructions. Temporary, short-term closures necessary to safely complete construction of the various project components may be necessary, and these will be coordinated through the appropriate authorities and advance notice will be provided where possible.
11. The impact upon abutting owners pursuant to RSA 482-A:11, II. For example, if an applicant is proposing to rip-rap a stream, the applicant shall be required to document the effect of such work on upstream and downstream abutting properties.
The SRP corridor includes easements across many parcels of land, that convey the right to Eversource to construct and replace transmission lines in support of the reliability of the transmission system. All permanent impacts will be restricted to the corridor, PSNH owned parcels, or lands where easements or other allowances are present. The vast majority of the impacts will be temporary and limited to wetlands and surface waters located within the ROW (or in areas adjacent to it, for access roads) and within easement bounds to the extent practicable. **BMPs and erosion control measures will be employed throughout construction and maintained to ensure that sediment and other pollutants do not leave the worksite and impact downstream/down-gradient abutting owners and any associated natural resources. The proposed permanent impacts (new structures) will have a minimal impact on surrounding areas due to a very small footprint. Temporarily impacted areas for access roads and work pads and along the underground portions of the project will be restored to grade and stabilized with native vegetation. Short-term, temporary impacts associated with the submarine portion of the line will be minimized and also controlled using sediment curtains and other measures where technically feasible.** **Additional information is included in the permit application narrative and associated NH SEC application materials.**
12. The benefit of a project to the health, safety, and well being of the general public.
The project will improve upon the existing network of electrical delivery system in southeast New Hampshire. This will have a positive impact on the lives of PSNH customers due to the increase in reliability of electricity delivery. The SRP is a critical project that will facilitate the transfer of power through these regions of the state to help ensure the availability of sufficient electricity during high demand periods, which frequently occur in the summer months. **PSNH will construct and operate the Project in accordance with all applicable safety and electrical codes, including the National Electrical Safety Code and all PSNH transmission line design standards.** **There will not be an increase in audible noise in the vicinity of the Project because audible noise and other associated effects of corona discharge are typically not noticeable at lower transmission operating voltages, such as that of this proposed 115 kV transmission line.** **In March 2015, the European Union's Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) issued its most recent review of health research on electromagnetic fields, including ELF EMF. Consistent with WHO's conclusion, the SCENIHR report did not conclude that the available scientific evidence confirms the existence of any adverse health effects associated with ELF EMF exposure.**

13. The impact of a proposed project on quantity or quality of surface and ground water. For example, where an applicant proposes to fill wetlands the applicant shall be required to document the impact of the proposed fill on the amount of drainage entering the site versus the amount of drainage exiting the site and the difference in the quality of water entering and exiting the site.
There will be no change in the quantity of surface water or groundwater as it currently enters and leaves the project corridor. Best management practices (BMPs) (New Hampshire Department of Resources and Economic Development 2010) will be employed to avoid temporary impacts to water quality during construction activity and these measures will be installed prior to construction, maintained throughout the work, and removed when applicable following the end of the project. Disturbed areas will be restored based on BMPs and agency recommendations. Construction of the marine portion of the Project has been designed to minimize the temporary impacts to water quality to the maximum extent practicable. Water quality changes related to the installation of cables within Little Bay will be minimized through advanced technology (jet plow), utilization of controls such as sediment curtains, and restricting work to coincide with favorable tidal conditions. Any changes in water quality from suspended sediment will be brief in duration and limited in scope. A water quality monitoring program is proposed to measure turbidity during construction. Potential emerging contaminants in groundwater associated with Pease are being tracked. The project will coordinate with NHDES and USEPA to develop a handling strategy if PFOA/S levels exceed acceptable levels in construction areas.
14. The potential of a proposed project to cause or increase flooding, erosion, or sedimentation.
The project is not expected to increase erosion or sedimentation, and techniques described in the New Hampshire BMP's manual (NH DRED 2010) will be followed during construction to prevent temporary impacts. The quantity of new fill in floodplains will not not measurably increase, with 5 new structures (six total poles) located in floodplain areas and a total of three existing distribution structures removed from floodplain areas. No permanent road construction or other significant earthwork is planned and disturbed areas will be restored and stabilized following construction. The underwater cable crossing will use a 2-stage jetplow to minimize sediment suspension. Sediment suspension and dispersion modelling indicates that all suspended sediments in excess of 10 mg/L will be undetectable after 3 hours for each of the three cable installations.
15. The extent to which a project that is located in surface waters reflects or redirects current or wave energy which might cause damage or hazards.
Proposed work in surface waters will be temporary in nature and associated with temporary access across terrestrial wetlands to the work sites located along the existing ROW. The majority of small streams will be temporarily bridged with timber matting and temporary culverts are necessary in only two areas. One perennial stream (College Brook located on the UNH Campus) is proposed to be crossed by an underground portion of the line via open trench. To accommodate the temporary installation of the line through this area, a temporary diversion will be needed so the work can be done under dry conditions within the stream. Following installation the streambed and banks will be restored to pre-existing conditions and stabilized and the temporary diversion of surface water will be removed. These terrestrial wetlands do not contain any currents or wave energy. **The Little Bay crossing will be located underground and/or as submarine cable installed via using jetplowing, along with hand-jetting and trenching in the nearshore areas. Concrete mattresses will be required where the cable cannot be buried to the specified depth to provide protection from anthropogenic and environmental disturbances. The mattresses are articulated and low-profile and are not ancitipated to reflect or redirect wave or current energy.** **Therefore this project will not permanently reflect or redirect current or wave energy as the areas will be restored to pre-construction grade.**

16. The cumulative impact that would result if all parties owning or abutting a portion of the affected wetland or wetland complex were also permitted alterations to the wetland proportional to the extent of their property rights. For example, an applicant who owns only a portion of a wetland shall document the applicant's percentage of ownership of that wetland and the percentage of that ownership that would be impacted.

This project serves the public, including the local landowners, and is therefore not directly comparable to an individual land-owner's desire to fill wetlands for private use. Nonetheless, permanent wetland impacts associated with the terrestrial portions of the project will be minimal (approx. 792 SF), and these permanent impacts are spread out over 24 separate wetlands in three towns: Madbury, Durham, and Newington. No permanent impacts are proposed within the City of Portsmouth. The largest permanent terrestrial impact in any wetland is 199 SF, which will occur in wetland MW2 in Madbury. Proposed permanent impacts to the estuarine portions of the Project will not exceed 5,336 SF, and may be less. These impacts have been minimized where possible and are associated with required protection measures where the submarine cable cannot be buried to a sufficient depth. The E2RS and E2US wetlands proposed to be impacted extend throughout the Little Bay area. Impacts are restricted to an existing cable crossing corridor which has been utilized in the past and contains de-energized cables that are obsolete. Overall, the potential cumulative impacts will be minimal due to the limited amount of terrestrial permanent impacts and regulatory restrictions associated with estuarine impacts outside of the existing cable crossing area.

17. The impact of the proposed project on the values and functions of the total wetland or wetland complex.

Permanent impacts to terrestrial wetlands are minor (792 SF) and have been avoided or minimized where possible. Temporary impacts are not anticipated to have any adverse effect on the functions and values associated with the affected wetland systems. Applicable construction BMPs, on-site monitoring, and restoration of temporarily impacted areas according to standards and based on agency recommendations will be employed. The functions most commonly associated with the permanently impacted terrestrial wetlands include groundwater discharge, floodflow alteration, production export, sediment/toxicant retention and wildlife habitat; however the small footprint of new transmission line structures will not affect these wetland functions or those associated with the wetland complex.

Permanent impacts to the estuarine wetlands associated with Little Bay have also been avoided and minimized where possible, and are limited to surficial protection measures (concrete mattresses) that are required by the National Electrical Safety Code (NESC) for submarine cables that cannot be buried to the required depth due to bedrock or other limiting material. Impacts will be restricted to the existing cable crossing area and are not anticipated to result in any undue adverse impacts to wetland functions and values.

Additional information is included in the permit application narrative and associated NH SEC application materials.

18. The impact upon the value of the sites included in the latest published edition of the National Register of Natural Landmarks, or sites eligible for such publication.

The SRP Project will have no impact upon the value of any sites listed on the National Register of Natural Landmarks. There are 11 sites designated as National Natural Landmarks in New Hampshire, only one of which is in the vicinity of the Project area, the Spruce Hole Bog site in Durham, NH. The Spruce Hole bog and surrounding Spruce Hole Conservation Area provide the Town of Durham with approximately 35.6 acres of permanent protection for land that sits atop the Spruce Hole Aquifer, a future public water supply. The bog is also adjacent to the Oyster River Forest, a permanently conserved 172± acre parcel owned by the Town of Durham. The SRP Project is located approximately 1.3 miles from the nearest boundary of the bog's conservation area. Several residential housing developments are located between the bog and the Project ROW. The Visual Assessment (VA) conducted for the SRP evaluated this area and determined that there will be "No Project Visibility." In addition, there will be no impacts within the Well Protection Area associated with the "future public water supply."

No other sites are identified on the National Natural Landmarks Program website as being eligible for designation and the last site designated in the state was finalized in 1987.

19. The impact upon the value of areas named in acts of congress or presidential proclamations as national rivers, national wilderness areas, national lakeshores, and such areas as may be established under federal, state, or municipal laws for similar and related purposes such as estuarine and marine sanctuaries.

There are no rivers designated as wild and scenic within the project corridor (National Wild and Scenic River System 2012). There are no New Hampshire State Parks within the project corridor (New Hampshire Parks and Recreation 2012). The Oyster River and Lamprey River Watershed are Designated Rivers managed as an outstanding natural and cultural resource in accordance with New Hampshire RSA 483, The Rivers Management and Protection Act. The SRP will span the Oyster River and pass through portions of the Lamprey River Watershed. Direct impacts are not proposed to the Oyster River or any of the main stem rivers listed as a part of the Lamprey River Watershed. Temporary timber mat bridges will be utilized where small streams need to be crossed for clearing or construction activities with no impact to the bed or banks. Great Bay, which includes Little Bay, is part of the National Estuarine Research Reserve System (NERRS). Impacts have been minimized within the Little Bay area and measures will be taken during construction to minimize any temporary impacts associated with the installation of the cable(s). The cables will be located within a designated cable crossing area, which has been used in the past and still contains cables that are not currently in use. Proposed permanent impacts have been minimized and associated with required safety measures designed to maintain reliability and public safety.

20. The degree to which a project redirects water from one watershed to another.

This project does not propose to divert flow from one watershed to another.

Additional comments

None. Please refer to the project narrative, appendices and plans for additional details.

6 The Seacoast Reliability Project: Project Description & Existing Conditions Narrative

Project Purpose

The SRP is a reliability project. The purpose of SRP is to provide a parallel path to enhance the existing 115 kV loop between the Deerfield and Scobie Pond Substations in order to address reliability concerns in the New Hampshire Seacoast Region, which have previously been identified by the Independent System Operator – New England ("ISO-NE"). PSNH, working with ISO-NE, conducted a needs assessment study which concluded that the New Hampshire Seacoast Region requires additional transmission capacity to support the reliable delivery of electric power to meet the Region's current demand and future increased demand.

This Project is proposed as a part of PSNH's continued effort to provide high-quality service to the customers of New Hampshire and to meet reliability and other applicable benchmarks. It has been approved by ISO-NE as part of PSNH's Seacoast Reliability Solution. It is one of seven projects in the Solution; the other six are relatively minor in nature, including line upgrades, line uprates, and substation improvements.

Primary Project Overview

The Project consists of a new overhead 115 kV electric transmission line, which will be known as the Line F107, to be located primarily within existing corridors between the Madbury Substation and the Portsmouth Substation, and modifications at both substations where the line terminates (Figure 1). The Environmental Maps, Section 16 or SEC Appendix 2, and the F107 Line Structure Location Plans in the Engineering Design Drawings, SEC Appendix 5, depict the location of each major part of the proposed facility. PSNH has the necessary rights to construct and operate the new overhead 115 kV transmission line. The line will be comprised of overhead transmission structures and conductor, underground cable, submarine cable. The substation modifications consist of terminal structures, breakers, disconnect switches, protection and control equipment, and miscellaneous electric infrastructure. The Project is designed in compliance with Eversource design standards and the National Electrical Safety Code ("NESC").

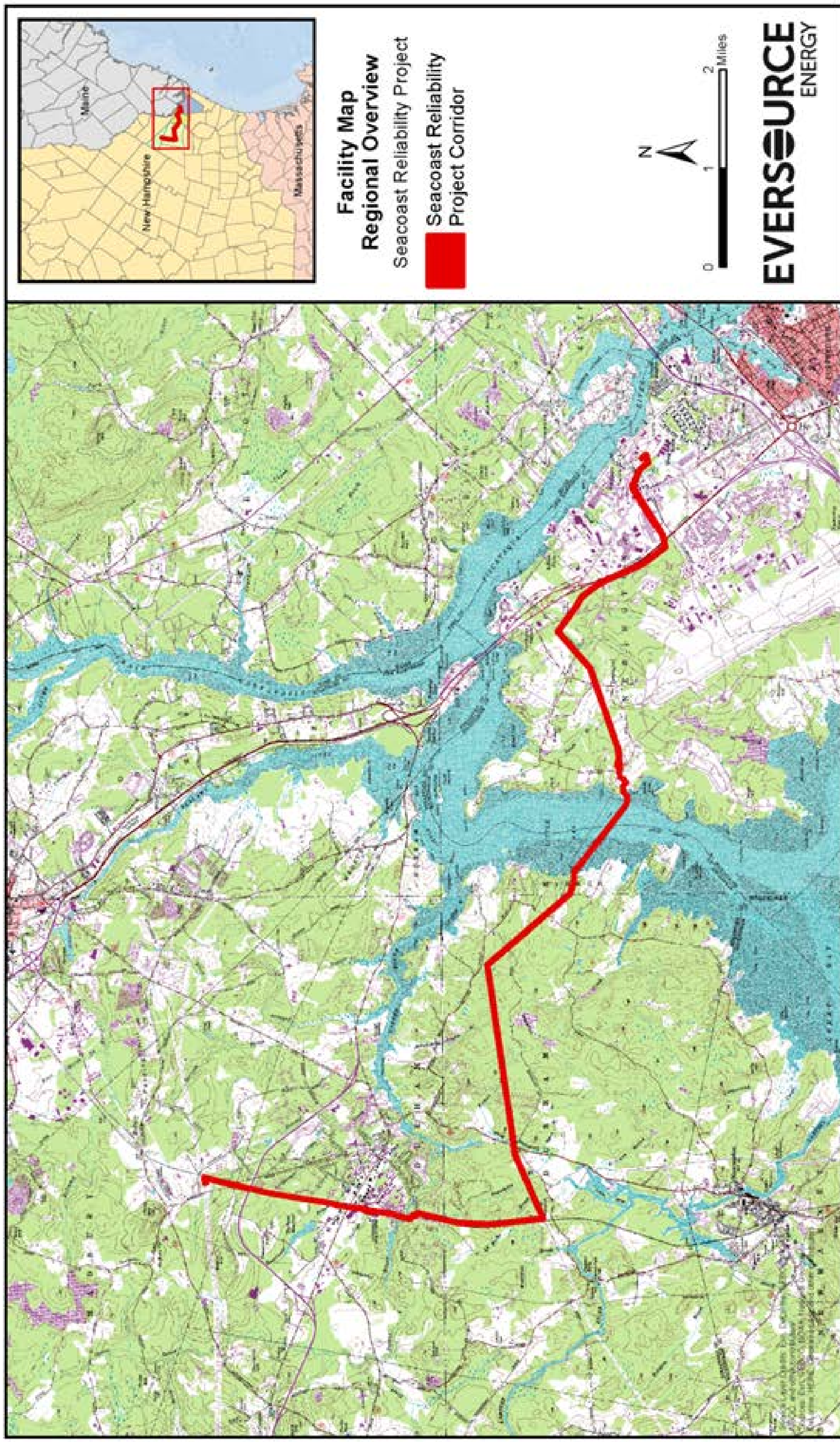

Figure 1. Overview Map of Seacoast Reliability Project (SRP)

A detailed description of the Project is described below.

Overhead Transmission

The proposed 115 kV transmission Line F107 will run approximately 12.9 miles from a new 115 kV bay at Madbury Substation to a new 115 kV bay at Portsmouth Substation. The transmission line will be located primarily within an existing electric utility corridor that is currently occupied by a 34.5 kV overhead distribution line supported by direct embedded wood pole structures. Circuits along the existing corridor include:

- 34.5 kV Line 380 from Madbury Substation (Madbury, NH) to Packers Falls Substation (Durham, NH),
- 34.5 kV Line 3162 from Packers Falls Substation to the west side of Little Bay (Durham, NH)
- 34.5 kV Line 3152 from Packers Falls Substation to Newmarket Road (Durham, NH)
- 34.5 kV Line 3850 from the east side of Little Bay (Newington, NH) to the proposed crossing of the Spaulding Turnpike (Portsmouth, NH).

Following the Turnpike crossing, the line will then be located within an existing transmission corridor with existing circuits Line E194 (115 kV), Line U181 (115 kV) & Line 3135 (345 kV). Portions of Line E194 will be rebuilt to provide adequate space within the existing corridor for Line F107.

The overhead portion of the Project will be constructed predominantly on single pole structures utilizing both vertical phase over phase and delta (triangular) phasing configurations, along with open wire distribution underbuild in a horizontal phasing configuration. The structure count for Line F107 is 150; the relocation of the E194 Line includes an additional four structures (for a total of 154 transmission structures that will be built). The majority of the new structures will be directly embedded self-weathering steel monopoles. Galvanized steel may be used in certain locations that are open or near other existing galvanized structures. Some structures are proposed to be self-weathering steel H-frames. In most locations, the proposed 115 kV overhead transmission line will be underbuilt with a 34.5 kV distribution line. Some locations will utilize either a single 115 kV line or new 115 kV line built on a single circuit line next to a relocated 34.5 kV line. In locations where the 34.5 kV lines are rebuilt on their own pole line, the 34.5 kV structures are proposed to be wood monopoles. Some structures, such as running angles and dead ends, will require the installation of guy wires or reinforced concrete drilled pier foundations. Typical transmission structure heights will vary between approximately 55 feet and 105 feet above grade with the most common height being 84 feet above grade. These heights will vary depending on terrain, required vertical clearance to ground, span length, underbuild, and other site specific conditions. *See* Engineering Design Drawings, SEC Appendix 5, for examples of the typical structure types to be used.

The overhead conductor will be a single 1590 kcmil 45/7 ACSR "Lapwing" per phase, while the rebuilt underbuild 34.5 kV circuits will be constructed utilizing a single 477 kcmil 18/1 ACSR "Pelican" per phase and one #4/0 AWG 6/1 ACSR "Penguin" neutral wire. The line will also carry a new 24 count fiber optical ground wire ("OPGW"). In places without a fiber OPGW or in places where additional lightning protection is required, a 19#10 Alumoweld shield wire will be installed above the phase conductors.

Submarine / Underground Transmission

There will be two terrestrial sections of the new 115 kV line that will be constructed underground with three solid dielectric insulated cables installed in individual PE conduits. The proposed conductor size is 3,500 kcmil copper and each phase will have one cable. There will be one additional section of the new 115 kV line that will be constructed completely underwater with three specialized solid dielectric insulated submarine cables directly buried in the soft sediments across Little Bay. The proposed conductor size for the submarine cable is 2,763 kcmil (1400mm^2) copper and each phase will have one cable. An all-dielectric fiber optic cable ("ADSS") will be installed in all underground sections with two ADSS cables installed in the submarine portion. All underground and submarine cables have been designed as an extra high voltage, extruded dielectric ("HVED") cable utilizing cross-linked polyethylene ("XLPE") insulation.

A detailed description of the proposed facilities is provided below.

Madbury Substation to NH Route 4: Structures 1 to 10

This section of the Project will be located on collectively PSNH fee owned property, on a newly acquired easement, or for one structure, on NH Department of Transportation ROW. The new transmission line will be located approximately 40 feet west of the existing distribution circuit. The structures along this portion of the Project will be direct embedded monopole or H-frame tubular self-weathering steel structures. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. The proposed new line will support the three 115 kV phases in a horizontal, vertical or delta phasing configuration with only structures 1 and 2 in this section including the 34.5 kV underbuild. The new 115 kV overhead line conductors will be carried on steel davit arms with suspension insulators, or directly attached to the poles or structure cross arms on suspension insulators. The 34.5 kV underbuild will be in a horizontal phasing configuration attached by suspension insulators and/or post insulators. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. Structure heights will vary between approximately 55 feet and 98 feet above grade. Typical span lengths in this section will average approximately 310 feet.

Route 4 to University of New Hampshire Parking Lot A: Structures 10 to 23

This section of the Project is predominantly within an existing Pan Am Railroad corridor. Additionally, PSNH has contracted to expand the corridor to include 25 feet of new width on UNH property. One structure will be located entirely on new easement that PSNH has contracted to acquire on UNH property. The new transmission centerline will be approximately 50 feet from the newly acquired western corridor edge and 36 feet from the existing rail centerline. The transition structure placed on the newly acquired easement will be approximately 95 feet west of the railroad centerline. The structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel or galvanized steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 350 feet. The new 115 kV overhead line conductors will primarily be in a delta phasing configuration on steel davit arms with suspension insulators or on braced post insulators, with the 34.5 kV underbuild in a horizontal phasing configuration attached by suspension insulators and/or post insulators. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. Structure heights will vary between approximately 80 feet and 95 feet above grade.

Structure 23 to UNH Waterworks Road: Underground Cable

This segment of the Project will be installed as an underground cable, in a buried duct bank consisting of PE and polyvinyl chloride ("PVC") conduits, on a newly acquired easement on UNH property. This segment will begin on a monopole self-supported self-weathering steel transition structure. The transition structure will be approximately 80 feet in height and will have the cable terminations and surge arresters located on davit arms in a delta configuration. The underground segment will continue approximately 2,100 feet along a new underground corridor located on University of New Hampshire property. The underground to overhead transition structure will be a monopole self-supported self-weathering steel structure approximately 80 feet in height and will have the cable terminations and surge arresters located on steel davit arms in a delta configuration.

The underground portion of the Project will consist of three solid dielectric insulated cables installed in individual PE conduits. The nominal trench for the duct bank will be five (5) feet wide by five (5) to twenty-two (22) feet deep. The duct bank will consist of four 8-inch diameter PE conduits, two 4-inch diameter PVC conduits for fiber-optic communication to protect the transmission lines, and one 2-inch diameter PVC conduit for a ground cable. The conduits will be directly buried with a minimum of 30 inches of cover, except for the section beneath Main Street, Durham. Due to the physical properties of fiber optic cable, the allowable pulling lengths cannot be as long as the underground power cable. As a result, handholes, which are approximately 5 feet wide by 7 feet long, are placed approximately every 600 feet along the underground route.

This portion of the line will be installed inside conduits within a reinforced concrete casing pipe installed beneath the road. The casing pipe will be installed beneath Main Street using a pipe-jacking construction method for a distance of approximately one hundred forty (140) feet.

UNH Waterworks Road to Packers Falls Substation: Structures 24 to 49

This section of the Project will be constructed within existing PSNH electric utility easements. The new transmission centerline will be located in the center of an approximately 100 foot wide corridor. The structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel or galvanized steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 370 feet. The new 115 kV overhead line conductors will be primarily in a delta phasing configuration on steel davit arms with suspension insulators or on braced post insulators, with the 34.5 kV underbuild in a horizontal phasing configuration attached by suspension insulators and/or post insulators. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. Monopole structure heights will vary between approximately 80 feet and 100 feet above grade.

Packers Falls Substation to Structure 57: Structures 49 to 57

This section of the proposed Project will be constructed within existing PSNH electric utility easements. From Packers Falls Substation to NH Route 108, the new double circuit transmission line will share the 100-foot wide corridor with another existing 34.5 kV electric utility line. The new centerline will be offset parallel to the existing distribution circuit by approximately 37 feet and be located approximately 42 feet from the Northern corridor edge. The structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 350 feet. The new 115 kV overhead line conductors will be primarily in a delta phasing configuration on braced post insulators, with the 34.5 kV underbuild in a horizontal phasing configuration, attached by suspension insulators and/or post insulators. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. Monopole structure heights will vary between approximately 80 feet and 95 feet above grade.

Structure 57 to NH Route 108 & Longmarsh Road: Structures 57 to 62

This section of the proposed Project will be constructed within existing PSNH electric utility easements. From Packers Falls Substation to NH Route 108, the new double circuit transmission line will share the 100-foot wide corridor with another existing 34.5 kV electric utility line. The new centerline will be offset parallel to the existing distribution circuit by approximately 35 feet and be located approximately 45 feet from the northern corridor edge. The structures along this portion of the Project will be direct embedded multi-pole H-frame tubular self-weathering steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 380 feet. The 115 kV electric conductors will be in a horizontal phasing configuration attached to a horizontal crossarm by suspension insulators, with the 34.5 kV under build in triangular phasing configuration utilizing spacer cable connected to a messenger cable attached to one of the 115kV poles on triangular shaped spacer insulators. Intermediate single wood stub poles will be installed to support the spacer cable on long spans. Multi-pole H-frame structure heights will vary between approximately 50 feet and 80 feet above grade. Single wood stub poles will vary between approximately 30 feet and 35 feet above grade. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms.

Longmarsh Road to Timberbrook Lane: Structures 62 to 64

This section of the proposed Project will be constructed within existing PSNH electric utility easements. The new transmission centerline will be located approximately 40 feet from southern edge of the approximately 100 foot wide corridor. The existing 34.5 kV line will be relocated to approximately 30 feet off the northern edge of the corridor. The 115kV structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 400 feet. The new 115 kV overhead line conductors will be in a delta phasing configuration on braced post insulators. The 34.5 kV line will be direct embedded wood poles. The new 34.5 kV overhead line conductors will be in a horizontal phasing configuration on post insulators on a wood or fiberglass crossarm. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. The new 115kV monopole structure heights will vary between approximately 70 feet and 80 feet above grade. The new 34.5kV structure heights will vary between approximately 40 feet and 45 feet above grade.

Timberbrook Lane to Durham Point Road: Structures 64 to 94

This section of the proposed Project will be constructed within existing PSNH electric utility easements. The new transmission centerline will be located in the center of an approximately 100 foot wide corridor. The structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 400 feet. The new 115 kV overhead line conductors will be primarily in a delta phasing configuration on steel davit arms with suspension insulators or braced post insulators, with the 34.5 kV underbuild in a horizontal phasing configuration attached by suspension insulators and/or post insulators. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. Monopole structure heights will vary between approximately 85 feet and 105 feet above grade.

Durham Point Road Crossing: Structures 94 to 96

This section of the proposed Project will be constructed within existing PSNH electric utility easements. The new transmission centerline will be located approximately 40 feet from the northern edge of the approximately 100 foot wide corridor. The existing 34.5 kV line will be relocated to approximately 30 feet off the southern edge of the corridor. The 115kV structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 410 feet. The new 115 kV overhead line conductors will be primarily in a delta phasing configuration on braced post insulators. The 34.5 kV line will be direct embedded wood poles. The new 34.5 kV overhead line conductors will be in a horizontal phasing configuration on post insulators on a wood or fiberglass crossarm. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. The new 115kV monopole structure heights will vary between approximately 80 feet and 95 feet above grade. The new 34.5kV structure heights will vary between approximately 40 feet and 45 feet above grade.

Durham Point Road to Little Bay Crossing: Structures 96 to 101

This section of the proposed Project will be constructed within existing PSNH electric utility easements and will consist only of the new 115 kV overhead transmission line. The new transmission centerline will be located in the center of an approximately 100 foot wide corridor. The structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel with some multi-pole horizontal configuration structures. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 450 feet. The new 115 kV overhead line conductors will be primarily in a delta phasing configuration on steel davit arms with suspension insulators or braced post insulators. Some structures will utilize multi-pole horizontal configurations with the conductor attached on a crossarm with suspension, or strain, insulators. Shield wires will be attached directly to the structures at the poles or on steel davit arms. Structure heights will vary between approximately 66 feet and 85 feet above grade.

Little Bay Crossing: Submarine Cable

This section of the proposed Project will be installed as a submarine cable. The cables will be installed in the existing, charted cable corridor across Little Bay. The existing cable corridor is approximately 1,000 feet in width. The transition from overhead to submarine cable on the western shore will occur on a monopole self-supported weathering steel structure. The pole will be approximately 80 feet in height and will have the cable terminations and surge arresters located on davit arms in a delta configuration. The submarine cable will proceed underground from the transition structure approximately 360 feet to the edge of Little Bay. From there the submarine cable will cross the bay a distance of approximately 5,470 feet and terminate in an underground vault on the eastern shore of Little Bay.

The proposed submarine cable design will consist of three individual solid dielectric insulated cables directly buried in the soft sediments across the bay. The cables will include a lead sheath to prevent water ingress and will also have an outer metallic armoring (copper wires) to provide mechanical strength during cable installation and retrieval activities. A fiber optic cable will be bundled with two of the three conductors to allow for a communication path. The nominal depth of burial for each cable is 42 inches in the shallow mud flats on the western shore and eight (8) feet in the deeper portions of the bay. Each cable will be separated by a distance of approximately 30 feet to prevent inadvertent mechanical damage during subsequent cable installation activities.

Little Bay Crossing to Little Bay Road: Underground Cable

This segment of the Project will be installed as an underground cable in a buried duct bank consisting of PE and PVC conduits. This segment will begin at a new precast concrete manhole located in the corridor on the eastern side of Little Bay in Newington and will proceed approximately 340 feet easterly to Gundalow Landing Circle in Newington. The underground segment will continue approximately 1,120 feet along Gundalow Landing Circle within the public ROW to three self-supported steel transition structures located approximately 10 feet off Little Bay Road. The total length of the underground segment is approximately 1,470 feet. The transition structures will be approximately 65 feet in height and will have the cable terminations and surge arresters located on davit arms in a horizontal configuration.

The proposed underground transmission line will consist of three solid dielectric insulated cables installed in individual PE conduits. The nominal trench for the duct bank will be five (5) feet wide by five (5) to eight (8) feet deep. The duct bank will consist of four 8-inch diameter PE conduits, two 4-inch diameter PVC conduits for fiber-optic communication to protect the transmission lines and one 2-inch diameter PVC conduit for a ground cable. The conduits will be directly buried with a minimum of 30 inches of cover. Due to the more delicate nature of fiber optic cable the allowable pulling lengths cannot match the underground power cable. As a result handholes, which are approximately 5 feet wide by 7 feet long, are placed approximately every 600 feet along the underground route.

Little Bay Road to Fox Point Road: Structures 102 to 115

This section of the Project will be constructed within existing PSNH electric utility easements and will consist only of the new 115 kV overhead transmission line. The new transmission centerline will be located in the center of an approximately 100 foot wide corridor. The structures along this portion of the Project will be direct embedded monopole, tubular self-weathering steel with some multi-pole horizontal configuration structures. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 520 feet. The existing 34.5kV line will be removed in this section of the corridor. Some of the new 115 kV overhead line conductors will be in a delta phasing configuration on steel davit arms with suspension insulators. Others structures will utilize multi-pole horizontal configurations with the conductor attached directly to the pole or on a horizontal crossarm with suspension insulators. Shield wires will be attached directly to the structures at the poles or on steel davit arms. Structure heights will vary between approximately 60 feet and 85 feet above grade.

Fox Point Road to Spaulding Turnpike Crossing: Structures 115 to 137

This section of the Project will be constructed within existing PSNH electric utility easements. The new transmission centerline will be primarily located approximately 40 feet from southern edge of the approximately 100 foot wide corridor. The existing 34.5 kV line will be relocated to approximately 30 feet of the northern edge of the corridor. The 115 kV structures along this portion of the Project will be direct embedded monopole tubular self-weathering steel. The running angle and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 420 feet. The new 115 kV overhead line conductors will primarily be in a delta phasing configuration on steel davit arms with suspension insulators or braced post insulators The 34.5 kV line will be direct embedded wood poles. The new 34.5 kV overhead line conductors will be in a horizontal phasing configuration on post insulators on a wood or fiberglass crossarm. A portion of the line in this segment will transition to double circuit direct embedded monopole, tubular self-weathering steel structures. Conductors will be in a delta phasing configuration on steel davit arms with suspension insulators, with the 34.5 kV underbuild in a horizontal phasing configuration. Shield wires and neutral conductors will be attached directly to the structures at the poles or on steel davit arms. The new 115 kV monopole structure heights will vary between approximately 65 feet and 100 feet above grade. The new 34.5 kV structure heights will vary between approximately 35 feet and 70 feet above grade.

Spaulding Turnpike Crossing to Structure 142: Structures 137 to 142

After crossing Spaulding Turnpike, the proposed Project will be constructed within an existing 300 foot wide PSNH electric utility easement. Structures along this portion of the Project will be direct embedded monopole, or H-Frame, tubular self-weathering steel. Some tangent, running angle, and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 435 feet. The 115 kV phase conductors will be in a horizontal phasing configuration with no distribution underbuild. Shield wires will be attached directly to the structures at the poles or on steel davit arms. Structure heights will vary between approximately 70 feet and 85 feet above grade.

Spaulding Turnpike Crossing to Portsmouth Substation: Structures 142 to 151

After crossing Spaulding Turnpike, the Project will be constructed within an existing 300 foot wide PSNH electric utility easement. This corridor currently includes two other 115 kV lines (U181 & E194) and one 345 kV line (3135). To make room for Project, portions of the existing 115 kV Line E194 will be relocated approximately 25 feet north of its existing location. The E194 structures will be constructed of monopole tubular self-weathering steel on a drilled pier foundation. The proposed new F107 Line will be approximately 37 feet south of the rebuilt Line E194, 50 feet north of the existing Line U181 and 125 feet north of the existing Line 3135. Structures along this portion of the Project will be direct embedded monopole, or H-Frame, tubular self-weathering steel. Some tangent, running angle, and dead end structures will require the installation of guy wires or reinforced concrete drilled pier foundations to support the applied loads. Span lengths will average approximately 380 feet. The 115 kV phase conductors will be in a horizontal, vertical, or delta phasing configuration with no distribution underbuild. The new 115 kV overhead line conductors will be carried on steel davit arms with suspension insulators, or directly attached to the poles or structure cross arms on suspension insulators. Shield wires will be attached directly to the structures at the poles or on steel davit arms. Structure heights will vary between approximately 30 feet and 95 feet above grade.

Madbury and Portsmouth Substations

Two PSNH substations will require modifications as part of this Project. Madbury Substation, off Miles Lane in Madbury, NH, and Portsmouth Substation at 280 Gosling Road in Portsmouth, NH, are being upgraded to accept a new line terminal position for the new F107 Line. There will be no expansion of the site or fenced area at either substation. All work will be occurring inside the existing fenced areas.

At Madbury Substation, there is an existing steel terminal structure, approximately 50 feet tall, already in place to accept the new line. Structural modifications will be performed on this terminal structure, and include the installation of steel bracing as well as modifications to the existing foundation. In addition to this structure work, a new 115 kV disconnect switch and circuit breaker will be installed. This will allow the new transmission line to be isolated from the rest of the electrical bus, protect critical station components from damage during a line fault, and allow for de-energization of the line for maintenance. Additionally, new coupling capacitor voltage transformers (“CCVTs”) and lightning arrestors will be installed. The fiber optic cable from the new transmission line will be tied into the existing control enclosure to connect into PSNH’s existing communication network. A 55 foot wood pole will be installed so that the fiber optic cable from the transmission line can be tied into the existing substation control closure. Additional controls and relaying for the new line will be installed in the existing control enclosure. There will be no expansion of the existing enclosure.

At Portsmouth Substation, a new bus extension will be installed with a new 50 feet tall galvanized steel terminal structure with two 10 feet tall lightning rods required to support the F107 Line. This work will include installation of rigid aluminum bus from an existing switch to the proposed location for the new line terminal structure. A new 115 kV disconnect switch will be installed on top of the terminal structure. Additionally, a new 115 kV circuit breaker, three CCVTs and lighting arrestors will be installed. This will allow the new transmission line to be isolated from the rest of the electrical bus, protect critical station components from damage during a line fault, and allow for de-energization of the line for maintenance. The fiber optic cable from the new transmission line will be tied into the existing substation control enclosure to connect into PSNH’s existing communication network. New control cabinets and relays will be installed within the control enclosure to accommodate the proposed line. Due to limited room in the existing enclosure, the enclosure will be expanded approximately 30 feet to the northeast. This expansion will be supplied with power from three new station service voltage transformers (“SSVT”) which will be installed on the 115 kV bus. The expanded control enclosure will be a reinforced masonry building with wood truss roof. The exterior will be sided with vinyl siding and asphalt shingles to match the existing facility.

Description of General Environmental Setting

Existing Natural Resources

Upland Plant Communities

The SRP is located within the Coastal Plain ecological region of New Hampshire. The highest elevation along the project corridor is approximately 130 feet above sea level near the Madbury Substation. Based on the NHF&G 2010 Wildlife Action Plan (WAP) cover type map and field observations, habitat cover types through which the project corridor passes consist mostly of Appalachian oak-pine forest, with smaller areas of marshes, floodplain forest and grasslands. The Appalachian oak-pine forests are found across the subtle ridges and rises within the landscape, with the depressions and low areas consisting mostly of larger wetland complexes.

The Appalachian oak and pine forests are common throughout southern New Hampshire on dry to dry-mesic glacial till soils and on sand plain features. Good examples of mesic Appalachian oak – hickory forests are known near Little Bay and have a mix of canopy species including white, black, scarlet and red oaks, shagbark hickory, white ash, white pine, and other species common in more northern portions of New Hampshire such as birches, maples and beech (Sperduto and Kimball, 2011). Understory species include Canada mayflower, poison ivy, wild sarsaparilla, and other low herbs and forbs.

The residential and open areas are planted with common landscaping species and lawn grasses and escaped ornamental species are common in close proximity to residential areas. Escaped invasive species were noted in many of the identified wetlands throughout the project ROW.

The vegetation communities within the corridor differed substantially from adjacent areas due to the routine vegetation management for the existing electric line. Relatively few trees occur within the corridor, with the majority of species consisting of shrubs and herbs. Common shrub species within upland areas included glossy buckthorn (*Rhamnus frangula*), multi-flora rose (*Rosa multiflora*), sumacs (*Rhus sp*), and dogwoods (*Cornus sp.*). Clovers (*Trifolium sp.*), hayscented fern (*Dennstaedtia punctilobula*), goldenrods (*Solidago sp.*), raspberries and blackberries (*Rubus sp.*), and plantain species (*Plantago sp.*) were frequently noted upland herbaceous plants in the ROW.

The state-Endangered crested sedge, *Carex cristatella*, and four exemplary natural communities (all in the Great Bay Estuary) were documented within the SRP corridor. See the Rare, Threatened, and Endangered Species and Exemplary Natural Community Report (Appendix C) for more information.

Wetland Plant Communities

Wetlands identified within the project ROW were generally dominated by both scrub-shrub and emergent (herbaceous) plant species. Common woody species include glossy buckthorn, silky dogwood (*Cornus amomum*), speckled alder (*Alnus incana*) and several meadowsweet (*Spiraea sp.*) species. Herbaceous species included sedges (*Carex sp.*), cattails (*Typha sp.*), several hydrophytic fern species including sensitive (*Onoclea sensibilis*), cinnamon and interrupted varieties (*Osmunda cinnamomea* and *O. claytoniana*), rushes (*Scirpus sp.*), and other species such as tearthumb (*Polygonum sp.*), asters (*Symphyotrichum sp.*), and purple loosestrife (*Lythrum salicaria*), which is an invasive species. Few trees were observed within the wetland due to routine clearing; however red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), and cedar (*Thuja sp.*) were mentioned in field observations and data forms.

See Natural Resources Existing Conditions Report (Appendix A) for additional detail.

Wetland and Stream Delineations (Wt 301.01)

Wetlands

Wetlands were delineated by experienced wetland scientists in 2013, 2014 and 2015 according to the criteria established by the USACE in the *1987 Corps of Engineers Wetlands Delineation Manual* and the relevant version of the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* for a routine delineation. Wetland boundary flags were located by Normandeau with a Trimble® handheld GPS, which is capable of sub-meter accuracy after post processing. The data was then overlaid onto an aerial base maps. The wetland boundary delineation work was completed and supervised by several Certified Wetland Scientists (CWS) including Sarah Allen (CWS# 083), William McCloy (CWS# 268), Daniel Coons (CWS #264), Erik Lema (CWS# 286), Ian Broadwater (CWS# 162) and Jennifer West (CWS# 015). Corps field data sheets were completed at several locations and are attached, along with photos of the wetlands to be impacted by the project. Wetlands were classified by the USFWS method (Cowardin et al. 1979).

Stream surveys included delineation of the top of bank and mean annual high water (first observable slope break and vegetation change). The State regulates activity in the river channel and the bank below the first observable slope break. Streams will be temporarily spanned with timber mats bridges, and no permanent culverts are planned. Temporary culverts are proposed under two work pads and a temporary diversion for installation of a portion of underground line is proposed; however these areas will be immediately restored. Therefore, additional stream data normally collected for stream crossings, such as watershed area, are not presented.

Vernal Pools

Potential vernal pools were identified during the 2013 wetland delineations. Each potential vernal pool encountered was then resurveyed during the springs of 2014 and 2015 vernal pool species breeding season for egg masses and/or larvae of amphibian vernal pool indicator species. A dip net was also used to survey for amphibian larvae and invertebrates. Vernal pools were identified in accordance with the NHDES Wetland Rules (Env-Wt) 101.99 and Env-Wt 301.01, and procedures described in *Identification and Documentation of Vernal Pools in New Hampshire*, 2nd Ed. 2004, published by the New Hampshire Fish and Game Department.

The follow-up investigations of potential vernal pools did not yield the requisite indicator species or the permanent hydroperiod did not meet the definition of a vernal pool, and therefore no vernal pools are located within the project ROW.

Streams and Waterbodies

The entire ROW study area is located in the Salmon Falls-Piscataqua River watershed (HUC8) of the larger Saco River basin (HUC6). The study area contained 18 perennial streams. These include Beards Creek, College Brook, Reservoir Brook, the Oyster River and several unnamed tributaries to the Oyster River, two reaches of LaRoche Brook (both located within the Lamprey River Watershed), Beaudette Brook, and Longmarsh Brook along with other unnamed drainages. Seven intermittent stream segments, including Hamel Brook, were also identified. The SRP crosses the Oyster River in Durham, which is a Designated River and as such is managed and protected for its outstanding natural and cultural resources in accordance with RSA 483, The Rivers Management & Protection Act (New Hampshire Department of Environmental Services 2011) and also subject to the requirement promulgated in the SWQPA. The SRP also passes through a small portion of the Lamprey River Watershed, which is also designated; however none of the river segments or tributaries listed in the designation report will be crossed. Pursuant to RSA 482-A:3,I(d)(2) the application and supporting materials have been sent by certified mail to the Oyster River and Lamprey River Watershed Local Advisory Committees.

A Shoreland Permit application has been filed with the NHDES Shoreland Department for impacts proposed within the buffers associated with the Oyster River and Little Bay.

Rare, Threatened and Endangered (RTE) Species

State- and federally-listed threatened or endangered species, rare or special concern species and exemplary natural communities are tracked by New Hampshire Natural Heritage Bureau (NHNHB). NHNHB database searches were requested in 2013, 2014 and 2015, and the appropriate surveys were conducted along the proposed Project area was conducted. The complete response, including maps, is attached (Appendix C).

RTE Plants and Natural Communities

On September 24 and 25, 2013, October 30, 2013, and May 20, 2014, Normandeau personnel surveyed targeted areas of the SRP area for rare, threatened or endangered (RTE) plant species and exemplary natural communities. The searches were conducted based on RTE data that the New Hampshire Natural Heritage Bureau (NHNHB) provided to Normandeau in 2013 (NHNHB 2013). In 2014, NHNHB provided Normandeau with an updated list of RTE species and exemplary natural communities in the vicinity of the site (NHNHB 2014a, b). The updated list contained two new RTE plant species, including a federally threatened species, and two new natural community types. Areas of the site containing potential habitat for the other RTE plant species were visited by Normandeau personnel in 2015, but the species were not observed. Normandeau botanists returned to the project area in July 2015, and identified the state-listed plant species, the state-Endangered crested sedge (*Carex cristatella*). Four exemplary natural communities or natural community systems have also been documented within the Project Area in Little Bay: *High salt marsh, Salt marsh system, Sparsely vegetated intertidal system* and *Subtidal system*.

No federally-listed threatened or endangered species were observed.

Coordination with the NHNHB occurred during a pre-application meeting with Melissa Coppolla, other agency representatives, PSNH and Normandeau on January 6, 2015 to discuss the protection of rare species during project work. A follow-up meeting occurred with Amy Lamb at NHNHB in August, 2015.

Impacts to the crested sedge habitat will be avoided entirely, with the exception of one small area where timber mats will be employed. This species requires open habitat, so the clearing of trees in the vicinity of the known population may benefit this species.

A narrow fringe of salt marsh will be temporarily impacted on both shores of Little Bay during cable laying. Prior to construction, salt marsh peat will be salvaged within the impact area and stockpiled for replacement during restoration. The stockpiled peat blocks will be protected and maintained for the duration of the installation period. Immediately upon completion of construction, the underlying gravel substrates will be restored to match surrounding elevations. The peat blocks will be replaced and anchored with rebar stakes driven into the gravel and/or adjacent peat. Any open interstices between the peat blocks will be filled with a mixed sand to cover exposed roots and maintain grades. The seaward face of the restored peat will be protected from ice and wave action with a coir log.

The intertidal flats and subtidal bottom will be allowed to restore and recolonize naturally after completion of the cable installation. The jetplow process will disturb sediments while laying the cable, but the water pressure of the jets and the speed of the plow will be controlled to maximize the return of sediments to the trench and minimize sediments going into suspension in the water column. The currents within the channel and wave and ice action on the tidal flats are expected to restore existing bottom contours in the vicinity of the trenches, followed by recolonization of benthic infauna and ultimately shellfish after completion of construction. Monitoring of all impacted tidal and freshwater resources will occur both during and after construction to assess the success of the habitat restoration.

RTE Wildlife

An evaluation of the wildlife habitat for the project corridor was conducted using aerial photography and other GIS data combined with site visits in specific locations. The lands surrounding the SRP have a low to moderate amount of development, including some protected conservation lands, substantial areas of low density residential development, and some areas of higher intensity development associated with Durham and Newington/Portsmouth. The undeveloped areas and low density residential areas are primarily forested while the vegetation maintenance practices conducted in the existing cleared corridor create grass and/or shrubby habitat types. Shrublands and grasslands are a required resource for many types of wildlife and are also relatively rare in New Hampshire's predominantly forested landscape. Although narrow (approximately 60 feet wide), the existing cleared corridor provides some relatively valuable habitat resources for grassland/shrubland species, and may also provide a dispersal corridor for species that depend on grassy and/or shrubby habitats.

The SRP corridor crosses though some areas designated as Highest Priority Habitat by the NH Wildlife Action Plan. The remainder of the corridor passes primarily though areas that are designated as Supporting Landscapes or that have no designation at all. The relative proportion of these habitat types in the corridor reflects their wider distribution in the surrounding landscape. The results of field surveys and desktop analyses indicate that the Project corridor may provide habitat for eight special status wildlife species, consisting of the ringed boghaunter (*Williamsonia lintneri*), northern black racer (*Coluber constrictor constrictor*), Blanding's turtle (*Emydoidea blandingii*), spotted Turtle (*Clemmys guttata*), bald eagle (*Haliaeetus leucocephalus*) osprey (*Pandion haliaetus*), northern long-eared bat (*Myotis septrionalis*), and the New England cottontail (*Sylvilagus transitionalis*). While a number of these species may use the corridor for portions of their life cycle, the New England cottontail is dependent on early successional habitat such as shrub and grasslands, and is declining throughout its range as these habitats mature or are developed. PSNH is actively working with NH Fish and Game to manage transmission corridors to benefit New England cottontail. The SRP corridor passes through UNH's Foss Farm and NH Fish and Game's LaRoche Brook parcel, both of which are being actively managed for this species, although New England cottontail has not yet been found at the site. The SRP corridor clearing will supplement that habitat and provide a connective route for the rabbit to disperse to other suitable habitats.

Permanent impacts of the Project include placement of new structures, removal of existing wooden poles, and vegetation clearing to remove trees for up to 100 feet within the ROW. Temporary impacts include mowing the work area, matting in wetlands to provide access for construction equipment, trenching (cut and cover) in the sections proposed for underground cable on land, and use of a jetplow to bury three cables under Little Bay.

In general, impacts to wildlife as well as protected species will be managed through species-specific management and standard Best Management Practices during construction. Examples include pre-construction surveys to ensure the absence of nesting bald eagles and osprey (if either species is breeding within or near the ROW, time-of-year restrictions may apply); surveys during construction to clear the work area of turtles and snakes; hand-cutting in the vicinity of the ringed boghaunter habitat in the unlikely case that larvae use the marginal habitat in the ROW; and minimization of clearing preferred shrubby areas in high priority New England cottontail habitat.

Seacoast Reliability Project Construction Methods

The Project will be constructed, operated, and maintained in accordance with federal, state, and local regulatory requirements, established industry practices, and PSNH policies and specifications. Applicable BMPs will be implemented as applicable during the construction of the Project.

Additional BMPs and industry standards and guidelines, applicable to transmission line construction activities within New Hampshire include, at least, *Best Management Practices Manual for Utility Maintenance in and adjacent to Wetlands and Waterbodies in New Hampshire*[2]; *Rock*

[2] http://www.nhdfl.org/library/pdf/Publications/DESUtilityBMPrev3.pdf

Blasting and Water Quality Measures That Can Be Taken To Protect Water Quality and Mitigate Impacts[3]; *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire*[4], and BMP worksheets provided on the Alteration of Terrain website.[5]

BMPs such as *Best Management Practices for Fueling and Maintenance of Excavation and Earthmoving Equipment* (WD-DWGB-22-6)[6] will be followed to prevent spills of fuel and other hazardous materials during all construction and clearing activities where equipment is refueled in the field.

The primary goal of these various BMPs is to use techniques that protect natural resources from unnecessary impacts. In addition to BMPs, there are many Project-specific or species-specific timing restrictions, preconstruction surveys, and monitoring techniques that will be used to avoid direct impacts to certain wildlife species. The Project has committed to following these BMPs, conditions, timing restrictions, and guidelines where applicable. BMPs have also been incorporated into the draft Project Construction Plan and will be incorporated into contractor bid documents.

Proposed BMPs include, but are not limited to, the following:

- Seasonal Restrictions (in critical locations, for protection [as needed] of, raptors, bats, etc.);
- Construction mat use in sensitive areas;
- Ground-based construction techniques and use of smaller, lighter equipment, or low pressure equipment, if practicable within sensitive areas;
- Fenced exclusion zones and wildlife survey areas (for species protection); and
- On-site construction monitoring (to monitor permit compliance, protection of resources, and erosion and sedimentation ["E&S"] control maintenance).

In addition to the Project Construction Plan, permitting plans, BMPs, and standard and Project-specific permit conditions, specific guidance for working in sensitive areas and E&S controls, etc. will be provided to the contractor and their contracts will include obligations to comply with all applicable laws, regulations, and permits. Environmental inspectors (as needed) will also be in the field during construction to monitor compliance with plans and permits and to address unanticipated natural and cultural resource issues that may arise.

Construction Procedures

Overhead Line Construction

New overhead line construction generally occurs in a well-established sequence. While some work activities on a given site may overlap, generally they occur sequentially. It is expected

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[3] http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-10-12.pdf
[4] http://www.nhdfl.org/library/pdf/Publications/BMPs%20erosion%20control%202004.pdf
[5] http://des.nh.gov/organization/divisions/water/aot/categories/forms.htm
[6] http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-22-6.pdf

that work at multiple sites will occur simultaneously in order to meet the project milestones for energization. In some areas existing infrastructure or existing lines may need to be re-located prior to the construction of the new overhead lines. The relocations will be planned and included as part of the construction sequencing activities.

Initially, the first activity is surveying/flagging/re-flagging the ROW to identify access roads, structure locations, and sensitive resource areas. Vegetation clearing will occur next (see Section 4.3 below for more details). Erosion control measures are installed following vegetation clearing, prior to ground disturbance, and maintained until disturbed areas have been restored. The ROW are cleared of trees and brush to provide the necessary access for construction equipment and a safe work area for crews. Clearing the ROW provides for an environment that safely and reliably supports the construction and ongoing operation of the transmission lines.

Construction vehicles must be able to access the location of each structure that will support the transmission lines. BMPs such as *Best Management Practices for Fueling and Maintenance of Excavation and Earthmoving Equipment* (WD-DWGB-22-6)[7] will be followed to prevent spills of fuel and other hazardous materials during construction and clearing activities where equipment is refueled in the field. Access roads are established, typically utilizing existing roads, developing new roads or by placing timber mats. Timber mats may be used in or around wetlands and to protect environmentally sensitive areas. Silt fencing and other environmental controls are also used to stabilize the soil and protect wetlands during construction. With the consent of property owners, gates are placed across new access roads where these intersect with town or state roads. Gates help deter unauthorized access to the ROW. By landowner request, gates are also installed where access roads cross agricultural land containing livestock. Access road/work area development averages two to three days on each property.

The next step in the construction process is to drill foundations for the new monopole transmission structures. This involves drilling large holes, which are then typically filled with concrete for the steel structure foundation. Drilling operations occur for a few days at each new structure location. Once drilling is complete, a steel rebar cage is placed in each hole and concrete is poured to create a secure foundation for the new steel structure. Concrete trucks are used to deliver the concrete mix for the foundations.

Some structures (such as steel or wood pole single pole or H-frame structures) are installed via direct-embed where a hole is excavated, rock drilled or blasted (where necessary due to bedrock) to the required depth based on the height of the structure, the base of the structure is inserted, and the hole is filled with a suitable backfill, rather than concrete.

Once the foundation is cured for drilled pier structures, transmission structure installation can begin. The crews will begin framing, erecting and setting the structures. The erection crews will likely utilize temporary crane pads which are approximately 5,000 to 14,000 square feet.

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[7] http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-22-6.pdf

These are used to stage structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to erect transmission structures. The new steel structures often come in sections that are assembled on or near the foundation. Cranes and/or bucket trucks are used to lift the structures and set them into position on the foundations. Grounding will be achieved at the location of each new structure once installation is complete.

With the new structures in place, the next step is to install the wire ("conductor"). The wire-stringing operation requires equipment at each end of the section that is being strung including a small work pad approximately 75 feet by 300 feet that is used for material and the puller and tensioner equipment. Wire is pulled between these "pulling sites" through stringing blocks (pulleys) at each structure. These pulling sites are set up at various intervals along the ROW. Typically wire pulls are several miles in length. Specific pulling sites are determined close to the time the stringing activity takes place. Once the wire is strung, the stringing blocks are removed and the wire clipped into its final hardware attachment. Helicopters can also be used during wire stringing operations. After construction activities are completed, disturbed areas will be restored to original or improved condition. Native shrubs and ground cover are allowed to regrow. Environmental controls are removed, though some may remain until the area is stabilized.

Distribution lines are the lower-voltage power lines that bring electricity to customers' homes. Sometimes, these lines are on transmission ROW, as is the case for the SRP. During construction, the removal of existing lines is carefully coordinated with the installation of new lines to allow workers to safely perform construction while customers continue to receive electrical power with no loss of service. The existing distribution line associated with the SRP ROW will be under-built, or located on the same new transmission structures underneath the new transmission conductors for most sections of the project. The old distribution structures will be removed and hauled away.

Where relocations are required, new distribution poles and wires are first installed in an alternate section of the ROW. In Newington Village, the distribution will be removed from the ROW entirely, and strung on existing poles along roadsides. Once complete, the existing distribution line is de-energized so that power can be transferred to the newly built line. The de-energized lines are then removed so that transmission line construction can continue.

Existing structures that require removal are de-energized and the overhead wires removed. Concrete foundations (where applicable) or the wooden butt-ends of the old structures are removed below grade and the area is filled and stabilized. All of the demolition debris such as wood poles, steel structures, insulators, conductor and concrete is taken off-site to an approved waste management facility for recycling or disposal.

Underground Line Construction

The underground line construction will progress in a linear approach similar to that of installing a water or sewer main. It is expected that work at multiple sites will occur simultaneously in order to meet the project milestones for energization and will begin by first performing survey, staking and protection of any sensitive areas, and contacting Dig Safe for demarcation of existing utilities. The installation of the underground transmission line will follow the existing ROW or road alignment to the extent possible and will include sections that are either under the roadway, in the roadway shoulder or in undeveloped areas. Where the installation is in paved road, the pavement will be saw cut on both sides of the trench to limit impact to the road surface. In undeveloped locations, temporary roads will be constructed for safe, efficient and environmentally compliant access to the work. The trench will be excavated to the design depth and the sidewalls shored for support to allow safe worker access and protect the public. Conduits will be installed into spacers to maintain their position in the trench. The conduits will be either backfilled with a granular material or a high slump concrete, then capped with a layer of concrete for protection against accidental dig-ups. Any temporary shoring will be removed as the trench is backfilled. After backfill, roadways will be restored and paved and undeveloped areas will be restored.

Trenches terminate either at splice pits or vaults. The conduit systems will be "proofed' or tested by pulling a specified dimensional mandrel through the duct from splice location to splice location. After installation and testing of the duct bank, vault and transition structure system, the conductors will be pulled to the splice locations. Conductors will be spliced in the pits, vaults or terminated at the underground to overhead transition structures. When an underground section is complete there will be a series of electrical tests performed on the cable before it is energized.

Typical techniques used for the underground construction are open trenching and direct bury duct banks with concrete caps, both described above. In some locations the use of a pipe jacking may be required.

Pipe jacking and micro-tunneling can be used for short distances when crossing under a railroad or highway particularly when depths exceed 20 feet. For this application, a reinforced jacking pit will be constructed to the depth of the proposed bore and similarly a reinforced receiving pit will be constructed at the termination point of the pipe. A concrete reaction wall will be poured inside the jacking pit opposite the exit point of the bore. Hydraulic equipment used to push the pipe string will be set up in the jacking pit. In Pipe jacking, the pipe is pushed along its path, and spoils will be removed from the inside of the pipe by auger or by hand. Micro-tunneling is very similar to Pipe jacking, except a remote controlled boring machine goes along the bore path first excavating ahead of the pipes which are jacked in behind it as the spoils are removed. Alignment of the pipe will be monitored, and adjustments made as required until the pipe reaches the termination point in the receiving pit.

A cable manhole will be installed on the east side of Little Bay where the line will be split for the submarine portions of the project. The manhole provides a protected location for making cable splices, and facilitate replacement cable installation when necessary. Typical manholes are constructed of precast concrete and are likely to be 6 x 10 x 30 feet. The manhole will be buried with two manhole covers at grade.

Underground cable is installed using puller/tensioner equipment. A cable reel trailer with a braking system or tensioner will be stationed at one end of the pull and a cable puller will be stationed at the other end. The puller will utilize a wire rope attached to the end of the conductor to pull the conductor through the duct system.

Submarine Line Construction

Three submarine cables will be laid and buried beneath the soft sediments of the bay floor using three methods. The primary installation method uses a jet plow in the subtidal and most of the intertidal zone. Other cable installation methods will include diver burial in the shallow intertidal zone and excavation for cable trenches in the transition zone from marine to the terrestrial structures. The cable will be buried to a target depth of eight (8) feet in the subtidal zone and forty two inches (42) in the intertidal zone and on land.

The submarine cables will be transported to the site individually on a specially outfitted cable laying barge. Beginning on the west shore, the cable laying barge will be positioned approximately 250 feet seaward of the trench and the cable will be "pulled" into position on shore by a wire rope and winch located on shore. Once the cable has been secured at the landing site, the cable lay barge will slowly move forward under anchor winches. While the barge is moving forward, the cable will be paid out as necessary until the jet plow starts to move.

The jet plow utilizes high-volume water pressure to temporarily liquefy the soft sediments immediately ahead of the plow blade. The water is sprayed out in specially designed nozzles located along the leading edge of the jet plow's blade. The submarine cable will feed from the barge, pass through the back of the blade, and into the liquefied sediments. The majority of the sediment will settle into the trench leaving the cable installed at the desired depth.

The jet plow will reach within approximately 600 feet of the east shore. The cable will be pulled ashore and fed into the vault. This process will be repeated until all three submarine cables are laid. The last step will be burial of the cable sections between the jet plow and cable trenches using diver burial and nearshore excavation. The intertidal sections of the diver burial zones will be enclosed within silt curtains.

Blasting

Blasting may be necessary to achieve the engineered specifications associated with all aspects of the Project, especially where shallow bedrock is present.

Blasting contractors will be required to adhere to all conditions specified in the Certificate of Site and Facility, to be applied to and issued by the NH Site Evaluation Committee ("SEC"), and will also be required to observe local (municipal) blasting-related ordinances. BMPs to protect water quality before and during blasting activities are outlined in the NHDES technical publication WD 10-12 *Rock Blasting and Water Quality Measures That Can Be Taken to Protect Water Quality and Mitigate Impacts*.

In some cases, controlled blasting to remove rock will be less impactful to nearby landowners than "hoe-ramming" because the blasting will occur over a shorter duration. Blasting will be performed in compliance with the State and Local Fire Marshal regulations. Pre-blast surveys will conducted at nearby properties.

All blasting will be performed by licensed blasting contractor(s), pursuant to the regulations of State and Local Fire Marshals. In addition, blasting near PSNH's existing transmission and distribution lines will be performed in accordance with PSNH minimum specifications.

Temporary Erosion and Sedimentation Controls and Stormwater Management

The installation of temporary erosion and sedimentation controls is an important aspect of project construction, and will coincide with the initiation of nearly every form of construction. All work performed by SRP contractors in New Hampshire will follow the New Hampshire Department of Environmental Service (NHDES) *Best Management Practices Manual For Utility Maintenance In And Adjacent To Wetlands And Waterbodies In New Hampshire* which is published by the New Hampshire Department of Resources and Economic Development (NHDRED)[8]. Additionally, PSNH requires that all employees and contractors are trained on wetland Best Management Practices that must be followed during construction activities[9].

SRP contractors are required to follow all appropriate procedures specified by state law and all permit conditions when they are issued for the project. Land clearing (forestry) contractors are should to comply with New Hampshire Department of Resources and Economic Development (DRED), Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire[10]. Blasting contractors will be required to adhere to the conditions specified in the Certificate of Site and Facility to be issued by the NH Site Evaluation Committee (SEC) and will also observe local municipal ordinances. NHDES has produced technical publication WD-10-12 Rock Blasting and Water Quality Measures That Can Be Taken to Protect Water Quality and Mitigate Impacts which outlines best management practices to protect water quality before and during blasting activities[11].

With respect to managing stormwater to protect sensitive wetlands and habitats during site preparation activities, SRP's contractors are required to follow the best management practices (BMPs) detailed in the *NH Stormwater Manual* (NHDES, 2008)[12] and adhere to the conditions specified in the Certificate of Site and Facility to be issued by the NH SEC.

Temporary erosion and sedimentation controls will also be installed and maintained in accordance with the New Hampshire Department of Transportation (NHDOT) Guidelines for Temporary Erosion and Sediment Control and Stormwater Management (NHDOT 2002) along underground portions of the project.

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[8] http://www.nhdfl.org/library/pdf/Publications/DESUtilityBMPrev3.pdf

[9] http://www.transmission-nu.com/contractors/pdf/Contractor_Online_Training.pdf

[10] http://www.nhdfl.org/library/pdf/Publications/BMPs%20erosion%20control%202004.pdf

[11] http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-10-12.pdf

[12] http://des.nh.gov/organization/divisions/water/stormwater/manual.htm

Contractor(s) will perform daily inspections to monitor controls, devices and features. Daily inspections will document the condition of Best Management Plans (BMPs) and will ensure BMPs are installed, functioning, and being maintained. All BMPs will be installed following vegetation removal and prior to ground disturbance, and will be maintained through final site restoration. All BMPs will be installed under the guidance of an environmental inspector, and will adhere to the standards described in the Federal, NHDES, NHDOT and local guidelines.

An issue that may require special attention is the potential presence of "emerging contaminants" in the vicinity of the former Pease Air Force Base (Pease). Pease is currently conducting sampling in groundwater and surface waters on and surrounding the base for perfluorinated compounds, considered emerging contaminants by the US Environmental Protection Agency (USEPA). The levels of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) have been stable and are well below USEPA's Provisional Health Advisory levels for many on-base wells, but have been elevated in some locations on and adjacent to the base. Results from a large-scale sampling effort in the fall of 2015 have not been released to the public, but preliminary samples indicate a spring near Pickering Brook in Newington has elevated PFOS levels. The project will continue to coordinate with Pease to determine if the groundwater in the vicinity of the proposed route requires special handling during underground and foundation construction. Should special handling be required, the Project will consult with NHDES and USEPA to select the correct treatment method.

Vegetation Removal, Including Tree Clearing

Clearing the SRP corridor of shrubs and trees provides for an environment that safely and reliably supports the construction and ongoing operation of the transmission lines. No herbicides will be used for clearing during construction. To meet electric industry vegetation clearance standards, targetspecies of trees must be permanently removed. These are trees that could become tall enough to grow or fall into the high-voltage transmission lines.

Land clearing (forestry) contractors should comply with New Hampshire Department of Resources and Economic Development (DRED), *Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire.* [13]

Vegetation Clearing Methods

Vegetation clearing crews must be able to access areas where vegetation removal is required for construction and within the clearance zones of the new 115-kV overhead lines, as well as to reach danger and hazard trees within or adjacent to the project corridor. In order to reach areas where vegetation clearing is necessary, clearing crews will use temporary access roads (refer to Sections 4.3.1 and 4.3.2).

[13] http://www.nhdfl.org/library/pdf/Publications/BMPs%20erosion%20control%202004.pdf

During the vegetation clearing process, SRP will implement measures to minimize the environmental effects of vegetation removal. The following low-impact clearing measures may be used to minimize environmental impacts:

- Consider soil and weather conditions when conducting vegetation removal activities (e.g. remove vegetation during frozen ground conditions if practical);
- Maximize use of uplands for clearing access routes and stockpiling cut timber and brush;
- Fell trees directionally (parallel to and within the ROW) to minimize impacts to off-ROW and residual vegetation, where practical;
- Adhere to project specific BMPs;
- Cut trees close to the ground, while leaving root systems and stumps, where practicable, to retain soil stability;
- And, adhere to project-specific clearing schedules designed to protect wildlife species during critical life stages, such as breeding, where applicable.

No temporary cleared areas will be stumped or grubbed.

Danger Trees

Danger trees will also be identified and cut down during vegetation removal and tree clearing stage of construction. "Danger trees" are dead, damaged, or dying trees located adjacent to the ROW itself that, due to their condition, pose an increased risk of contact with the transmission line. Some danger trees may be within or adjacent to protected natural resources. Danger trees located outside the limits of the Project clearing may also be identified and removed. Landowners will be informed prior to the removal of any off-corridor danger trees.

Wood Management

Woody material will be either chipped or diced and windrowed in uplands or removed from the ROW. Chips generated from the tree clearing may be utilized for erosion control purposes. At the discretion of the environmental monitor, some woody material may be left in wetlands to avoid physical impacts to the wetland that would result from removing the wood. Where possible, for landowners who request to retain timber or firewood that is cleared during the construction process, the timber/firewood will be placed on the landowner's property in upland areas in locations that do not interfere with the project.

Access Roads

Access to the project corridor will be achieved through upgrading or developing new temporary access roads. Where gravel roads or ATV trails are already present, the access roads will follow them; however, developing new roads or placing timber mats on existing roads will be required on those sections that have no trails or roads. Timber mats may be used in or around wetlands, and mapped archaeological and rare species sites to protect these sensitive areas. Erosion controls such as silt socks, bark mulch berms, hay bales, silt fencing and other environmental controls are also used to stabilize the soil and protect wetlands and streams during construction. With the consent of property owners, gates will be placed across new access roads where the access roads intersect town or state roads. Gates provide added security and limit unauthorized access to rights-of-way. By landowner request, gates will also be installed where access roads cross agricultural land containing livestock.

On-Corridor Access Roads

On-corridor access roads will be constructed by mowing vegetation and placing timber mats in environmentally sensitive areas. By using these construction techniques, permanent impacts to wetland and waterbody and other sensitive resources will be avoided. The on-corridor access roads will be approximately 16 feet wide to accommodate the necessary construction vehicles and materials. All impacts to wetland resources will be temporary, and wetland grades will be restored and soils stabilized when the timber mats are removed.

Off-Corridor Access Roads

Limited off-corridor access roads will be needed to access the Project corridor, and any impacts associated with these areas have been quantified. Similar to on-corridor access roads, these areas will be minimally improved as needed to meet the access requirements and all impacts will be temporary in nature.

Temporary Storage and Staging Areas

Construction of the proposed Project will require temporary storage and staging areas, generally located in the vicinity of the ROW. Storage and staging areas will be located on property owned by PSNH, when feasible, or leased. The areas will be identified in the construction management plan and will go through all necessary approvals prior to establishment and use, but in all cases, previously disturbed upland areas, such as large parking lots or storage sites, will be given priority. In general, temporary storage areas will require approximately two to five acres of land and will primarily be used to store equipment and construction materials, provide parking for construction crews, and provide meeting locations and equipment maintenance areas. Temporary storage areas are typically used for a period of time when construction is occurring in the vicinity, and will often be moved as construction progresses. Following construction, the areas will be restored to pre-construction conditions. Staging areas are generally smaller than storage areas (less than two acres) and are most often used for stockpiling construction materials (e.g. erosion control materials). As with storage areas, staging areas are relocated throughout the construction process.

Work Pads

Work pads, or crane pads, are temporary areas around each new structure which are approximately 5,000 to 14,000 square feet in size, depending on the type of structure and installation method. These areas are used to stage structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to erect transmission structures. Some temporary grading may be necessary to accommodate the work; however these areas will be restored following construction.

Pull-pads serve as level staging areas for installing pull ropes and conductors, and will typically be approximately 300 feet in length, and of variable width depending on site constraints and construction needs. Pulling angles, the length of the conductor on the reels, the type of equipment required, topography, and access restrictions determine the specific locations and sizes of the pull-pads. These sites must be level to support the weight of the equipment, and pull-pad sites often require some amount of grading. Where soils are saturated or soft, construction mats will be used for stability. Should extreme conditions be encountered, on-site consultation will be performed with the third party inspector prior to locating any portion of a pulling or tension set-up in or near a protected natural resource.

Clean-Up and Restoration

All areas disturbed during construction activities will be restored as closely as possible to pre-construction conditions. Contours and drainages will be restored. Disturbed wetland soils will be mulched with straw for final restoration in accordance with the New Hampshire Department of Environmental Service (NHDES) *Best Management Practices Manual For Utility Maintenance In And Adjacent To Wetlands And Waterbodies In New Hampshire*. Upland areas not adjacent to wetlands and streams will be seeded with a suitable seed mix and mulched with hay. Seeding may not be necessary in some areas as upland and wetland vegetation typically re-establishes quickly. Seeding may be omitted from specific sensitive areas at the direction of the NHNHB where recovery of native vegetation or listed species is the priority. In addition, specific revegetation plans may be developed in response to landowner requests, as long as the plan is equally protective of natural resources. In no cases will invasive species be included in any seed mixes.

Construction debris (litter, hardware, bracing) will be removed from the ROW and disposed of at a licensed recycling or solid waste disposal facility. Erosion and sedimentation controls will be installed as needed and maintained through the duration of the restoration efforts. Temporary erosion control devices will be removed once the area has been stabilized.

PSNH personnel and/or qualified representative(s) will walk through the completed program and check for any potential erosion problems or areas that require further restoration to pre-existing conditions. Any problem areas will be reported and permanently stabilized.

Potential Project Impacts and Avoidance and Minimization Measures

A discussion of Project alternatives, avoidance and minimization and proposed impacts to water resources is included below. Additional details are available in the Natural Resource Impact Assessment (Appendix B), Rare, Threatened, and Endangered Species and Exemplary Natural Community Report (Appendix C), the Biological Assessment for the Northern Long-eared Bat for the Seacoast Reliability Project (Appendix D) and the report entitled *Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Little Bay, New Hampshire* (Appendix E). Water resources and proposed impacts along with buffer areas and other information is also included on the detailed plans included in Section 16, below.

Alternative Analysis

Preferred Location

The preferred location of the SRP was chosen after PSNH conducted a thorough analysis of potential alternatives. The proposed project will be sited within an existing utility corridor that contains one or more existing 34.5 kV electric distribution lines or transmission lines, has existed for decades, and is the least impactful (of the three route alternatives) between the existing Madbury and Portsmouth substations.

The preferred location of the project was chosen based on an analysis of the chosen route and all other alternatives that PSNH considered. The preferred route is the most economical, the most protective of environmental and historical resources, and the most technically complete option. The selected route represents the most efficient and least cost alternative that will solve the local electrical reliability problems identified by the *New Hampshire/Vermont 2011 Needs Assessment Report* because it is located almost entirely within an existing utility corridor, requires fewer land acquisitions than the other alternatives, does not have significant utility corridor constraints, would result in fewer impacts to wetlands and other environmental resources, will result in fewer impacts to historical resources, has fewer permitting risks and associated schedule delays, and can be built within the desired timeframe identified by ISO-New England.

Site Selection Process

As part of its route selection process, PSNH analyzed alternative routes within the area between the Madbury and Portsmouth substations. The study area included the Lee, New Hampshire area to the west, Dover, New Hampshire and Eliot, Maine area to the north, New Castle, New Hampshire and Kittery, Maine area to the east, and Stratham, New Hampshire area to the south. Route locations beyond these general limits were not evaluated because any resulting route options would have been significantly longer, resulted in greater impacts and higher costs, and did not provide the necessary electrical solutions that the project was designed to meet.

Route Options Considered and Rejected

Early in the process, routes along the Spaulding Turnpike and Route 4 were investigated; however, the potential route options associated with the use of the Route 4 and Spaulding Turnpike corridors were eliminated from further consideration following discussions with the New Hampshire Department of Transportation (NHDOT). Specifically, the NHDOT indicated that co-locating transmission lines within the corridors of these two state roads would only be possible and allowable if there were no other options available and that extreme hardship could be proven. Also, NHDOT maps indicated that there would be space constraints for co-locating a transmission line and construction presented safety challenges associated with traffic density. In addition, PSNH would need to obtain rights from the NHDOT, as there are currently no rights in either the Route 4 or Spaulding Turnpike corridors to site and construct a 115-kV transmission line, regardless of its configuration (i.e., overhead or underground). As there are other potential viable route options available that would meet the Project schedule and be consistent with the evaluation criteria for route selection, these State-corridor options are currently eliminated from further consideration.

Alternate Routes Evaluated

PSNH determined that there were three logical route alternatives, which were divided into geographic groupings: the Northern Route Alternative, the Middle Route Alternative, and the Southern Route Alternative. See Appendix 23 in the SEC application for a map of the routes.

The Northern Route Alternative

The Northern Route Alternative would have utilized existing transmission corridors that travel east from Madbury, New Hampshire into Eliot, Maine, turn to head southeast to Kittery, Maine and then return into Portsmouth, New Hampshire. The Northern Route Alternative was rejected because it presented significant constructability, permitting, land rights, and cost issues. Primarily, the 12.5 mile long Northern Route was rejected because 11.5 miles of the existing 115 kV and 345 kV transmission lines within the existing corridor would need to be relocated and rebuilt to accommodate the new line; the construction of the new line and relocation of existing transmission lines would have necessarily required the construction of approximately 24 miles of transmission lines. The relocation and rebuild for a significant portion of the new line would increase cost, add one or more years to the overall project schedule, and could potentially jeopardize the stability of the electric system in the region during construction because the existing transmission lines would have been removed from service for extended periods of time.

If PSNH chose the Northern Route Alternative, 11.8 miles/acres of additional (ROW)would be needed. To secure these rights, PSNH would have to engage in landowner discussions along significant portions of the route in both the State of New Hampshire and State of Maine to purchase the necessary rights. Such efforts which would increase costs and extend the project timeframe. In particular, the existing corridor in and around Kittery, Maine presented severe constraints for the construction and operation of an additional 115 kV transmission line. This route also had two significant water crossings over the Piscataqua River, which would add to the complexity and cost of this route.

In addition, the Northern Route Alternative presented significant risks associated with State permitting and siting requirements in two states, which would expand the time table for project completion. Indeed, both Maine and New Hampshire would have permitting and siting authority, which would increase the complexity of the process. For these reasons, the Northern Route was rejected.

The Southern Route Alternative

The Southern Route Alternative would have traveled south from Madbury until it reached Stratham, New Hampshire where the line would head east into Greenland, New Hampshire, and eventually turn north into Portsmouth. The Southern Route would have utilized the existing railroad corridor and the existing PSNH utility corridor from Madbury through Durham—the same corridors that will be used by the preferred route. The Southern Route was rejected because it would likely create more voltage and reliability issues than it would solve. The Southern Route Alternative was almost twice the length of the Northern Route and the Middle Route, approximately seven (7) miles longer, which would result in greater "line-loss" and inefficiency. Also, if the line was routed farther to the south of the Project area, the new 115 kV transmission line would be further from the end point connections of the Madbury Substation and the Portsmouth Substation. As the length of the line increases, the cost of the project increases significantly. Further, this route would require construction of an additional capacitor bank at the Rochester or Madbury substation, which would not be required for the other routes. The additional capacitor bank would also increase costs.

The Southern Route also presented other technical issues associated with constructing the project through the Portsmouth traffic circle, the need to secure additional land rights to construct the project, and greater environmental impacts to wetlands and State-designated prime wetlands in the southern sections of the State. For these reasons, the Southern Route Alternative was not selected as the preferred route.

The Middle Route Alternative

The Middle Alternative was eventually chosen as the preferred route because it maximizes the use of the existing linear corridor that already contains existing electric utility lines for the entire route, including an existing submarine cable corridor through Little Bay.

The preferred route also requires the least amount of additional land rights, minimizes impacts to environmental and historical resources, maximizes the electrical reliability of the regional electrical system while addressing the needs in a cost-effective manner, and will ensure that a project is designed and constructed to meet ISO-NE's project requirements.

The proposed route was determined to be the most cost-effective project that would successfully meet the needs identified in the *New Hampshire/Vermont 2011 Needs Assessment Report*. The preferred route was identified, in part, to reduce the total costs borne by the ratepayers in the State of New Hampshire and the New England region in accordance with Good Utility Practice. By choosing the most cost-effective route, the cost of the project borne by the ratepayers in the State is minimized while at the same time a higher level of transmission reliability is provided.

Impact Avoidance

Within the proposed route, permanent and temporary impacts to water resources were avoided where possible throughout the design and engineering phases of project development. Multiple rounds of preliminary design reviews were conducted between project engineering and environmental specialists. New structures were located outside of wetlands, unless technical constraints pertaining to project corridor limitations, structure height and maximum spans dictated that a structure be placed in a wetland resource. In the final design, 27 new structures, of the 180 proposed new or relocated will be located within or partially within wetland areas and will result in permanent impacts.

Access routes and temporary work pads for construction were similarly reviewed and wetland crossings were avoided where possible. The required tree clearing along the edges of the existing corridor limited the amount of wetland avoidance; however other methods such as clearing during winter/frozen-ground conditions and hand cutting may be employed to minimize temporary impacts associated with these activities (see below).

Impact Minimization

Engineering constraints limited the ability to avoid placing 27 new structures within or partially within wetland areas, thus wetlands have been avoided by approximately 85 percent of the 180 proposed new or relocated structures. Additionally, it should be noted that approximately 51 existing distribution structures will be removed from wetland areas by utilizing double circuit designs where necessary. The existing distribution line will be co-located on the same new structures below the new transmission lines. This will result in the net decrease of 24 structures within wetland areas.

The spatial extent of temporary impacts is significant; however several steps will be taken to minimize their effect on protected areas, including wetlands. For the terrestrial portions of the Project, temporary impacts will be associated with construction access, access for corridor tree removal, access for the removal of existing structures, and construction work pads around new structures. Timber mats (approximately 16 feet long by 4 feet wide) will be utilized where necessary depending on the ground conditions during construction activities. Work will be performed where possible during frozen or dry conditions and using low-ground pressure vehicles as practicable. To the extent feasible, access paths already present in the corridor will be utilized to avoid creating new routes and minimize wetland crossings. Additionally, mats will be placed on shrubs to help prevent mat timbers from sinking into wetland soils. Previous similar projects have found that the shrubs survive the short-term matting. Streams will be spanned with timber mats from bank to bank, with no permanent impacts anticipated.

Potential impacts to water quality related to the construction of the SRP were also considered during project planning and design. Erosion control measures including adherence to the *Best Management Practices Manual for Utility Maintenance in and Adjacent to Wetlands and Waterbodies in New Hampshire* and applicable internal Best Management Practices (BMP) associated with erosion control and clearing during transmission line construction will be strictly enforced. The NH BMPmanual includes 14 different BMPs that are detailed in Appendix A of the document. BMP #1 through #13 are applicable to the access roads and work pad areas associated with the SRP, and should be utilized where needed.

In addition, the project alignment and all proposed work areas were reviewed to identify potentially high-risk sites for erosion and other soil disturbances associated with construction activities where enhanced BMPs may be needed in addition to those referenced in the applicable BMPs. These areas included steep upland slopes (generally >10 percent) that are located in close proximity to wetland and riparian resources where access roads or work pads are proposed. Minimal grading and gravel may be required in these locations to safely accommodate the required construction equipment. In addition to the standard BMPs, water bars should be installed on access roads that are located on steep (>10% slope) slopes and greater than 100 feet in length, with level spreaders located at the downslope end to disperse flow. If roadside ditches are required, stone check dams should be installed to limit the velocity of any stormwater prior to dispersal into adjacent upland areas.

The identified high-risk sites are listed below, and identified on the Project's Environmental Mapping:

1. Proposed Structure #6 (Madbury): Steep slopes associated with Madbury Road up-gradient of Wetland MW1
2. Proposed Structures #13/14 (Durham): Steep slope north of Wetland DW91 and Stream DS92
3. Proposed Structures #28-#30 (Durham): Steep slopes to the north and south of the Oyster River (DS53) including small tributary streams (DS51, DS61, DS61A and DS61B) and multiple wetland areas (DW49, DW55, DW59, DW63)
4. Proposed Structure #47 (Durham): access road on steep slopes up-gradient of Wetland DW56
5. Proposed Structure #58 (Durham): access road and work pad on steep slopes up-gradient of Wetland DW31
6. Proposed Structures #66-#67 (Durham): access roads on steep slopes located immediately to the east and west of Wetland DW9
7. Proposed Structures #80-#81 (Durham): access road traverses steep side-slope up-gradient of Wetland DW42
8. Proposed Structures #82-#83 (Durham): steep access road immediately east of Structure #82 and up-gradient of Wetland DW38

Normandeau environmental monitors and PSNH construction monitors will be on site during construction to insure that the construction contractors follow the approved access plans and construction Best Management Practices (BMP).

Construction of the submarine portion of the project within Little Bay will also involve temporary disturbances to the subtidal and intertidal estuarine areas during the jetplowing process. No wetland impacts will occur as a part of the underground sections landward of either side of the bay as the new line will be installed within upland and existing road beds. Several submarine cable burial construction technologies were investigated to determine if they would be feasible and cost effective. This included horizontal directional drilling (HDD) and the chosen jetplow technique. HDD was determined to be impractical, due to the length of the crossing, the presence of bedrock under Little Bay, the large staging area needed for the terrestrial components and a risk of "frack-out" during the drilling process.

Normandeau and PSNH representatives will be on site during construction to ensure that the Contractors follow the approved Access Plans and construction BMPs.

Impact Analysis

Unavoidable direct and secondary impacts to water resources and associated upland buffer areas were reviewed throughout the Project area. Direct impacts include permanent and temporary disturbances, as discussed above (See Table 1). Secondary impacts were also reviewed, including forested wetland conversion and upland clearing within perennial and intermittent stream buffers. Forested wetland conversion will occur where forested wetland areas within the SRP corridor are cleared to allow for the safe construction and operation of the proposed transmission line. Temporary direct impacts from timber matting to allow for mechanized clearing and construction of the transmission line will be necessary in these areas. These areas will not be stumped or grubbed and soil disturbance will be minimal. The forested wetlands will naturally convert to emergent or scrub-shrub resources following the clearing activities. Upland stream buffer tree removal within 100 feet of perennial streams, 50 feet of intermittent streams, and 25 feet of ephemeral streams was also quantified.

Expected Impact Types

Direct Permanent Impacts

Direct permanent impacts will result from the placement of new and relocated structures, their associated foundations, and caissons; and other permanent fill consisting of concrete mattresses in jurisdictional resource areas within Little Bay.

Direct Temporary Impacts

Direct temporary impacts will result from the placement of temporary construction mats, or timber mats for access and construction activities, temporary mat bridges and culverts for stream crossings, and temporary work pads for installing the structures. Direct temporary impacts will also result where the underground portions of the line are installed in trenches through jurisdictional natural resources. Conducting work during frozen or dry conditions will also help to minimize disturbances to wetlands and streams. Where winter construction is not possible, access across wetlands and streams will employ timber mats or other approved BMPs. All access roads across wetlands and streams will be temporary and designed to minimize impacts and surface water disturbance.

Secondary Impacts

Based on pre-application meetings with the federal regulatory agencies, secondary wetland and stream impacts for the Project will include the conversion of forested wetlands to scrub-shrub or emergent wetlands through tree clearing and clearing of upland forest within 100 feet of perennial streams, 50 feet of intermittent streams, 25 feet of ephemeral streams.

For calculating the amount of secondary impacts that must be compensated for in the mitigation package, the following guidance was provided by the federal agencies:

- 15% of forested wetland conversion in existing ROW
- 15% of upland stream buffers in existing ROW

Table 1. Summary of total proposed direct permanent and temporary wetland impacts by town.

Town	Permanent (SF)	Temporary (SF)	Total (SF)
Madbury	199	29,261	29,460
Durham	3,764	325,627	329,391
Newington	2,165	221,520	223,685
Portsmouth	0	851	851
Total (Sq. Ft.):	6,128	577,259	583,387
Total (Acres):	0.14	13.25	13.39

The resulting quantities for secondary impacts are added to the direct permanent impacts, and this represents the wetland impacts that must be compensated for at the specified federal mitigation ratios.

Direct Wetland Impact

Direct permanent and temporary wetland impacts associated with the SRP total 6,128 SF (0.14 acres) and 577,259 SF (13.25 acres), respectively. The breakdown of impacts by town and Cowardin cover class associated with the SRP is summarized in Table 2. The SRP will impact greater than 20,000 square feet of non-tidal wetland and intersects with potential habitat for wetland-dependent threatened and endangered species. It is therefore classified as a Major project in accordance with Env-Wt 303.02(c) and Env-Wt 303.02(h).

A detailed summary table of wetland impacts, wetland classification and functions/values is attached along with additional information from the Natural Resources Existing Conditions Report (Appendix A). The following is an overview of the wetlands proposed to be impacted during the project.

Table 2. Proposed wetland impacts by cover class and town

Cover Type	# Wetlands	Permanent Impact (SF)	Temporary Impact (SF)	Total (SF)
Madbury				
PEM/PSS	1	199	28,940	29,139
PSS	1	0	321	321
Sub-Total:	*2*	*199*	*29,261*	*29,460*
Durham				
E1UB (Subtidal)	1	0	49,832	49,832
E2US (Mud Flat)	1	3,550	114,166	117,716
E2EM (Salt Marsh)	1	0	624	624
E2RS (Rocky Shore)	1	0	279	279

Cover Type	# Wetlands	Permanent Impact (SF)	Temporary Impact (SF)	Total (SF)
PEM (Emergent/Marsh)	5	71	31,185	31,256
PEM/PSS	23	60	72,663	72,723
PEM/PSS/PFO	1	0	807	807
PEM/PSS/PUB	1	20	18,285	18,305
PEM (Wet Meadow)	8	20	5,779	5,799
PFO	3	23	4,517	4,540
PSS	11	20	18,120	18,140
PSS/PFO	4	0	9,370	9,370
Sub-Total:	*60*	*3,764*	*325,627*	*329,391*
Newington				
E1UB (Subtidal)	1	0	77,565	77,565
E2US (Mud Flat)	1	1,484	29,925	31,409
E2EM (Salt Marsh)	1	0	598	598
E2RS (Rocky Shore)	1	302	217	519
PEM (Emergent/Marsh)	2	134	16,500	16,634
PEM/PSS	8	173	54,020	54,193
PEM/PSS/PFO	3	0	3,722	3,722
PEM/PUB	2	0	976	976
PEM (Wet Meadow)	5	41	13,829	13,870
PSS	3	20	8,854	8,874
PSS/PFO	2	0	4,131	4,131
PSS/PUB	1	11	10,063	10,074
PUB	1	0	1,120	1,120
Sub-Total:	*31*	*2,165*	*221,520*	*223,685*
Portsmouth				
PEM/PSS/PFO	1	0	648	648
PEM (Wet Meadow)	1	0	203	203
Sub-Total:	*2*	*0*	*851*	*851*
Total:	**SF**	**6,128**	**577,259**	**583,387**
	Acres	**0.14**	**13.25**	**13.39**

Madbury

Two wetlands (MW1/MW2) will be impacted in Madbury, totaling 199 SF (0.005 acres) of permanent and 29,261 SF (0.672 acres) of temporary disturbance. Permanent impacts are associated with new structures and temporary impacts are associated with access roads, work pads and areas needed for “pulling” the new conductors. These wetlands are located near the existing PSNH Madbury Substation and numerous transmission lines and also parallel a railroad corridor. Wetland MW1 is predominantly a PSS wetland and MW2 is a combination of PEM and PSS cover types.

Durham

Sixty (60) wetlands will be impacted in Durham, totaling 3,764 SF (0.09 acres) of permanent and 325,627 SF (7.48 acres) of temporary impacts. Permanent impacts are associated with new structures and concrete mattresses and temporary impacts are associated with access roads for construction and tree clearing, work pads and work areas needed for "pulling" the new conductors. Temporary impacts are also associated with the intertidal and subtidal areas of Little Bay which will be crossed via submarine cable. The new transmission line will be installed via trench and jetplow depending on the location and substrate. These areas will be returned to the original grade following construction and restored where applicable.

The majority (80%) of the permanently impacted terrestrial wetlands are PEM/PSS wetlands, wet meadow wetlands (PEM), or scrub-shrub (PSS) wetlands. The remaining wetlands are other combinations of cover types including small area of forested and unconsolidated bottom features. The permanent impacts to estuarine wetlands are limited to the potential need to place concrete mattresses for cable protection in areas of intertidal mudflats (E2US) and a small amount of intertidal rocky shore (E2RS). Subtidal unconsolidated bottom (E1UB) wetland in Little Bay will also be temporarily impacted during the installation of the submarine cable along with small areas of intertidal wetlands, including salt marsh (E2EM), intertidal rocky shore (E2RS) and areas of intertidal mudflats (E2US).

Newington

Thirty-one (31) wetlands will be impacted in Newington, totaling 2,165 SF (0.05 acres) of permanent and 221,520 SF (5.08 acres) of temporary impacts. Permanent impacts are associated with new structures on land and concrete mattresses in Little Bay. Temporary impacts are associated with access roads for construction and tree clearing, work pads and areas needed for "pulling" the new conductors. Temporary impacts are also associated with the intertidal and subtidal areas of Little Bay which will be crossed via submarine cable (see description, above).

As with Durham, the majority (98%) of the permanently impacted terrestrial wetlands are PEM/PSS wetlands, wet meadow wetlands (PEM), or scrub-shrub (PSS) wetlands and the remaining wetlands are combinations of cover types including wetlands with small areas of forested cover along the edges of the ROW. Subtidal unconsolidated bottom (E1UB) wetlands in Little Bay will also be temporarily impacted during the installation of the submarine cable. Additionally, small areas intertidal rocky shore (E2RS) and mudflats (E2US) will also be permanently and temporarily impacted.

Portsmouth

Two wetlands will be impacted in Portsmouth, totaling 851 SF (0.02 acres) of temporary impacts. Permanent impacts have been avoided and temporary impacts are associated with access roads for construction and tree clearing, work pads and areas needed for "pulling" the new conductors.

Wetland PW5 is a PEM/PSS wetland that is mostly wet meadow and PW2 has a small component of forested wetland PFO outside of the PEM/PSS wetland covertype found in the cleared ROW area.

Estuarine Effects

The three transmission cables will be installed across Little Bay within an area mapped as "Cable Area" on NOAA Chart 13825. The primary installation will involve creation of a temporary trench for each cable using a jet plow (Figure 2). This process essentially opens a narrow trench, lays the cable, and buries the cable in one step. The jet plow functions by injecting pressurized water into the sediment to fluidize it, allowing the cable to settle below the bay floor to the required depth (3.5-foot burial on the tidal flats; 8-foot burial in the channel). The support barge and jet plow will not be able to reach the shoreline on either side, however. In these nearshore areas, the cable will be laid on the substrate surface and divers will use hand jets to lower the cable to the desired 3.5-foot burial depth (a total distance of approximately 880 ft [268 m] per cable). Silt curtains will be placed surrounding the intertidal areas to be hand jetted or trenched to contain suspended sediments.

Within the tidal zone where jet plowing is possible, each cable will require a rectangular trench about 1-foot wide and about 4,266 feet (1,300 m) long for a total direct surface disturbance of 4,266 sq. ft. (0.1 acre) per crossing or a total of 12,798 sq. ft. (0.3 acres) for all three cables. The jet plow installation will begin on the western tidal flat approximately 300 ft (95 m) seaward of the shoreline and continue until approximately 580 ft (178 m) west of the eastern landfall. For the majority of the length, the cables will be laid 30-feet apart on center, although as they near the shorelines they funnel together to rejoin. The wide separation is necessary to protect the cables because the physical constraints of the crossing will require a multipoint anchoring system on the installation barge.

Both the jet plowing and diver hand jetting will require the support of a barge. On the shallow tidal flats, the barge will be grounded for a period of time for each installation phase.

Additional underwater construction activity will include removal of sections of existing cables and other minor debris that could present obstacles to the jet plow. Four PSNH transmission cables from an earlier crossing currently lie on or within 24 inches of the sediment surface within the Cable Area. The cables are between 60 and 110 years old, and are largely intact on the seafloor. PSNH attempted to remove the cables in the mid-1990's (NHDES Wetlands Board Permit 95-02299; US Army Corps of Engineers Permit 1996-00160), but the effort was halted after the cables fractured during the removal attempt. An inspection by divers in 2014 indicated that the cables were sufficiently intact to be successfully "grappled" to the surface. Most of one cable and approximately half of a second cable lie within the jet plow route. The planned approach is to sever the old cables and cap the ends at the minimum length necessary to clear the jet plow route. The severed cable sections will be lifted to a barge for on-land disposal.

The jetplow operation is expected to extend over a period of three to four weeks, including all equipment mobilization. Each cable will require about five to seven days in total, during which the jet plow installation process will generally take place over one day. Divers using hand held jets will complete the cable burial from the end of the jet plow to each landfall. This process will take up to 90 days. Cable laying is planned for the fall (after Labor Day) and will be completed before air temperatures remain below 32˚F, a point at which the cables would not be flexible enough to handle off the spool.

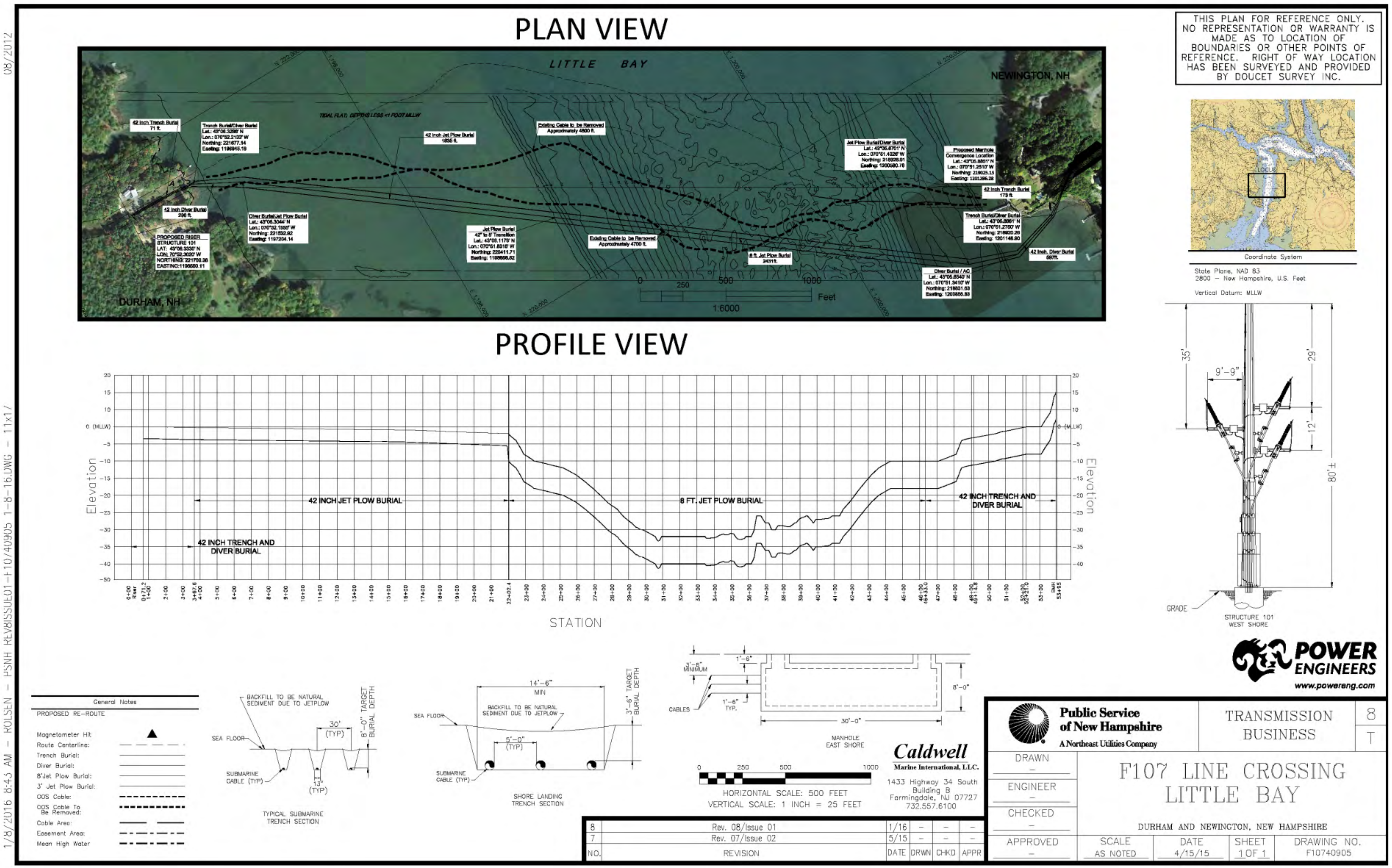

Figure 2. Little Bay cable crossing detail for Seacoast Reliability Project (SRP)

Potential temporary impacts along the Little Bay crossing include:

- Direct disturbance of the sediment surface from cable installation along each cable trench (quantifiable) and from anchoring of the installation vessel (not quantifiable)
- Deposition of sediments suspended during the jet plowing and dispersed beyond the footprint of each trench (quantifiable)
- Increase in suspended sediments above ambient conditions during jet plowing
- Entrainment of planktonic organisms in the jet plow water intake

Potential long-term impacts as a result of the operating cables include:

- Exposure of organisms to electromagnetic fields emitted from the three cables
- Exposure of organisms to heat emanating from the cables

Direct Stream Impacts

Direct permanent impacts to streams have been avoided, with all structures located in upland or wetland areas. Direct temporary impacts to streams total 211 square feet (104 linear feet) (see Table 3). The majority of streams will be crossed using temporary mat bridges, with matting placed parallel to, but outside of each bank, to serve as bridge supports, and other matting placed perpendicularly on top of these to bridge the stream. Erosion controls such as bark mulch or silt socks will be placed adjacent to the timber mats serving as bridge supports to minimize soil disturbance and prevent sediment from entering the stream. Two streams are located within work pad areas, and may need temporary culverts during construction activities. Temporary culverts will be sized based on appropriate guidelines to accommodate flows. These areas will be inspected and maintained throughout construction by an Environmental Monitor and the temporary culverts will be removed when no longer needed.

Additionally, one perennial stream in Durham, College Brook (DS74), is proposed to be crossed with an open trench associated with underground line construction. A short section of this stream will be temporarily relocated using coffer dams to divert water around the impact area during construction. The underground electrical conduit will be installed and the impacted portion of the channel will be reconstructed with native material and stream flow will be restored to its original channel. The area will be stabilized as needed to support the disturbed banks.

Table 3. Proposed stream impacts by town and flow regime with proposed crossing type

Stream ID	Stream Type	Name	Temp. Impact (SF)	Temp. Impact (LF)	Crossing Type
		Durham			
DS8	Ephemeral		0	0	Mat Bridge
DS32	Intermittent		0	0	Mat Bridge
DS34	Ephemeral		0	0	Mat Bridge
DS35	Perennial	Beaudette Brook	0	0	Mat Bridge
DS39	Perennial		0	0	Mat Bridge
DS46	Perennial	LaRoche Brook	0	0	Mat Bridge
DS51	Perennial		20	10	Temp. Culvert
DS60	Perennial	LaRoche Brook	0	0	Mat Bridge
D061	Perennial		0	0	Mat Bridge
DS74	Perennial	College Brook	146	49	Diversion, Trench & Mat Bridge
DS92	Intermittent		0	0	Mat Bridge
		Subtotal:	*166*	*59*	
		Newington			
NS8	Intermittent		0	0	Mat Bridge
NS14	Ephemeral		0	0	Mat Bridge
NS36	Ephemeral		45	45	Temp. Culvert
NS50	Intermittent		0	0	Mat Bridge
NS107	Perennial		0	0	Mat Bridge
		Subtotal:	*45*	*45*	
		Total:	211	104	

Secondary Wetland and Stream Impacts

Secondary impacts include wetland conversion from a forested canopy to scrub-shrub and emergent due to tree removal within wetlands and upland stream buffer tree removal within 100 feet of perennial streams, 50 feet of intermittent streams and 25 feet of ephemeral streams.

The majority of the existing corridor is 100 feet wide; however the width of currently cleared and regularly maintained areas vary widely from nearly the entire 100 feet width to as narrow as 30 feet. To safely accommodate the proposed transmission line while meeting the applicable clearances for 115kV and the co-located distribution lines, the entire corridor will need to be cleared of target species to 100 feet in width. Capable species are those woody (tree) species that are capable of growing to a height that could pose a risk to the structures and conductor if they were to fall or come in contact with the conductor. Lower growing shrubs and herbaceous vegetation will not be cleared as they will not grow up to a height that could endanger the line. Minimum clearances from all vegetation must be maintained, and routine maintenance clearing according to PSNH's vegetation clearing procedures and practices is an important component of the SRP operation[14].

Wetland areas within the surveyed treeline boundary were quantified within each town (Table 4). Temporary access routes were also established to facilitate the efficient removal of target species. The access roads in wetlands will consist of 16-foot wide timber mat roads, as necessary. Cleared wetlands will not be stumped or grubbed and PSNH will consult with individual landowners on the managementof cut trees. The remaining logs and slash will be removed from wetlands. Woody material will be either chipped or diced and windrowed in uplands or removed from the ROW. Chips generated from the tree clearing may be utilized for erosion control purposes. At the discretion of the environmental monitor, some woody material may be left in wetlands to avoid physical impacts to the wetland that would result from removing the wood.

Table 4. Forested wetland conversion by town

Town	Wetland Conversion (SF)	Wetland Conversion (acres)
Madbury	2,072	0.05
Durham	217,334	4.99
Newington	87,089	2.00
Portsmouth	11,305	0.26
Total:	317,800	7.30

Stream buffers function to protect the riparian areas of streams from sedimentation by trapping runoff, erosion by binding the soils near and along streambanks, and providing shade to keep water cool and for cover, plus other habitat benefits for wildlife and aquatic organisms. Tree removal within wetland areas near streams is included in the forested wetland conversion discussed above (Table 4). Proposed tree clearing of upland areas within 100 feet of perennial streams, 50 feet of intermittent streams, and 25 feet of ephemeral streams were quantified based on agency recommendations (Table 5). Cleared areas within these buffers will not be stumped or grubbed and ground disturbances will be limited to those associated with the logging equipment. Additionally, low-growing native shrubs and other species common within riparian buffers will remain. Over time, other shrub and low-growing woody species will colonize these areas helping to enhance and restore these important functions.

[14] Northeast Utilities, 2013. *Vegetation Clearing Procedures and Practices for Transmission Line Sections*. OTRM 230. Rev. 2 8/19/2013.

Table 5. Upland stream buffer clearing by town

Town	Perennial Stream Buffer (SF)	Intermittent Stream Buffer (SF)	Ephemeral Stream Buffer (SF)	Total (SF)
Madbury	7,383	0	0	7,383
Durham	53,348	11,453	4,221	69,022
Newington	5,010	4,691	1,119	10,820
Portsmouth	0	0	0	0
Total (SF):	65,741	16,144	5,340	87,225
Total (Acres):	1.51	0.37	0.12	2.00

Vernal Pool Impacts

No vernal pools were identified within the SRP corridor and no impacts are anticipated.

Effects on Wetland Functions and Values

Permanent impacts to wetlands and streams were avoided and minimized wherever possible. The remaining unavoidable permanent impacts to terrestrial (palustrine) wetlands are relatively minor in extent (792 SF) and distributed across 27 structures in 24 wetlands. Table 6 summarizes the total proposed permanent impact to each principal wetland function or value in each town. These data do not include functions or values that a wetland is classified as suitable for, as the wetland was not observed performing this function or value within or immediately adjacent to the ROW area. Additionally, because wetlands can have multiple principal functions or values, proposed permanent impacts to a given function or value will exceed the total permanent impact to each given wetland. The functions most commonly associated with the permanently impacted wetlands include groundwater discharge, floodflow alteration, production export, sediment/toxicant retention and wildlife habitat. The small footprint of the new transmission line structures is not expected to affect the existing wetland functions or values. The impacted wetland areas are primarily located within an existing electric corridor and are already subject to periodic maintenance including clearing and other repair work. Temporary impacts are anticipated to have minimal adverse effects on the functions and values associated with the impacted wetland systems. Applicable construction BMPs, on-site monitoring, and restoration of temporarily impacted areas according to standards and based on agency recommendations will be employed (Section 4.0).

Table 6. Permanent impacts to principal functions and values for wetlands in each town.

Town	Groundwater Discharge	Floodflow Alteration	Fish/Shellfish	Sediment/Toxicant Retention	Nutrient Removal	Production Export	Shoreline/Sediment Stabil.	Wildlife Habitat	Recreation	Education/Scientific	Uniqueness/Heritage	Visual Quality/Heritage	RTE Habitat
Madbury	199	199	199	0	0	199	199	199	0	199	0	199	0
Durham	94	3,550	3,550	3,570	0	3,553	0	3,600	3,550	3,550	3,550	3,570	0
Newington	298	1,979	1,786	1,940	154	1,959	0	1,817	1,786	1,786	1,786	1,786	0
Portsmouth	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	591	5,728	5,535	5,510	154	5,711	199	5,616	5,336	5,535	5,336	5,555	0

Tidal Buffer Zone (TBZ) Impacts

The 100-foot tidal buffer zones (TBZ) associated with Little Bay were mapped and permanent and temporary impacts were calculated based on the proposed underground design. The TBZ associated with the project include previously established residential areas including a yard, and structures in Durham and a maintained side yard in Newington; therefore the entire area was considered "developed." Total impacts to the TBZ are 11 SF of permanent impacts associated with at-grade manhole covers for an underground vault and 21,166 SF of temporary impacts associated with areas where the cable will be installed underground in a trench, and backfilled and restored to pre-construction conditions.

7 Mitigation Narrative

Permanent and secondary impacts that are unavoidable due to safety, engineering, or landownership issues or constraints will be mitigated through compensatory mitigation.

The mitigation plan was developed in accordance with the New Hampshire Wetland Rules (Env-Wt 800) and federal regulatory rules for mitigation in New England under Section 404 of the Clean Water Act (40 CFR Part 230). It incorporates views of state and regional federal regulators with the NHDES Wetlands Bureau, USACE, the US EPA, NHFG, and USFWS per pre-application meeting discussions, as recorded in meeting and phone conversation notes.

Compensatory Wetland Mitigation Narrative

Because of the linear nature of the Project and its wetland resource impacts, high value within-project mitigation would be difficult. The Project includes four towns, multiple watersheds and a variety of freshwater and estuarine resources. In consultation with NH DES and the US Army Corps of Engineers, payment into New Hampshire's Aquatic Resource Mitigation (ARM) Fund was determined to be appropriate mitigation for the 5,336 square feet of permanent estuarine impact, the 792 square feet of permanent terrestrial wetland impact, the 317,800 square feet of forested wetland conversion and 87,225 square feet of upland stream buffer clearing associated with the SRP. Calculations for payment into the In-Lieu Fee program based on the types and extent of impacts by town are shown in Table 7. The estimated total payment based on the latest 2016 ARM Fund Calculator is estimated $309,971.11, although this may change during the review process with NHDES and USACE, should design modifications result in changes in wetland impacts.

The Town of Durham provided a potential wetland restoration and upland buffer protection project, summarized below. The restoration concept has merit for compensation for different aspects of wetland resource impacts by the SRP if the regulatory agencies concur.

Durham

The Town of Durham has proposed an environmental mitigation project to reduce the amount of erosion from the Wagon Hill Farm shoreline bordering the Great Bay Estuary and the Oyster River. Wagon Hill Farm is Town-owned conservation land consisting of 139 acres with 1100 feet of tidal frontage on the Little Bay, Oyster River and Smith Creek, and 8.5 acres of tidal and freshwater wetlands. The project proposes to stabilize the existing eroded portions of the shoreline, which is the result of uncontrolled foot traffic along the shoreline. These pathways have eroded and the erosion has been exacerbated by natural conditions including wind, wave and ice action. This erosion is continuing to degrade shoreline and salt marsh habitats and has negative impacts on wildlife, shellfish, and fish habitats. The erosion stabilization would include both stabilizing and restoring the shoreline, as well as further measures to halt foot traffic in the sensitive areas by re-designing nearby walking paths to discourage off-path travel, fences and viewing platforms on the adjacent upland. A second habitat protection effort is a footbridge proposed to be constructed over Davis Creek and adjacent wetlands to control off-path travel by people and pets.

The stabilization projects will help to protect the water quality and aquatic habitats of the local streams, adjoining bordering wetlands, and the Great Bay estuary including the adjacent Salt Marsh and Sparsely Vegetated Intertidal systems, both of which are Exemplary Natural Communities documented by NHNHB. Preliminary estimates suggest that approximately 700-900 square feet of salt marsh, plus approximately 1,100 linear feet of adjacent shoreline could be restored. Impacts to freshwater wetlands along Davis Creek are estimated as 500 square feet. The Town of Durham has recently partnered with UNH ecologists and DES coastal staff to develop strategies for restoring salt marsh and developing long-term stabilization along the shoreline. This partnership will bring current and potentially innovative techniques to addressing erosion, controlling freshwater runoff, and protecting from human-caused destabilization.

The Wagon Hill Farm shoreline stabilization project provides the opportunity to mitigate for unavoidable permanent impacts caused by SRP structures in freshwater wetlands (approximately 700 square feet in Durham), potentially 2,500 square feet of impact from concrete mattresses on tidal flats, and clearing of freshwater wetlands and streams as a result of tree removal within the SRP project corridor. It also provides the opportunity to restore sections of deteriorated or fully eroded salt marsh, and would further reduce sediment loading into critical estuarine habitats. The project has been estimated to cost $370,000, including $340,000 for shoreline restoration, $10,000 for a bridge over Davis Creek, and $20,000 to stabilize and restore Davis Creek Point. The Town of Durham is anticipating that Eversource's contribution of approximately $170,000 would complete the project, in addition to $115,000 from the Lois Brown Trust and approximately $84,000 to be raised by the town. The Durham Selectmen and Budget Committee have approved this project as part of the 2016 annual budget, pending regulatory permit approval for the Eversource contribution. Additional detail on the project is provided in Appendix F of this report within a memorandum regarding *Environmental Mitigation Project along the Wagon Hill Farm Shoreline* prepared by the Town of Durham Department of Public Works.

PSNH will continue to work with applicable parties to develop a mitigation package that will be acceptable to NHDES and USACE.

Table 7. Summary of impacts and estimated ARM Fund payment

Town	A: Secondary Impact: Forested Wetland Conversion (SF)	A1: Conversion Mitigation Area (15% of total area A)(SF)	B: Secondary Impact: Stream Buffer Clearing (SF)	B1: Conversion Mitigation Area (15% of total area B)(SF)	C: Permanent Impacts (SF)	Total Impacts for Mitigation by Town (SF) (Sum A1+B1+C)	ARM Payment (from NH DES ARM Fund Calculator by Town)[15] (USD)
Madbury	2,072	311	7,383	1107	199	1,617	$6,488.92
Durham (Freshwater)	217,334	32,600	69,022	10,353	214	43,167	$183,385.10
Durham (Tidal)	-	-	-	-	3,550	3,550	$30,162.72
Newington (Freshwater)	87,089	13,063	10,820	1,623	379	15,065	$66,079.42
Newington (Tidal)	-	-	-	-	1,786	1,786	$15,667.82
Portsmouth	11,305	1,696	0	0	0	1,696	$8,187.14
Total:	317,800	47,670	87,225	13,084	6,128	66,882	$309,971.11

[15] http://des.nh.gov/organization/divisions/water/wetlands/wmp/

Temporary Impacts Restoration Plan

Wetland and upland areas temporarily disturbed for access road and pole replacement activities will be restored. The likely wetland restoration areas correspond to the location of timber mats shown for the poles and access roads in wetlands on the construction plans. Once timber mats and other temporary wetland protections have been removed, any displaced or compacted topsoil will be smoothed or graded to match previous or adjacent soil elevations. Acquired upland and wetland topsoil or reused topsoil will be evaluated for project use in any areas requiring fill, and will be spread to a depth of 6 inches or to match adjacent grades, and moderately compacted. Areas with disturbed soils will be stabilized with upland or wetland seed mix of native and naturalized species along with annual ryegrass (for erosion control while the other seed germinates). Alternative seed mixes or stabilization methods may be negotiated with individual landowners for upland areas by the contractor, as long as these alternatives are equally protective of jurisdictional wetlands and waterbodies.

Areas of the fringing salt marsh that will be temporarily impacted by the underwater cable installation will be restored immediately following completion of the cable laying. Salt marsh peat will be salvaged within the impact area and stockpiled for replacement during restoration. The stockpiled peat blocks will be protected and maintained for the duration of the installation period. The underlying gravel substrates will be restored to match surrounding elevations. The peat blocks will be replaced and anchored with rebar stakes driven into the gravel. Any open interstices between the peat blocks will be filled with a mixed sand to cover exposed roots and maintain grades. The seaward face of the peat will be protected from ice and wave action with a coir log.

Construction and restoration will be done under the supervision of the Engineer and Restoration Specialist to ensure minimization of impacts to native vegetation and wildlife, and that all disturbed areas are stabilized.

Maintenance and Monitoring

The Restoration specialist will assure compliance with permit conditions during and after the construction activities, including one year of post-construction monitoring after one full growing season, and preparation of the appropriate compliance reports for submittal to NHDES. The monitoring will include a site inspection, cover estimates in restored wetlands, including the salt marsh, and uplands by species in random plots, photographs, and wildlife observations. Areas with less than 80% cover at the end of the growing seasons will require additional seed. Any areas with erosion will be repaired. Non-biodegradable erosion control materials will be removed as soon as they are no longer necessary. Other potential maintenance issues, such as erosion gullies or vandalism, will be documented and reported immediately to PSNH for repair.

Restored areas will be monitored for invasive species. Potential invasive species on this site include purple loosestrife, buckthorn, and autumn olive among others. Invasive plants will be pulled and removed from restoration areas and disposed of in a manner and location to preclude their survival or spread. A monitoring report will be submitted to the NHDES by

November of the year when construction commences and each additional year where construction is active following initial work until the project is complete and all areas are suitably stabilized.

Normandeau will provide construction oversight and mowing oversight to insure the contractors follow the planned access roads in wetlands and sensitive areas (rare species and sensitive archeological sites) via the use of barriers to demarcate and protect wetlands and sensitive areas. These barriers will be silt fence and/or haybales where sedimentation/erosion control is also needed, or construction barrier fencing where sedimentation/erosion control is not necessary.

8 NH NHB Review

PSNH and Normandeau have coordinated with NHNHB throughout the Project's design and development.

A copy of the NHNHB database results provided for the project is included below. Mapping and detailed records for identified species have been removed because the information is considered sensitive.

Additional information is included in Appendix C and Appendix D.

Memo

NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

To: Susan Hegarty, Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

From: Amy Lamb, NH Natural Heritage Bureau
Date: 11/9/2015 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB15-3561 Town: Madbury, Durham, Newington, Portsmouth Location:

Description: Eversource is proposing to construct a new 13-mile 115kV transmission line between their Madbury and Portsmouth substations. It will predominantly follow existing ROW. It will consist primarily of overhead structures, but will have an underground section at UNH in Durham and will have a submarine segment under Little Bay. This is an update request. Our previously requested data expired on 10/2/2015. NHB file ID: NHB14-3618.

cc: Kim Tuttle

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

Comments: This review is a follow-up to NHB14-3618 (9/24/2014) and the NHB14-3618 Addendum (10/2/2014). Continued coordination with NHB and NH Fish & Game is needed as this project progresses through permitting.

Invertebrate Species	**State[1]**	**Federal**	**Notes**
Ringed Boghaunter (*Williamsonia lintneri*)	E	--	Contact the NH Fish & Game Dept (see below).

Natural Community	**State[1]**	**Federal**	**Notes**
Hemlock - beech - oak - pine forest	--	--	Threats include logging, introduction of invasive species, and direct destruction due to development.
High salt marsh	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as ditching or tidal restrictions that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.
Red maple - sensitive fern swamp	--	--	These swamps are influenced by groundwater seepage and springs which moderate water fluctuations and maintain conditions favorable for the accumulation of organic matter. The primary threats are changes to the hydrology of the wetland complex, particularly raising or lowering the water levels, and increased nutrient and pollutant input carried in by stormwater runoff.

Salt marsh system	--	--	Threats are primarily changes to the hydrology of the system, introduction of invasive species, and increased input of nutrients and pollutants.
Sparsely vegetated intertidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.
Subtidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.

Plant species	**State[1]**	**Federal**	**Notes**
Black Maple (*Acer nigrum*)	T	--	Threats are primarily damage to its floodplain or riverbank habitat, including changes to local hydrology, land conversion and fragmentation, introduction of invasive species, and increased input of nutrients and pollutants.
bulbous bitter-cress (*Cardamine bulbosa*)	E	--	This species occurs in forested swamps, low floodplain forest, and moist thickets.. Threats to the plants include canopy removal and destruction (draining) of its habitat.
crested sedge (*Carex cristatella*)*	E	--	This wetland species, which occurs in bogs, fens, seeps, and wet meadows, would be threatened by changes to local hydrology, including increased nutrient input from stormwater runoff, and sedimentation from nearby disturbance.
Engelmann's Quillwort (*Isoetes engelmannii*)*	E	--	Primarily vulnerable to changes to the hydrology of its wetland habitat, especially alterations that change water levels. It may also be susceptible to increased pollutants and nutrients carried in stormwater runoff.
great bur-reed (*Sparganium eurycarpum*)	T	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
greater fringed-gentian (*Gentianopsis crinita*)*	T	--	Vulnerable to shading by invading trees and to disturbances that destroy plants or impede their ability to reproduce (such as mowing in the mid-summer while the plants are in bloom).
Marsh Elder (*Iva frutescens*)	T	--	Threats are primarily alterations to the hydrology of the wetland, such as ditching or tidal restrictions that might affect the sheet flow of tidal waters across the intertidal flat, activities that eliminate plants, and increased input of nutrients and pollutants in storm runoff.
Rigid Sedge (*Carex tetanica*)*	--	--	This plant relies on open habitat, and maintenance of the hydrology of any wetland where it occurs.
Sensitive species	T	T	Please contact NH Natural Heritage (271-2215 x 323) if project impacts could occur

in the area shown on the map.

Vertebrate species	State[1]	Federal	Notes
American Eel (*Anguilla rostrata*)	SC	--	Contact the NH Fish & Game Dept (see below).
Bald Eagle (*Haliaeetus leucocephalus*)	T	--	Contact the NH Fish & Game Dept (see below).
Banded Sunfish (*Enneacanthus obesus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).
Eastern Hognose Snake (*Heterodon platirhinos*)*	E	--	Contact the NH Fish & Game Dept (see below).
Grasshopper Sparrow (*Ammodramus savannarum*)	T	--	Contact the NH Fish & Game Dept (see below).
Least Bittern (*Ixobrychus exilis*)	SC	--	Contact the NH Fish & Game Dept (see below).
Northern Black Racer (*Coluber constrictor constrictor*)	T	--	Contact the NH Fish & Game Dept (see below).
Osprey (*Pandion haliaetus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Sea Lamprey (*Petromyzon marinus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Sedge Wren (*Cistothorus platensis*)	E	--	Contact the NH Fish & Game Dept (see below).
Spotted Turtle (*Clemmys guttata*)	T	--	Contact the NH Fish & Game Dept (see below).
Swamp Darter (*Etheostoma fusiforme*)	SC	--	Contact the NH Fish & Game Dept (see below).
Upland Sandpiper (*Bartramia longicauda*)	E	--	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.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

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

9 NH Programmatic General Permit (PGP) Requirements

U.S. Army Corps of Engineers New Hampshire PGP Appendix B – Corps Secondary Impacts Checklist

Note: U.S. Army Corps of Engineers data sheets will be provided electronically as part of NH SEC application.

US Army Corps of Engineers®
New England District

Programmatic General Permit (PGP)
Appendix B - Required Information and Corps Secondary Impacts Checklist

In order for the Corps of Engineers to properly evaluate your application, applicants must submit the following information along with the DES Wetlands Bureau application or permit notification forms. Some projects may require more information. For a more comprehensive checklist, go to www.nae.usace.army.mil/regulatory, "Forms/Publications" and then "Application and Plan Guideline Checklist." Check with the Corps at (978) 318-8832 for project-specific requirements. For your convenience, this Appendix B is also attached to the State of New Hampshire DES Wetlands Bureau application and Permit by Notification forms.

All Projects:

- Corps application form (ENG Form 4345) as appropriate.
- Photographs of wetland/waterway to be impacted.
- Purpose of the project.
- Legible, reproducible black and white (no color) plans no larger than 11"x17" with bar scale. Provide locus map and plan views of the entire property.
- Typical cross-section views of all wetland and waterway fill areas and wetland replication areas.
- In navigable waters, show mean low water (MLW) and mean high water (MHW) elevations. Show the high tide line (HTL) elevations when fill is involved. In other waters, show ordinary high water (OHW) elevation.
- On each plan, show the following for the project:
- Vertical datum and the NAVD 1988 equivalent with the vertical units as U.S. feet. Don't use local datum. In coastal waters this may be mean higher high water (MHHW), mean high water (MHW), mean low water (MLW), mean low lower water (MLLW) or other tidal datum with the vertical units as U.S. feet. MLLW and MHHW are preferred. Provide the correction factor detailing how the vertical datum (e.g., MLLW) was derived using the latest National Tidal Datum Epoch for that area, typically 1983-2001.
- Horizontal state plane coordinates in U.S. survey feet based on the [insert state grid system] for the [insert state] [insert zone] NAD 83.
- Show project limits with existing and proposed conditions.
- Limits of any Federal Navigation Project in the vicinity of the project area and horizontal State Plane Coordinates in U.S. survey feet for the limits of the proposed work closest to the Federal Navigation Project;
- Volume, type, and source of fill material to be discharged into waters and wetlands, including the area(s) (in square feet or acres) of fill in wetlands, below the ordinary high water in inland waters and below the high tide line in coastal waters.
- Delineation of all waterways and wetlands on the project site, including vernal pools:
- Use Federal delineation methods and include Corps wetland delineation data sheets. See GC 2; Endnotes 1, 6, 7 and 15 in Appendix A; and www.nero.noaa.gov/hcd for eelgrass survey guidance.
- Appendix A, (e) Moorings, contains eelgrass survey requirements for the placement of moorings.
- For activities involving discharges of dredged or fill material into waters of the U.S., include a statement describing how impacts to waters of the U.S. are to be avoided and minimized, and either a statement describing how impacts to waters of the U.S. are to be compensated for (or a conceptual or detailed mitigation plan) or a statement explaining why compensatory mitigation should not be required for the proposed impacts. Please contact the Corps for guidance.

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New England District

New Hampshire Programmatic General Permit (PGP)
Appendix B - Corps Secondary Impacts Checklist
(for inland wetland/waterway fill projects in New Hampshire)

1. Attach any explanations to this checklist. Lack of information could delay a Corps permit determination.
2. All references to "work" include all work associated with the project construction and operation. Work includes filling, clearing, flooding, draining, excavation, dozing, stumping, etc.
3. See PGP, GC 5, regarding single and complete projects.
4. Contact the Corps at (978) 318-8832 with any questions.

1. Impaired Waters	Yes	No
1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water? See http://des.nh.gov/organization/divisions/water/wmb/section401/impaired_waters.htm to determine if there is an impaired water in the vicinity of your work area.*		
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?		
2.2 Are there proposed impacts to SAS, shellfish beds, special wetlands and vernal pools (see PGP, GC 26 and Appendix A)? Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) website, www.nhnaturalheritage.org, specifically the book Natural Community Systems of New Hampshire.		
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?		
2.4 Would the project remove part or all of a riparian buffer? (Riparian buffers are lands adjacent to streams where vegetation is strongly influenced by the presence of water. They are often thin lines of vegetation containing native grasses, flowers, shrubs and/or trees that line the stream banks. They are also called vegetated buffer zones.)		
2.5 The overall project site is more than 40 acres.		
2.6 What is the size of the existing impervious surface area?		
2.7 What is the size of the proposed impervious surface area?		
2.8 What is the % of the impervious area (new and existing) to the overall project site?		
3. Wildlife	Yes	No
3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project? (All projects require a NHB determination.)		
3.2 Would work occur in any area identified as either "Highest Ranked Habitat in N.H." or "Highest Ranked Habitat in Ecological Region"? (These areas are colored magenta and green, respectively, on NH Fish and Game's map, "2010 Highest Ranked Wildlife Habitat by Ecological Condition.") Map information can be found at: • PDF: www.wildlife.state.nh.us/Wildlife/Wildlife_Plan/highest_ranking_habitat.htm. • Data Mapper: www.granit.unh.edu. • GIS: www.granit.unh.edu/data/downloadfreedata/category/databycategory.html.		

	Yes	No
3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?		
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		
3.5 Are stream crossings designed in accordance with the PGP, GC 21?		
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?		
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?		
5. Historic/Archaeological Resources		
For a minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) shall be sent to the NH Division of Historical Resources as required on Page 5 of the PGP**		

*Although this checklist utilizes state information, its submittal to the Corps is a Federal requirement.

** If project is not within Federal jurisdiction, coordination with NH DHR is not required under Federal law..

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More details for each question are included below.

Supplemental Corps Appendix B Narrative

1. Impaired Waters

1.1 Will any work occur within 1 mile upstream in the watershed of an impaired water?

The majority of the SRP corridor is within 1 mile upstream of an impaired water, according to the mapping provided by the NH DES and referenced on the Appendix B form. Much of the project area is developed, including the Durham area near UNH and portions of Newington and Portsmouth. Wetlands and stream impacts have been avoided and minimized to the greatest extent practicable. Construction and erosion control BMPs will be employed throughout course of the project and maintaining water quality will be a priority. Erosion control measures will be installed prior to construction, maintained throughout the active phases of work, and disturbed areas will be restored. The permanent impacts associated with new transmission structures will not have an adverse impact on water quality.

2. Wetlands

2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?

Streams, brooks and rivers were delineated in the field by experienced wetland scientists and have been included on project plans and mapping. Permanent impacts to streams have been avoided and the majority of the other streams located within the project corridor will be temporarily spanned with timber matting resulting in no impact to the bed and banks. Three streams will likely require temporary culverts during construction. One stream will be crossed via trench during the installation an underground section of the line. Stream crossings and temporary culverts have been designed in accordance with the PGP, GC 21 (see 3.5, below). Please refer to NH DES permit narrative (Section 6) and attached Natural Resource Existing Condition Report (Appendix A) for additional detail.

2.2 Are there proposed impacts to SAS, shellfish beds, special wetlands and vernal pools?

Temporary impacts are proposed within salt marsh wetlands and mud flats, which are both considered Special Aquatic Sites (SAS). Shellfish beds are present within the existing Cable Area; however it is permanently closed to harvesting. Two fringing salt marshes (special wetlands) will be temporarily impacted during the Little Bay cable laying, and will be restored. No vernal pools will be impacted. Please refer to NH DES permit narrative (Section 6) and attached Natural Resource Existing Condition Report (Appendix A) and the Natural Resource Impact Assessment (Appendix B) for additional detail.

2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?

Yes. Wetland crossings will be temporary and utilize timber matting where necessary (if frozen ground conditions are not present). Streams and other areas of horizontal flow will be accommodated through the utilization of temporary timber mat bridges and allow for hydrology, sediment transport and wildlife passage. Erosion controls, such as straw wattles and bark mulch berms, will be used around matting in wetlands so as to not form a barrier like silt fence does. Please refer to NH DES permit narrative (Section 6) and attached Natural Resource Existing Condition Report (Appendix A) and the Natural Resource Impact Assessment (Appendix B) for additional detail.

2.4 Would the project remove part or all of a riparian buffer?

Clearing of trees within riparian buffer areas will be necessary to safely accommodate the proposed SRP transmission line. The ROW currently contains a smaller distribution line in a cleared corridor approximately 60-feet wide, and has not been cleared to the full 100-foot width needed for the SRP in most areas. Cleared areas will not be stumped or grubbed and ground disturbances will be minor. Timber matting will be used during clearing activities within or over delineated wetlands and near streams. Some tree clearing near streams at the edges of the corridor and within riparian buffers will be required, however low-growing shrub and other common riparian species will remain and it is anticipated that these species will colonize newly opened areas with limited impacts to riparian habitat.

2.5 The overall project site is more than 40 acres.

Yes.

2.6 – 2.8 What is the size of the existing impervious surface area? What is the size of the proposed impervious surface area? What is the % of the impervious area (new and existing) to the overall project site?

New impervious surfaces resulting from the 12.9-mile long SRP will be limited to the bases of the transmission structures, estimated as 7,234 square feet. Construction and work area access will be temporary and no new permanent roads will be constructed. Substation modification will be restricted to the existing substation footprint within perimeter fencing and substation expansions are not necessary.

3. Wildlife

3.1 Has the NHB determined that there are known occurrences of rare species, exemplary natural communities, Federal and State threatened and endangered species and habitat, in the vicinity of the proposed project?

The NHNHB, US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) have been consulted throughout the SRP design process. Known records of rare species, exemplary natural communities, Federal and State threatened and endangered species and potential habitat for these species were received and reviewed in the field where appropriate. Appropriate construction and erosion BMPs will be employed to protect water quality during and after construction and actions recommended by resource agencies to protect wildlife and other habitat areas will be followed. Please refer to NH DES permit narrative (Section 6), the Rare, Threatened, and Endangered Species and Exemplary Natural Community Report (Appendix C), and the Biological Assessment for the Northern Long-eared Bat for the Seacoast Reliability Project (Appendix D).

3.2 Would work occur in any area identified as either "Highest Ranked Habitat in N.H." or "Highest Ranked Habitat in Ecological Region"?

Yes. Multiple portions of the project pass through these areas along the existing ROW corridor. Appropriate construction and erosion BMPs will be employed to protect water quality during and after construction and actions recommended by resource agencies to protect wildlife and other habitat areas will be followed. Please refer to NHDES permit narrative (Section 6), the Rare, Threatened, and Endangered Species and Exemplary Natural Community Report (Appendix C).

3.3 Would the project impact more than 20 acres of an undeveloped land block (upland, wetland/waterway) on the entire project site and/or on an adjoining property(s)?

The SRP is located completely within existing electrical distribution/transmission corridors that have been subject to periodic and routine maintenance and disturbances for decades. The ROW also includes roads, railroads, residential, commercial and industrial areas along with natural areas. The submarine portion of the SRP is located within a mapped Cable Area through Little Bay that has historically been utilized by other submarine cables (current cables are inactive and will not be used).

3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?

No. The project is a utility project.

3.5 Are stream crossings designed in accordance with the PGP, GC 21?

Yes. All stream crossings will be temporary and not impact the bed or banks of the streams, with the exception of three streams: two where temporary culverts may be needed during construction to facilitate equipment needed to install the new structures; and one perennial stream where trenching for underground conduit will occur. Stream banks in these areas will be restored upon completion of construction. The remaining stream crossings will be made using timber matting and surrounded by appropriate erosion control BMPs. These areas will be inspected during construction and maintained as appropriate. Matting will be removed promptly when no longer needed. Please refer to NH DES permit narrative (Section 6, Direct Stream Impacts) and attached Natural Resource Existing Condition Report (Appendix A) and the Natural Resource Impact Assessment (Appendix B) for additional stream details.

4. Flooding/Floodplain Values

4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?

Yes, the SRP corridor crosses several floodplain areas and five new structures (a total of 6 individual poles) will be located within Zone A/AE, or 100-year floodplains. The underground and submarine portions of the project within and adjacent to the floodplains associated with College Brook and Little Bay (respectively) will all be installed below grade and restored to original grade with no effect on the flood storage of the affected areas.

4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?

Minimal flood storage losses are anticipated due to the five new structures or the underground/submarine portions of the project and therefore compensatory flood storage will not be provided. Three existing structures will be removed from floodplain areas resulting in a net increase of only two transmission structures and areas surrounding the proposed new structures will be restored to their original grade following installation.

5. Historic/Archaeological Resources

Because this is a major impact project, an RPR form has been filed with the NH Division of Historical Resources (NHDHR). The NHDHR has been consulted during the SRP development and an extensive Archaeological and Historical Resources review has been completed in accordance with NHDHR requirements for new transmission line projects. Please refer to these reports in SEC Appendices 9, 10, and 11 for additional information.

NH Division of Historic Resources (NHDHR) Coordination

See 5. above.

Endangered Species Act

PSNH and Normandeau have coordinated with the NHF&G and USFWS throughout Project development. No permanent impacts to endangered species or critical habitat are proposed.

See Appendices C and D for additional information.

10 Designated River Check (RSA 482-A:3,I(d)(2))

The Project will span the Oyster River (no direct impacts) and pass through portions of the Lamprey River Watershed, both of which are currently protected under the Rivers Management & Protection Act (RMP)(RSA 483).

A complete copy of this application has been sent via certified mail to the Local River Advisory Committee (LAC) for each designated river/watershed. Contacts are listed below and were updated in January 2016[16]. Copies of the receipts from the mailing are included below.

Oyster River Local Advisory Committee
Eric Fiegenbaum, Chair
6 Moharimet Drive
Madbury, NH 03823
eric@lefh.net
www.oysterriverlac.org
603-750-7519

Lamprey Rivers Local Advisory Committee
Richard Snow, Chair
P.O. Box 10037
Candia, New Hampshire 03040-0037
rherbertsnow@netscape.net
www.lampreyriver.org/
603-483-2722

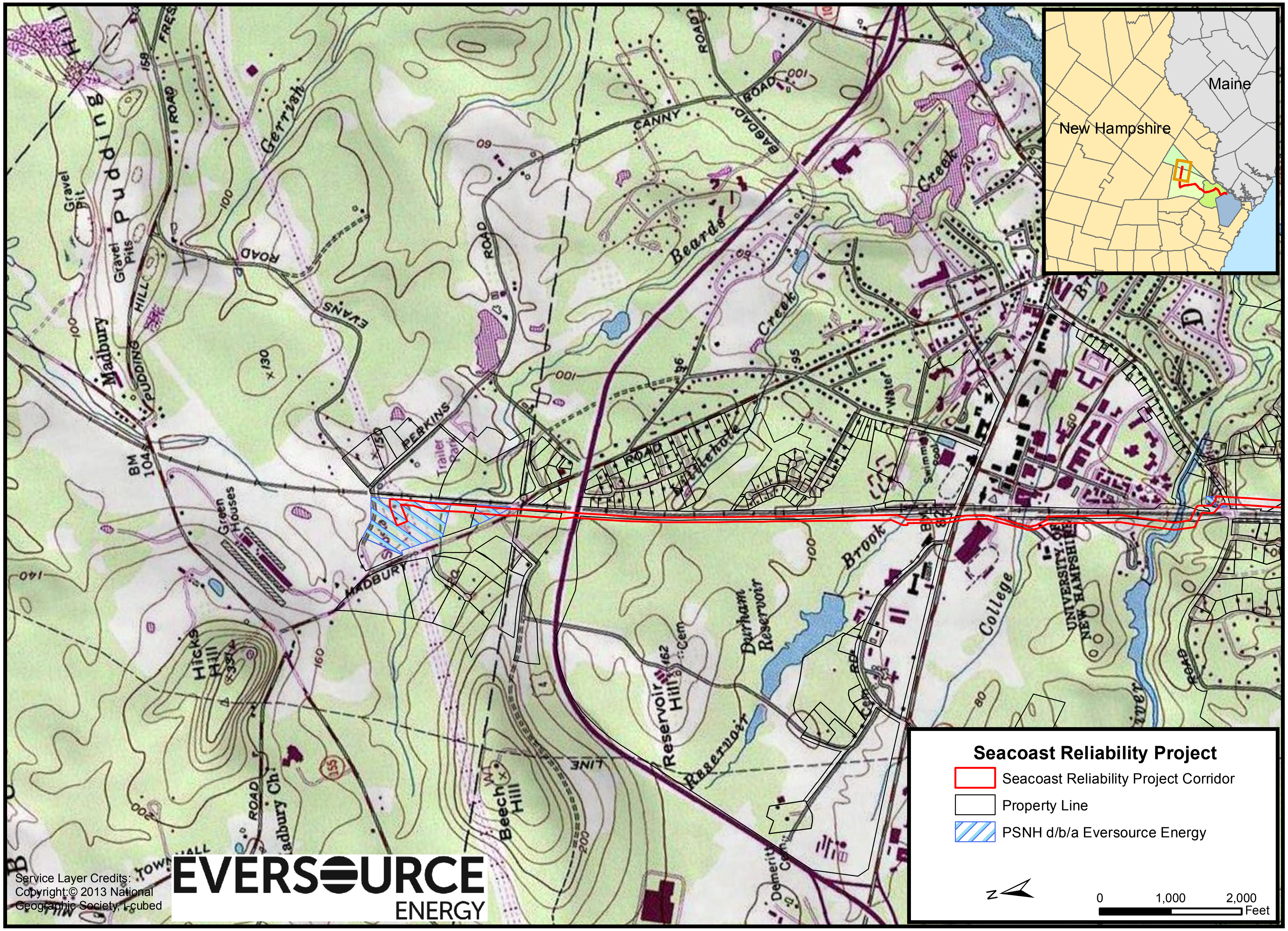

U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only
For delivery information, visit our website at www.usps.com®.
OFFICIAL USE
7015 1520 0002 9696 2935
Certified Mail Fee $ 3.45
Extra Services & Fees (check box, add fee as appropriate)
☒ Return Receipt (hardcopy) $ 2.80
☐ Return Receipt (electronic) $
☐ Certified Mail Restricted Delivery $
☐ Adult Signature Required $
☐ Adult Signature Restricted Delivery $
Postage $ 2.54
Total Postage and Fees $ 8.79
Postmark Here
BEDFORD RURAL BEDFORD NH 03110
Sent To Lamprey Rivers LAC (Richard Snow)
Street and Apt. No., or PO Box No. PO Box 10037
City, State, ZIP+4® Candia, NH 03040
PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions


U.S. Postal Service™
CERTIFIED MAIL® RECEIPT
Domestic Mail Only
For delivery information, visit our website at www.usps.com®.
OFFICIAL USE
7015 1520 0002 9696 2928
Certified Mail Fee $ 3.45
Extra Services & Fees (check box, add fee as appropriate)
☒ Return Receipt (hardcopy) $ 2.80
☐ Return Receipt (electronic) $
☐ Certified Mail Restricted Delivery $
☐ Adult Signature Required $
☐ Adult Signature Restricted Delivery $
Postage $ 2.54
Total Postage and Fees $ 8.79
Postmark Here
BEDFORD RURAL BEDFORD NH 03110
Sent To Eric Fiegenbaum
Street and Apt. No., or PO Box No. 6 Moharimet Dr.
City, State, ZIP+4® Madbury, NH 03823
PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

[16] http://des.nh.gov/organization/divisions/water/wmb/rivers/lac/documents/lac_contacts.pdf

11 USGS Map (Env-Wt 501.02(a)(4) & 505.01(g))

A U. S. Geological Survey (USGS) topographic map set upon which the property lines and Project limits have been outlined (surveyed property boundaries not required) are included below. The maps are at an unaltered scale of 1:24,000 or 1″ = 2,000 feet (1:25,000 metric map) and due to the linear nature of the Project, are presented on sequential sheets from the Madbury Substation to the Portsmouth Substation.



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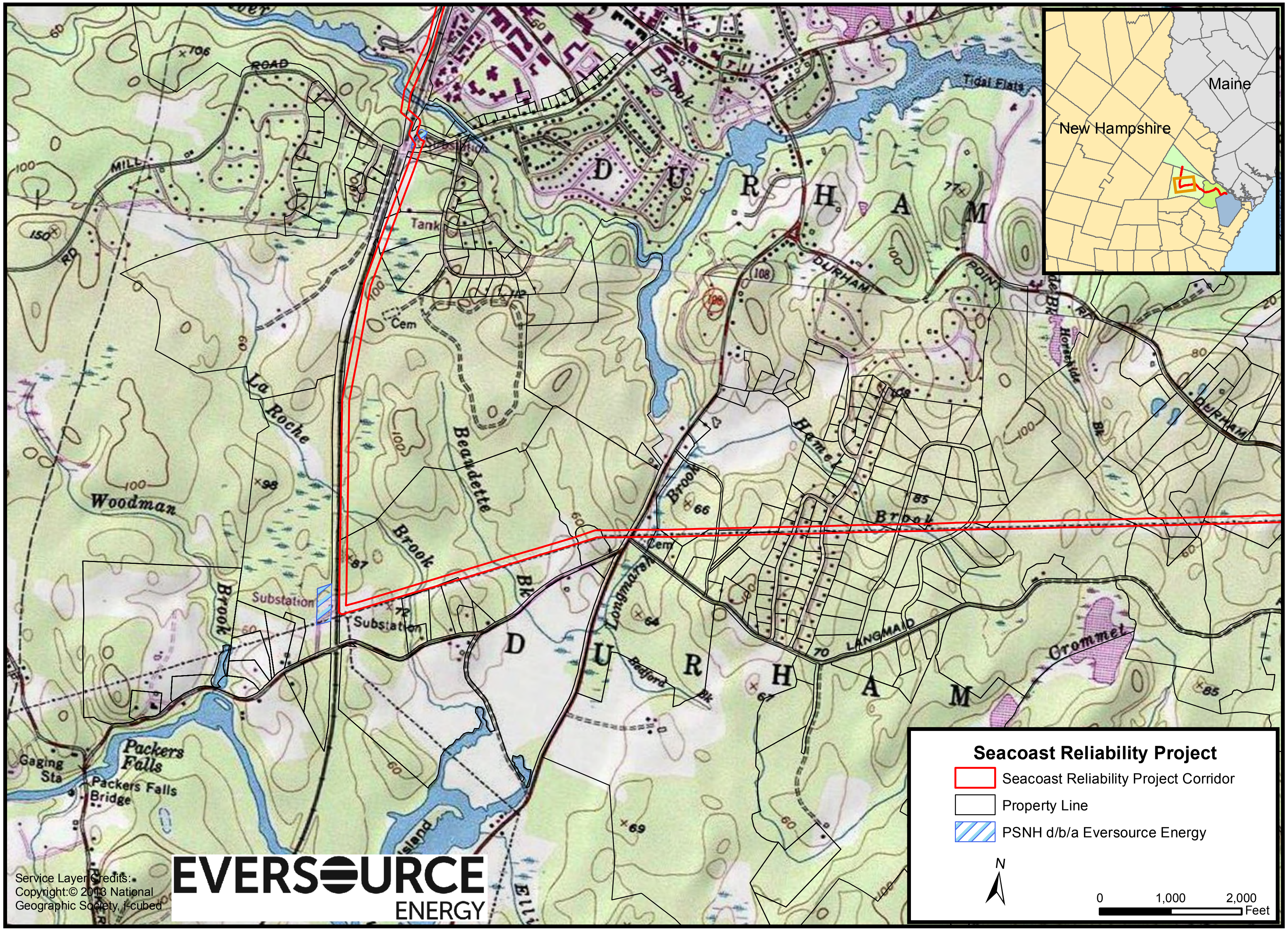

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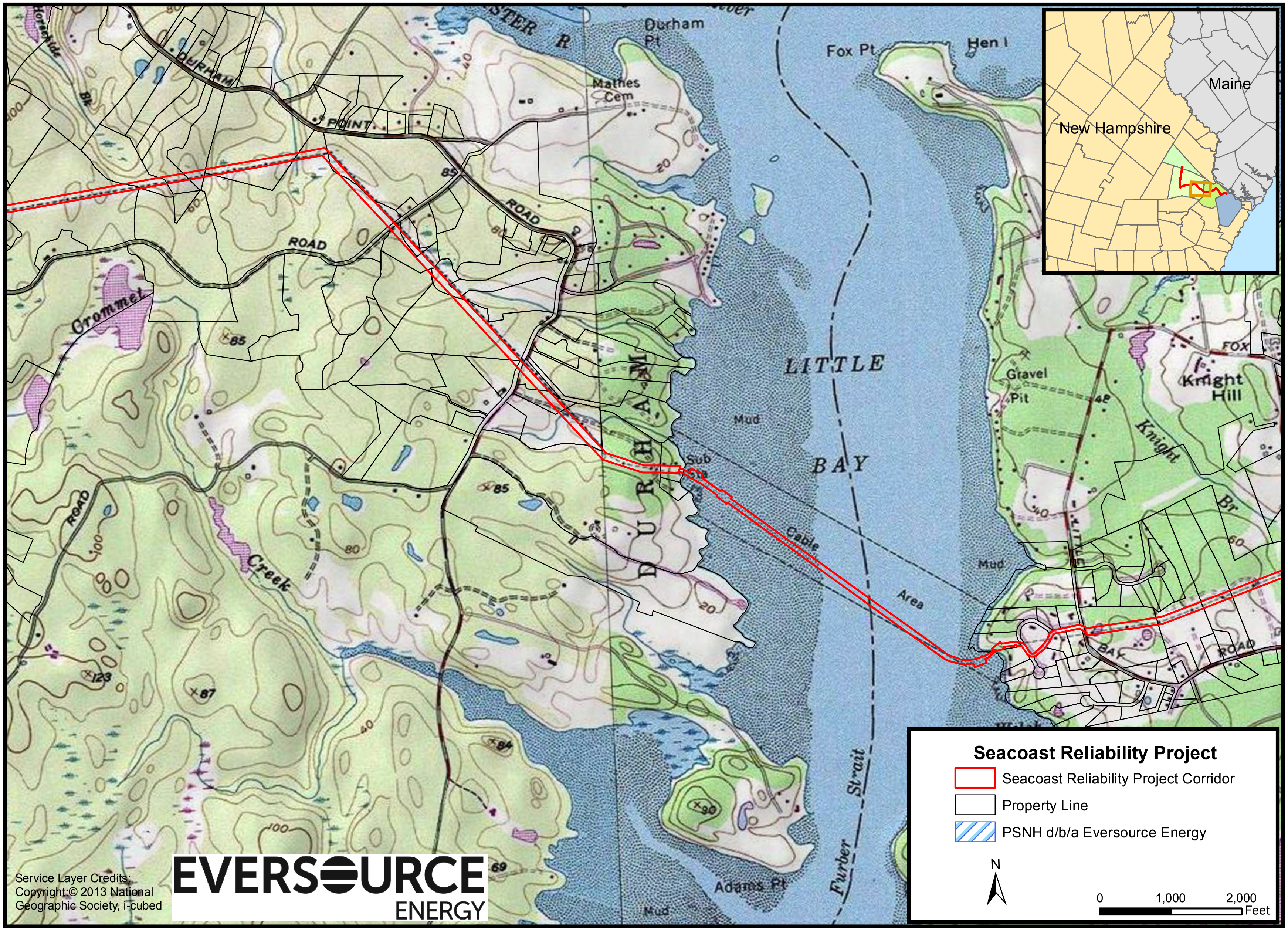
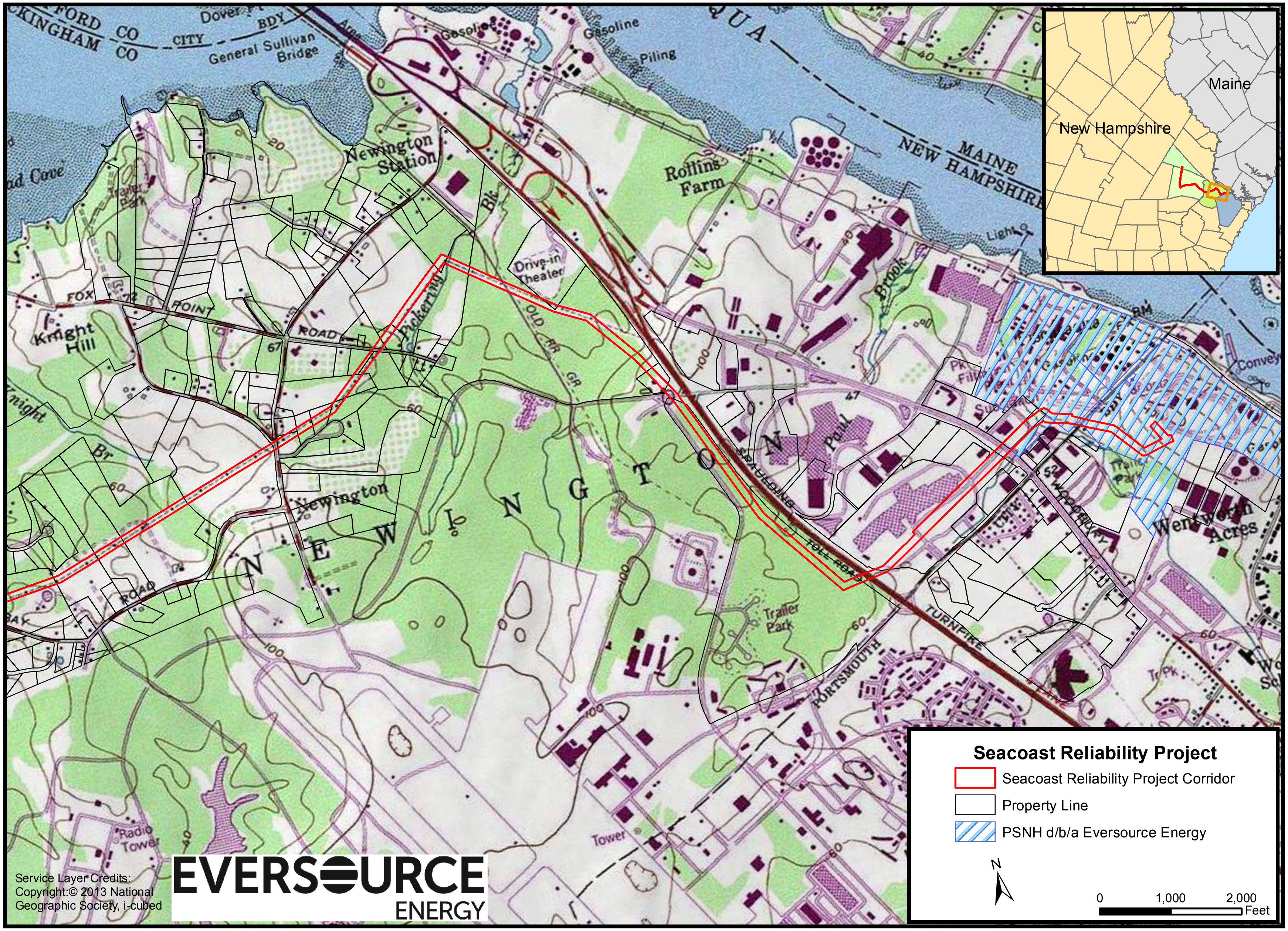


Service Layer Credits:
Copyright:© 2013 National
Geographic Society, i-cubed

EVERSOURCE ENERGY

Document Path J:\Projects\PSNH_F107\MXD\PS_107_Wetland_Permit_010816.mxd



Document Path J:\Projects\PSNH_F107\MXD\PS_107_Wetland_Permit_010816.mxd

12 Photographs (Env-Wt 501.02(a)(3) & 505.01(i))

Dated, labeled color photographs of the resources where impacts are proposed are included below.


Wetland MW1: View northwest


Wetland MW2: View west

Wetland DNW2: View northeast (F#14)

Wetland DW2: View northeast (F#5)

Wetland DW4: View southeast (F#15) along road

Wetland DW5: View east

Wetland DW6: View north (F#3)

Wetland DW7: View north


Wetland DW9: View north


Wetland DW10: View northwest (F#3)


Wetland DW12: View northeast (F#7)


Wetland DW13: View north


Wetland DW14: View west (F#24)


Wetland DW16: View northwest (F#1)


Wetland DW17: View east


Wetland DW18: View east (F#5)


Wetland DW20: View southeast (F#10)


Wetland DW21: View north


Wetland DW22: View northwest (F#2)


Wetland DW24: View north (F#7)


Wetland DW25: (F#6)


Wetland DW26: View south (F#3)


Wetland DW27: (F#4)


Wetland DW28: View east (F#1)


Wetland DW29: (F#12)


Wetland DW30: View northwest (F#9)


Wetland DW31: (F#18)


Wetland DW33: (F#9)


Wetland DW36: View north


Wetland DW37: (F#12)


Wetland DW38: View southwest


Wetland DW40: View west


Wetland DW41: (F#5X)


Wetland DW44: View north


Wetland DW45: (F#13)


Wetland DW47: (F#17)


Wetland DW48: View east


Wetland DW49: (F#5)


Wetland DW50: View north


Wetland DW52: View east


Wetland DW54: View north


Wetland DW56: View south


Wetland DW58: View east

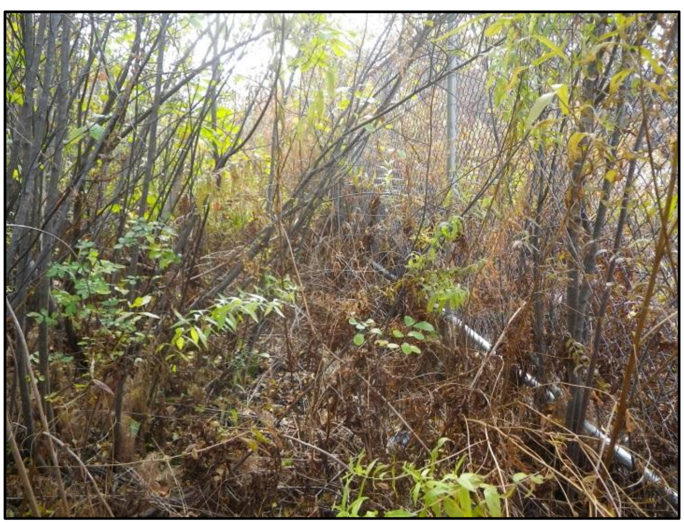

Wetland DW65: (F#10)


Wetland DW67: (F#4)


Wetland DW69: (F#5)


Wetland DW74: View east


Wetland DW76: View northeast


Wetland DW77: View west


Wetland DW79: View north


Wetland DW80: View south


Wetland DW91: View west


Wetland DW93: View west


Wetland DW94: View southwest


Wetland DW100: View east (F#3)


Wetland DW101: View west (F#5)

Wetland DW105: View west


Stream DS8: View upstream (F#1)
[Mat Bridge – No Impacts]


Stream DS32: View downstream (F#7)
[Mat Bridge – No Impacts]


Stream DS34: View downstream (F#1)
[Mat Bridge – No Impacts]


Stream DS35: (F#2) (Beaudette Brook)
[Mat Bridge – No Impacts]


Stream DS39: (F#5open)
[Mat Bridge – No Impacts]


Stream DS46: View north (LaRoche Brook)
[Mat Bridge – No Impacts]

Stream DS51: (F#1)
[Temporary Culvert]

Stream DS60: View west (LaRoche Brook)
[Mat Bridge – No Impacts]

Stream DS61: (F#1)
[Mat Bridge – No Impacts]

Stream DS74: View west (College Brook)
[Diversion, Trench & Mat Bridge]

Stream DS92: View west
[Mat Bridge – No Impacts]


Wetland DNW2: View west


Wetland NW1: View south


Wetland NW3: View west


Wetland NW4: View south (F#10)


Wetland NW6: View southwest (F#16)


Wetland NW9: View southwest


Wetland NW10: View south (F#8)


Wetland NW11: View west


Wetland NW12: View west (F#13)


Wetland NW13: View southeast


Wetland NW16: View west (F#14)


Wetland NW17: View west


Wetland NW18: View west (F#1)


Wetland NW19: View northwest


Wetland NW21: View southeast


Wetland NW22: View west (F#8)


Wetland NW24: View east (F#3)


Wetland NW26: View west (F#12)


Wetland NW28: View east (F#3)


Wetland NW30: View southwest (F#11)


Wetland NW32: View east (F#2)


Wetland NW34: View south (F#1)


Wetland NW35: View west (F#21)


Wetland NW37: View across wetland (F#3Y)


Wetland NW42: View west (F#5)


Wetland NW43: View south (F#9)


Wetland NW45: View north


Stream NS8: View upstream (F#2)
[Mat Bridge – No Impacts]


Stream NS14: View downstream (F#5)
[Mat Bridge – No Impacts]


Stream NS36: Ephemeral Stream/Ditch
[Temporary Culvert]


Stream NS50: View upstream (F#3)
[Mat Bridge – No Impacts]

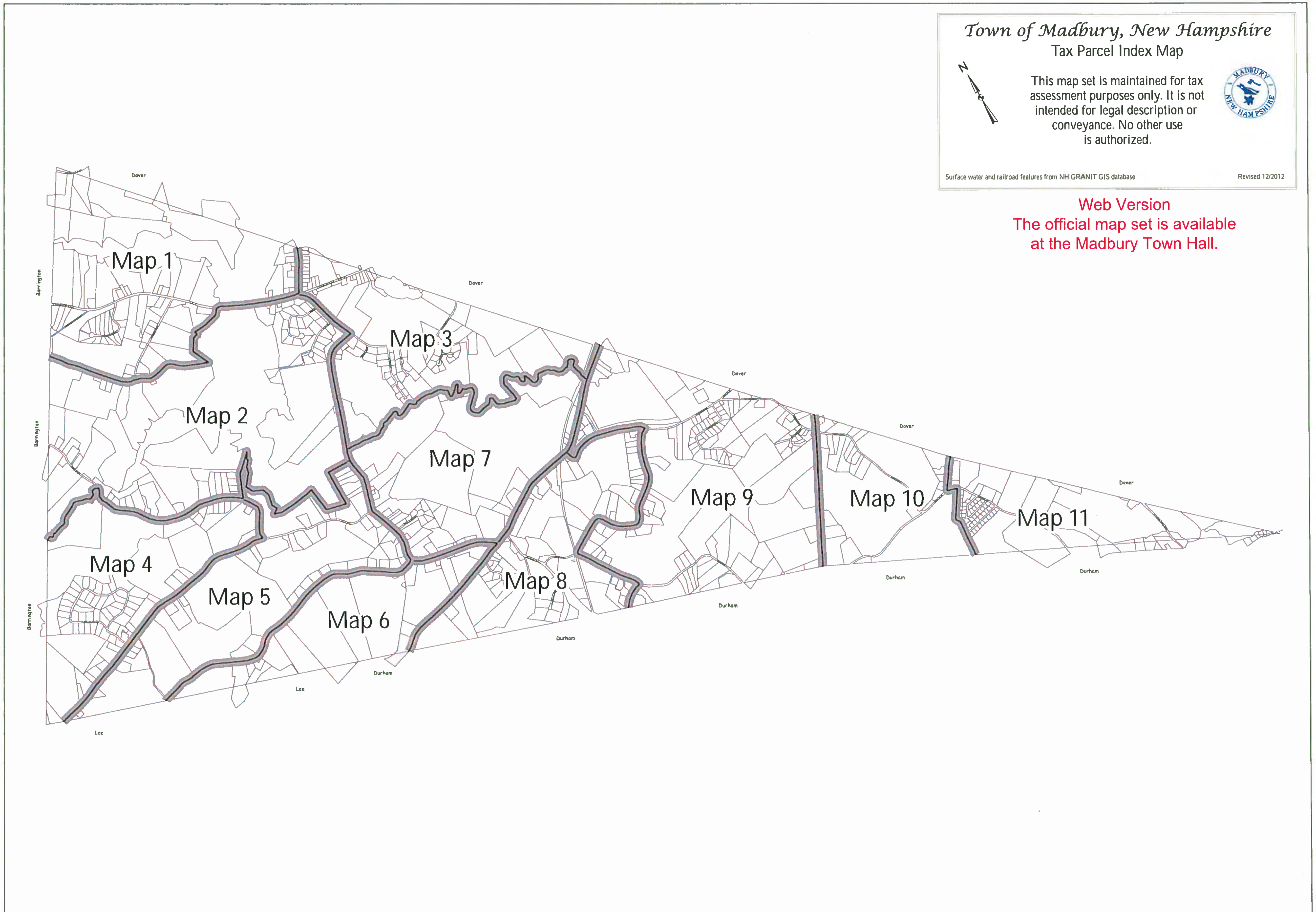

Stream NS107: View downstream (North)
[Mat Bridge – No Impacts]

Wetland PW2: View north (F#13)

Wetland PW5: View south (F#7)

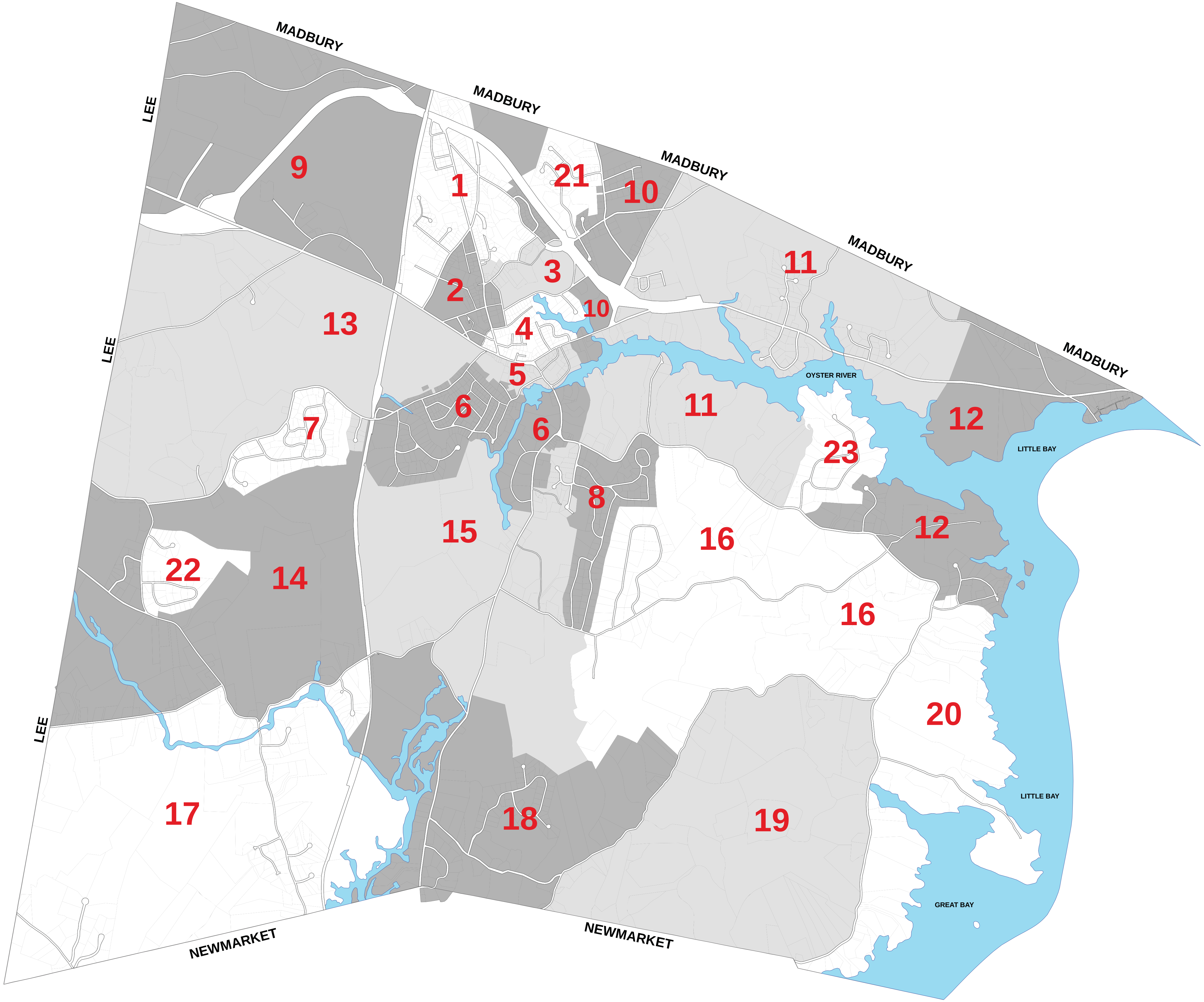
13 Tax Maps (Env-Wt 501.02(a)(1)& 505.01(e))

Tax maps for Project area are included below. Parcels are also included on the detailed environmental plans included below in Section 16.

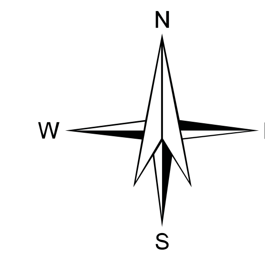


Town of Madbury, New Hampshire
Tax Parcel Index Map
N
This map set is maintained for tax assessment purposes only. It is not intended for legal description or conveyance. No other use is authorized.
Surface water and railroad features from NH GRANIT GIS database
Revised 12/2012
Web Version
The official map set is available at the Madbury Town Hall.
Map 1
Map 2
Map 3
Map 4
Map 5
Map 6
Map 7
Map 8
Map 9
Map 10
Map 11
Dover
Dover
Dover
Dover
Dover
Barrington
Barrington
Barrington
Durham
Durham
Durham
Durham
Durham
Lee
Lee


Town of Madbury, New Hampshire
Tax Parcel Map 8
N
14:C
Tax Parcel [lot:sublot]
Adjacent Map tax parcels
0
500
1,000
2,000 Feet
Surface water and railroad features from NH GRANIT GIS database.
Revised 12/2012
Web Version
The official map set is available
at the Madbury Town Hall.
Durham
Durham
Pudding Hill Road
Kelley Road
Knox Marsh Road
Evans Road
Miles Lane
Madbury Road
Perkins Road
Perkins Rd
S.R. 155
Town Hall Road
Madbury Woods
Lee Road
Sarah Paul Hill Rd



COMPOSITE MAP



Grid North
NH State Plane
NAD 1983 (Feet)

0 1,000 2,000 4,000 6,000 8,000 Feet

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

Mapsheet

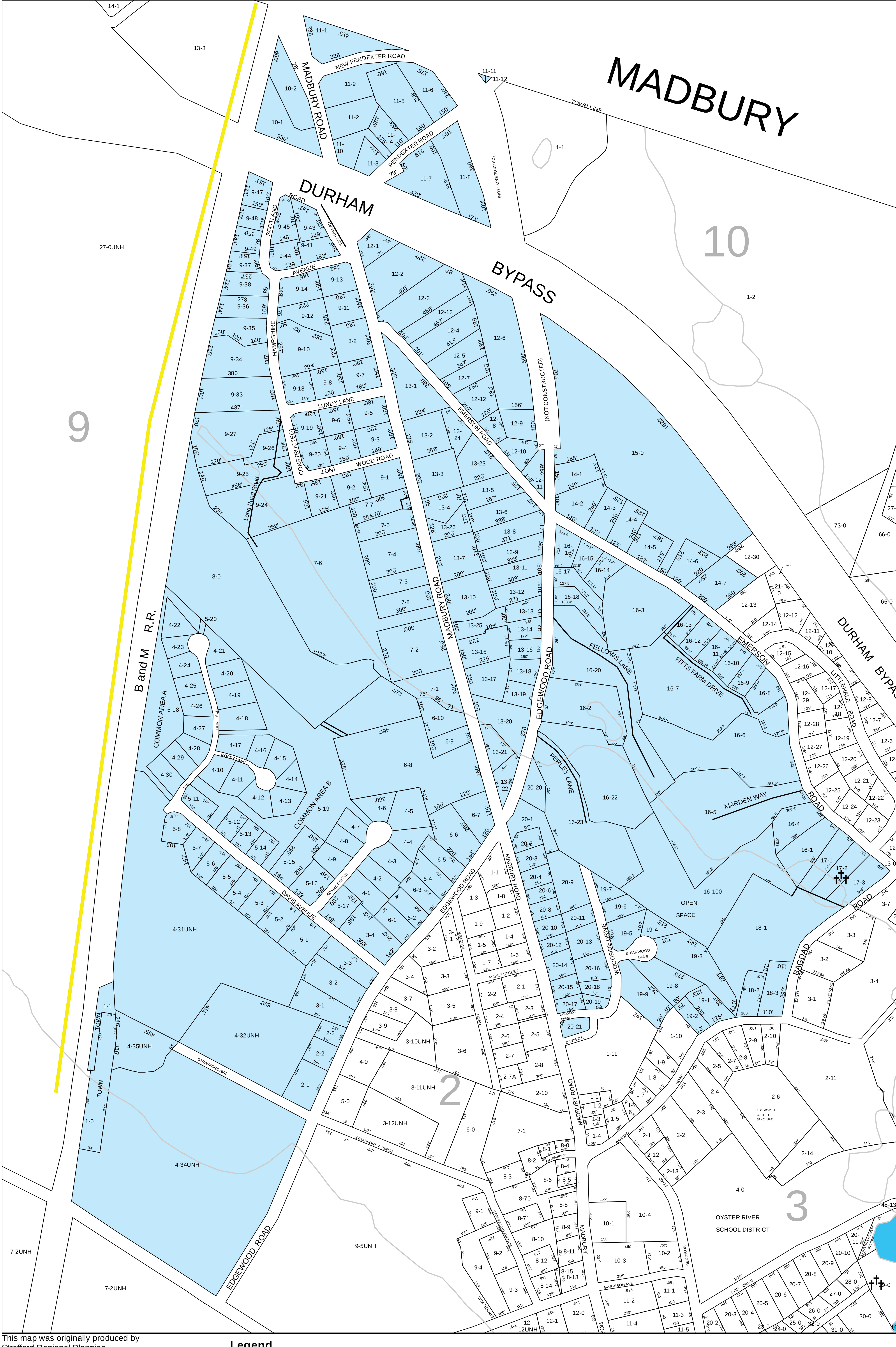
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23

DESCRIPTION

This is an updated property map of the Town of Durham, NH. The map was produced by digitizing parcel changes from printouts of existing tax maps at nominal mapscale. Corresponding updates were made to the lot annotation layer.

Originally, this map was produced by Strafford Regional Planning Commission in October 2004, but, has been modified for web deployment by the Department of Public Works.

THIS MAP IS FOR ASSESSMENT PURPOSES.
IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.



This map was originally produced by Strafford Regional Planning Commission in October 2004, and was updated by the Town of Durham in February 2013.
THIS MAP IS FOR ASSESSMENT PURPOSES. IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.

Legend

- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

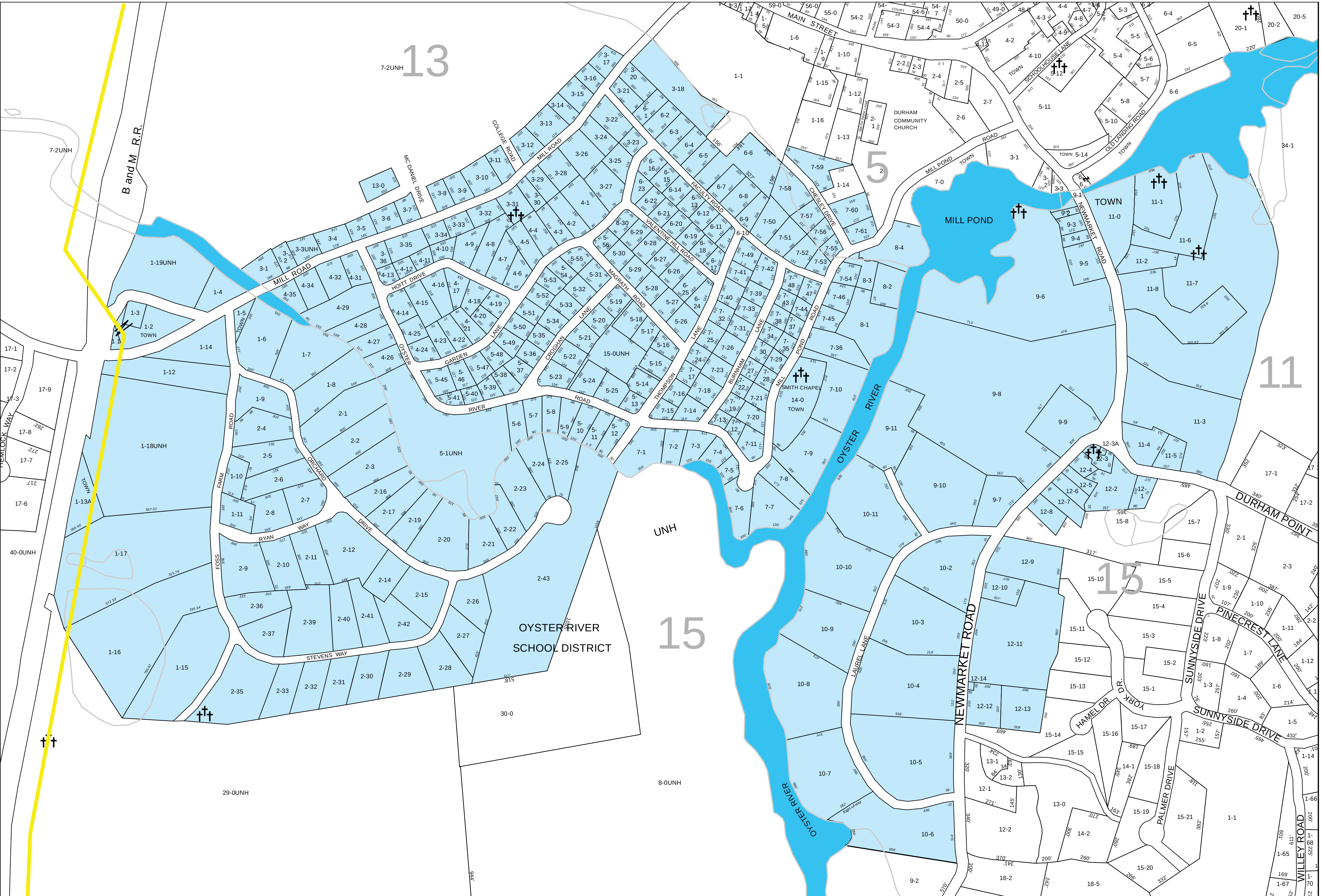
PROPERTY MAP

DURHAM

NEW HAMPSHIRE

1 inch = 435 feet

Map 1



Map 6

N

PROPERTY MAP

DURHAM

NEW HAMPSHIRE

Legend

Adjacent Map Sheets

Current Map Sheet

Cemetery

1 inch = 500 feet

This map was originally produced by Strafford Regional Planning Commission in October 2004, and was updated by the Town of Durham in March 2014.

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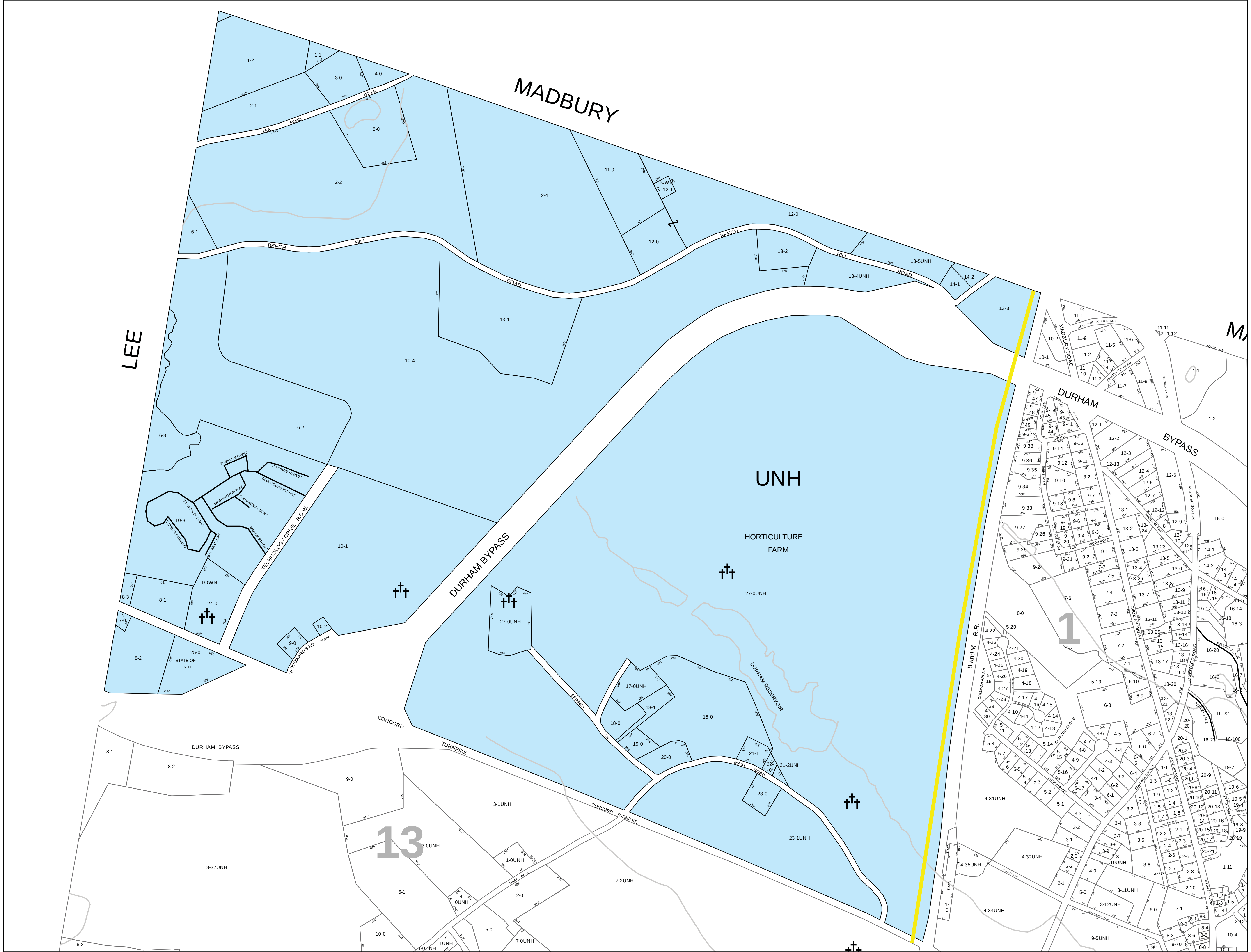

Map 9

N

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

Legend

Adjacent Map Sheets

Current Map Sheet

Cemetery

1 inch = 840 feet

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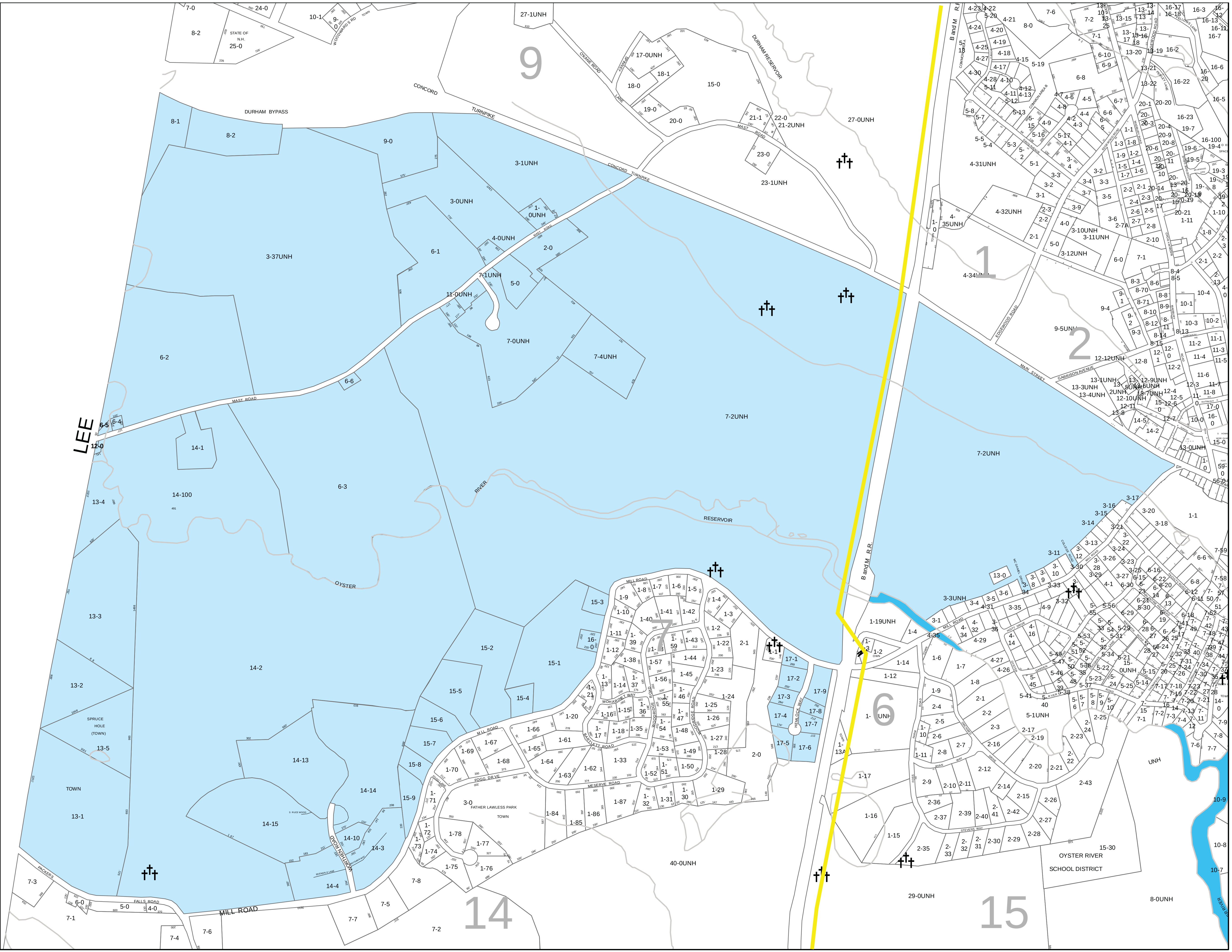

Map 13

N

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

Legend

- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

1 inch = 935 feet

This map was originally produced by Strafford Regional Planning Commission in October 2004 and updated by the Town of Durham in January 2014.

THIS MAP IS FOR ASSESSMENT PURPOSES ONLY.
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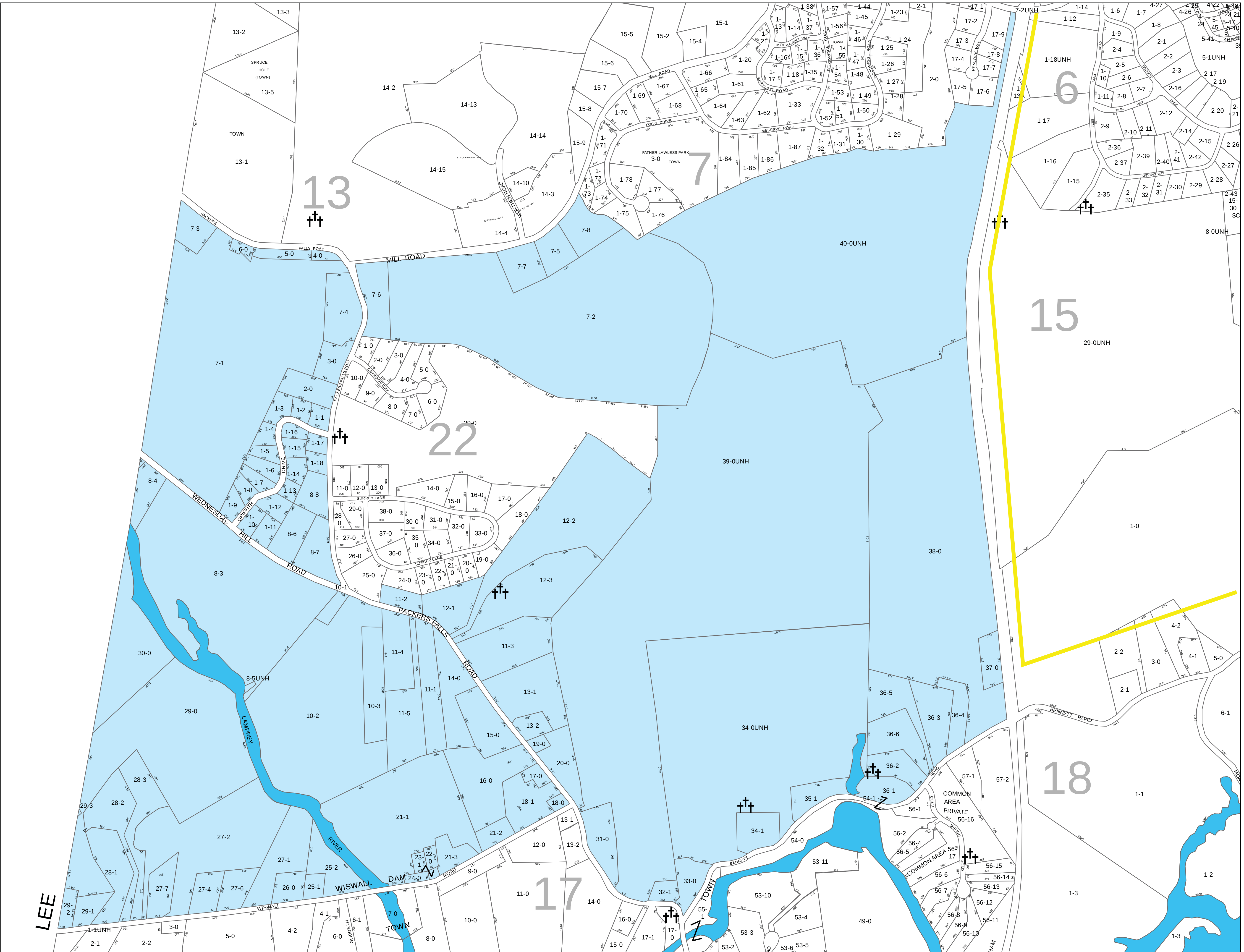


Map 14

N

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

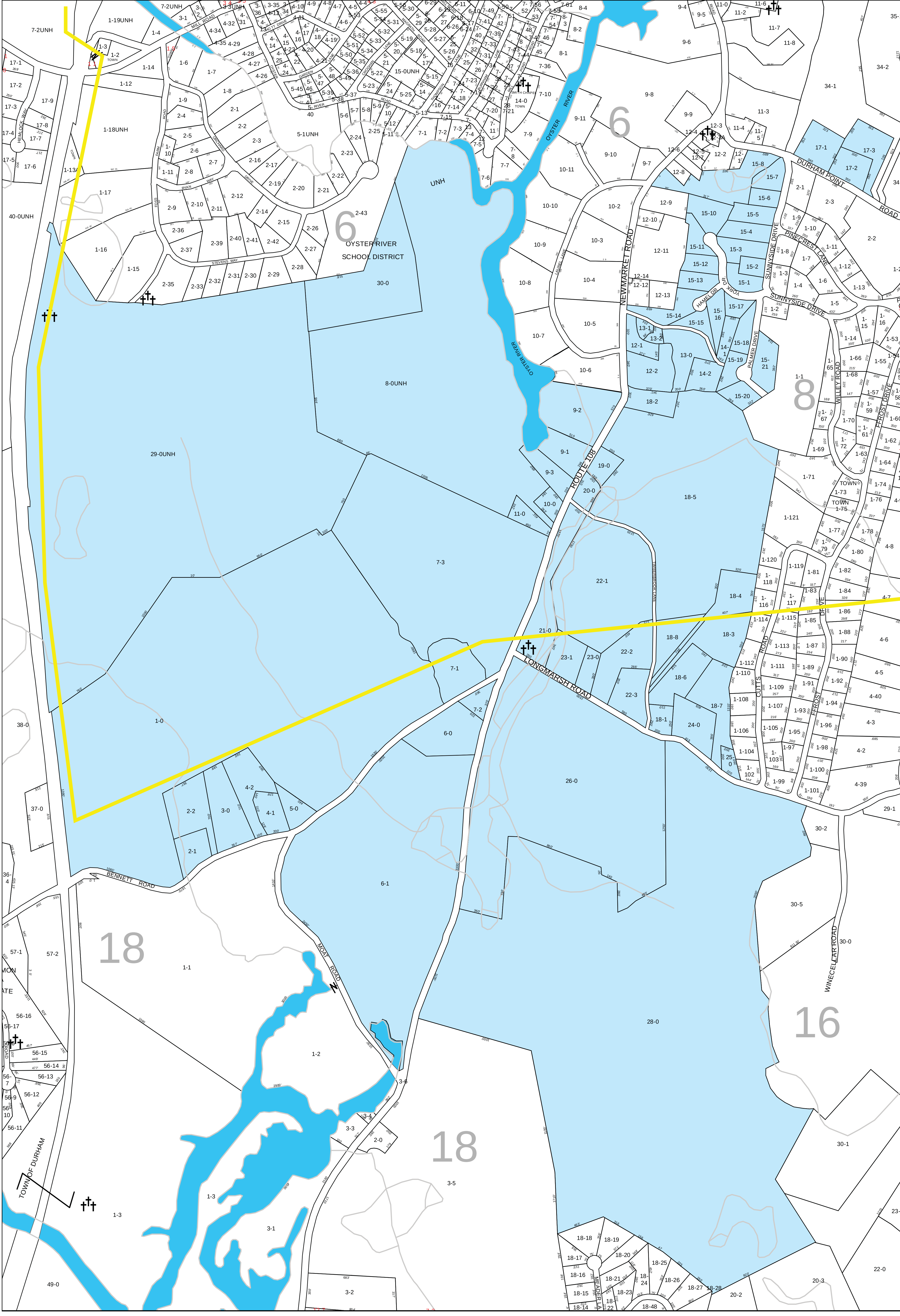
Legend

- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

1 inch = 935 feet

This map was originally produced by Strafford Regional Planning Commission in October 2004 and updated by the Town of Durham in February 2014.

THIS MAP IS FOR ASSESSMENT PURPOSES ONLY.
IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.



This map was originally produced by Strafford Regional Planning Commission in October 2004, and was updated by the Town of Durham in February 2014.

THIS MAP IS FOR ASSESSMENT PURPOSES. IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.

Legend

- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

N

Map 15

1 inch = 757 feet

Map 8

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

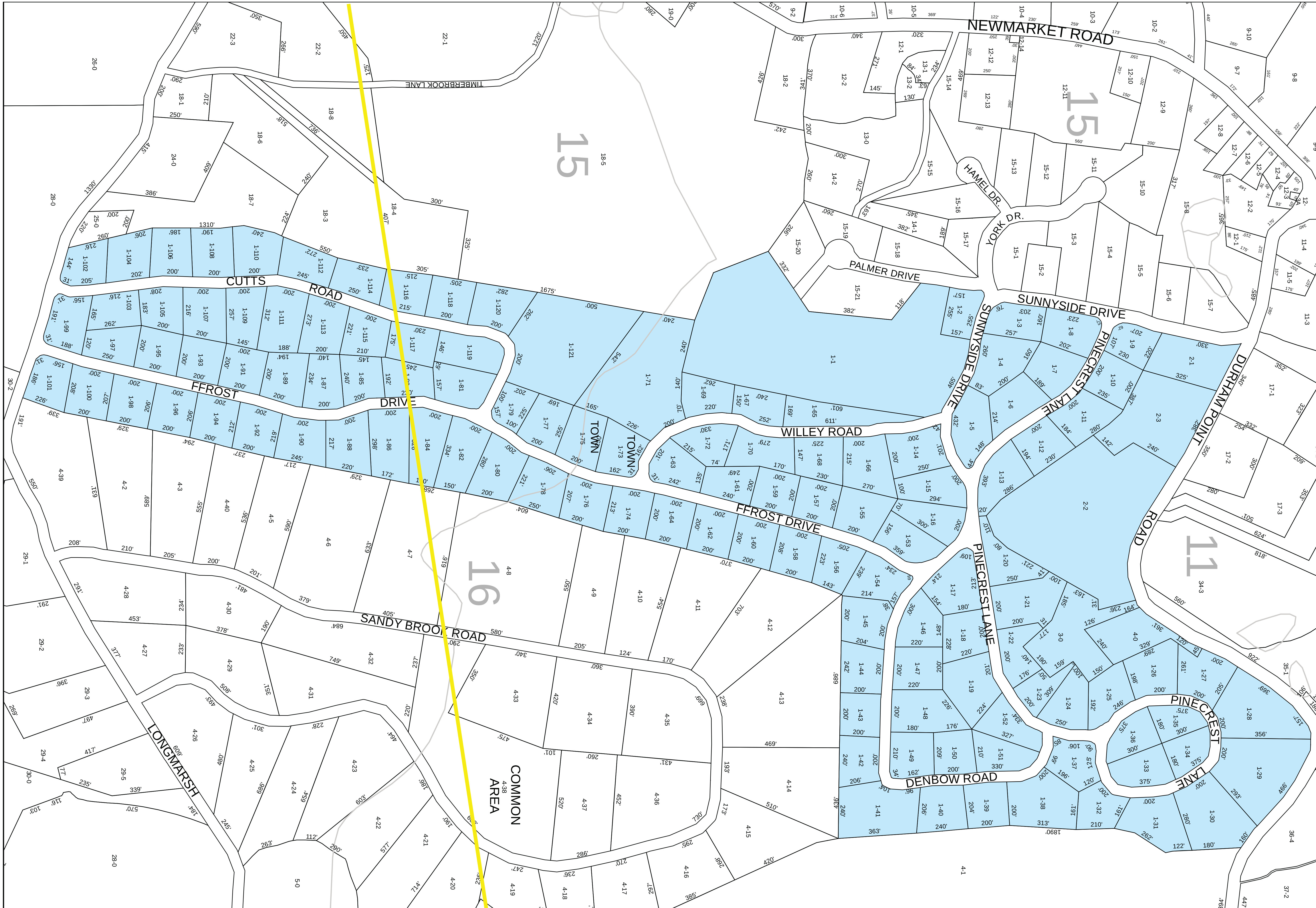
1 inch equals 410 feet

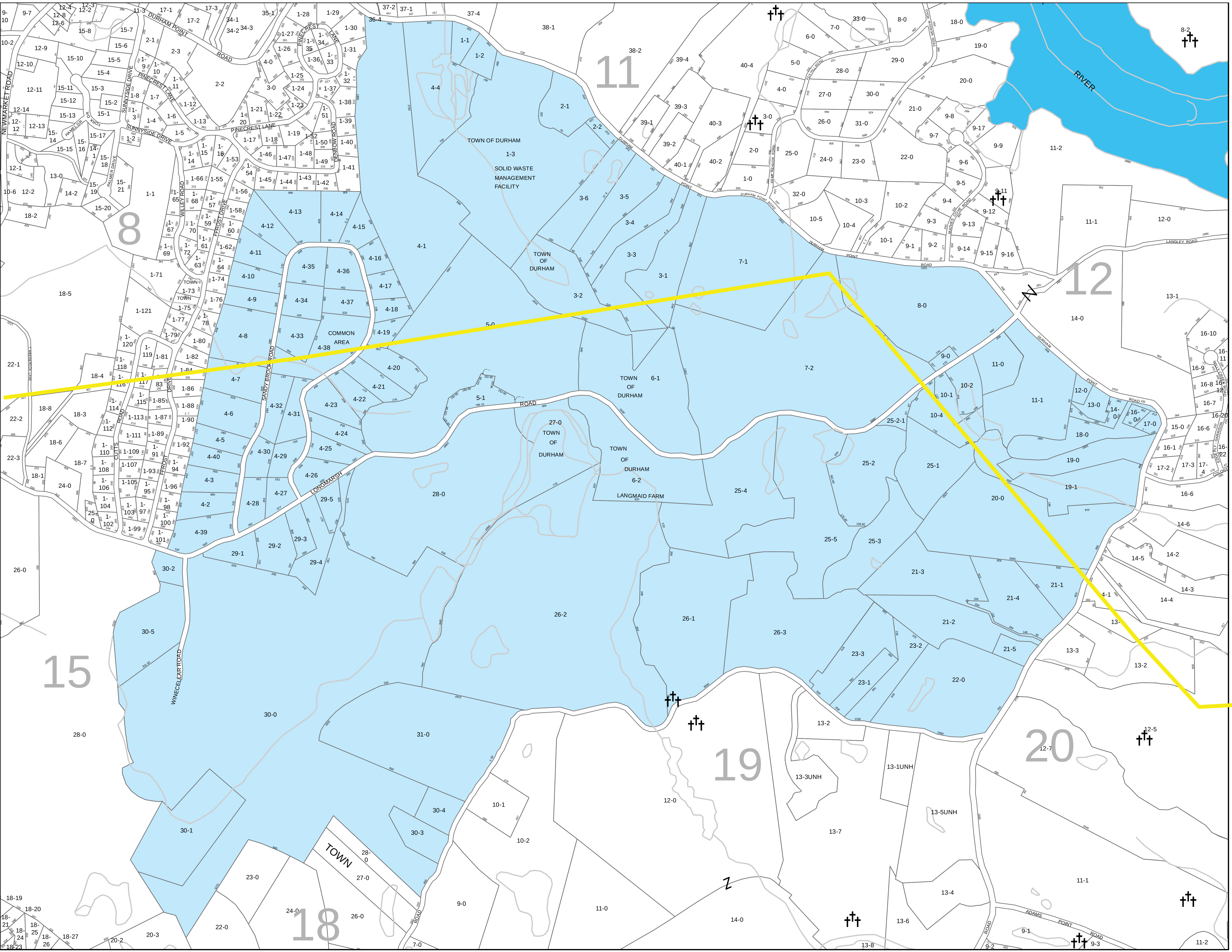
This map was originally produced by Strafford Regional Planning Commission in October 2004, and was updated by the Town of Durham in June 2007.

THIS MAP IS FOR ASSESSMENT PURPOSES. IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.

Legend

- Adjacent Map Sheets
- Current Map Sheet





Map 16

N

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

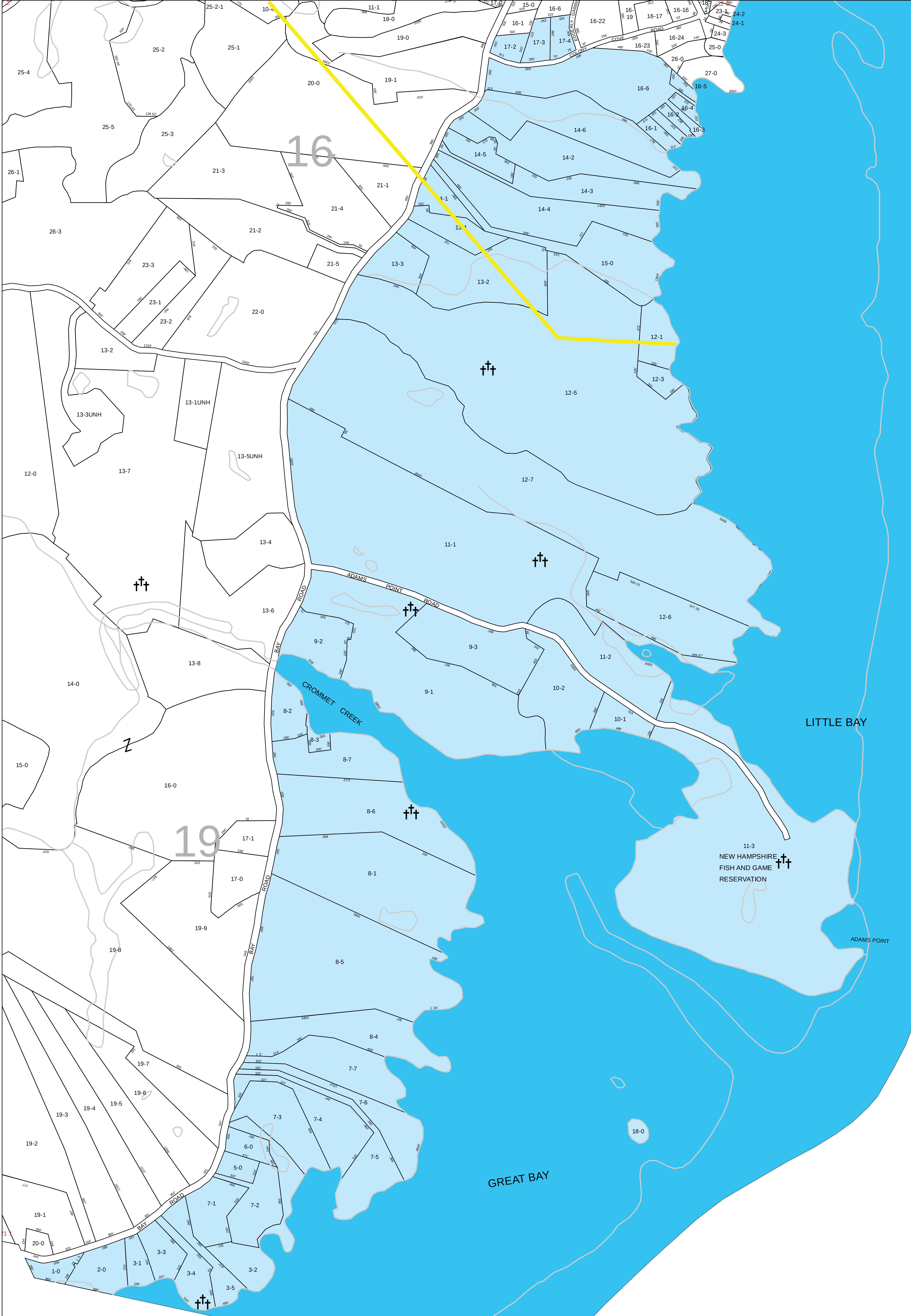
Legend

- Adjacent Map Sheets
- Current Map Sheet

1 inch = 975 feet

This map was originally produced by Strafford Regional Planning Commission in October 2004 and updated by the Town of Durham in February 2013.

THIS MAP IS FOR ASSESSMENT PURPOSES ONLY.
IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.



This map was originally produced by Strafford Regional Planning Commission in October 2004, and was updated by the Town of Durham in February 2014.

THIS MAP IS FOR ASSESSMENT PURPOSES. IT IS NOT INTENDED FOR LEGAL DESCRIPTION OR CONVEYANCE.

Legend

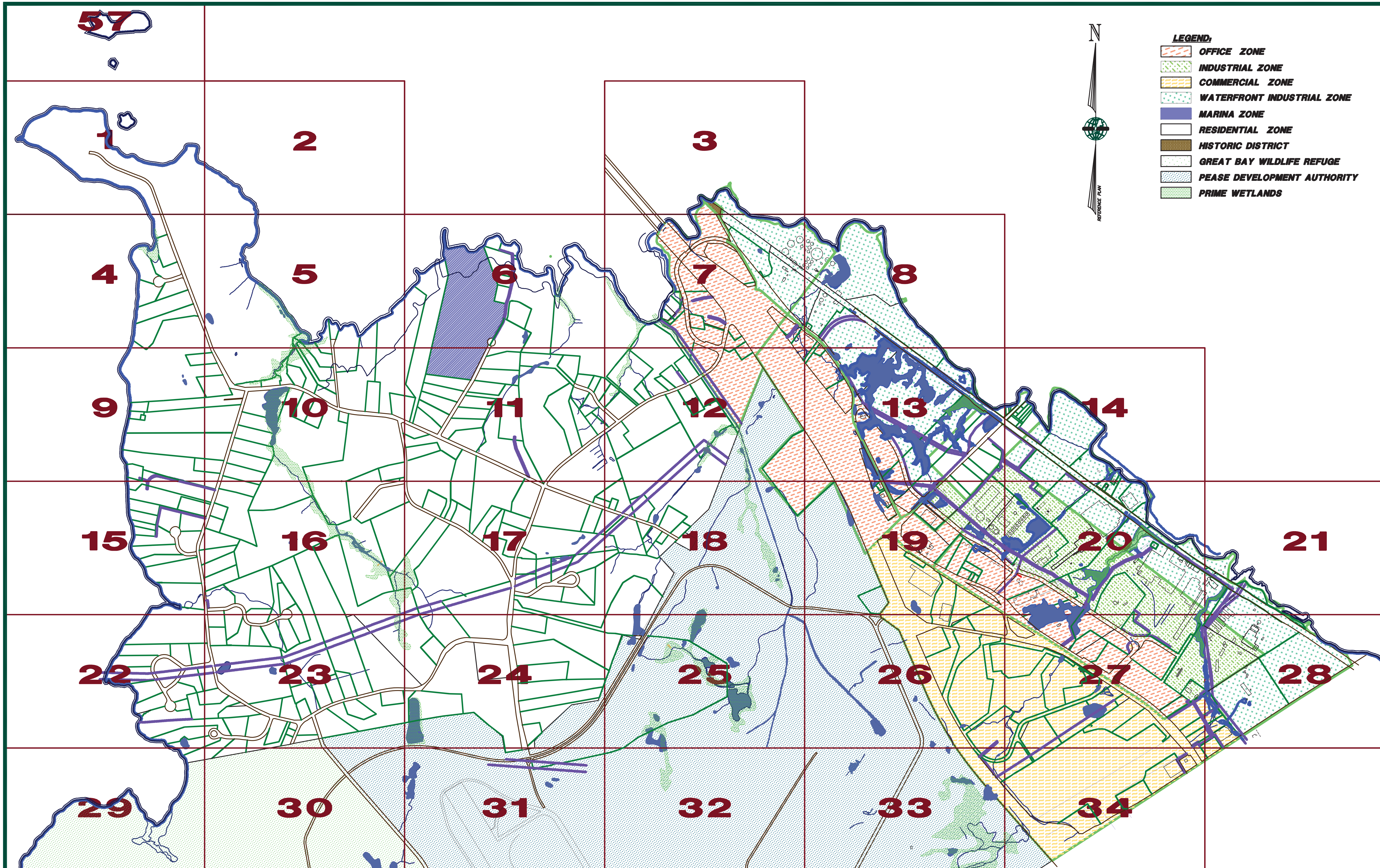
- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

PROPERTY MAP
DURHAM
NEW HAMPSHIRE

N

1 inch = 777 feet

Map 20



MERIDIAN LAND SERVICES, INC.
31 OLD NASHUA ROAD, AMHERST, N.H. 03110
TEL. 603-673-1441 FAX 603-673-1584
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

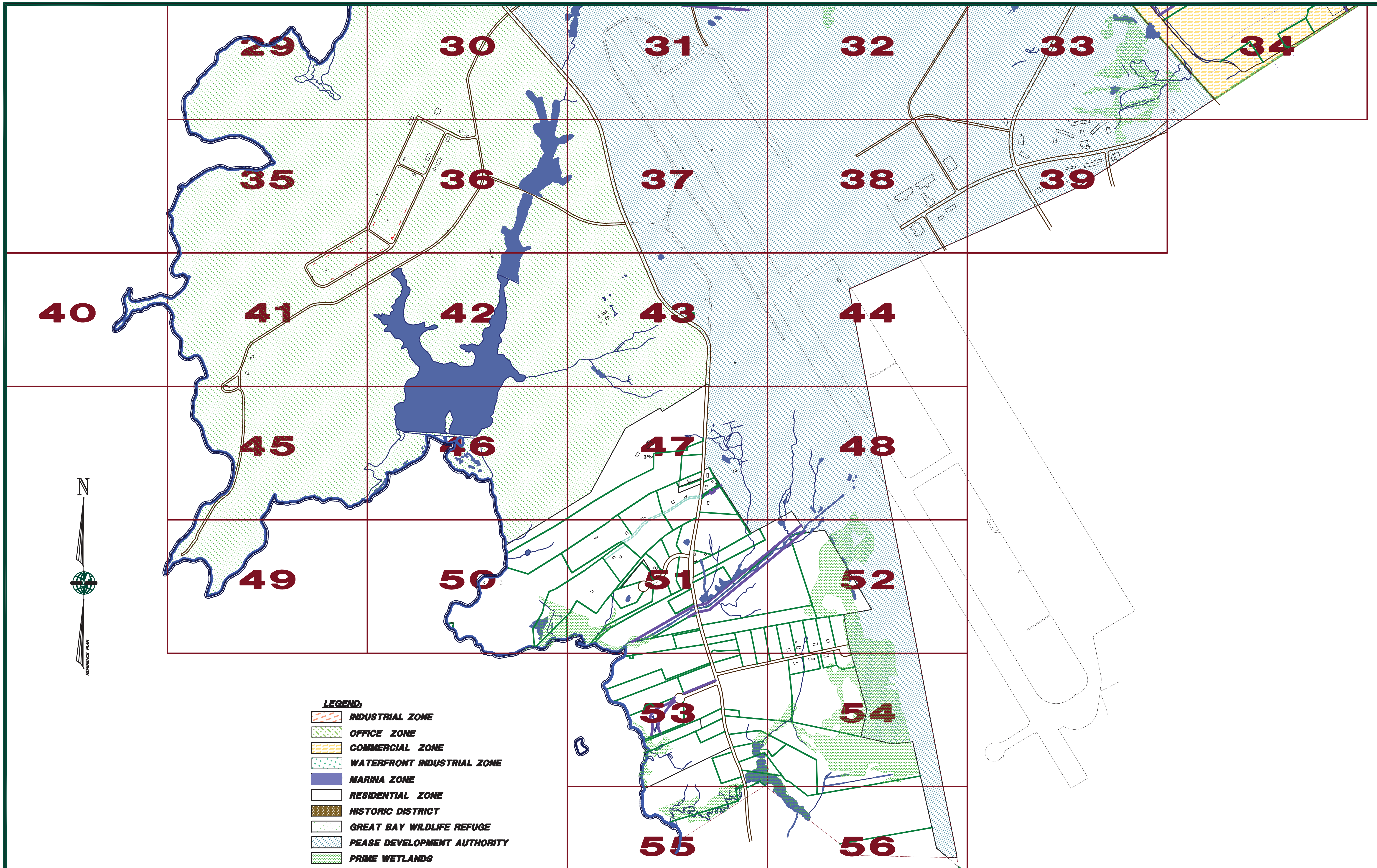
THIS DOCUMENT HAS BEEN PREPARED TO SHOW APPROXIMATE LOT LOCATION ONLY. INFORMATION SHOWN IS NOT TO BE USED FOR DEED DESCRIPTIONS.

NEWINGTON, N.H.

TAX MAP
SCALE: 1 INCH = 600 FEET
JANUARY 17, 2011
DATE OF LATEST REVISION

GRAPHIC SCALE
0 300' 600' 1200'
MLS JOB NO. 4171.00

NORTH INDEX



MERIDIAN LAND SERVICES, INC.
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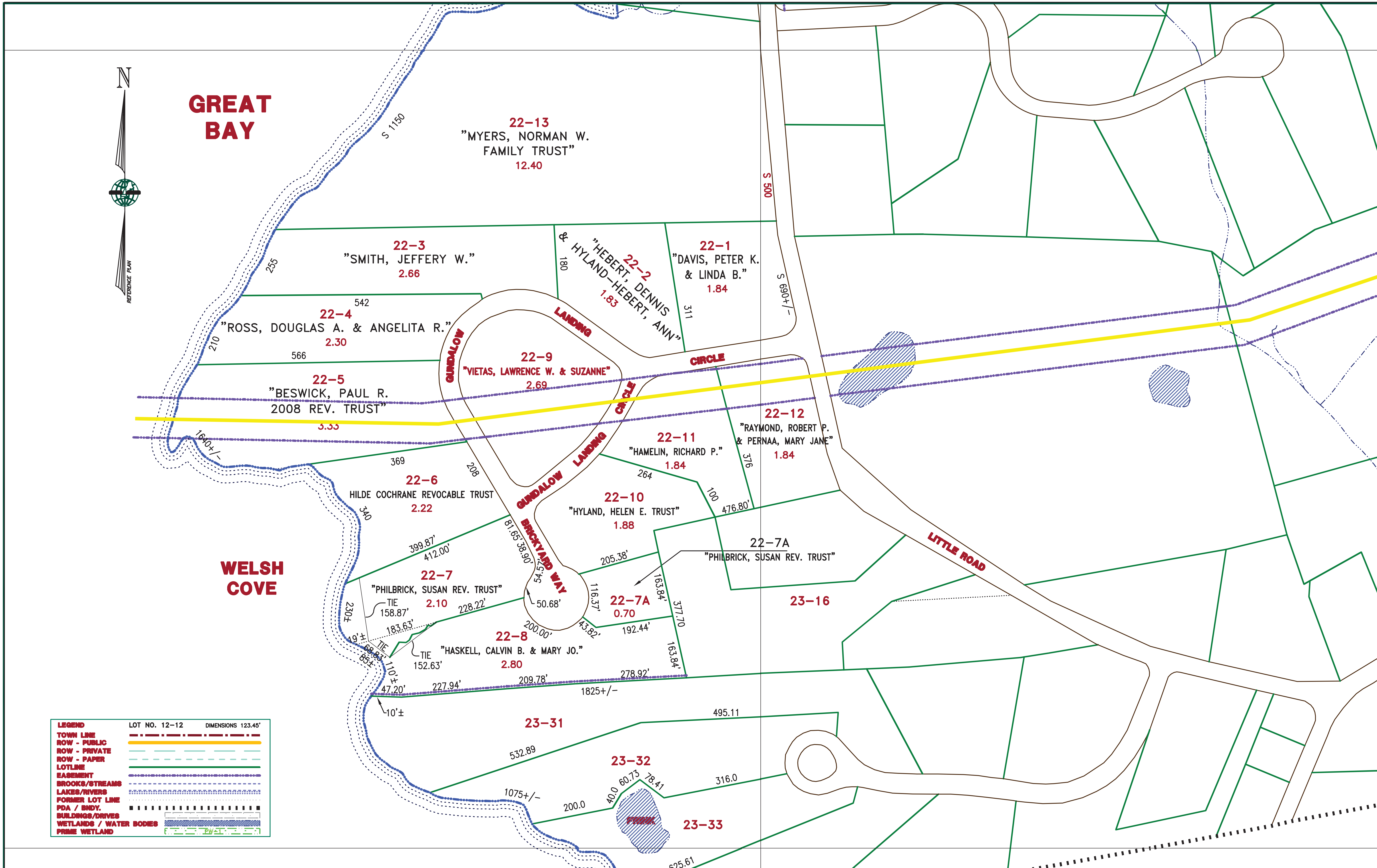
THIS DOCUMENT HAS BEEN PREPARED TO SHOW APPROXIMATE LOT LOCATION ONLY. INFORMATION SHOWN IS NOT TO BE USED FOR DEED DESCRIPTIONS.

NEWINGTON, N.H.

TAX MAP
SCALE: 1 INCH = 600 FEET
JANUARY 17, 2011
DATE OF LATEST REVISION

GRAPHIC SCALE
0 300' 600' 1200'
MLS JOB NO. 4171.00

SOUTH INDEX



MERIDIAN LAND SERVICES, INC.
31 OLD NASHUA ROAD, AMHERST, N.H. 03110
TEL. 603-673-1441 FAX 603-673-1584
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

THIS DOCUMENT HAS BEEN PREPARED TO SHOW APPROXIMATE LOT LOCATION ONLY. INFORMATION SHOWN IS NOT TO BE USED FOR DEED DESCRIPTIONS.

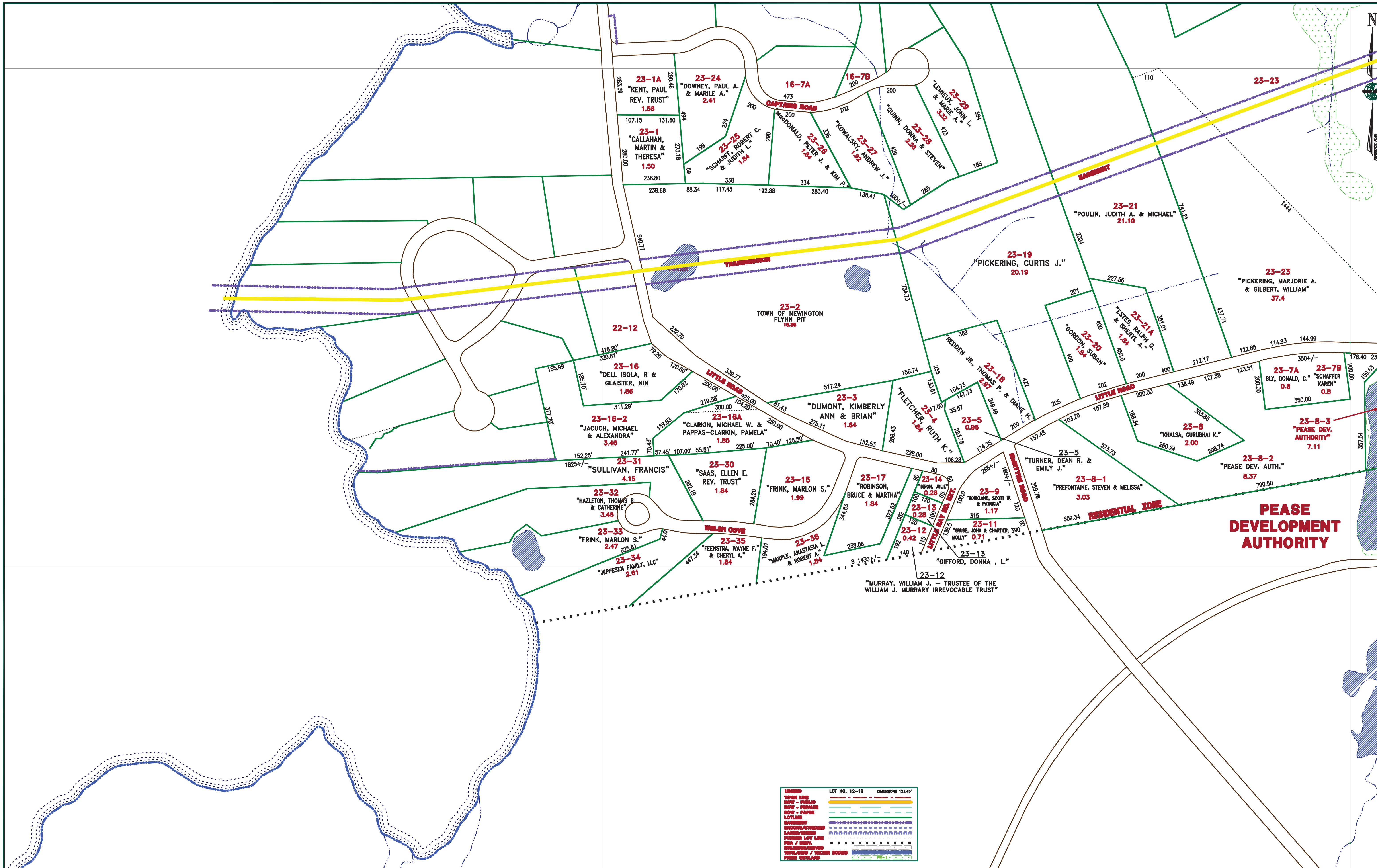
NEWINGTON, N.H.

TAX MAP SCALE
24"x36" PLOT - 1"=100'
11"x17" PLOT - 1"=220'+/-
JANUARY 17, 2011
DATE OF LATEST REVISION

GRAPHIC SCALE
0 50' 100' 200'
MLS JOB NO. 4171.00

15	16
	23
29	30

22



MERIDIAN LAND SERVICES, INC.
31 OLD NASHUA ROAD, AMHERST, N.H. 03110
TEL. 603-673-1441 FAX 603-673-1584
ENGINEERS - LAND SURVEYORS - SCIENTISTS - LAND PLANNERS

THIS DOCUMENT HAS BEEN PREPARED TO SHOW APPROXIMATE LOT LOCATION ONLY. INFORMATION SHOWN IS NOT TO BE USED FOR DEED DESCRIPTIONS.

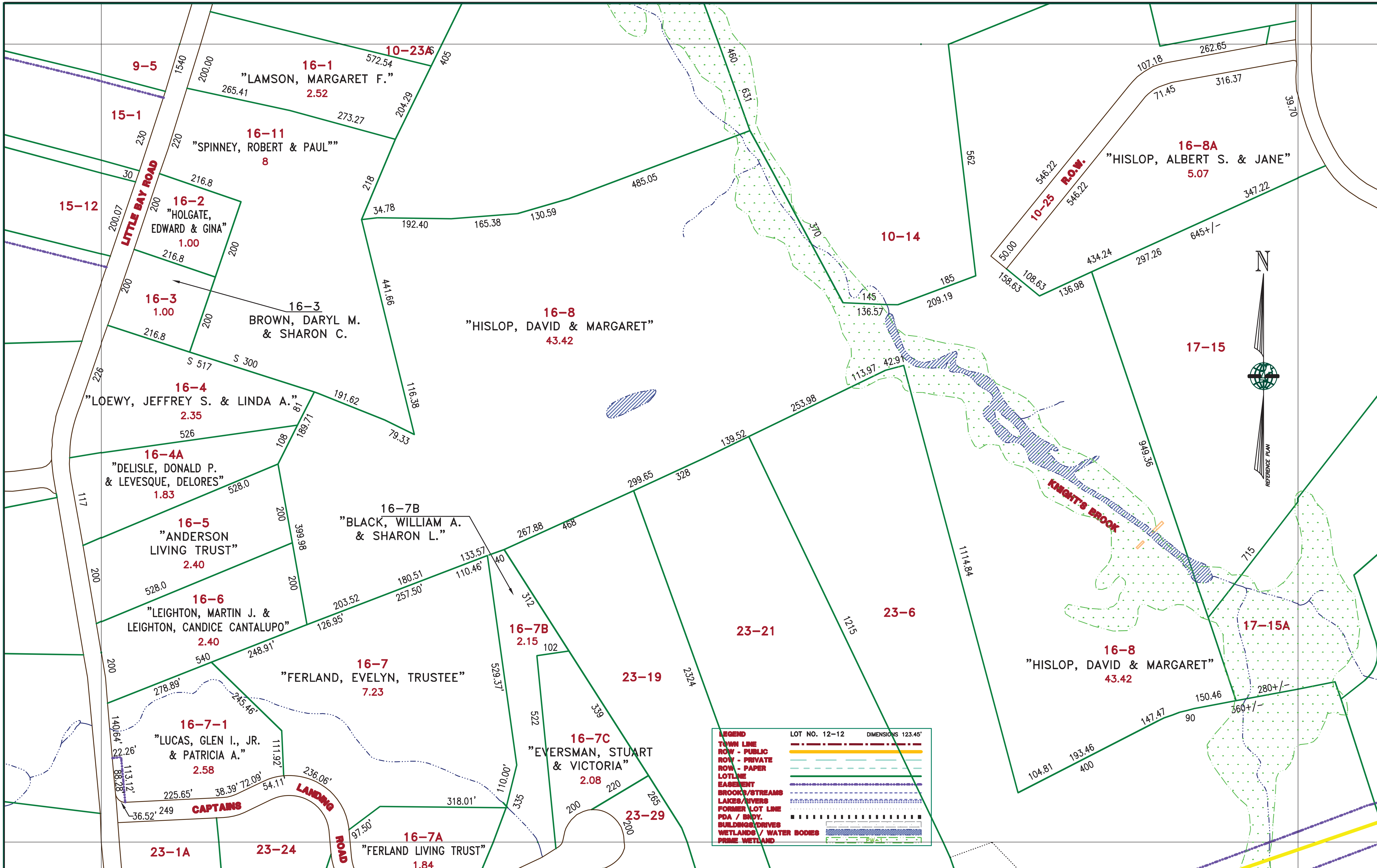
NEWINGTON, N.H.

TAX MAP SCALE
24"x36" PLOT - 1"=100'
11"x17" PLOT - 1"=220'+/-
JANUARY 17, 2011
DATE OF LATEST REVISION

GRAPHIC SCALE
0 50' 100' 200'
MLS JOB NO. 4171.00

15	16	17
22		24
29	30	31

23



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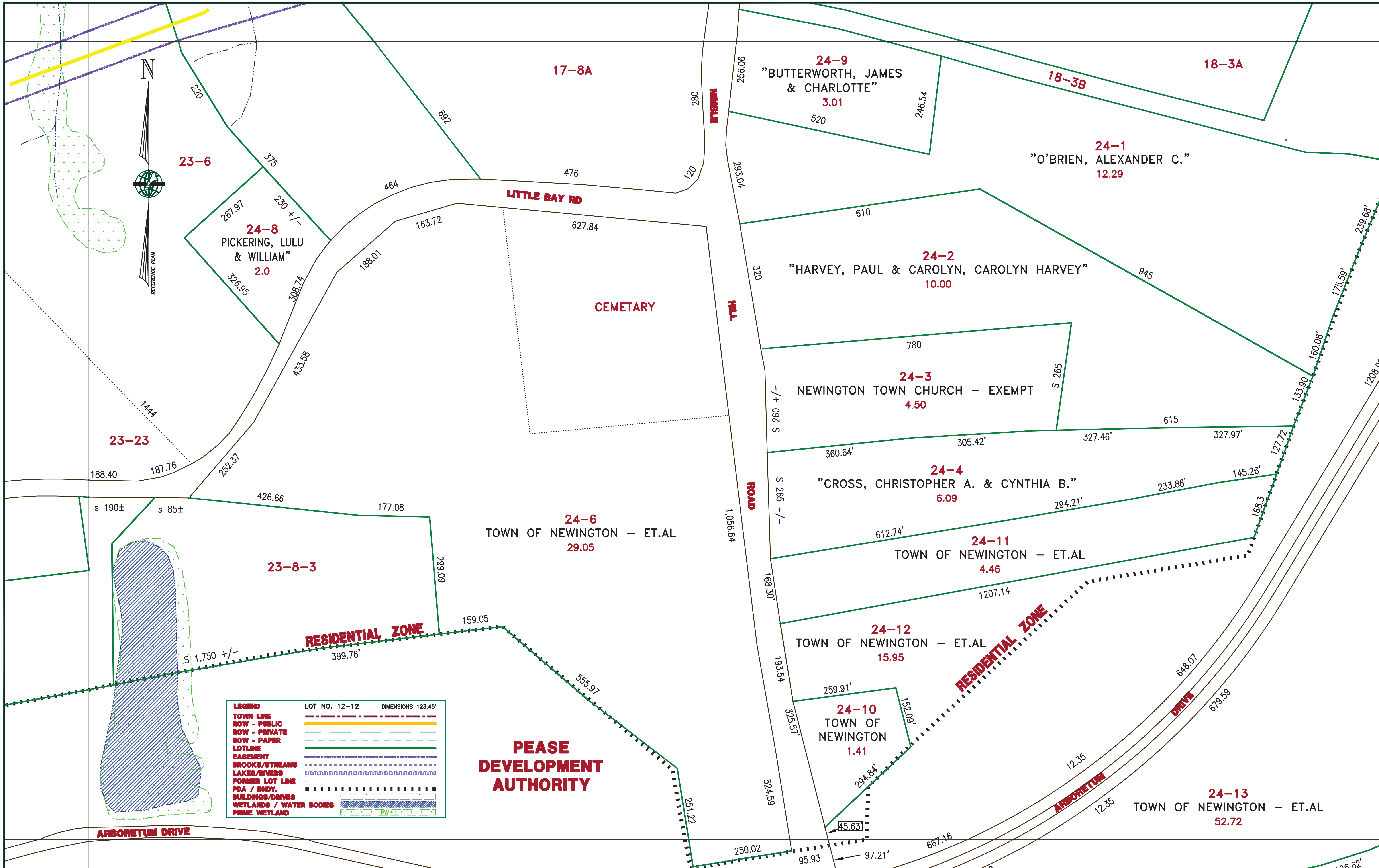
9	10	11
15		17
22	23	24

16



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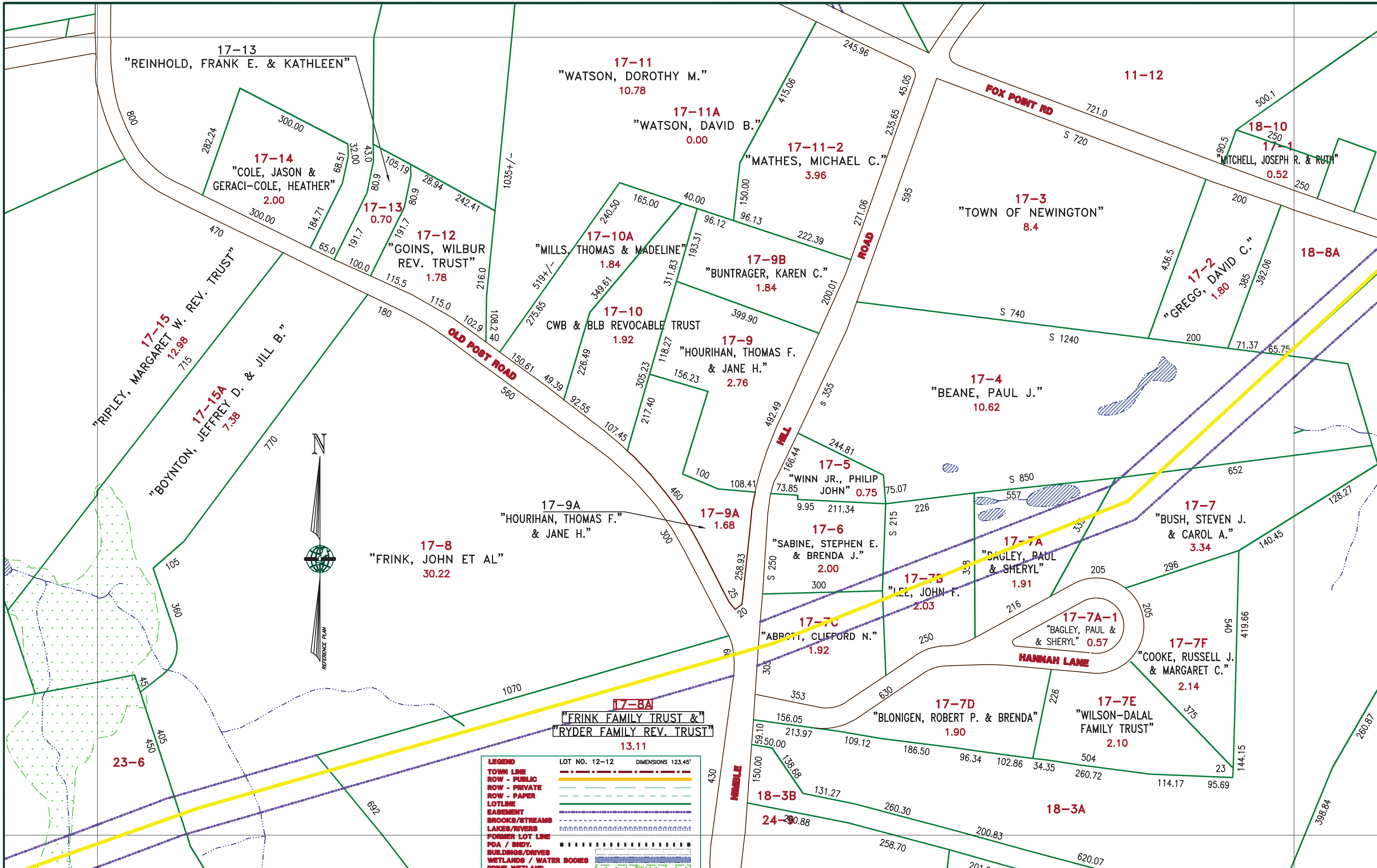
16	17	18
23		25
30	31	32

24



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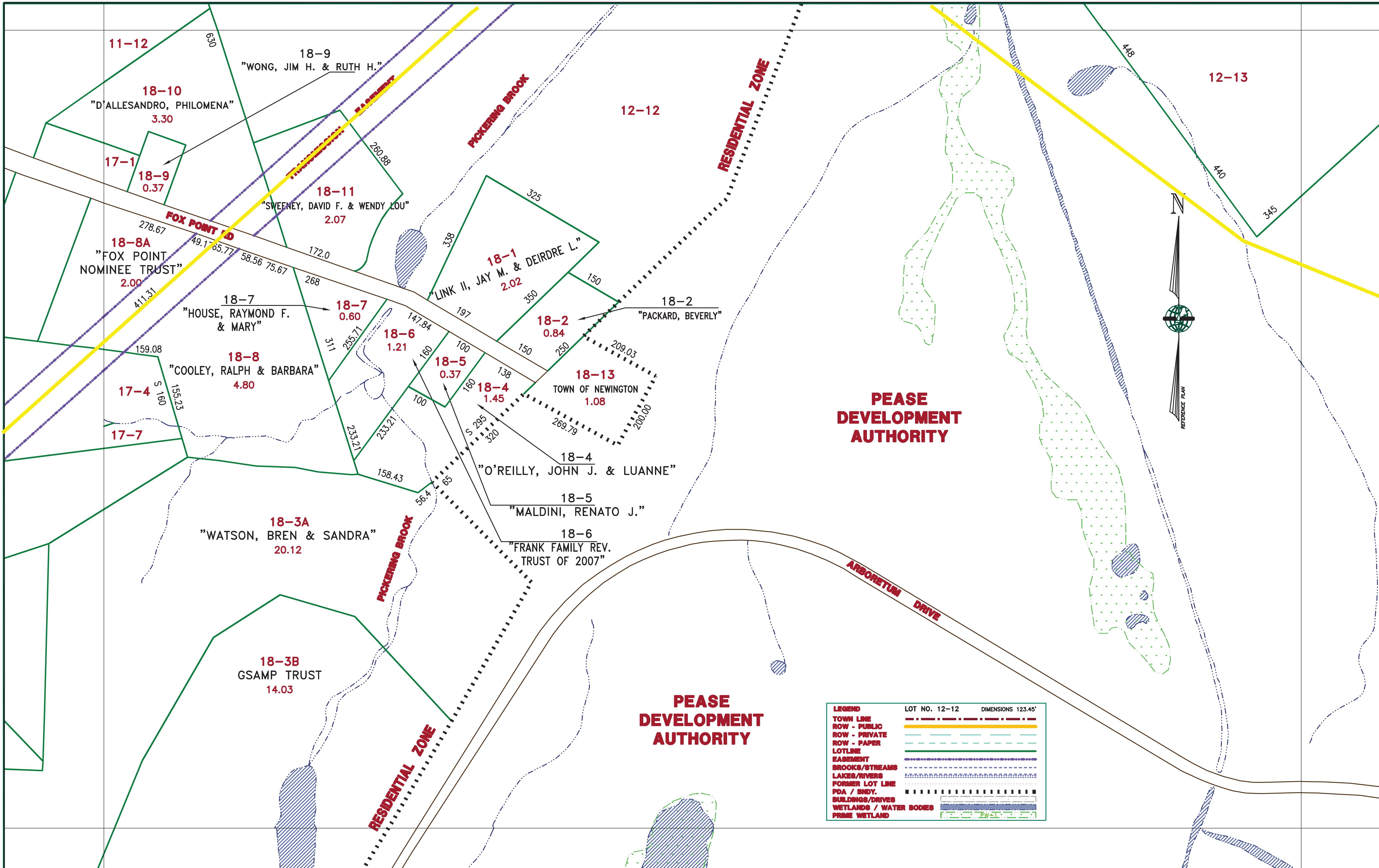
10	11	12
16		18
23	24	25

17



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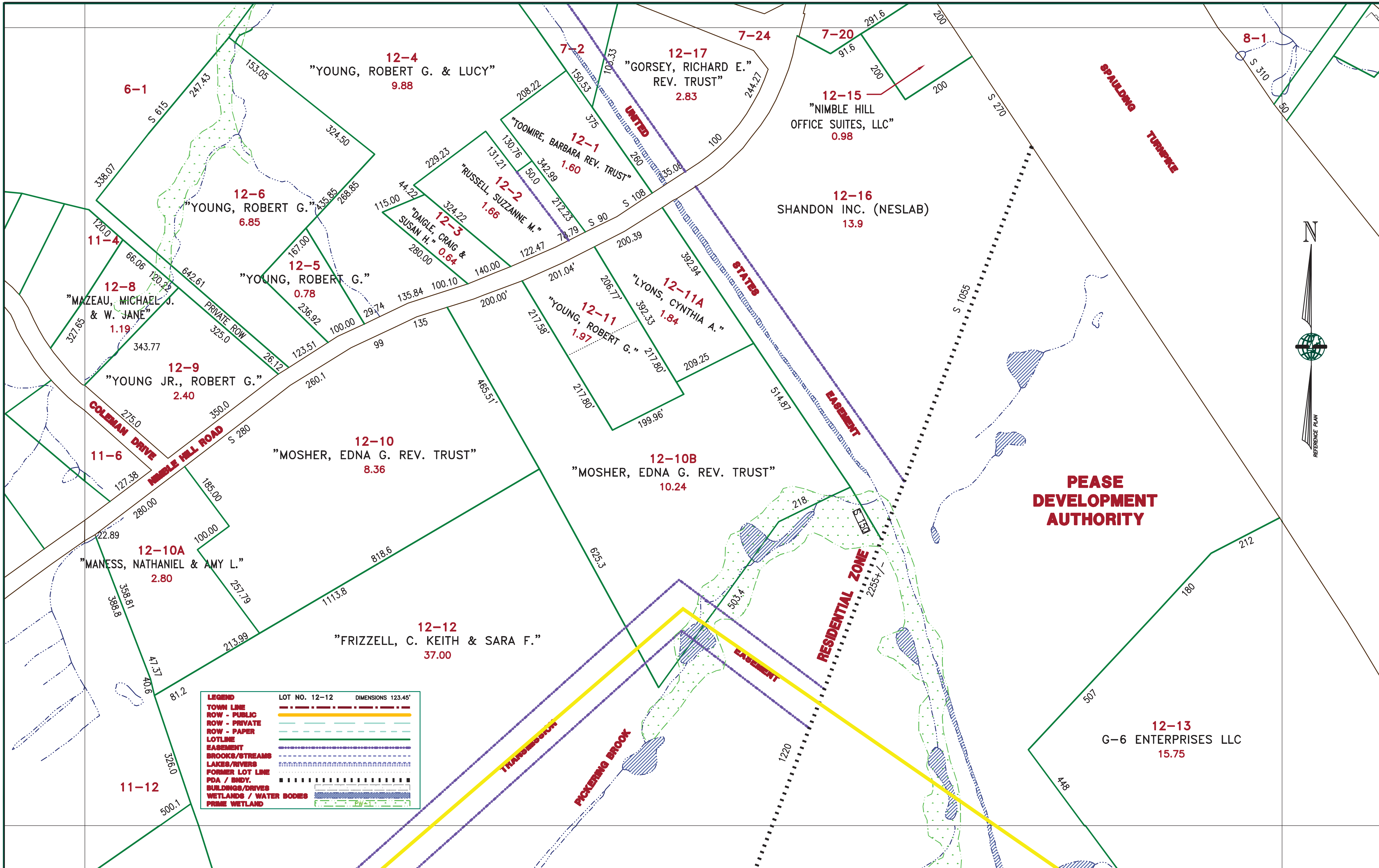
11	12	13
17		19
24	25	26

18



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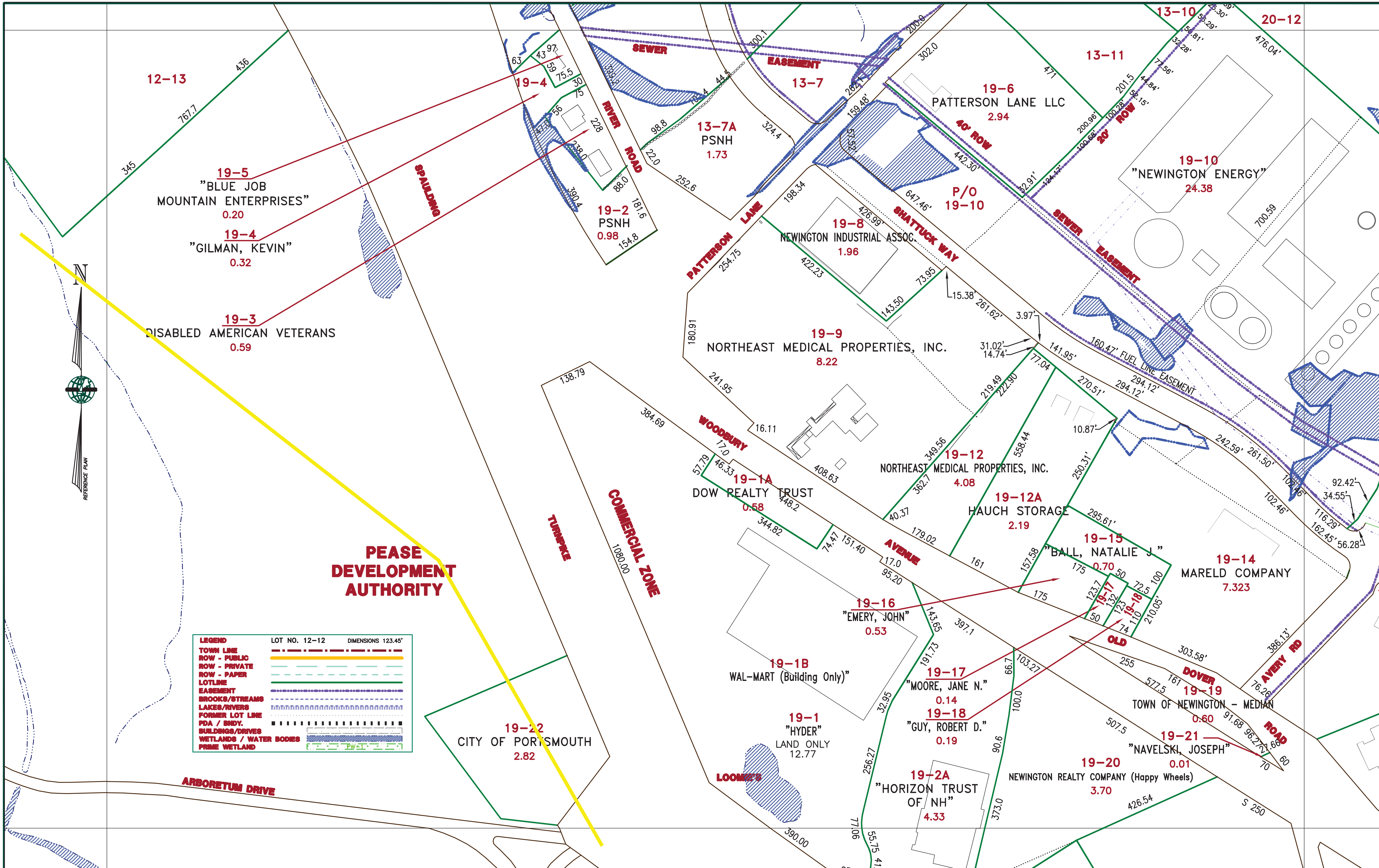
6	7	8
11		13
17	18	19

12



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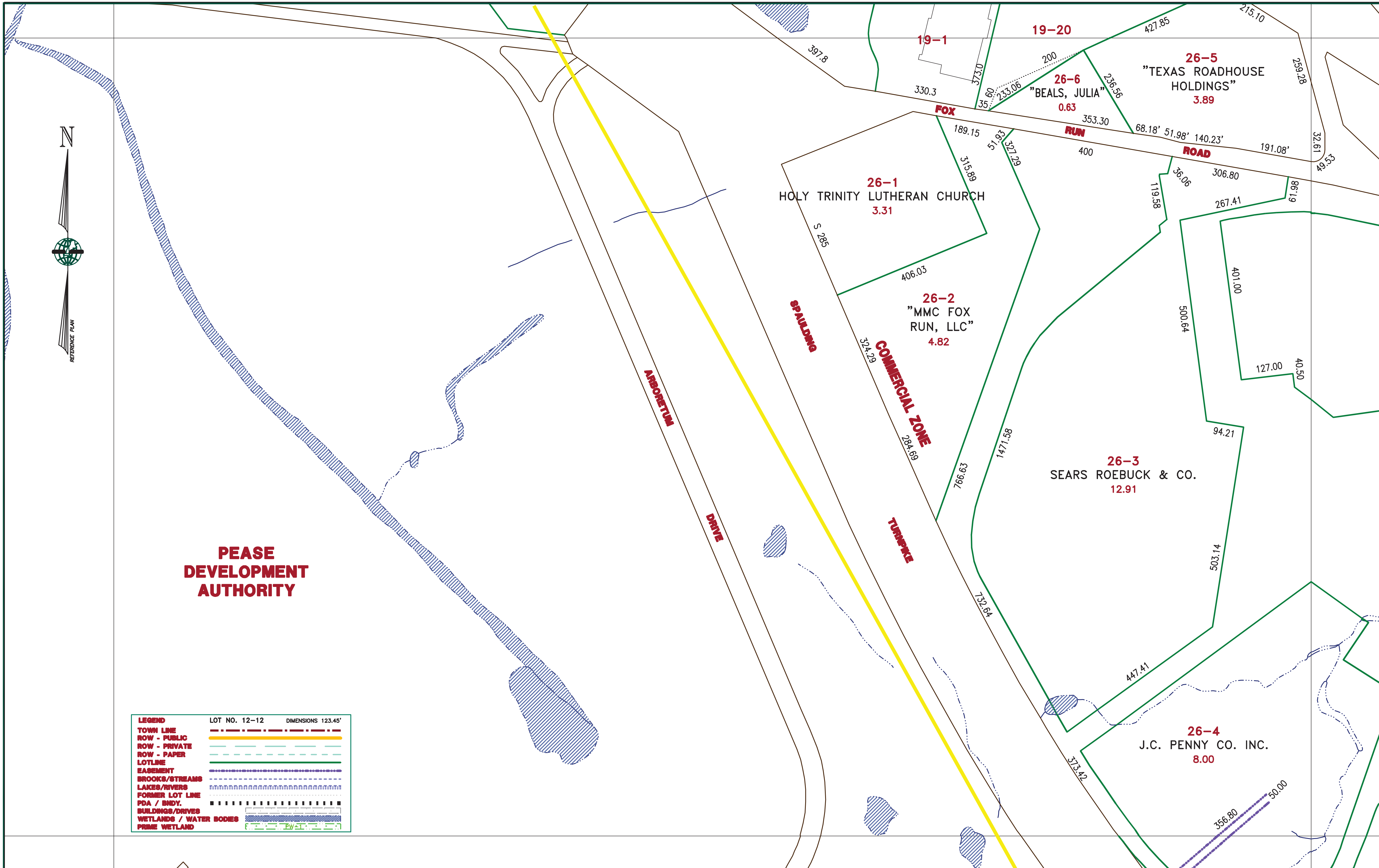
12	13	14
18		20
25	26	27

19



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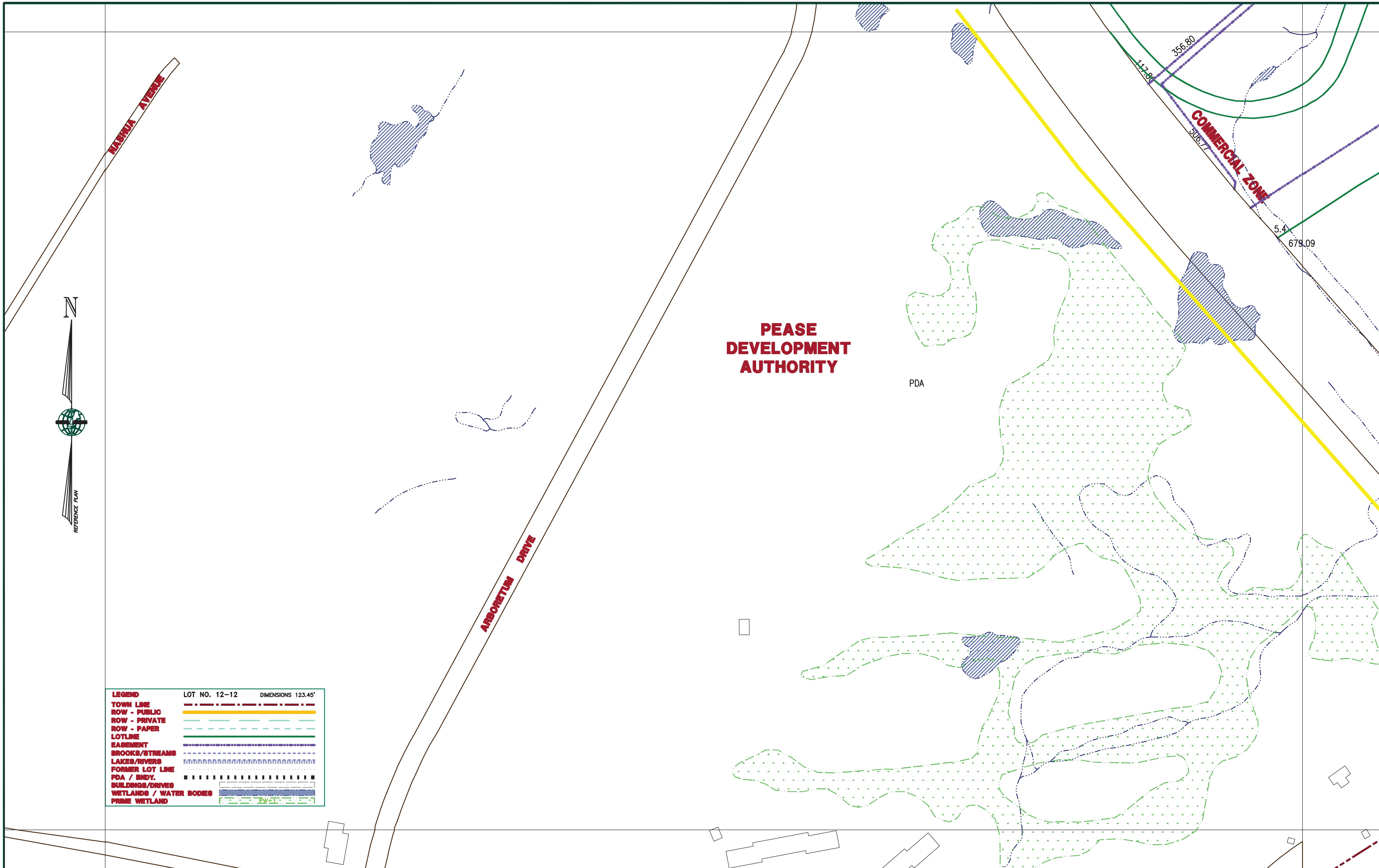
18	19	20
25		27
32	33	34

26



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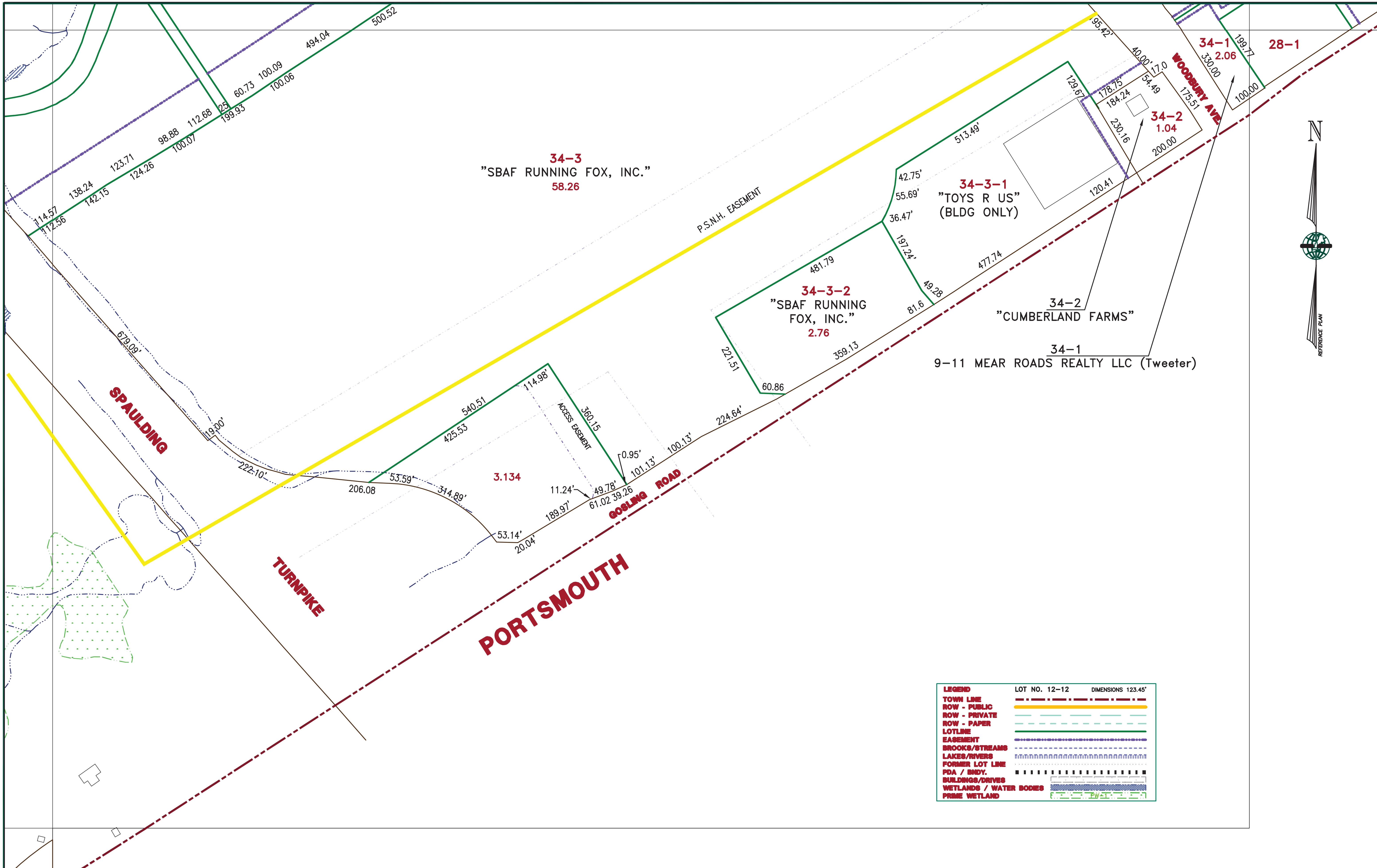
25	26	27
32		34
38	39	

33



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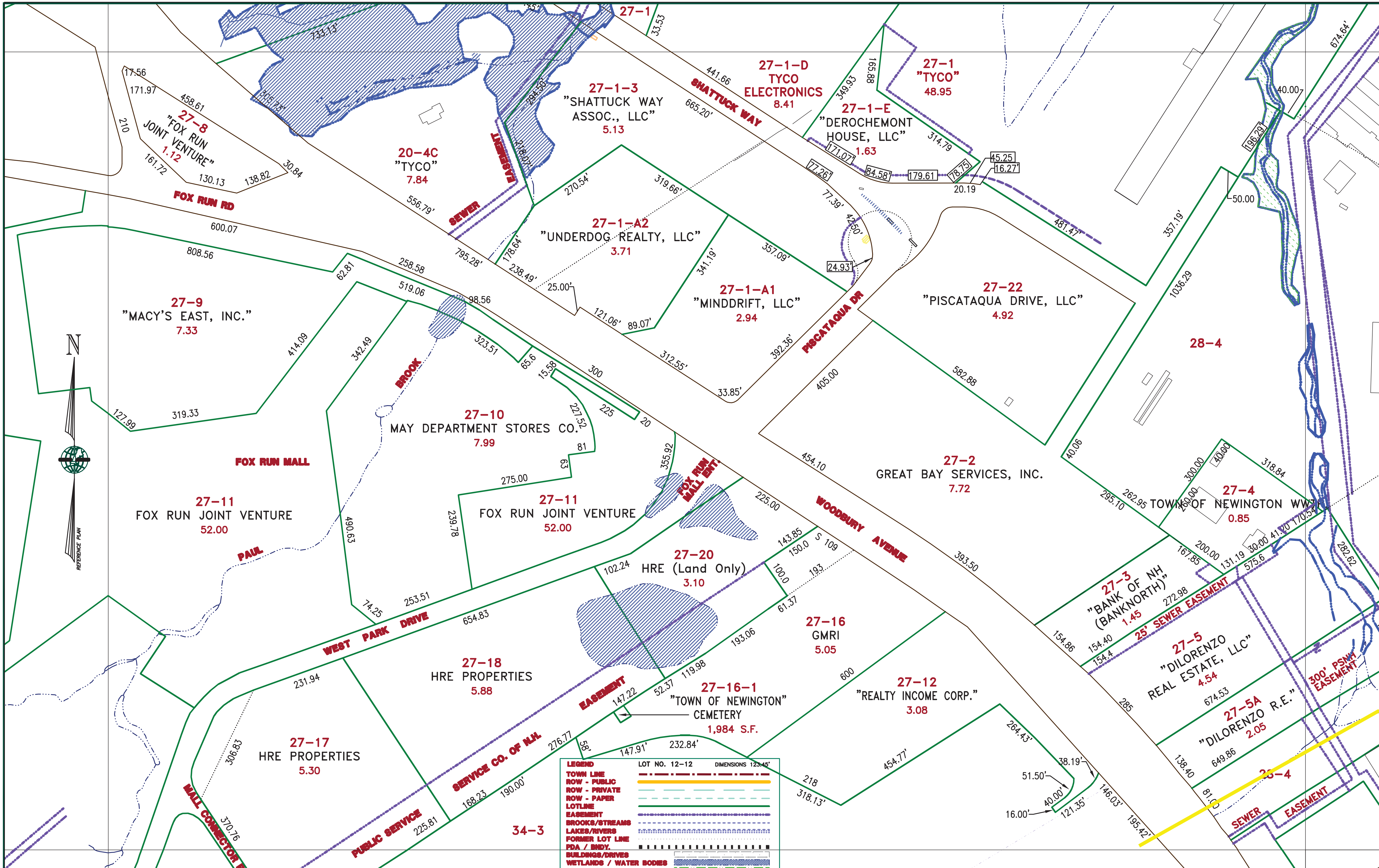
26	27	28
33		
39		

34



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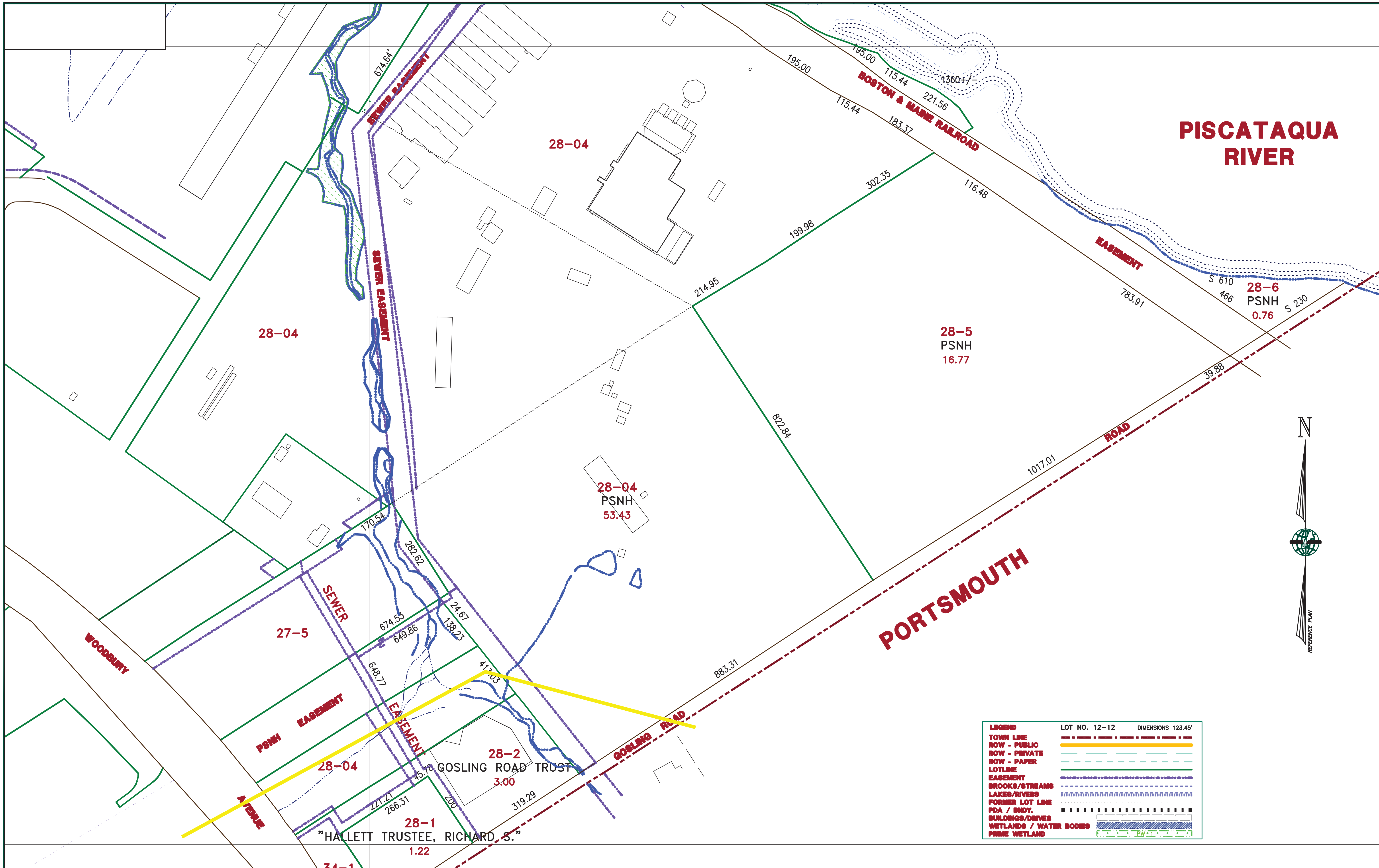
19	20	21
26		28
33	34	

27



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20	21	
27		
34		

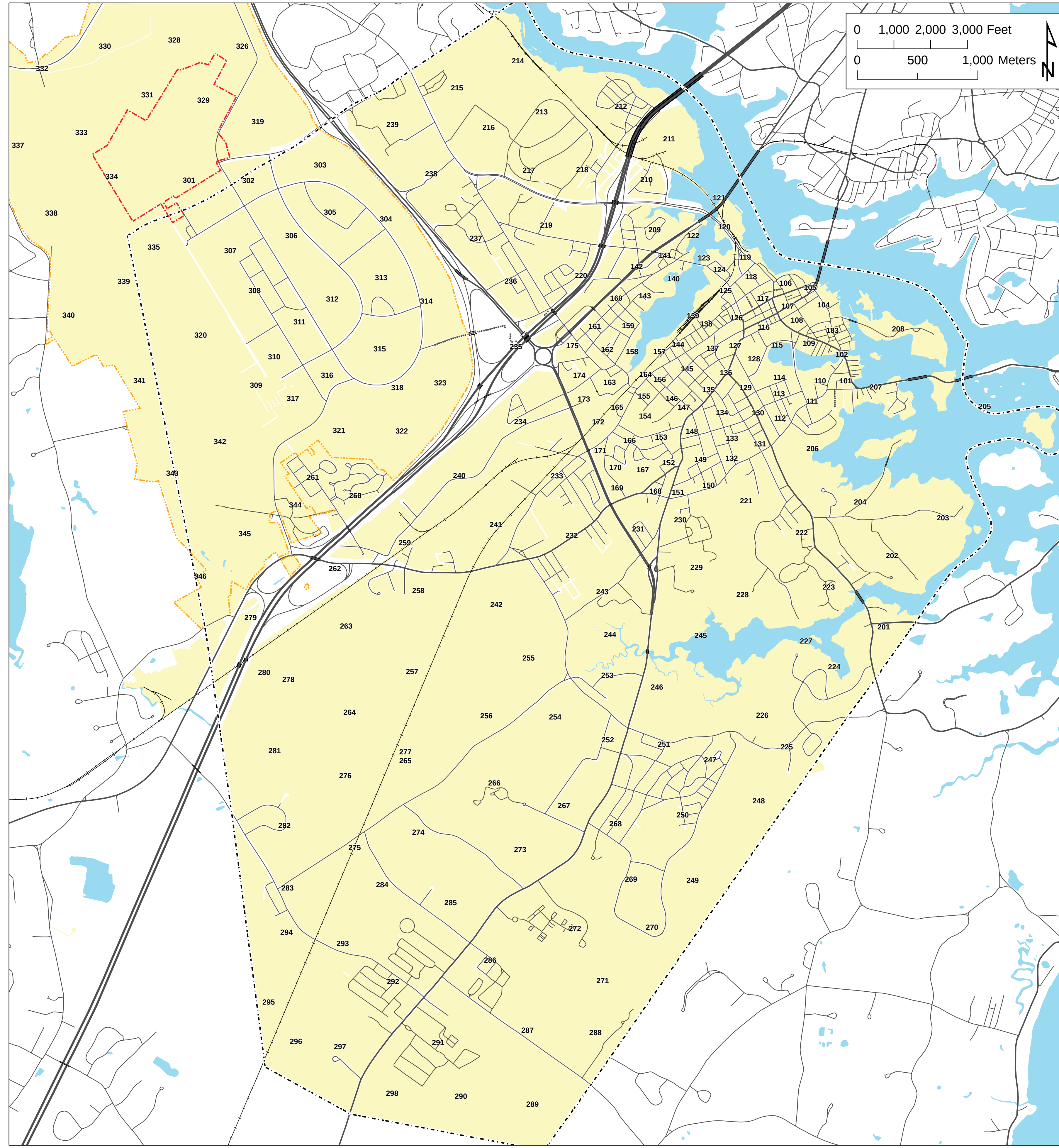
28

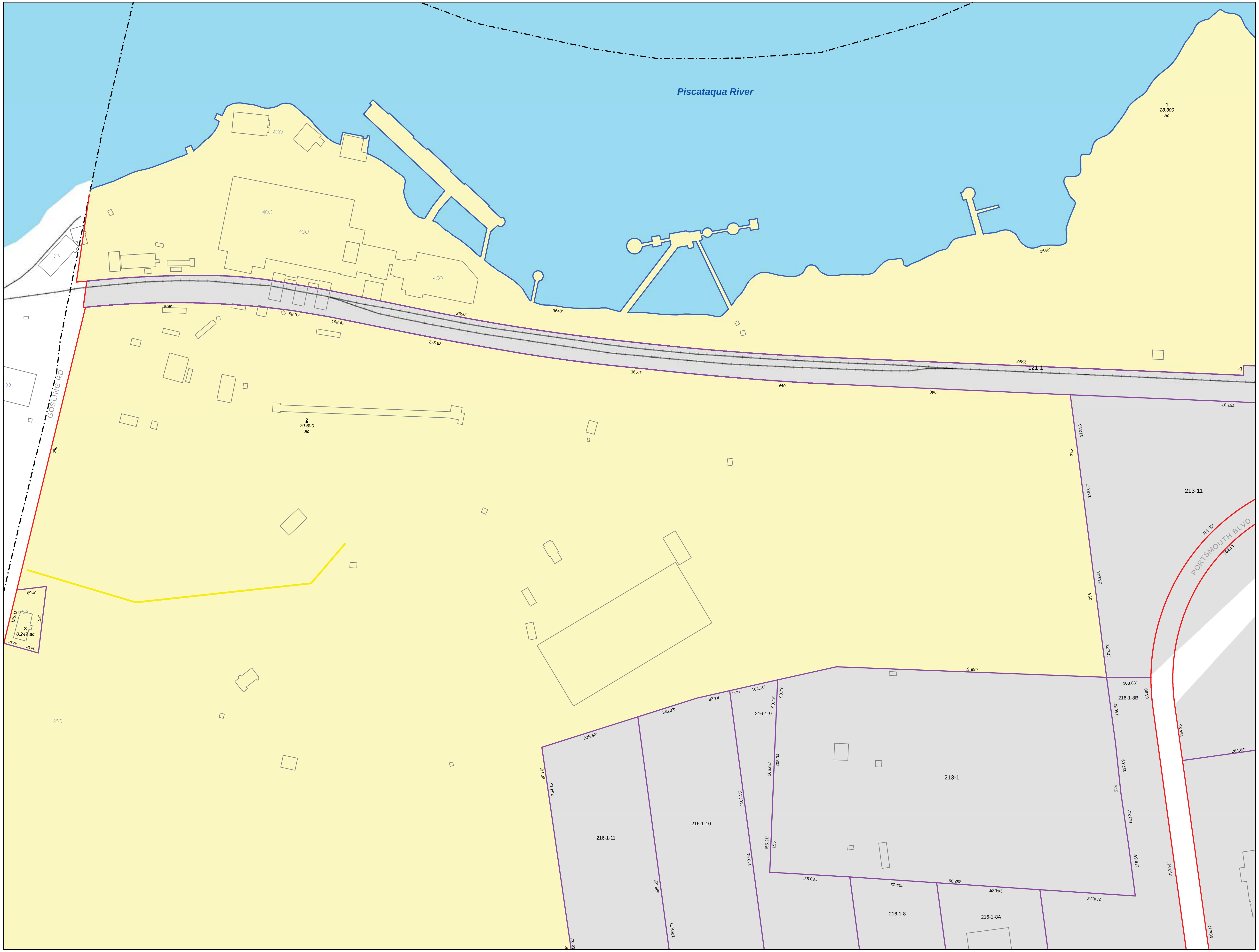
City of Portsmouth
2014 Rural Tax Maps

Maps 201-298

Tax Map Legend

- 7-5A — Lot or Lot-Unit Number
- 2.56 ac — Parcel Area in Acres
- 25 — Address Number
- 233-137 — Parcel Number from a Neighboring Map
- 68' — Parcel Line Dimension
- SIMS AVE — Street Name
- *Piscataqua River* — Water Body
- Cemetery
- Parcel Assigned to the Current Map
- Parcel from Another Map (please refer to the appropriate map)
- Water
- Parcel in Current Use
- Line Between Parcels
- Line Between Parcel and Right of Way
- Line Between Parcel and Water
- City Line
- New Hampshire Air National Guard (NHANG) Boundary
- Pease International Tradeport Boundary
- Structure (2006 data)
- Swimming Pool (2006 data)
- Railroad Track





Partial Legend

See the cover sheet for the complete legend.

7-5A	Lot or lot-unit number
2.56 ac	Parcel area in acres (ac) or square feet (sf)
25	Address number
233-137	Parcel number from a neighboring map
68'	Parcel line dimension
SIMS AVE	Street name
	Parcel/Parcel boundary
	Parcel/ROW boundary
	Water boundary
	Structure (1994 data)
	Parcel covered by this map
	Parcel from a neighboring map (see other map for current status)

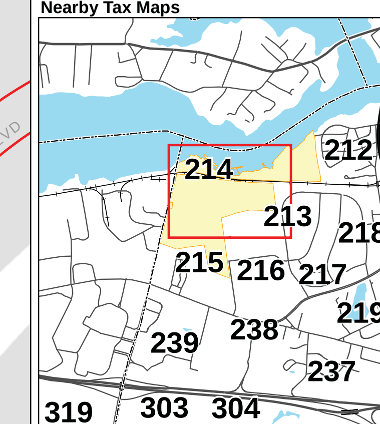
N

0 50 100 200 300 Feet

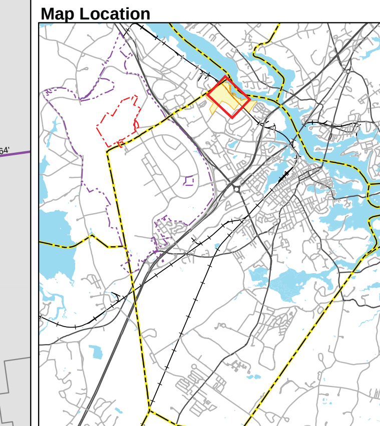
0 20 40 80 Meters

This map is for assessment purposes only. It is not intended for legal description or conveyance. Parcels are mapped as of April 1. Building footprints are 2006 data and may not represent current structures. Streets appearing on this map may be paper (unbuilt) streets. Lot numbers take precedence over address numbers. Address numbers shown on this map may not represent posted or legal addresses.

Nearby Tax Maps



Map Location



Portsmouth, New Hampshire
2014

Tax Map 214

14 Abutter Notification (Env-Wt 101.03, Env-Wt 501.01(c), 501.02(a)(1)& 505.01(f))

Per, Env-Wt 501.01(c) abutter notification is not required for projects in utility ROWs; therefore abutter notification has not been completed for the portions of the Project located in existing and/or proposed utility ROW areas.

It should be noted that the Project has conducted and will continue to conduct pro-active outreach actions throughout Project permitting and construction, and public hearings will take place in accordance with NH SEC rules.

15 Permission for Work within 20 Feet (Env-Wt 304.04)

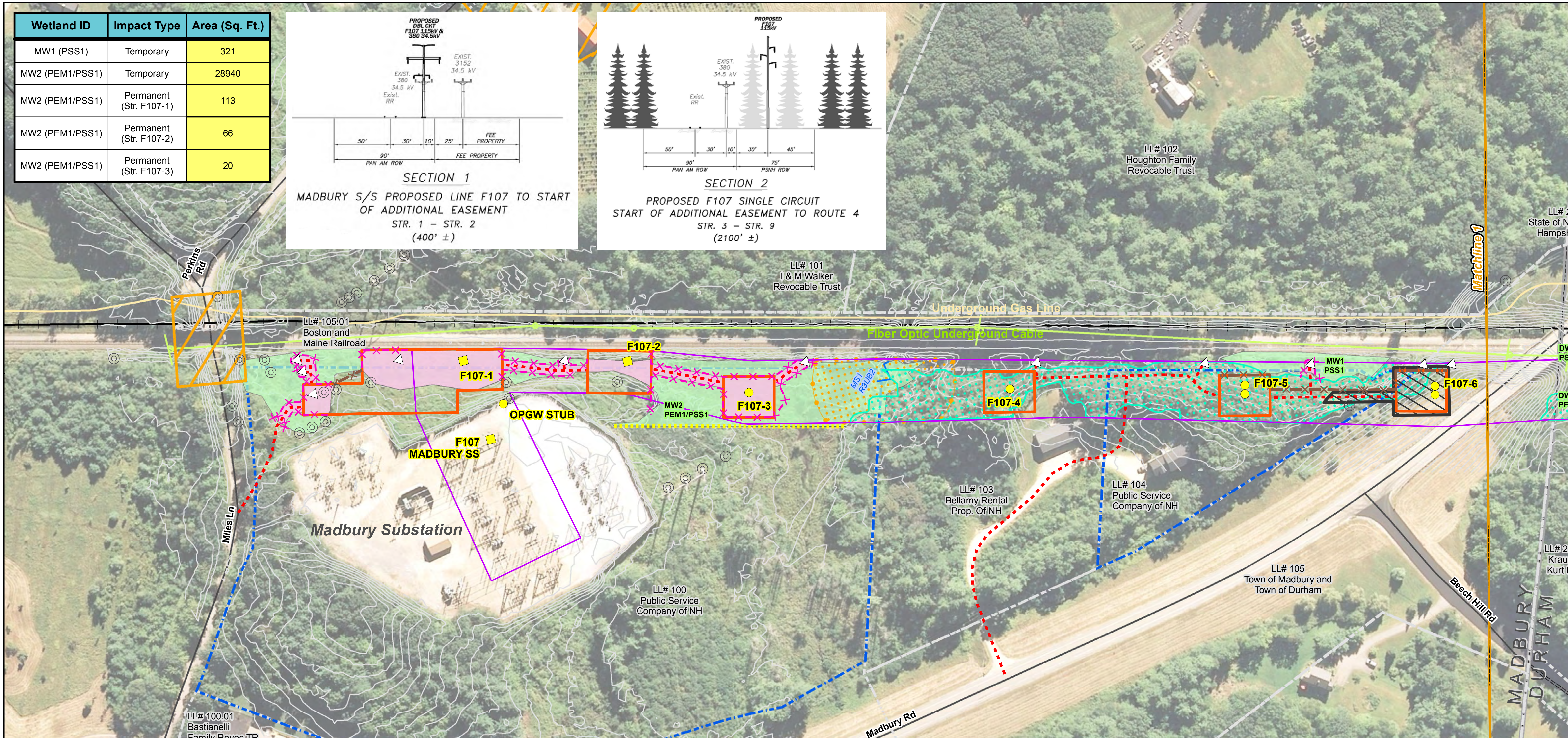
Per review of regulations and discussion with NHDES staff, this notification is not required. Little Bay is the only waterbody in the Project with in-water work, and there are no permanent structures in Little Bay to which the 20-foot setback from an imaginary extension of the property line would apply.

Extensive outreach efforts to all abutters and interested parties have occurred or are on-going as a part of the NH SEC process.

16 Plans (Env-Wt 501.02, Chapter Env-Wt 900)

Detailed plans depicting existing conditions and proposed impacts are included on the following Environmental Maps.

Wetland ID	Impact Type	Area (Sq. Ft.)
MW1 (PSS1)	Temporary	321
MW2 (PEM1/PSS1)	Temporary	28940
MW2 (PEM1/PSS1)	Permanent (Str. F107-1)	113
MW2 (PEM1/PSS1)	Permanent (Str. F107-2)	66
MW2 (PEM1/PSS1)	Permanent (Str. F107-3)	20



Date : 2/25/2016

Drawn By: athompson

Project No.: 22860.003

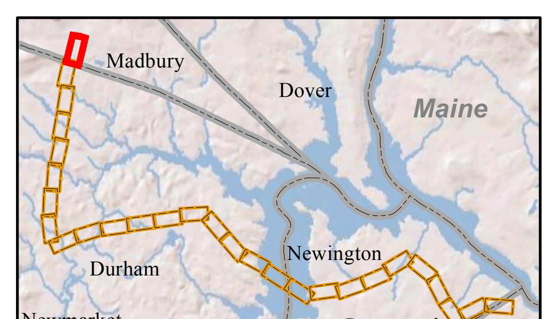
Legend

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
- Work Pad
- Roads
  - Local
  - Not Maintained
  - Private
  - State
  - Railroad
- Existing Str (Remain)
- Existing Str (Removed/Modified)
- Structures
  - Direct Embed
  - Drilled Pier
  - Relocated Distribution
- Access Roads
- Underground Cable
- Silt Curtain
- Silt Fence, Hay Bale, Erosion Control Mix Berm
- Straw Wattle
- Wetland
- Prime Wetland
- Wetland Extends
- Wetlands Impact
- Stream Centerline
- Stream Top of Bank
- Temporary Culvert
- Temporary Mat Bridge
- Historical Sites
- Designated River Buffer 250'
- Conservation Lands
- 100 Year Floodplain
- Steep Slope BMPs
- Tree Clearing
- Stream Buffer
- 2ft Contour

Service Layer Credits: Copyright:© 2014 Esri, granit.edu.

0 75 150 300 Feet

1 inch = 150 feet



EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES
Environmental Consultants

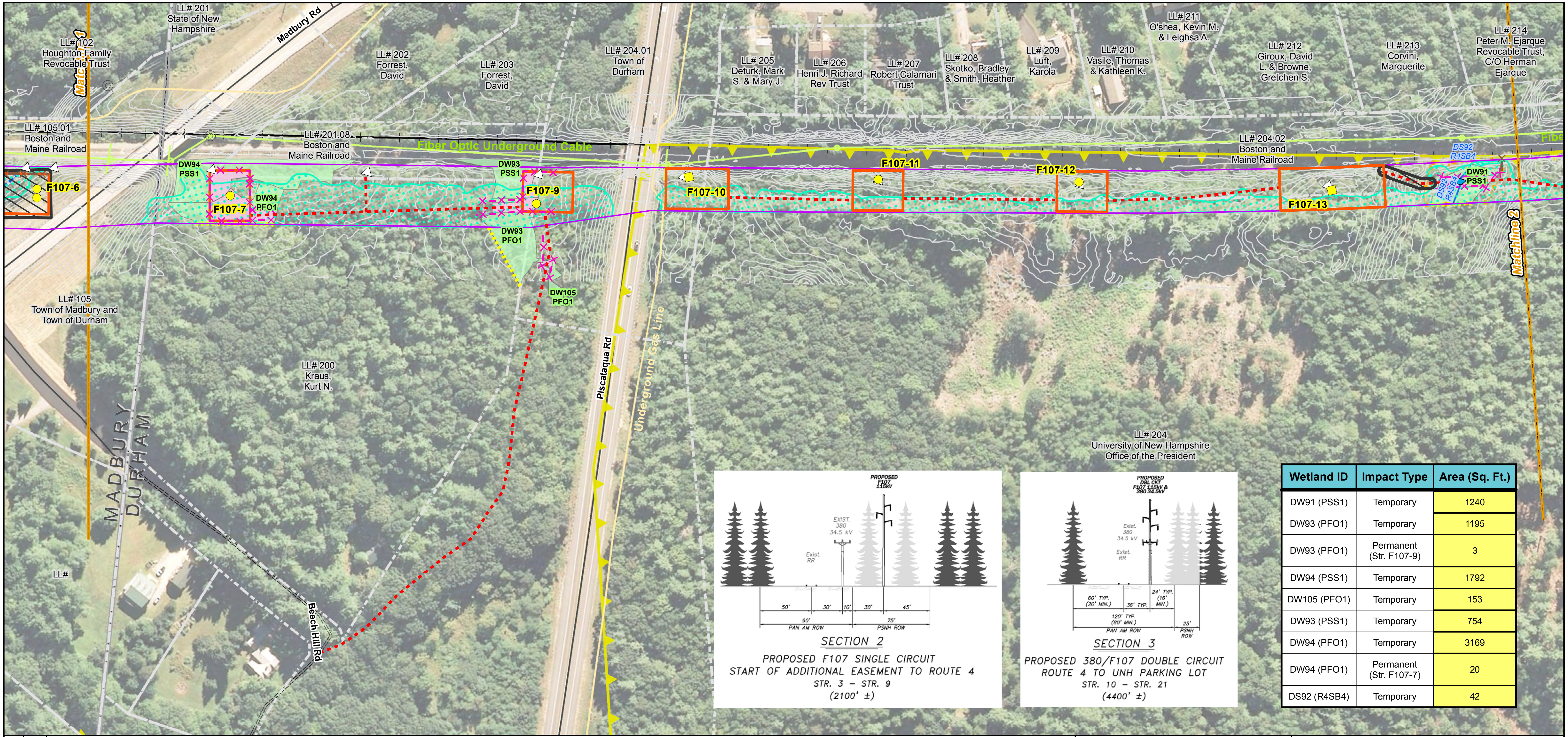
Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST

1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd



Wetland ID	Impact Type	Area (Sq. Ft.)
DW91 (PSS1)	Temporary	1240
DW93 (PFO1)	Temporary	1195
DW93 (PFO1)	Permanent (Str. F107-9)	3
DW94 (PSS1)	Temporary	1792
DW105 (PFO1)	Temporary	153
DW93 (PSS1)	Temporary	754
DW94 (PFO1)	Temporary	3169
DW94 (PFO1)	Permanent (Str. F107-7)	20
DS92 (R4SB4)	Temporary	42

Date: 2/25/2016

Drawn By: athompson

Project No: 22860.003

Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

Roads
Local
Not Maintained
Private
State
Railroad

Existing Str (Remain)
Existing Str (Removed/Modified)

Structures
Direct Embed
Drilled Pier
Relocated Distribution
Access Roads
Underground Cable
Silt Curtain
Silt Fence, Hay Bale, Erosion Control Mix Berm
Straw Wattle

Wetland
Prime Wetland
Wetland Extends
Wetlands Impact
Stream Centerline
Stream Top of Bank
Temporary Culvert
Temporary Mat Bridge
Historical Sites

Designated River Buffer 250'
Conservation Lands
100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

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0 75 150 300 Feet

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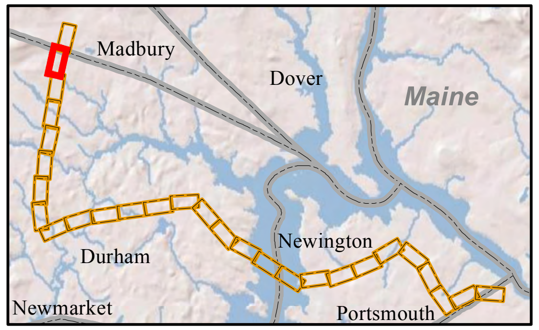

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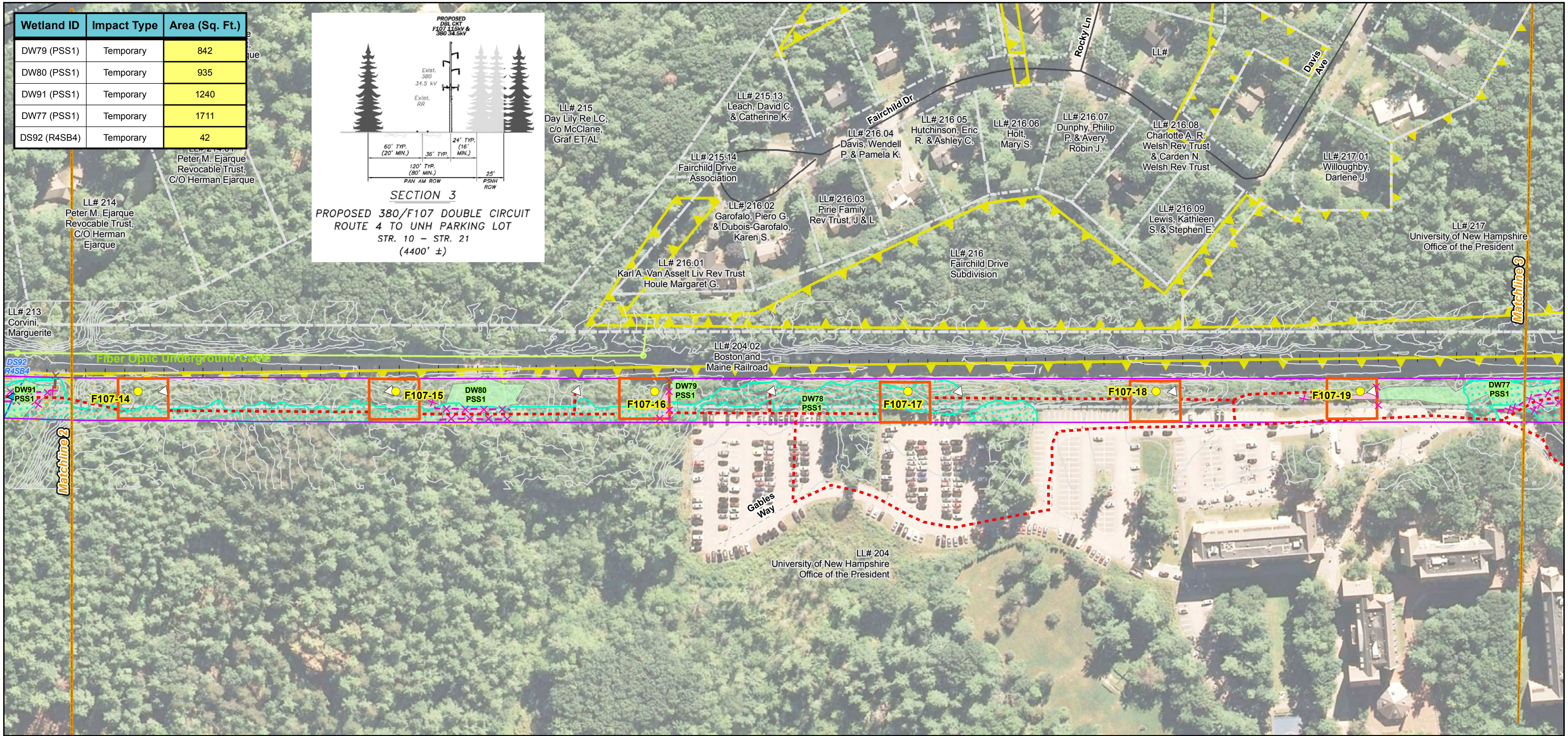
STATE OF NEW HAMPSHIRE SARAH D. ALLEN No. 083 CERTIFIED WETLAND SCIENTIST

1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516_Pg2.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
DW79 (PSS1)	Temporary	842
DW80 (PSS1)	Temporary	935
DW91 (PSS1)	Temporary	1240
DW77 (PSS1)	Temporary	1711
DS92 (R4SB4)	Temporary	42



Date: 2/25/2016

Drawn By: athompson

Project No: 22860.003

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
- Work Pad

Roads
- Local
- Not Maintained
- Private
- State
- Railroad

- Existing Str (Remain)
- Existing Str (Removed/Modified)

Structures
- Direct Embed
- Drilled Pier
- Relocated Distribution
- Access Roads
- Underground Cable
- Silt Curtain
- Silt Fence, Hay Bale, Erosion Control Mix Berm
- Straw Wattle

- Wetland
- Prime Wetland
- Wetland Extends
- Wetlands Impact
- Stream Centerline
- Stream Top of Bank
- Temporary Culvert
- Temporary Mat Bridge
- Historical Sites

- Designated River Buffer 250'
- Conservation Lands
- 100 Year Floodplain
- Steep Slope BMPs
- Tree Clearing
- Stream Buffer
- 2ft Contour

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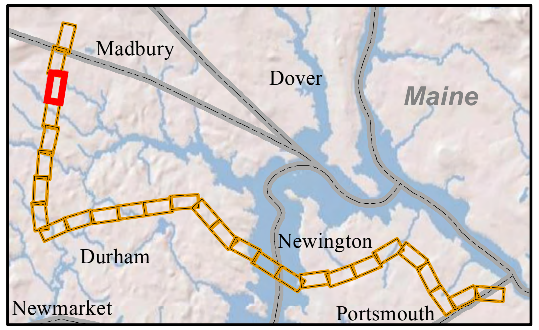
0 75 150 300 Feet

1 inch = 150 feet



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1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
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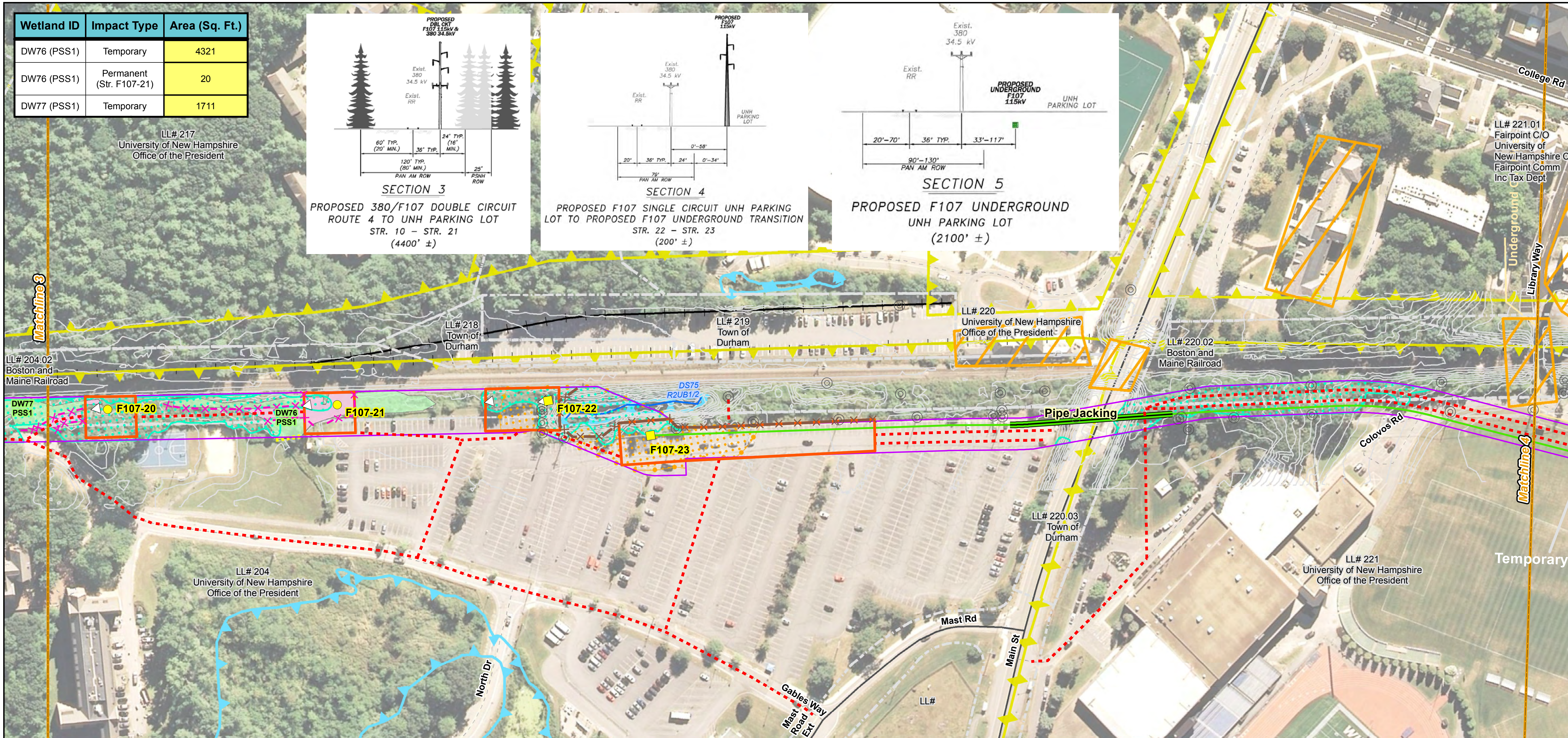
DW76 (PSS1)	Permanent (Str. F107-21)	20
DW77 (PSS1)	Temporary	1711



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

Roads
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- Private
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Existing Str (Remain)
Existing Str (Removed/Modified)

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Prime Wetland
Wetland Extends
Wetlands Impact
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Temporary Mat Bridge
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Designated River Buffer 250'
Conservation Lands
100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

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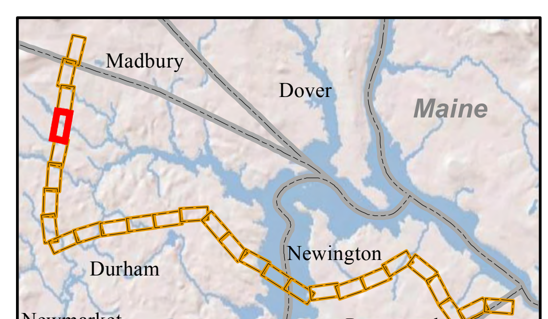
0 75 150 300 Feet
1 inch = 150 feet



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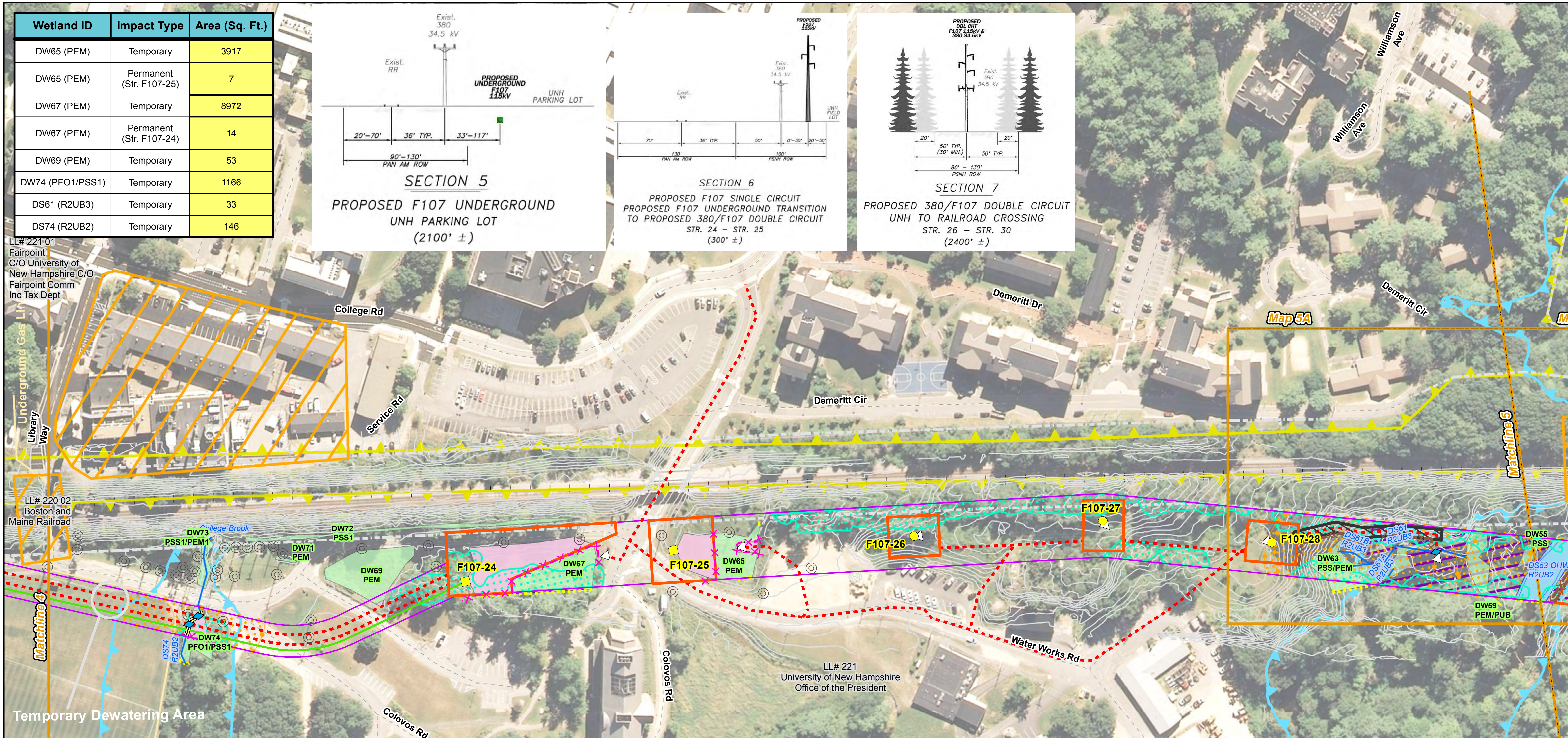
Drawn By: athompson
Project No: 22860.003

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
DW65 (PEM)	Temporary	3917
DW65 (PEM)	Permanent (Str. F107-25)	7
DW67 (PEM)	Temporary	8972
DW67 (PEM)	Permanent (Str. F107-24)	14
DW69 (PEM)	Temporary	53
DW74 (PFO1/PSS1)	Temporary	1166
DS61 (R2UB3)	Temporary	33
DS74 (R2UB2)	Temporary	146



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

Roads
- Local
- Not Maintained
- Private
- State
- Railroad

Existing Str (Remain)
Existing Str (Removed/Modified)

Structures
- Direct Embed
- Drilled Pier
- Relocated Distribution

Access Roads
Underground Cable
Silt Curtain
Silt Fence, Hay Bale, Erosion Control Mix Berm
Straw Wattle

Wetland
Prime Wetland
Wetland Extends
Wetlands Impact
Stream Centerline
Stream Top of Bank
Temporary Culvert
Temporary Mat Bridge
Historical Sites

Designated River Buffer 250'
Conservation Lands
100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

0 75 150 300 Feet
1 inch = 150 feet

Madbury, Dover, Maine, Durham, Newington, Newmarket, Portsmouth

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Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES
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Seacoast Reliability Project

Environmental Maps

State of New Hampshire
SARAH D. ALLEN
No. 083
Certified Wetland Scientist
1/28/16

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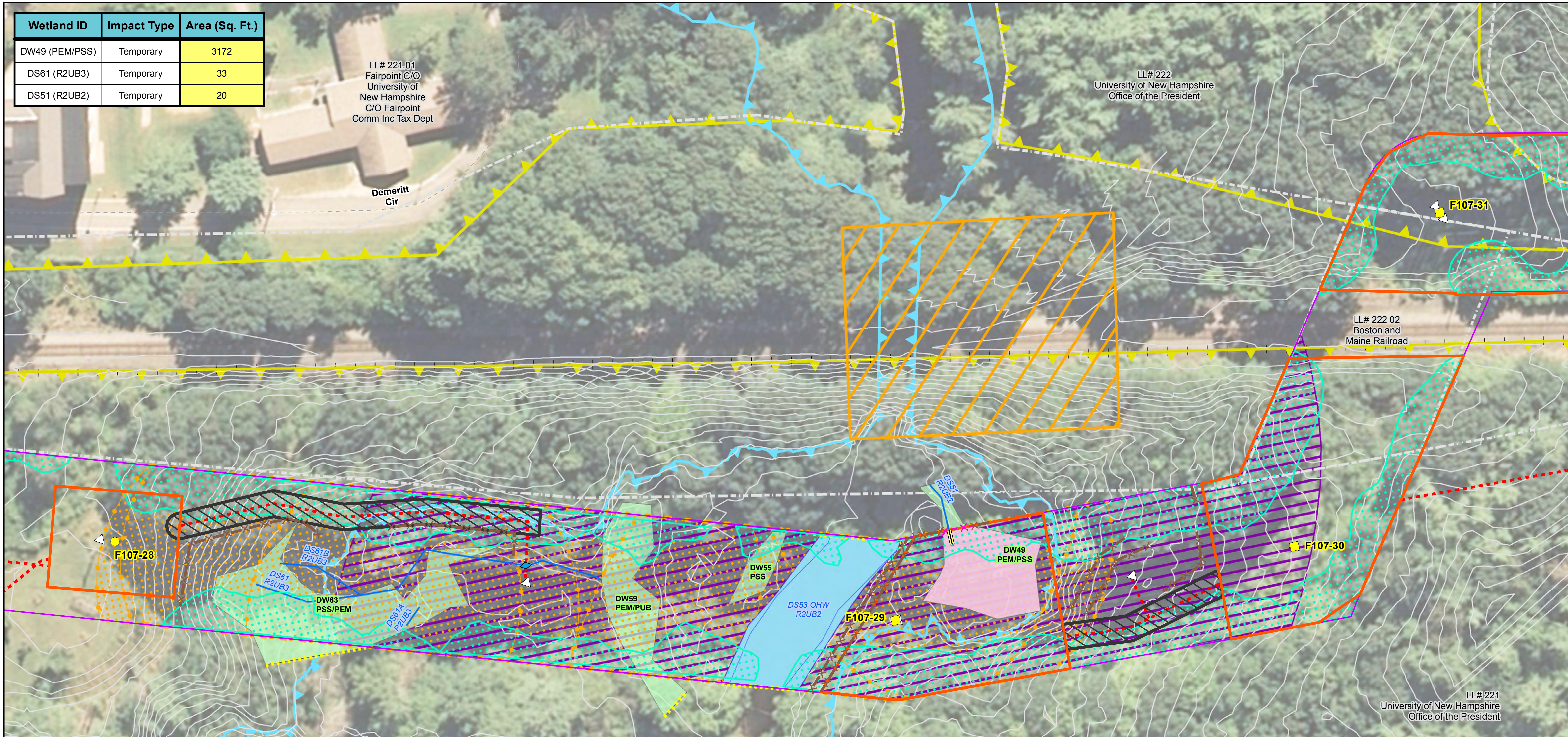
Wetland ID	Impact Type	Area (Sq. Ft.)
DW49 (PEM/PSS)	Temporary	3172
DS61 (R2UB3)	Temporary	33
DS51 (R2UB2)	Temporary	20



Legend

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
- Work Pad

Roads
- Local
- Not Maintained
- Private
- State
- Railroad

- Existing Str (Remain)
- Existing Str (Removed/Modified)

Structures
- Direct Embed
- Drilled Pier
- Relocated Distribution
- Access Roads
- Underground Cable
- Silt Curtain
- Silt Fence, Hay Bale, Erosion Control Mix Berm
- Straw Wattle

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- Prime Wetland
- Wetland Extends
- Wetlands Impact
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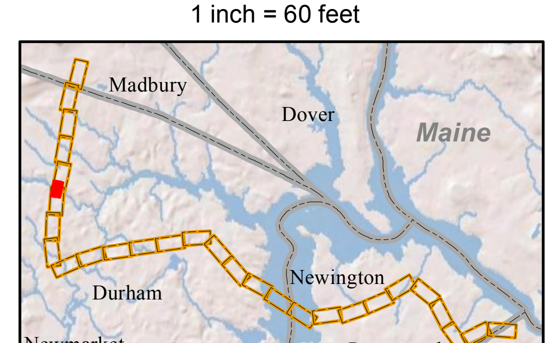
- Stream Top of Bank
- Temporary Culvert
- Temporary Mat Bridge
- Historical Sites

- Designated River Buffer 250'
- Conservation Lands
- 100 Year Floodplain
- Steep Slope BMPs
- Tree Clearing
- Stream Buffer
- 2ft Contour

0 60 120 Feet

1 inch = 60 feet



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Seacoast Reliability Project

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STATE OF NEW HAMPSHIRE SARAH D. ALLEN No. 083 CERTIFIED WETLAND SCIENTIST

1/28/16

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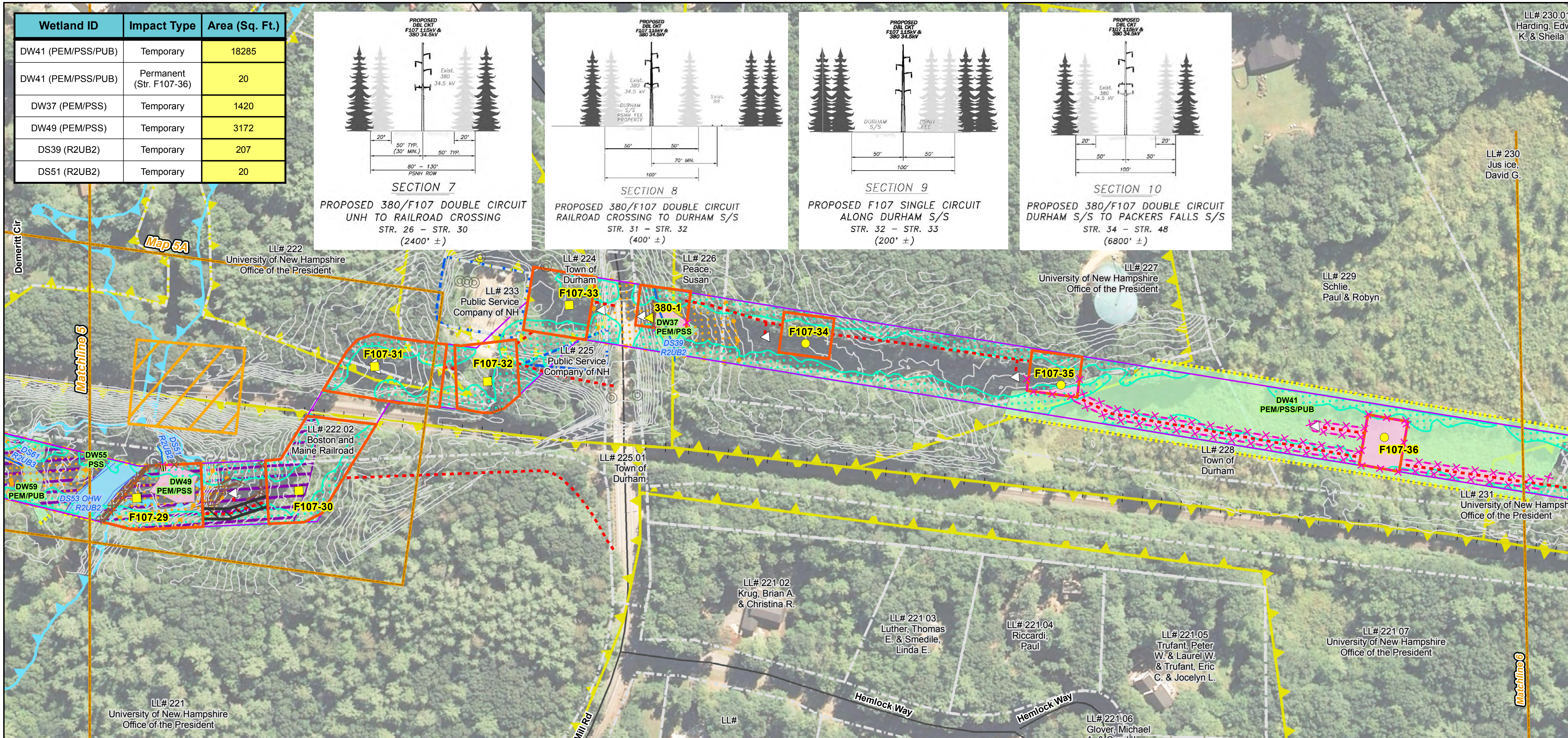
Wetland ID	Impact Type	Area (Sq. Ft.)
DW41 (PEM/PSS/PUB)	Temporary	18285
DW41 (PEM/PSS/PUB)	Permanent (Str. F107-36)	20
DW37 (PEM/PSS)	Temporary	1420
DW49 (PEM/PSS)	Temporary	3172
DS39 (R2UB2)	Temporary	207
DS51 (R2UB2)	Temporary	20



Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

Legend

Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad
Roads
Local
Not Maintained
Private
State
Railroad
Existing Str (Remain)
Existing Str (Removed/Modified)
Structures
Direct Embed
Drilled Pier
Relocated Distribution
Access Roads
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Silt Fence, Hay Bale, Erosion Control Mix Berm
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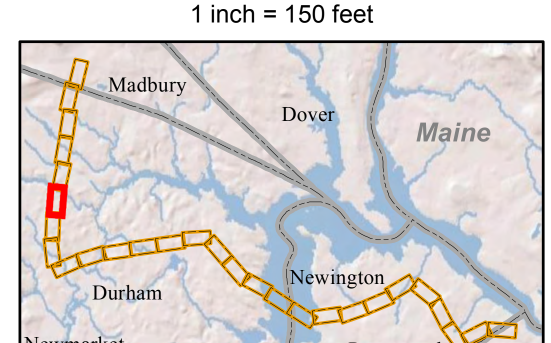
Temporary Mat Bridge
Historical Sites
Designated River Buffer 250'
Conservation Lands
100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

0 75 150 300 Feet
1 inch = 150 feet



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STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST
1/28/16

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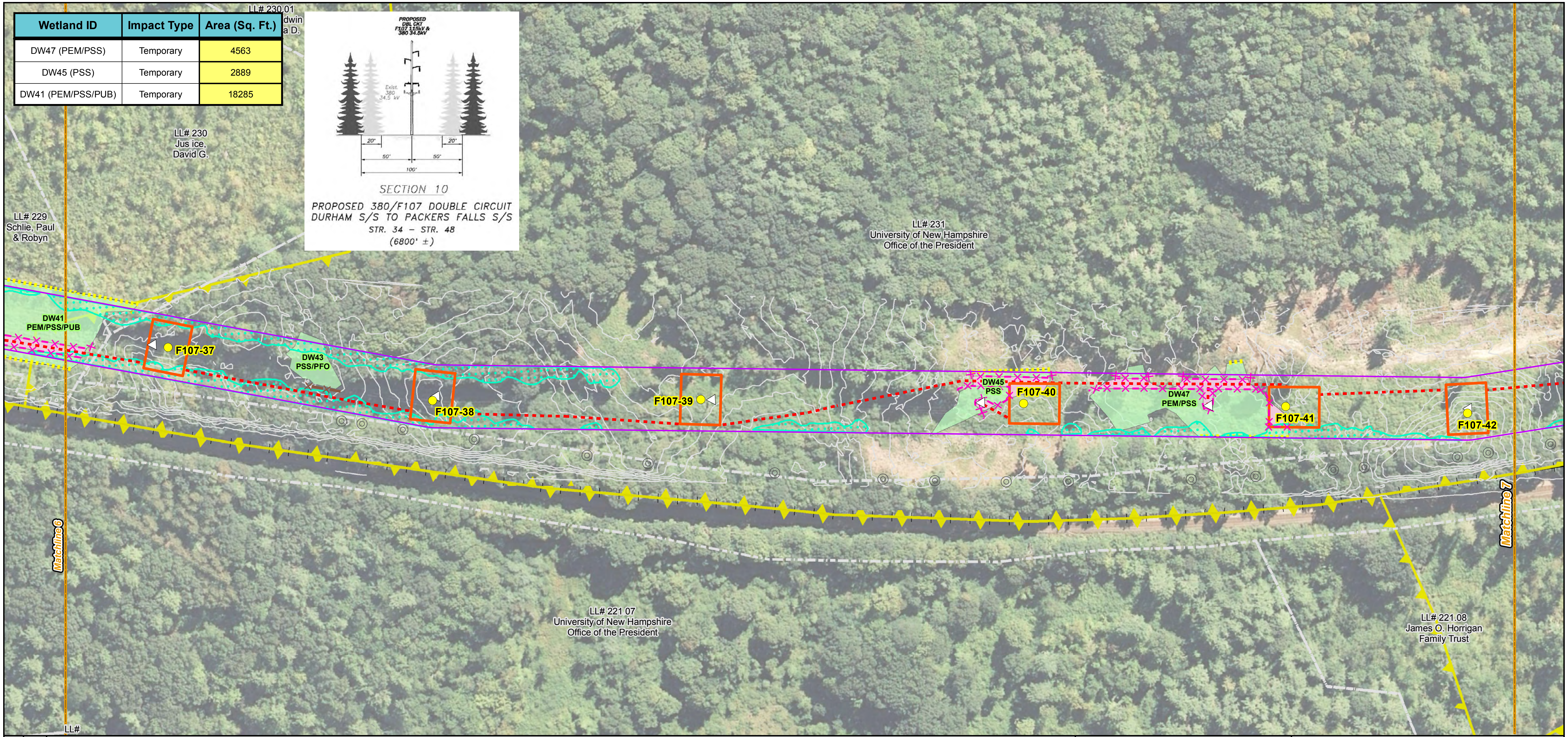
Wetland ID	Impact Type	Area (Sq. Ft.)
DW47 (PEM/PSS)	Temporary	4563
DW45 (PSS)	Temporary	2889
DW41 (PEM/PSS/PUB)	Temporary	18285



Date : 2/25/2016

Drawn By: athompson

Project No: 22860.003

Legend

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
- Work Pad

Roads
- Local
- Not Maintained
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- State
- Railroad

- Existing Str (Remain)
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Structures
- Direct Embed
- Drilled Pier
- Relocated Distribution
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- Designated River Buffer 250'
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- Tree Clearing
- Stream Buffer
- 2ft Contour

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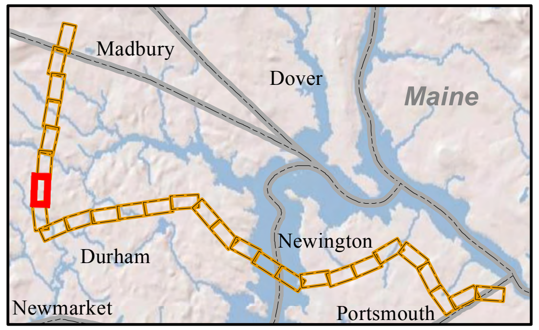
0 75 150 300 Feet

1 inch = 150 feet



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Environmental Maps

State of New Hampshire — Sarah D. Allen — No. 083 — Certified Wetland Scientist

1/28/16

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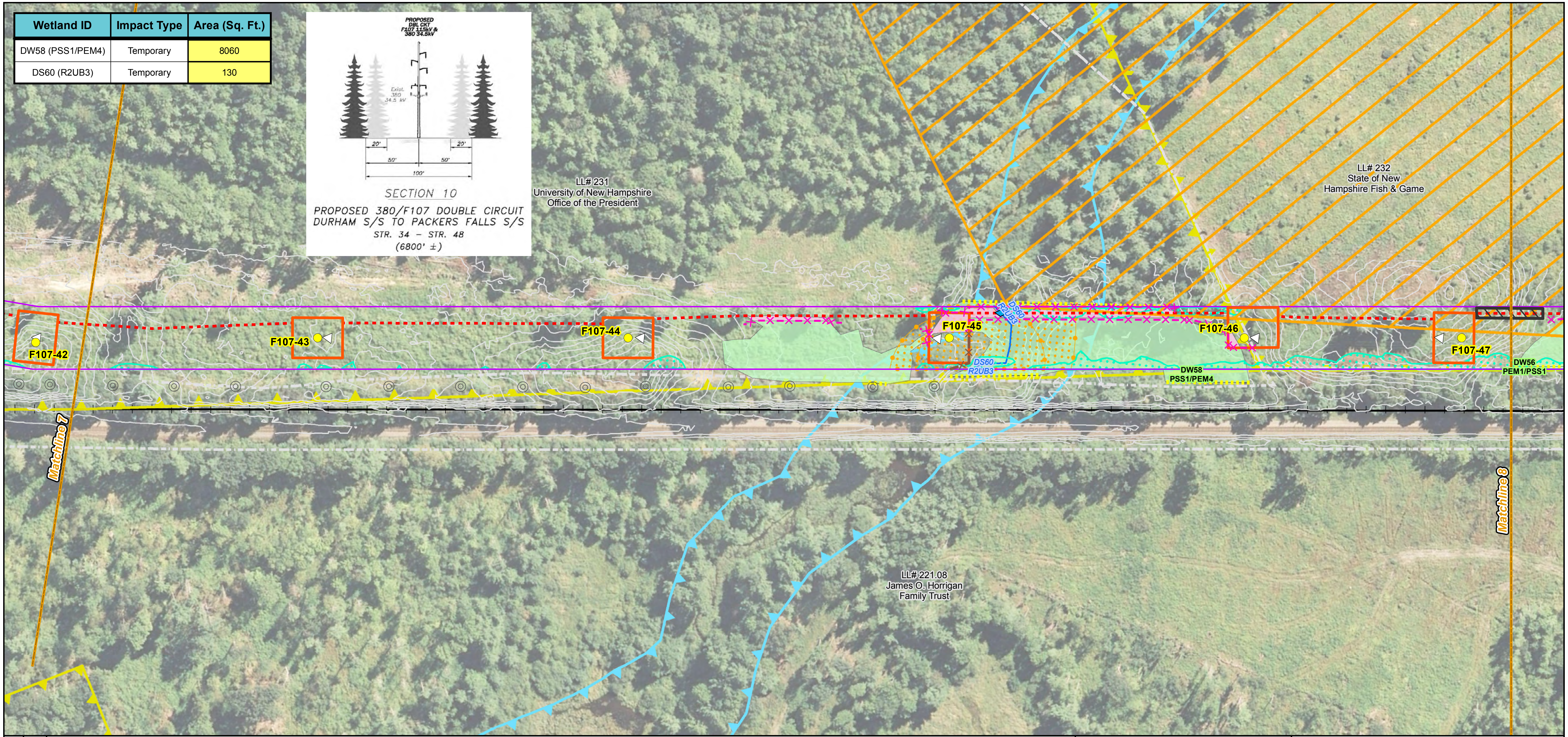
Wetland ID	Impact Type	Area (Sq. Ft.)
DW58 (PSS1/PEM4)	Temporary	8060
DS60 (R2UB3)	Temporary	130



Date : 2/25/2016

Drawn By: athompson

Project No: 22860.003

Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

Roads
Local
Not Maintained
Private
State
Railroad

Existing Str (Remain)
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Temporary Mat Bridge
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Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

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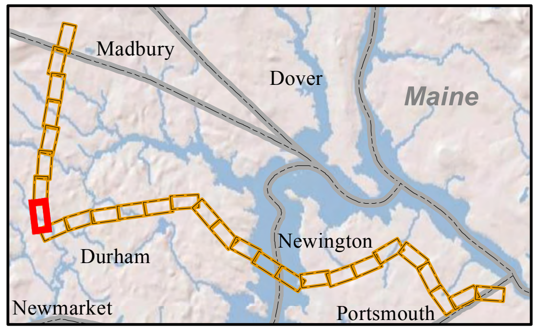
0 75 150 300 Feet

1 inch = 150 feet



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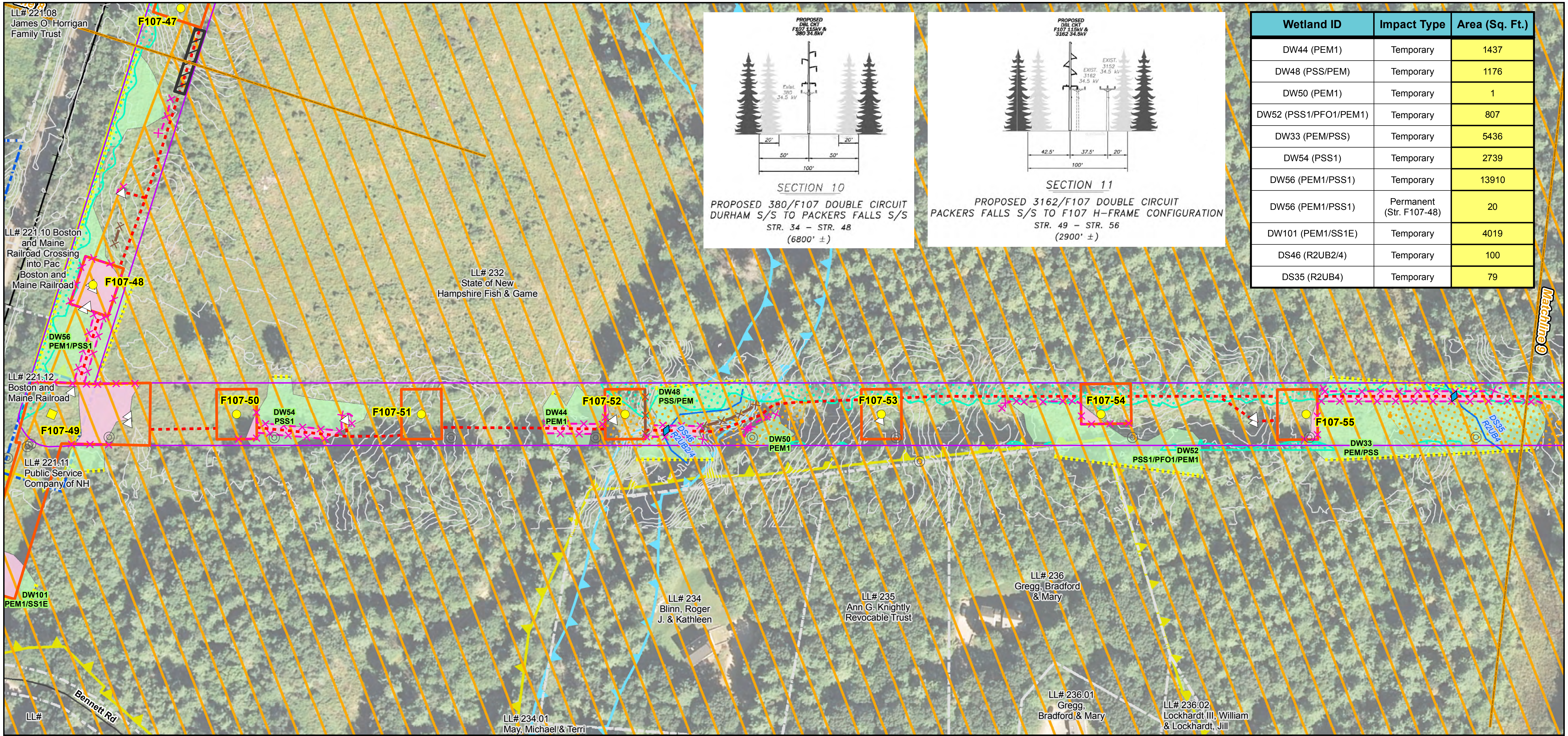
Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST

1/28/16



Wetland ID	Impact Type	Area (Sq. Ft.)
DW44 (PEM1)	Temporary	1437
DW48 (PSS/PEM)	Temporary	1176
DW50 (PEM1)	Temporary	1
DW52 (PSS1/PFO1/PEM1)	Temporary	807
DW33 (PEM/PSS)	Temporary	5436
DW54 (PSS1)	Temporary	2739
DW56 (PEM1/PSS1)	Temporary	13910
DW56 (PEM1/PSS1)	Permanent (Str. F107-48)	20
DW101 (PEM1/SS1E)	Temporary	4019
DS46 (R2UB2/4)	Temporary	100
DS35 (R2UB4)	Temporary	79

Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

Town Boundary
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Tree Clearing
Stream Buffer
2ft Contour

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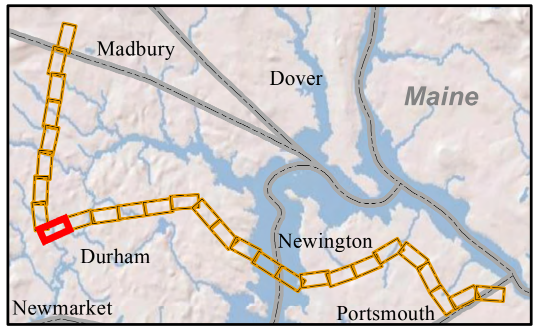
0 75 150 300 Feet
1 inch = 150 feet



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Environmental Maps

STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST
1/28/16

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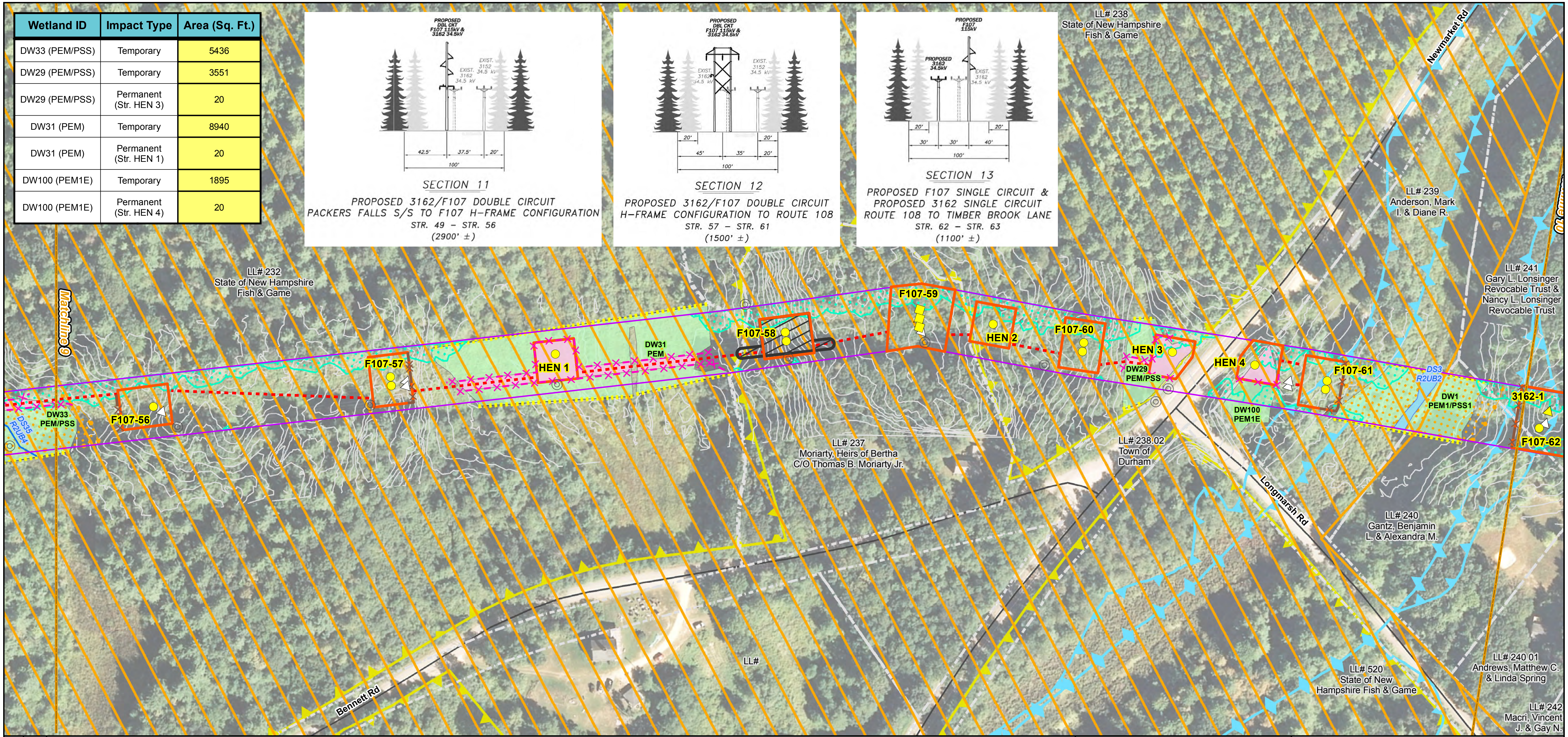
Wetland ID	Impact Type	Area (Sq. Ft.)
DW33 (PEM/PSS)	Temporary	5436
DW29 (PEM/PSS)	Temporary	3551
DW29 (PEM/PSS)	Permanent (Str. HEN 3)	20
DW31 (PEM)	Temporary	8940
DW31 (PEM)	Permanent (Str. HEN 1)	20
DW100 (PEM1E)	Temporary	1895
DW100 (PEM1E)	Permanent (Str. HEN 4)	20



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

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Access Roads
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Silt Fence, Hay Bale, Erosion Control Mix Berm
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Temporary Mat Bridge
Historical Sites

Designated River Buffer 250'
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100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

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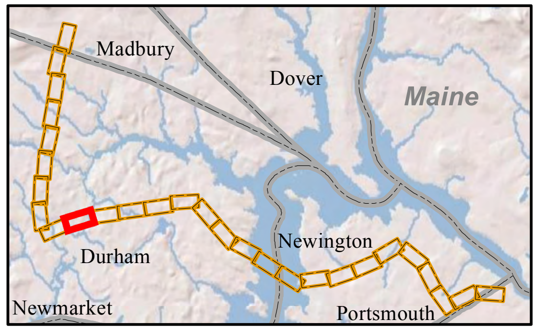
0 75 150 300 Feet
1 inch = 150 feet



Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

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STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST
1/28/16

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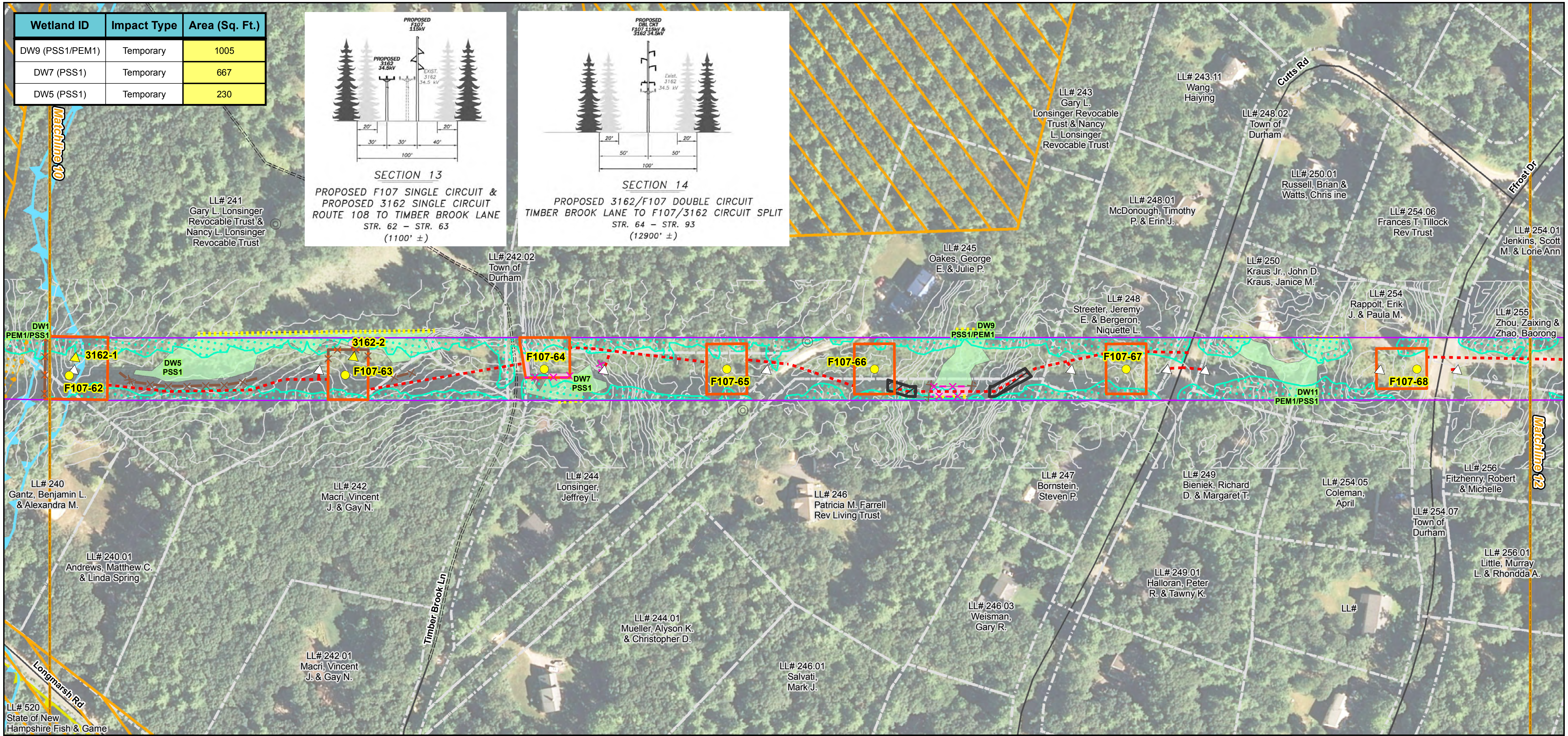
Wetland ID	Impact Type	Area (Sq. Ft.)
DW9 (PSS1/PEM1)	Temporary	1005
DW7 (PSS1)	Temporary	667
DW5 (PSS1)	Temporary	230



Date : 2/25/2016

Drawn By: althompson

Project No: 22860.003

Legend

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
- Work Pad
- Roads
  - Local
  - Not Maintained
  - Private
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- Tree Clearing
- Stream Buffer
- 2ft Contour

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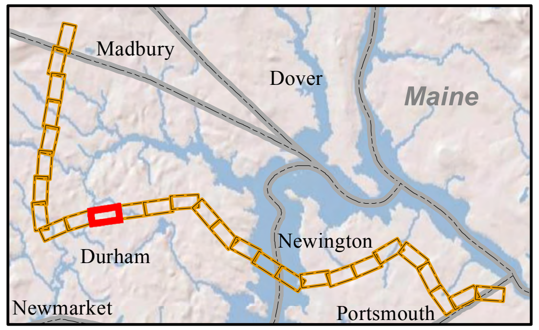
0 75 150 300 Feet

1 inch = 150 feet



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Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST

1/28/16

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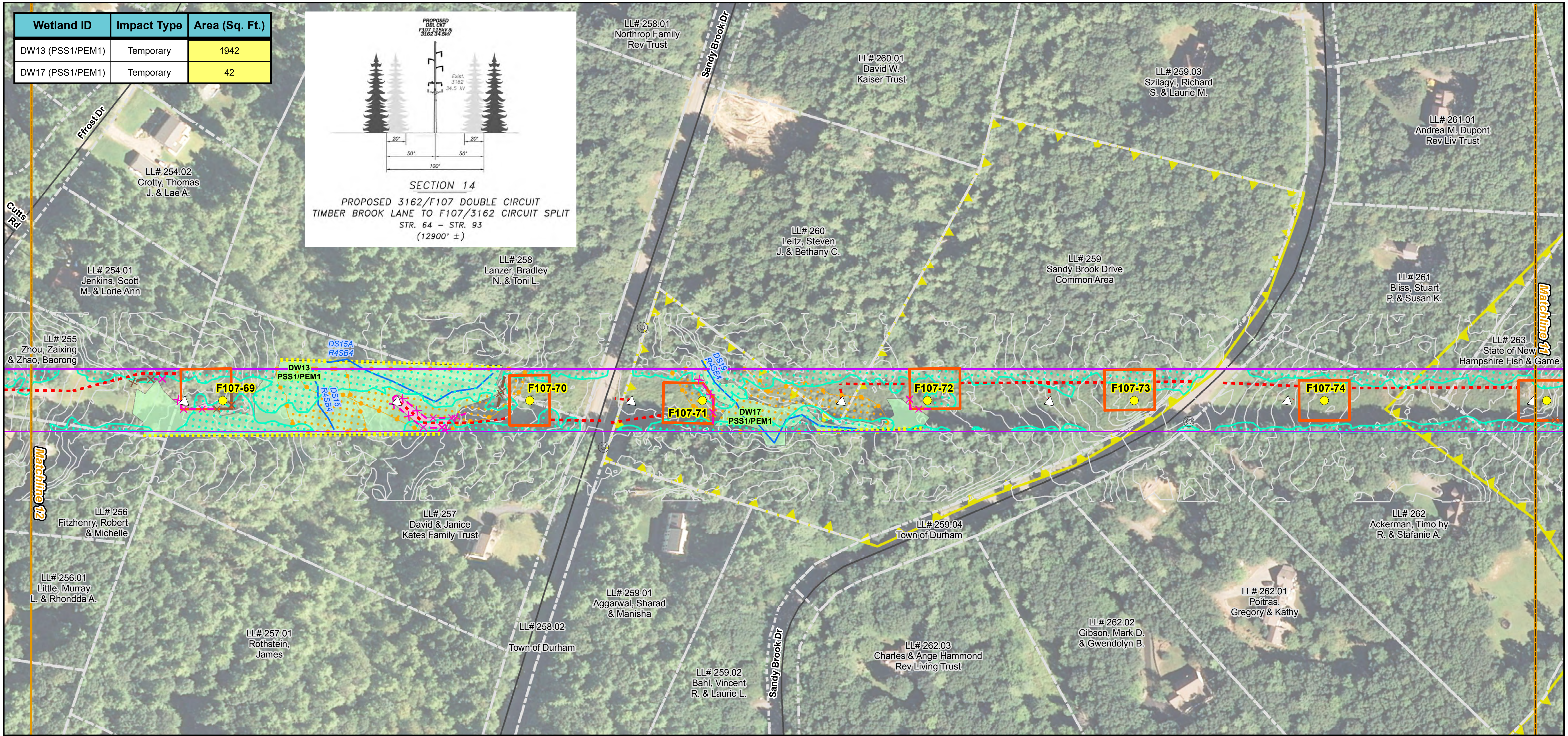
Wetland ID	Impact Type	Area (Sq. Ft.)
DW13 (PSS1/PEM1)	Temporary	1942
DW17 (PSS1/PEM1)	Temporary	42



Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
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Railroad

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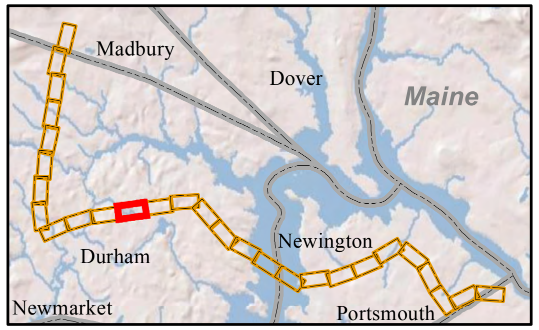
0 75 150 300 Feet
1 inch = 150 feet



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Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST
1/28/16

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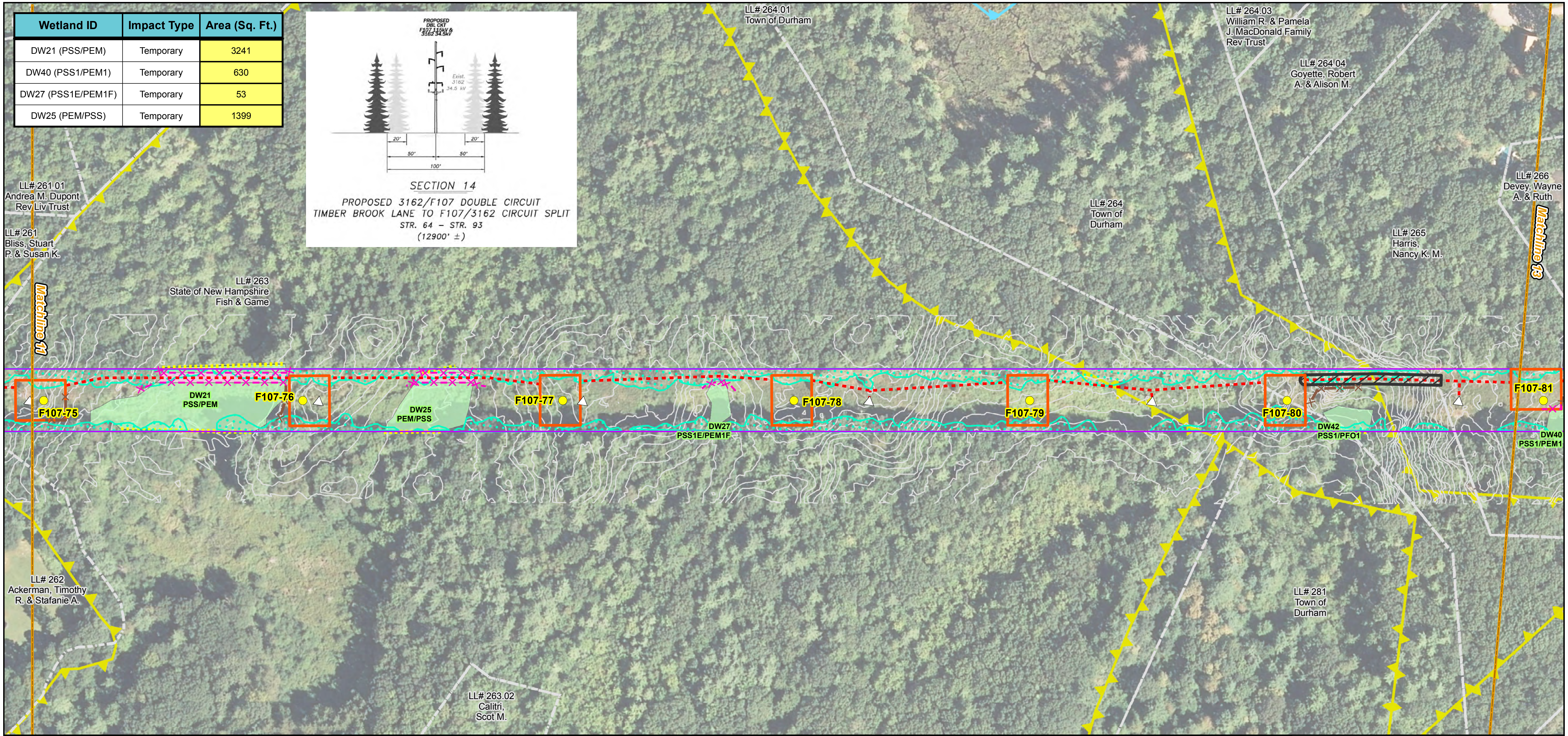
Wetland ID	Impact Type	Area (Sq. Ft.)
DW21 (PSS/PEM)	Temporary	3241
DW40 (PSS1/PEM1)	Temporary	630
DW27 (PSS1E/PEM1F)	Temporary	53
DW25 (PEM/PSS)	Temporary	1399



Legend

- Town Boundary
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- Project Corridor
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0 75 150 300 Feet
1 inch = 150 feet

Madbury, Dover, Maine, Durham, Newington, Newmarket, Portsmouth

Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES Environmental Consultants

Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE SARAH D. ALLEN No. 083 CERTIFIED WETLAND SCIENTIST
1/28/16

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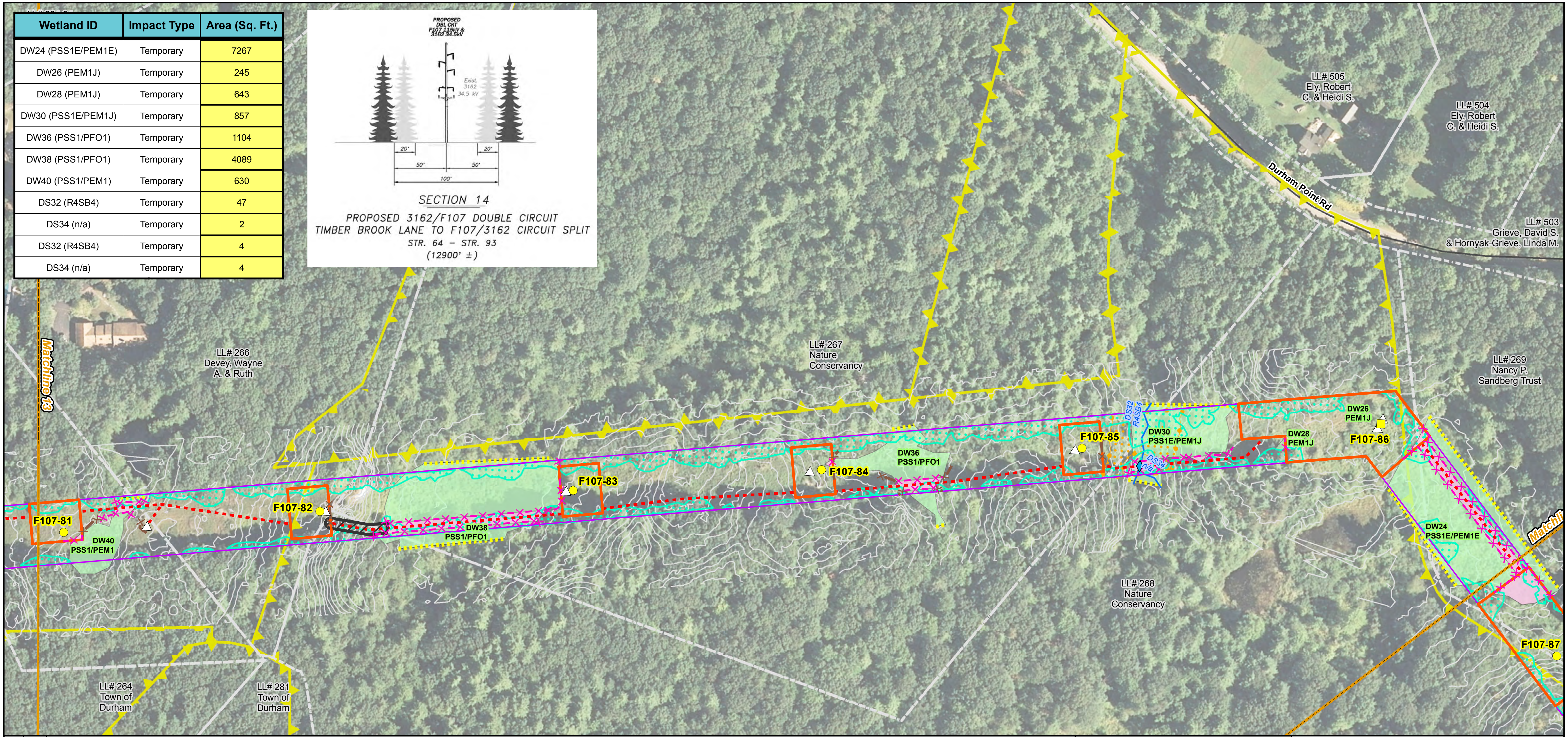
Wetland ID	Impact Type	Area (Sq. Ft.)
DW24 (PSS1E/PEM1E)	Temporary	7267
DW26 (PEM1J)	Temporary	245
DW28 (PEM1J)	Temporary	643
DW30 (PSS1E/PEM1J)	Temporary	857
DW36 (PSS1/PFO1)	Temporary	1104
DW38 (PSS1/PFO1)	Temporary	4089
DW40 (PSS1/PEM1)	Temporary	630
DS32 (R4SB4)	Temporary	47
DS34 (n/a)	Temporary	2
DS32 (R4SB4)	Temporary	4
DS34 (n/a)	Temporary	4



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
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Not Maintained
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0 75 150 300 Feet
1 inch = 150 feet

Madbury
Dover
Maine
Durham
Newington
Newmarket
Portsmouth

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Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

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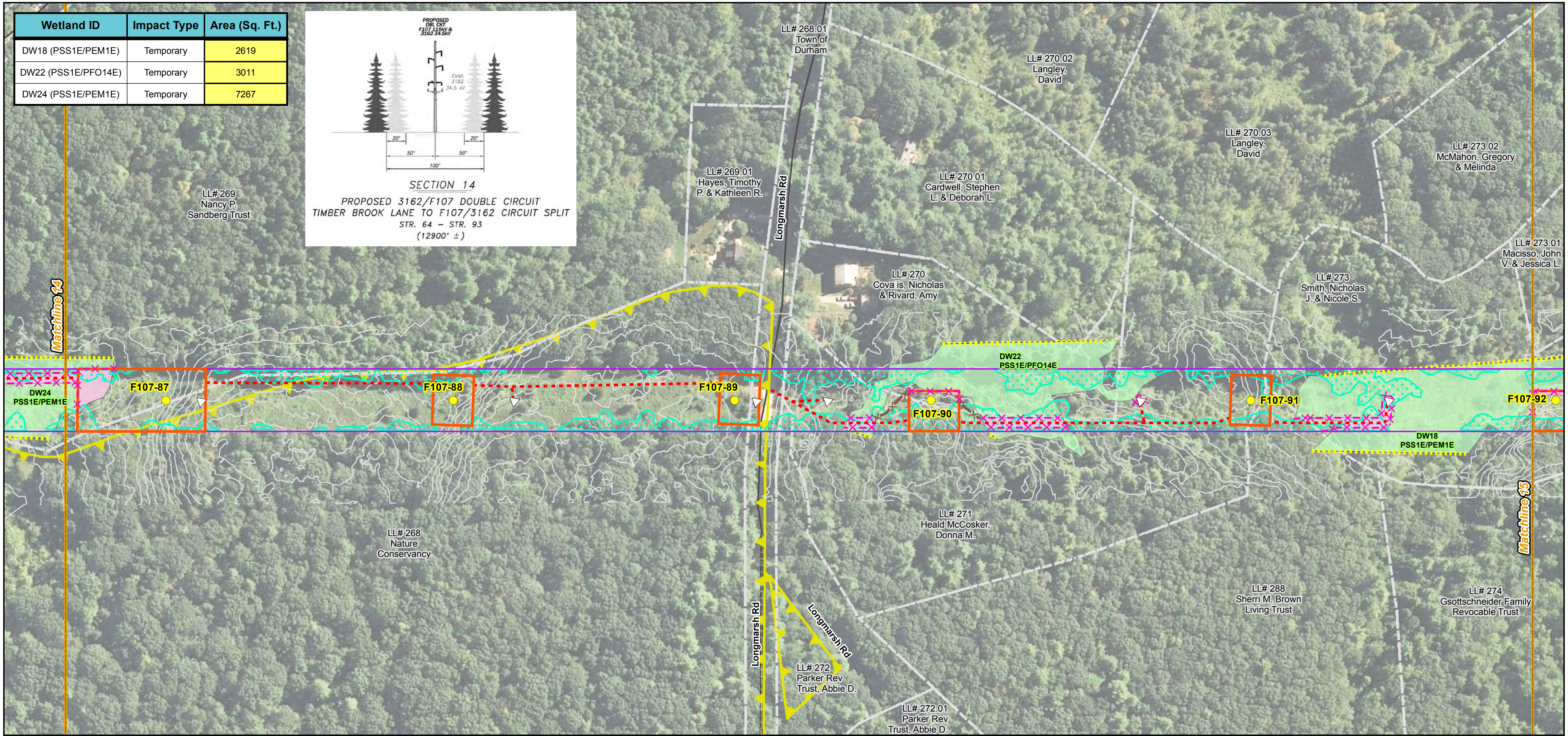
STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST
1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
DW18 (PSS1E/PEM1E)	Temporary	2619
DW22 (PSS1E/PFO14E)	Temporary	3011
DW24 (PSS1E/PEM1E)	Temporary	7267



Date : 2/25/2016

Drawn By: athompson

Project No: 22860.003

- Town Boundary
- Approximate Parcel Boundary
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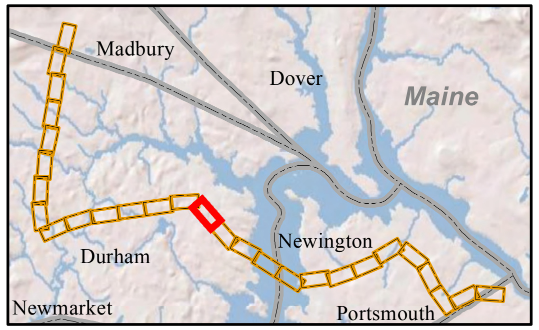
- Silt Fence, Hay Bale, Erosion Control Mix Berm
- Straw Wattle

- Wetland
- Prime Wetland
- Wetland Extends
- Wetlands Impact
- Stream Centerline
- Stream Top of Bank
- Temporary Culvert
- Temporary Mat Bridge
- Historical Sites

- Designated River Buffer 250'
- Conservation Lands
- 100 Year Floodplain
- Steep Slope BMPs
- Tree Clearing
- Stream Buffer
- 2ft Contour

0 75 150 300 Feet

1 inch = 150 feet



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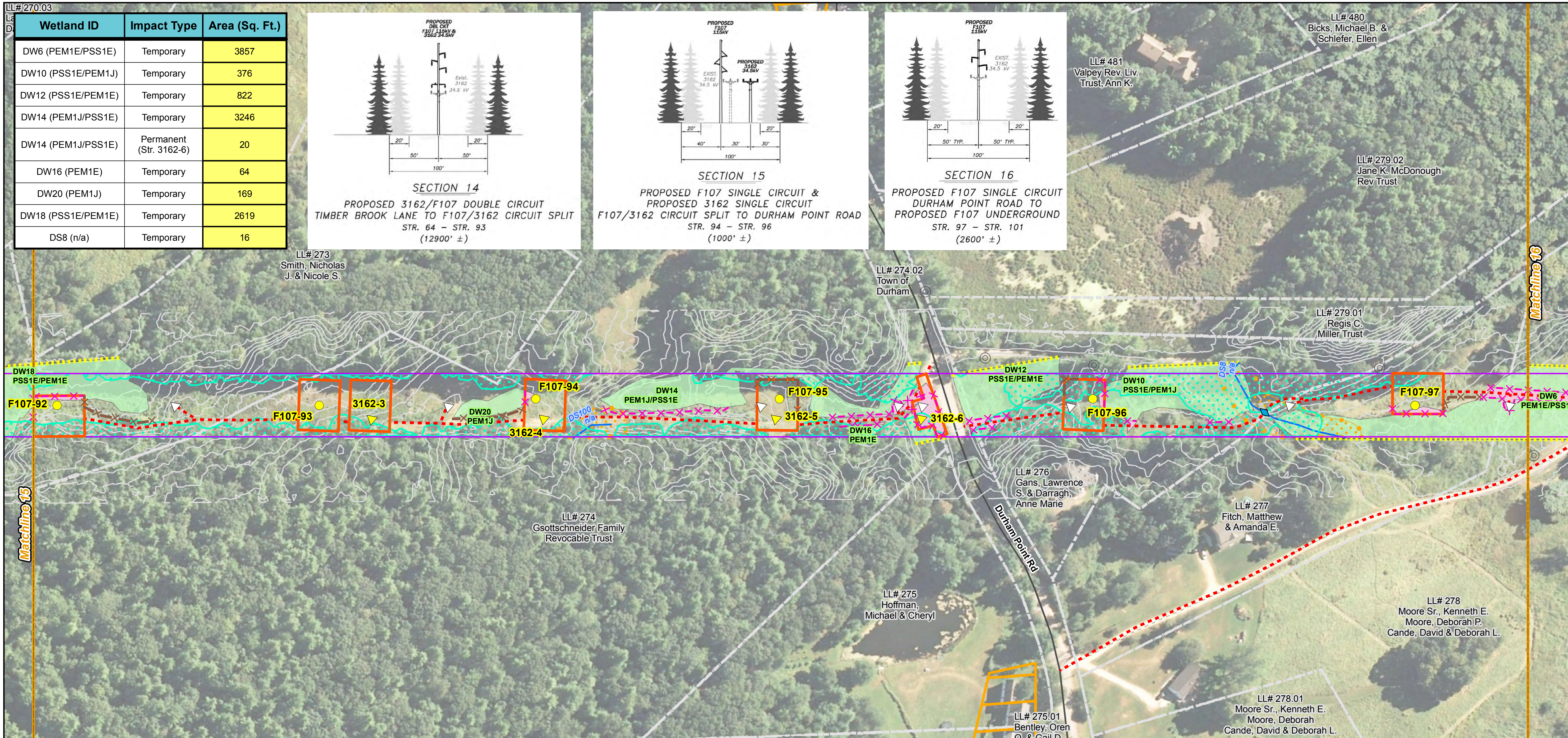
STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST

1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
DW6 (PEM1E/PSS1E)	Temporary	3857
DW10 (PSS1E/PEM1J)	Temporary	376
DW12 (PSS1E/PEM1E)	Temporary	822
DW14 (PEM1J/PSS1E)	Temporary	3246
DW14 (PEM1J/PSS1E)	Permanent (Str. 3162-6)	20
DW16 (PEM1E)	Temporary	64
DW20 (PEM1J)	Temporary	169
DW18 (PSS1E/PEM1E)	Temporary	2619
DS8 (n/a)	Temporary	16



Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

Legend

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
- Work Pad
- Roads
  - Local
  - Not Maintained
  - Private
  - State
  - Railroad
- Existing Str (Remain)
- Existing Str (Removed/Modified)
- Structures
  - Direct Embed
  - Drilled Pier
  - Relocated Distribution
- Access Roads
- Underground Cable
- Silt Curtain
- Silt Fence, Hay Bale, Erosion Control Mix Berm
- Straw Wattle
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- 2ft Contour

0 75 150 300 Feet
1 inch = 150 feet

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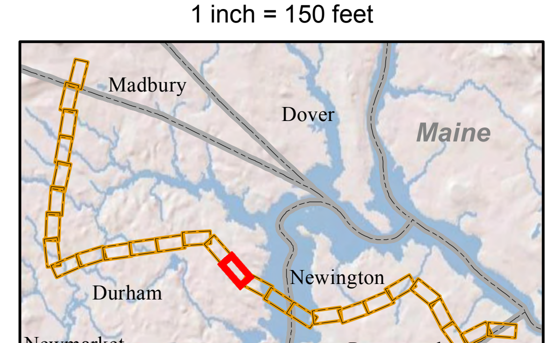

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SARAH D. ALLEN
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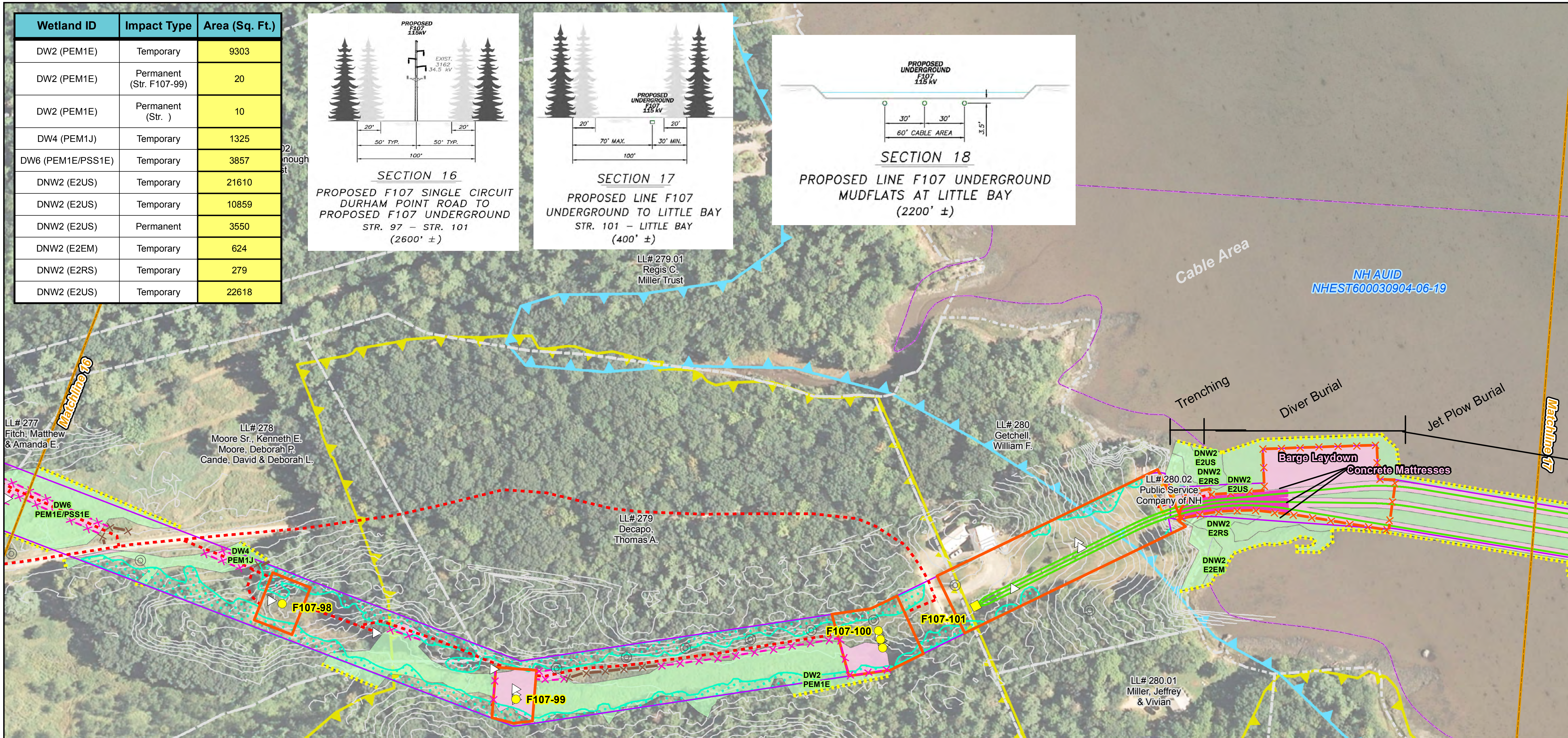
1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
DW2 (PEM1E)	Temporary	9303
DW2 (PEM1E)	Permanent (Str. F107-99)	20
DW2 (PEM1E)	Permanent (Str.)	10
DW4 (PEM1J)	Temporary	1325
DW6 (PEM1E/PSS1E)	Temporary	3857
DNW2 (E2US)	Temporary	21610
DNW2 (E2US)	Temporary	10859
DNW2 (E2US)	Permanent	3550
DNW2 (E2EM)	Temporary	624
DNW2 (E2RS)	Temporary	279
DNW2 (E2US)	Temporary	22618



Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

Legend

- Town Boundary
- Approximate Parcel Boundary
- PSNH Fee Area
- Project Corridor
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0 75 150 300 Feet
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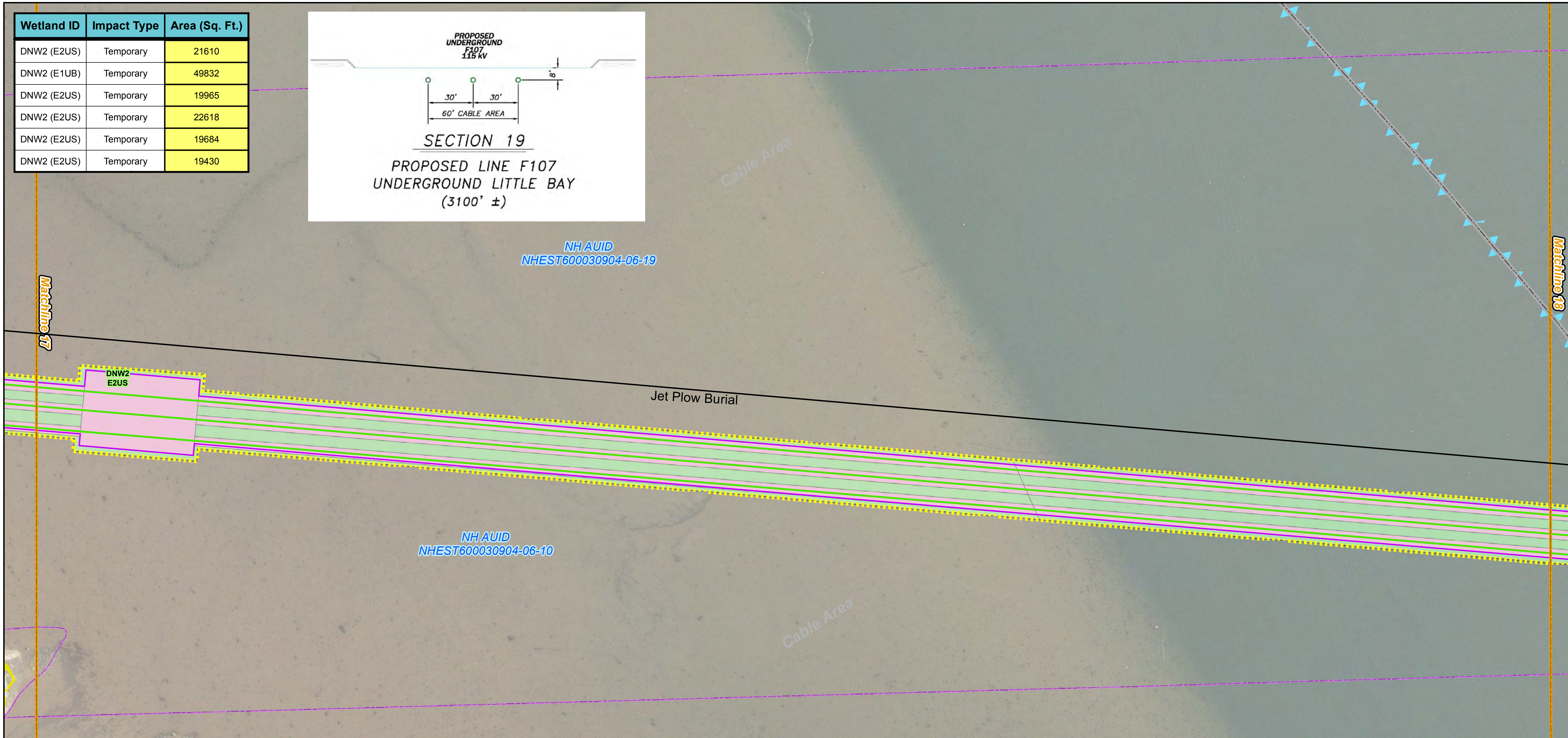
Wetland ID	Impact Type	Area (Sq. Ft.)
DNW2 (E2US)	Temporary	21610
DNW2 (E1UB)	Temporary	49832
DNW2 (E2US)	Temporary	19965
DNW2 (E2US)	Temporary	22618
DNW2 (E2US)	Temporary	19684
DNW2 (E2US)	Temporary	19430



Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad
Roads
Local
Not Maintained
Private
State
Railroad

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Existing Str (Removed/Modified)
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Wetlands Impact
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Temporary Mat Bridge
Historical Sites

Designated River Buffer 250'
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Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

0 75 150 300 Feet
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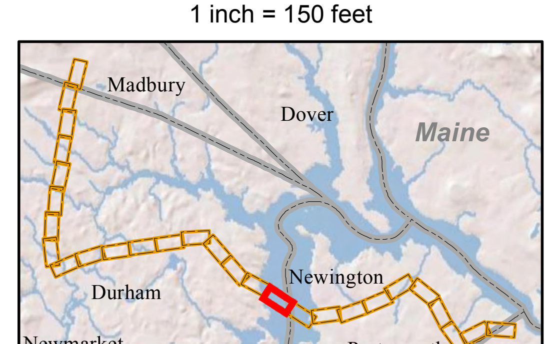

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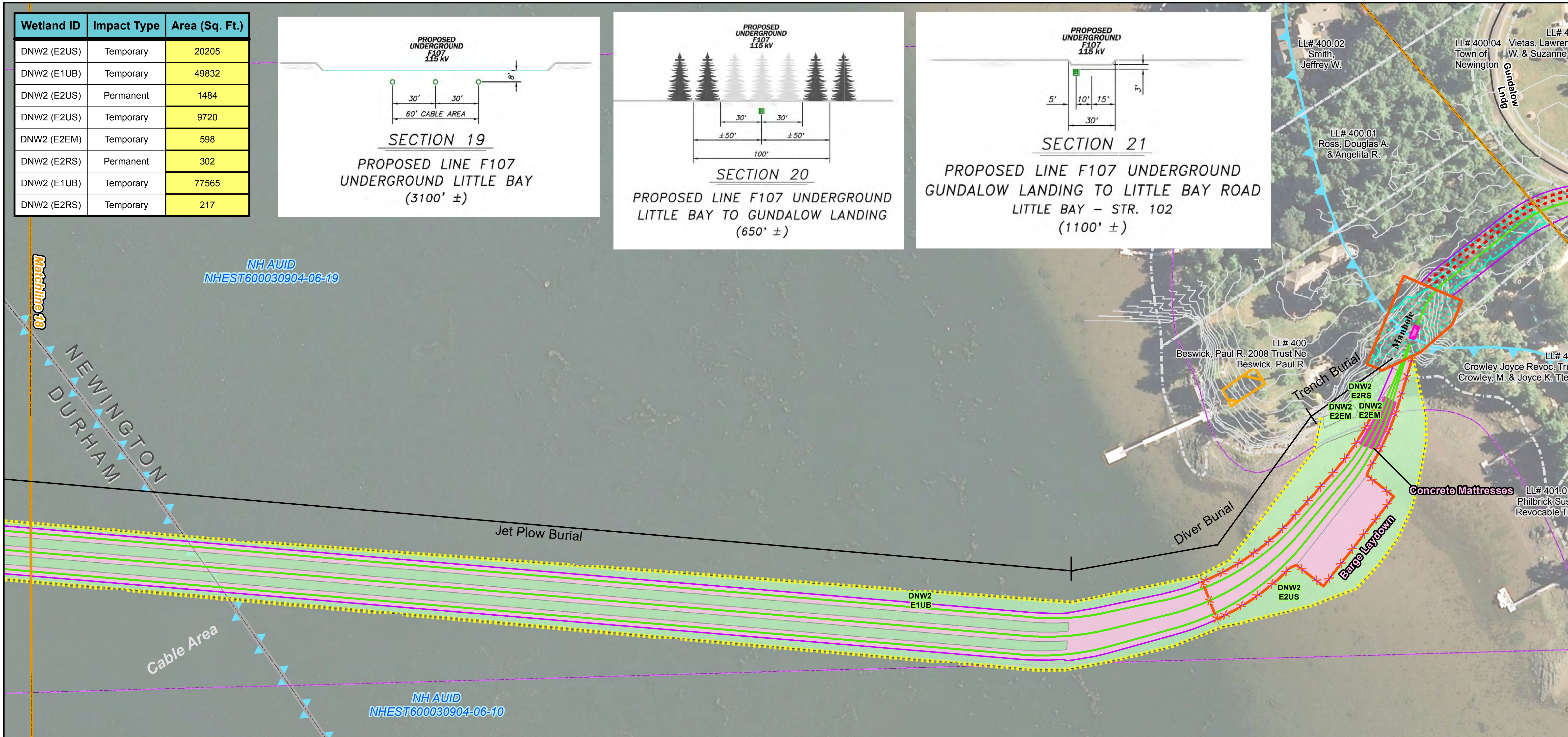
Wetland ID	Impact Type	Area (Sq. Ft.)
DNW2 (E2US)	Temporary	20205
DNW2 (E1UB)	Temporary	49832
DNW2 (E2US)	Permanent	1484
DNW2 (E2US)	Temporary	9720
DNW2 (E2EM)	Temporary	598
DNW2 (E2RS)	Permanent	302
DNW2 (E1UB)	Temporary	77565
DNW2 (E2RS)	Temporary	217



Date : 2/25/2016

Drawn By: athompson

Project No: 22860.003

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- Project Corridor
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- Structures
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  - Drilled Pier
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- Access Roads
- Underground Cable
- Silt Curtain
- Silt Fence, Hay Bale, Erosion Control Mix Berm
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- Wetland Extends
- Wetlands Impact
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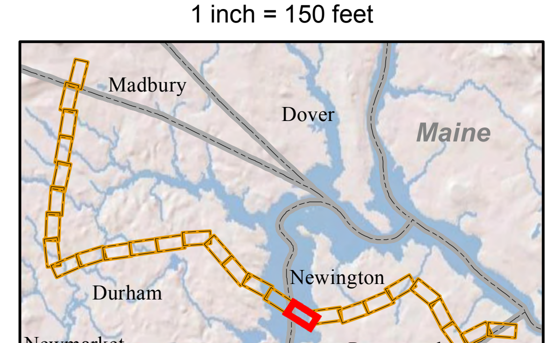
- Conservation Lands
- 100 Year Floodplain
- Steep Slope BMPs
- Tree Clearing
- Stream Buffer
- 2ft Contour

0 75 150 300 Feet

1 inch = 150 feet



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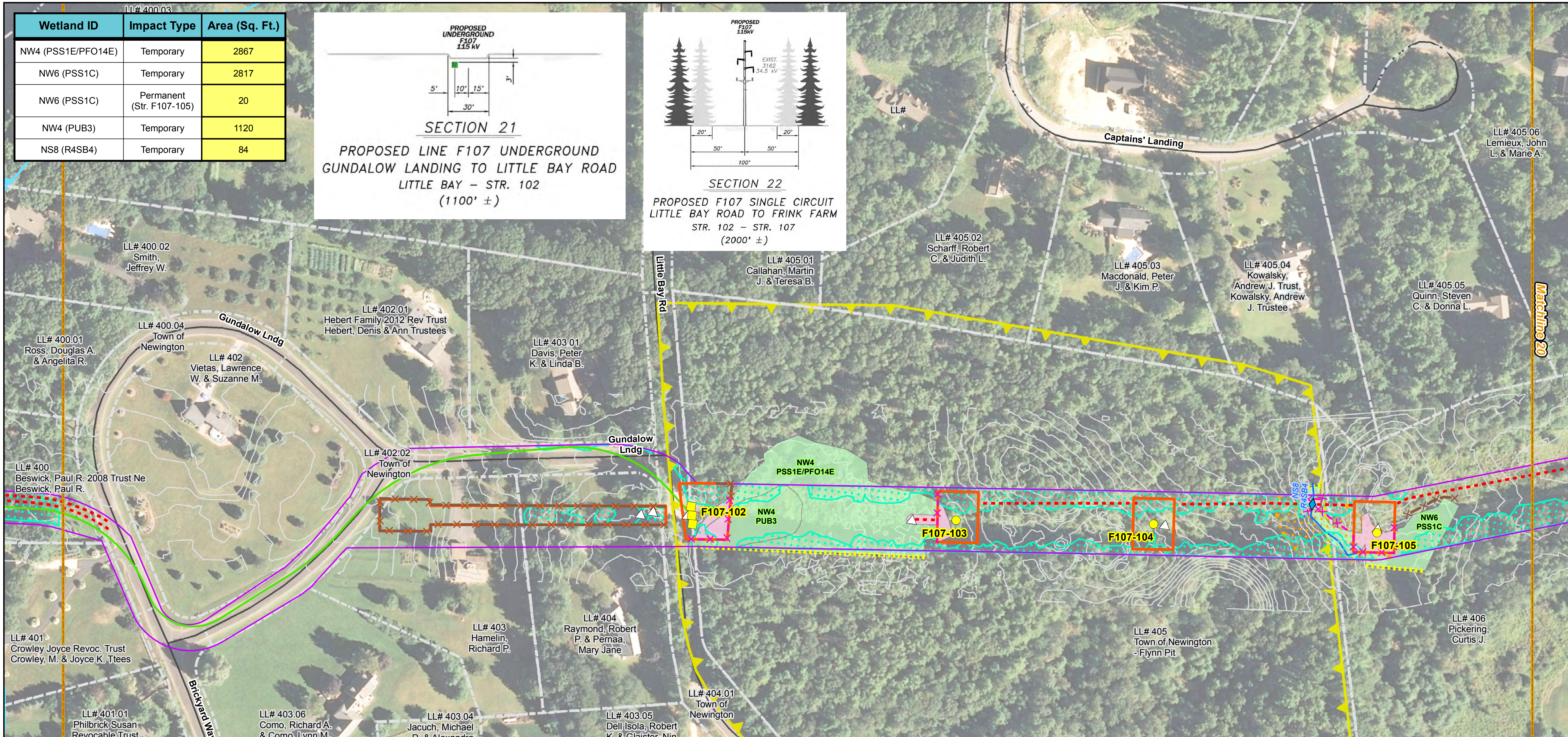
1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
NW4 (PSS1E/PFO14E)	Temporary	2867
NW6 (PSS1C)	Temporary	2817
NW6 (PSS1C)	Permanent (Str. F107-105)	20
NW4 (PUB3)	Temporary	1120
NS8 (R4SB4)	Temporary	84

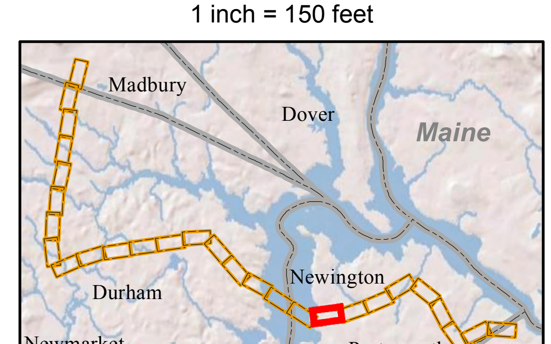


Town Boundary	Existing Str (Remain)	Wetland	Designated River Buffer 250'
Approximate Parcel Boundary	Existing Str (Removed/Modified)	Prime Wetland	Conservation Lands
PSNH Fee Area	**Structures**	Wetland Extends	100 Year Floodplain
Project Corridor	Direct Embed	Wetlands Impact	Steep Slope BMPs
Work Pad	Drilled Pier	Stream Centerline	Tree Clearing
Roads	Relocated Distribution	Stream Top of Bank	Stream Buffer
Local	Access Roads	Temporary Culvert	2ft Contour
Not Maintained	Underground Cable	Temporary Mat Bridge	
Private	Silt Curtain	Historical Sites	
State	Silt Fence, Hay Bale, Erosion Control Mix Berm		
Railroad	Straw Wattle		

0 75 150 300 Feet

1 inch = 150 feet

N W E S



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STATE OF NEW HAMPSHIRE SARAH D. ALLEN No. 083 CERTIFIED WETLAND SCIENTIST

1/28/16

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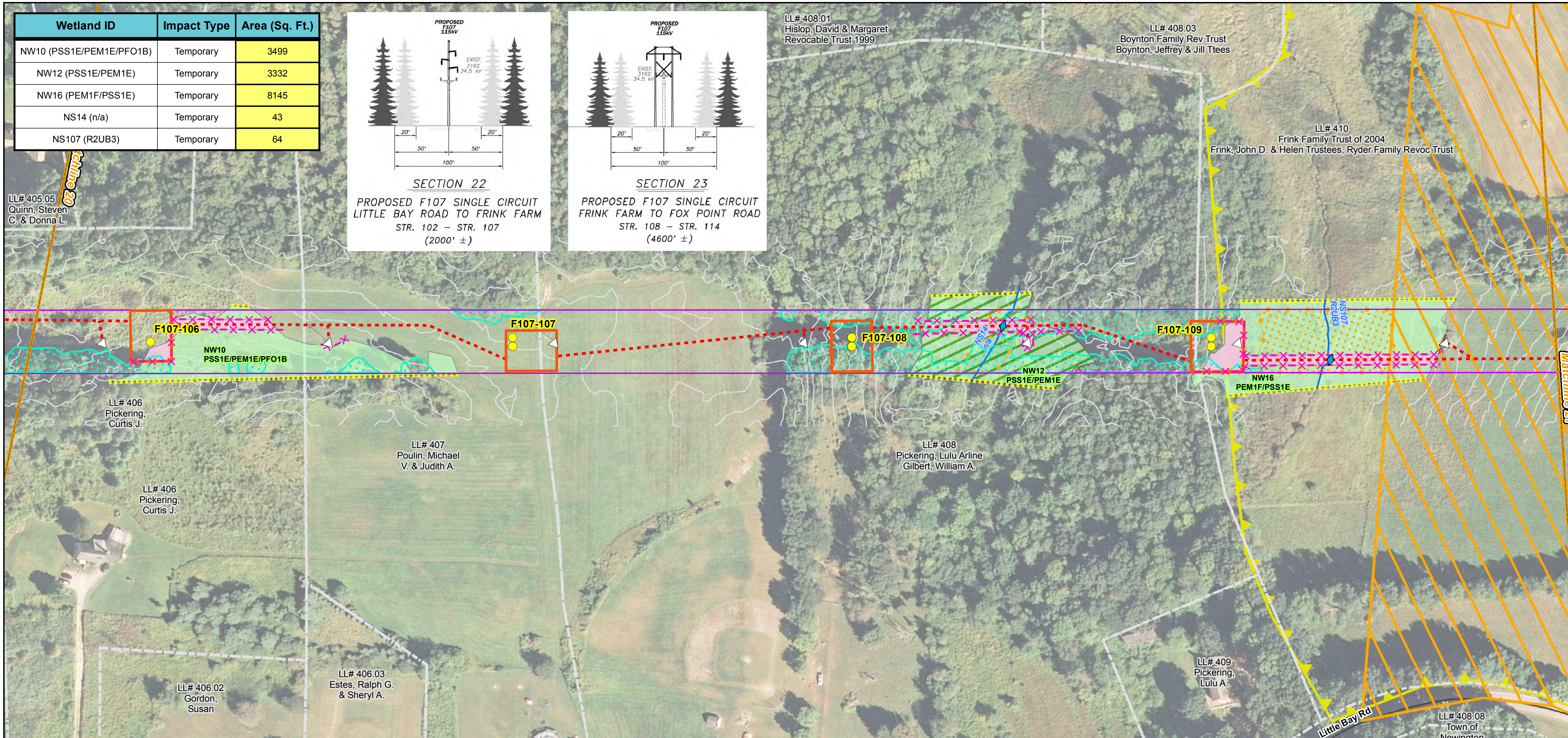
Wetland ID	Impact Type	Area (Sq. Ft.)
NW10 (PSS1E/PEM1E/PFO1B)	Temporary	3499
NW12 (PSS1E/PEM1E)	Temporary	3332
NW16 (PEM1F/PSS1E)	Temporary	8145
NS14 (n/a)	Temporary	43
NS107 (R2UB3)	Temporary	64



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

Roads
- Local
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- State
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Existing Str (Remain)
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Wetland Extends
Wetlands Impact
Stream Centerline
Stream Top of Bank
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Historical Sites

Designated River Buffer 250'
Conservation Lands
100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

0 75 150 300 Feet
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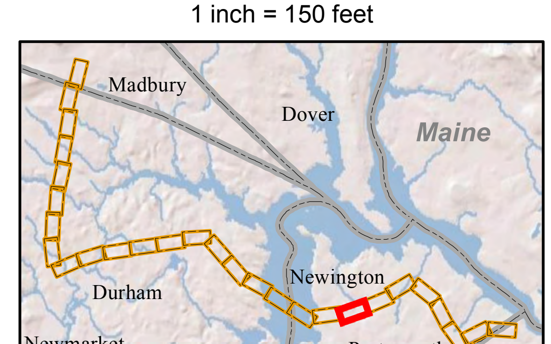

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STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
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1/28/16

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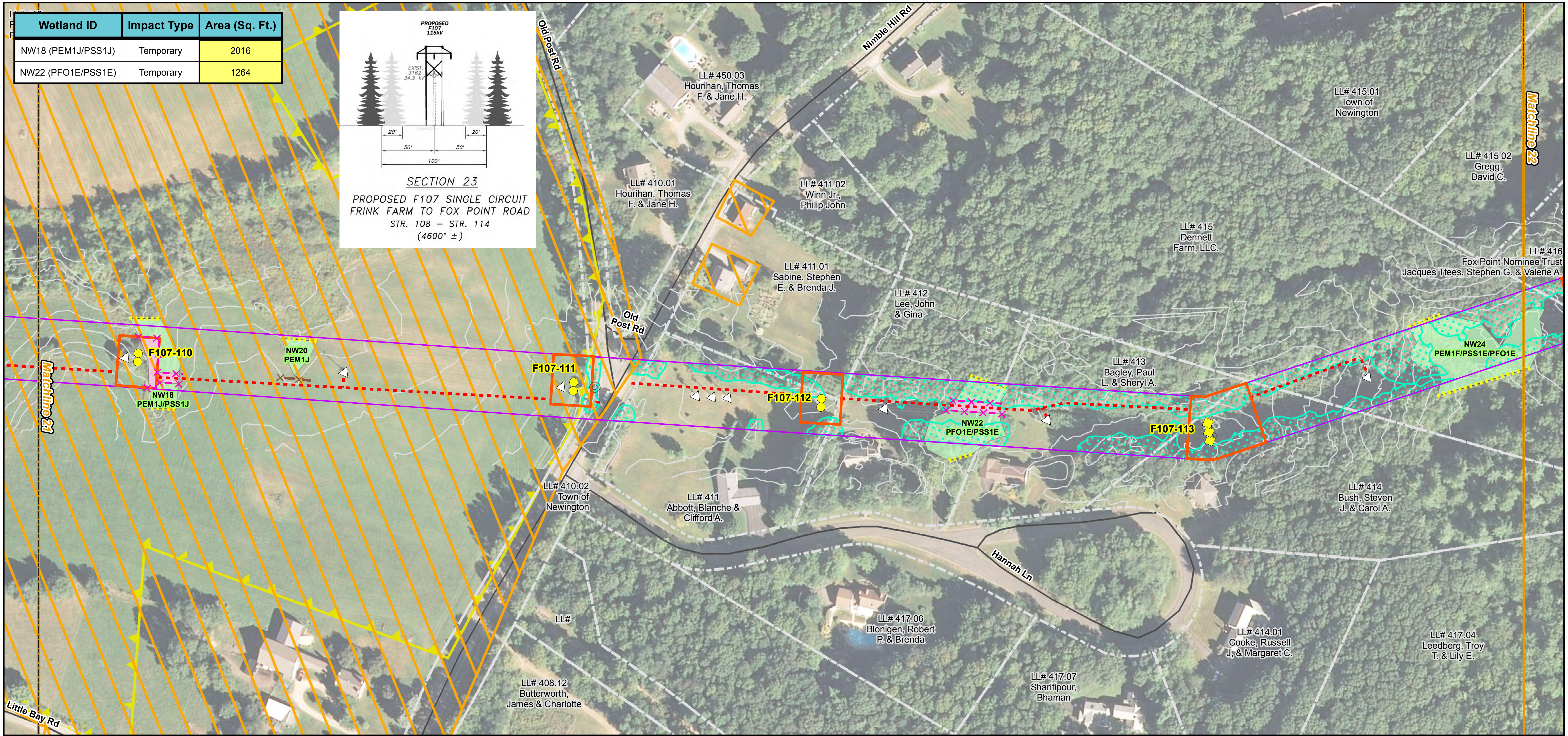
Wetland ID	Impact Type	Area (Sq. Ft.)
NW18 (PEM1J/PSS1J)	Temporary	2016
NW22 (PFO1E/PSS1E)	Temporary	1264



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad
Roads
Local
Not Maintained
Private
State
Railroad

Existing Str (Remain)
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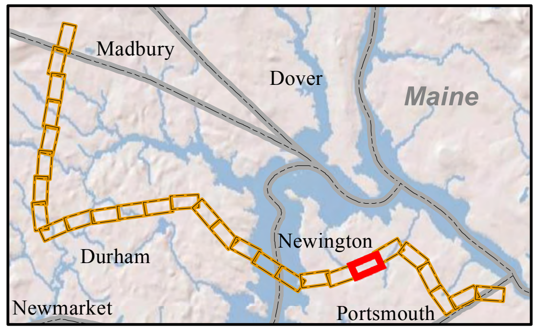
0 75 150 300 Feet
1 inch = 150 feet



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1/28/16

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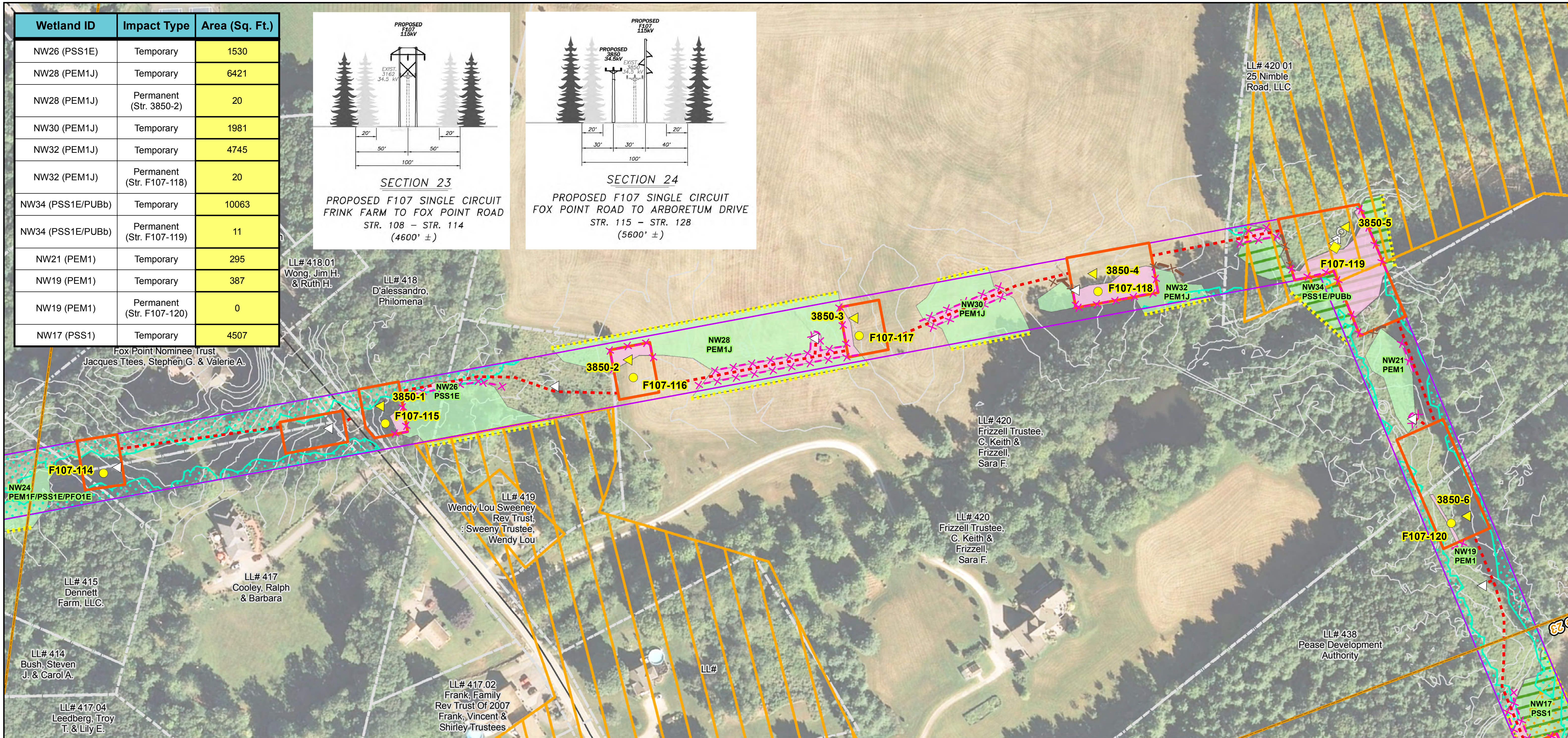
Wetland ID	Impact Type	Area (Sq. Ft.)
NW26 (PSS1E)	Temporary	1530
NW28 (PEM1J)	Temporary	6421
NW28 (PEM1J)	Permanent (Str. 3850-2)	20
NW30 (PEM1J)	Temporary	1981
NW32 (PEM1J)	Temporary	4745
NW32 (PEM1J)	Permanent (Str. F107-118)	20
NW34 (PSS1E/PUBb)	Temporary	10063
NW34 (PSS1E/PUBb)	Permanent (Str. F107-119)	11
NW21 (PEM1)	Temporary	295
NW19 (PEM1)	Temporary	387
NW19 (PEM1)	Permanent (Str. F107-120)	0
NW17 (PSS1)	Temporary	4507



Date : 2/25/2016

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Project No: 22860.003

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PSNH Fee Area
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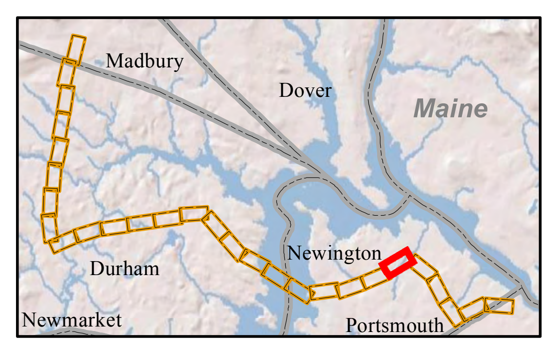

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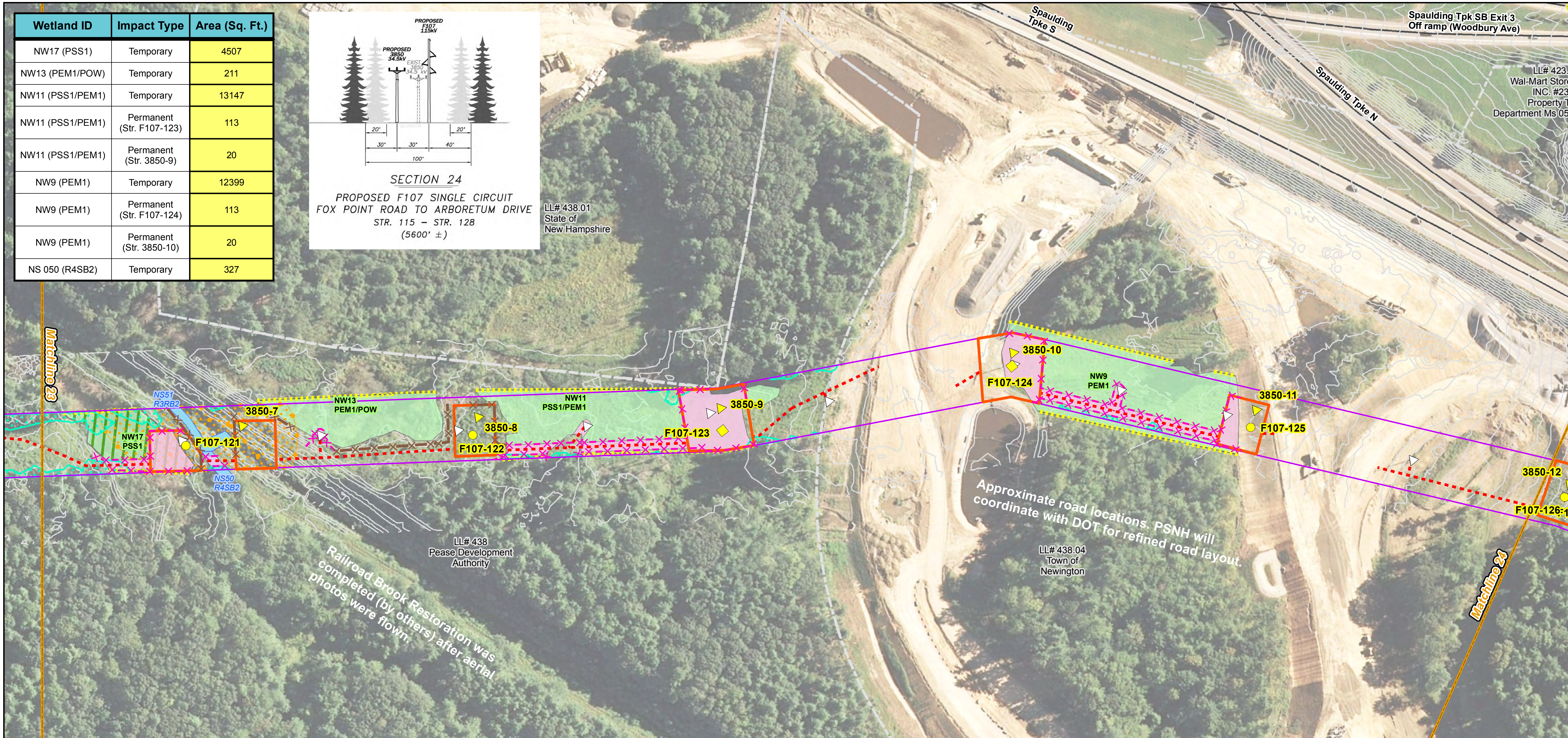
Wetland ID	Impact Type	Area (Sq. Ft.)
NW17 (PSS1)	Temporary	4507
NW13 (PEM1/POW)	Temporary	211
NW11 (PSS1/PEM1)	Temporary	13147
NW11 (PSS1/PEM1)	Permanent (Str. F107-123)	113
NW11 (PSS1/PEM1)	Permanent (Str. 3850-9)	20
NW9 (PEM1)	Temporary	12399
NW9 (PEM1)	Permanent (Str. F107-124)	113
NW9 (PEM1)	Permanent (Str. 3850-10)	20
NS 050 (R4SB2)	Temporary	327



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Madbury
Dover
Maine
Durham
Newington
Newmarket
Portsmouth

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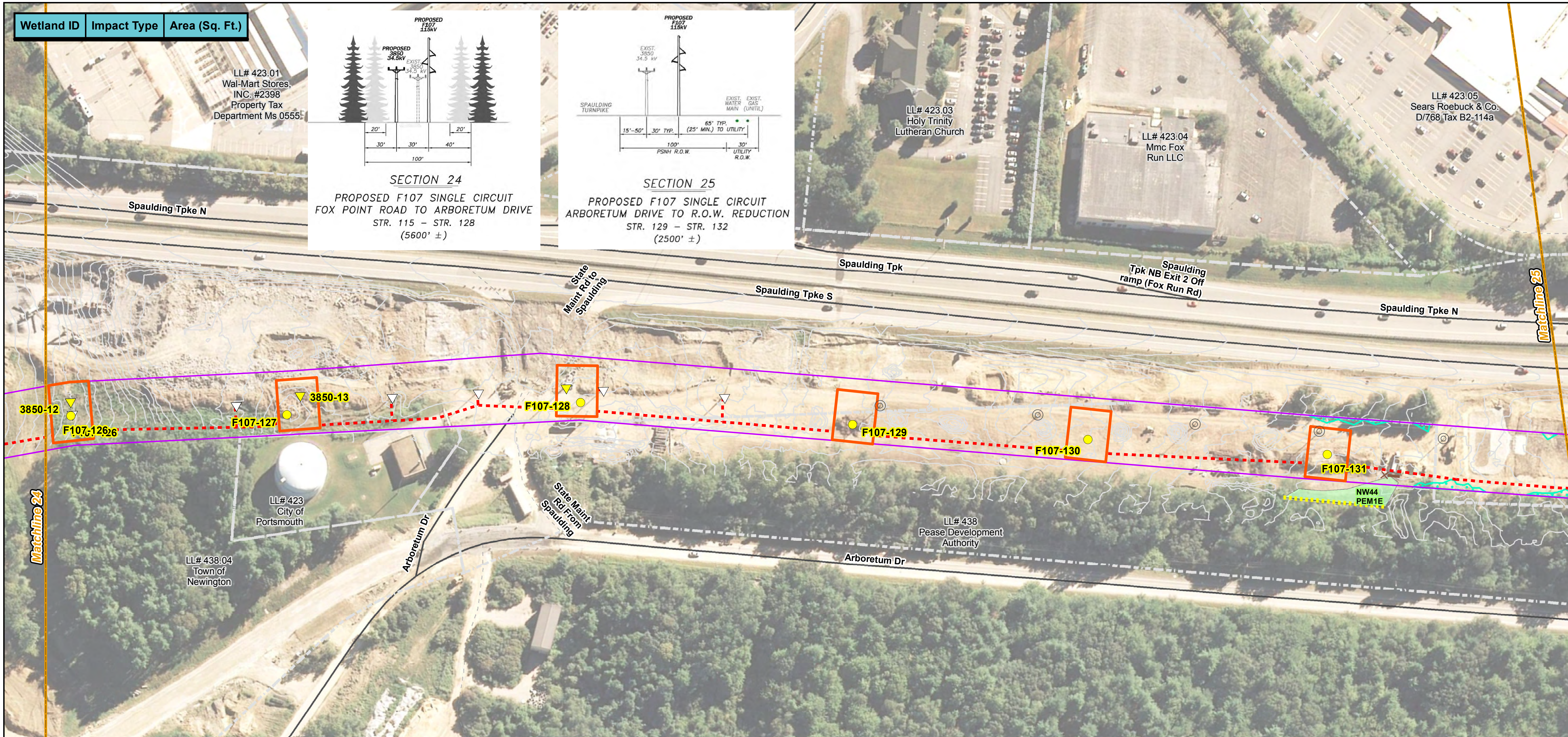

Town Boundary
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1 inch = 150 feet

Madbury, Dover, Maine, Durham, Newington, Newmarket, Portsmouth

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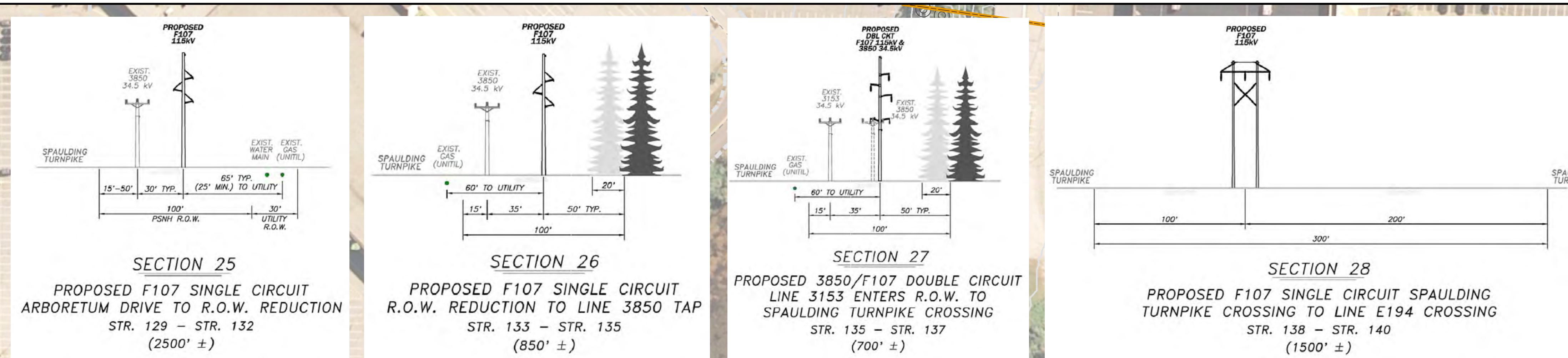
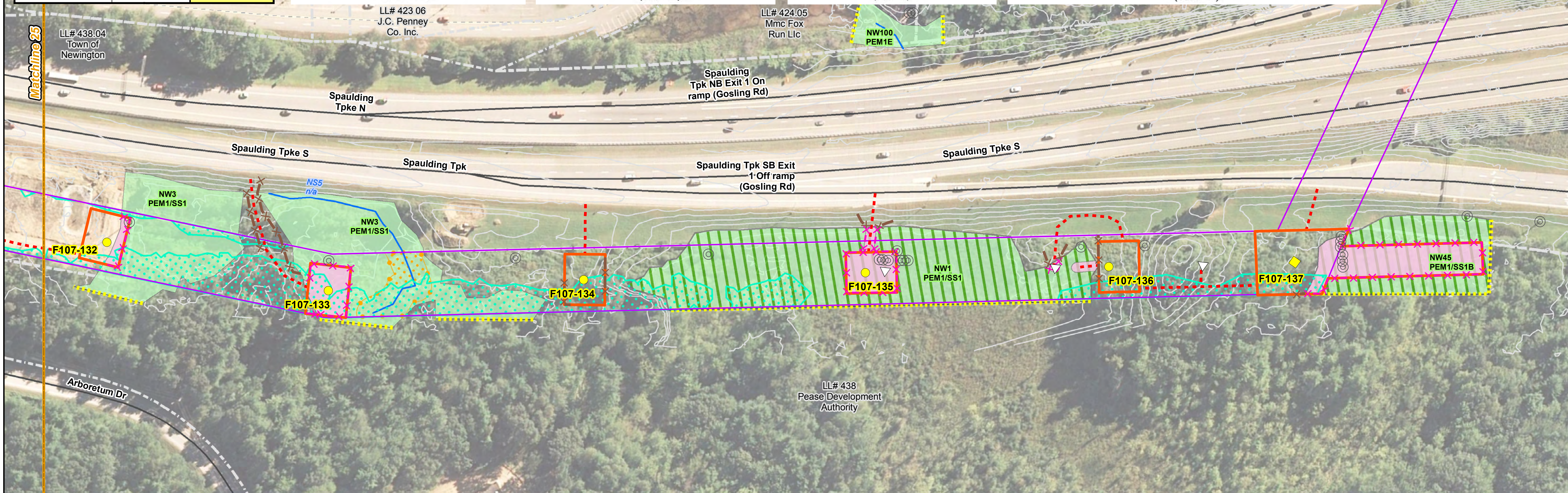
Wetland ID	Impact Type	Area (Sq. Ft.)
NW3 (PEM1/SS1)	Temporary	1256
NW1 (PEM1/SS1)	Temporary	6583
NW1 (PEM1/SS1)	Permanent (Str. F107-135)	20
NW45 (PEM1/SS1B)	Temporary	14112
NW43 (PEM1E)	Temporary	4101
NW43 (PEM1E)	Permanent (Str. F107-138)	0
NW3 (PEM1/SS1)	Temporary	4885
NW3 (PEM1/SS1)	Permanent (Str. F107-133)	20





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Structures
Direct Embed
Drilled Pier
Relocated Distribution
Access Roads
Underground Cable
Silt Curtain
Silt Fence, Hay Bale, Erosion Control Mix Berm
Straw Wattle

Wetland
Prime Wetland
Wetland Extends
Wetlands Impact
Stream Centerline
Stream Top of Bank
Temporary Culvert
Temporary Mat Bridge
Historical Sites

Designated River Buffer 250'
Conservation Lands
100 Year Floodplain
Steep Slope BMPs
Tree Clearing
Stream Buffer
2ft Contour

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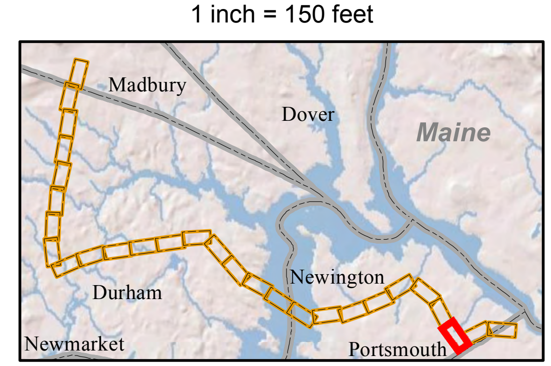
0 75 150 300 Feet

1 inch = 150 feet



EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES
Environmental Consultants

Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE
SARAH D. ALLEN
No. 083
CERTIFIED WETLAND SCIENTIST

1/28/16

Path: J:\Projects\PSNH_F107\MXD\SRP_MapSet_150ft_022516.mxd

Wetland ID	Impact Type	Area (Sq. Ft.)
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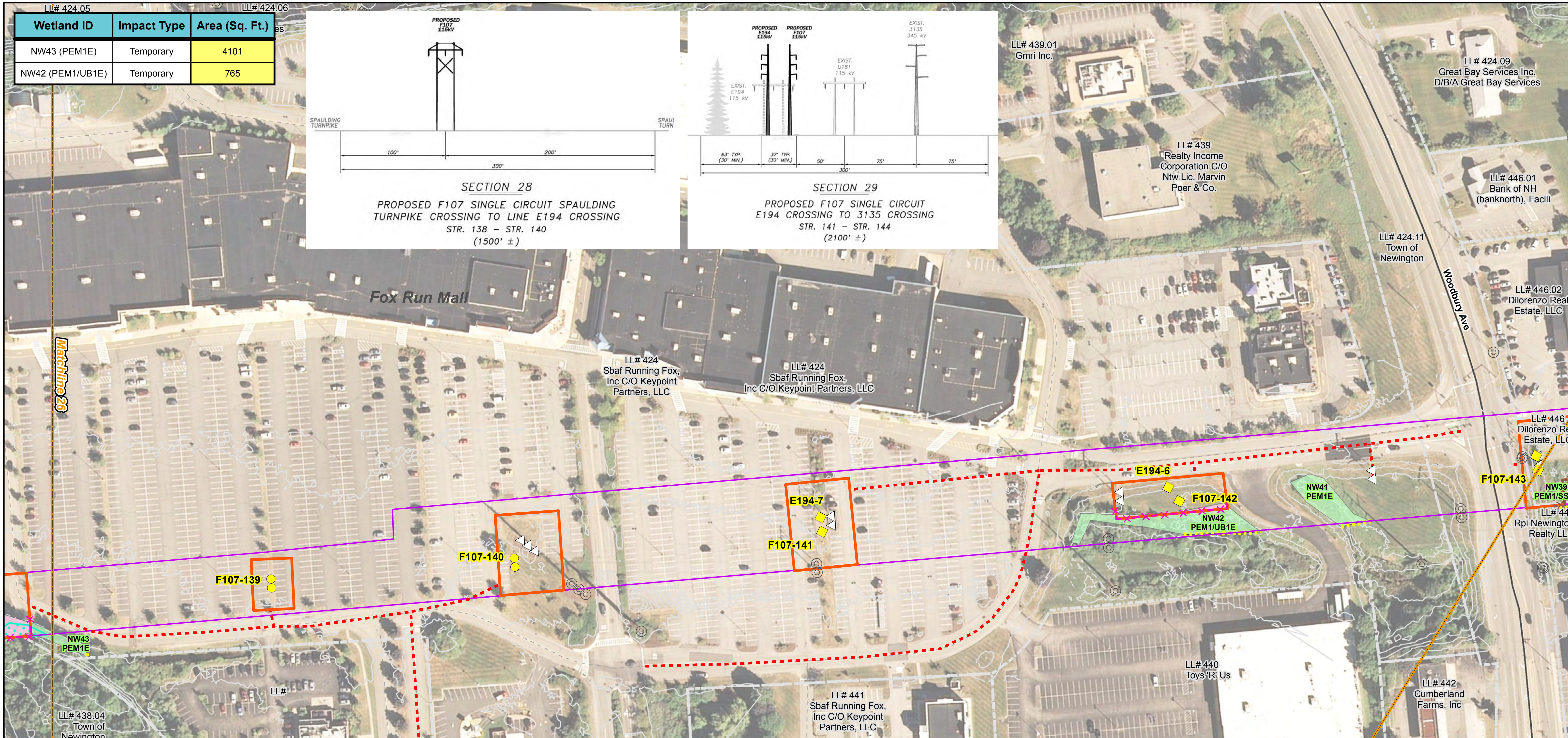
NW42 (PEM1/UB1E)	Temporary	765



Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad

Roads
- Local
- Not Maintained
- Private
- State
- Railroad

Existing Str (Remain)
Existing Str (Removed/Modified)

Structures
- Direct Embed
- Drilled Pier
- Relocated Distribution

Access Roads
Underground Cable
Silt Curtain
Silt Fence, Hay Bale, Erosion Control Mix Berm
Straw Wattle

Wetland
Prime Wetland
Wetland Extends
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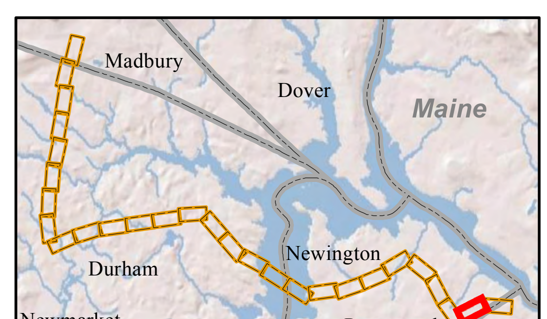

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Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

EVERSOURCE ENERGY

Seacoast Reliability Project

Environmental Maps

NORMANDEAU ASSOCIATES
Environmental Consultants

State of New Hampshire
Sarah D. Allen
No. 083
Certified Wetland Scientist
1/28/16

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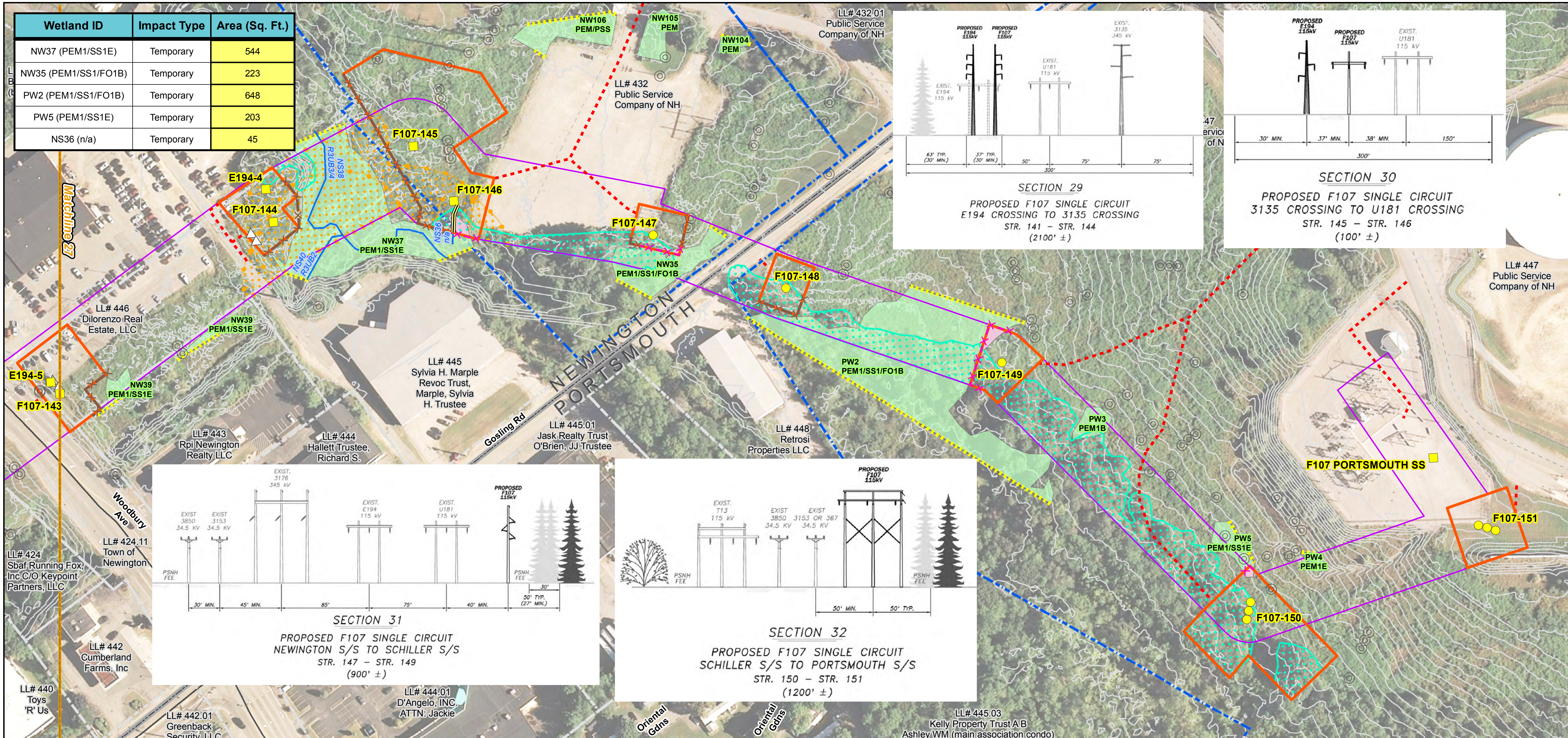
Wetland ID	Impact Type	Area (Sq. Ft.)
NW37 (PEM1/SS1E)	Temporary	544
NW35 (PEM1/SS1/FO1B)	Temporary	223
PW2 (PEM1/SS1/FO1B)	Temporary	648
PW5 (PEM1/SS1E)	Temporary	203
NS36 (n/a)	Temporary	45



Legend

Town Boundary
Approximate Parcel Boundary
PSNH Fee Area
Project Corridor
Work Pad
Roads
Local
Not Maintained
Private
State
Railroad

Existing Str (Remain)
Existing Str (Removed/Modified)
Structures
Direct Embed
Drilled Pier
Relocated Distribution
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Date : 2/25/2016
Drawn By: athompson
Project No: 22860.003

EVERSOURCE ENERGY

NORMANDEAU ASSOCIATES Environmental Consultants

Seacoast Reliability Project

Environmental Maps

STATE OF NEW HAMPSHIRE SARAH D. ALLEN No. 083 CERTIFIED WETLAND SCIENTIST

1/28/16

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17 Appendices

Appendix A: Natural Resource Existing Condition Report

Public Service of New Hampshire
Seacoast Reliability Project

Madbury, Durham, Newington & Portsmouth, NH

Natural Resource Existing Conditions Report

Prepared For:
Public Service Company of New Hampshire
d/b/a Eversource Energy
780 North Commercial Street
Manchester, NH 03101

Submitted:
March 2016

Prepared By:
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25 Nashua Road
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Executive Summary

Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH") is proposing to construct a new 115 kilovolt ("kV") transmission line between the existing Madbury and Portsmouth substations. The Seacoast Reliability Project ("SRP") would be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. The 12.9-mile long project would begin at the existing PSNH Madbury Substation in Madbury, traversing Durham, crossing Little Bay via an underwater cable into Newington, and then continuing east before ending in Portsmouth. The terrestrial portions of the project lie almost entirely within an existing electric utility corridor, and the submarine portions of the project are proposed within a mapped cable corridor across Little Bay. Natural resources, including wetlands, streams, vernal pools, estuarine resources, soils and wildlife, were identified in the approximately 152-acre Project Area. This report summarizes the methodology used in the surveys, and describes the existing natural resources along the proposed SRP corridor.

Streams, Rivers and Ponds

The majority of the streams identified in the Project Area are perennial or intermittent (81%), which is consistent with the flat topography and low elevation of the site. Eighteen perennial streams were mapped; the most notable being the Oyster River which is a designated river under the New Hampshire Rivers Management and Protection Program ("RMPP")(RSA 483). As a designated river, the Oyster River is subject to the protections afforded by the New Hampshire Shoreland Water Quality Protection Act ("SWQPA"). The SRP corridor crosses through a small portion of the Lamprey River Watershed which is also designated; however it does not cross the Lamprey River, or any of the tributaries cited in the watershed designation description (North Branch, North, Little, Pawtuckaway, or Piscassic Rivers). The only other water resource protected under the SWQPA is Little Bay, which the Project will cross via underwater cable.

Wetlands

Wetlands were delineated in 2013, 2014 and 2015 with a total of 114 wetlands identified within the SRP corridor. Approximately 77 percent (by area) of the delineated wetlands were palustrine (freshwater) systems, while the remaining 23 percent were estuarine. Due to the routine vegetation maintenance activities associated with the existing electric lines, the majority of the terrestrial wetlands were a combination of palustrine emergent and scrub-shrub systems (49%) or palustrine emergent (17%) wetlands. The remaining palustrine wetlands were different combinations of emergent, scrub-shrub, forested and unconsolidated bottom. A fringing salt marsh borders the west shore and portions of the east shore of Little Bay. Other estuarine wetlands include rocky shore, mudflat and subtidal unconsolidated sands and mud associated with Little Bay. Many of the wetlands were parts of larger wetland systems that included the SRP corridor, and many were disturbed to some extent due to development and other ongoing activities. In the freshwater wetlands, the most common principal functions and values identified across the study area include groundwater recharge/discharge, wildlife habitat, production export, sediment retention, and floodflow alteration. Five of the wetlands are sections of three prime wetlands mapped in the Town of Newington.

Vernal Pools

Some of the water resource surveys were conducted outside of the vernal pool identification window, which typically occurs in April and May along the coastal plain of New Hampshire. During the initial wetland and stream delineation in the summer and fall of 2013, two potential vernal pools ("PVPs") were identified. A follow-up survey was conducted in the spring of 2014 to identify any other active vernal pools and verify the previously identified PVPs. Another vernal pool review was conducted in the spring of 2015 and resulted in one area that contained a primary vernal pool indicator (wood frogs) utilizing a permanently inundated pond within a larger wetland complex. The pond did not meet the definition of a vernal pool. Based on the 2014 and 2015 spring surveys, no vernal pools occur within the Project Area.

Little Bay Bathymetry and Substrate

The SRP crosses Little Bay north of Adams Point and Furber Strait into Newington north of Welsh Cove within an area denoted as Cable Area on the National Oceanic and Atmospheric Administration ("NOAA") navigation chart 13285. A broad tidal flat with depths ranging from about +1 to -1 feet Mean Lower Low Water ("MLLW") extends from the western shoreline approximately 1800 feet. At this point water depths increase gradually (over a distance of about 800 feet) to ~30 feet below MLLW. Water depth remains deep for about 400 feet, gradually decreasing to about 17 feet below MLLW and then more abruptly to 0 feet MLLW. The tidal flat on the eastern shoreline into northern Welsh Cove is about 500 feet wide.

Sediment surveys by PSNH and by others were consistent in showing that the substrate on the western tidal flat was predominantly silt-clay and in the channel and eastern channel slope was predominantly sand. Values for samples within Little Bay (by others) indicated that total organic carbon ranged from 0.55 to 2.35 percent, averaging 1.4 percent, a relatively low value. Sediment toxicity testing by others revealed no significant mortality among test benthic organisms. Based on these data, USEPA (2007) characterized sediment quality in Little Bay as good. Trowbridge (2009) noted that although sediment contaminant levels in tributaries to the Great Bay/Little Bay system often exceeded NOAA screening levels, the concentrations within the bays themselves did not. It is unlikely that this has changed since the last assessment. Sediment contamination was not considered as a factor affecting the estuary in Piscataqua Region Estuary Program's 2013 State of the Estuary report.

Little Bay Water Quality

NOAA's National Estuarine Eutrophication Assessment program has designated all of Little Bay as part of the Seawater Zone of the Great Bay Estuary system, with salinities exceeding 25 parts per thousand (ppt). In Great Bay, estimates of water temperature from April 2009 through September 2014, ranged from -2 to 29.1°C (28.4 to 84.4°F), with July having the highest monthly mean temperature (24°C; 75.2°F). Dissolved oxygen ("DO") levels ranged from 3.7 to 17.4 mg/l during April 2009 through September 2014, with the lowest monthly mean DO in July (7.5 mg/l).

Several studies have found that total suspended solids off Adams Point located south of the project area were statistically higher during the period from 2001-2008 than during 1974-1981. This increase was linked to decreases in eelgrass, whose root and rhizome system stabilizes sediments and helps sequester nutrients in the substrate. Total suspended solids concentrations vary widely both seasonally and tidally.

Eelgrass and Macroalgae

Eelgrass is the most widespread aquatic vegetation in the Great Bay Estuary, of which Little Bay is part. Eelgrass provides significant habitat functions and values both biologically and physically. It is important for cover, nursery and breeding grounds for invertebrates and fish, sediment stability, and nutrient and carbon retention. Eelgrass distribution in Little Bay has varied tremendously over decades. In the Project Area, it has varied from thick beds in the 1980s to sparse or absent in more recent years. Project specific surveys did not observe any attached eelgrass within the survey areas.

Most macroalgae require hard substrate for attachment so their presence is restricted in Little Bay to nearshore areas where bedrock outcrops, cobble, or boulders are present. Substrate in the Cable Area is predominantly unconsolidated fine granular sediment however limited areas of rock outcrops occur along both shorelines where the macroalgae was observed.

Shellfish

The Great Bay estuary system supports populations of several shellfish species of interest to harvesters, including oysters (*Crassostrea virginica* and *Ostrea edulis*), softshell clams (*Mya arenaria*), blue mussels (*Mytilus edulis*), razor clams (*Ensis directus*), and sea scallops (*Placopecten magellanicus*). Recreational harvesting of oysters and softshell clams is allowed in specified areas in the estuary but the proposed SRP lies within a Cable Area mapped on NOAA chart 13285 and is permanently closed to harvest. Major natural oyster beds have not been documented in Little Bay in recent years; the closest beds to the Cable Area are at Adams Point (about 0.75 mile south of the Cable Area) and Nannie Island (off of Woodman Point; about 1.75 mile south of the Cable Area). Small populations of oysters are likely to be present on some rocky surfaces in Little Bay. New Hampshire Department of Environmental Services ("NHDES") is also encouraging oyster aquaculture in the estuary. Existing aquaculture operations include an aquaculture lease that falls partially within the Cable Area; NHDES may move this lease to the north to avoid the non-harvestable Cable Area. New Hampshire Department of Fish and Game ("NHFG") considers the western tidal flats of Little Bay to provide suitable habitat for softshell clams, razor clams, and the non-harvested *Macoma balthica*. Normandeau's field surveys on the western flats identified softshell clams at nine of fifteen stations and live razor clams were identified at two. Razor clam shells were noted in several locations. No live *Macoma* were observed although shells were present. These results confirm that these resources are present within the Cable Area.

Benthic Infauna

Benthic infauna are the macro- and micro-organisms that reside in the sediments of tidal and intertidal systems. In the Project Area, infaunal abundance was generally highest at the stations on the western tidal flat, most variable in the channel, and most consistent along the channel slope. The total number of unique taxa was most consistent on the tidal flat and most variable among the stations in the channel and along the channel slope.

Results of the project-specific survey compare well to data collected between 2000 and 2006 for the National Coastal Condition Assessment ("NCCA") program. Most taxa that were numerical dominants in the NCCA samples were also dominants in the Project Area. A study of infauna in the Great Bay estuary reported that species richness and dominant species (including *Streblospio*, *Heteromastus*, *Scoloplos*, *Pygospio*, *Aricidea*, and oligochaetes, many of the dominants in the Project Area) were similar over a twenty-year period (1972-1995) indicating that the benthic infaunal community in the estuary was been relatively stable in composition for those three decades. The National Estuary Program rated benthic conditions in Little Bay as good based on the fact that Shannon-Weiner diversity at all of the stations within the bay itself (excluding tributaries) exceeded 0.63, a condition that was also met in the project-specific data collected in 2014.

Epibenthos

Epibenthic organisms that live and feed on the substrate surface and are known to, or are likely to, occur in the Great Bay Estuary include American lobster (*Homarus americanus*), rock crabs (*Cancer irroratus*), green crabs (*Carcinus maenas*), mud crabs (Xanthidae) and horseshoe crabs (*Limulus polyphemus*) (Jones 2000). These species move around on and burrow into the substrate seeking food or refuge. Bioturbation caused by these activities can have a substantial effect on the infaunal biota and on eelgrass beds. Lobsters are present throughout the estuary and are fished both commercially and recreationally, although no landings or distribution data are available for the estuary. Lobsters move in and out of the estuary seasonally, with their greatest presence during late spring through fall.

Horseshoe crabs are ecologically important because their eggs, laid intertidally, provide a rich food source for migrating shorebirds in the spring. In addition, the crabs forage in muddy substrates for food and by doing so, bioengineer the substrate. Studies have not identified breeding habitat in the immediate vicinity of the Project. Juveniles are most apt to reside in the upper regions of Great Bay, with none being observed in Little Bay. Mudflats throughout the Great Bay Estuary are important feeding habitats for both adult and juvenile horseshoe crabs.

Rock crabs have been reported from the Great Bay system and may occur in deeper portions of the proposed cable crossing as this species prefers sandy substrate (Jeffries 1966). Rock crabs are fished commercially and recreationally to some degree. NHFG has found green crabs, an invasive species, to be the most abundant invertebrate species collected in New Hampshire's estuaries (NHFG 2014c). Green crabs have been shown to consume juvenile softshell clams, contributing to the failed recruitment to harvestable sizes and to uproot eelgrass plants, particularly in restoration areas. Abundances of rock and green crabs in Great Bay are not readily available; results of the NHFG surveys are reported as total Great Bay, Little Bay, Piscataqua River, Little Harbor and Hampton/Seabrook Estuary combined (NHFG 2014c). Jones (2000), however, noted that rock crabs are abundant in Great Bay and that green crabs are more common in Little Bay than in Great Bay.

Fish

A number of fish species are known to utilize the Great Bay Estuary during at least one life stage. The NHFG and National Marine Fisheries Service are tasked with management of ecologically and economically important fish species including, diadromous fish species, Essential Fish Habitat ("EFH") species, and rare, threatened, or endangered ("RTE") species. Diadromous fish species either spend their life in saltwater and spawn in freshwater (anadromous) or spend their life in freshwater and spawn in the ocean (catadromous), and are discussed below. EFH (SEC Appendix 38) and RTE (SEC Appendix 37, NHDES Wetlands Application Appendix C) fish species are also summarized, and described in more detail in separate reports.

Six species of diadromous fish utilize Great Bay Estuary for some portion of their life cycle: American eel, American shad, alewife, blueback herring, rainbow smelt, and sea lamprey. All species with the exception of American shad have been observed in the Mill Pond fish ladder on the Oyster River, and therefore have the potential to be within the corridor crossing the Oyster River. All species except blueback herring may transit through the Cable Area in Little Bay during migrations between the marine and freshwater environments.

Two federally listed fish species, short-nosed sturgeon (Endangered) and Atlantic sturgeon (Threatened), may use the Little Bay corridor as feeding habitat. Neither species is known to breed in New Hampshire, and short-nosed sturgeon is considered extirpated in New Hampshire, but adults from other populations in the Gulf of Maine could occasionally feed in Great Bay, including the Project Area. Three state-listed Special Concern fish species, American eel, swamp darter and banded sunfish, are known to occur upstream and downstream of several streams crossing the Project Area, including the Oyster River. These species are assumed to periodically use the Project Area.

The proposed Project Area in Little Bay was determined to provide EFH for at least one life stage of 10 species at some point during the year: Atlantic cod, Atlantic Halibut, Atlantic mackerel, bluefish, pollock, red hake, white hake, windowpane flounder, winter flounder, and yellowtail flounder.

Soils, Vegetation and Habitat Types

The Natural Resources Conservation Service ("NRCS") soil mapping indicates that soils within the Project Area are derived from till, or are of glaciomarine or outwash parent material. The soils observed during field surveys were primarily fine or very fine sandy loams or silt loams. Example series include the Hollis-Charlton very rocky fine sandy loams, Scantic silt loam, Buxton silt loam, Suffield silt loam, and Swanton fine sandy loam. In Little Bay, surveys showed that sediments on the western tidal flat were predominantly silt-clay and in the channel and eastern channel slope were predominantly sand.

The project corridor is located within the Coastal Plain ecological region of New Hampshire. The highest elevation is approximately 130 feet above sea level near the Madbury Substation. Based on the NHFG 2015 Wildlife Action Plan's ("WAP") cover type map and field observations, habitat cover types in the vicinity of the SRP consist mostly of Appalachian oak-pine forest, with smaller areas of wet meadow/shrub wetlands, grasslands, and temperate swamp. The Appalachian oak-pine forests are found across the subtle ridges and rises within the landscape, with the depressions and low areas consisting mostly of larger wetland complexes. One rare plant species in Durham, and four exemplary natural communities all associated with Little Bay have been identified within the Project Area.

Wildlife

Transmission corridors in general are known to provide suitable habitat for a variety of wildlife species, including mammals, birds, reptiles, amphibians, and invertebrates. Species with small home range requirements may use a portion of a corridor as their primary habitats. Animals with larger home ranges may use a corridor as a part of their overall home range, or as a travel/dispersal route. Transmission corridors may also provide intrinsic habitat value as a relatively undeveloped habitat area in locations were the surrounding land use consists of commercial, institutional, and/or residential development.

The undeveloped areas and low density residential areas surrounding the SRP are primarily forested while the vegetation maintenance practices conducted in the existing cleared corridor create grass and/or shrubby habitat types. Although narrow (approximately 60 feet wide), the existing cleared corridor provides some relatively valuable habitat resources for grassland/shrubland species, and may also provide a dispersal corridor for species that depend on grassy and/or shrubby habitats.

The SRP corridor crosses though some areas designated as Highest Priority Habitat by the New Hampshire WAP, primarily in Durham. Most of the remainder of the corridor is designated as Supporting Landscapes or has no designation at all.

In late fall, Great Bay typically hosts large numbers (>500) of migrating Canada geese and black ducks, as well as smaller numbers (<100) of other diving and dabbling ducks, shorebirds and seabirds. These birds use a variety of areas around the bay and are not likely resource constrained. Bald eagles and osprey also nest on lands bordering Great Bay. No known nests occur in the vicinity of the Project Area.

1.0 Introduction

Public Service Company of New Hampshire d/b/a Eversource Energy is proposing to construct a new 115 kV transmission line between their existing Madbury and Portsmouth substations to enhance the electric reliability in the seacoast region. The SRP would be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. Normandeau Associates ("Normandeau") was contracted by PSNH to delineate and evaluate natural resources including rivers, streams and ponds, wetlands, vernal pools, wildlife, fish, shellfish, benthic infauna, eelgrass, and water quality in Little Bay for the Project. This report summarizes the methodology used by Normandeau and describes the existing conditions along the proposed Seacoast Reliability Project corridor.

1.1 Project Description

The SRP is proposed to be approximately 12.9 miles long including a 0.9-mile crossing under Little Bay (Figure 1.1-1). The entire line will be constructed within existing electric corridors, with minor adjustments to right-of-way ("ROW") widths in several locations. The corridor ranges from 40-130 feet wide, but is predominantly 100 feet wide. For most of its length, a mowed clearing approximately 60 feet in width has been maintained by PSNH in support of the existing electric distribution line. The edges of the corridor are unmaintained and frequently support forest (approximately 20 feet on each side) which will need to be cleared for the SRP. The cable crossing proposed in Little Bay will directly affect a corridor approximately 90 feet wide within a charted Cable Area approximately 1,000 feet wide.

The majority of the SRP will be constructed aboveground on overhead structures between 65 and 115 feet in height. It will cross under Little Bay by being buried 3.5-8 feet in the substrate using jet plow and hand jet technology. For this crossing, the transmission line will be necessarily split into three cables to maintain the required transmissivity for the reliability project. East of Little Bay, the line will remain underground until it crosses Little Bay Road in Newington, after which it will emerge to cross overland until it terminates at Portsmouth substation. In most locations, the existing distribution line will be co-located on the new structures and the existing distribution structures will be removed. In several locations, the existing distribution line will be relocated outside of the SRP corridor and the new structures will carry the new transmission cables only. A short portion of an existing transmission line will need to be relocated to accommodate the new SRP alignment at Crossings at Fox Run Mall in Newington. Substation improvements in Madbury and Portsmouth will be confined to the existing substation footprints. No other substation modifications are proposed.

1.2 Site Description

The length and acreage of the SRP is in each of the four towns is shown in Table 1.2-1. The Project begins in Madbury at the existing PSNH Madbury Substation located off of Perkins Road. From the Madbury Substation, the corridor passes immediately into Durham and follows an existing PSNH distribution line that parallels a railway line

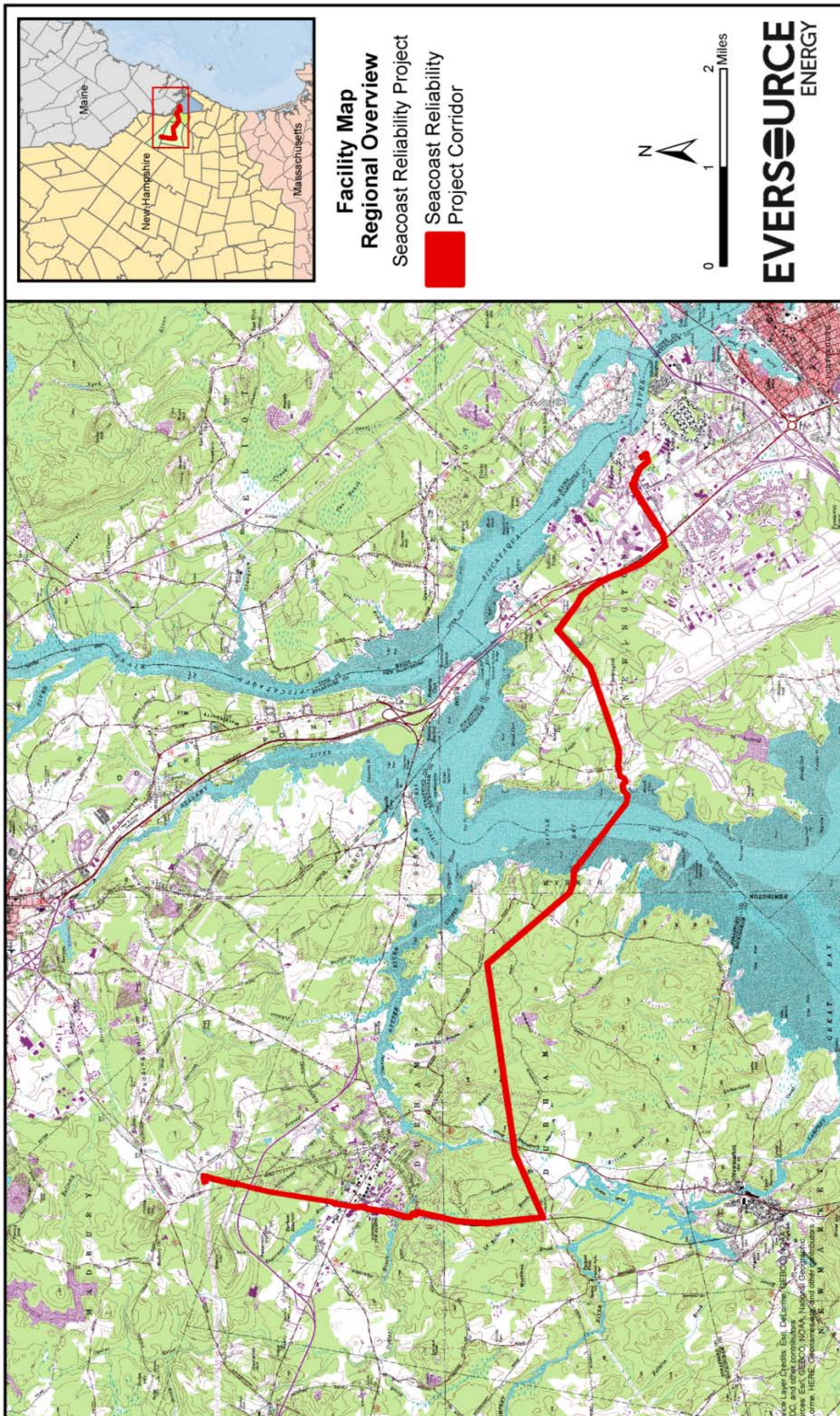

Figure 1.1-1. Site Location Map.

Table 1.2-1. Extent of the Seacoast Reliability Project's corridor within the four towns.

Town	Length (Miles)	Area (acres)
Madbury	0.4	5
Durham	7.8	87
Newington	4.4	56
Portsmouth	0.3	4
Total	12.9	152

southward towards the campus of the University of New Hampshire ("UNH"). The corridor passes to the west of the main campus and continues south over Mill Road where it crosses through undeveloped lands as it approaches Bennett Road. From just north of Bennett Road, the corridor bends sharply to the east and traverses rolling hills and a mix of undeveloped and residential areas where it crosses NH Route 108 and Durham Point Road before approaching the western shore of Little Bay.

The transmission line will transition from an overhead line to an underwater cable and cross Little Bay within an existing charted Cable Area. Remnants of a former electric cable crossing are still present in the form of cable houses on both shores, and four old de-energized cables still present within the Cable Area. On the east side of Little Bay, the line will transition from an underwater cable to an underground line where it will pass through a residential area buried in Gundalow Landing (road). Where the corridor crosses Little Bay Road, the line will transition once again to an overhead line and continue to the east before bending south parallel to the Spaulding Turnpike. After approximately one mile, the corridor crosses over the Spaulding Turnpike and passes through densely developed commercial and industrial areas associated with Gosling Road and Woodbury Avenue. Near the Newington Substation the line turns south until it terminates at the existing PSNH Portsmouth Substation.

The Project corridor crosses through a diverse assemblage of land uses and habitat types. These include relatively rural and undeveloped areas in Madbury and Durham, densely developed areas associated with the UNH campus and commercial lands to the east of the Spaulding Turnpike in Newington and Portsmouth, and several lower and moderate density residential areas to the east and west of Little Bay. The topography is generally flat to rolling which is typical in the coastal areas of eastern New Hampshire.

1.3 Agency Pre-Application Meetings

Three pre-application meetings have been held with New Hampshire and federal natural resource regulatory agencies. The first was at the NHDES in Concord, New Hampshire, on January 6, 2015. Agencies represented included NHDES staff from the Wetlands Bureau, Coastal Program, Alteration of Terrain, and Public Information; NHFG; New Hampshire Department of Resource and Economic Development's Natural Heritage Bureau ("NHB"); U.S. Army Corps of Engineers ("USACE"); U.S. Environmental Protection Agency ("USEPA"); U.S. Fish and Wildlife Service ("USFWS") and National Marine Fisheries Service. The agencies were given a presentation of the proposed Project and preliminary natural resource studies and findings, which were then followed by a discussion of the various regulatory concerns. Key decisions that resulted from the meeting and feedback immediately following the meeting were as follows:

- an Alteration of Terrain permit would likely not be required because most of the project will not trigger the need for the permit, and the Little Bay crossing is entirely within wetlands thus will be reviewed by the Wetlands Bureau; however follow-up conversations indicated that an Alteration of Terrain permit would indeed be required to address potential disturbances;
- water quality impacts in Little Bay will be reviewed by NHDES;
- compensatory wetland mitigation via in-lieu-fee payment to the Aquatic Resource Mitigation (ARM) fund appears appropriate; and
- the Corps expects the Project to qualify for a General Permit review, given that almost all impacts are temporary and permanent terrestrial impacts are less than <1,000 square feet.

Data and study requests included justification for the jetplow installation versus horizontal directional drilling, rationale for the need to cross the Oyster River during construction which was resolved by utilizing a new access route that avoids the need for the crossing, the addition of sea lamprey to diadromous fish list, and a final eelgrass survey the growing season before the Little Bay cable installation.

A meeting of the marine agencies was held on March 3, 2015, at Normandeau's Portsmouth office. Agencies present included NHDES Watershed Bureau, USACE, National Marine Fisheries Service, and USEPA. The focus was to discuss the Little Bay crossing in particular, including the construction process, and impacts on potential resources and water quality.

Another joint pre-application meeting was held January 12, 2016 with state and federal agencies. Attendees included NHDES Wetlands Bureau, Alteration of Terrain, and Water Quality staff, NHFG; NHB; USACE; USEPA; USFWS and National Marine Fisheries Service ("NMFS"). The purpose of this meeting was to present the final permitting design, describe the project community outreach efforts, and request any outstanding agency concerns. Topics of discussion included a description of alternatives, installation methods in Little Bay, impact details to terrestrial and marine areas and sedges, resource survey findings such as eel grass, mitigation and permitting, monitoring including salt marsh areas, water quality, and re-deposition of sediments. The development of Little Bay water quality monitoring program, post-construction bathymetric surveys, and *Carex cristatella* monitoring were also discussed.

In addition to these multi-agency meetings, the SRP has met or spoken with various agencies individually or in small focus groups to provide updates on the Project; discuss specific rare species, historic, and mitigation measures; and present Great Bay impacts.

Summaries of all meetings are provided in SEC application.

2.0 Methods

This section describes the methods used to investigate terrestrial and estuarine natural resources within the limits of the SRP.

2.1 Terrestrial Resources

Normandeau used qualified and experienced staff scientists to provide wetland delineations, wildlife habitat surveys, botanical surveys and marine surveys. Normandeau New Hampshire Certified Wetland Scientists ("NHCWS") and other field scientists investigated the study area in 2013, 2014 and 2015. All delineated resource boundaries, including wetlands, streams, and vernal pools were located with a Trimble® Global Positioning System ("GPS") that is capable of sub-meter accuracy. A project-specific data dictionary was used with each GPS unit to supplement the data recorded on field data sheets. The dictionary aided in maintaining consistency for data collection between field teams. The GPS files were post-processed and incorporated into a geodatabase using ESRI ArcMap 10.2. Selected field delineations were subjected to field Quality Assurance/Quality Control reviews by senior Normandeau biologists and other wetland staff throughout the field data collection effort.

Other resources, such as water quality, fish, epibenthos, general vegetation cover types, wildlife, rare species, soil map units and conservation lands, were investigated via a combination of mapped resources from GRANIT and the municipalities, as well as field observations.

Latin names for plants used in this document are from *Flora Novae Anglia* (Haines 2012), which includes the most current plant taxonomy.

Streams, Rivers and Ponds

All jurisdictional streams and waterbodies within the study area were delineated and located with GPS. A project-specific data form was utilized to standardize the collection of stream characteristics. The centerlines of streams less than six feet wide were delineated with orange flagging and approximate channel width noted. The tops of bank for streams greater than six feet wide were individually flagged. Drainage swales and ditches in uplands were not considered jurisdictional streams when it was apparent that water flow only occurred during precipitation events and the ditch or swale was not functioning as a wetland, or did not provide a connection between wetlands. The data forms included basic information such as flow regime, apparent flow (at the time of delineation), width, depth and relationship to other streams and wetlands. The following guidance was used in determining the watercourse type, which is based on Federal definitions (Federal Register, March 12, 2007) and is generally consistent with New Hampshire regulations:

- *Ephemeral stream*: Flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from precipitation is the primary source of water for stream flow.
- *Intermittent stream*: Flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from precipitation is a supplemental source of water for stream flow.
- *Perennial stream*: Flowing water year round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary

source of water for stream flow. Runoff from precipitation is a supplemental source of water for stream flow.

The New Hampshire Shoreland Water Quality Protection Act (SWQPA; RSA 483-B) provides oversight of activities within designated buffers that range between 50 to 250 feet from an established reference line, either the ordinary high water mark for rivers or a defined surface elevation for lakes and ponds, or the highest observable tide line associated with waters subject to the ebb and flow of the tide (NHDES 2011a). Waterbodies include lakes and ponds greater than 10 acres in size, tidal waters, fourth order and greater streams and rivers and, "designated rivers" under the Rivers Management and Protection Act of 1988 (RSA 483).

The portions of the project corridor that are within 250 feet of the highest observable tide line for Little Bay are subject to the requirements of the SWQPA. The corridor also crosses the Oyster River, which is a Designated River and is therefore managed and protected for its outstanding natural and cultural resources in accordance with RSA 483, The Rivers Management & Protection Act. The portions of the corridor within 250 feet of the ordinary high water mark on the Oyster River will also be subject to the SWQPA. No other rivers or waterbodies within the project corridor qualify for review under the SWQPA.

Wetlands

The NHDES has jurisdiction of wetland resources under RSA 482-A and New Hampshire Code of Administrative Rules (Env-Wt.100-900). The USACE has jurisdiction over wetlands and waterways under Section 404 of the Clean Water Act. Field protocols were developed to ensure consistency during the delineation of wetlands and the documentation of wetland characteristics. Wetland boundaries were delineated by, or with oversight by, a NHCWS. Wetland delineations were completed in the field using the routine determination according to the criteria established by the USACE in the *1987 Corps of Engineers Wetlands Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (2012). The manual and regional supplement both utilize a three parameter approach to the field determination of wetland boundaries and requires the presence of hydric soils, hydrophytic vegetation and hydrology under normal circumstances.

Wetland boundaries were flagged with pink and black "Wetland Delineation" flagging and numbered with an identifier for the wetland and a flagging sequence. The wetland boundary flags were located with GPS and a project-specific data form was completed for each wetland. The data form included an evaluation of the functions and values of each wetland according to the USACE "Highway Methodology" (USACE 1995). Functions and values considered principal for the wetland, as well as those considered suitable were noted. Other field information gathered and recorded on the data forms included wetland associations with water bodies, streams, vernal pools and dominant cover type class based on the USFWS classification system (Cowardin, et al. 1979).

Under RSA 482-A:15 and the associated administrative rules (Env-Wt 700), individual municipalities may elect to designate wetlands as "prime-wetlands" if the municipality can demonstrate that high-quality wetlands are present. Newington and Portsmouth have designated Prime wetlands and Durham and Madbury have not. The Newington and Portsmouth prime wetland maps were reviewed and those that intersect with the SRP corridor are indicated on the project Environmental Maps.

Vernal Pools

The SRP corridor was surveyed for potential vernal pools during wetland delineations. Each potential vernal pool encountered was visually inspected for egg masses and/or larvae of amphibian vernal pool indicator species during the spring 2014 vernal pool species breeding season. A follow-up review of specific areas was also conducted in the spring of 2015. A dip net was also used to survey for amphibian larvae and invertebrates. Vernal pools were identified in accordance with the NHDES Wetland Rules (Env-Wt) 101.106 and Env-Wt 301.01, and procedures described in *Identification and Documentation of Vernal Pools in New Hampshire*, published by the New Hampshire Fish and Game Department (NHFG 2004).

A vernal pool is defined (Env-Wt 101.106(a-b)) as:

> *a surface water or wetland, including an area intentionally created for purposes of compensatory mitigation, which provides breeding habitat for amphibians and invertebrates that have adapted to the unique environments provided by such pools and which:*
>
> *(a) Is not the result of on-going anthropogenic activities that are not intended to provide compensatory mitigation, including but not limited to: (1) Gravel pit operations in a pit that has been mined at least every other year; and (2) Logging and agricultural operations conducted in accordance with all applicable New Hampshire statutes and rules; and*
>
> *(b) Typically has the following characteristics: (1) Cycles annually from flooded to dry conditions, although the hydroperiod, size, and shape of the pool might vary from year to year; (2) Forms in a shallow depression or basin; (3) Has no permanently flowing outlet; (4) Holds water for at least 2 continuous months following spring ice-out; (5) Lacks a viable fish population; and (6) Supports one or more primary vernal pool indicators, or 3 or more secondary vernal pool indicators.*

Primary and secondary vernal pool indicator species are described in Env-Wt 101.75 and Env-Wt 101.86, respectively. Under these rules, primary vernal pool indicators refer to:

> "*the presence or physical evidence of breeding by marbled salamander (Ambystoma opacum), wood frog (Rana sylvatica), spotted salamander (Ambystoma maculatum), Jefferson-blue spotted salamander complex (Ambystoma jeffersonianum/A. laterale complex), or fairy shrimp (Eubranchipus sp.)*". [Env-Wt 101.71]

Secondary vernal pool indicators are:

> "*physical evidence used by wildlife biologists or certified wetlands scientists who are familiar with vernal pool habitats as evidence of the presence of a vernal pool, if primary vernal pool indicators are absent and other vernal pool characteristics suggest vernal pool habitat. Secondary vernal pool indicators include, but are not limited to, caddisfly larvae and cases (Limnephilidae, Phyrganeidae, or Polycentropodidae), clam shrimp and their shells (Laevicaudata, Spinicaudata), fingernail clams and their shells (Sphaeriidae), aquatic beetle larvae (Dytiscidae, Gyrinidae, Haliplidae, and Hydrophilidae), dragonfly larvae and exuviae (Aeshnidae, Libellulidae), spire-shaped snails and their shells (Physidae, Lymnaeidae), flat-spire snails exuviae (Coenagrionidae, Lestidae), and true fly larvae and pupae (Culicidae, Chaoboridae, and Chironomidae).*" [Env-Wt 101.82]

2.2 Estuarine Resources

Normandeau investigated estuarine resources within the SRP corridor in 2013 and 2014. The investigations included a desktop review of historical and existing eelgrass (*Zostera marina)*, macroalgae, shellfish areas, benthic infauna, fish, sediment characteristics and water quality. Field surveys were performed to confirm the current condition of eelgrass, shellfish and benthic infauna, and incidentally observed macroalgae and sediment characteristics.

Eelgrass

On October 14, 2013, Normandeau conducted a towed underwater video survey along transects within and south of the charted Cable Area where eelgrass had been reported in 2012. One transect extended across the bay to the western shoreline. No attached eelgrass was observed on any of the five transects. In addition, because water clarity was good, the field crew was able to observe that eelgrass was absent on the eastern side of the cable route. Other incidental observations by Normandeau biologists during shellfish surveys in September 2014 did not find eelgrass on the western tidal flats within the cable corridor. Surveys by the marine contractor in mid-July 2014 to inspect the condition of the existing cables also did not observe eelgrass in the corridor.

Shellfish

A conversation with Mr. Bruce Smith, NHFG on August 25, 2014, indicated that the department considers the Cable Area as suitable habitat for softshell clams (*Mya arenaria*), razor clams (*Ensis directus*), and the non-harvested *Macoma balthica*. In order to assess this resource, at the suggestion of Mr. Smith, Normandeau conducted an observational survey within the Cable Area on the western tidal flat on September 16, 2014. Scientists accessed the area by canoe and a molluscan expert observed the substrate through a view tube in water depths ranging from about 1 to 2 feet. Three transects equating to nearshore, mid-tidal flat, and off-shore tidal flat were pre-selected in the office to cross the 1000-foot charted Cable Area. On each transect, five stations were distributed equidistantly along transects that extended beyond the boundaries of the Cable Area identified on NOAA Chart 13285 such that three stations on each transect were within the Cable Area and two were beyond to serve as reference stations. Including reference stations beyond the potential impact area facilitates the evaluation of whether the shellfish within the Cable Area is unique or similar to nearby resources. In the field, each of the 15 sampling stations was located by GPS, and three circular fields of vision using an underwater viewtube (each approximately 1 foot in diameter (0.8 square feet) were examined. The number of distinct molluscan siphon holes, species of mollusk and associated macrofauna were recorded. The three species of interest have distinct siphons so it was possible to identify feeding individuals to species.

Benthic Infauna

A site-specific benthic survey was undertaken on September 9, 2014. Fifteen stations were sampled along three depths zones to represent the western shallow subtidal mud flat (approximately 0 to -1 foot MLLW), the channel (approximately -30 feet MLLW), and the eastern channel slope (approximately -20 feet MLLW). Stations were distributed equidistantly along transects that extended beyond the boundaries of the Cable Area identified on NOAA Chart 13285 such that three stations on each transect were within the Cable Area and two were beyond to serve as reference stations. Including reference stations beyond the potential impact area facilitates the evaluation of whether the benthos within the Cable Area is unique or similar to nearby resources and it also minimizes the concern that recovery could be masked by broadscale temporal changes in the benthos. Infaunal samples were collected using a 0.43 ft^2 (0.04 m^2) Ted Young grab, the same sampler used for the NCCA (USEPA 2007) program which evaluates long-term conditions in Great Bay as part of a national estuary assessment. Samples were processed in Normandeau's biological laboratory where all organisms were removed from the sediment and identified to the lowest practical taxonomic level, generally species, consistent with NCCA protocols.

3.0 Existing Conditions

3.1 Watersheds and Water Bodies

Watersheds

The entire project corridor is located in the Salmon Falls-Piscataqua River watershed (HUC8) of the larger Saco River basin (HUC6; Appendix A; Map 1) . Northernmost portions of the study area, in Madbury and Durham, are located in the Oyster River watershed (HUC10). The central portions of Durham and Newington are located in the Great Bay Drainage watershed. A small portion of the corridor in Durham is located in the Lamprey River (HUC10) watershed before the corridor bends east and crosses back into the Great Bay Drainage in Durham and Newington near Little Bay. The easternmost portions of the project corridor in Newington and Portsmouth are located in the Portmouth Harbor watershed.

Streams and Rivers

Streams were classified using the Cowardin classification system (Cowardin et al, 1979). A total of 32 streams were delineated within the project study area (Map 2; Appendix A). A summary table of the delineated streams is included in Appendix B.

The study area contained 18 perennial streams (Table 3.1-1). These include Beards Creek, College Brook, Oyster River and several unnamed tributaries to Oyster River, two reaches of LaRoche Brook, Beaudette Brook, and Longmarsh Brook (Map 2; Appendix A). Eight intermittent stream segments, including Hamel Brook and Reservoir Brook were also identified; with the remaining six stream segments classified as ephemeral.

In general, the streams identified within the project corridor were low gradient, slow flowing systems that are consistent with the flat topography of the coastal plain region of New Hampshire. Anthropogenic influences were observed near established development, including highways and larger-scale commercial developments; these influences included culverts, evidence of stormwater input, and ditching.

Table 3.1-1. Number and percent of stream segments by flow regime within the SRP study area.

Stream Flow Regime	#	%
Perennial	18	56%
Intermittent	8	25%
Ephemeral	6	19%
Total:	32	100%

The most significant drainage identified within the study area is the Oyster River. The Oyster River is a designated river, under the RMPP(RSA 483). According to the NHDES:

> *The Oyster River contains some of the highest quality natural habitat in New Hampshire. It is home to at least 12 rare, threatened or endangered wildlife species. One hundred-thirty-nine plant species have been identified along the river corridor, making it one of the most vegetation-diverse rivers in New Hampshire. Eighteen species of fish are known to live within the river, most notably the state endangered American brook lamprey and the state threatened bridle shiner. A large number of the fish are diadromous, capable of moving between fresh and salt waters. To facilitate this, a fish ladder has been installed at the Mill Pond Dam. The Oyster River is considered critical spawning ground for blueback herrings and sea lamprey, and is accessible via a fish ladder on the Mill Pond dam in Durham. However, blueback herring numbers have declined significantly in recent years, possibly due to decreased levels of dissolved oxygen.*(NHDES, 2011).

The Oyster River is also protected as a part of the New Hampshire Shoreland Water Quality Protection Act (SWQPA; RSA 483-B) because it is a designated river and also a fourth order or greater river. The SWQPA provides oversight of activities within designated buffers that range between 50 to 250 feet from the ordinary high water ("OHW") mark.

The project corridor crosses through a small portion of the Lamprey River watershed, including LaRoche Brook. Sections of the Lamprey River and five of its tributaries (the North Branch, North, Little, Pawtuckaway, and Piscassic Rivers) are also designated under the RMPP; however the Project does not cross any of these rivers or designated sections.

The project corridor also includes a recently implemented stream restoration project located in Newington along an abandoned railroad line north of Arboretum Drive. This area was constructed after the SRP's initial delineations in 2013, the area was re-delineated to reflect current conditions in the spring of 2015. It presently consists of a stone-armored channel, an outfall, and emergent seeding. Additional plantings may still be scheduled.

Ponds

No named freshwater ponds were identified within the study area. Several wetlands were noted to contain small areas of ponded water as indicated by the unconsolidated bottom ("UB") Cowardin classification, and others are prone to flooding as observed on aerial photography. Some of the ponds appear to be beaver influenced, associated with larger drainages and floodplains, or in a few cases associated with stormwater detention and treatment or are constructed landscaping features near residential areas. A small pond was mapped in Newington's Flynn Pit Town Forest, and is contained within a delineated wetland (NW4) immediately east of Little Bay Road.

Water Quality

Nearly the entire project corridor is located within one mile of an impaired freshwater waterbody, according to the NHDES OneStop GIS database and the 2010 Surface Water Impairments listing. The most common impairments are dissolved oxygen, total nitrogen, fecal coliform, *Escherichia coli*, enterococcus, and dissolved oxygen saturation. Other impairments include Chlorophyll-a, chloride, Benthic-Macroinvertebrate Bioassessments and aluminum. In

2012, the NHDES categorized all surface waters as Category 5 as a result of a statewide fish consumption advisory for mercury in freshwater fish (Edwardson 2012).

3.2 Wetlands

A total of 114 wetlands were delineated along the approximately 152-acre ROW (Map 2; Appendix A). A summary table of each wetland including cover type and functions and values is included in Appendix B.

The wetlands delineated within the SRP corridor were generally portions of larger wetlands that extended outside of the project corridor. These large, flat wetlands are common throughout the Coastal Plain region of New Hampshire. Land use and vegetation management within and around the project corridor governed wetland structure and species composition, and this is reflected in the cover type classifications documented in the field.

Wetland Cover Types

Table 3.2-1 lists the extent of the dominant vegetation cover types delineated within the study area. All but four of the wetlands fit the Palustrine system, symbolized by the letter "P" and defined as Freshwater Nontidal wetlands (Cowardin 1979). The wetlands associated with Little Bay are symbolized by the letter "E" and are characterized as Estuarine, Intertidal and Subtidal wetlands.

The majority of the freshwater wetlands delineated within the Project Area were mixed systems comprised of both emergent and scrub-shrub cover types (49%), followed by emergent (17%) and then various combinations of emergent, forested, scrub-shrub and unconsolidated bottom systems (Table 3.2-1). Forested wetland cover types were uncommon, due to the routine vegetation management within the existing electric line corridor, and were generally restricted to the wetland areas at the edges of the project corridor. Shallow ponded areas observed within the delineated wetlands were classified as UB. The UB areas were typically bordered by emergent or scrub-shrub cover types and included shallow ponds, beaver ponds, and other sparsely vegetated (generally less than 30 percent) areas with standing water of shallow but unknown depth. Many of the wetlands continued outside of the project corridor as either forested, scrub-shrub or emergent wetlands, however these areas were not reviewed in detail due to lack of permission to access.

The estuarine wetlands delineated within Little Bay include two different subsystems and multiple classes depending on the nature of the substrate material and vegetation. Beginning at the highest observable tide line ("HOTL") and continuing downslope to the lowest observable tide line ("LOTL") the wetlands are considered intertidal, and include emergent high-marsh and low-marsh areas dominated by saltmarsh grasses (*Spartina* sp.), rocky shore, and unconsolidated tidal flats. Below the LOTL the wetland is considered subtidal and is dominated by sands (unconsolidated bottom), and sparse macroalgae, depending on the nature of the substrate and any algal growth.

Photographs of common wetland cover types are included in Appendix C.

Table 3.2-1. Cover type of wetlands delineated within the study area of the SRP Project.

Wetland Cover Type	Area (acres)	%
Palustrine (Freshwater) Wetlands		
Emergent and Scrub-Shrub Wetlands	21.6	48.9%
Palustrine Emergent Wetlands	7.5	17.1%
Palustrine Emergent, Scrub-Shrub and Unconsolidated Bottom Wetlands	3.7	8.3%
Palustrine Scrub-Shrub Wetlands	3.5	8.0%
Palustrine Scrub-Shrub and Forested Wetlands	3.5	7.9%
Palustrine Emergent, Scrub-Shrub and Forested Wetlands	3.2	7.2%
Other combinations of Palustrine Classifications (Emergent, Scrub-Shrub, and Unconsolidated Bottom)	1.2	2.6%
Sub-total:	*44.1*	
Estuarine Wetlands		
Subtidal Estuarine Wetlands	6.0	46.2%
Intertidal Estuarine Wetlands (includes saltmarsh, rocky intertidal, and mudflats)	6.9	53.8%
Sub-total:	*12.9*	

Mixed Emergent and Shrub-Scrub Wetland (PEM1/PSS)

The majority of the wetlands identified within the project corridor contained both emergent and scrub-shrub components. These natural communities were often distributed according to the hydrologic regime; the wettest portion of the wetland was an emergent marsh often dominated by cattail (*Typha latifolia and T. angustifolia*), and the percentage of woody shrub and sapling species increased as the water regime trended drier. Wetland NW11 and DW18 are examples of these circumstances. A more detailed description of the emergent and scrub-shrub components are provided below.

Wetland DW41 is a large example of a wetland system that is primarily emergent and scrub-shrub, but that also contains small pockets with limited vegetation cover and ponded water (classified as Unconsolidated Bottom), especially near the railroad tracks.

Emergent (PEM1)

Emergent marsh and/or wet meadow wetlands were common throughout the project corridor. These wetlands were dominated by non-woody, herbaceous plant species and were primarily the result of on-going land use including utility maintenance mowing, clearing in wet areas associated with agriculture and residential areas. The hydrology in these emergent wetlands was mainly groundwater controlled and a reflection of a shallow water table and seasonal fluctuations of this water table. Other hydrological influences included floodflow where the wetlands were located adjacent to large water courses and groundwater seeps in the hillier portions of the project corridor. The species composition of the emergent marshes frequently included cattail, sedges such as fringed sedge (*Carex crinita*) and tussock sedge (*C. stricta*), ferns species such as sensitive and marsh ferns (*Onoclea sensibilis* and *Thelypteris palustris*), rushes such as soft rush (*Juncus effusus*), and goldenrods (*Solidago* sp.). Invasive species noted during the delineations included purple loosestrife (*Lythrum salicaria*) and reed canary grass (*Phalaris arundinacea*). Examples of emergent wetlands include wetlands MW02, DW02, and DW67.

Wetland NW28, NW30 and NW32 are examples of wet meadow wetlands that are associated with actively mowed hayfields; consequently the species composition of these resources were dominated by grasses, such as reed canary grass, sedges, rushes and bulrushes (e.g. *Scirpus cyperinus*).

Shrub-Scrub Wetland (PSS1)

As with the emergent wetlands, the scrub-shrub resources were governed primarily by land use. Scrub-shrub wetlands were found away from mowed hayfields and residential areas, and included shrub species as well as small, regenerating tree species that are routinely mowed during utility line maintenance. The hydrology of these wetlands was primarily controlled by a shallow water table; however some areas were also influenced by floodflows, particularly near larger water courses in the floodplains. Common shrub species noted in these wetlands include speckled alder (*Alnus incana*), meadowsweet (*Spiraea alba*), steeplebush (*S. tomentosa*), glossy buckthorn (*Frangula alnus*), highbush blueberry (*Vaccinium corymbosum*) and assorted willows (*Salix* sp.). Commonly observed tree species include birches (*Betula* sp.), red maple (*Acer rubrum*), and swamp white oak (*Quercus bicolor*). Several invasive species were also documented throughout the project corridor and include glossy buckthorn, autumn olive (*Elaeagnus umbellate*), oriental bittersweet (*Celastrus orbiculatus*), and multiflora rose (*Rosa multiflora*). All of these latter species are listed on the New Hampshire Prohibited Invasive Plant Species List[1].

Approximately nineteen were classified as predominantly scrub-shrub wetlands, although many included some lesser areas where emergent/herbaceous vegetation was dominant. Examples include NW15, which is primarily an alder swamp, and NW26 which is a disturbed area located between a road and hayfield.

Unconsolidated Bottom (UB), Forested (FO) and Other Wetland Classifications

Several wetlands delineated within the project corridor included either unconsolidated bottom or forested classifications. The unconsolidated bottom wetlands were primarily small ponds and the forested wetland components were a result of tree species bordering the project corridor. Approximately 50% of wetland NW34 was flooded at the time of delineation due to a beaver dam along Pickering Brook outside of the corridor. Nearby, wetland NW13 was also flooded due to beaver activity, and included fringing areas of emergent vegetation including cattails and rooted aquatic species; this wetland also hosted waterfowl.

Wetlands with forested components include DW22, DW36, DW38, DW74 and NW04. In most cases, the percentage of the wetland that was forested within the project corridor was low at approximately 20 percent, but continued as forested outside of the corridor where vegetation management was not performed. Common tree species include red maple and white pine

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[1] http://agriculture.nh.gov/publications-forms/documents/prohibited-invasive-species.pdf

(*Pinus strobus*), with fewer instances of swamp white oak and Atlantic white cedar (*Chamaecyparis thyoides*).

Estuarine Wetland (E1 or E2)

The entire corridor in Little Bay is classified as an estuarine wetland, with both intertidal and subtidal subsystems depending on the location relative to the LOTL. On the western shore, beginning at the HOTL, the wetlands included a fringing marsh of shallow peat over a cobble and rock substrate. The saltmarsh vegetation was dominated by salt cordgrass (*Spartina alterniflora)*, with smaller patches of salt hay (*S. patens)*, and sea-blite (*Sueda linearis)* along the upper limit of the marsh. The substrate was a mix of peat over mud and bedrock outcrops as the wetland descended to the LOTL. Rocky shore (bedrock colonized by fucoid algae (*Fucus vesiculosus* and *Ascophyllum nodosum*) followed a ledge/rock outcrop below the salt marsh. The western shore had extensive tidal flats for approximately 2,000 feet dominated by a mud mix of silt, fine sand, clay and organics. The subtidal channel was predominantly sands with silts at depth. On the eastern shore, the intertidal zone was primarily unvegetated muck tidal flat. This shore included a patchy band of salt cordgrass near the high tideline.

Wetland Functions and Values

Representative wetland functions and values were assessed for each wetland using the U.S. Army Corps of Engineers Highway Methodology (USACE 1999). This methodology evaluates thirteen functions and values potentially provided by individual wetlands. The assessment relies on professional judgment that is documented according to characteristics provided within the methodology for each function. The methodology indicates whether a wetland provides a specific function, and if that function is considered Principal. Principal functions are those that provide "an important physical component of a wetland ecosystem (function only) and/or are considered of special value to society, from a local, regional and/or national perspective". The functions and values for all wetlands are provided in the summary table in Appendix B. While multiple functions were provided to some degree by most wetlands, the principal functions were the distinguishing features among the wetland types. The most common principal functions include: Groundwater Recharge/Discharge, Wildlife Habitat, Production Export, Sediment/Toxicant/Pathogen Retention, Floodflow Alteration and Nutrient Retention. Fewer than ten wetlands were noted as having Fish/Shellfish Habitat, Sediment/Shore Stabilization, Visual Quality/Aesthetics, Education, Recreation, Rare/Threatened/Endangered Species or Uniqueness/Heritage principal function or values. The following descriptions address the principle functions in general terms.

Groundwater Recharge/Discharge (GW)

This function combines recharge and discharge into a single function, based on the concept that many wetlands provide both recharge and discharge depending on seasonality and the relative position of ground and surface waters. On the coastal plain of New Hampshire, the majority of the wetlands were interacting with groundwater, with discharge more prevalent in the hillier areas of the corridor and recharge where sandier substrates were noted. In reality, most of the wetlands were likely functioning as both recharge and discharge sites depending on the spatial location within the wetland and also depending on the season and location of the water table.

Ninety-eight percent (98%) of the delineated wetlands were characterized having the GW function as a principal function or as suitable for either recharge or discharge and this was by far the most common wetland function.

Nutrient Removal & Sediment/Toxicant Retention (NUT & STR)

These two functions are combined because they are provided by similar wetland conditions – those that have the exposure to a pollutant and/or nutrient source, and have the structure and vegetation to treat it. Sixty-eight percent (68%) of the wetlands in the project corridor were listed as suitable or principal for the STR function and 50% were listed for the NUT function. These functions are mostly associated with the ability for the large wetlands identified along the project corridor to trap and attenuate nutrients, sediments, fertilizers, and toxicants from the many roadways and turnpikes, residential areas, and dense commercial and educational development.

Wildlife Habitat Function (WH)

Wildlife habitat is a very broad term applicable to many wetland types, and for a variety of wildlife species. Fifty-eight percent (58%) of the wetlands delineated within the project corridor were observed or presumed to be suitable for the Wildlife Habitat function; with 31 listed as having Wildlife Habitat as a principal function. Common wildlife species observed within the wetlands included deer, beaver, water fowl, other bird species such as songbirds and species such as bittern; amphibians and reptiles along with invertebrates including dragonflies were also noted. The larger scrub-shrub wetlands provide breeding habitat for a number of passerine species: red-winged blackbird, swamp sparrow, yellowthroat and black and white warbler. The Little Bay wetlands provide habitat for multiple marine species.

Floodflow Alteration & Sediment/Shoreline Stabilization (FF & SSS)

Wetlands with dense vegetation that are in close proximity to larger brooks and rivers are typically valuable for detaining and storing surface water and reducing downstream flooding. Fifty-three percent (53%) of the wetlands delineated within the project corridor are suitable or principal for this function, most of which are associated with larger drainages. Examples include DW01 along Longmarsh Brook,DW58 which is associated with Roche Brook and DW74 located along College Brook. The Sediment/Shoreline Stabilization ("SSS") is related, and generally associated with wetlands that border larger streams, rivers and areas of open water. Twenty-seven percent (27%) of the wetlands were noted as either suitable or principal for this function.

Production Export (PE)

The ability for a wetland to produce food or useable products is considered when evaluating this function. Other functions are considered when rating this function: wildlife habitat and fish or shellfish habitat for the consideration of food; and sediment/shore stabilization for the consideration of export by stream. Thirty-eight percent (38%) of wetlands were suitable for production export within the study area, including 21 listed as principal. These were primarily attributed to dense patches for fruiting shrubs (primarily high-bush blueberry). The Little Bay wetland also contributes this function due to fish, shellfish and other benefits. Wetlands connected to streams are also important for production export.

Fish & Shellfish Production (FSH)

While not a common function, fish and shellfish production is an important function for several wetlands, including all of the estuarine wetlands and several rivers and streams known to support anadromous and/or rare species of fish. Several listed fish species are known to utilize the Oyster River, the Valentine Canal and the subtidal and intertidal portions of Little Bay. Diadromous fish (those that migrate between fresh and salt water in the course of their life cycles) also use these water bodies, and some rely on adjacent wetland vegetation for cover, food, spawning and nursery habitat. Additionally, the intertidal and subtidal area in Little Bay provide habitat for several commercially important shellfish species, including oysters, softshell clams and razorclams.

Wetland Values (REC, EDU, UH, VQ, & RTE)

In general, the majority of the identified wetlands within the study area were common for the region, slightly disturbed, not easily accessible, or the leased lands were generally posted against unauthorized access for hunting, hiking, and other forms of recreation. These factors contributed to the relatively low levels of function and values associated with visual quality and aesthetics, recreation, uniqueness and heritage and rare, threatened, and endangered species. Several wetlands within the corridor are located near the UNH campus; however, the extent of their use for educational purposes or research is low due to the ongoing routine maintenance, and access and safety considerations.

The exceptions are the Little Bay wetlands. Salt marsh and sparsely vegetated intertidal flats are considered Exemplary Natural Communities by the NHB.

Prime Wetlands

Newington and Portsmouth have designated specific wetlands as "prime" due in part to their large size, unspoiled character and ability to sustain populations of rare or threatened plant and animal species. Three of the Newington prime wetlands (designated as Prime Wetlands Q, K and F) intersect with the SRP study area in five different locations, and therefore correspond with five individually delineated wetlands (Map 2c). These locations include Wetland NW12 to the west of Nimble Hill Road (Prime Wetland Q, Knight's Brook); Wetlands NW34 and NW17 to the north of Fox Point Road (Prime Wetland K, Pickering Brook); and Wetlands NW1 and NW45 along the Spaulding Turnpike (Prime Wetland F)(West Environmental, 2005). Field surveys indicated that no sections of these wetlands within the project corridor contain rare species or communities.

3.3 Vernal Pools

Springtime surveys of all pools identified during resource mapping in the SRP corridor did not yield habitats that met the definition of a vernal pool (Env-Wt 101.106(a-b)) and also contained the requisite indicator species, and therefore no vernal pools are located within the project corridor. One pond in Newington associated with delineated wetland NW4 contained wood frogs in spring 2015, however observations in 2013, 2014 and 2015 suggest that the deeper portion of this pond is permanently flooded year-round. The permanent hydroperiod does not meet the definition of a vernal pool.

3.4 Estuarine Resources

3.4.1 Eelgrass

Eelgrass (*Zostera marina*) is the most widespread aquatic vegetation in the Great Bay Estuary. Eelgrass provides significant habitat values and functions both biologically and physically (Thayer et al. 1984; Jones 2000). In the Great Bay system, the plants create a three-dimensional structure on an otherwise flat substrate. This structure provides refuge, settlement surfaces, and feeding opportunities for numerous invertebrates and finfishes. Invertebrates, including lobsters, and finfishes, including winter flounder, have been documented as using eelgrass beds as breeding or nursery grounds. A vascular plant, eelgrass generally occurs subtidally in the Northeast. Eelgrass is a deciduous, perennial plant with an extensive root and rhizome system that remains year-round even when above-ground biomass has gone senescent and been shed. The underground structures help bind the sediments and retain nutrients and carbon. During the months when above-ground structures are abundant, these structures can attenuate current flow and wave action, enhancing sedimentation in the immediate vicinity. Plant growth is typically greatest from May through August (Nedeau 2004). Light penetration, or water clarity, is a critical factor in controlling the depth at which eelgrass can survive (Morrison et al. 2008) and can be affected by phytoplankton, suspended sediments, and colored dissolved organic matter. Based on the assumption that eelgrass needs 22% of surface incident light to survive (Koch 2001), Morrison et al. (2008) predicted that the survival depth of eelgrass in Little Bay would range from 1.068 to 1.679 meters (3.4 to 5.4 feet) below mean water level ("MWL") and average 1.404 meters (4.5 feet) below MWL.

Eelgrass distribution in Little Bay has varied tremendously over decades. In 1980, eelgrass beds were found throughout Little Bay, covering the entire length of the shallow subtidal zones along both sides of the upper bay from Adams Point to Fox Point (Jones 2000). It was completely absent from Little Bay in 1991 (Jones 2000). PREP (2013) reported that it was essentially absent from Little Bay from 2007 through 2010. More recently, eelgrass was recorded in Welsh Cove and along the eastern shoreline from the point north of Welsh Cove nearly to Fox Point in 2011 and 2012 (Figure 3.4-1). Short (2013) noted that the bed along the eastern shore first appeared as seedlings that developed into patches of reproductive plants in 2010 and expanded into beds in 2011 through vegetative growth and seed production. When Barker (2014) mapped the distribution of eelgrass in the Great Bay system from aerial photography in August 2013 with field verification in September and October, he found, however, that eelgrass was absent from both Welsh Cove and the eastern side of Little Bay (Figure 3.4-1; 2014 survey results not available through GRANIT as of 12/09/15). Eelgrass was also absent from Welsh Cove and the eastern side of Little Bay in 2014 (P. Colarusso, USEPA, pers. com. 03/03/15).

Normandeau did not observe any attached eelgrass during the five video transect surveys conducted in early fall 2013 (Figure 3.4-2). In addition, because water clarity was good, the field crew was able to observe that eelgrass was absent to the shoreline in Welsh Cove in the vicinity of the proposed SRP corridor. Other incidental observations by Normandeau biologists during shellfish surveys in September 2014 did not find eelgrass on the western tidal flats within the cable corridor.

It is not expected that there will be an established eelgrass bed in the Project Area when cable installation takes place in 2017. As seen by the recent disappearance of the bed in Little Bay, eelgrass bed development from seed dispersal may not be successful. Various factors, such as burrowing invertebrates (e.g., lobsters or green crabs) or storm waves can uproot seedlings. Eelgrass beds can expand through vegetative growth of the rhizomes, but this is a slow process. Marbà and Duarte (1998) reported that horizontal growth of *Z. marina* rhizomes was about 26 cm/year (10 inches/year). The nearest established eelgrass bed is located within Great Bay proper more than 3,000 feet (914 meters) away from the Project Area.

3.4.2 Macroalgae

Mathieson and Penniman (1991, as cited in Jones 2000) reported 132 species of macroalgae occurring in Little Bay. Most macroalgae require hard substrate for attachment so their presence is restricted in Little Bay to nearshore areas where bedrock outcrops, cobble, or boulders are present. As detailed below, substrate in the Cable Area is predominantly unconsolidated fine granular sediment however small areas of rock outcrops occur along both shorelines. Dominant macroalgae observed during field surveys were rockweeds, predominantly *Fucus vesiculosus* with lesser amounts of *Ascophyllum nodosum*. As Short (2013) has pointed out, distribution and biomass of nuisance algae including *Gracilaria* sp. (graceful red weed) and *Ulva* sp. (sea lettuce) have increased in the Great Bay system. *Ulva* was observed during field surveys of the cable corridor. These species are considered to be threats to eelgrass habitat because they cover the substrate, essentially smothering the eelgrass shoots (Short 2013). Based on maps presented in Nettleton et al. (2011) and PREP (2012), Great Bay itself is the area of greatest concern in terms of nuisance algae, although no widespread surveys are available. In addition to *Ulva* and *Gracilaria*, smaller algal species often settle on eelgrass fronds and this biofouling has been regarded as contributing to the decline of eelgrass in the Great Bay system.

3.4.3 Shellfish

The Great Bay estuary system supports populations of several shellfish species of interest to harvesters, including oysters (*Crassostrea virginica* and *Ostrea edulis*), softshell clams, blue mussels (*Mytilus edulis*), razor clams, and sea scallops (*Placopecten magellanicus*) (Jones 2000). Blue mussels are generally limited by salinity to the lower estuary (Dover Point to Portsmouth Harbor) and sea scallops occur in the lower Piscataqua and Portsmouth Harbor. Historical distribution of major oyster and softshell clam beds is shown in Figure 3.4-3. Capone, et al. (2008) reported finding, however, high densities of oysters (up to $150/m^3$) associated with the fucoid alga *Ascophyllum nodosum* in the rocky intertidal at both Nannie Island and Woodman Point in the Great Bay estuary. Presumably, other rocky intertidal areas in the estuary support oysters as well. It is likely that small beds of oysters occur subtidally as well. Recreational harvesting of both of these species is allowed in specified areas in the estuary (Figure 3.4-4). The area designated as Cable Area on NOAA Chart 13285 and estimated in Figure 3.4-4 is permanently closed to harvest.

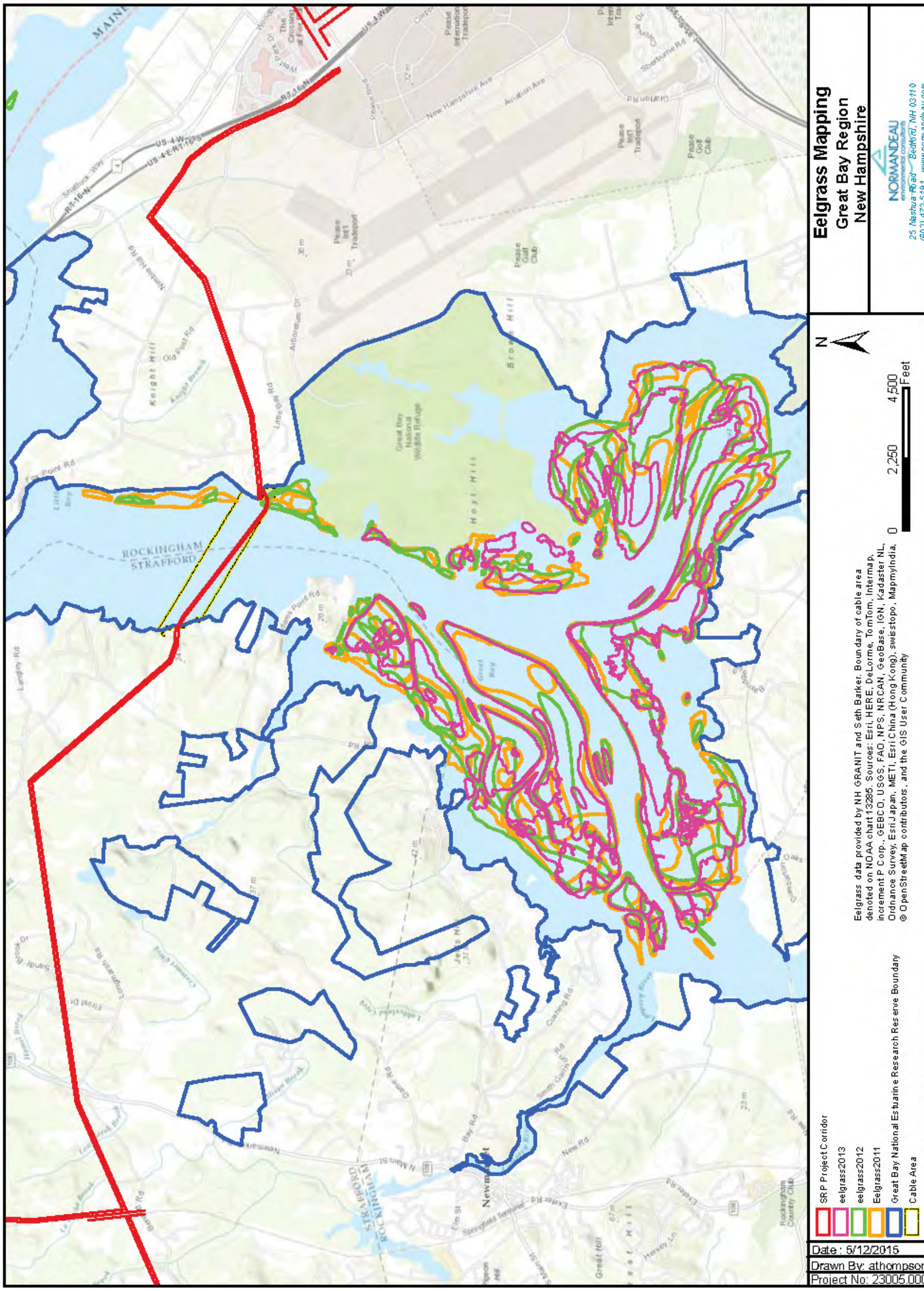


Figure 3.4-1. Historical Eelgrass Distribution.

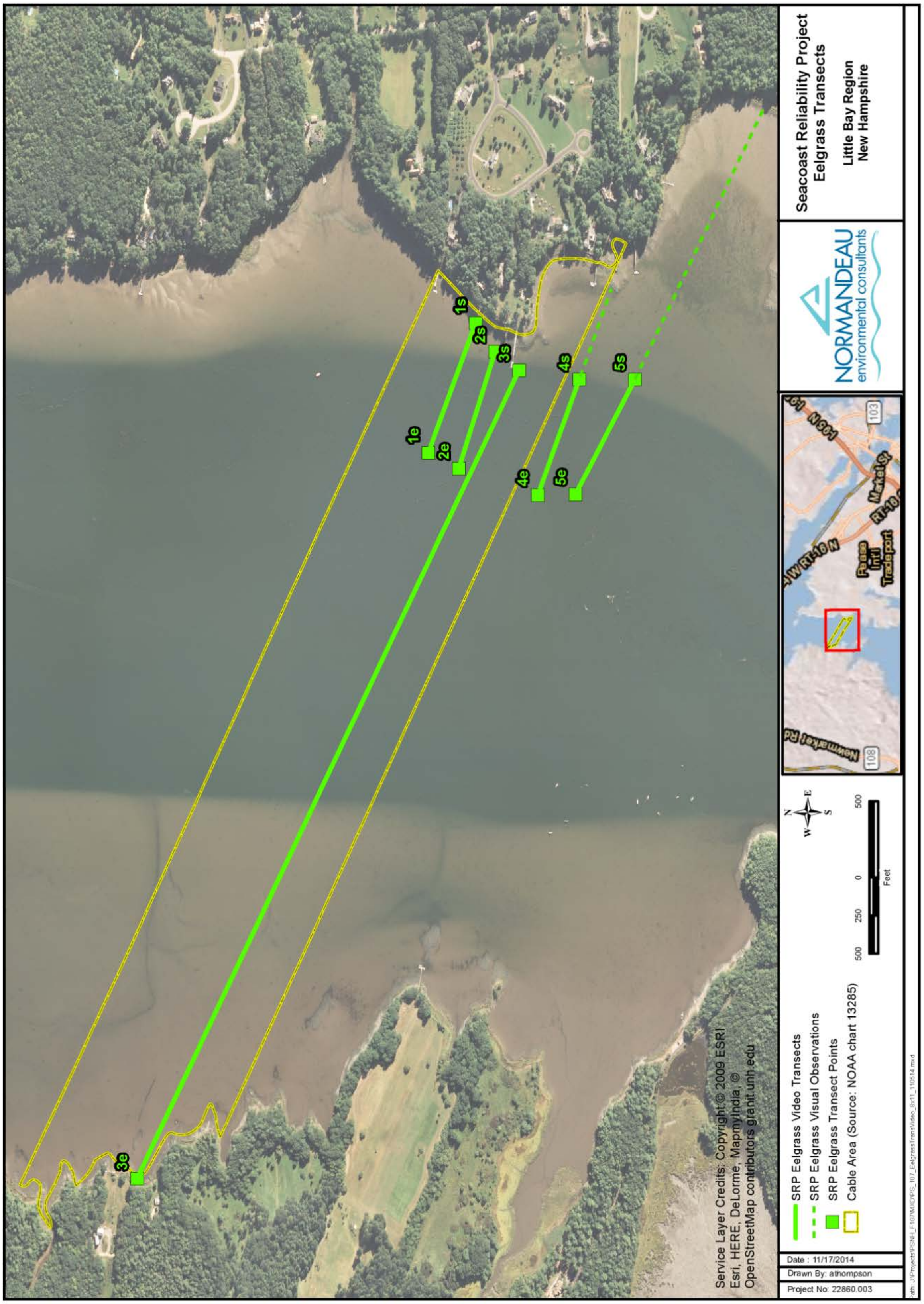


Figure 3.4-2. Normandeau Eelgrass Video Transects.

The status of oyster beds in the estuary has been of great concern to the Piscataqua Regional Estuary Project ("PREP") and other Great Bay environmental groups because this species is considered an indicator of environmental health. Oysters are long-lived, filter feeding organisms and therefore reflect cumulative exposure to environmental conditions. Major natural oyster beds have not been documented in Little Bay; the closest major beds to the Cable Area are at Adams Point (about 0.75 mile south of the Cable Area) and Nannie Island (off of Woodman Point; about 1.75 mile south of the Cable Area). Grizzle and Ward (2013) surveyed the known oyster beds in 2012 to estimate size and relative density. They determined that the bed at Adams Point in Furber Strait covered an area of 13.9 acres and classified it as a reef because more than 20 percent of the area contained shell cover and live oysters. The bed off Nannie Island was about 32.4 acres in 2012 and was also classified as a reef. The standing stock of oysters in the Great Bay estuary has been monitored since 1993 when there were more than 25 million oysters in the bays. PREP (2013) reported that in 2011, the standing stock was less than 10 percent of that total. Oyster populations at both Adams Point and Nannie Island experienced substantial declines. PREP (2013) attributed at least part of the decline observed starting in the mid-1990s to the oyster diseases MSX and Dermo and suggested that the large increase in Dermo in the last decade could be related to warming water temperatures. Konisky et al. (2014) indicated that siltation, resulting from increases in impervious surfaces within the watershed that have changed runoff patterns, may also be a factor in oyster decline (Great Bay Siltation Commission 2010).

There has been an active effort to restore oyster beds in Great and Little Bays and their tributaries with restoration sites located at the mouths of the Squamscott, Lamprey, and Oyster Rivers, in upper Great Bay, in the Bellamy River, and in the Piscataqua River (Konisky et al. 2014) (Figure 3.4-3). Restoration efforts include placement of clamshells on the substrate to serve as settlement sites to allow for natural settlement and rearing of oyster larvae for settlement in holding tanks prior to placement in the restoration sites. In 2014, oyster spat were reared at eight locations in upper Little Bay, including adjacent to the northern boundary of the charted Cable Area along the western shoreline; spat were retrieved from these sites in late September (McKeton et al. 2014). Monitoring has demonstrated that natural settlement at the restored oyster reefs is occurring and laboratory-reared spat are surviving in the field.

NHDES is also encouraging oyster aquaculture in the estuary. Grizzle and Ward (2012) evaluated the potential for shellfish aquaculture in the Great Bay system based on occurrence of red tide toxicity, water depth, harvest closures, eelgrass distribution, and mooring fields and concluded that conditions were most suitable in Little Bay (Figure 3.4-5), although there is no expectation that the entire suitable area would be utilized for aquaculture. Existing and recently proposed aquaculture operations as of December 2015 are shown on Figure 3.4-6. However, applications for new or expanded facilities are made frequently (C. Nash, NHDES Shellfish Coordinator; pers. comm. 07/17/15). The aquaculture lease that falls partially within the Cable Area may move to the north although bathymetric conditions could limit this.

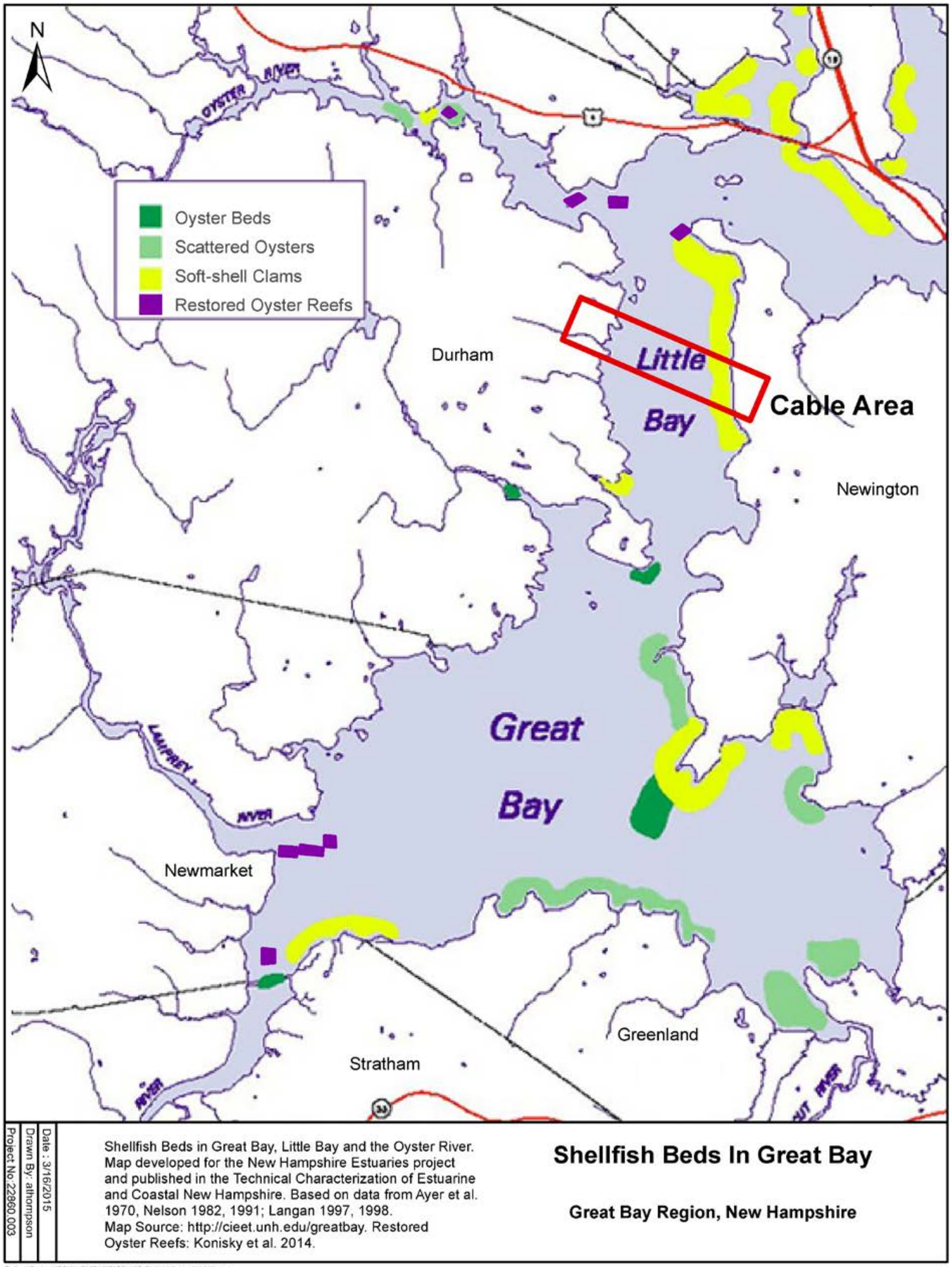


Figure 3.4-3. Historical Distribution of Shellfish.

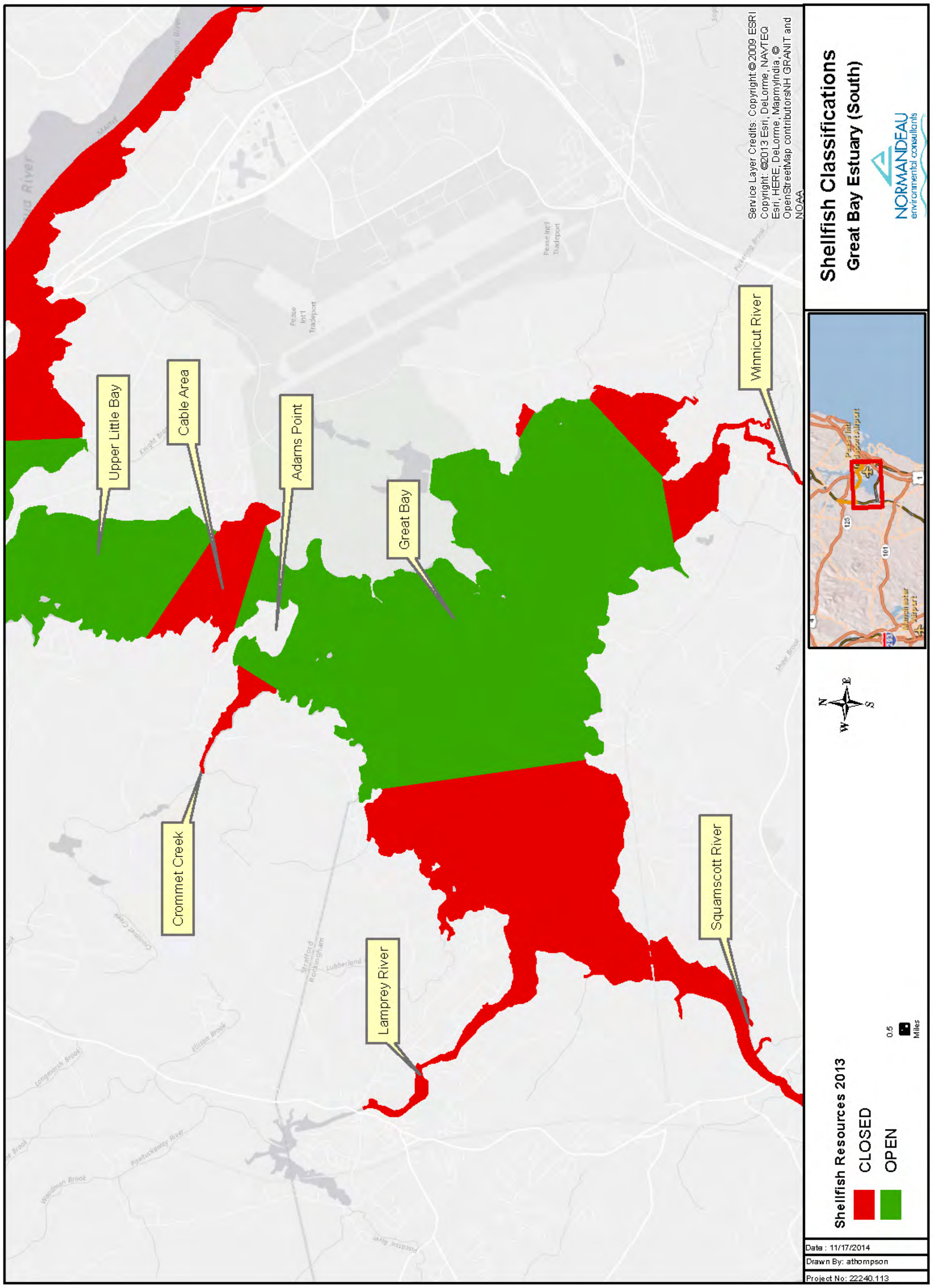


Figure 3.4-4. NHDES Classification of Great Bay Estuary Waters for Shellfish Harvesting.

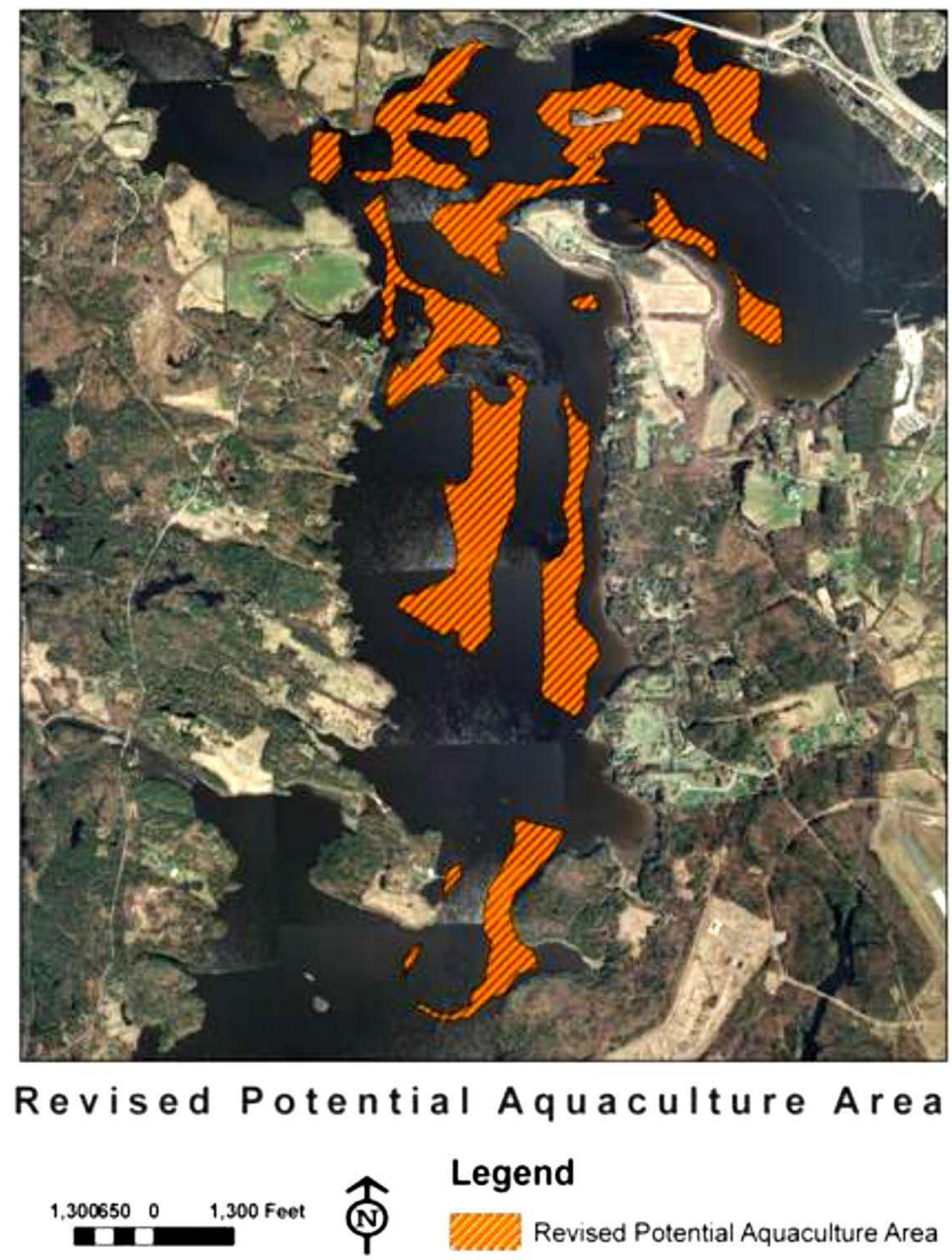


Figure 3.4-5. Areas Suitable for Aquaculture Identified by Grizzle and Ward (2012).

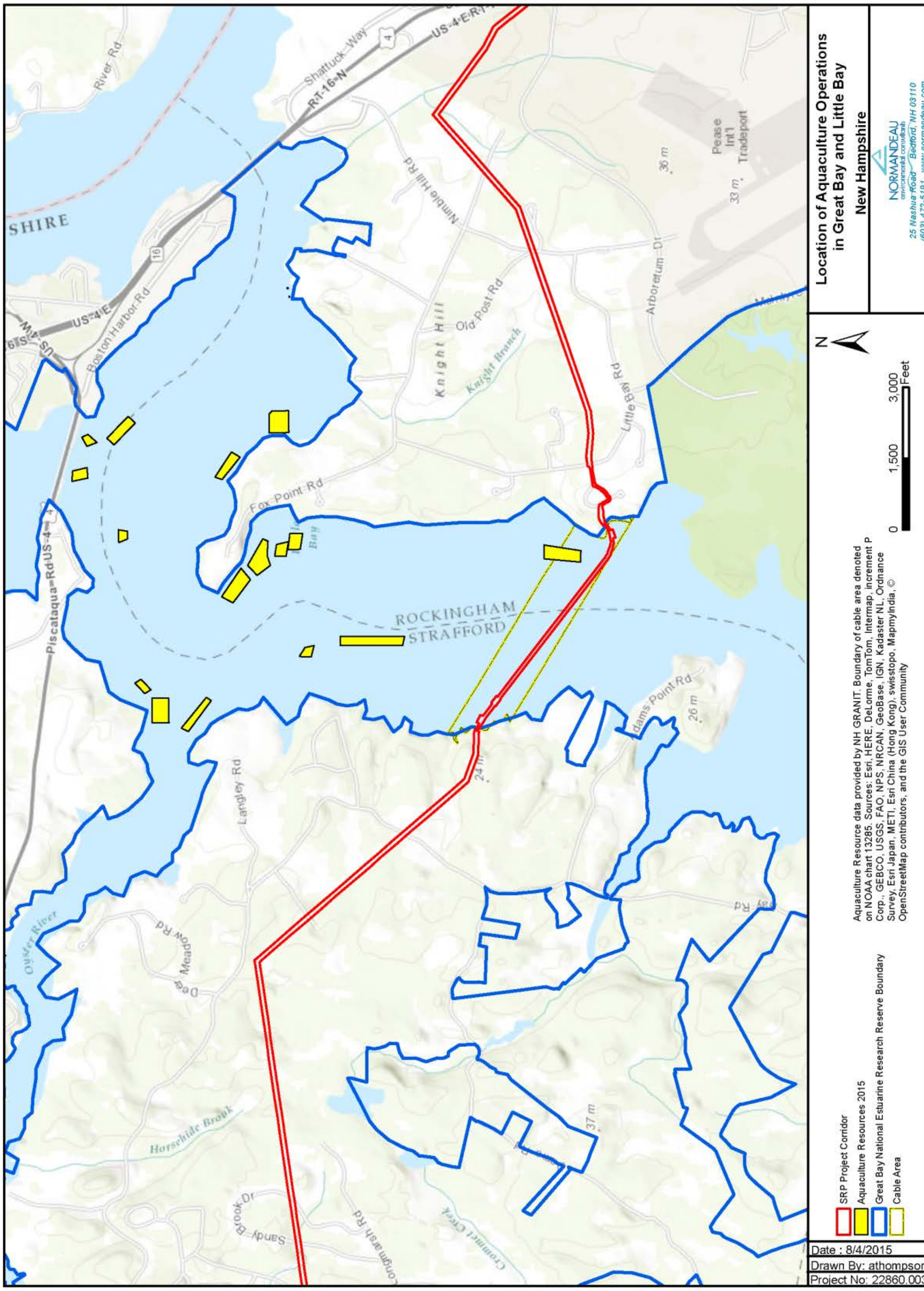


Figure 3.4-6. Location of Aquaculture Leases as provided by NHDES in 2015.

Historically, softshell clams were widespread in Great Bay and Little Bay (Figure 3.4-3). In New England, softshell clams are most abundant in the intertidal and shallow subtidal zone. Past records do not show softshell clam beds on the western side of Little Bay, although, it is possible that the historic records partially reflect accessibility. The substrate on the western tidal flat is very soft mud, unsuitable for access on foot. A conversation with Mr. Bruce Smith, NHFG, indicated that the department considers this area to provide suitable habitat for softshell clams, razor clams, and the non-harvested *Macoma balthica*.

Results of Normandeau's field surveys on the western flats are presented in Table 3.4-1 and Figure 3.4-7. Softshell clams (*Mya*) were observed at nine stations and live razor clams (*Ensis*) were identified at two. Razor clam shells were noted in several locations. No live *Macoma* were observed although shells were present. In addition to the bivalves observed, mud snails (*Ilyanassa trivitattus*) were numerous in many locations and were likely grazing on the benthic diatoms that were present. Hermit crabs were also common. Most sites had numerous invertebrate holes, most likely polychaetes (see Section 3.4.4 on benthic infauna). While this survey was not designed to quantify the bivalve population on the tidal flat, it clearly shows that these resources are present within the Cable Area.

3.4.4 Benthic Infauna

Benthic resources along the cable route will be affected by the installation process. In order to evaluate the ability of the infaunal resources to recover from this impact and to evaluate whether this impact would have consequences to other resources, such as species that rely on the benthos for feeding, it is important to characterize the benthos. USEPA's NCCA program includes sampling of benthic infauna in the Great Bay system (http://water.epa.gov/type/oceb/assessmonitor/ncca.cfm), but data available for Little Bay are limited (Figure 3.4-8) particularly in the immediate vicinity of the Project.

Benthic infaunal community structure is closely linked to substrate conditions and water depth. The Normandeau field crew characterized the sediment at the fifteen benthic infauna stations (Figure 3.4-9). Substrate texture differed among the three depth zones in the Project Area. All stations on the tidal flat consisted of a fine soft silt surface layer with some clay at the bottom of the grab. In the channel, sediments at the northern stations were fine sand with silt and shell hash and the three southern stations consisted of fine and medium sand. Along the channel slope, sediments were fine sand mixed with silt and shells or shell hash; the two northern stations also included some small gravel.

Infaunal abundance was generally highest at the stations on the western tidal flat, most variable in the channel, and most consistent along the channel slope (Table 3.4-2). The total number of unique taxa was most consistent on the tidal flat and most variable among the stations in the channel and along the channel slope (Table 3.4-2).

Table 3.4-1. Results of visual inspection of western tidal flat for shellfish and other benthic resources conducted on September 16, 2014 from mid-ebb to start of flood tide.

Station	Water Depth	Tide Stage	*Mya*	*Ensis*	Polychaetes	Mud snails	Hermit crabs	Substrate	Comments[b]	Between transects
1	24″	Ebb	1		holes	9	1	Diatom cover Soft silt (anoxic just below surface)		Areas with dense numbers of mud snails (*Ilyanassa*)
S2	n/a		2		holes		1	Diatom cover Soft silt (anoxic just below surface)	*Mya* shell Green crab depression	
S3	20″		4		holes		2	Diatom cover	Crab hole	
S4	18″		4		holes	2	3	Soft silt (anoxic just below surface)		
S5	16″		1		holes			Diatom cover	Crab burrow	
S6	24″		1		holes			Soft silt (anoxic just below surface)	*Macoma* shells	
S7	20″				holes			Diatom cover	Drift algae *Macoma* shells	Razor clam shells between stations
S8	20″					Too numerous to count	Present	Soft silt (anoxic just below surface)		
S9	20″	Low slack	2		holes	Present	2	Diatom cover	*Macoma* shells *Ascophyllum scarpoides*	
S10	20″			(1-shell)	holes	Too numerous to count		Soft silt (anoxic just below surface)	*Ulva*	
S11	18″				holes			Diatom cover	Unidentified bivalve holes (2) 3 small “grapes” (egg cases?) *Ulva*	
S12	18″			(2-shell)	holes	Present		Soft silt (anoxic just below surface)	Drift algae Razor clam shells	
S13	18″	Flood		4	holes		Present	Diatom cover		
S14	18″		1	3	holes		Present	Soft silt (anoxic just below surface)	Razor clam shells *Macoma* shells Drift algae (cover ~25%) *Ulva*	
S15	21″		2		holes		Present	Diatom cover	Drift algae Green crab burrow	
S16[c]	24″				holes			Soft silt (anoxic just below surface)	Snail trail Drift algae “grape”	Several horseshoe crabs

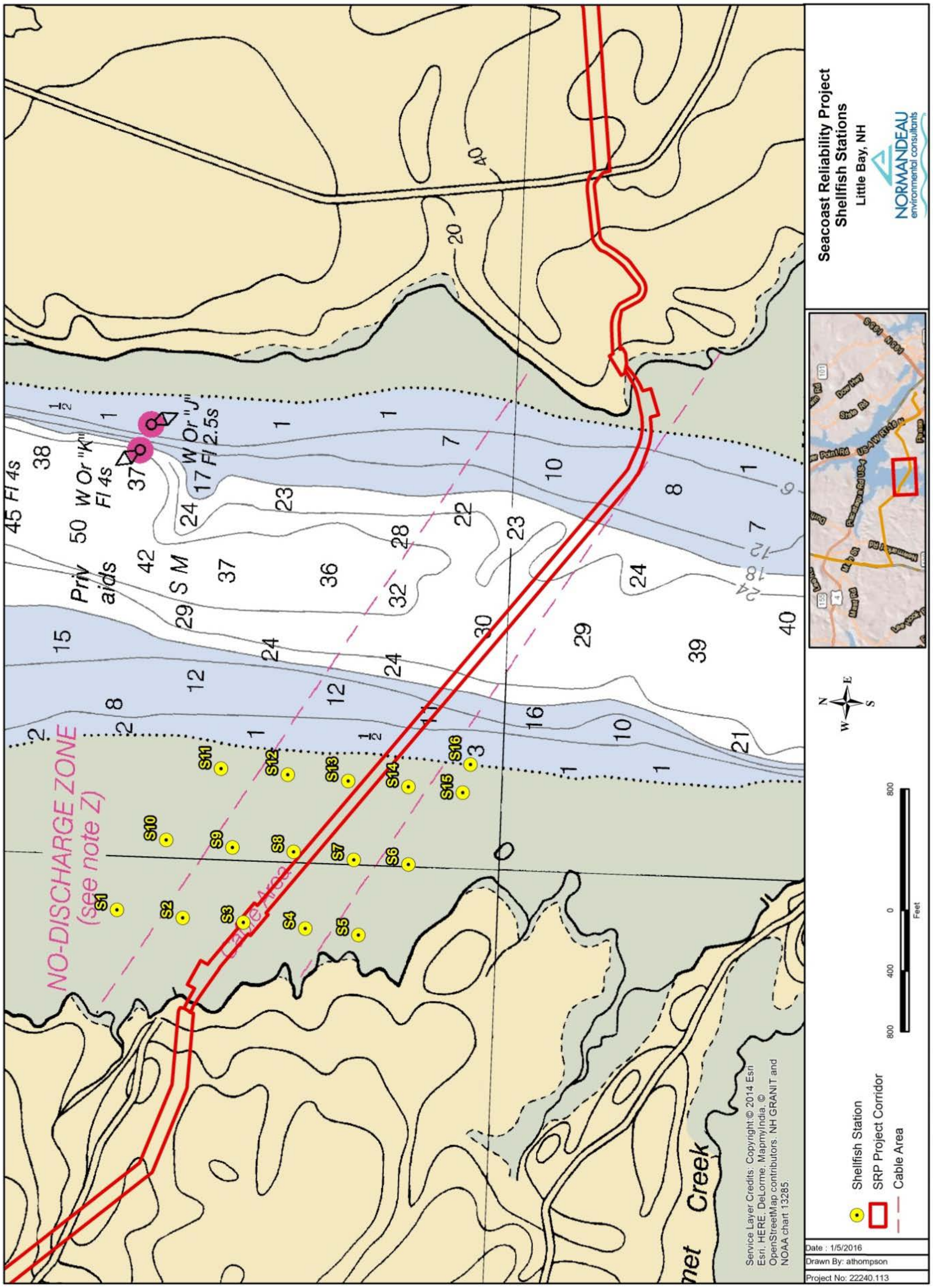
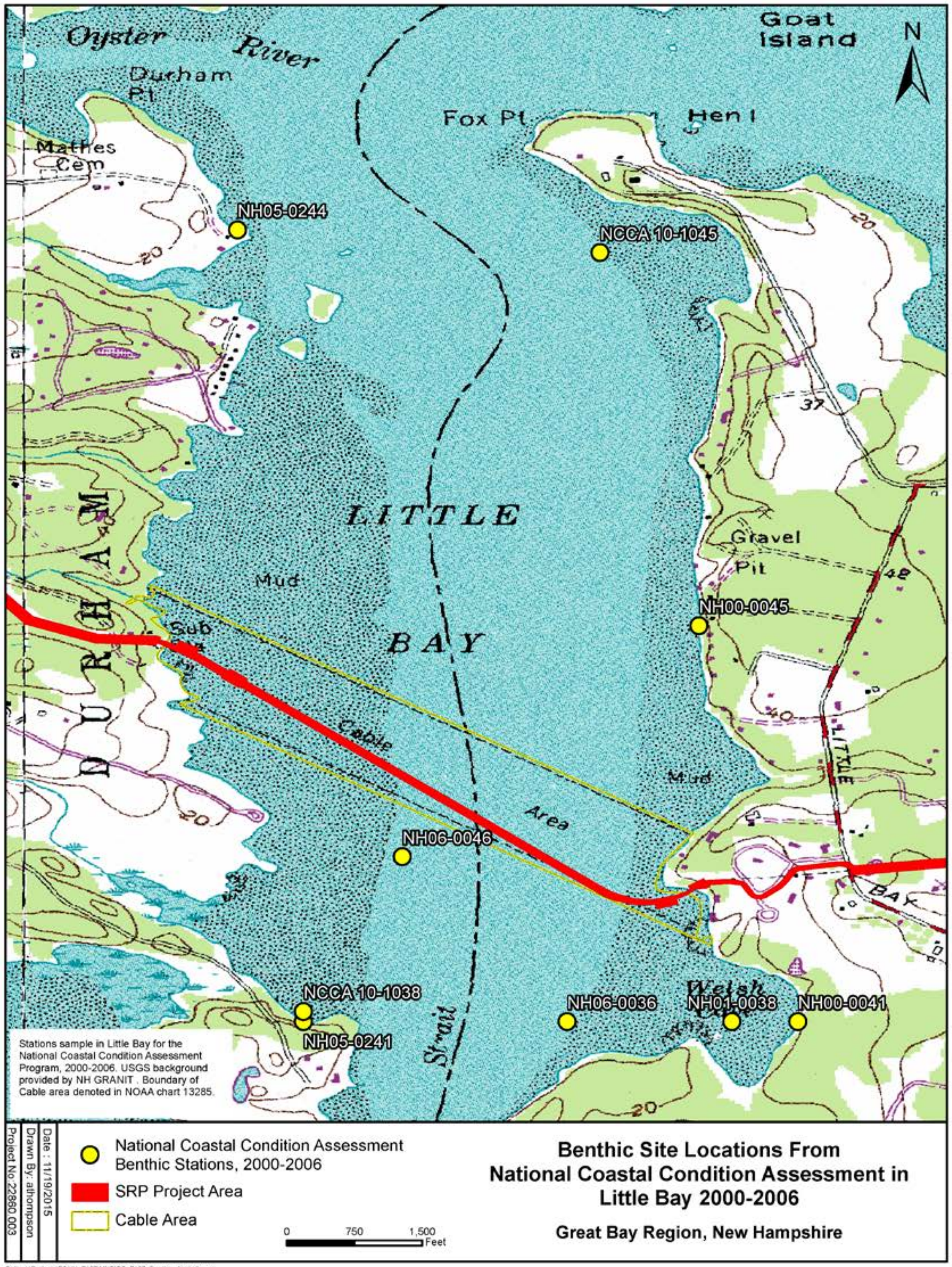


Figure 3.4-7. Normandeau Shellfish Survey Stations.



Source: http://www.epa.gov/emap/nca/html/data/index.html

Figure 3.4-8. National Coastal Condition Assessment Sampling Locations, 2000-2006.

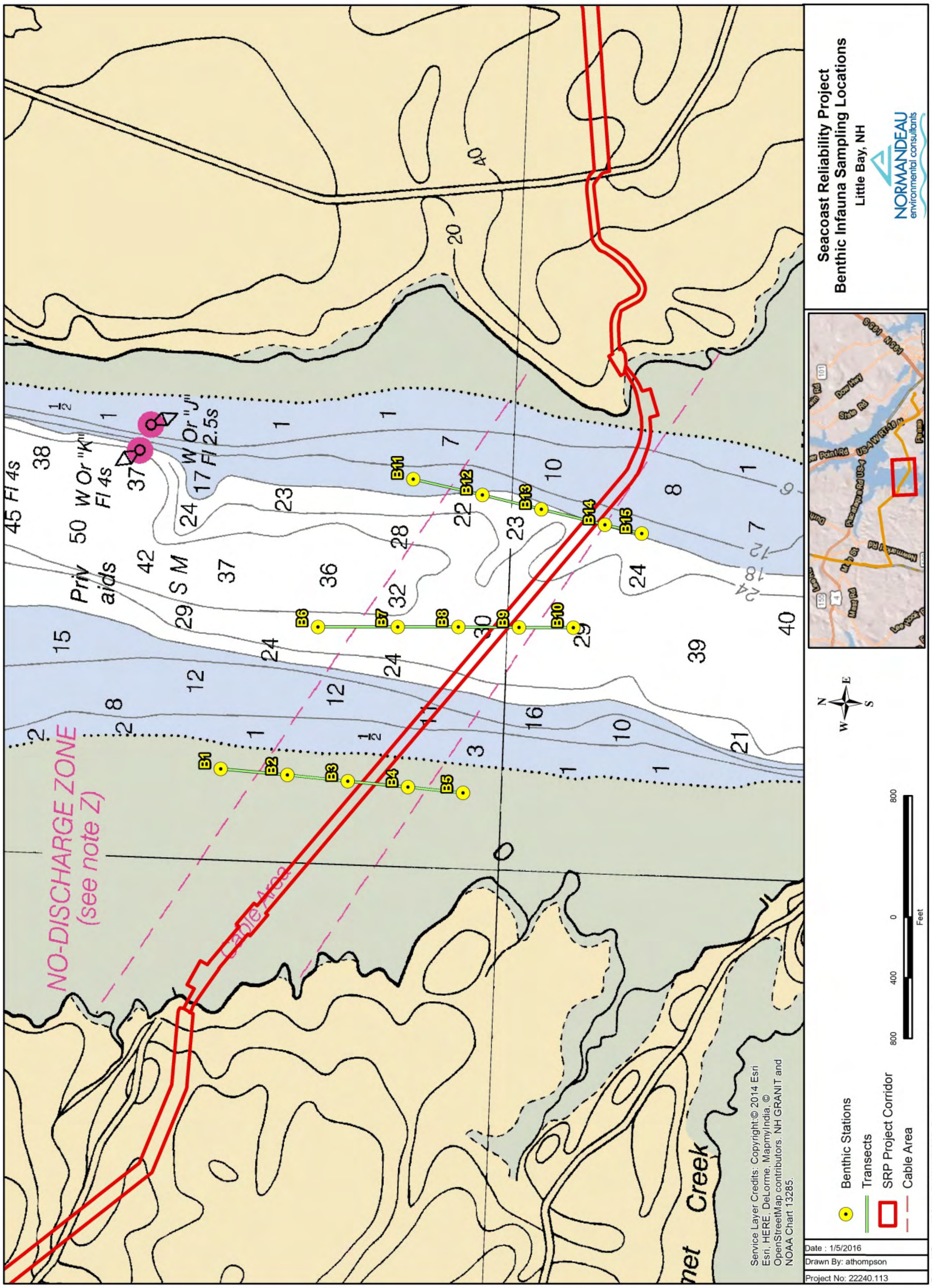


Figure 3.4-9. Normandeau Benthic Infauna Sampling Locations.

Table 3.4-2. Total abundance (no./0.04 m² grab), species richness (no./0.04 m² grab), diversity (H'), and evenness (J') of benthic infauna at stations along the cable route in Little Bay, August 2014.

Parameter	Range (mean) values		
	Tidal flat	Channel	Channel slope
Abundance (no./grab)	1,961 – 3,883 (2,733)	548 – 2,521 (1,470)	1,039 – 1,397 (1,204)
No. of unique taxa (no./grab)	26 - 31 (28.2)	22 - 35 (25.8)	22 - 33 (27.8)
Shannon-Weiner Diversity (H')	1.43 - 1.79 (1.564)	1.59 - 2.12 (1.812)	1.66 - 1.63 (1.796)
Pielou's Evenness (J')	0.44 – 0.56 (0.476)	0.47 – 0.69 (0.574)	050 – 0.60 (0.556)

Table 3.4-3. Mean abundance (no./0.04 m² grab) and rank of dominant taxa (≥ 1% of mean total abundance within area) along the cable route in Little Bay.

Taxon	Mean Abundance (Rank)		
	Tidal Flat	Channel	Channel Slope
Nematoda	246.4 (3)	78.8 (5)	74.2 (5)
Hypereteone heteropoda	68.4 (6)	*	*
Scoletoma tenuis	1457 (1)	*	
Aricidea (Acmira) catherinae	*	375.4 (2)	226.4 (3)
Polydora cornuta	83.4 (4)		*
Spio filicornis		*	11.6 (9)
Pygospio elegans	*	14 (9)	*
Streblospio benedicti	541.4 (2)	56 (7)	24.6 (7)
Scolelepis (Parascolelepis) texana	58.6 (8)	159 (3)	389.8 (1)
Cirratulidae	*	76.8 (6)	61.4 (6)
Tharyx acutus	60.8 (7)	417.8 (1)	249 (2)
Capitella capitata	*	40.2 (8)	11.8 (8)
Oligochaeta	*	106.4 (4)	105 (4)
Haminoea solitaria	80.8 (5)		

*present in area, but not among the dominant taxa

Within each of the three depth zones, eight or nine taxa individually made up more that 1% of the total abundance (Table 3.4-3). Combined, these taxa made up more than 90% of the total abundance in each zone. Although four taxa were among the dominants in each depth zone (nematodes, and three polychaetes: *Streblospio benedicti*, *Scolelepis texana*, and *Tharyx acutus*), the composition of the dominants was clearly different on the tidal flat than in the channel or the slope. These differences in species compositions likely reflected a combination of depth zone and substrate texture differences. Muddy sediments tend to support different benthic infaunal species than do sandier sediments. Two species, the lumbrinerid polychaete *Scoletoma tenuis* and the spionid polychaete *Streblospio benedicti*, accounted for more than 70% of the mean total abundance on the tidal flat. *Scoletoma i*s an actively burrowing species that reworks the sediment and is indicative of a moderately stable community. *Streblospio*, on the other hand, is often considered an opportunistic species that is capable of rapid population of disturbed sediments. Most of the other dominant polychaetes (*Polydora*, *Scolelepis*, and *Tharyx*) are also surface deposit feeders (Fauchald and Jumars 1979). Nematodes move about in the sediment and feed primarily on microorganisms and sediment particles. The gastropod snail *Haminoea solitaria* is among the dominants only on the tidal flat. This species lives and feeds on the sediment surface, consuming sediment particles and benthic diatoms (Chester 1993). The dominance by surface oriented infauna suggests that the sediments are frequently disturbed, perhaps by wave action during storms or icing in the cold months, although the species richness indicates good quality habitat.

Dominant taxa were virtually identical in the channel and on the channel slope although rank order differed. As on the tidal flat, polychaetes were the most important taxa numerically. The same three species (*Aricidea* (*Acmira*) *catherinae*, *Scolelepis* (*Parascolelepis*) *texana*, and *Tharyx acutus*) together contributed 65-70% of the total abundance at these depths indicating that sediment texture had a larger role in structuring the benthic community than depth. Each of these three species are considered to be surface deposit feeders but exhibit different levels of mobility, with *Aricidea* the most mobile and *Tharyx* sessile (Fauchald and Jumars 1979). A variety of behaviors provides some resiliency, but the predominance by surface-oriented species suggests some instability in the habitat, such as mobile sediments (to which *Scolelepis* is adapted; Fauchald and Jumars 1979).

Although polychaetes dominate both in terms of abundance and in terms of species richness, both arthropods and mollusks were well represented in each depth zone (Table 3.4-4).

Table 3.4-4. Number of unique species (no. across all samples) and mean total abundance (no./0.04 m^2 grab) of arthropods, mollusks, and polychaetes along the cable route in Little Bay

Taxonomic Group	Tidal Flat	Channel	Channel Slope
Arthropoda No. species	8	10	12
Mean abundance	41.2	82	21.2
Mollusca No. species	10	3	6
Mean abundance	97	11.6	5.6
Polychaeta No. species	15	23	21
Mean abundance	2307	1187.8	995.2

Species richness of arthropods was highest on the channel slope but abundances of these species were lowest in this area. Species richness and abundance of mollusks were highest on the tidal flat. Polychaete species richness was highest in the channel and lowest on the tidal flat but abundance was nearly double on the tidal flat compared to other areas. Results of the project-specific survey compare well to data collected between 2000 and 2006 for the NCCA program. Of the seven stations sampled during that time frame, total abundances (no./0.04 m^2 grab) ranged from 40 to 785 individuals and species richness (no. per grab) ranged from 5 to 22 unique taxa. Most taxa that were numerical dominants in the NCCA samples were also dominants in the Project Area. Jones (2000) reported that species richness and dominant species (including *Streblospio*, *Heteromastus*, *Scoloplos*, *Pygospio*, *Aricidea*, and oligochaetes, many of the dominants in the project area) in the Great Bay Estuary were similar over a twenty-year period (1972-1995) indicating that the benthic infaunal community in the estuary has been relatively stable in composition in the last three decades.

Recent alignment changes in the Little Bay crossing result in a short segment passing through the northern portion of Welsh Cove where no samples were collected during the benthic survey. However, several stations sampled during previous NCCA surveys were located in Welsh Cove (Figure 3.4-8). Total abundances and number of taxa of benthic infauna were lower in Welsh Cove than on the western tidal flat, but dominant taxa were similar which reinforces the concept that the estuary has supported a relatively stable macrofauna community for an extended period.

The National Estuary Program rated benthic conditions in Little Bay as good based on the fact that Shannon-Weiner diversity at all of the stations within the bay itself (excluding tributaries) exceeded 0.63 (USEPA 2007). The site-specific sampling confirmed this condition in the Project Area in 2014 (Table 3.4-2). Hale and Heltshe (2008), considered Shannon-Weiner diversity and predominance of capitellid polychaetes as two of the important factors indicating benthic habitat quality in the nearshore Gulf of Maine. The relatively low abundance of capitellids in the Project Area is an indication of good sediment quality (absence of organic pollution). Compared to Hale and Heltshe index values for diversity, the habitat value is most stressed on the western tidal flat and most consistently diverse on the channel slope.

Epibenthos

Epibenthic organisms that live and feed on the substrate surface known to, or are likely to, occur in the Great Bay Estuary include American lobster (*Homarus americanus*), rock crabs (*Cancer irroratus*), green crabs (*Carcinus maenas*), mud crabs (Xanthidae) and horseshoe crabs (*Limulus polyphemus*) (Jones 2000). These species move around on and burrow into the substrate seeking food or refuge. Bioturbation caused by these activities can have a substantial effect on the infaunal biota and on eelgrass beds. Lobsters are present throughout the bays and are fished both commercially and recreationally, although no landings or distribution data are available specifically for the estuary. Banner and Hayes (1996) reviewed environmental conditions (preferred substrate availability, salinity, temperature, and depth) in the estuary and concluded that the deeper portions of Little Bay provided good habitat for adult lobsters, but not juveniles. Watson et al. (1999) found that males were more common than females in the bay and that berried females tended to move into coastal waters to release larvae. Lobsters are generally active nocturnally, residing in burrows or crevices when they are not feeding. Although omnivorous, they feed primarily on large invertebrates (Jones 2000). Lobsters move in and out of the estuary seasonally in response to variations in salinity and temperature, with their greatest presence during late spring through fall (Watson et al. 1999; Jones 2000).

Rock crabs have been reported from the Great Bay system and may occur in deeper portions of the proposed cable crossing as this species prefers sandy substrate (Jeffries 1966). Rock crabs are fished commercially and recreationally to some degree. NHFG has found green crabs, an invasive species, to be the most abundant invertebrate species collected in New Hampshire's estuaries (NHFG 2014c). Green crabs have been shown to consume juvenile softshell clams, contributing to the failed recruitment to harvestable sizes and to uproot eelgrass plants, particularly in restoration areas. Abundances of rock and green crabs in Great Bay is not readily available; results of the NHFG surveys are reported as total catch from Great Bay, Little Bay, Piscataqua River, Little Harbor and Hampton/Seabrook Estuary combined (NHFG 2014c). Jones (2000) reported that green crabs were more abundant in the Piscataqua River and Little Bay than in Great Bay, however, and that both rock crabs and mud crabs are abundant in Great Bay.

Horseshoe crabs are ecologically important because their eggs, laid intertidally, provide a rich food source for migrating shorebirds. In addition, the crabs forage in muddy substrates for food and by doing so, bioengineer the substrate. Lee (2010) reported that mudflats in the Great Bay Estuary are important feeding habitats for both adult and juvenile horseshoe crabs. Horseshoe crabs are most noticeable in the estuary in the late spring and early summer when they undergo their spawning movements onto intertidal beaches (Mills 2010). According to Atlantic States Fisheries Management Commission ("ASFMC" 1998), preferred spawning habitat is sandy beaches in protected bays and coves, although spawning has been observed on substrates such as mud or peat. The tidal flats within the Project location could, therefore, provide spawning habitat. After investigating 15 locations in the estuary, ASFMC (undated) identified five (Wagon Hill Farm, Adams Point, Chapman's landing, Sandy Point, and Emery Point) as potential horseshoe crab spawning and nursery habitat. Over five years (2001-2006), researchers observed nesting and eggs in all but 2001 at these locations. CPUE was highest at beaches farther up Great Bay than at Adams Point. According to Cheng (2014) juveniles are most apt to reside in the upper regions of Great Bay, with none being observed in Little Bay.

3.4.5 Bathymetry and Substrate

The SRP crosses Little Bay north of Adams Point and Furber Strait, a span of approximately 5,470 feet. A broad tidal flat with depths ranging from about +1 to -1 foot MLLW extends from the western shoreline approximately 1800 feet. Moving eastward, water depths increase gradually (over a distance of about 800 feet) to ~30 feet below MLLW. Water depth remains deep for about 400 feet, gradually decreasing to about 17 feet below MLLW and then more abruptly to 0 feet MLLW. The tidal flat on the eastern shoreline is about 100 feet wide. Bathymetric conditions in Little Bay are shown in Figure 3.4-10.

Information on sediment texture in the Project vicinity is available from three sources – a vibracore survey conducted along the proposed cable alignment in April 2014 with the purpose of obtaining sediments for testing their thermal conductance properties (Figure 3.4-11), a survey conducted by Professor Thomas Lippmann (University of New Hampshire, personal communication, 2014) on a transect south of the cable route (Figure 3.4-12), and a diver survey along the route to determine the locations of existing cables. As the cable will be routed only through the northernmost portion of Welsh Cove, samples collected in the cove during the vibracore and Lippmann surveys are not relevant to this characterization. Sediment characteristics observed during the vibracore survey are shown in Table 3.4-5 and from Dr. Lippmann's survey are shown in Table 3.4-6. These two surveys were consistent in showing that sediments on the western tidal flat were predominantly silt-clay and in the channel and eastern channel slope were predominantly sand. Sediments were generally consistent within depth zones: the western tidal flat was predominantly silt with some clay and detritus; the channel (water depth about 30 feet below MLLW) was predominantly fine to medium sand with shell hash; the eastern channel slope (water depth about -20 feet below MLLW) was predominantly fine sand with silt and some shells. Neither survey collected samples in the northernmost section of Welsh Cove, however vibracore station LB-

11 and Lippmann stations 1-4 are likely to be fairly representative of conditions across the eastern tidal flat along the crossing. These results indicate that sediments farthest offshore are sandier and sediments closer to shore are siltier. During the in-water survey investigating old cables, Caldwell divers described the substrate at water depths of 10.6 to 32 feet as compact gravel, covered with 0-24 inches of fine sands and soft mud (Caldwell 2014). For depths <10 feet within the cable corridor, the substrate assumed to be fine sand and soft mud.

USEPA's NCCA has conducted surficial sediment quality sampling in Little Bay. The most recent publically available data were collected in 2000-2010. Stations sampled in Little Bay for this program are shown on Figure 3.4-8.

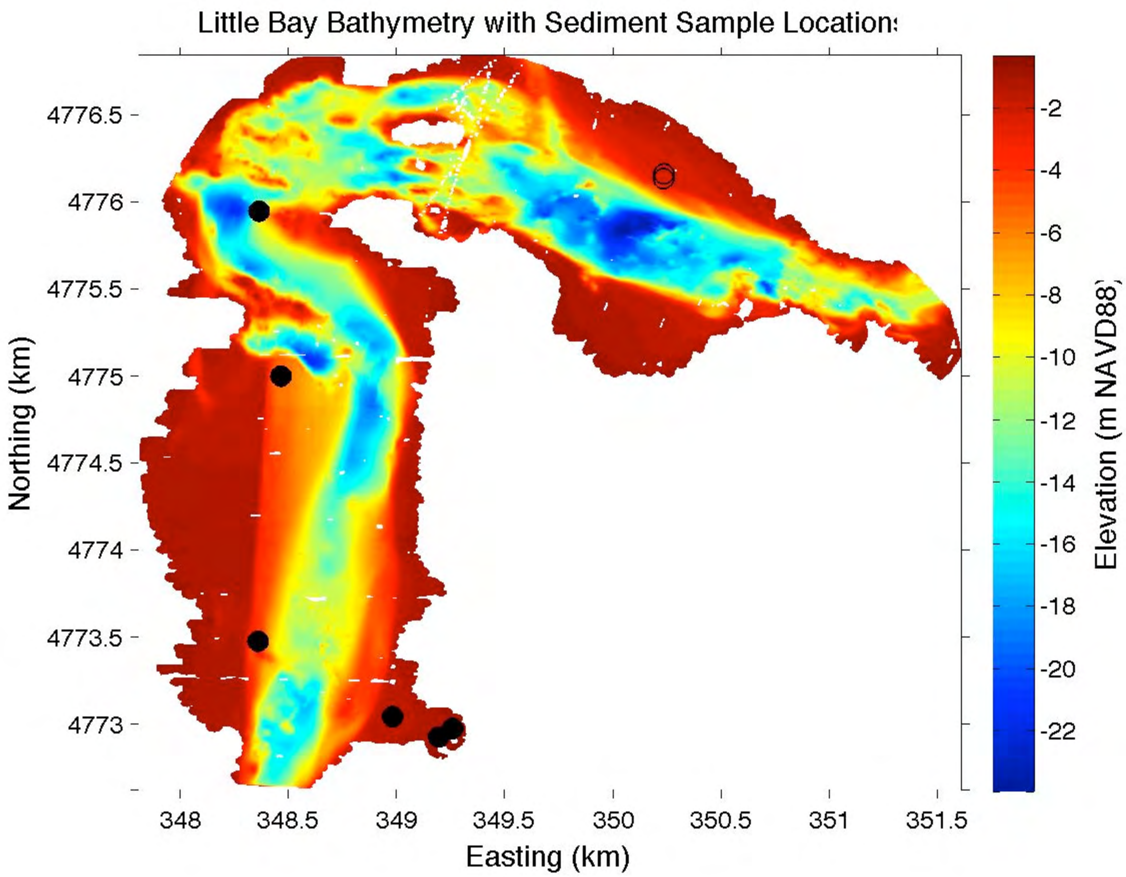


Figure 3.4-10. Bathymetric Map of Little Bay (Lippman 2013).

Values for total organic carbon ("TOC") at these stations ranged from 0.55 to 2.35 percent, averaging 1.4 percent, a relatively low value. Chemistry data are shown in Table 3.4-7. Sediment toxicity testing in 2000-2006 revealed no significant mortality among test benthic organisms. Based on the 2000-2006 data, USEPA (2007) characterized sediment quality in Little Bay as good. Trowbridge (2009) noted that although sediment contaminant levels in tributaries to the Great Bay/Little Bay system often exceeded NOAA screening levels, the concentrations within the bays themselves did not, which is consistent with low TOC values. It is unlikely that this has changed since the last assessment. Sediment contamination was not even considered as a factor affecting the estuary in the 2013 State of the Estuary report (PREP 2012, 2013). Data from 2010 (Table 3.4-7) suggest that sediment contaminant levels have shown little change since the previous assessment.

Table 3.4-5. Qualitative description of sediments along cable route from vibracore collections, April 2014.

Zone	Station	Penetration Depth	Sediment Description
Tidal Flat (west)	LB-1-A	94″	Cohesive Clay with silt
	LB-2-B	104″	
	LB-3-B	104″	
	LB-4-A	120″	Cohesive Clay with silt and trace of fine sands
	LB-5-B	86″	
Channel	LB-6-A	44″	Cohesive Fine to medium sand with small amount of clay and silt
	LB-7-B	63″	0-19″: Cohesive Fine to medium sand with small amount of clay and silt
			19-63″: cohesive Clay with silt
	LB-8-B	29″	0-15″: cohesive Fine to medium sand with small amount of clay and silt
			15-22″: cohesive Fine sand and clay, shell fragments present
			22-29″: cohesive Clay
Slope	LB-9-A	97″	0-22″: cohesive Fine to medium sand with small amount of clay and silt
			22-97″: cohesive Clay with silt, minor shell fragments throughout
Tidal Flat (east)	LB-10-D	44″	Cohesive Fine to medium sand with small amounts of clay
Welsh Cove	LB-11-B	103″	Cohesive Clay and fine sand with silt
	LB-12-B	46″	0-18″: cohesive Clay and fine sand with silt
			Cohesive Fine to medium sand with little clay and silt; minor amount of wood debris and shell fragments

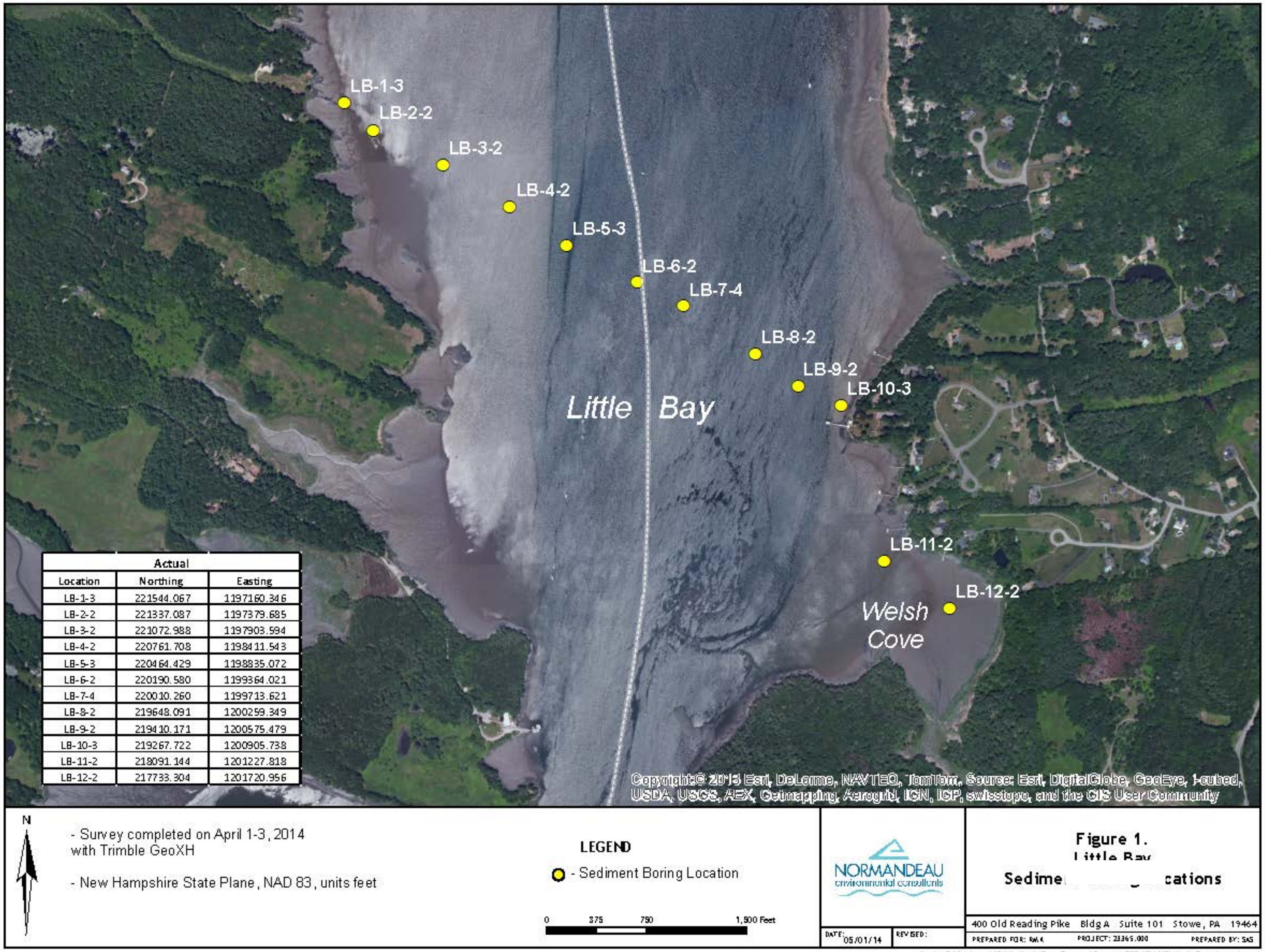


Figure 3.4-11. Normandeau Vibracore Sediment Boring Locations.

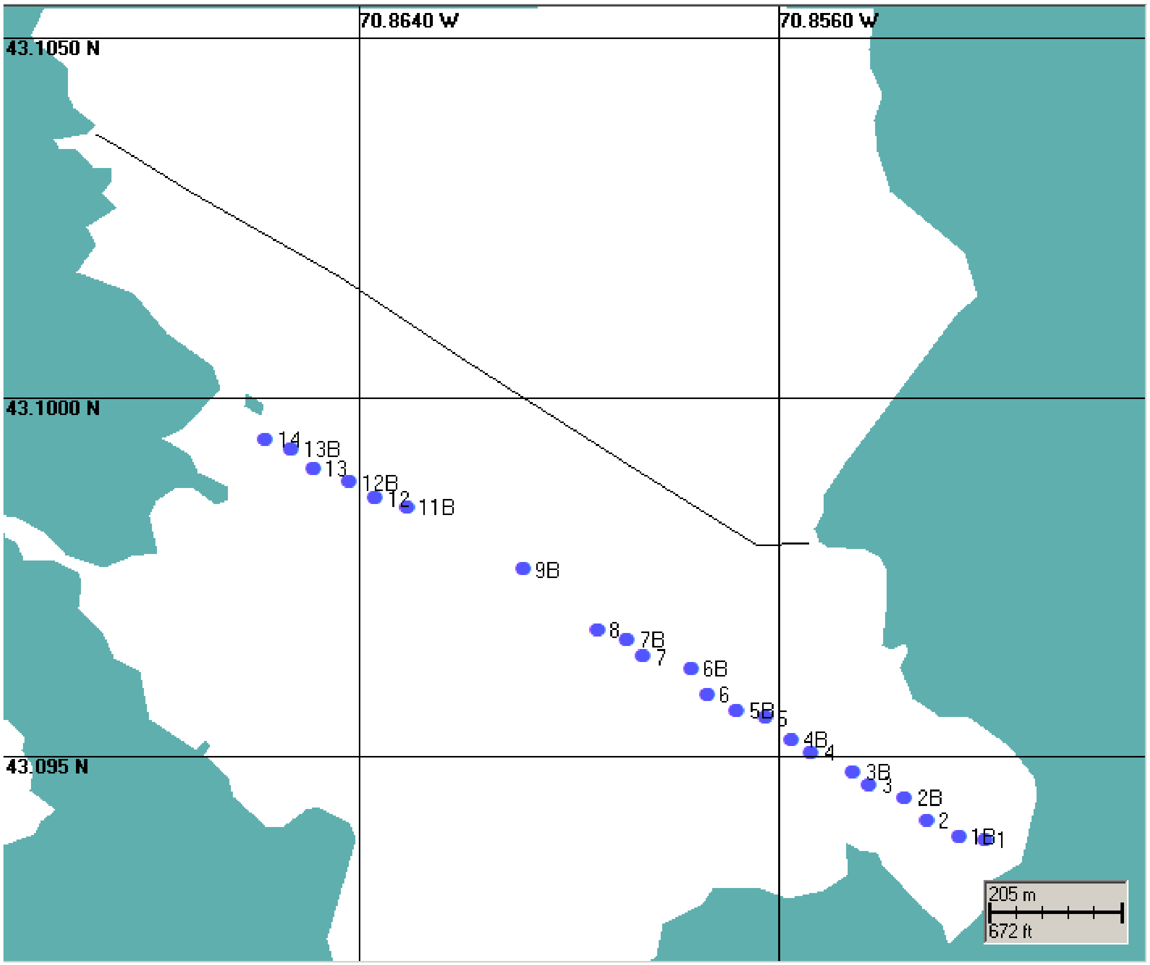


Figure 3.4-12. UNH Sediment Samples (Lippman, unpublished data, 2014).

Table 3.4-6. Grain size distributions (in percent) for Lippmann sampling stations. (refer to Figure 3.4-12 for sampling locations)

Station	14	13B	13	12B	12	11B	9B	8	7B	7	6B	6	5	4	3	2	1
Clay	10.71	9.20	6.97	4.41	7.03	1.34	2.78	0.00	0.00	0.00	1.18	2.14	3.08	6.58	4.22	5.53	5.31
F Silt	20.68	18.31	15.14	8.53	12.87	2.91	4.76	0.00	0.00	0.00	1.99	3.93	5.71	12.76	8.67	11.62	11.13
C Silt	40.42	32.02	35.52	19.38	23.84	6.02	5.74	0.00	2.13	0.00	3.71	6.95	9.85	28.02	24.75	40.89	36.62
F Sand	26.65	37.69	40.28	60.37	50.84	84.57	49.43	16.67	48.34	69.43	87.46	83.05	68.06	51.23	57.03	40.45	43.78
C Sand	1.54	2.79	2.10	7.31	5.41	5.17	37.29	83.33	49.53	30.57	5.66	3.92	13.30	1.41	5.34	1.52	3.15

Source: Lippmann 2014, pers. comm.

Table 3.4-7. Chemistry of surficial sediments at Stations in Little Bay sampled as part of the National Coastal Condition Assessment, 2000-2006.

Analyte (units)	NH00-045 2000	NH00-045 2000	NH01-0038 2001	NH06-0036 2006	NH06-0046 2006	NH10-1038 2010	NH10-1045 2010
Silver (ug/g)	0.4	0.1	0.5	0.736	0.743	1.6	1.1
Aluminum (ug/g)	54800	38100	59300	56100	48200	34310	18400
Arsenic (ug/g)	9	2	8	7.55	4.46	10.8	4.8
Cadmium (ug/g)	0.31	0.12	0.2	0.325	0.211	1.5	0.8
Chromium (ug/g)	73	21	81	65.3	33.6	95	34.6
Copper (ug/g)	14	4	16	11.9	5.75	16.8	5.6
Iron (ug/g)	24400	9780	24100	20800	13800	23410	10610
Mercury (ug/g)	0.14	0.04	0.14	0.149	0.056	0.2	0.06
Manganese (ug/g)	426	436	401	399	521	400.3	439.8
Nickel (ug/g)	15	6	17	14.6	9.16	18.9	8.1
Lead (ug/g)	38.8	22.2	36.5	36.1	24.4	43.4	24
Antimony (ug/g)	0.3	0.1	0.3	0.292	0.188	0.4	0.2
Selenium (ug/g)	0.28	0.06	0.23	0.371	0.29	0	0
Tin (ug/g)	5.8	2	5.9	5.85	2.91	9.4	4.1
Zinc (ug/g)	79	28	80	63.8	35.6	82.5	32.9
High Molecular Wgt PAHs (ng/g)	829	191.1	685	659.7	265.6	385.6	1029.7
Low Molecular Wgt PAHs (ng/g)	124.7	27.16	64.04	58.9	23.4	128.2	270
Total PAHs (ng/g)	994.7	229.26	786.04	801.2	323.1	585.2	1479.4
Total PCBs (ng/g)	3.999	0.841	7.52	0	0	0	0
Aldrin (ng/g)	<0.4	<0.27	<0.37	<1	<1	0	0
Alpha-Chlordane (ng/g)	<0.37	<0.25	0.045	<1	<1	0	0
Total DDTs (ng/g)	1.474	0.256	1.99	0	0	0	0
Dieldrin (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0
Endosulfan I (ng/g)	<0.62	<0.42	<0.58	<1	<1	0	0
Endosulfan II (ng/g)	0.12	<0.42	<0.58	<1	<1	0	0
Endosulfan (ng/g)	0.092	<0.12	0.068	<1	<1	0	0
Endrin (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0

Source: http://www.epa.gov/emap/nca/html/data/index.html

(continued)

Table 3.4-7. (Continued)

Analyte (units)	NH00-045 2000	NH00-045 2000	NH01-0038 2001	NH06-0036 2006	NH06-0046 2006	NH10-1038 2010	NH10-1045 2010
Heptachlor (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0
Heptachlor Epoxide (ng/g)	<0.37	<0.25	<0.34	<1	<1	0	0
Hexachlorobenzene (ng/g)	<0.18	<0.12	0.027	<1	<1	0	0
Lindane (ng/g)	0.041	<0.18	<0.25	<1	<1	0	0
Mirex (ng/g)	<0.18	<0.12	0.16	<1	<1	0	0
2,4'-DDD (ng/g)	0.32	0.099	0.24	<1	<1	0	0
2,4'-DDE (ng/g)	<0.62	<0.42	<0.58	<1	<1	0	0
2,4'-DDT (ng/g)	<0.62	<0.42	0.16	<1	<1	0	0
4,4'-DDD (ng/g)	0.4	0.064	0.56	<1	<1	0	0
4,4'-DDE (ng/g)	0.66	0.093	0.87	<1	<1	0	0
4,4'-DDT (ng/g)	0.094	<0.58	0.16	<1	<1	0	0
Trans-Nonachlor (ng/g)	0.034	<0.18	0.054	<1	<1	0	0
Toxaphene (ng/g)			<23	<10	<10		

Source: http://www.epa.gov/emap/nca/html/data/index.html

3.4.6 Water Quality

NOAA's National Estuarine Eutrophication Assessment program has designated all of Little Bay as part of the Seawater Zone of the Great Bay Estuary system (Figure 3.4-13). Salinity in this zone exceeds 25 parts per thousand ("ppt"). Data from the National Estuarine Research Reserve System ("NERRS") Great Bay sampling station (station ID: GRBGBWQ) were used as estimates of water temperature and dissolved oxygen at the Little Bay cable crossing location (Figure 3.4-13). From April 2009 through September 2014, water temperature in Great Bay ranged from -2 to 29.1°C (28.4 to 84.4°F), with July having the highest monthly mean temperature (24°C; 75.2°F; NERRS 2014; Figure 3.4-14). DO levels in Great Bay ranged from 3.7 to 17.4 mg/l during April 2009 through September

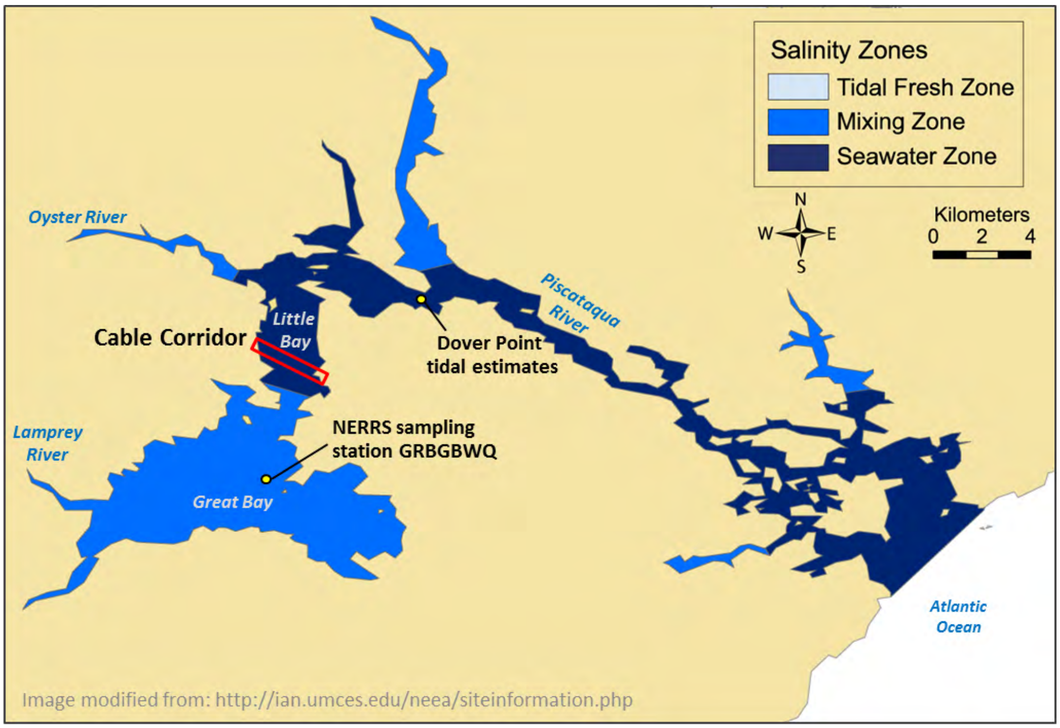


Figure 3.4-13. Salinity Zones of Great Bay (NERRS 2014).

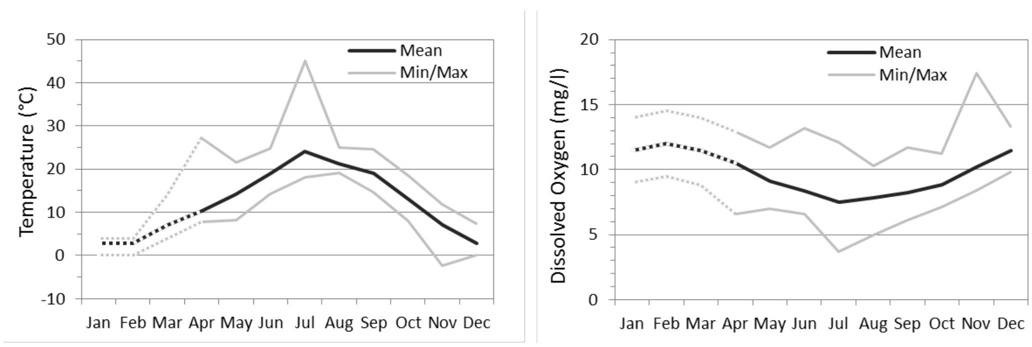
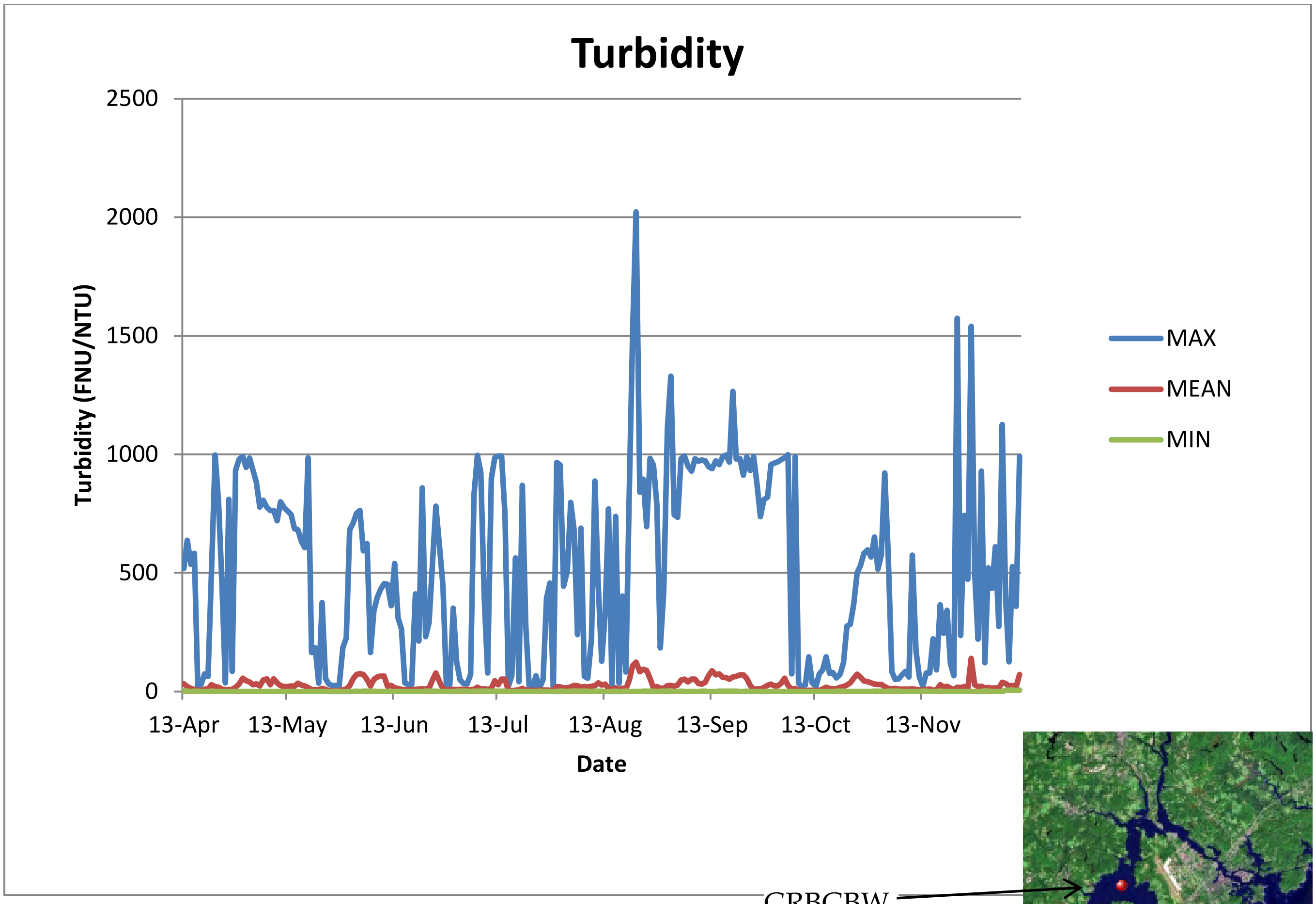


Figure 3.4-14. Monthly Temperature and Dissolved Oxygen in Great Bay (NERRS 2014).



(source: http://www.greatbaydata.org/gb_buoy.html)

Figure 3.4-15. Range of Turbidity at Station GRBGBW (NERRS 2014).

2014, with the lowest monthly mean DO in July (7.5 mg/l; NERRS 2014; Figure 3.4-14). For the months not sampled (January - March), the report estimated that temperature and dissolved oxygen levels ranged between the December and April estimates.

Trowbridge (2009) compiled total suspended solids ("TSS") data collected off Adams Point and found that mean concentrations at low tide were statistically higher during the period from 2001-2008 than during 1974-1981 (Table 3.4-8). Consistent with that finding, PREP (2013) reported that TSS concentrations more than doubled (122% increase) at Adams Point between 1976 (mean of 1974-1976) and 2011 (mean of 2009-2011; averaging 16.3 mg/L). PREP linked this increase to decreases in eelgrass, an aquatic plant whose root and rhizome system stabilize sediments and help sequester nutrients in the substrate. It is likely that TSS concentrations can vary widely both seasonally and tidally. Monthly TSS measurements in surface waters off Adams Point indicated that from 2002 through 2011 maximum values in the fall ranged from 18 to 105 mg/L (GBNERR undated). Although not directly relatable, turbidity levels are often used as a surrogate for TSS because turbidity can be measured in the field whereas TSS requires a laboratory test. Figure 3.4-15 shows continuously collected turbidity measurements over four years (2009-2013) at Station GRBGBWQ located in central Great Bay. While mean turbidity values are typically low, the range of values clearly show a high level of variability with maximum values frequently exceeding mean values by 100-

fold. As GRBGBWQ is located along the main northeast/southwest axis of Great Bay, it is likely representative of conditions northeast of Furber Strait and the general vicinity of the Cable Area, at least in terms of fluctuations of turbidity. Jones (2000) noted that wave action on tidal flats, rain events, and ice scour are important factors in resuspension of fine grained sediments. Jones (2000) also cited studies that showed large variation in TSS over tidal cycles and over seasons.

Table 3.4-8. Total suspended solids (TSS) data collected off Adams Point (Trowbridge 2009).

Statistic	Total Suspended Solids (mg/L)		
	n	Mean	Standard Deviation
1974-1981	65	8.825	10.822
1993-2000	94	10.185	5.687
2001-2008	73	19.705	13.799
T-test	Significant ($p<0.05$}		
Kruskall-Walls test	Significant ($p<0.05$}		
Percent Change	123.28%		

T-test, Kruskall-Wallis test, and percent change calculated using 1974-1981 and 2001-2008 data.

3.4.7 Fish

A number of fish species are known to utilize the Great Bay Estuary during at least one life stage. The NHFG and NMFS are tasked with management of ecologically and economically important fish species. Management goals include the restoration of populations that have been depleted from historic levels, maintenance of recently recovered populations, and protection of populations that may be at risk due to habitat loss or overexploitation. Although not mutually exclusive of each other, groups of fish considered for management include: diadromous fish species, EFH species, and RTE species. Diadromous fish species either spend their life in saltwater and spawn in freshwater (anadromous) or spend their life in freshwater and spawn in the ocean (catadromous), and are discussed below. EFH (SEC Appendix 38) and RTE (SEC Appendix 37, NHDES Wetlands Application Appendix C) fish species are also summarized, and described in more detail in separate reports

Diadromous Fish

The proposed Project Area, which includes both freshwater and estuarine habitats, potentially contains habitat for multiple Species of Special Concern (“SC”) as identified by the NHFG. SC species are also considered trust resources by NMFS. Species of Special Concern are classified as Category A or B. Species with Category A designation as are considered ‘Near-threatened’ presently, but may become ‘Threatened’ in the near future if conservation actions are not taken. Sub-category A1 describes species susceptible to further decline. Sub-category A2 identifies species that are considered recovered and were recently down-listed from the state Endangered and Threatened list. Category B Species of Special Concern are described as ‘Responsibility Species’, with a major portion of the total global population existing with New Hampshire.

The fish Species of Special Concern related to the proposed Project include diadromous (anadromous and catadromous) and freshwater species. Anadromous describes species that live as adults in the ocean and spawn in freshwater where the early life stages develop before migrating to the ocean. Catadromous fish live in freshwater, and migrate to the ocean to spawn. Freshwater species are strictly found in freshwater for all life stages.

American Eel *(Anguilla rostrata)*

American Eel is currently designated as a Species of Special Concern Category A1 (SC-A1) due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

The American Eel is a catadramous species found from Greenland to South America (Collette and Klein-MacPhee 2002). Spawning occurs in the winter and spring, and larval development occurs in the ocean. In the spring, juveniles ("elvers") migrate into estuaries as transparent "glass eels", where they develop into pigmented juveniles ("browns"). Elvers then continue upstream migration into freshwater to develop into adults and remain for up to 25 years as "yellow" eels before migrating back to sea to spawn as "silvers".

Ongoing surveys in the Oyster River (yellow eels) and Lamprey River (glass eels/elvers) indicate that the Great Bay Estuary and its tributaries should be considered currently viable American Eel habitat (NHFG 2013a, Enterline *et al*. 2012). From late-April through late-September 2012, a total of 4,092 glass eels and 121 browns were collected during a NHFG survey of the Lamprey River in Newmarket, New Hampshire (NHFG 2013a). Therefore, the proposed Project Area may contain both freshwater and marine habitat for American Eels. The corridor crosses the Oyster River (freshwater) in Durham, New Hampshire where American Eels were reported in 1985 and 1998 (NHB 2014). Additionally, American Eels were reported in 2003 in the Lamprey River (freshwater) in Durham, New Hampshire (NHB 2014). Although the SRP does not cross the Lamprey River, access to the Lamprey River from the Atlantic Ocean requires passage through the Little Bay cable corridor. The reported occurrence of American Eel in the Lamprey River indicates that Little Bay had provided temporary habitat for migrating glass eels and elvers during their transition into freshwater. Assuming survival to reproductive age within the Lamprey River, Little Bay would also provide temporary habitat for adults migrating back to the ocean for spawning.

In New England, juvenile American Eel migration into freshwater may occur from March through June (Greene *et al*. 2009). Glass eels progress into estuaries by drifting on flood tides and holding position near the bottom during ebb tides (McCleave and Wippelhauser 1987). Migrating elvers are mainly active at night, and may burrow into soft undisturbed bottom sediments or remain in deep waters during the day (Facey and Van den Avyle 1987). Spawning in the ocean occurs during the winter and the spring (McCleave and Kleckner 1985), indicating that Little Bay has the potential to be used by out-migrating adults in the fall and winter. Based on this, the habitat at the Little Bay project location may be considered American Eel habitat during the spring for juveniles and during fall and winter for adults. If present, juveniles would be most susceptible to jet plowing impacts during the day when they may be burrowed into soft substrate. The portion of the Oyster River within the SRP corridor may be considered year-round habitat for adult (yellow) American Eels.

American Shad *(Alosa sapidissima)*

American Shad is currently designated as SC-A1 due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

The geographic distribution of American Shad adults includes the coastal watersheds of New Hampshire. Although the historic spawning distribution within these New Hampshire coastal watersheds is not well documented, American Shad likely spawned in all rivers and tributaries throughout the Atlantic coast from Newfoundland to Florida prior to the construction of impassable dams (Colette and Klein-MacPhee 2002, NHFG 2005, Greene et al. 2009). Migrating adults may spend two to three days in estuarine waters before continuing to tidal or non-tidal freshwater rivers to spawn with an optimal water temperatures range of 57 to 77°F (Leggett 1976, Chittenden 1976, Greene et al. 2009). American Shad eggs and larvae remain at the spawning location or are transported downstream and may be found in areas with salinities < 15ppt and a minimum dissolved oxygen level of 5mg/l (Miller et al. 1982, Greene et al. 2009). For northern New England rivers, the spawning migration would occur from late-April through August, and juvenile out-migration to the ocean would occur during September and October. NHFG (2014a) determined that suitable spawning habitat for American Shad is accessible in both the Exeter and Lamprey Rivers. No American Shad passage through fish ladders was estimated for the Oyster, Lamprey, or Winnicut Rivers during April 15 through June 3, 2013 (NHFG 2014b). This suggests that the likelihood of American Shad using habitat within the proposed Little Bay cable corridor is low.

River Herrings *(Alewife (Alosa pseudoharengus) and Blueback Herring (Alosa aestivalis))*

Alewife (sea-run only) and Blueback Herring (together "River Herrings") are currently designated as SC-A1 due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

River Herrings are anadromous species with a current geographic range extending from North Carolina to Newfoundland. Spawning occurs in freshwater rivers, where the eggs, larvae, and early juveniles remain until the juveniles migrate downstream to estuaries and the ocean to develop into adults. Juvenile migration from freshwater nursery habitats to estuaries occurs from late summer to early fall for Alewife, and in the fall for Blueback Herring (NHFG 2005). Alewife spawning generally occurs in northern New England from early-April through mid-June, with Blueback Herring generally spawning 3 to 4 weeks later than Alewife in areas where the species overlap geographically (Greene *et al*. 2009).

Surveys by the NHFG in 2012 found 2,573 River Herring (55% Blueback Herring, 45% Alewife) in the Oyster River, and 86,862 (100% Alewife) in the Lamprey River (NHFG 2013b). From April 15 through June 3, 2013 the estimated total number of River Herring that passed through fish ladders was 79,408 for the Lamprey River, and 7,149 for the Oyster River (NHFG 2014). These recent spawning migrations occurred from mid-April through late-June in the Oyster River, and from mid-April through the end of May in the Lamprey River. This indicates that the portion of the Oyster River within the proposed project corridor may contain Alewife and Blueback Herring spawning habitat from April through June, and nursery (egg, larvae, juvenile) habitat from May through October. Note that no impacts to the Oyster River are expected because a new off-ROW access route will be utilized to access the area south of the river. Additionally, Alewife migration between the Atlantic Ocean and the Lamprey River would require passage through the Little Bay cable corridor in May and April for adults and in September and October for juveniles.

Rainbow Smelt *(Osmerus mordax, sea-run stock only)*

Rainbow Smelt is currently designated as SC-A1 because of restricted access to historical spawning areas due to undersized culverts and dams, and existing spawning habitat vulnerability to sedimentation and pollution (NHFG 2009).

Great Bay and its tributaries are important spawning and nursery habitats for coastal (anadromous) Rainbow Smelt populations. Following the breakup of winter ice in early spring, adult Rainbow Smelt migrate upstream from coastal areas into rivers to spawn at the head-of-tide. Smelt are transported downstream as larvae in the spring to brackish nursery areas, move into upper estuarine areas as juveniles by fall, and complete the migration to the ocean by the following spring (Collette and Klein-MacPhee 2002).

Adult Rainbow Smelt have been identified in recent NHFG surveys of the Oyster River (2008, 2010, 2011), and tributaries of Great Bay: the Lamprey (2008), Squamscott (2008-2011), and Winnicut Rivers (2008-2011; Enterline *et al*. 2012). The spawning run in the Squamscott and Oyster Rivers occurs from March through May. Rainbow Smelt egg deposition surveys were also conducted by NHFG from mid-March to mid-April, 1978 through 2007, in the Oyster, Lamprey, Squamscott and Winnicut Rivers (Enterline *et al*. 2012). These surveys indicate that the portion of the Oyster River within the proposed project corridor currently has the potential to provide spawning habitat for sea-run Rainbow Smelt adults, and nursery habitat for eggs and larvae. No impacts to the Oyster River are anticipated. Additionally, the area of the Little Bay cable crossing may provide nursery habitat for larvae and juveniles spawned in the tributaries of Great Bay, including the Lamprey, Winnicut, and Squamscott Rivers. Passage through the Little Bay cable corridor would also be required for adult Rainbow Smelt spawning in or for juveniles emigrating from any Great Bay tributaries.

Sea Lamprey *(Petromyzon marinus)*

Sea Lamprey is currently designated as a Species of Special Concern Category A1 (SC-A1) due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

Sea Lamprey are anadromous, and in the western Atlantic Ocean range from Greenland to the Gulf of Mexico (Collette and Klein-MacPhee 2002). In Gulf of Maine tributaries, adults migrate upstream from the ocean to spawn in freshwater rivers during May and June, and all adults die after spawning. Eggs and larvae remain in the natal stream until approximately October, when metamorphosis into juveniles is complete. Juvenile out-migration to the ocean begins following metamorphosis, and overwintering in estuaries may occur (Collette and Klein-MacPhee 2002).

From April 15 through June 3, 2013, an estimated 48 Sea Lamprey passed through the Oyster River fish ladder, and 114 passed through the Lamprey River fish ladder (NHFG 2014). These recent spawning migrations occurred in early-May in the Oyster River and from early-May through the early-June in the Lamprey River. This indicates that the portion of the Oyster River within the proposed project corridor may contain Sea Lamprey spawning habitat in May, and nursery (eggs and larvae) habitat from June through October. Additionally, Sea Lamprey spawning in the Lamprey River would require passage of migrating adults through the Little Bay cable corridor during May and June. The Little Bay cable corridor may also provide overwintering habitat for out-migrating juvenile Sea

Lamprey from both the Oyster and Lamprey Rivers. Note that no impacts to the Oyster or Lamprey Rivers are anticipated.

3.5 Conserved and Public Lands

The SRP is located in New Hampshire's coastal watersheds, which have experienced rapid development over the past few decades and as a result, are the focus of ongoing conservation efforts. The 2006 report titled *The Land Conservation Plan for New Hampshire's Coastal Watersheds* identified areas that are important for conserving native plants, animals and natural communities and water quality in the coastal watersheds (Zankel, M., et al. 2006). These focus areas, which are available as GIS layers, and GIS data for existing conserved and public lands (as of April 2013) were reviewed along the project corridor. A more detailed report including conservation lands associated with the SRP is included in the *Review of Land Use and Local and Regional Planning, The Seacoast Reliability Project* report (See SEC, Appendix 43).

The SRP corridor crosses through portions of fifteen conserved parcels. Approximately 58 acres (36%) of the corridor are located within these conserved areas. The majority of the areas identified as "core" conservation focus areas in the vicinity of the project corridor are currently protected via conservation easements or other protection strategies. These lands near the corridor are concentrated in two clusters in Durham: the first located in and around the UNH campus including portions of the UNH College Woods, Foss Farm, Horticulture Farm, and NHFG La Roche Brook parcel; and the second to the east of Sandy Brook Drive and northwest of Longmarsh Road (Map 3; Appendix A). This second cluster is associated with the Durham Point Sedge Meadow Preserve and Crommet Creek. The Durham Point Sedge Meadow Preserve is a 20-acre site located north of the SRP corridor owned by The Nature Conservancy ("TNC"), and provides habitat for the globally-rare banded bog skimmer dragonfly (*Williamsonia lintneri*), which is listed as Endangered (S1) in New Hampshire. The conservation lands around Crommet Creek include parcels owned by TNC, plus state and municipally owned lands.

The project corridor crosses several other conserved and public parcels including six other fee ownership parcels, one parcel that has been set aside as open space, off Sandy Brook Drive, and three parcels protected by conservation easements. The corridor also crosses through a parcel owned by the Town of Durham, adjacent to the existing Durham Substation off Mill Road.

In Newington, the project corridor crosses a small town-owned conserved parcel (Flynn Pit) immediately to the east of Little Bay Road and the lower hay fields of the historic Frink Farm. No other conserved lands are crossed by the Project between the Frink Farm and the Portsmouth Substation. No conserved lands lie within or near the project corridor in Madbury or Portsmouth.

Little Bay is part of the Great Bay NERRS. The Great Bay estuary is New Hampshire's largest estuarine system that includes a diversity of land and water area, including upland forest, salt marsh, mudflats, tidal creeks, rocky intertidal, eelgrass beds, channel bottom/subtidal and upland field habitats (NERRS, 2014). The reserve encompasses 10,235 acres, including approximately 7,300 acres of open water and wetlands. The Great Bay's cultural heritage is equally diverse, ranging from paleo-Indian villages from 6,000 years ago to colonial transportation and industrial use (NERRS 2014).

3.6 Soils

The soils within the project corridor were mapped by the NRCS and these data were reviewed using GIS software. The NRCS soil surveys are made for planning purposes at a scale of 1:20,000. Due to mapping scale, inclusions of less than 3 acres may not be identified without detailed field surveys. The Project field delineations of wetlands, streams and vernal pools, completed by Normandeau provide more detail on hydric soil inclusions overlooked by the NRCS soil survey.

NRCS soil data and Normandeau's wetland delineations highlight the variation in soils within the project corridor. These differences are a result of variations in parent materials, landscape position, elevation, slope, aspect and vegetation. Deeper soils with larger areas of poorly drained (hydric) soils are found in depressions on the landscape while the low hills and higher elevations have shallower soils. The majority of the soils mapped within the corridor are derived from till, or are of glaciomarine or outwash parent material. The following is an overview of the soils within the project corridor by town. Soil maps are provided in the *Phase I-A Preliminary Archeological Survey* report and addenda (See SEC, Appendix 9).

Town of Madbury

Only a small portion of the Project is located within the Town of Madbury. Three soils are mapped within Madbury, and include Buxton silt loam, Scantic silt loam, and Paxton fine sandy loam. Buxton soils are moderately well drained, while Scantic soils are poorly drained, hydric soils and Paxton fine sandy loams are well drained and partially hydric.

Town of Durham

The soils mapped within the project corridor in Durham are primarily fine or very fine sandy loams or silt loams. Examples include the Hollis-Charlton very rocky fine sandy loams, Scantic silt loam, Buxton silt loam, Suffield silt loam, and Swanton fine sandy loam. The majorities of the soils in the corridor within Durham are well drained or poorly drained, which is consistent with the number and extent of wetlands delineated within the town.

Town of Newington

Similar to the soils mapped within Durham, the soils mapped within the project corridor in the Town of Newington are predominantly fine or very fine sandy loam or silt loams. Examples include Pennichuck Channery very fine sandy loam, Boxford silt loam, Scitico silt loam, and Hoosic gravelly fine sandy loam. Urban land and complexes that include urban land are also present in modest quantities. The majority of the soils in Newington are mapped as partially hydric or of unknown hydric nature.

City of Portsmouth

Only a very small portion of the Project is located within the City of Portsmouth. This area is predominantly mapped as a mix of the urban land-Canton complex and the Chatfield-Hollis-Canton complex. The latter is well drained and slopes range from three to 15 percent.

3.7 Vegetation Communities and Habitat Types

The SRP is located within the Coastal Plain ecological region of New Hampshire. The highest elevation along the project corridor is approximately 130 feet above sea level near the Madbury Substation. Based on the NHFG 2015 WAP cover type map and field observations, the undeveloped habitat cover types through which the Project passes consist mostly of Appalachian oak-pine forest, with smaller areas of wet meadow/shrub wetlands, grasslands, and temperate swamp (Map 4; Appendix A). The Appalachian oak-pine forests are found across the subtle ridges and rises within the landscape, with the depressions and low areas consisting mostly of larger wetland complexes.

The Appalachian oak and pine forests are common throughout southern New Hampshire on dry to dry-mesic glacial till soils and on sand plain features. Good examples of mesic Appalachian oak – hickory forests are known near Little Bay and have a mix of canopy species including white, black, scarlet and red oaks, shagbark hickory, white ash, white pine, and other species common in more northern portions of New Hampshire such as birches, maples and beech (Sperduto and Kimball, 2011). Understory species include Canada mayflower, poison ivy, wild sarsaparilla, and other low herbs and forbs.

The residential and open areas are planted with common landscaping species and lawn grasses and escaped ornamental species are common in close proximity to residential areas. Escaped invasive species were noted in many of the identified wetlands throughout the project corridor.

In natural habitats, the vegetation communities within the existing electric corridor frequently differed substantially from adjacent communities due to the routine vegetation management typical of utility corridors. Under the existing electric lines, the vegetation was shrub and grasses as a result of periodic mowing in contrast with the adjacent forested communities. Common upland forest species found along the edge of the corridor included white pine (*Pinus strobus*), red and white oak (*Quercus rubra* and *Q. alba*), quaking aspen (*Populus tremuloides*) and gray birch (*Betula populifolia*). The size of trees varied from mature to early successional depending on the adjacent land use. Common shrub species within upland areas included glossy and common buckthorn (*Rhamnus frangula* and *R. cathartica*), multi-flora rose (*Rosa multiflora*), sumacs (*Rhus* spp.), barberries (*Berberis* spp.), honeysuckles (*Lonicera* spp.) and dogwoods (*Cornus* spp.). Many of these species are non-native invasives in New Hampshire. Clovers (*Trifolium* sp.), hayscented fern (*Dennstaedtia punctilobula*), sweet fern (*Comptonia peregrina*), goldenrods (*Solidago* spp.), common juniper (*Juniperus communis*), raspberries and blackberries (*Rubus* spp.), little bluestem (*Schizachyrium scoparium*), and plantain species (*Plantago* sp.) were frequently noted upland herbaceous plants in the maintained portion of the corridor.

Wetlands identified within the project corridor were generally dominated by both scrub-shrub and emergent (herbaceous) plant species (Section 3.2). Common woody species include red maple, glossy buckthorn, silky dogwood (*Cornus amomum*), speckled alder

(*Alnus incana*) and several meadowsweet (*Spiraea* sp.) species. Herbaceous species included sedges (*Carex* sp.), cattails (*Typha* sp.), several hydrophytic fern species including sensitive (*Onoclea sensibilis*), cinnamon and interrupted varieties (*Osmunda cinnamomea* and *O. claytoniana*), rushes (*Scirpus* sp.), and other species such as tearthumb (*Polygonum* sp.), asters (*Symphyotrichum* sp.), and purple loosestrife (*Lythrum salicaria*), which is an invasive species. Trees were observed within the wetland along the edges of the corridor, including red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), and cedar (*Thuja* sp.).

One State-listed plant species, *Carex cristatella,* and four Exemplary Natural Communities or Natural Community Systems were documented within the project corridor: *High salt marsh (shallow peat variant)*, *Salt marsh system*, *Sparsely vegetated intertidal system* and *Subtidal system.*. No federally listed rare plant species were observed within the SRP corridor. See the *Rare, Threatened, and Endangered Species and Exemplary Natural Community Report* for more information.

3.8 Wildlife Habitat and Wildlife

Transmission corridors in general are known to provide suitable habitat for a variety of wildlife species, including mammals, birds, reptiles, amphibians, and invertebrates. Species with small home range requirements may use a portion a corridor as their primary habitats. Animals with larger home ranges may use a corridor as a part of their overall home range, or as a travel/dispersal corridor. Transmission corridors may also provide intrinsic habitat value as a relatively undeveloped habitat area in locations were the surrounding land use consists of commercial, institutional, and/or residential development.

An evaluation of the wildlife habitat for the project corridor was conducted using aerial photography and other GIS data combined with site visits in specific locations. The lands surrounding the SRP have a low to moderate amount of development, including some protected conservation lands, substantial areas of low density residential development, and some areas of higher intensity development associated with Durham and Newington/Portsmouth. The undeveloped areas and low density residential areas are primarily forested while the vegetation maintenance practices conducted in the existing cleared corridor create grass and/or shrubby habitat types. Shrublands and grasslands are a required resource for many types of wildlife and are also relatively rare in New Hampshire's predominantly forested landscape. Although narrow (approximately 60 feet wide), the existing cleared corridor provides some relatively valuable habitat resources for grassland/shrubland species, and may also provide a dispersal corridor for species that depend on grassy and/or shrubby habitats.

The SRP corridor crosses though some areas designated as Highest Priority Habitat by the WAP (Map 5). The remainder of the corridor passes primarily though areas that are designated as Supporting Landscapes or that have no designation at all. The relative proportion of these habitat types in the corridor reflects their wider distribution in the surrounding landscape.

In late fall, Great Bay typically hosts large numbers (>500) of migrating Canada geese and black ducks, as well as smaller numbers (<100) of other diving and dabbling ducks, shorebirds and seabirds. These birds use a variety of areas around the bay and are not likely resource constrained.

Portions of the SRP corridor are in the vicinity of state-listed rare wildlife species, including New England cottontail, northern long-eared bat, northern black racer, Blandings turtle, spotted turtle, and ringed boghaunter, among others. While a number of these species may use the corridor for portions of their life cycle, the New England cottontail is dependent on early successional habitat such as shrub and grasslands and is declining throughout its range as these habitats mature or are developed. PSNH is actively working with NHFG to manage electric corridors to benefit New England cottontail. The SRP corridor passes through UNH's Foss Farm and NHFG's LaRoche Brook parcel, both of which are being actively managed for this species. The SRP corridor clearing will supplement that habitat and provide a connective route for the rabbit to disperse to other suitable habitats. See the *Rare, Threatened, and Endangered Species and Exemplary Natural Community Report* for more information.

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Appendices

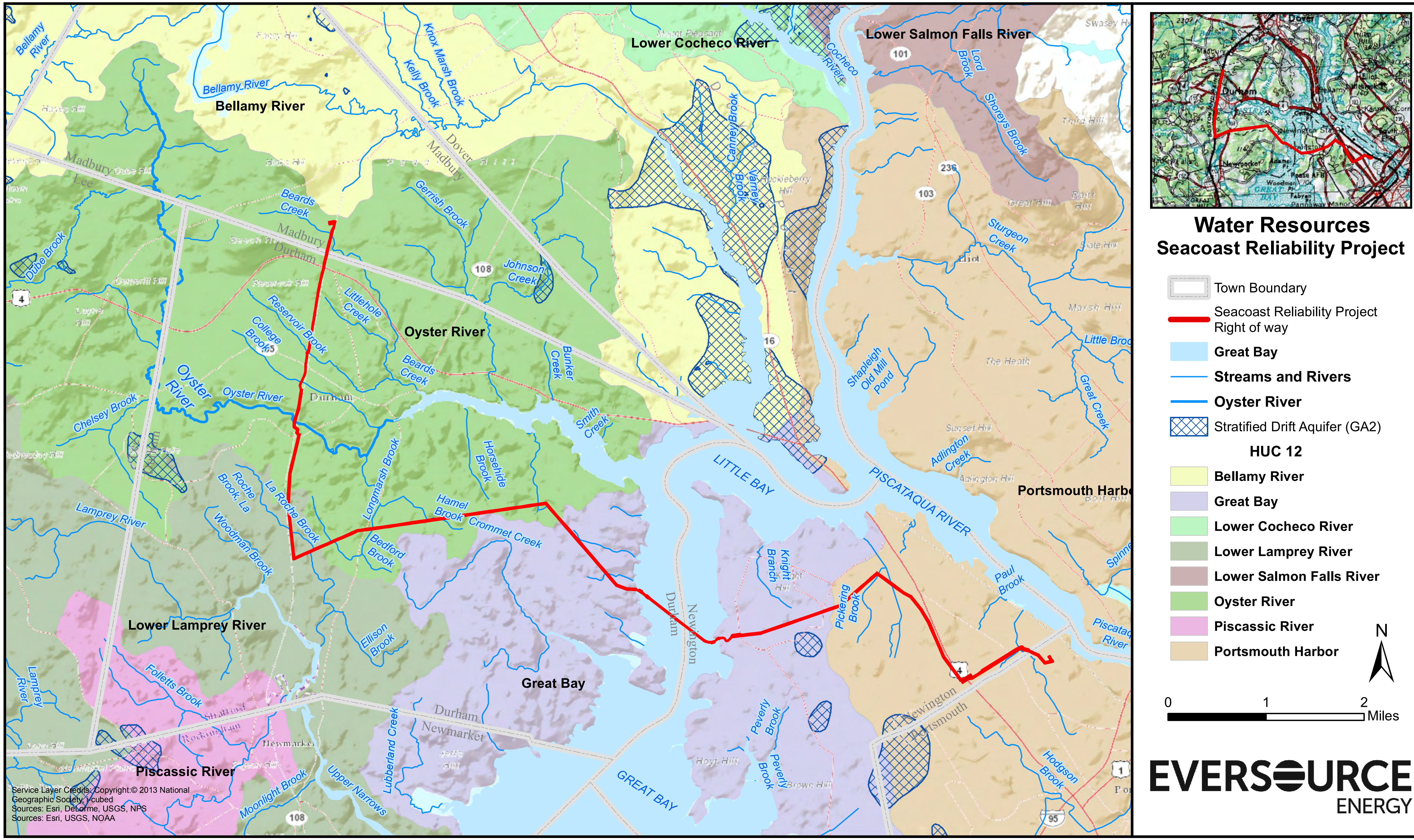
Appendix A. Maps

Map 1: Water Resources

Map 2: Wetland and Stream Map

Map 3: Conservation Land

Map 4: NH Wildlife Action Plan (WAP) Communities



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Date : 12/22/2015
Drawn By: wmccloy
Project No: 22240.113

SRP Project Area/ROW
Town Boundary

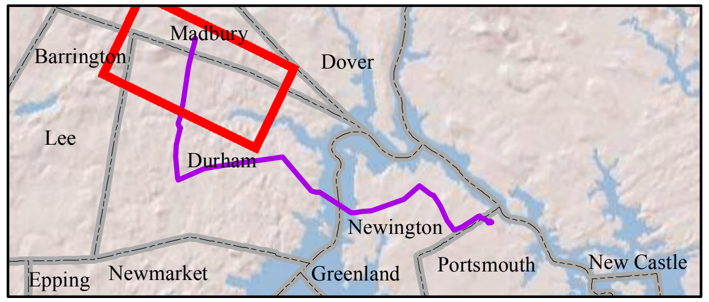
Roads
Local
Not Maintained
Private
State

Wetlands
Not Prime
Prime
River Stream
Ephemeral Stream
Intermittent Stream
Perennial Stream

NHD Flowline
Streams and Rivers
Oyster River

N E S W

0 0.25 0.5 Miles



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Seacoast Reliability Project

Wetlands And Streams

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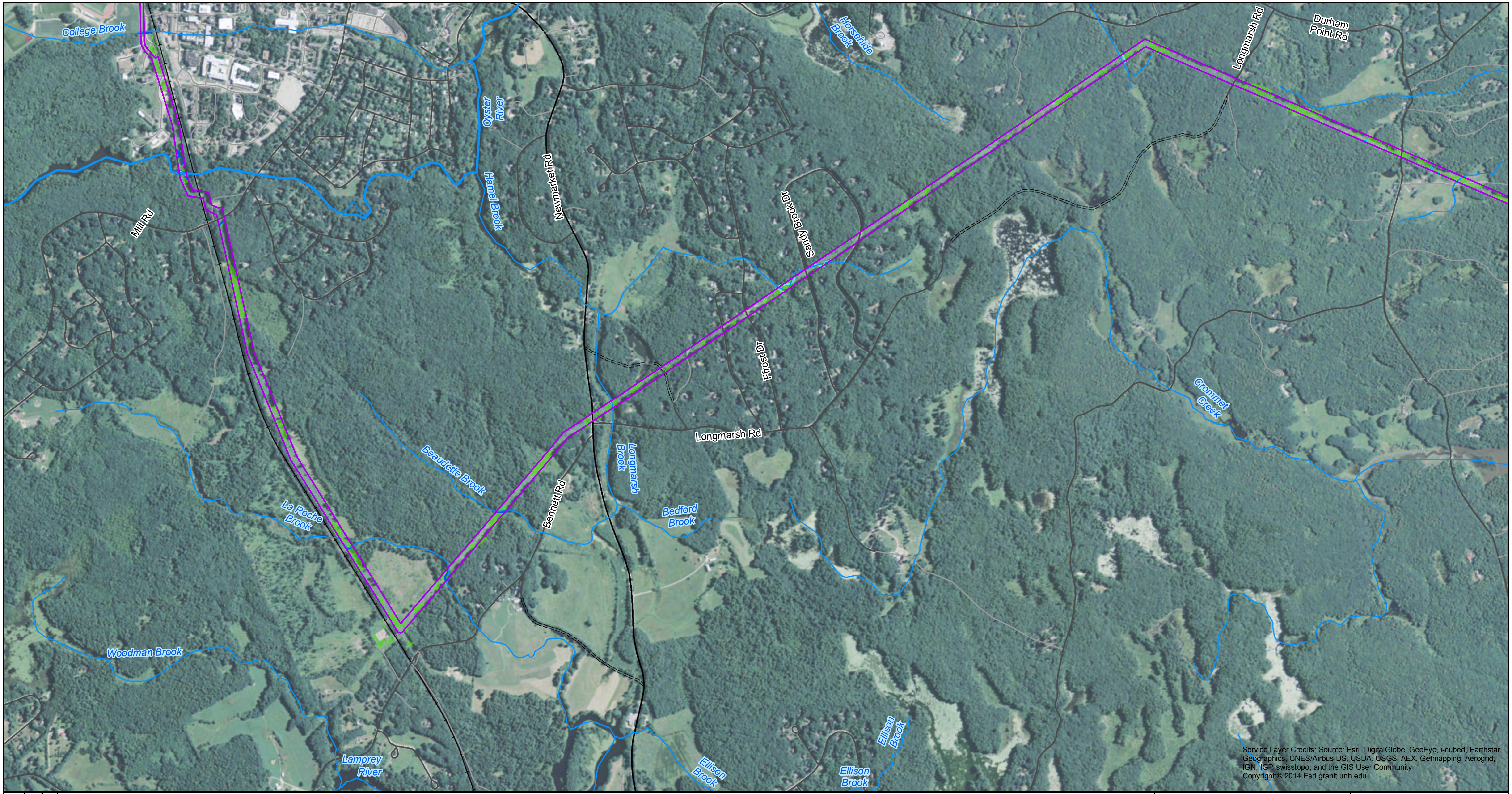


Project No: 22240.113
Drawn By: wmccloy
Date: 12/22/2015

SRP Project Area/ROW
Town Boundary

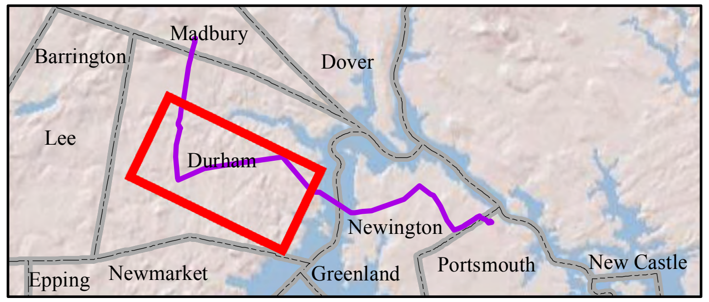
Roads
- Local
- Not Maintained
- Private
- State

Wetlands
- Not Prime
- Prime
- River Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream

NHD Flowline
- Streams and Rivers
- Oyster River

N E S W

0 0.25 0.5 Miles



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Wetlands And Streams

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Path: J:\Projects\PSNH_F107\MXD\PS_107_Wetlands_Map_040815.mxd

Project No: 22240.113
Drawn By: wmccloy
Date : 12/22/2015

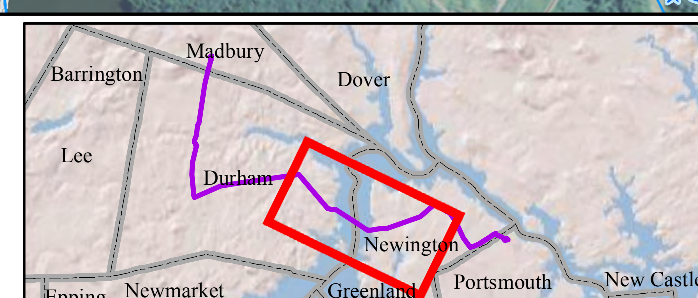
SRP Project Area/ROW
Town Boundary

Roads
- Local
- Not Maintained
- Private
- State

Wetlands
- Not Prime
- Prime
- River Stream
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream

NHD Flowline
- Streams and Rivers
- Oyster River

0 0.25 0.5 Miles



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Wetlands And Streams

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Project No: 22240.113
Drawn By: wmccloy
Date : 12/22/2015

SRP Project Area/ROW
Town Boundary

Roads
- Local
- Not Maintained
- Private
- State

Wetlands
- Not Prime
- Prime
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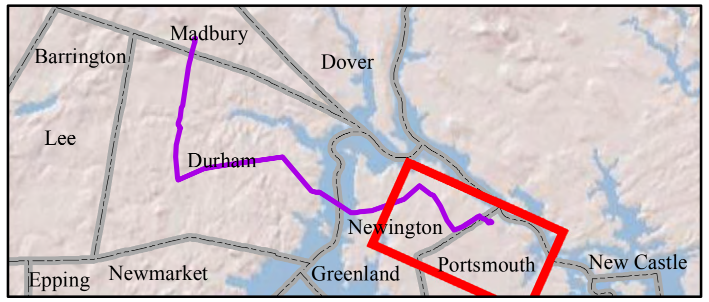
- Ephemeral Stream
- Intermittent Stream
- Perennial Stream

NHD Flowline
- Streams and Rivers
- Oyster River

N E S W

0 0.25 0.5 Miles



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Seacoast Reliability Project

Wetlands And Streams

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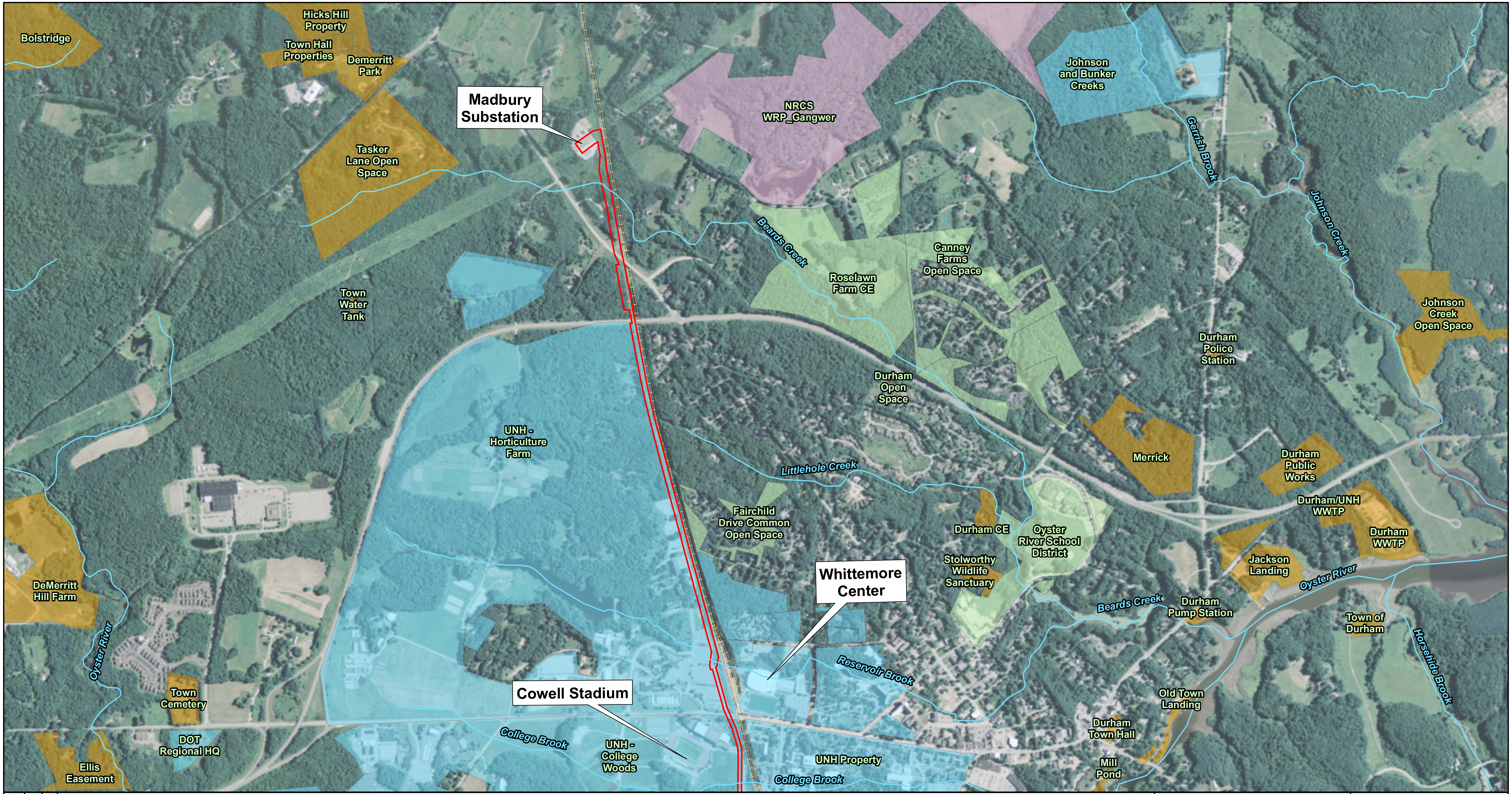

Project No: 22240.113
Drawn By: wmccloy
Date: 12/22/2015

Conservation Lands

- Municial/County
- Federal
- State
- Private
- Streams and Rivers
- Railroads

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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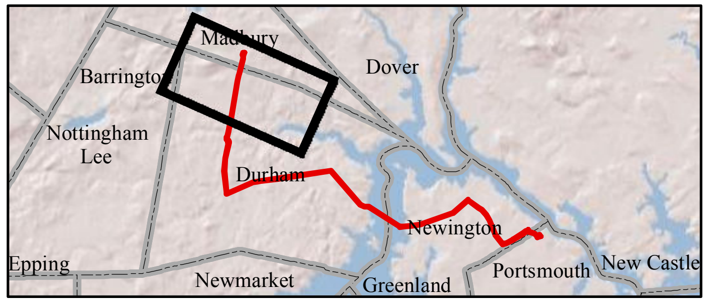
N E S W

0 600 1,200 Feet



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Conservation Mapping

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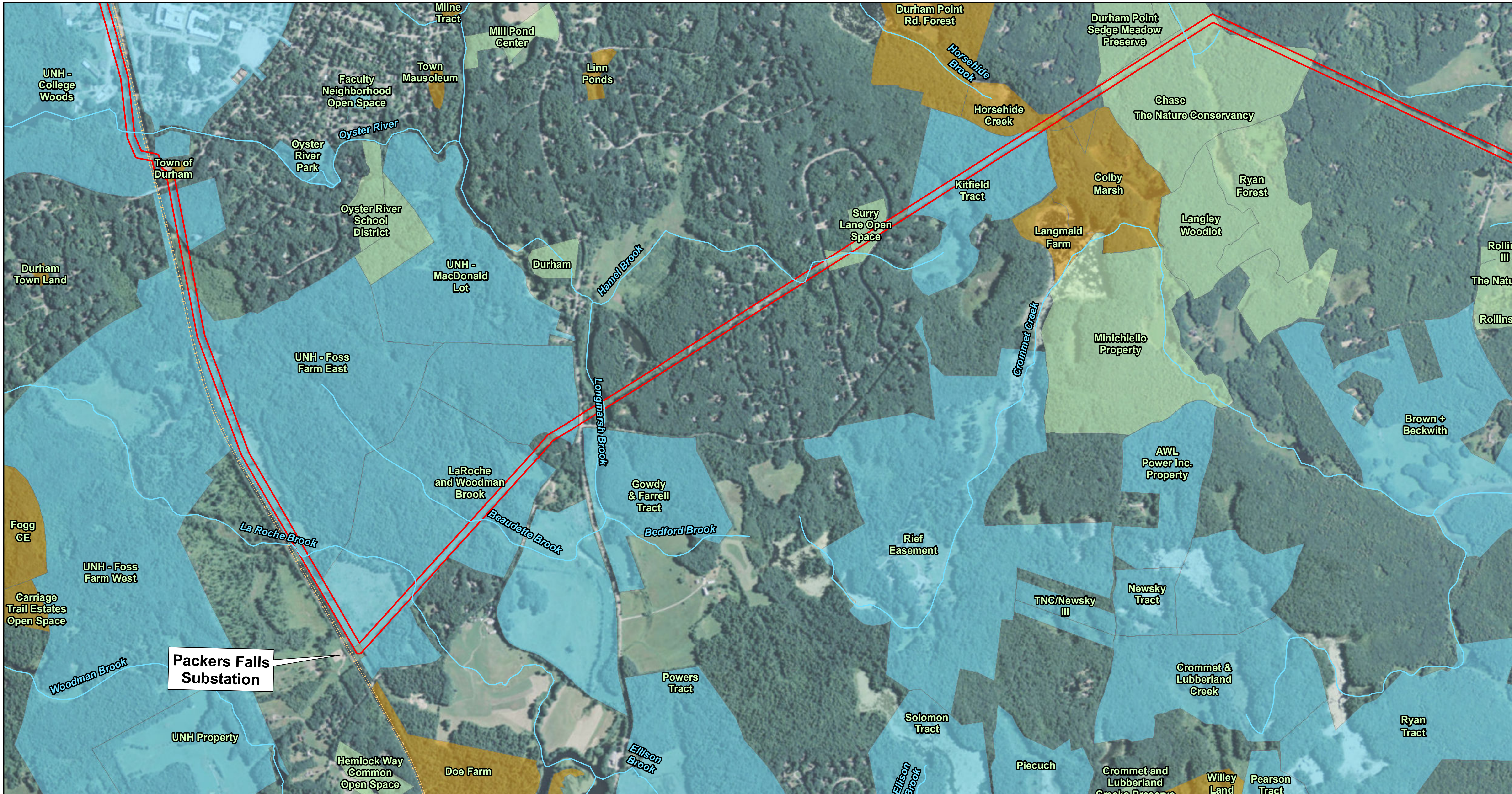

Project No: 22240.113
Drawn By: wmccloy
Date: 12/22/2015

Conservation Lands

- Municial/County
- State
- Private
- Streams and Rivers
- Railroads

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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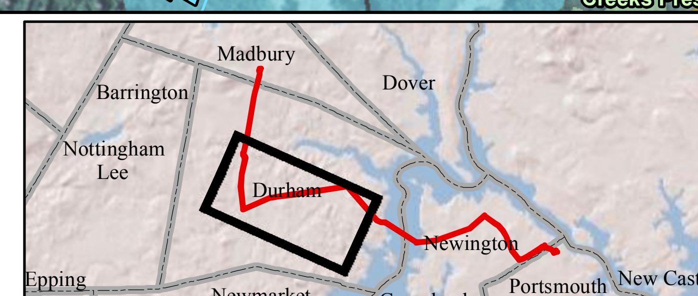
N E S W

0 600 1,200 Feet



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Project No: 22240.113

Drawn By: wmccloy

Date : 12/22/2015

Conservation Lands

- Municial/County
- Federal
- State
- Other Public/Quasi-Public Entity
- Private
- Streams and Rivers

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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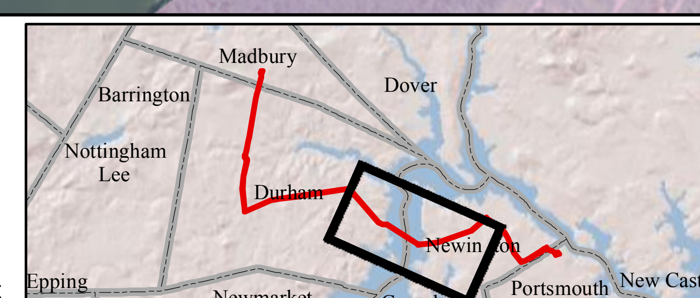

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Seacoast Reliability Project

Conservation Mapping

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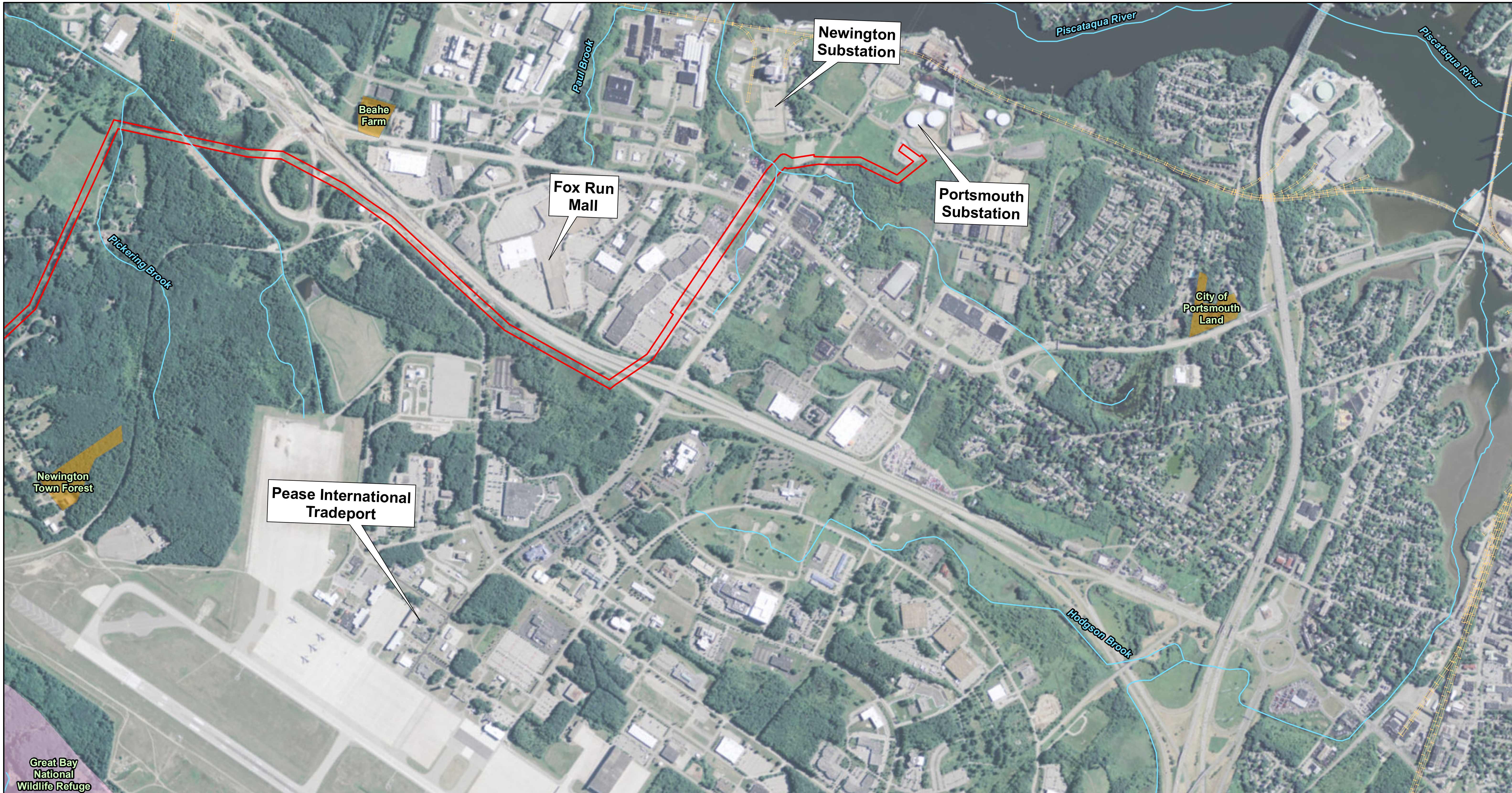

Date : 12/22/2015
Drawn By: wmccloy
Project No: 22240.113

Conservation Lands

- Municial/County
- Federal
- Streams and Rivers
- Railroads

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
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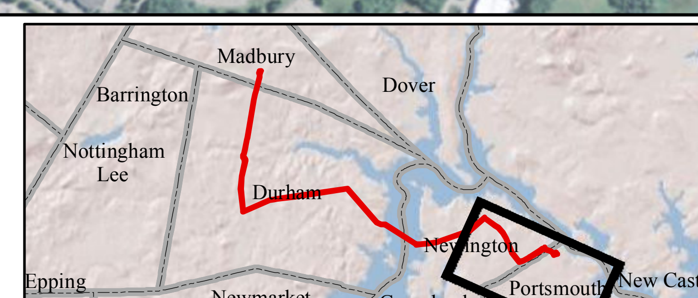
N E S W

0 600 1,200 Feet



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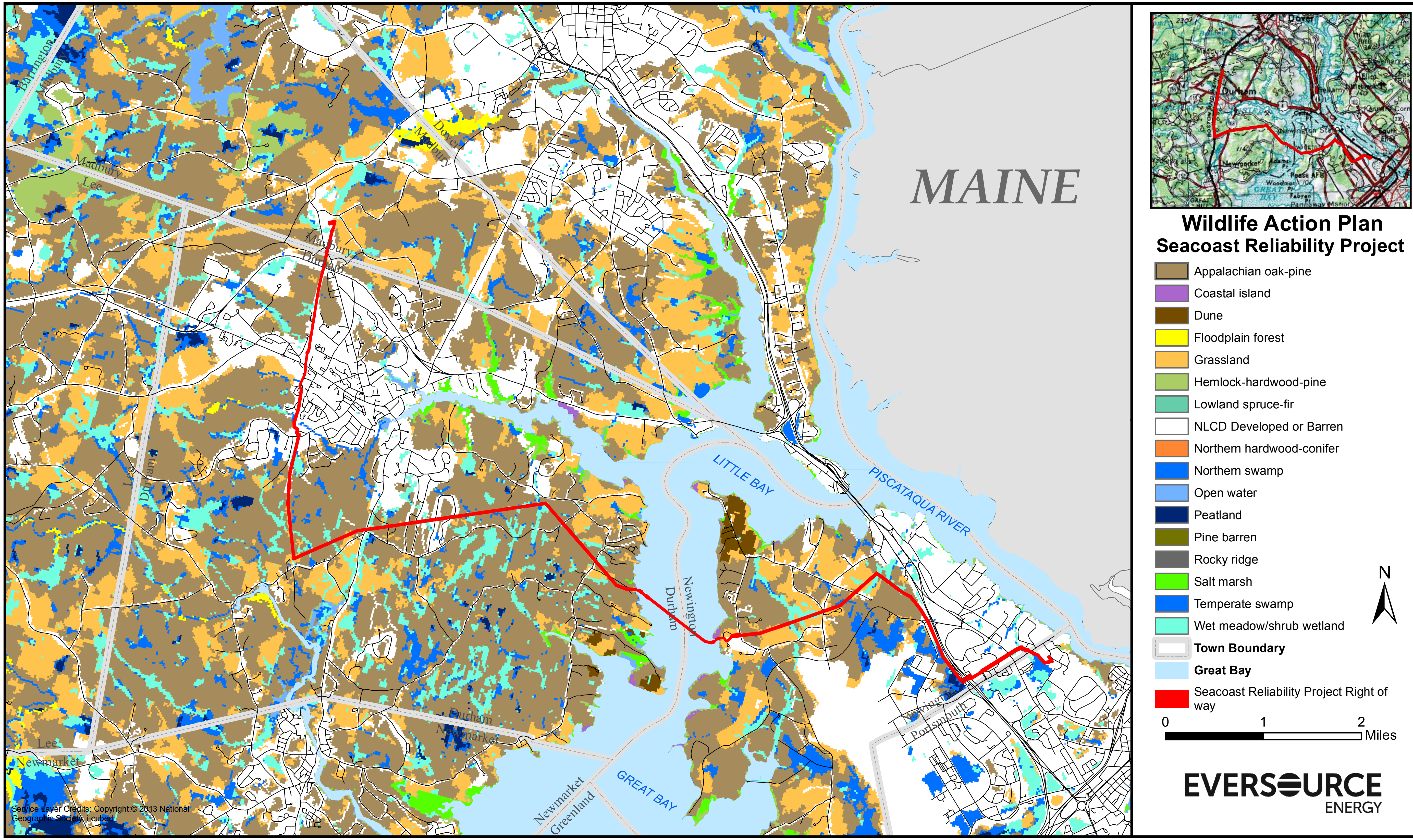

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Appendix B. Summary Tables

PSNH Seacoast Reliability Project (SRP)
Wetland Summary Table

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DNW2 (Subtidal)	E1UB	259,459	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Salt Marsh)	E2EM	9,047	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Rocky Shore)	E2RS	15,636	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Intertidal Flats)	E2US	278,668	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DW1	PEM1/PSS1	18,663	Durham	S	S	S	S	S	S	S	S	-	S	-	S	-
DW2	PEM1E	51,456	Durham	P	-	-	-	-	S	-	P	-	-	-	S	-
DW4	PEM1J	6,829	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW5	PSS1	18,121	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW6	PEM1E/PSS1E	35,338	Durham	S	S	-	S	-	P	S	P	-	-	-	S	-
DW7	PSS1	4,726	Durham	S	S	-	S	S	-	-	-	-	-	-	-	-
DW9	PSS1/PEM1	5,839	Durham	S	S	-	S	S	-	-	-	-	-	-	-	-
DW10	PSS1E/PEM1J	17,144	Durham	S	-	-	-	-	P	-	S	-	-	-	-	-
DW11	PEM1/PSS1	7,353	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW12	PSS1E/PEM1E	11,821	Durham	S	-	-	S	-	-	-	P	-	-	-	S	-
DW13	PSS1/PEM1	48,977	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW14	PEM1J/PSS1E	21,504	Durham	P	S	-	S	-	S	-	P	S	-	-	P	-
DW16	PEM1E	763	Durham	S	S	-	-	-	-	-	S	-	-	-	-	-
DW17	PSS1/PEM1	11,886	Durham	S	P	-	P	P	S	P	P	-	-	-	-	-
DW18	PSS1E/PEM1E	54,161	Durham	P	S	-	-	-	S	-	P	-	S	-	S	-
DW20	PEM1J	3,144	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW21	PSS/PEM	24,887	Durham	S	-	-	S	S	S	-	S	-	-	-	-	-
DW22	PSS1E/PFO14E	40,728	Durham	P	S	-	-	-	S	-	P	-	-	-	-	S
DW24	PSS1E/PEM1E	35,043	Durham	S	-	-	-	-	P	-	P	-	P	S	S	-
DW25	PEM/PSS	10,231	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW26	PEM1J	245	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW27	PSS1E/PEM1F	2,294	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW28	PEM1J	839	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW29	PEM/PSS	9,272	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW30	PSS1E/PEM1J	14,577	Durham	S	S	-	S	-	P	S	P	-	S	-	-	-
DW31	PEM	46,279	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW33	PEM/PSS	39,676	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW36	PSS1/PFO1	10,787	Durham	P	P	-	-	-	-	-	-	-	-	-	-	-
DW37	PEM/PSS	3,294	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW38	PSS1/PFO1	32,062	Durham	P	S	-	-	-	S	-	-	-	-	-	-	-
DW40	PSS1/PEM1	6,354	Durham	P	-	-	-	-	P	-	S	-	-	-	P	-

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DW41	PEM/PSS/PUB	96,107	Durham	S	S	-	S	S	-	S	S	-	-	-	-	S
DW42	PSS1/PFO1	4,930	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW43	PSS/PFO	4,476	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW44	PEM1	7,145	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW45	PSS	7,812	Durham	S	-	-	-	-	-	-	S	-	-	-	-	-
DW47	PEM/PSS	23,061	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW48	PSS/PEM	14,505	Durham	P	P	-	-	-	S	P	S	-	-	-	-	-
DW49	PEM/PSS	3,533	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW50	PEM1	2,753	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW52	PSS1/PFO1/PEM1	18,865	Durham	P	-	-	-	-	S	-	-	-	-	-	-	-
DW54	PSS1	12,577	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW55	PSS	687	Durham	S	-	-	S	-	-	-	S	-	-	-	-	-
DW56	PEM1/PSS1	41,860	Durham	P	-	-	-	-	S	-	S	-	-	-	-	-
DW58	PSS1/PEM4	70,192	Durham	P	P	-	-	-	P	P	P	-	-	-	-	-
DW59	PEM/PUB	3,150	Durham	S	S	S	S	S	-	S	-	-	-	-	-	-
DW63	PSS/PEM	6,200	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW65	PEM	8,221	Durham	P	-	-	S	S	-	-	-	-	-	-	-	-
DW67	PEM	15,266	Durham	P	S	-	S	S	-	-	S	-	-	-	-	-
DW69	PEM	7,574	Durham	P	S	-	P	S	-	-	S	-	-	-	-	-
DW71	PEM	163	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW72	PSS1	2,527	Durham	-	-	-	S	S	-	-	-	-	-	-	-	-
DW73	PSS1/PEM1	1,098	Durham	S	S	S	S	S	-	S	-	-	S	-	-	-
DW74	PFO1/SS1	2,795	Durham	S	P	-	S	S	-	S	-	-	-	-	-	-
DW76	PSS1	12,237	Durham	S	-	-	-	-	-	-	-	-	-	-	S	-
DW77	PSS1	9,755	Durham	P	-	-	P	-	-	-	-	-	-	-	-	-
DW78	PSS1	139	Durham	P	-	-	P	P	-	-	-	-	-	-	-	-
DW79	PSS1	2,189	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW80	PSS1	5,966	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW91	PSS1	4,177	Durham	S	S	-	-	-	-	S	S	-	-	-	-	-
DW93	PSS1	4,637	Durham	P	-	-	-	-	P	-	-	-	-	-	-	-
DW94	PSS1	12,802	Durham	S	-	-	S	-	S	-	-	-	-	-	-	-
DW100	PEM1E	6,571	Durham	S	S	-	P	-	-	-	-	-	-	-	-	-
DW101	PEM1/SS1E	3,219	Durham	S	-	-	S	-	-	-	S	-	-	-	-	-
DW102	PSS1E	5,043	Durham	-	-	-	S	-	-	-	-	-	-	-	-	-
DW103	PSS1/EM1B	12,099	Durham	P	-	-	S	S	S	-	S	-	-	-	-	-

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DW104	PSS1/EM1E	874	Durham	P	-	-	S	S	-	-	-	-	-	-	-	-
DW105	PFO1E	1,227	Durham	S	-	-	S	S	S	-	S	-	S	-	-	-
MW1	PSS1	8,078	Madbury	P	-	-	-	-	P	-	-	-	-	-	-	-
MW2	PEM1/PSS1	74,736	Madbury	P	P	P	-	-	P	P	P	-	P	-	P	-
NW1*	PEM1/SS1	75,679	Newington	S	P	-	P	P	P	-	-	-	-	-	S	-
NW3	PEM1/SS1	80,336	Newington	S	P	-	S	S	-	S	-	-	-	-	-	-
NW4	PSS1E/PUB3/PFO14E	48,442	Newington	S	S	-	P	S	S	-	P	-	-	-	S	-
NW6	PSS1C	13,332	Newington	S	P	-	S	-	P	S	P	-	-	-	-	-
NW9	PEM1	44,940	Newington	P	-	-	S	-	-	-	-	-	-	-	S	-
NW10	PSS1E/PEM1E/PFO1B	31,671	Newington	P	-	-	-	-	-	-	P	S	-	-	-	-
NW11	PSS1/PEM1	38,909	Newington	P	P	-	P	P	P	-	S	-	-	-	S	-
NW12*	PSS1E/PEM1E	30,058	Newington	S	S	-	S	-	P	S	P	-	-	-	-	-
NW13	PEM1/PUB	16,815	Newington	S	S	-	S	S	S	S	P	-	-	-	S	-
NW16	PEM1F/PSS1E	47,505	Newington	P	S	-	S	-	S	-	P	-	S	-	S	-
NW17*	PSS1	12,715	Newington	P	-	-	S	S	S	-	-	-	-	-	-	-
NW18	PEM1J/PSS1J	7,003	Newington	S	-	-	P	-	-	-	S	-	-	-	-	-
NW19	PEM1	578	Newington	S	-	-	-	-	S	-	-	-	-	-	-	-
NW20	PEM1J	1,929	Newington	P	-	-	S	-	-	-	S	-	-	-	-	-
NW21	PEM1	6,666	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW22	PFO1E/PSS1E	10,953	Newington	P	-	-	-	-	-	-	S	-	-	-	-	-
NW24	PEM1F/PSS1E/PFO1E	18,186	Newington	S	-	-	S	-	P	-	P	-	-	-	-	-
NW26	PSS1E	15,500	Newington	P	-	-	S	-	-	-	S	-	-	-	-	-
NW28	PEM1J	39,285	Newington	P	-	-	S	-	-	-	-	-	-	-	-	-
NW30	PEM1J	13,978	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW32	PEM1J	11,001	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW34*	PSS1E/PUBb	23,065	Newington	P	S	S	S	-	S	S	P	-	-	-	-	-
NW35	PEM1/SS1/FO1B	8,824	Newington	P	S	-	P	P	-	-	P	-	-	-	-	-
NW37	PEM1/SS1E	33,462	Newington	P	P	S	P	P	P	P	P	-	-	-	-	-
NW39	PEM1/SS1E	2,472	Newington	P	P	-	P	P	P	P	P	-	-	-	-	-
NW41	PEM1E	4,114	Newington	P	P	-	P	P	P	S	S	-	-	-	-	-
NW42	PEM1/UB1E	7,736	Newington	P	P	-	P	P	S	S	P	-	-	-	-	-
NW43	PEM1B	9,495	Newington	P	S	-	P	P	-	S	S	-	-	-	-	-
NW44	PEM1E	4,194	Newington	P	S	-	P	P	S	S	P	-	-	-	-	-
NW45*	PEM1/SS1B	27,199	Newington	P	P	-	P	P	-	-	P	-	-	-	-	-
NW100	PEM1E	6,727	Newington	S	S	-	P	-	-	-	S	-	-	-	-	-

Wetland ID	Cowardin Class	Area (SF)	Town	Functions and Values^												
				GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
NW102	PEM/PFO/PSS	33,836	Newington	S	-	-	S	S	-	-	-	-	-	-	-	-
NW104	PEM	716	Newington	S	S	-	S	S	-	-	-	-	-	-	-	-
NW105	PEM	3,070	Newington	S	-	-	S	S	-	-	-	-	-	-	-	-
NW106	PEM/PSS	6,017	Newington	S	S	-	S	S	-	-	-	-	-	-	-	-
PW1	PEM/PSS	2,440	Portsmouth	S	-	-	S	S	-	-	-	-	-	-	-	-
PW2	PEM1/SS1/FO1B	51,333	Portsmouth	P	S	-	S	S	-	-	P	-	-	-	-	-
PW3	PEM1B	2,132	Portsmouth	P	S	-	S	S	-	-	P	-	-	-	-	-
PW4	PEM1E	535	Portsmouth	P	S	-	P	P	-	-	S	-	-	-	-	-
PW5	PEM1/SS1E	2,760	Portsmouth	S	-	-	S	S	-	-	-	-	-	-	-	-

^ GW= Groundwater Recharge/Discharge; FF= Floodflow Alteration; FSH= Fish/Shellfish Habitat; STR= Sediment/Toxicant Retention; NUT= Nutrient Removal; PE= Production Export; SSS= Sediment/Shoreline Stabilization; WH= Wildlife Habitat; REC= Recreation; EDU= Education/Scientific Value; UH= Uniqueness/Heritage; VQ= Visual Quality/Aesthetics; RTE= Endangered Species

* Prime Wetland

PSNH Seacoast Reliability Project (SRP)
Stream Summary Table

Stream ID	Town	Flow Regime	Cowardin Class	Average Width (ft)	Length (ft)	Area (SF)
DS3	Durham	Perennial	R2UB2	5	278	2,016
DS8	Durham	Ephemeral	n/a	1	238	238
DS15	Durham	Intermittent	R4SB4	2	103	154
DS15A	Durham	Intermittent	R4SB4	3	294	881
DS19	Durham	Intermittent	R4SB4	2	344	688
DS32	Durham	Intermittent	R4SB4	3	139	416
DS34	Durham	Ephemeral	n/a	2	48	72
DS35	Durham	Perennial	R2UB4	4	144	575
DS39	Durham	Perennial	R2UB2	3	120	361
DS46	Durham	Perennial	R2UB2/4	5	222	1,110
DS51	Durham	Perennial	R2UB2	2	49	98
DS53	Durham	Perennial	R2UB2	45	428	6,887
DS57	Durham	Perennial	R2UB2	6	226	1,877
DS60	Durham	Perennial	R2UB3	7	189	1,323
DS61	Durham	Perennial	R2UB3	2	236	473
DS61A	Durham	Perennial	R2UB3	2	13	27
DS61B	Durham	Perennial	R2UB3	2	56	112
DS74	Durham	Perennial	R2UB2	5	220	1,100
DS75	Durham	Perennial	R2UB1/2	6	215	1,288
DS92	Durham	Intermittent	R4SB4	3	56	140
DS100	Durham	Ephemeral	n/a	1	65	65
MS1	Madbury	Perennial	R3UB2	4	56	225
NS5	Newington	Ephemeral	n/a	1	391	391
NS8	Newington	Intermittent	R4SB4	5	153	763
NS14	Newington	Ephemeral	n/a	3	115	288
NS36	Newington	Ephemeral	n/a	1	62	62
NS38	Newington	Perennial	R3UB3/4	2	506	1,011
NS40	Newington	Perennial	R3UB2	3	94	283
NS50	Newington	Intermittent	R4SB2	10	35	346
NS51	Newington	Perennial	R3RB2	6	119	712
NS101	Newington	Intermittent	R4SB4	1	61	61
NH107	Newington	Perennial	R2UB2	3	149	447

Appendix C. Wetland Photographs

Wetland NW11: Emergent and Scrub-Shrub Wetland

Wetland DW18: Emergent and Scrub-Shrub Wetland

Wetland DW41: Emergent and Scrub-Shrub Wetland

Wetland MW2: Emergent Wetland

Wetland DW41: Emergent Wetland with Cattail, Sedges and Ferns

Wetland DW67: Emergent Wetland with Cattail and Grasses

Wetland NW28: Emergent Wet Meadow Wetland

Wetland NW30: Wet Meadow with Sedges and Other Hydrophytic Herbs

Wetland NW15: Scrub-Shrub Wetland

Wetland NW26: Wetland that is Primarily Scrub-Shrub

Wetland NW34: Flooded Wetland with Unconsolidated Bottom and Emergent Cover

Wetland DW22: Wetland with Area of Predominantly Forested Cover

Wetland NW4: Wetland with Forested Areas along Edge of ROW

Wetland DNW2: Estuarine Wetland along Little Bay

Wetland DNW4: Estuarine Wetland along Little Bay with Saltmarsh Fringe in foreground and Rocky Intertidal in background

Appendix B: Natural Resource Impact Assessment

Public Service of New Hampshire
Seacoast Reliability Project

Madbury, Durham, Newington & Portsmouth, NH

Natural Resource Impact Assessment

Prepared For:
Public Service Company of New Hampshire
d/b/a Eversource Energy
780 North Commercial Street
Manchester, NH 03101

Submitted:
March 2016

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1.0 Project Description

Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH") is proposing to construct a new 115 kilovolt ("kV") transmission line between their existing Madbury and Portsmouth substations to enhance the electric reliability in the seacoast region. The Seacoast Reliability Project ("SRP") is proposed to be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. The SRP transmission line will be approximately 12.9 miles long, including a 0.9 mile crossing under Little Bay (Figure 1-1). It will be primarily located in an existing electric corridor, 12.0 miles of which will be a new transmission route, 0.9 miles will be in an existing transmission corridor. The corridor ranges from 50-300 feet wide, but is predominantly 100 feet wide. For most of the length of the corridor, a mowed area approximately 60 feet in width has been maintained by PSNH in support of the existing electric distribution line. The edges of the corridor are unmaintained and frequently support forest which will need to be cleared for the SRP. The cable crossing proposed in Little Bay will affect a corridor approximately 100 feet wide within a charted Cable Area approximately 1,000 feet wide.

2.0 Proposed Work

PSNH has designed the SRP to avoid environmental impacts where possible. Extensive environmental surveys were conducted by an experienced team of consultants and in consultation with the regulatory agencies. Detailed descriptions of the various natural resources in Little Bay are included in the Natural Resource Existing Conditions Report (see Appendix), Rare, Threatened and Endangered Species and Exemplary Natural Communities Report (see Appendix) the Essential Fish Habitat Report (see Appendix), and the Modeling Sediment Dispersion from Cable Burial report (see Appendix) . The results of these studies were incorporated into the siting, design and construction aspects of the Project, resulting in a final design that avoids and minimizes environmental impacts to the greatest extent possible, while still achieving the goals of the Project. The resulting unavoidable impacts to natural resources are presented below.

The majority of the SRP will be constructed aboveground on overhead structures between about 65 and 120 feet in height. It will cross under Little Bay by being buried about 3.5-8 feet in the substrate using a combination of jet plow and hand-jet technology. For this crossing, the transmission line will be necessarily split into three cables to maintain the required transmissivity for the Reliability Project (Figure 2-1). East of Little Bay, the line will remain underground until it crosses Little Bay Road in Newington, after which it will emerge to cross overland until it terminates at Portsmouth substation. In most locations, the existing distribution line will be co-located on the new structures and the existing distribution structures will be removed. In several locations, the existing distribution line will be relocated outside of the project corridor and the new structures will carry the new transmission cables only. A short portion of an existing transmission line will be relocated to accommodate the new SRP alignment at The Crossings at Fox Run Mall in Newington.

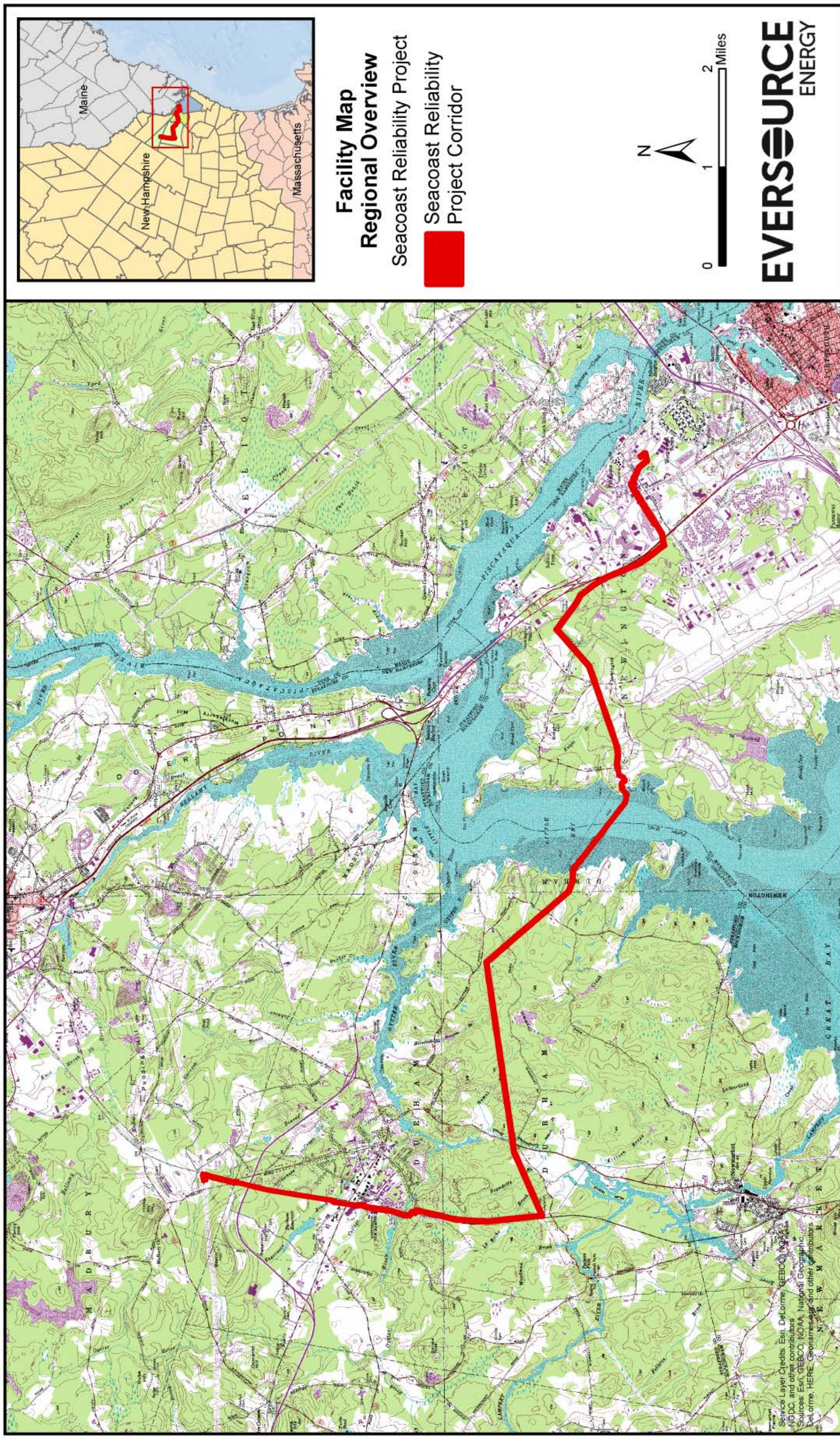


Figure 1-1. Seacoast Reliability Project location map.

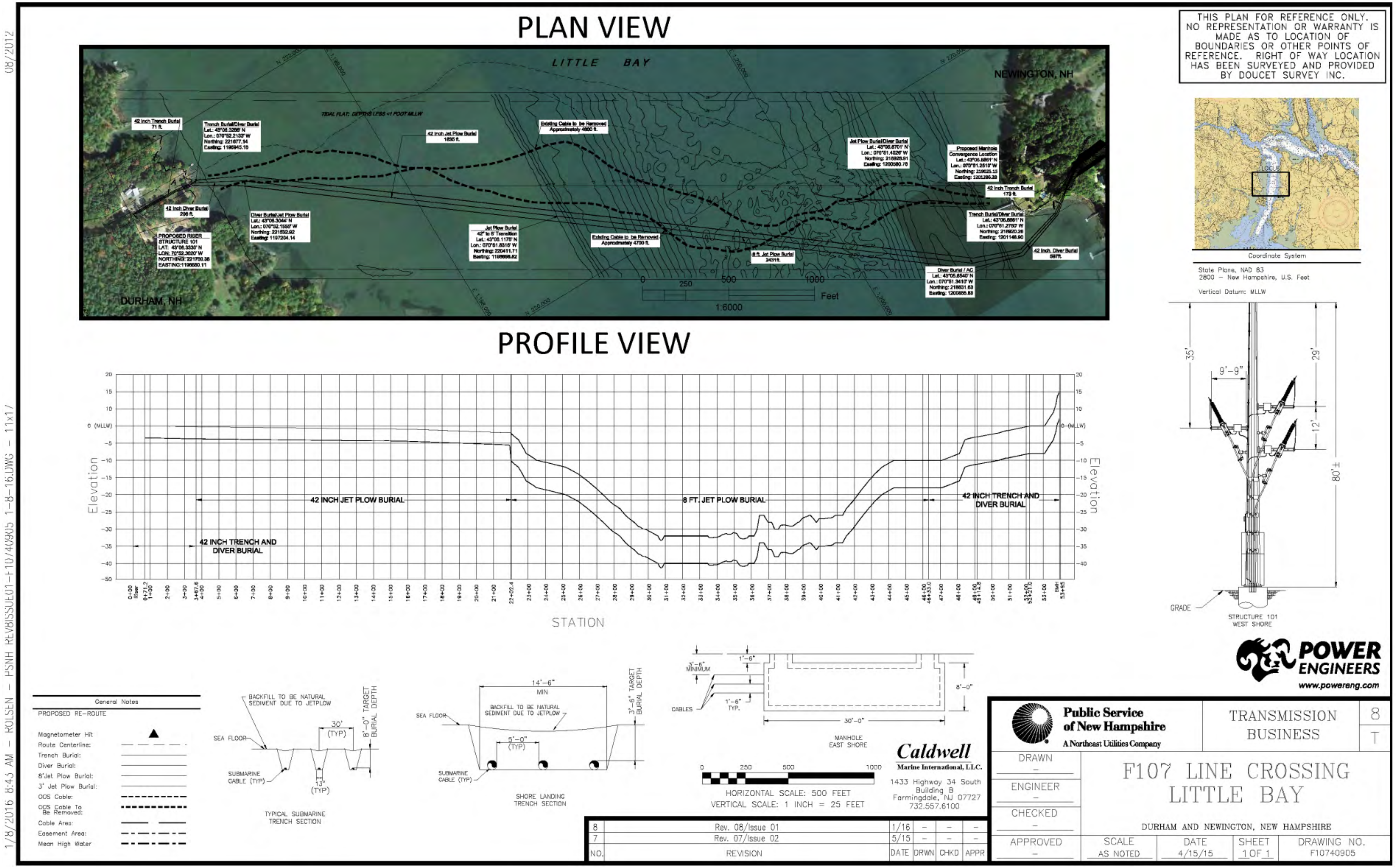


Figure 2-1. Little Bay cable crossing detail for the Seacoast Reliability Project

Substation improvements in Madbury and Portsmouth will be confined to the existing substation footprints. No other substation modifications are proposed.

The Project will result in minor permanent impacts and wetland conversion, plus temporary impacts during construction to both terrestrial and freshwater resources, as well as Little Bay. The following sections discuss the physical and biological components of those impacts in two sections: terrestrial and water resources (including estuarine wetlands), and estuarine resources, primarily effects to tidal waters in Little Bay. See the Natural Resource Existing Conditions Report in Appendices for a detailed description of each component.

3.0 Water Resource Effects

The impacts to freshwater and estuarine water resources, including wetlands and streams, are predominantly temporary (Table 3.0-1). Direct fill impacts have been avoided where possible, resulting in 792 square feet (0.02 acres) of permanent fill in freshwater wetlands; and 5,336 square feet (0.12 acres) of permanent fill in estuarine areas associated with Little Bay. Total proposed permanent impacts are 6,128 square feet (“SF”), or 0.14 acres. Permanent impacts to terrestrial areas are associated with new transmission line structures, their associated foundations,and relocated distribution structures. Permanent impacts to Little Bay are associated with concrete “mattresses” which are required by National Electrical Safety Code (“NESC”) Code (NESC Section 352D) to be laid over the submarine cables where the minimum burial depths (42 inches to the top of the cable) cannot be reached due to bedrock or other material. The articulated concrete mattresses provide protection to the cables from accidental and environmental contact/disturbances. The extent of the need for concrete mattresses will not be identified until the project is installed, but has been conservatively estimated for the permit application review. Permanent wetlands to streams and rivers have been avoided.

Temporary impacts to freshwater wetlands primarily result from timber matting to access structure sites, to clear trees and to establish work pads around proposed structures (304,053 square feet, 6.98 acres). Temporary estuarine wetland impacts result from open cut-and-cover in the salt marsh (1,222 square feet; 0.03 acres), and sediment disturbance during cable burial via jet plow and hand-jetting across the tidal flat and subtidal waters (271,984 square feet; 6.24 acres). Temporary impacts to streams are minimal and limited to 211 SF (104 linear feet) of temporary culverts where streams pass through proposed work pad areas and in one location where the underground line will be installed under College Brook in Durham via an open trench.

Indirect, or secondary, impacts are related to vegetation conversion (permanent tree removal) of forested or forest canopy covered wetlands and upland clearing within stream buffers. Clearing is proposed within 317,800 SF (7.30 acres) of forested or forest canopy covered wetlands and within 87,225 SF (2.00 acres) of upland areas within 100 feet of perennial streams, 50 feet of intermittent streams and 25 feet of ephemeral streams.

Table 3.0-1. Summary of Total Proposed Direct Permanent and Temporary Wetland Impacts by Town.

Town	Permanent (SF)	Temporary (SF)	Total (SF)
Madbury	199	29,261	29,460
Durham	3,764	325,627	329,391
Newington	2,165	221,520	223,685
Portsmouth	0	851	851
Total (Sq. Ft.):	6,128	577,259	583,387
Total (Acres):	0.14	13.25	13.39

As required by State and Federal regulations, the SRP design has avoided and minimized impacts to water resources wherever it was feasible and reasonable to do so. The following sections describe the avoidance and minimization measures, and the type and extent of the remaining unavoidable impacts.

3.1 Impact Avoidance

Permanent and temporary impacts to water resources were avoided where possible throughout the design and engineering phases of project development. Multiple rounds of preliminary design reviews were conducted between project engineering and environmental specialists. New structures were located outside of wetlands, unless technical constraints pertaining to project corridor limitations, structure height and maximum spans dictated that a structure be placed in a wetland resource. With the final design, 27 new structures, of the 180 proposed new or relocated transmission and distribution structures will be located within or partially within wetland areas and will result in permanent impacts.

Access routes and temporary work pads for construction were similarly reviewed and wetland crossings were avoided where possible. The required tree clearing along the edges of the existing corridor limited the amount of wetland avoidance; however other methods such as clearing during winter/frozen-ground conditions and hand cutting, may be employed to minimize temporary impacts associated with these activities (see below).

3.2 Impact Minimization

Engineering constraints limited the ability to avoid placing 27 new structures within or partially within wetland areas, thus wetlands have been avoided by approximately 85 percent of the 180 proposed new structures. Additionally, it should be noted that approximately 51 existing distribution structures will be removed from wetland areas by utilizing double circuit designs where necessary. The existing distribution line will be co-located on the same new structures below the new transmission lines. This will result in the net decrease of 24 structures within wetland areas.

Several steps are planned to minimize the extent of temporary impacts on protected areas, including wetlands. For the terrestrial portions of the Project, temporary impacts will be associated with construction access, access for corridor tree removal, access for the removal of existing structures, and construction work pads around new structures. Timber mats (approximately 16 feet long by 4 feet wide) will be utilized where necessary depending on the ground conditions during construction activities. Work will be performed where possible during frozen conditions and using low-ground pressure vehicles as practicable. To the extent feasible, access paths already present in the corridor will be utilized to avoid creating new routes and minimize wetland crossings. Additionally, timber mats will be placed on shrubs to reduce mat timbers sinking into wetland soils. Previous similar projects have found that the shrubs survive the short-term matting. Streams will be spanned with timber mats from bank to bank, with no permanent impacts anticipated.

Potential impacts to water quality related to the construction of the SRP were also considered during project planning and design. Erosion control measures including adherence to New Hampshire Department of Environmental Services ("NHDES") *Best Management Practices Manual for Utility Maintenance in and Adjacent to Wetlands and Waterbodies in New Hampshire* and applicable in ternal Best Management Practices ("BMP") associated with erosion control and clearing during transmission line construction will be strictly enforced. The NHDES manual includes 14 different BMPs that are detailed in Appendix A of thatdocument. BMP #1 through #13 are applicable to the access roads and work pad areas associated with the SRP, and will be utilized where needed.

In addition, the project alignment and all proposed work areas were reviewed to identify potentially high-risk sites for erosion and other soil disturbances associated with construction activities where enhanced BMPs may be needed in addition to those referenced in the applicable BMPs. These areas included steep upland slopes (generally >10 percent) that are located in close proximity to wetland and riparian resources where access roads or work pads are proposed. Minimal grading and gravel may be required in these locations to safely accommodate the required construction equipment. In addition to the standard BMPs, water bars will be installed on access roads that are located on steep (>10% slope) slopes and greater than 100 feet in length, with level spreaders located at the downslope end to disperse flow.

The identified high-risk sites are listed below, and identified on the Project's Environmental Mapping:

1. Proposed Structure #6 (Madbury): Steep slopes associated with Madbury Road up-gradient of Wetland MW1
2. Proposed Structures #13/14 (Durham): Steep slope north of Wetland DW91 and Stream DS92
3. Proposed Structures #28-#30 (Durham): Steep slopes to the north and south of the Oyster River (DS53) including small tributary streams (DS51, DS61, DS61A and DS61B) and multiple wetland areas (DW49, DW55, DW59, DW63)
4. Proposed Structure #47 (Durham): access road on steep slopes up-gradient of Wetland DW56
5. Proposed Structure #58 (Durham): access road and work pad on steep slopes up-gradient of Wetland DW31
6. Proposed Structures #66-#67 (Durham): access roads on steep slopes located immediately to the east and west of Wetland DW9

7. Proposed Structures #80-#81 (Durham): access road traverses steep side-slope up-gradient of Wetland DW42
8. Proposed Structures #82-#83 (Durham): steep access road immediately east of Structure #82 and up-gradient of Wetland DW38

Normandeau environmental monitors and PSNH construction monitors will be on site during construction to insure that the construction contractors follow the approved access plans and construction BMPs.

3.3 Impact Analysis

Unavoidable direct and secondary impacts to water resources and associated upland buffer areas were reviewed throughout the Project area. Direct impacts include permanent and temporary disturbances, as discussed above. Secondary impacts were also reviewed, including wetland conversion and upland clearing within perennial and intermittent stream buffers. Wetland conversion will occur where forested wetland areas within the SRP corridor are cleared to allow for the safe construction and operation of the proposed transmission line. Temporary direct impacts from timber matting to allow for mechanized clearing and construction of the transmission line may be necessary in these areas. These areas will not be stumped or grubbed and soil disturbance will be minimal. The forested wetlands will naturally convert to emergent or scrub-shrub resources following the clearing activities. Upland stream buffer tree removal within 100 feet of perennial streams, 50 feet of intermittent streams, and 25 feet of ephemeral streams was also quantified.

3.3.1 Direct Wetland Impacts

The SRP will impact greater than 20,000 square feet of tidal and non-tidal wetland and intersects with potential habitat for wetland-dependent threatened and endangered species. It is therefore classified as a Major project in accordance with Env-Wt 303.02(c) and Env-Wt 303.02(h).

Direct permanent wetland impacts associated with the SRP total 6,128 SF (0.14 acres). The breakdown of impacts by town and Cowardin cover class associated with the SRP is summarized in Table 3.3-1. A detailed table of individual wetland resources, cover classification, functions and values, and impacts is included in Appendix A of this report.

3.3.2 Direct Stream Impacts

Direct permanent impacts to streams have been avoided, with all structures located in upland or wetland areas. Direct temporary impacts to streams total 211 square feet (104 linear feet) (see Table 3.3-2). The majority of streams will be crossed using temporary mat bridges, with matting placed parallel to, but outside of each bank, and other matting placed perpendicular to these and over the stream. Three streams are located within work pad areas, and may need temporary culverts during construction activities. Temporary culverts will be sized based on appropriate guidelines to accommodate flows. These areas will be inspected and maintained throughout construction by an environmental monitor and the temporary culverts will be removed when no longer needed.

Table 3.3-1. Proposed Direct Permanent and Temporary Wetland Impacts by Cover Class and Town.

	# Wetlands	Permanent Impact (SF)	Temporary Impact (SF)	Total (SF)
Madbury				
PEM/PSS	1	199	28,940	29,139
PSS	1	0	321	321
Sub-Total:	***2***	***199***	***29,261***	***29,460***
Durham				
E1UB (Subtidal)	1	0	49,832	49,832
E2US (Mud Flat)	1	3,550	114,166	117,716
E2EM (Salt Marsh)	1	0	624	624
E2RS (Rocky Shore)	1	0	279	279
PEM (Emergent/Marsh)	5	71	31,185	31,256
PEM/PSS	23	60	72,663	72,723
PEM/PSS/PFO	1	0	807	807
PEM/PSS/PUB	1	20	18,285	18,305
PEM (Wet Meadow)	8	20	5,779	5,799
PFO	3	23	4,517	4,540
PSS	11	20	18,120	18,140
PSS/PFO	4	0	9,370	9,370
Sub-Total:	***60***	***3,764***	***325,627***	***329,391***
Newington				
E1UB (Subtidal)	1	0	77,565	77,565
E2US (Mud Flat)	1	1,484	29,925	31,409
E2EM (Salt Marsh)	1	0	598	598
E2RS (Rocky Shore)	1	302	217	519
PEM (Emergent/Marsh)	2	134	16,500	16,634
PEM/PSS	8	173	54,020	54,193
PEM/PSS/PFO	3	0	3,722	3,722
PEM/PUB	2	0	976	976
PEM (Wet Meadow)	5	41	13,829	13,870
PSS	3	20	8,854	8,874
PSS/PFO	2	0	4,131	4,131
PSS/PUB	1	11	10,063	10,074
PUB	1	0	1,120	1,120
Sub-Total:	***31***	***2,165***	***221,520***	***223,685***
Portsmouth				
PEM/PSS/PFO	1	0	648	648
PEM (Wet Meadow)	1	0	203	203
Sub-Total:	***2***	***0***	***851***	***851***
Total:	**SF**	**6,128**	**577,259**	**583,387**
	Acres	**0.14**	**13.25**	**13.39**

Additionally, one perennial stream in Durham, College Brook (DS74), is proposed to be crossed with an open trench associated with underground line construction. A short section of this stream will be temporarily relocated using coffer dams to divert water around the impact area during construction. The underground electrical conduit will be installed and the impacted portion of the channel will be reconstructed with native material and stream flow will be restored to its original channel. The area will be stabilized as needed to support the disturbed banks.

3.3.3 Secondary Wetland and Stream Impacts

Secondary impacts include wetland conversion from a forested canopy to scrub-shrub and emergent due to tree removal within wetlands and upland stream buffer tree removal within 100 feet of perennial streams, 50 feet of intermittent streams and 25 feet of ephemeral streams.

The majority of the existing legal corridor is 100 feet wide; however the width of currently cleared and regularly maintained area is on average 60 feet, although it varies from nearly the entire 100 feet width to as narrow as 30 feet. To safely accommodate the proposed transmission line while meeting the applicable clearances for 115kV and the co-located distribution lines, the entire corridor will need to be cleared of capable tree species to its full width. Capable species are those woody (tree) species that have the potential of growing to a height (typically 30 feet) that could pose a risk to the structures and conductor if they were to fall. Lower growing shrubs and herbaceous vegetation will not be cleared as they will not grow up to a height that could endanger the line. Minimum clearances from all vegetation must be maintained, and routine maintenance clearing according to PSNH's vegetation clearing procedures and practices is an important component of the SRP operation[1].

Wetland areas within the surveyed treeline boundary were quantified within each town (Table 3.3-3). Cleared wetlands will not be stumped or grubbed and PSNH will consult with individual landowners on the disposal of cut trees. The remaining logs and brush will be removed from wetlands and either sold or chipped for erosion control.

Stream buffers function to protect the riparian areas of streams from sedimentation by trapping runoff, erosion by binding the soils near and along stream banks, and providing shade to keep water cool and for cover, plus other habitat benefits for wildlife and aquatic organisms. Tree removal within wetland areas near streams is included in the forested wetland conversion calculation. Proposed tree clearing of upland areas within 100 feet of perennial streams, 50 feet of intermittent streams and 25 feet of ephemeral streams was quantified based on agency recommendations (Table 3.3-4). Cleared areas within these buffers will not be stumped or grubbed and ground disturbances will be limited to those associated with the logging equipment. Additionally, low-growing native shrubs and other species common within riparian buffers will not be removed. Over time, other shrub and low-growing woody species will colonize the cleared areas helping to enhance and restore stream functions.

[1] Northeast Utilities, 2013. *Vegetation Clearing Procedures and Practices for Transmission Line Sections*. OTRM 230. Rev. 2 8/19/2013.

Table 3.3-2. Proposed Temporary Stream Impacts by Town and Flow Regime with Proposed Crossing Type.

Stream ID	Stream Type	Name	Temp. Impact (SF)	Temp. Impact (LF)	Crossing Type
Durham					
DS8	Ephemeral		0	0	Mat Bridge
DS32	Intermittent		0	0	Mat Bridge
DS34	Ephemeral		0	0	Mat Bridge
DS35	Perennial	Beaudette Brook	0	0	Mat Bridge
DS39	Perennial		0	0	Mat Bridge
DS46	Perennial	LaRoche Brook	0	0	Mat Bridge
DS51	Perennial		20	10	Temp. Culvert
DS60	Perennial	LaRoche Brook	0	0	Mat Bridge
D061	Perennial		0	0	Mat Bridge
DS74	Perennial	College Brook	146	49	Diversion, Trench & Mat Bridge
DS92	Intermittent		0	0	Mat Bridge
		Subtotal:	*166*	*59*	
Newington					
NS8	Intermittent		0	0	Mat Bridge
NS14	Ephemeral		0	0	Mat Bridge
NS36	Ephemeral		45	45	Temp. Culvert
NS50	Intermittent		0	0	Mat Bridge
NS107	Perennial		0	0	Mat Bridge
		Subtotal:	*45*	*45*	
		Total:	**211**	**104**	

Table 3.3-3. Forested Wetland Conversion by Town.

	Wetland Conversion (SF)	Wetland Conversion (acres)
Madbury	2,072	0.05
Durham	217,334	4.99
Newington	87,089	2.00
Portsmouth	11,305	0.26
Total (SF):	**317,800**	**7.30**

Table 3.3-4. Upland Stream Buffer Tree Removal by Town.

	Perennial Stream Buffer (SF)	Intermittent Stream Buffer (SF)	Ephemeral Stream Buffer (SF)	Total (SF)
Madbury	7,383	0	0	7,383
Durham	53,348	11,453	4,221	69,022
Newington	5,010	4,691	1,119	10,820
Portsmouth	0	0	0	0
Total (SF):	**65,741**	**16,144**	**5,340**	**87,225**
Total (Acres):	**1.51**	**0.37**	**0.12**	**2.00**

3.3.4 Vernal Pool Impacts

No vernal pools were identified within the SRP corridor and no impacts are anticipated.

3.3.5 Effects on Wetland Functions and Values

Permanent impacts to wetlands and streams were avoided and minimized wherever possible. The remaining unavoidable permanent impacts to terrestrial (palustrine) wetlands are relatively minor in extent (792 SF) and distributed across 27 structures in 24 wetlands. Table 3.3-5 summarizes the total proposed permanent impact to each princiapal wetland function or value in each town. These data do not include functions or values that a wetland is classified as suitable for, as the wetland was not observed performing this function or value within or immediately adjacent to the ROW area. Additionally, because wetlands can have multiple principal functions or values, proposed permanent impacts to a given function or value will exceed the total permanent impact to each given wetland. Wetlands The functions most commonly associated with the permanently impacted wetlands include groundwater discharge, floodflow alteration, production export, sediment/toxicant retention and wildlife habitat. The small footprint of the new transmission line structures is not expected to affect the existing wetland functions or values. The impacted wetland areas are primarily located within an existing electric corridor and are already subject to periodic maintenance including clearing and other repair work. Temporary impacts are anticipated to have minimal adverse effects on the functions and values associated with the impacted wetland systems. Applicable construction BMPs, on-site monitoring, and restoration of temporarily impacted areas according to standards and based on agency recommendations will be employed (Section 4.0). More details on the expected impacts to the estuarine resources associated with Little Bay are included below (Section 5).

Table 3.3-5. Permanent Impacts to Principal Functions and Values for Wetlands in each Town.

Town	Groundwater Discharge	Floodflow Alteration	Fish/Shellfish	Sediment/Toxicant Retention	Nutrient Removal	Production Export	Shoreline/Sediment Stabil.	Wildlife Habitat	Recreation	Education/Scientific	Uniqueness/Heritage	Visual Quality/Heritage	RTE Habitat
Madbury	199	199	199	0	0	199	199	199	0	199	0	199	0
Durham	94	3,550	3,550	3,570	0	3,553	0	3,600	3,550	3,550	3,550	3,570	0
Newington	298	1,979	1,786	1,940	154	1,959	0	1,817	1,786	1,786	1,786	1,786	0
Portsmouth	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (SF):	**591**	**5,728**	**5,535**	**5,510**	**154**	**5,711**	**199**	**5,616**	**5,336**	**5,535**	**5,336**	**5,555**	**0**

*RTE: Rare, Threatened and Endangered

3.3.6 Temporary Impacts Restoration Plan

Wetland and upland areas temporarily disturbed for access road and structure replacement activities will be restored. The likely wetland restoration areas will be associated with the location of timber mats shown for the structures and access roads in wetlands on the construction plans. Once timber mats and other temporary wetland protections have been removed, any displaced or compacted topsoil will be smoothed or graded to match previous or adjacent soil elevations. Acquired upland and wetland topsoil or reused topsoil will be evaluated for project use in any areas requiring fill, and will be spread and moderately compacted to match adjacent grades. Areas with disturbed soils will be stabilized with upland or wetland seed mix of native and naturalized species along with annual ryegrass (for erosion control while the other seed germinates). Alternative seed mixes or stabilization methods may be negotiated with individual landowners for upland areas by the contractor, as long as these alternatives are equally protective of jurisdictional wetlands and waterbodies and do not introduce noxious or invasive species.

Areas of the fringing salt marsh that will be temporarily impacted by the underwater cable installation will be restored immediately following completion of the cable laying. Prior to construction, all salt marsh peat will be salvaged within the impact area and stockpiled for replacement during restoration. The stockpiled peat blocks will be protected and maintained for the duration of the installation period. Upon completion of construction, the underlying gravel substrates will be restored to match surrounding elevations. The peat blocks will be replaced and anchored with rebar stakes driven into the gravel and/or adjacent peat. Any open interstices between the peat blocks will be filled with a mixed sand to cover exposed roots and maintain grades. The seaward face of the restored peat will be protected from ice and wave action with a coir log.

All construction and restoration will be done under the supervision of the Engineer and an environmental monitor to ensure minimization of impacts to native vegetation and wildlife, and that all disturbed areas are stabilized.

The environmental monitor will assure compliance with permit conditions during and after the construction activities, including one year of post-construction corridor monitoring after one full growing season, and preparation of the appropriate compliance reports for submittal to NHDES. The monitoring will include a site inspection, vegetation cover estimates in restored wetlands and uplands by species in random plots, photographs, and wildlife observations. Areas with less than 80% cover at the end of the growing season will require additional seed or other appropriate enhancements. Any areas with erosion will be repaired immediately. Non-biodegradable erosion control materials will be removed as soon as they are no longer necessary. Other potential maintenance issues, such as erosion gullies or vandalism, will be documented and reported immediately to PSNH for repair.

Restored areas will be monitored for invasive species. Potential invasive species on this site include purple loosestrife, glossy and smooth buckthorn, bittersweet, multiflora rose and autumn olive among others. Invasive plants will be pulled and removed from restoration areas and disposed of in a manner and location to preclude their survival or spread. PSNH has a maintenance mowing protocol that encourages native shrubs while removing capable trees and non-native species. A monitoring report will be submitted to NHDES by November 1 of the year following construction impacts.

4.0 Compensatory Wetland Mitigation

Compensatory mitigation is proposed for unavoidable impacts to permanent wetland fill, and conversion of forested wetlands as a result of tree clearing. The first steps in mitigating wetland impacts are to avoid and minimize impacts. This has been a key component of the design for SRP project. The Project design team has worked with engineers and scientists to make design changes in order to avoid and minimize wetland impacts wherever possible (Sections 3.1 and 3.2)

Permanent direct wetland impacts are below the NHDES threshold for mitigation (10,000 SF of permanent wetland impact). . Secondary impacts due to tree removal are in accordance with applicable U.S. Army Corps of Engineers ("USACE") regulations and guidance, howver, mitigation is proposed for direct and secondary Project impacts to wetlands and impacts to stream buffers.

SRP wetland resource impacts are currently calculated as 5,336 square feet of permanent estuarine impact, 792 square feet of permanent terrestrial wetland impact, 317,800 square feet of forested wetland conversion and 87,225 square feet of upland stream buffer clearing. Direct temporary impacts to streams total 211 square feet (104 linear feet). No vernal pool impacts occur. Mitigation ratios were applied to these anticipated impacts in accordance with the *New England Army Corps of Engineers Mitigation Guidance* document and in coordination with the USACE, and NHDES. A qualitative assessment of 13 wetland functions and values using the USACEHighway Methodology found that, while multiple functions were provided to some degree by most wetlands, the principal functions were the distinguishing features among the wetland types. The most common principal functions include: Groundwater Recharge/Discharge, Wildlife Habitat, Production Export, Sediment/Toxicant/Pathogen Retention, Floodflow Alteration and Nutrient Retention.

Because of the linear nature of the Project and its wetland resource impacts, high value within-project mitigation would be difficult. The Project includes four towns, multiple watersheds and a variety of freshwater and estuarine resources. During agency pre-application meetings, NHDES and USACE agreed that in-lieu fee payment into the State's Aquatic Resource Mitigation fund was potentially appropriate compensatory mitigation for a linear project such as the SRP. Mitigation ratios were applied to these anticipated impacts in accordance with the *New England Army Corps of Engineers Mitigation Guidance* document and in coordination with the USACE, and NHDES. Calculations for payment into the In-Lieu Fee program based on the types and extent of impacts by town are shown in Table 4.0-1. The dollar value shown in Table 4.0-1 may change during the review process with NHDES and USACE should design modifications result in changes in wetland impacts.

The Town of Durham provided a potential wetland restoration and upland buffer protection project, summarized below. The restoration concepthas merit for compensation for different aspects of wetland resource impacts by the SRP if the regulatory agencies concur.

Durham

The Town of Durham has proposed an environmental mitigation project to reduce the amount of erosion from the Wagon Hill Farm shoreline bordering the Great Bay Estuary and the Oyster River. Wagon Hill Farm is Town-owned conservation land consisting of 139 acres with 1100 feet of tidal frontage on the Little Bay, Oyster River and Smith Creek, and 8.5 acres of tidal and freshwater wetlands. The project proposes to stabilize the existing eroded portions of the shoreline, which is partially the result of uncontrolled foot traffic along the shoreline. The erosion has been exacerbated by natural conditions including wind, wave, ice action, and shading from mature trees on the bank. This erosion is continuing to degrade shoreline and salt marsh habitats and has negative impacts on wildlife, shellfish, and fish habitats. The erosion stabilization would include both stabilizing and restoring the shoreline, as well as further measures to halt foot traffic in the sensitive areas by re-designing nearby walking paths to discourage off-path travel, fences and viewing platforms on the adjacent upland. A second habitat protection effort is a footbridge proposed to be constructed over Davis Creek and adjacent wetlands to control off-path travel by people and pets.

The stabilization projects will help to protect the water quality and aquatic habitats of the local streams, adjoining bordering wetlands, and the Great Bay estuary including the adjacent Salt Marsh and Sparsely Vegetated Intertidal systems, both of which are Exemplary Natural Communities documented by NHNHB. Preliminary estimates suggest that approximately 700-900 square feet of salt marsh, plus approximately 1,100 linear feet of adjacent shoreline could be restored. Impacts to freshwater wetlands along Davis Creek are estimated as 500 square feet. The Town of Durham has recently partnered with UNH ecologists and DES coastal staff to develop strategies for restoring salt marsh and developing long-term stabilization along the shoreline.. This partnership will bring current and potentially innovative techniques to addressing erosion, controlling freshwater runoff, and protecting from human-caused destabilization.

The Wagon Hill Farm shoreline stabilization project provides the opportunity to mitigate for unavoidable permanent impacts caused by SRP structures in freshwater wetlands (approximately 700 square feet in Durham), potentially 2,500 square feet of impact from concrete mattresses on tidal flats, and clearing of freshwater wetlands and streams as a result of tree removal within the SRP project corridor. It also provides the opportunity to restore sections of deteriorated or fully eroded salt marsh, and would further reduce sediment loading into critical estuarine habitats. The project has been estimated to cost $370,000, including $340,000 for shoreline restoration, $10,000 for a bridge over Davis Creek, and $20,000 to stabilize and restore Davis Creek Point. The Town of Durham is anticipating that PSNH's contribution of approximately $170,000 would complete the project, in addition to $115,000 from the Lois Brown Trust and approximately $84,000 to be raised by the town. The Durham Selectmen and Budget Committee have approved this project as part of the 2016 annual budget, pending regulatory permit approval for the PSNH contribution. Additional detail on the project is provided in Appendix B of this report within a memorandum regarding *Environmental Mitigation Project along the Wagon Hill Farm Shoreline* prepared by the Town of Durham Department of Public Works.

PSNH will continue to work with applicable parties to develop a mitigation package that will be acceptable to NHDES and USACE.

Table 4.0-1. New Hampshire Aquatic Resource Mitigation (ARM) Fund Payment Calculation for Permanent and Secondary Wetland Impacts

Town	A: Secondary Impact: Forested Wetland Conversion (SF)	A1: Conversion Mitigation Area (15% of total area A)(SF)	B: Secondary Impact: Stream Buffer Clearing (SF)	B1: Conversion Mitigation Area (15% of total area B)(SF)	C: Permanent Impacts (SF)	Total Impacts for Mitigation by Town (SF) (Sum A1+B1+C)	ARM Payment (from NH DES ARM Fund Calculator by Town)[2] (USD)
Madbury	2,072	311	7,383	1107	199	1,617	$6,488.92
Durham (Freshwater)	217,334	32,600	69,022	10,353	214	43,167	$183,385.10
Durham (Tidal)	-	-	-	-	3,550	3,550	$30,162.72
Newington (Freshwater)	87,089	13,063	10,820	1,623	379	15,065	$66,079.42
Newington (Tidal)	-	-	-	-	1,786	1,786	$15,667.82
Portsmouth	11,305	1,696	0	0	0	1,696	$8,187.14
Total:	317,800	47,670	87,225	13,084	6,128	66,882	$309,971.11

[2] http://des.nh.gov/organization/divisions/water/wetlands/wmp/

5.0 Impacts in Little Bay

The three transmission cables will be installed across Little Bay within an area mapped as "Cable Area" on NOAA Chart 13825. The primary installation will involve sinking each cable to the desired burial depth using a jet plow (Figure 2-1). This process essentially softens sediments, lays the cable which sinks through the softened sediments, and buries the cable in one step. The jet plow functions by injecting pressurized water into the sediment to fluidize it, allowing the cable to settle below the bay floor to the required depth (3.5-foot burial on the tidal flats; 8-foot burial in the channel). The support barge and jet plow will not be able to reach the shoreline on either side, however. In these nearshore areas, the cable will be laid on the substrate surface and divers will use hand jets to lower the cable to the desired 3.5-foot burial depth (a total distance of approximately 880 feet [268 meters] per cable). Silt curtains will be placed surrounding the intertidal areas to be hand jetted or trenched to contain suspended sediments.

Within the jet plowing zone, each cable will disturb a rectangular area about 1-foot wide (the width of the plow blade) and about 4,266 feet (1,300 meters) long for a total direct surface disturbance of 4,266 SF (0.1 acre) per crossing or a total of 12,798 SF (0.3 acres) for all three cables. The jet plow installation will begin on the western tidal flat approximately 300 feet (95 meters) seaward of the shoreline and continue until approximately 580 feet (178 meters) west of the eastern landfall. For the majority of the length, the cables will be laid 30-feet apart on center, although as they near the shorelines they funnel together to rejoin. The wide separation is necessary to protect the cables because the physical constraints of the crossing will require a multipoint anchoring system on the installation barge.

Both the jet plowing and diver hand jetting will require the support of a barge. On the shallow tidal flats, the barge will be grounded for a period of time for each installation phase.

Additional underwater construction activity will include removal of sections of existing cables and other minor debris that could present obstacles to the jet plow. Four PSNH transmission cables from an earlier crossing currently lie on or within 24 inches of the sediment surface within the Cable Area. The cables are between 60 and 110 years old, and are largely intact on the seafloor. PSNH attempted to remove the cables in the mid-1990's (NHDES Wetlands Board Permit 95-02299; USACEPermit 1996-00160), but the effort was halted after the cables fractured during the removal attempt. An inspection by divers in 2014 indicated that the cables were sufficiently intact to be successfully "grappled" to the surface. Most of one cable and approximately half of a second cable lie within the proposed jet plow route. The planned approach is to sever the old cables and cap the ends at the minimum length necessary to clear the jet plow route. The severed cable sections will be lifted to a barge for on-land disposal (See proposed Marine Work Plan in Appendix).

The jet plow process is expected to extend over a period of three to four weeks, including all equipment mobilization. Each cable will require about five to seven days in total, including equipment mobilization and cable preparation. The jet plow installation will generally take one day per cable. Divers using hand held jets will complete the cable burial from the end of the jet plow to each landfall. This process will take up to 90 days. Cable laying is planned for the fall (after Labor Day) and will be completed before air temperatures routinely fall below 32˚F, a point at which the cables would not be flexible enough to handle off the spool.

Potential temporary impacts along the Little Bay crossing include:

- Direct disturbance of the sediment surface from cable installation along each cable trench (quantifiable) and from anchoring of the installation vessel (not quantifiable)
- Deposition of sediments suspended during the jet plowing and dispersed beyond the footprint of each trench (quantifiable)
- Increase in suspended sediments above ambient conditions during jet plowing
- Entrainment of planktonic organisms in the jet plow water intake

Potential long-term impacts as a result of the operating cables include:

- Exposure of organisms to electromagnetic fields emitted from the three cables
- Exposure of organisms to heat emanating from the cables

5.1 Water Quality Effects

RPS ASA used the SSFATE model to predict the excess suspended sediment concentration and dispersion of suspended sediments from jet plowing and hand jetting (see Appendices). Since ambient suspended sediment concentrations are variable and unpredictable based on available information, the model predicts excess concentration, defined as the concentration above ambient suspended sediment concentration that results from the jetting activities. SSFATE also calculates the resulting deposition thickness of suspended sediments that have resettled back on the bottom. Ambient current speeds, tidal stage, trench depth and rate of advance of the jet plow are important factors in predicting settlement, resuspension and dispersion. The jet plow model was run assuming spring tide conditions. Spring tides usually result in a larger areal coverage (larger transport from the currents) but with lower concentrations and deposition thickness (since sediment would be spread over a larger area) than neap tides. The three-to-four week duration of the installation process will encompass at least one spring and one neap tidal period. The hand jetting model assumed that no silt curtains would be used to isolate the work area in order to evaluate the worst case for this activity.

5.1.1 Water Quality Effects from Jet Plowing

Jet plowing will always be initiated on the western tidal flat and, because of the shallow depths encountered on the flat, it will have to start at high tide. Burial depth determines the amount of sediment that could potentially be fluidized and released into the water column. The Project has determined that each cable must be buried to 3.5 feet below the sediment surface on the western and eastern tidal flats and 8 feet below the sediment surface under the channel. According to the marine contractor, Caldwell Marine Inc., the jet plow is likely to advance at a rate of 100 m/hr (330 ft/hr). At this rate, each installation will take approximately 13 hours. The likelihood of starting the jet plowing substantially later than high slack tide on a given day or of moving more slowly than the modeled advance rate is very low. The jet plow will be launched (i.e., placed on the substrate) the day before the scheduled crossing so that it will be ready to activate immediately as soon as water depths are sufficient for operation of the barge. Should the plow encounter an obstruction, the blade will be raised incrementally until it clears the obstruction. The ability to adjust the vertical position of the blade ensures that forward progress will continue.

Figures 5.1-1 through 5.1-4 show the plan view of the predicted excess suspended sediments ("SS") concentration at one-hour intervals starting one hour after jet plowing has been initiated for one cable. The colored contours can be identified from the legend showing concentrations from 10 mg/L on up. Figures 5.1-1 and 5.1-2 depict an ebbing or low tide and the plume is directed northward. By eight hours after the start (Figure 5.1-3), the tide has begun the flood stage and the plume has headed south towards Furber Strait. When the jet plow has reached the eastern end, the tide is still flooding (Figure 5.1-4). The contours show the highest concentrations centered directly over and adjacent to the immediate location of the jet plow on the cable route. Once the jet plow shuts down, no additional sediment will be dispersed into the water column and the plume will quickly dissipate. This is depicted in the two bottom panels in Figure 5.1-4 (13.5 and 14 hours after start).

A vertical section view of the cable path is inserted at the bottom of the figure. The insert shows that the highest concentrations occur just above the jet plow near the bottom with reduced concentrations extending up into the water column above the plow. In the shallow portions of the route, the plume reaches the surface but in the deeper portions the plume is generally restricted to the lower half of the water column.

At any given point in time during the crossing, the size of the entire plume (defined as greater than or equal to 10 mg/L excess suspended sediments) would encompass an area of about 14 acres (4 hours after start) to 55 acres (9 hours after start), averaging 37 acres. The area encompassed by the portion of the plume where excess suspended sediment concentrations are predicted to be equal to or greater than 100 mg/L is estimated to range from 0.8 (8 hours after start) to 15.9 (2 hours after start) acres instantaneously averaging 5 acres. 100 mg/L is the highest "natural" concentration measured by GBNERR off Adams Point in the fall during monthly surface water collections between 2002 and 2011. Concentrations of 1000 mg/L or higher would encompass a maximum of 3.5 acres and would typically be much smaller in extent (averaging <1 acre).

Figure 5.1-5 shows the plan view of the maximum time-integrated (i.e., maximum extent of plume at any given time over the entire installation period for one cable) excess SS concentration for the entire 13-hour jet plowing operation plus continuation for six additional hours in order to track the residual plume. This plot shows only the maximum excess SS concentration integrated over time and would not actually be seen in the Bay. However, it is useful for understanding the maximum potential extent of the plume for identifying natural resources exposure. The biological significance of that exposure depends on both excess suspended sediment concentration and the duration; these are summarized in Figure 5.1-6 and Table 5.1-1 for each plume concentration identified in Figure 5.1-5. At 10 mg/L excess SS concentration, the area that is enclosed by the contour is 90.2 hectares (222.9 acres) but lasts for only 1 hour. This short duration continues through all the concentration thresholds through 1000 mg/L. The areas quickly drop in time for a given concentrations so by 2 hours the 10 mg/L area has dropped to 32.2 hectares (79.6 acres). The plume will have completely disappeared within six hours. The area coverages drop dramatically for the higher concentrations near the jet plow indicating that the duration and extent of the plume are relatively limited.

5.1.2 Water Quality Effects from Hand Jetting

Cable installation in nearshore areas with insufficient water depth to support the jet plow and installation barge will involve a two-step process. Each cable will be laid directly on the substrate surface and then divers will use hand-operated jets to fluidize the sediments under the cables, allowing them to sink to the required burial depth (3.5 feet). Caldwell estimates that each this process will temporarily open a 4-foot wide trench for burial of each cable. This work will take place during a four-hour window around high slack tide. With an advancement rate of approximately 30 feet per day (7.5 ft/hr), it is estimated that installation for all three cables will take approximately 30 days on the west side and 60 days on the east side. Silt curtains will be placed around the entire work area on the west and a portion of the work area on the east (370 feet) to contain the suspended sediments. A 230-foot long section of the area to be hand jetted on the east side is located offshore of the intertidal and is likely to be exposed to currents in excess of 0.5 knot, the limiting speed for silt curtains.

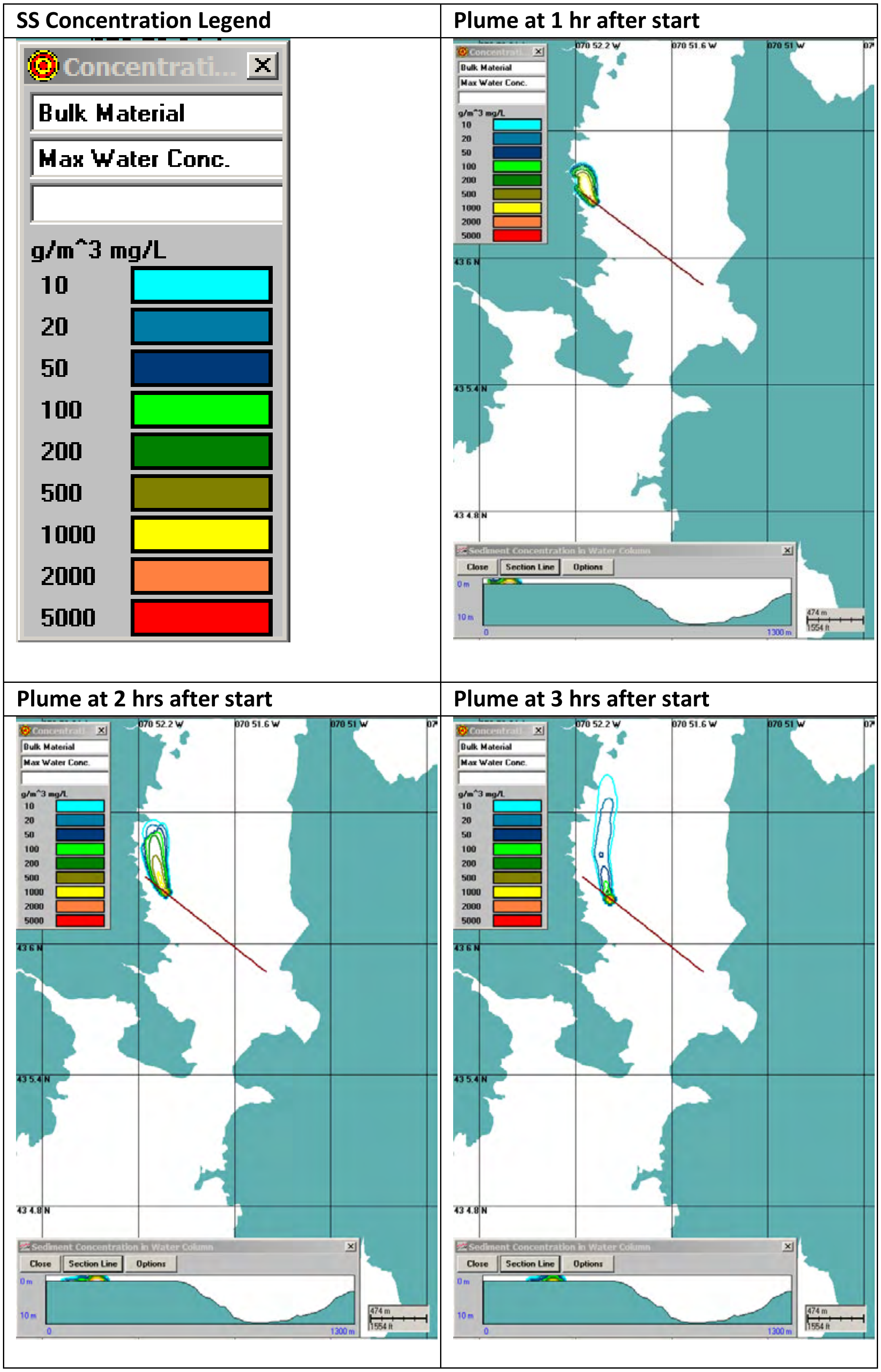


Figure 5.1-1. Plan view of instantaneous excess SS concentrations at 1 through 3 hours after start of jet plowing initiated at high slack. Vertical section view at lower left.

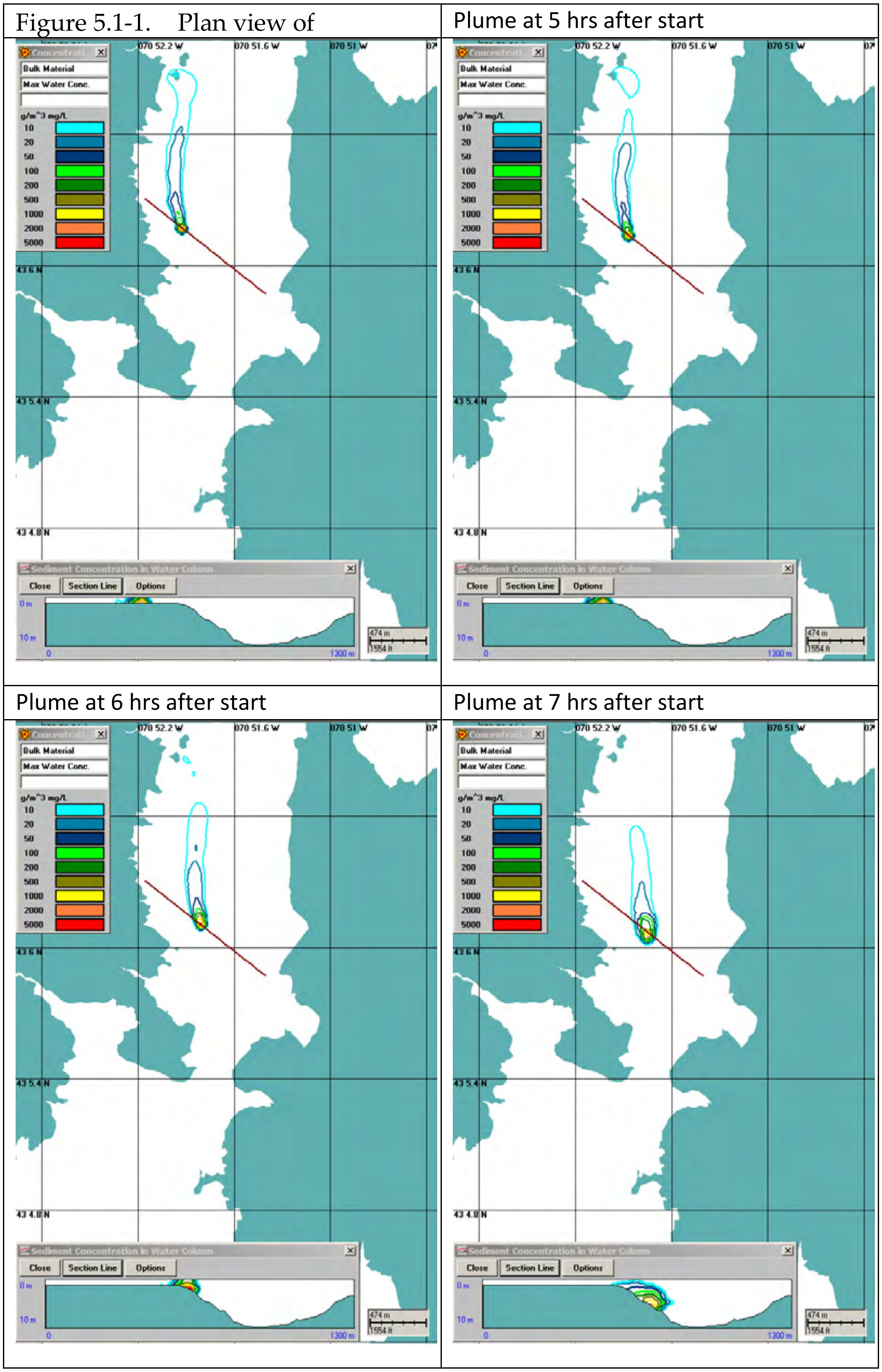


Figure 5.1-2. Plan view of instantaneous excess SS concentrations At 4 through 7 hours after start of jet plowing initiated at high slack. Vertical section view at lower left.

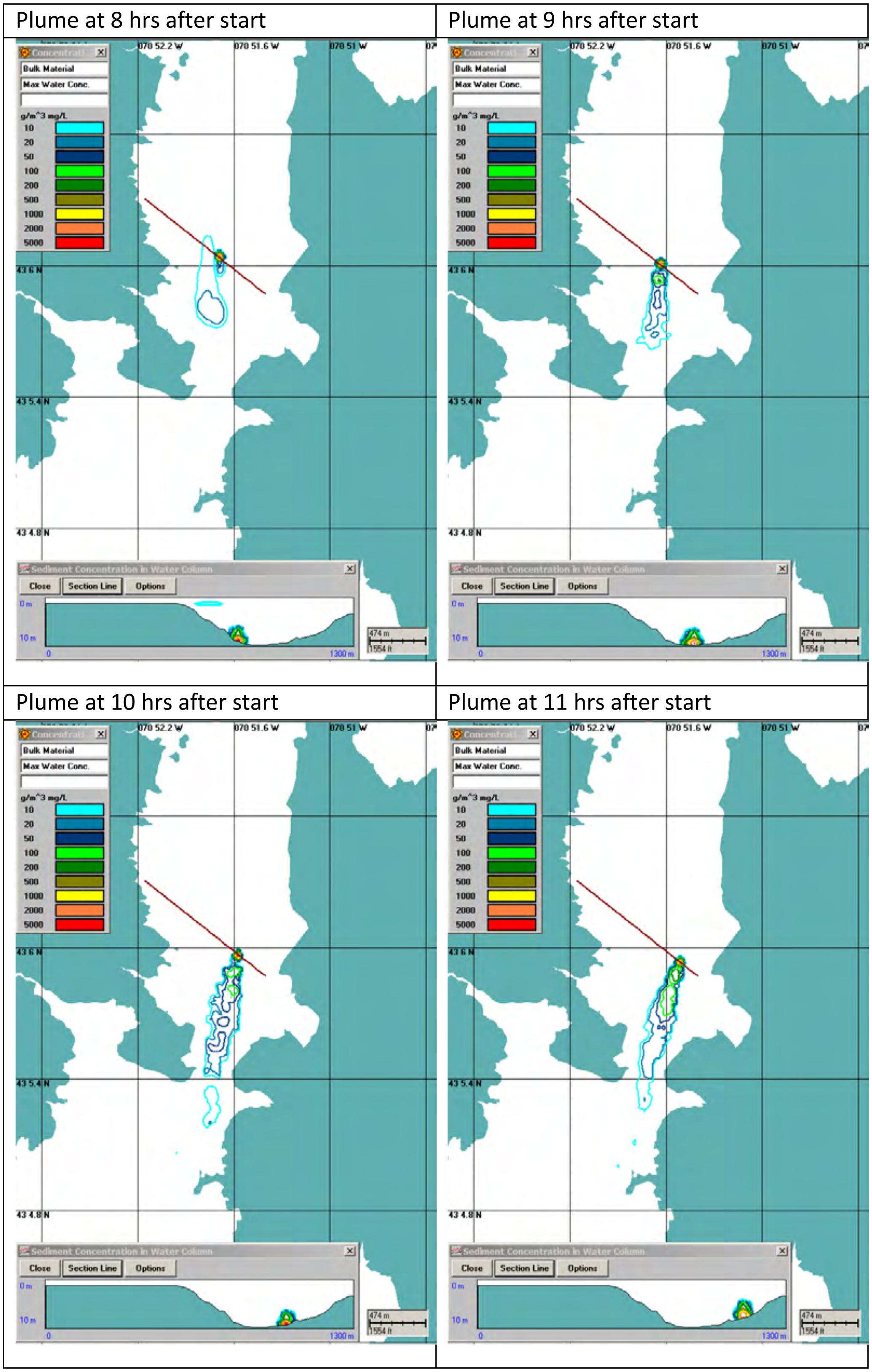
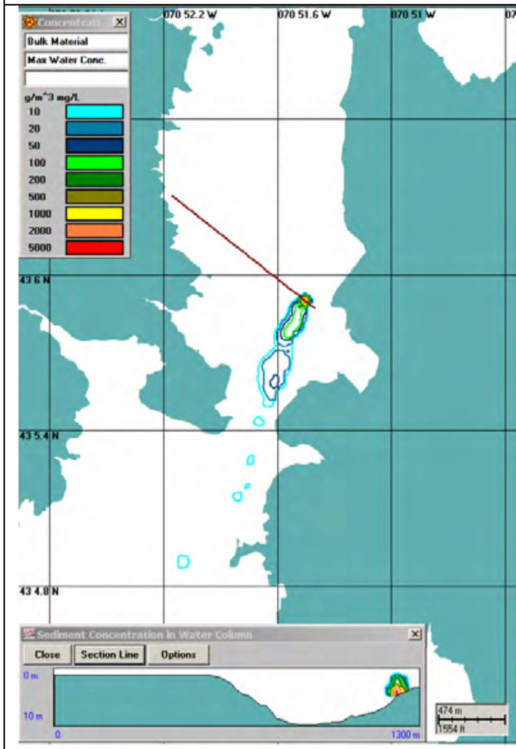
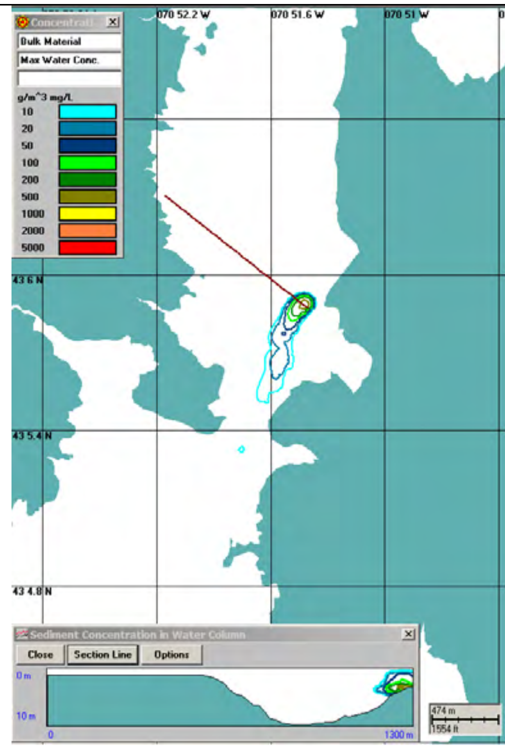


Figure 5.1-3. Plan view of instantaneous excess SS concentrations At 8 through 11 hours after start of jet plowing initiated at high slack. Vertical section view at lower left.

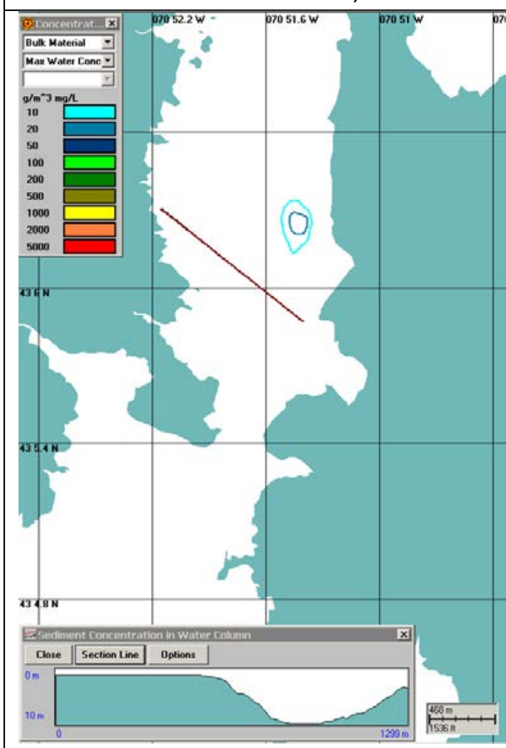
Plume at 12 hrs after start



Plume at 13 hrs after start



Plume at 13.5 hrs after start; 0.5 hr after stop



Plume at 14 hrs after start; 1.0 hr after stop

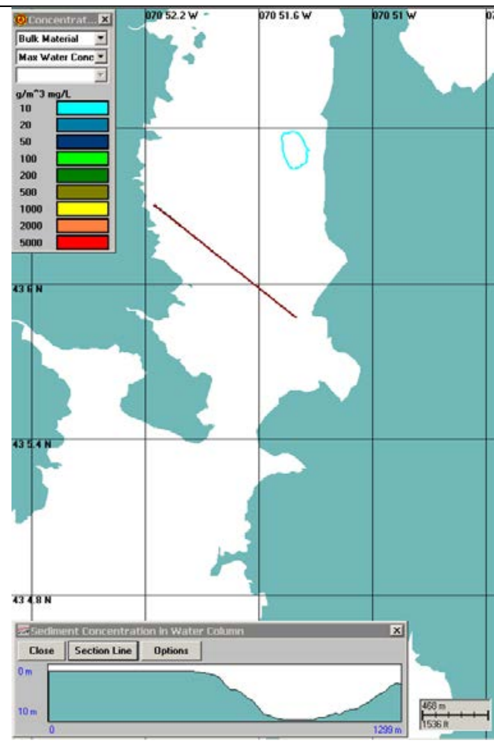


Figure 5.1-4. Plan view of instantaneous excess SS concentrations at 12 through 14 hours after start of jet plowing initiated at high slack and ending at hour 13. Vertical section view at lower left.

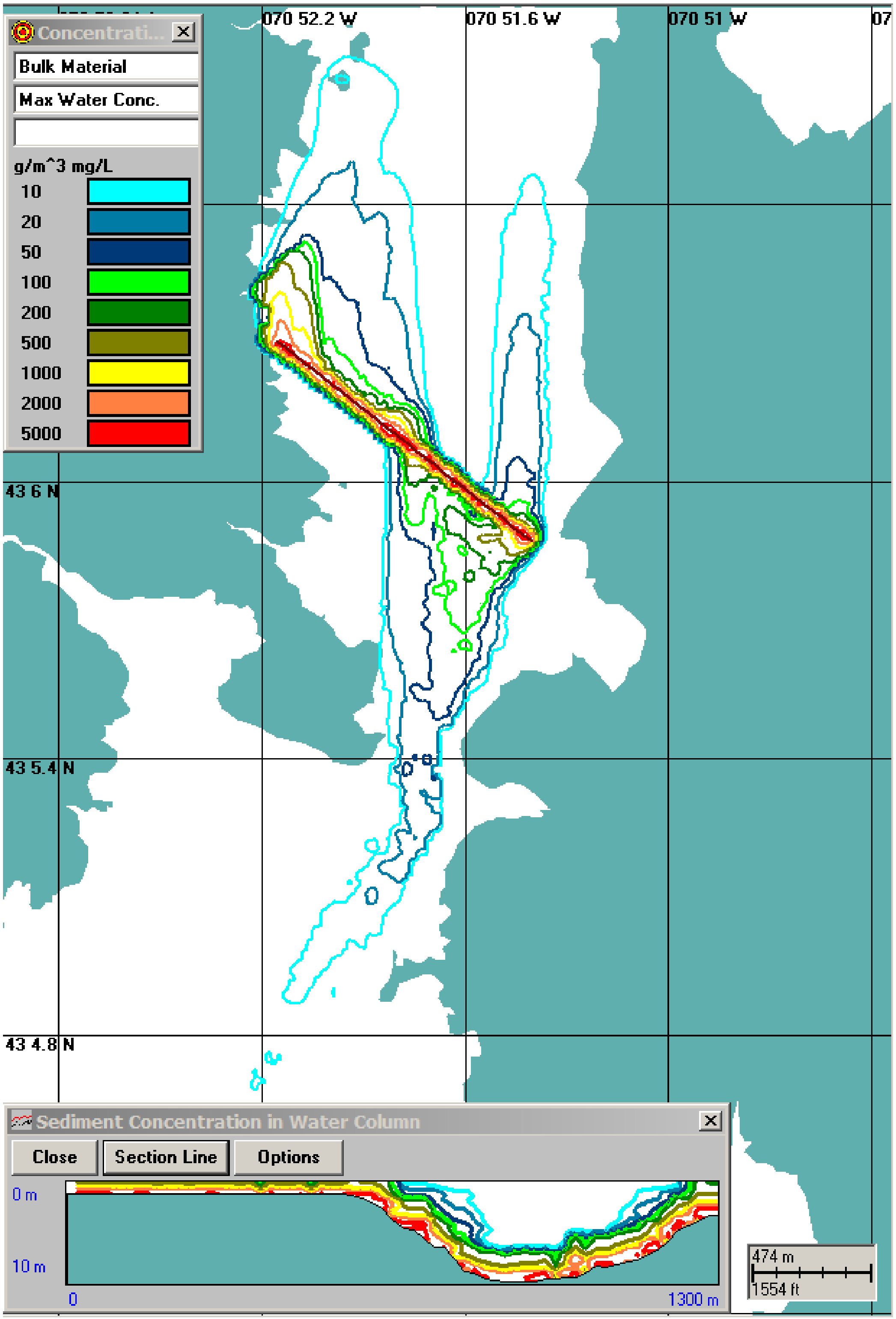


Figure 5.1-5. Plan view of maximum time integrated excess SS concentration over the entire jet plowing operation during one passage of a jet plow on a spring tide. Vertical section view at lower left.

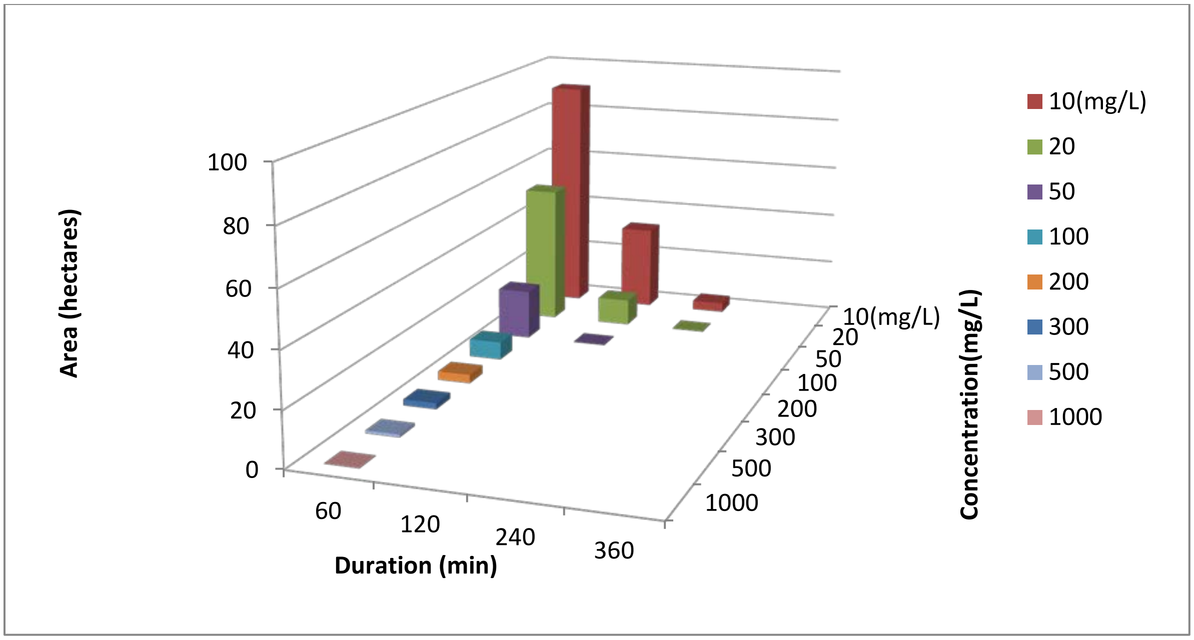


Figure 5.1-6. Duration (minutes) and area (hectares) of maximum time integrated excess SS concentration during one complete passage of a jet plow on a spring tide.

Table 5.1-1. Duration (Minutes) and Area (Hectares and Acres) of Maximum Time Integrated Excess SS Concentration During One Passage of a Jet Plow on a Spring Tide.

SS Concentration	Hectares				Acres			
	60	120	200	360	60	120	200	360
(mg/L)	(min)	(min)	(min)	(min)	(min)	(min)	(min)	(min)
10	90.20	32.20	4.76		222.89	79.57	11.76	
20	52.60	10.00			129.98	24.71		
50	18.70	0.16			46.21	0.40		
100	6.72				16.61			
200	3.20				7.91			
300	2.24				5.54			
500	1.04				2.57			
1000	0.08				0.20			

Water quality modeling of the hand jetting operation was conducted assuming that no silt curtains would be used and that work would only take place during the period from two hours before until two hours after high slack tide. Figure 5.1-7 shows those results, but is actually directly applicable only to the outer portion of the east side. At any given time, the plume (defined as the suspended sediment concentration of 10 mg/L above ambient) from the hand jetting in the section not protected by silt curtains is, likely to extend approximately 850 feet (260 meters) north of the work area and occupy an area of less than 5 acres. Highest

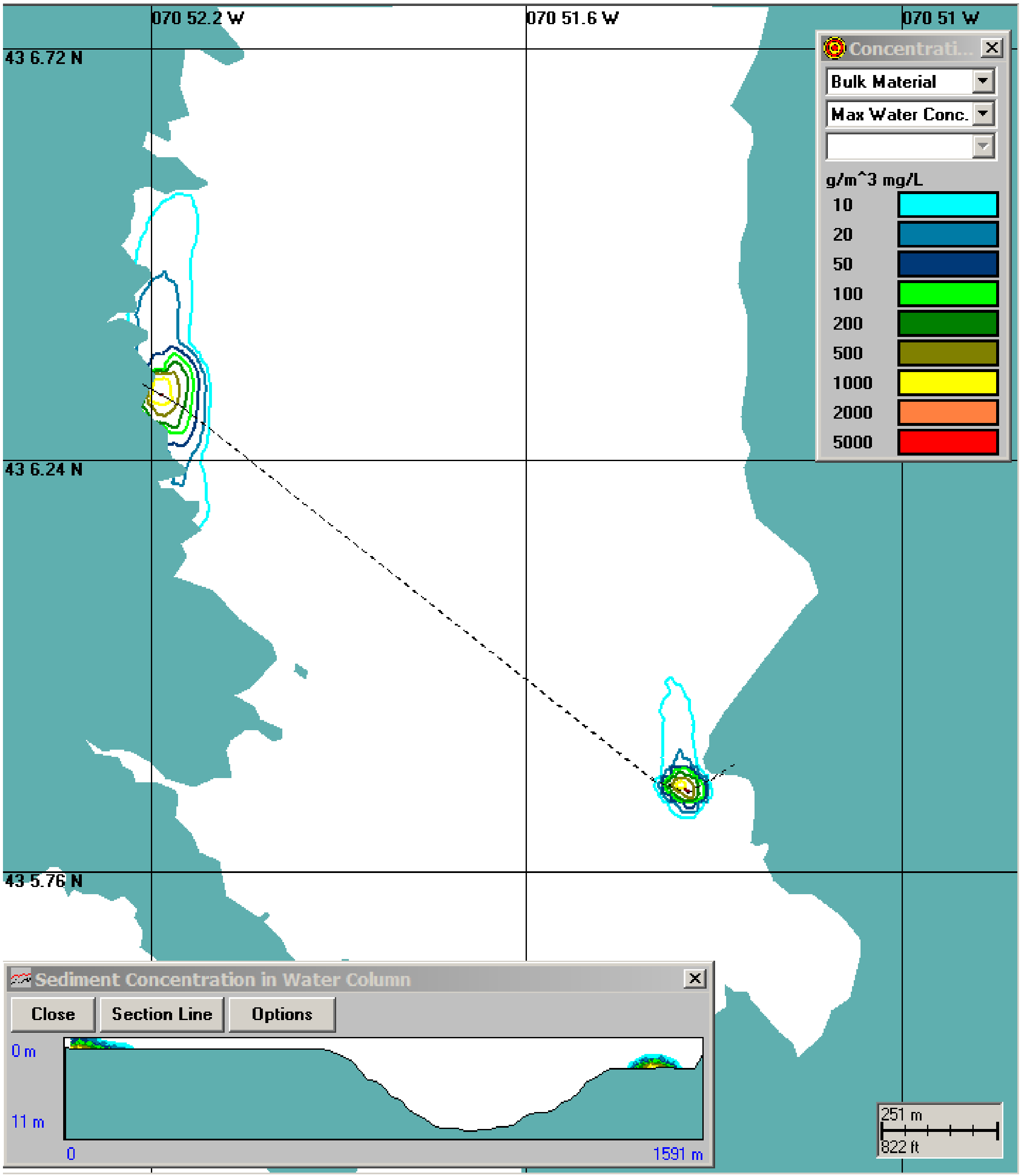


Figure 5.1-7. Plan view of instantaneous maximum excess suspended sediment concentrations for one day approximately midway across the west and east diver burial sections assuming silt curtains were not used. Vertical section view at lower left.

concentrations would be centered over the immediate vicinity of the activity. The plume would remain in the lower half of the water column. RPS ASA (2015) predicted that a residual plume of 10 mg/L excess suspended sediments would remain for about two days after hand jetting is completed because the initial buildup occurs near slack water and the sediments are mostly silts and clays. Water depths along a portion of the outermost section where silt curtain use is unfeasible are sufficient to allow divers to also work around low slack tide as well. When this occurs, the plume would flow primarily to the south. The horizontal and vertical distribution of suspended sediments would have a similar pattern to that described for the northerly flowing plume.

Use of silt curtains around the remaining areas where hand jetting will take place will greatly reduce the potential for a sediment plume outside the work area. The USACE has published suspended sediment retention rates of 80-100% (Francingues and Palermo 2005; Lackey, et al. 2012) for correctly deployed silt curtains. Thus, plumes escaping the silt curtains can be of low concentration with the 10 mg/L contour extending approximately 1100 feet (244 meters) beyond the work area on the west and 200 feet (152 meters) beyond the work area on the east.

5.2 Impacts to Bathymetry and Sediments

In addition to the temporary changes in bathymetry caused by cable installation (through jet plowing, hand jetting, or excavating), substrate conditions in the Project Area will be affected by redeposition of suspended sediments (jet plowing and hand jetting) and potentially by placement of artificial material on top of the cables to ensure the required level of protective cover. These impacts are discussed in this section.

5.2.1 Impacts to Bathymetry and Sediments from Jet Plowing

During the mobilization process for each cable, the installation barge will be maneuvered onto the tidal flat during high tide to allow deployment of the jet plow to the west. It is likely that the barge will become grounded on the substrate as the tide recedes and will compress the unconsolidated sediments beneath. Grounding will affect an area equivalent to three times the dimensions of the barge, a total of approximately 29,160 SF (0.67 acre).

SSFATE modeling conducted by RPS ASA also examined the redeposition of sediments suspended by the jet plow. Figure 5.2-1 shows the plan view of the cumulative bottom deposition thickness distribution from 0.1 milimeter to 50 milimeters (0.004-2.0 inches; see color legend) due to jet plowing the three cables. The distribution pattern is generally similar to the water column plume (ebb-flood-ebb) but much reduced in extent. The higher deposition areas are at and adjacent to the cable routes. There are a few non-contiguous areas of 0.1 – 0.5 milimeter (0.004-0.02 inch) further south of the cable route that are due to the slight changes in current direction transporting water column plumes from slightly different locations on the route so they happen to form a thin deposit at the same place.

The sizes of the deposition thickness patterns seen in Figure 5.2-1 are summarized in Table 5.2-1. The model predicts that an area totaling 144.5 acres would experience redeposition of sediments suspended by the jet plow as a result of installation of three cables. Of this total, 87.9 acres would receive deposition in the range of 0.1 -> 0.5 milimeter (0.004->0.02 inch) thick. These areas drop dramatically for the higher deposition thicknesses (e.g., 2.4 hectares [5.9 acres]

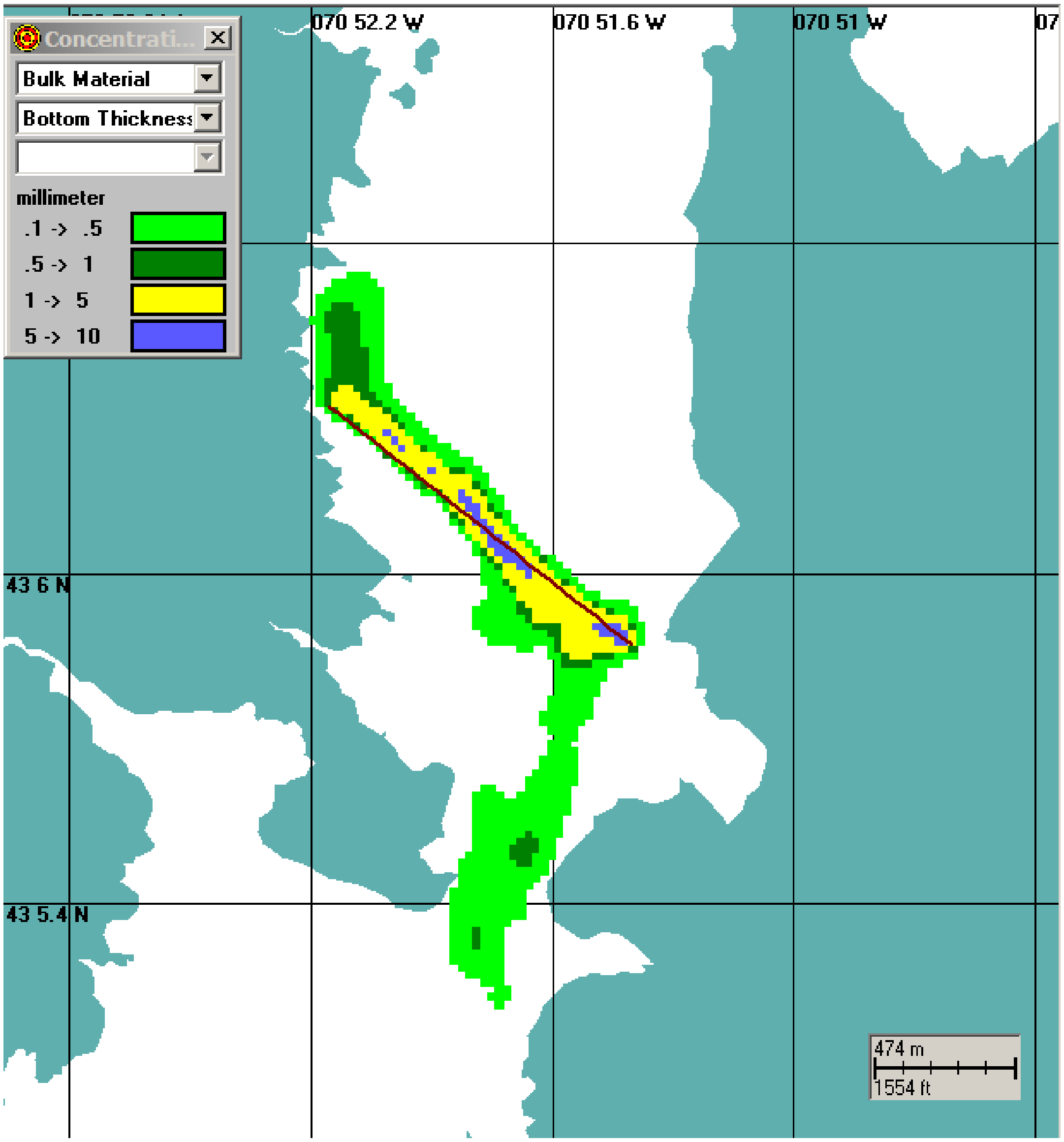


Figure 5.2-1. Plan view of cumulative bottom thickness (milimeters) distribution due to jet plowing for the three cable trenches.

Table 5.2-1. Bottom Thickness (Milimeters) Area Distribution (Hectare and Acre) Due to Jet Plow Installation of Three Cables.

Thickness (mm)	Area (ha)	Thickness (in)	Area (ac)
0.1 -> 0.5	35.6	0.004 -> 0.02	87.9
0.5 -> 1	8.1	0.02 -> 0.04	20.0
1 -> 5	12.4	0.04 -> 0.2	30.7
5 -> 10	2.4	0.2 -> 0.4	5.9

for the 5 -> 10 milimeter [0.2->0.4 inch] thickness range) near the jet plow indicating that the extent of the plume is relatively limited. This deposition may be temporary. RPS ASA (2015) concluded that newly deposited silt/clay and sand grains could be resuspended on subsequent flood and ebb tide within the channel because tidal velocities are sufficient to do so. Tidal currents are lower on the tidal flats, however, so the likelihood of resuspension due to currents is reduced; however Jones (2000) noted that rain events and ice scour are also important factors in resuspension of fine grained sediments on tidal flats in the Great Bay system. All of these factors are likely to contribute to post-installation reworking of the sediments on the tidal flat.

Existing data show that contaminant levels in sediments that will be disturbed by cable installation are low (EPA 2007). Therefore, there is little risk that use of the jet plow will result in dispersal of contaminants to other parts of the estuary.

5.2.2 Impacts to Bathymetry and Sediments from Hand Jetting

Divers performing the hand jetting will operate from a support vessel, either the installation barge or a smaller vessel. Where silt curtains are used, the vessel will be maneuvered inside the silt curtains and then remain stationary. At low tide, it will become grounded and the sediments compressed beneath. On both the west and the east sides, the maximum area affected this way would be the dimensions of the installation barge, 9,720 SF (0.22 acre).

All hand jetting on the western end of the Little Bay crossing will be conducted within silt curtains so an estimated 90% of the sediments suspended during this activity will be redeposited within the work area. The fine grained sediments in this area will likely be more or less uniformly redeposited within the work area forming a layer that averages 94 milimeters (3.7 inch) thick, although deposition will be thickest directly over (and filling) the trench and taper towards the silt curtains. Some evidence of the trenches created by the divers will remain until the uncompacted sediments are reworked and redistributed by currents. The same thing will occur in the eastern intertidal area where use of silt curtains is feasible. The temporary deposition layer in the eastern intertidal is expected to average about 110 milimeters (4.3 inch) thick, with the thickest deposition directly over (and filling) the trench and thinnest near the silt curtains.

Because it will not be feasible to use silt curtains in the offshore portion of the area requiring hand jetting on the eastern end of the route, suspended sediments will be dispersed and redeposited beyond the work area. Areas in the immediate vicinity of, but beyond, the trenches could experience deposition of up to 50 milimeters (2 inches). Beyond that, the depositional layer is likely to be less than 10 milimeters (0.4 inch) thick. Tidal action will rework and redistribute the uncompacted sediments and will tend to fill in the trenches. It is unlikely that the support vessel in this area will become grounded.

5.2.3 Impacts to Bathymetry and Sediments from Placement of Protective Mats

Portions of both shorelines have rock or ledge and the thickness of unconsolidated sediments above large rocks or bedrock has not been determined. Hand probing detected some areas where burial to only 12 inches (30 centimeters) may be achievable. As a result, it is not known whether the marine cable installer will be able to bury the cables to the required 3.5 feet (106 centimeters) burial depth in all locations. If this burial depth cannot be achieved, protective matting must be placed over the cables. The matting will consist of articulated concrete mattresses measuring 8 feet by 20 feet (2.4 m x 6.1 m) and 9 inches (0.2 meter) thick. Caldwell estimated that up to 24 mattresses (3,550 SF; 0.08 acre) might be required at the western shoreline and a total of 12 mattresses (1,920 SF; 0.04 acre) might be required at the eastern shoreline.

Placement of articulated concrete mattresses will permanently change the substrate from unconsolidated to artificial hard ("rock") substrate. It is likely that macroalgae such as *Fucus vesiculosus* or *Ascophyllum nodosum* and invertebrates such as oysters and barnacles that are common on the nearby rocky shore will ultimately colonize the mattresses.

5.3 Impacts to Eelgrass

The shallow flats along the eastern side of Little Bay have supported eelgrass in some years, most recently in 2011 and 2012 when it occurred in the southern portion of the Cable Area. Surveys conducted in 2013 and observations in 2014 indicate there is no established eelgrass bed in this area at the present time. Repopulation of the area would likely be governed by dispersal of seeds from other eelgrass beds rather than through vegetative growth, as was hypothesized by Short (2013) for the new bed observed in 2011. Therefore, the likelihood of the Project directly affecting eelgrass is very low. Results of water quality modeling discussed in Sections 5.1 and 5.2 indicate that the likelihood of indirect impacts to eelgrass is also very low as neither the plume nor the areas of deposition are predicted to intersect with established eelgrass beds. The cable installation will be performed in the fall, at the time when eelgrass is senescing for the year, further limiting any potential impacts.

Because of the importance of eelgrass to the Great Bay estuary system however, PSNH is committed to conducting an eelgrass survey in the summer of 2017 prior to installation of cables through Little Bay. If the Project area (particularly Welsh Cove) has been re-colonized by eelgrass, potential impacts are still likely to be minor. The portion of the cable route that crosses Welsh Cove will be disturbed during diver installation of the three cables. Any eelgrass within the three four-foot wide trenches or in the area where the diver support barge is grounded would be uprooted and killed. Eelgrass adjacent to the trenches within the area bounded by silt curtains (0.5 acre) would be subject to sedimentation, but may survive because once the silt curtains are removed as it is likely that some of the recently deposited sediments will be redistributed as a result of current and scour processes reworking the sediments. It is expected that the habitat conditions would be as suitable for eelgrass in the following year as they were prior to installation.

5.4 Impacts to Macroalgae

Distribution of macroalgae within Little Bay is not well known but is likely concentrated on rocky areas. An estimated 496 SF of rocky shore within the work area will be temporarily disturbed, and macroalgae on the rocks will be eliminated. Once construction is complete, it is likely that the same species of macroalgae currently present on the rocks will recolonize during the next reproductive season. The temporary sediment plumes and minor redeposition are not expected to adversely affect other macroalgae beds.

Up to 302 square feet (0.01 acres) of rocky shore may be permanently impacted if concrete mattresses are required to protect the cable; however if placement of concrete mattresses over unconsolidated intertidal substrate is required in order to provide sufficient protective cover for the cables, this material is likely to be colonized by macroalgae such as the commonly occurring

Fucus vesiculosus or *Ascophyllum nodosum*, thereby increasing suitable habitat for intertidal macroalgae by an area of up to approximately 5,760 SF (0.13 acre).

5.5 Impacts to Shellfish

Molluscan shellfish are sessile organisms that reside in or on the substrate. Normandeau surveys found that the soft substrate conditions along the proposed cable route provide suitable habitat for several species of infaunal shellfish, including softshell clams, razor clams, and the noncommercial *Macoma*. Highest abundances of these species are most likely to occur on the shallow subtidal flats although they may also be present in the channel. Individuals that are in the areas where the barge becomes grounded will be crushed. Those in the direct path of the jet plow will be displaced and potentially injured or killed. Shellfish adjacent to the trenched areas may be buried. Maurer et al. (1986) reported that deep and rapidly burrowing species were able to tolerate burial by as much as 10-50 centimeter (3.9 – 5.9 inches), with larger individuals being more resistant than smaller individuals. Thus, it is likely that adult softshell clams and razor clams covered by sediments deposited after passage of the jet plow would survive, although juveniles (e.g., less than at least half the deposition depth) would not. Individuals located between two cables may be subjected to deposition a second time. If concrete mattressing is required on either side of the route, any shellfish residing in the sediment will be covered and the substrate will no longer be suitable for infaunal shellfish. However, the mattresses could provide new substrate for oysters, particularly if the new substrate is colonized by macroalgae; Capone et al. (2008) reported the intertidal occurrence of oysters in association with macroalgae in the Great Bay estuary.

There are no major natural or restored oyster beds identified in the immediate vicinity of the Cable Area although it is likely that oysters are present in relatively small numbers wherever there is suitable habitat (hard substrate). The closest major bed is located offshore of the southeastern point of Adams Point and a planned restoration area adjacent to this bed is expected to be in place by the time cable installation occurs. Water quality modeling indicates that by the time the turbidity plume reaches this area excess suspended sediment concentrations will likely be ≤10 mg/L and that the plume will be likely to intersect only a small portion of the bed for two hours or less (Figure 5.5-1), an exposure level that Wilbur and Clarke (2001) indicated would be too low to elicit any response from the oysters. Deposition closest to the oyster bed will be ≤0.5 milimeter (≤0.02 inch). Thus, there will be no sedimentation impacts to natural oyster beds from the jet plow operation. The sediment plume and subsequent redeposition of sediments suspended by hand jetting outside of silt curtains are not expected to reach the vicinity of the Adams Point oyster bed.

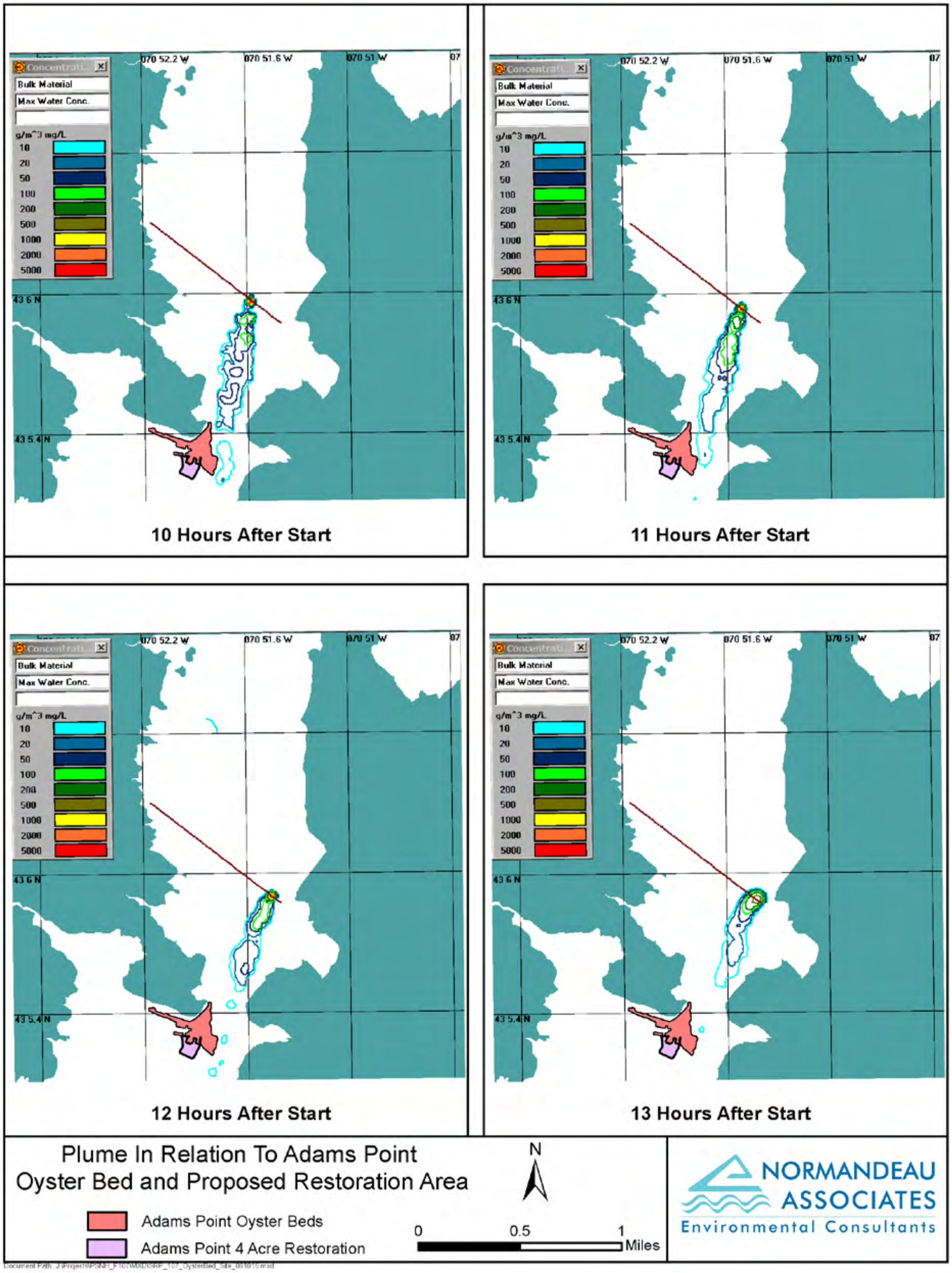


Figure 5.5-1. Potential exposure of Adams Point oyster bed and restoration area to sediment plume generated by jet plow installation of cable.

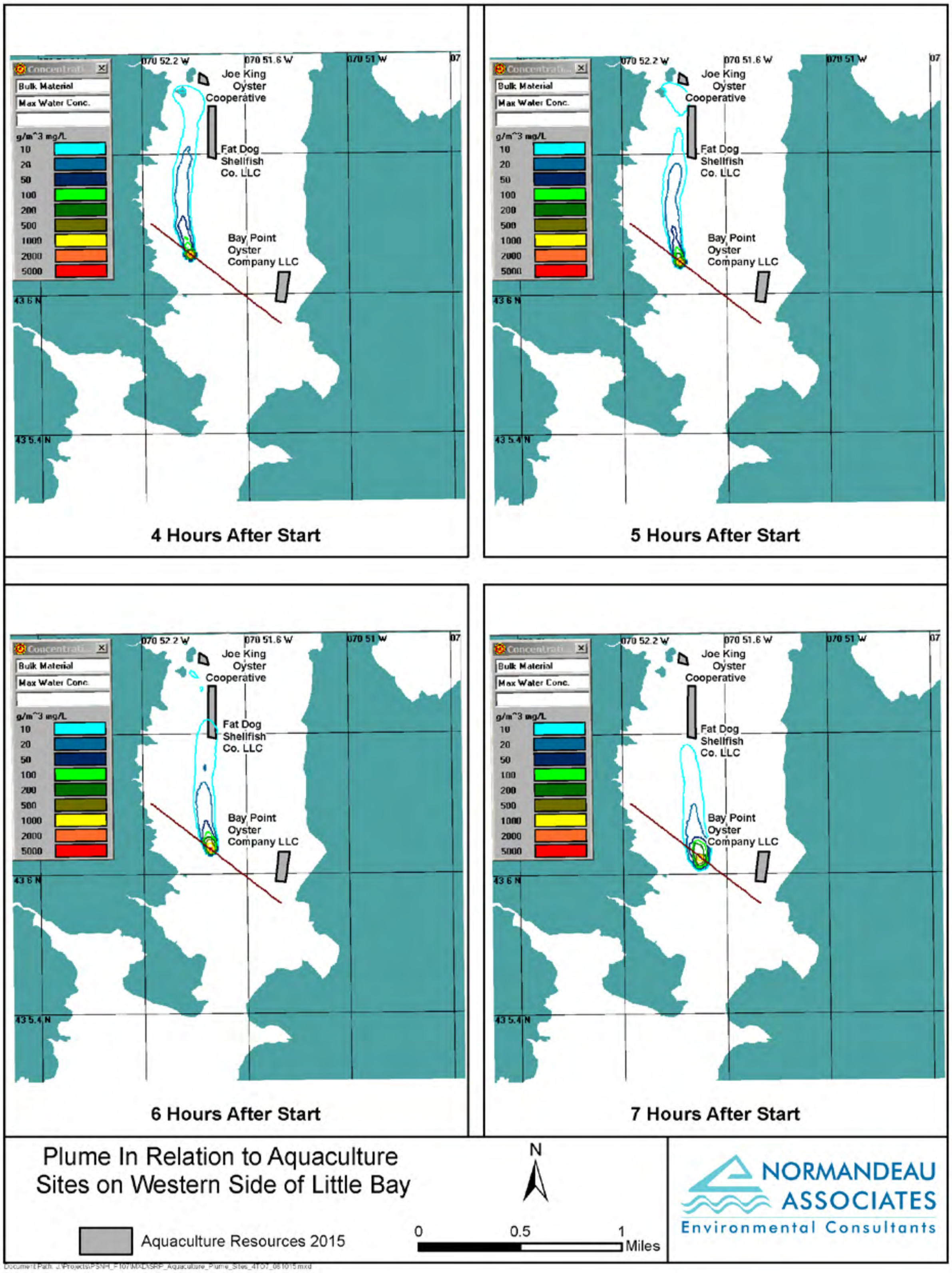


Figure 5.5-2. Potential exposure of shellfish aquaculture areas on west side of Little Bay to sediment plume generated by jet plow installation of cable.

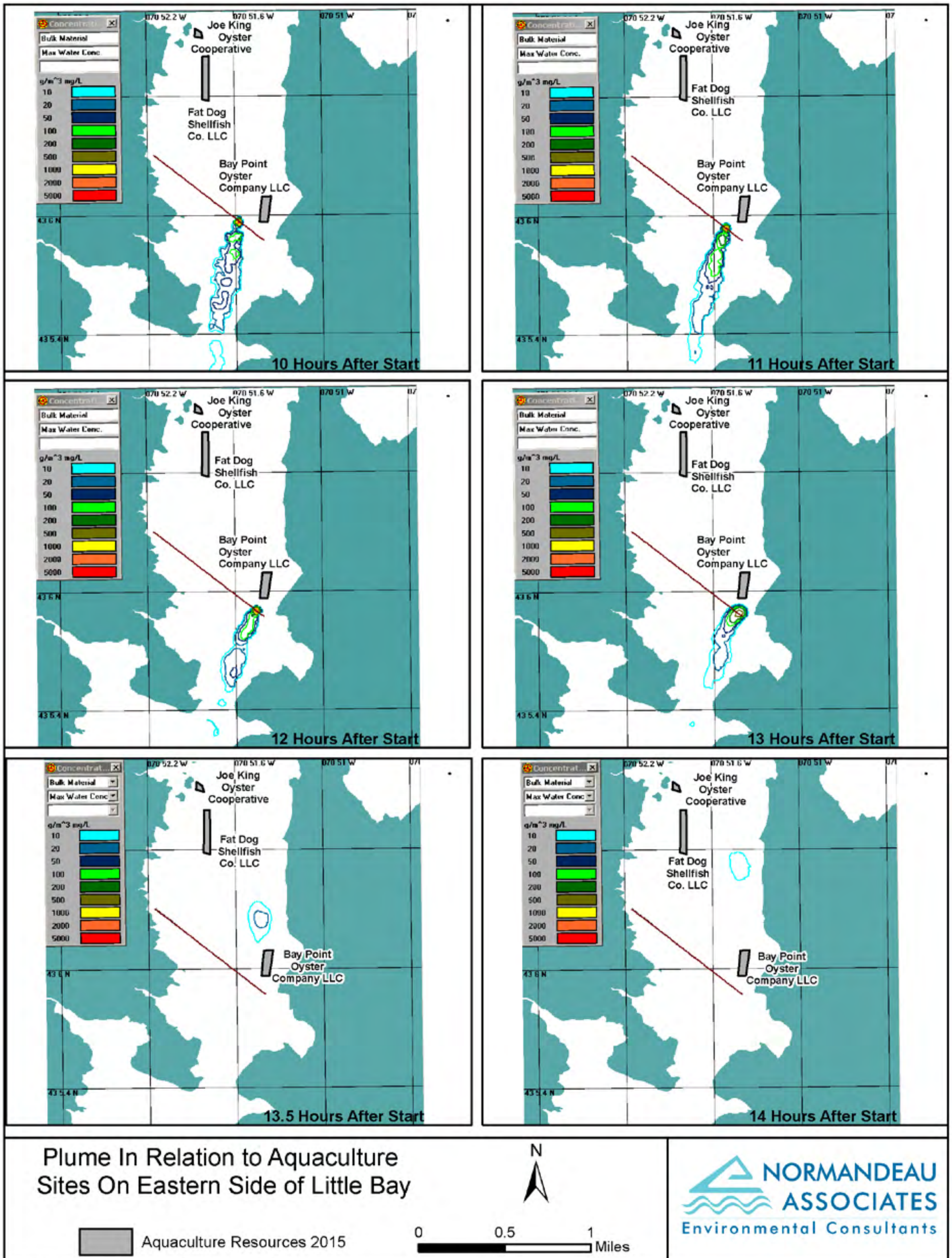


Figure 5.5-3. Potential exposure of shellfish aquaculture areas on east side of Little Bay to sediment plume generated by jet plow installation of cable.

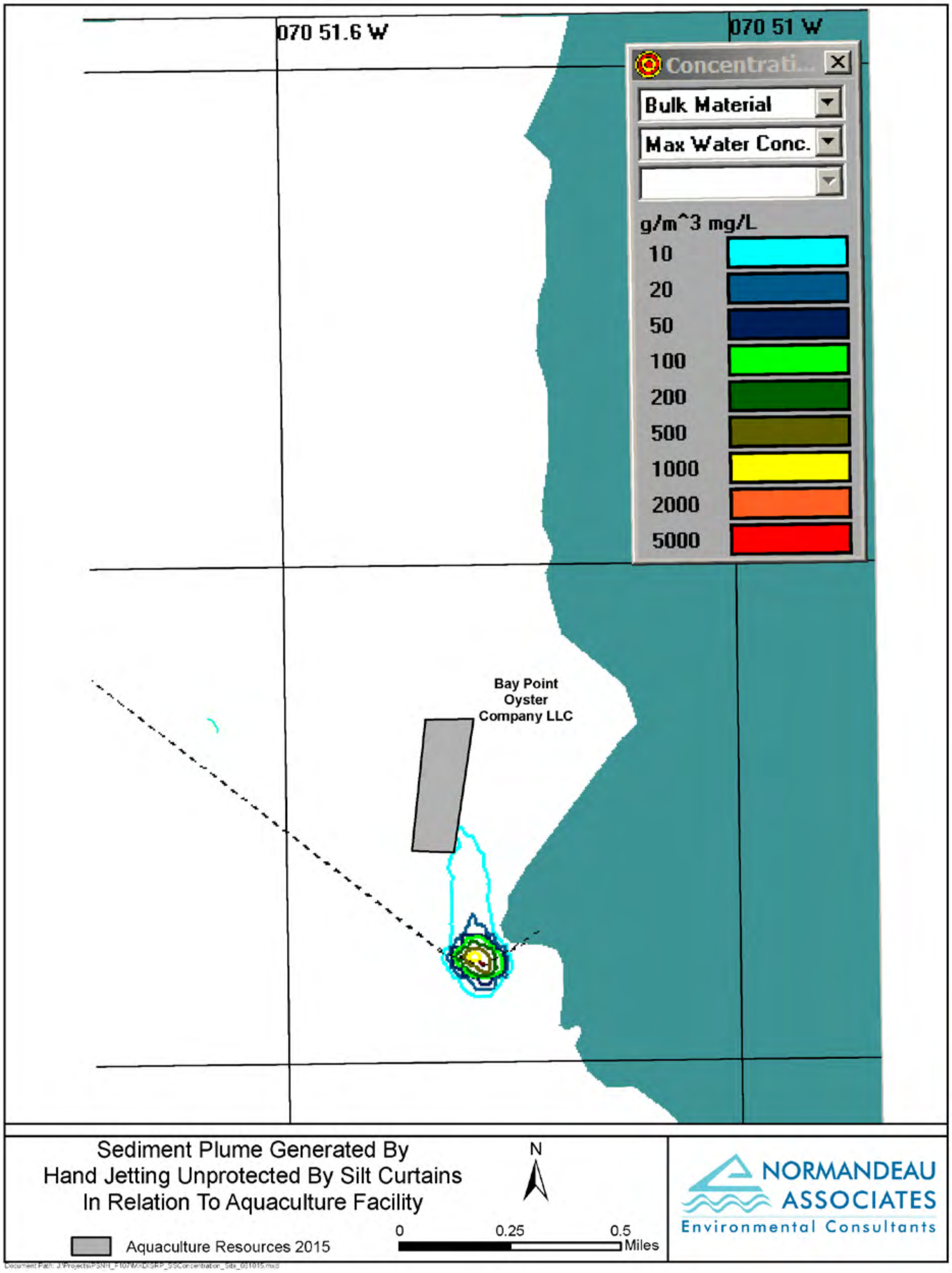


Figure 5.5-4. Potential exposure of shellfish aquaculture areas on east side of Little Bay to sediment plume generated by burial of cable by hand jetting in area where use of silt curtains is infeasible.

Larval forms of both American oysters and softshell clams may be in the water column during the cable installation. The jet plow will cycle approximately 1,000 m^3/hr (264,172 gallons/hour) during this process from a depth of about 4-5 feet below the water surface, for an approximate total of $4.2x10^4$ m^3 ($1.11x10^7$ gallons). As there will be no filtration on the intake, planktonic organisms will be entrained in the system and will be unlikely to survive. Trowbridge (2007) determined that the volume of water contained in upper Little Bay, where the crossing is located, is $1.58x10^7$ m^3 ($4.16x10^9$ gallons) at low tide and $2.51x10^7$ m^3 ($6.62x10^9$ gallons) at high tide. Water withdrawn from the bay for the jet plow will therefore consume 0.17 to 0.27 percent of the volume of upper Little Bay and the associated plankton. There are no data on shellfish larval densities available to calculate absolute losses, but these percentages represent a very minor proportion of the Little Bay capacity so should be considered insignificant.

There are several aquaculture operations (Joe King Oyster Cooperative, Fat Dog Shellfish Co., and Bay Point Oyster Co.) within the predicted range of the plume generated by the jet plow. As shown in Figure 5.5-2, the plume is predicted to flow north on the western side of the bay and reach the vicinity of Joe King Oyster Cooperative and Fat Dog Shellfish Co. for a period of several hours. It is expected that the highest excess suspended sediment concentrations that will near, and potentially intersect with, these operations will be limited to 10-20 mg/L. Wilbur and Clarke (2001) reported that the eastern oyster exhibited no discernible response to a three-week exposure to TSS concentrations as high as 710 mg/L but a two-day exposure to concentrations $\geq$1000 mg/L resulted in reduced pumping activity. Based on this research, it is likely that the farmed oysters will exhibit no response to the turbidity plume. If they do continue pumping, subsequent exposure to less turbid seawater will allow them to cleanse any excess sediments from their tissues. It is also possible that sediments will be deposited on the shells and cages. The low levels of sediment contaminants means that there is negligible risk of contaminating the meat of the farmed shellfish. Because of the low suspended sediment concentrations reaching these two shellfish farms, sedimentation is expected to be negligible, less than 0.1 milimeter (0.004 inch).

While the Bay Point Oyster Company LLC is located immediately north of the proposed cable route off Gundalow Landing, exposure to a suspended sediment plume caused by jet plowing is expected to be very limited. As Figure 5.5-3 shows, as the jet plow approaches this operation the tide will be flooding causing the plume to flow towards the south. Once the jet plow stops, about 13 hours after starting and at about high slack tide, no additional sediment will be dispersed into the water column. Thus when the tide starts ebbing, the plume will dissipate quickly. It is expected that concentrations in the residual plume will be on the order of $\leq$ 20 mg/L when it passes over this facility and the duration of exposure will be well under an hour. Bay Point Oyster Co. is located north of the area where cable burial must be done by divers using hand-held jets and the currents are too swift to allow use of silt curtains. When this work is conducted during the period from about two hours before until two hours after high slack, a sediment plume will flow towards the aquaculture site (Figure 5.5-4). However, any sediment plume associated with the hand jetting that reaches this facility will be of very low suspended sediment concentration (10 mg/L). A portion of the hand jetting is likely to take place during the four-hour period around low slack tide. As noted in Section 5.1.2, the resulting suspended sediment plume will flow primarily to the south away from the Bay Point Oyster farm. Sedimentation on this bottom-oriented oyster farm is expected to be negligible. For both jet plowing and hand jetting, plume concentrations in the vicinity of the oyster farm would be within the range of natural conditions.

There is some level of infestation of oysters in Great Bay by the polychaete *Polydora* a genus that was found in the site-specific surveys for the Project. The concern was raised that disturbing the sediments to bury the cables could increase the risk of infestation to farmed oysters. *Polydora* densities ranged from 0 to 7 per 0.04 m^2 on the eastern channel slope and from 39 to 98 per 0.04 m^2 on the western tidal flat. Given that these organisms are much larger than sediment particles, although less dense, it is likely that individuals suspended in the water column would be redeposited well within the area demarcated by the 0.1 milimeter thickness contour shown on Figure 5.2-1. Impacts to farmed oysters through increased exposure to *Polydora* would therefore be negligible.

The buried cables have the potential to emit electromagnetic fields into the sediments surrounding the cables (Eversource 2015). Cable design, including sheathing, will prevent emission of electric fields from the buried cable but cannot prevent emission of magnetic fields. Infaunal shellfish could potentially be exposed to the magnetic fields. Immediately above the cable, Eversource (2015) predicted a maximum magnetic field strength of 100 milliGauss (mG) that would decay laterally to 20 mG within 60 feet either side of the center cable. The magnetic field will also decay vertically above the cable. Several researchers (Malagoli et al. 2003, 2004 and Ottaviani et al. 2002) have examined the physiological effects of exposure of the Mediterranean mussel *Mytilus galloprovincialis* to magnetic fields from a 50 Hz source. In each case, the minimum magnetic field strength required to evoke a change (e.g., change in shape of immunocyts or increase in concentration of heat shock proteins) was 30 to 40 times higher than the predicted magnetic field strength at the cables in Little Bay. It is unlikely, therefore, that the magnetic fields emitted by the SRP cables will have a discernable effect on area shellfish or on the oysters stock at the Bay Point Oyster Co.

The buried cables could also emit heat. Power Engineers (2015) predicted that each cable will elevate the temperature of the sediment two feet (0.6 meter) above the cable (or 1.5 feet [0.5 meter] below the substrate surface in the tidal flats) to 30˚C. Adult softshell clams may burrow that deep into the substrate so could be exposed to elevated temperatures, although smaller clams will reside closer to the substrate surface and, therefore, not be exposed to as great an increase in temperature. Kennedy and Mihursky (1971) found that softshell clams (*Mya arenaria*) acclimated at 20-25˚C (likely temperature of the substrate in the summer in Little Bay) experienced a 50 percent mortality rate when exposed to temperatures of 31-32˚C. *Macoma balthica*, another common estuarine bivalve, exhibited similar temperature tolerance (Kennedy and Mihursky 1971). The area where increased sediment temperatures will occur is limited to a narrow band above each cable, so any deleterious effects to shellfish will be limited. Increased temperature associated with the cables in the deep burial (8 feet) section will not reach the biotic zone of the substrate.

5.6 Impacts to Benthic Infauna

Benthic infauna along each cable route will be displaced into the water column and adjacent substrate by the jet plow and the diver jetting. Displaced individuals may or may not survive. Predators such as lobsters and demersal-feeding fish are often attracted to areas of disturbance, so the likelihood of being consumed will be increased for displaced infauna. Individuals buried by redeposition may or may not survive depending on their mobility. The most abundant species on the western tidal flat is the polychaete *Scoletoma tenuis*, an active burrower that reworks the sediments. Individuals from this species may survive burial. The second most abundant species in this area (*Streblospio benedicti*) is a small-bodied sessile surface deposit feeder. While it is unlikely to survive burial, it is considered to be an opportunist with high reproductive rates that can quickly colonize disturbed sediments. This species will be able to recolonize the cable route from adjacent habitats. The most abundant species in the channel, *Tharyx acutus*, *Aricidea (Acmira) catherinae*, and *Scolelepis (Parascolelepis) texana*, are all sessile surface deposit feeders so may not survive burial. Again, however, these species are present outside the Cable Area so they are likely to be available to recolonize the disturbed areas. Small areas in the upper intertidal may require placement of articulated concrete mattresses to provide sufficient protection for the cables. This will result in the conversion of unconsolidated substrate to hard substrate. It is likely that this material will be ultimately colonized with the same organisms that occupy the nearby rocky intertidal.

Recovery of the benthic infauna will be dependent on recruitment from nearby populations. As noted, the numerically-dominant species are present beyond the area to be disturbed and will provide a source of individuals for recruitment. Some mobile species may start moving into the disturbed sediments soon after installation is complete simply by crawling or burrowing. It is likely that most repopulation will not occur until the next major reproductive period when infauna produce planktonic larvae however. This will probably take place the following spring and summer.

As described in Section 5.5 (Impacts to Shellfish), the buried cables have the potential to emit low level magnetic fields into the sediments to which benthic infauna could potentially be exposed. Little is known about how benthic invertebrates respond to EMF (Normandeau et al. 2011), and while exposure would be higher on the tidal flats where cable burial is shallower than in the channel, the fact that the predicted field from the SRP cables is too low to evoke physiological changes in mussels suggests it is unlikely that other benthic organisms would be affected either. It is unlikely that the magnetic fields emitted by the SRP cables will have a discernable effect on area benthic infauna.

As described in Section 5.5, the buried cables could also emit heat. The potential effects on benthic infauna are unknown. Because most infauna occur in the uppermost 6 inches (0.2 meter) and will be separated from the cables by at least 3 feet (1 meter), effects are likely to be very limited.

5.7 Impacts to Epibenthos

American lobsters and horseshoe crabs are both large benthic organisms likely to occur along the submarine cable route although population estimates for these species are not available for Little Bay. American lobsters often burrow in the substrate during the daytime, feeding actively at night. The soft sediments along the cable route would be suitable for burrowing. Lobsters that have burrowed along the cable route would be displaced and potentially injured or killed by the force of the jet plow. Lobsters adjacent to the jet plowroute would be subject to burial although it is likely that they would be able to uncover themselves even in the area of thickest deposition as the newly deposited sediments would be loose and unconsolidated and lobsters are capable of rapid excavation. Lobsters close to the jet plow paths would likely be attracted to the disturbed sediments to scavenge for exposed prey items so may receive some feeding benefits.

Horseshoe crabs likely feed on the tidal flats along the Little Bay shorelines. This species bulldozes through the sediments in search of benthic infaunal prey items. Those located along the jet plow path would be displaced and potentially injured or killed by the force of the plow. Those adjacent to the plowed area would be subject to burial. Horseshoe crabs are adapted to turbulent conditions because they must cross the nearshore wave zone to reach the intertidal zone for spawning. When flipped over, adults are able to right themselves using their elongated telson. Thus, those adult individuals that are simply displaced by the jet plow or buried under a relatively thin layer sediment are unlikely to experience more than a fleeting impact from cable installation. The proposed time frame for cable installation avoids the critical spring spawning period for horseshoe crabs so there will be no effect on the vulnerable early lifestages.

Population estimates for lobsters and horseshoe crabs in the Great Bay estuary are not available. There is no reason to believe that the Cable Area represents unique habitat for either species within the estuary. Thus, the proportion of suitable habitat within the Great Bay system affected by the cable installation is small and it is reasonable to assume that the number of American lobsters or horseshoe crabs potentially affected is also small.

Jury et al. (1994) reported that American lobster larvae have been documented in Great Bay in fall months when cable installation will occur making them susceptible to entrainment by the jet plow water intake. As described for shellfish, the volume of water that will be withdrawn to support the jet plow represents about 0.17 to 0.27 percent of the volume of upper Little Bay so entrainment impacts to American lobster would be insignificant.

It is unlikely that horseshoe crab larvae will be present in the water column during cable installation. Horseshoe crabs spawn in the spring and Rudloe (1979, 1980) and Botton et al. (2010) reported that the duration of the planktonic stage is approximately one week. Thus there will be no entrainment impacts to this species.

Spiny lobsters (*Panulirus*) have been found to be able to detect magnetic fields from DC sources, but not from AC sources (Normandeau et al. 2011). It is not expected, therefore, that EMF emitted from the SRP cables will affect American lobsters in the Project Area.

5.8 Impacts to Fish

Impacts to fishes will be temporary and include alteration of benthic habitat, increased levels of suspended sediments, and mortality of early life stages entrained in the jet plow’s water system. Available habitat for demersal species will be temporarily disturbed and altered, slightly reducing the area available for use. Disturbance of sediment during jet plowing will, however, expose some benthic infauna which may attract demersal feeders. While this could expose them to increased suspended sediments, reduced effort to capture prey could be beneficial energetically.

Highest concentrations of suspended sediments will be close to the seafloor adjacent to the cable route being plowed. This could be a deterrent for some fishes and cause them simply to avoid the densest part of the plume. Wilbur and Clarke (2001) reported that salmonids exposed to suspended sediment concentrations of 1000 mg/L or higher for up to one full day generally respond with behavioral changes (e.g., altered swimming behavior with either attraction or repulsion to the plume) or experience sublethal effects (e.g., reduced feeding). Given that the duration of the highest densities in the plume is limited to about an hour per cable, it is not expected that fish would be impacted by exposure.

According to Jury et al. (1994), eggs or larvae of a number of fishes, included Atlantic cod, Atlantic mackerel, white hake, windowpane flounder, and yellowtail flounder may be present in the water column during the fall when cable installation will occur. These early lifestages would be vulnerable to entrainment by the withdrawal of water for the jet plow. As indicated in the discussion on shellfish, the amount of water expected to be withdrawn represents approximately 0.17 to 0.27 percent of the total volume in upper Little Bay so the impact to early fish lifestages is expected to be insignificant.

The buried cables have the potential to emit magnetic fields into the sediments and overlying water column and demersal and pelagic fishes could potentially be exposed to these fields, particularly in the shallow portions of the crossing where cables will be buried with only 3.5 feet of cover. Normandeau et al. (2011) found, however, that the magnetic fields emitted from low voltage AC cables are unlikely to be detectable by most fishes.

5.8.1 Impacts to Essential Fish Habitat

The proposed crossing provides EFH for juvenile, adult, or spawning life stages of ten species at some point during the year. Of these, Atlantic halibut, red hake, white hake, windowpane flounder, winter flounder, and yellowtail flounder are demersal (bottom-dwelling) species. Pollock is a semi-demersal species; Atlantic mackerel and bluefish are pelagic (mid-column dwelling) species. One or more lifestages of six of these species is expected to be in Little Bay in September-October during the cable installation work window. EFH for demersal species will be temporarily reduced in areal extent during the installation of the cables due to suspended solids and bottom disturbance for several hours for any given location. It is expected that along the jet plow routes, plowing and cable burialwill occur nearly simultaneously. EFH for pelagic species will be temporarily degraded by increased suspended sediments for a short period in a narrow band perpendicular to the cable route during installation of each cable. No permanent impacts to EFH are anticipated.

5.8.2 Impacts to Diadromous Fish

Diadromous species are those that use both freshwater and saltwater for some portion of their life cycle. Diadromous fish require unobstructed passage through any streams within the proposed project corridor that meet the habitat requirements for migration, spawning, or development. Additionally, any migrations to and from tributaries of Great Bay (e.g. Lamprey River) would require passage through the Little Bay cable corridor. The Little Bay cable crossing area may also provide nursery or staging habitat for diadromous species. Any impacts to diadromous species habitat within the corridor or Little Bay related to construction activities could be minimized by restricting underwater construction activities or adhering to customary time-of-year restrictions to address the time period when the least number of species are likely to occur (Table 5.9-1).

Adult American eel (“yellow”) and juvenile alewife, blueback herring, American shad, and rainbow smelt may all encounter the cable installation process during their seaward migration in the fall. Eels burrow into the substrate during the day so those in the pathway of the cable installation will be disturbed by the advancing jet plow. Each species has the potential to encounter the turbidity plume generated by the jet plow. Although none of these species was specifically examined by either Newcombe and Jensen (1996) or Wilbur and Clarke (2001), it is likely that results of those studies can be applied in general. Specifically, lethal or sublethal effects are likely to require exposures to SS concentrations for a minimum of several hours. Because these fishes would not be constrained to remain in the jet plow plume if conditions were "distasteful," the most likely response to exposure to the plume would be to actively swim away from it or to meander in the general area. Within a short distance or a short period of time, the fish would find more favorable water quality conditions and be able to continue their outmigration.

Table 5.9-1. Summary of Potential Seasonal Occurrence of Diadromous Species Within the Proposed Project Corridor and Little Bay Cable Corridor.

Species	Designation*	Life Stage	Spring	Summer	Fall	Winter
American Eel	SC-A1	Juveniles (Elvers)	X			
		Adults (Yellow)	X	X	X	X
		Adults (Silver)	X			X
Alewife (Oyster River)	SC-A1	Eggs/Larvae/Juveniles	X	X	X	
		Adults	X			
Alewife (Little Bay)	SC-A1	Juveniles		X	X	
		Adults	X			
Blueback Herring (Oyster River)	SC-A1	Eggs/Larvae/Juveniles	X	X	X	
		Adults	X			
American Shad	SC-A1	Juveniles			X	
		Adults	X	X		
Rainbow Smelt (Oyster River)	SC-A1	Eggs/Larvae	X			
		Adults	X			
Rainbow Smelt (Little Bay)	SC-A1	Juveniles		X	X	X
		Adults	X			
Sea Lamprey (Oyster River)	SC-A1	Eggs/Larvae		X	X	
		Adults	X			
Sea Lamprey (Little Bay)	SC-A1	Juveniles	X			X
		Adults	X			

* New Hampshire Fish and Game Department - Nongame and Endangered Species Program (NHFG 2009).

6. 0 Impacts on Rare Species

One state-listed plant species, the state-Endangered crested sedge (*Carex cristatella*), was observed within the Project Area. Four exemplary natural communities or natural community systems were confirmed within the Project Area in Little Bay: *High salt marsh, Salt marsh system, Sparsely vegetated intertidal system* and *Subtidal system*.

The ringed boghaunter, a state Endangered dragonfly, occurs in a sedge meadow near the Project Area. Some marginally suitable larval habitat for this species was identified during a field survey, but no exuvia were observed.

Two federally listed fish species, shortnosed sturgeon (Endangered) and Atlantic sturgeon (Threatened), may use the Project Area in Little Bay as feeding habitat. Neither species is known to breed in New Hampshire, but adults could occasionally feed in Great Bay, including the Project Area. Short-nosed sturgeon is considered extirpated in New Hampshire. Three state-listed Special Concern fish species, American eel, swamp darter and banded sunfish, are known to occur upstream and downstream of several streams crossing the SRP corridor, including the Oyster River. These species are assumed to periodically use the Project Area.

Three state-listed reptiles, northern black racer (Threatened), Blandings turtle (Endangered), and spotted turtle (Threatened), and two state listed bird species, bald eagles (Threatened), and osprey (Special Concern) are likely to occur in the Project Area based on their relatively large home ranges and use of varied habitats. Two listed mammals, northern long-eared bat (federally Threatened; state Threatened) and New England cottontail (state Endangered species) have habitat potential within the Project Area.

In general, impacts to protected species will be avoided and minimized through species-specific management practices and standard BMPs during construction. Species specific management practices will include include pre-construction surveys to ensure the absence of nesting bald eagles and osprey (if either species is breeding within or near the Project Area, time-of-year restrictions may apply); cable installation in the fall to minimize impacts to marine species; repeated surveys during land-based construction to clear the active work area of turtles and snakes; handcutting in the vicinity of the ringed boghaunter habitat; and minimization of clearing preferred shrubby areas in high priority New England cottontail habitat.

The northern long-eared bat (NLEB; *Myotis septrionalis*) is state and federally threatened. Therefore, a formal consultation with the USFWS is required as part of the permitting process (NLEB Biological Assessment, see Appendices). The USFWS rules and guidance on this species are still evolving. The interim 4(d) rule published as part of the NLEB's April 2, 2015 listing allows tree clearing for expansions of transmission corridors up to 100 feet from the edge of an existing cleared Project Area, which applies to the SRP, but the final rule may contain different or additional requirements. PSNH is committed to meeting the USFWS rules when finalized.

Unavoidable temporary impacts to the fringing salt marsh will be restored following burial of the cable. Restoration techniques will include salvaging the intact peat prior to trenching for replacement after the cables are buried.

The intertidal flats and subtidal bottom will be allowed to restore and recolonize naturally after completion of the cable installation. The jetplow process will disturb sediments while laying the cable, but the water pressure of the jets and the speed of the plow will be controlled to maximize the return of sediments to the trench and minimize sediments going into suspension in the water column. The currents within the channel and wave and ice action on the tidal flats are expected to restore existing bottom contours in the vicinity of the trenches, followed by recolonization of benthic infauna and shellfish after completion of construction.

Monitoring of all impacted rare, threatened and endangered ("RTE") habitats will occur both during and after construction to assess the success of the habitat restoration.

7.0 References

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Appendix A. Wetland Resource Summary Table

PSNH Seacoast Reliability Project (SRP)
Wetland Summary Table

Wetland ID	Permanent Impact (SF)	Temporary Impacts (SF)	Cowardin Class	Delineated Area (SF)	Town	Functions and Values^												
						GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DNW2 (Subtidal)	0	127,397	E1UB	259,459	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Salt Marsh)	0	1,222	E2EM	9,047	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Rocky Shore)	302	496	E2RS	15,636	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DNW2 (Intertidal Flats)	5,034	144,091	E2US	278,668	Durham/Newington	S	P	P	P	S	P	S	P	P	P	P	P	S
DW1	0	0	PEM1/PSS1	18,663	Durham	S	S	S	S	S	S	S	S	-	S	-	S	-
DW2	30	9,303	PEM1E	51,456	Durham	P	-	-	-	-	S	-	P	-	-	-	S	-
DW4	0	1,325	PEM1J	6,829	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW5	0	230	PSS1	18,121	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW6	0	3,857	PEM1E/PSS1E	35,338	Durham	S	S	-	S	-	P	S	P	-	-	-	S	-
DW7	0	667	PSS1	4,726	Durham	S	S	-	S	S	-	-	-	-	-	-	-	-
DW9	0	1,005	PSS1/PEM1	5,839	Durham	S	S	-	S	S	-	-	-	-	-	-	-	-
DW10	0	376	PSS1E/PEM1J	17,144	Durham	S	-	-	-	-	P	-	S	-	-	-	-	-
DW11	0	0	PEM1/PSS1	7,353	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW12	0	822	PSS1E/PEM1E	11,821	Durham	S	-	-	S	-	-	-	P	-	-	-	S	-
DW13	0	1,942	PSS1/PEM1	48,977	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW14	20	3,246	PEM1J/PSS1E	21,504	Durham	P	S	-	S	-	S	-	P	S	-	-	P	-
DW16	0	64	PEM1E	763	Durham	S	S	-	-	-	-	-	S	-	-	-	-	-
DW17	0	42	PSS1/PEM1	11,886	Durham	S	P	-	P	P	S	P	P	-	-	-	-	-
DW18	0	2,619	PSS1E/PEM1E	54,161	Durham	P	S	-	-	-	S	-	P	-	S	-	S	-
DW20	0	169	PEM1J	3,144	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW21	0	3,241	PSS/PEM	24,887	Durham	S	-	-	S	S	S	-	S	-	-	-	-	-
DW22	0	3,011	PSS1E/PFO14E	40,728	Durham	P	S	-	-	-	S	-	P	-	-	-	-	S
DW24	0	7,267	PSS1E/PEM1E	35,043	Durham	S	-	-	-	-	P	-	P	-	P	S	S	-
DW25	0	1,399	PEM/PSS	10,231	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW26	0	245	PEM1J	245	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW27	0	53	PSS1E/PEM1F	2,294	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW28	0	643	PEM1J	839	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW29	20	3,551	PEM/PSS	9,272	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW30	0	857	PSS1E/PEM1J	14,577	Durham	S	S	-	S	-	P	S	P	-	S	-	-	-
DW31	20	8,940	PEM	46,279	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW33	0	5,436	PEM/PSS	39,676	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW36	0	1,104	PSS1/PFO1	10,787	Durham	P	P	-	-	-	-	-	-	-	-	-	-	-
DW37	0	1,420	PEM/PSS	3,294	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW38	0	4,089	PSS1/PFO1	32,062	Durham	P	S	-	-	-	S	-	-	-	-	-	-	-
DW40	0	630	PSS1/PEM1	6,354	Durham	P	-	-	-	-	P	-	S	-	-	-	P	-
DW41	20	18,285	PEM/PSS/PUB	96,107	Durham	S	S	-	S	S	-	S	S	-	-	-	-	S
DW42	0	0	PSS1/PFO1	4,930	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW43	0	0	PSS/PFO	4,476	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-
DW44	0	1,437	PEM1	7,145	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW45	0	2,889	PSS	7,812	Durham	S	-	-	-	-	-	-	S	-	-	-	-	-
DW47	0	4,563	PEM/PSS	23,061	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW48	0	1,176	PSS/PEM	14,505	Durham	P	P	-	-	-	S	P	S	-	-	-	-	-
DW49	0	3,172	PEM/PSS	3,533	Durham	S	S	-	S	S	-	-	S	-	-	-	-	-

Wetland ID	Permanent Impact (SF)	Temporary Impacts (SF)	Cowardin Class	Delineated Area (SF)	Town	Functions and Values^												
						GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
DW50	0	1	PEM1	2,753	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW52	0	807	PSS1/PFO1/PEM1	18,865	Durham	P	-	-	-	-	S	-	-	-	-	-	-	-
DW54	0	2,739	PSS1	12,577	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW55	0	0	PSS	687	Durham	S	-	-	S	-	-	-	S	-	-	-	-	-
DW56	20	13,910	PEM1/PSS1	41,860	Durham	P	-	-	-	-	S	-	S	-	-	-	-	-
DW58	0	8,060	PSS1/PEM4	70,192	Durham	P	P	-	-	-	P	P	P	-	-	-	-	-
DW59	0	0	PEM/PUB	3,150	Durham	S	S	S	S	S	-	S	-	-	-	-	-	-
DW63	0	0	PSS/PEM	6,200	Durham	S	S	-	S	S	-	S	S	-	-	-	-	-
DW65	7	3,917	PEM	8,221	Durham	P	-	-	S	S	-	-	-	-	-	-	-	-
DW67	14	8,972	PEM	15,266	Durham	P	S	-	S	S	-	-	S	-	-	-	-	-
DW69	0	53	PEM	7,574	Durham	P	S	-	P	S	-	-	S	-	-	-	-	-
DW71	0	0	PEM	163	Durham	P	-	-	-	-	-	-	-	-	-	-	-	-
DW72	0	0	PSS1	2,527	Durham	-	-	-	S	S	-	-	-	-	-	-	-	-
DW73	0	0	PSS1/PEM1	1,098	Durham	S	S	S	S	S	-	S	-	-	S	-	-	-
DW74	0	1,166	PFO1/SS1	2,795	Durham	S	P	-	S	S	-	S	-	-	-	-	-	-
DW76	20	4,321	PSS1	12,237	Durham	S	-	-	-	-	-	-	-	-	-	-	S	-
DW77	0	1,711	PSS1	9,755	Durham	P	-	-	P	-	-	-	-	-	-	-	-	-
DW78	0	0	PSS1	139	Durham	P	-	-	P	P	-	-	-	-	-	-	-	-
DW79	0	842	PSS1	2,189	Durham	S	-	-	S	S	-	-	-	-	-	-	-	-
DW80	0	935	PSS1	5,966	Durham	S	-	-	-	-	-	-	-	-	-	-	-	-
DW91	0	1,240	PSS1	4,177	Durham	S	S	-	-	-	-	S	S	-	-	-	-	-
DW93	3	1,949	PSS1	4,637	Durham	P	-	-	-	-	P	-	-	-	-	-	-	-
DW94	20	4,961	PSS1	12,802	Durham	S	-	-	S	-	S	-	-	-	-	-	-	-
DW100	20	1,895	PEM1E	6,571	Durham	S	S	-	P	-	-	-	-	-	-	-	-	-
DW101	0	4,019	PEM1/SS1E	3,219	Durham	S	-	-	S	-	-	-	S	-	-	-	-	-
DW102	0	0	PSS1E	5,043	Durham	-	-	-	S	-	-	-	-	-	-	-	-	-
DW103	0	0	PSS1/EM1B	12,099	Durham	P	-	-	S	S	S	-	S	-	-	-	-	-
DW104	0	0	PSS1/EM1E	874	Durham	P	-	-	S	S	-	-	-	-	-	-	-	-
DW105	0	153	PFO1E	1,227	Durham	S	-	-	S	S	S	-	S	-	S	-	-	-
MW1	0	321	PSS1	8,078	Madbury	P	-	-	-	-	P	-	-	-	-	-	-	-
MW2	199	28,940	PEM1/PSS1	74,736	Madbury	P	P	P	-	-	P	P	P	-	P	-	P	-
NW1*	20	6,583	PEM1/SS1	75,679	Newington	S	P	-	P	P	P	-	-	-	-	-	S	-
NW3	20	6,141	PEM1/SS1	80,336	Newington	S	P	-	S	S	-	S	-	-	-	-	-	-
NW4	0	3,987	PSS1E/PUB3/PFO14E	48,442	Newington	S	S	-	P	S	S	-	P	-	-	-	S	-
NW6	20	2,817	PSS1C	13,332	Newington	S	P	-	S	-	P	S	P	-	-	-	-	-
NW9	133	12,399	PEM1	44,940	Newington	P	-	-	S	-	-	-	-	-	-	-	S	-
NW10	0	3,499	PSS1E/PEM1E/PFO1B	31,671	Newington	P	-	-	-	-	-	-	P	S	-	-	-	-
NW11	133	13,147	PSS1/PEM1	38,909	Newington	P	P	-	P	P	P	-	S	-	-	-	S	-
NW12*	0	3,332	PSS1E/PEM1E	30,058	Newington	S	S	-	S	-	P	S	P	-	-	-	-	-
NW13	0	211	PEM1/PUB	16,815	Newington	S	S	-	S	S	S	S	P	-	-	-	S	-
NW16	0	8,145	PEM1F/PSS1E	47,505	Newington	P	S	-	S	-	S	-	P	-	S	-	S	-
NW17*	0	4,507	PSS1	12,715	Newington	P	-	-	S	S	S	-	-	-	-	-	-	-
NW18	0	2,016	PEM1J/PSS1J	7,003	Newington	S	-	-	P	-	-	-	S	-	-	-	-	-

Wetland ID	Permanent Impact (SF)	Temporary Impacts (SF)	Cowardin Class	Delineated Area (SF)	Town	Functions and Values^												
						GW	FF	FSH	STR	NUT	PE	SSS	WH	REC	EDU	UH	VQ	RTE
NW19	1	387	PEM1	578	Newington	S	-	-	-	-	S	-	-	-	-	-	-	-
NW20	0	0	PEM1J	1,929	Newington	P	-	-	S	-	-	-	S	-	-	-	-	-
NW21	0	295	PEM1	6,666	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW22	0	1,264	PFO1E/PSS1E	10,953	Newington	P	-	-	-	-	-	-	S	-	-	-	-	-
NW24	0	0	PEM1F/PSS1E/PFO1E	18,186	Newington	S	-	-	S	-	P	-	P	-	-	-	-	-
NW26	0	1,530	PSS1E	15,500	Newington	P	-	-	S	-	-	-	S	-	-	-	-	-
NW28	20	6,421	PEM1J	39,285	Newington	P	-	-	S	-	-	-	-	-	-	-	-	-
NW30	0	1,981	PEM1J	13,978	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW32	20	4,745	PEM1J	11,001	Newington	S	-	-	-	-	-	-	-	-	-	-	-	-
NW34*	11	10,063	PSS1E/PUBb	23,065	Newington	P	S	S	S	-	S	S	P	-	-	-	-	-
NW35	0	223	PEM1/SS1/FO1B	8,824	Newington	P	S	-	P	P	-	-	P	-	-	-	-	-
NW37	0	544	PEM1/SS1E	33,462	Newington	P	P	S	P	P	P	P	P	-	-	-	-	-
NW39	0	0	PEM1/SS1E	2,472	Newington	P	P	-	P	P	P	P	P	-	-	-	-	-
NW41	0	0	PEM1E	4,114	Newington	P	P	-	P	P	P	S	S	-	-	-	-	-
NW42	0	765	PEM1/UB1E	7,736	Newington	P	P	-	P	P	S	S	P	-	-	-	-	-
NW43	1	4,101	PEM1B	9,495	Newington	P	S	-	P	P	-	S	S	-	-	-	-	-
NW44	0	0	PEM1E	4,194	Newington	P	S	-	P	P	S	S	P	-	-	-	-	-
NW45*	0	14,112	PEM1/SS1B	27,199	Newington	P	P	-	P	P	-	-	P	-	-	-	-	-
NW100	0	0	PEM1E	6,727	Newington	S	S	-	P	-	-	-	S	-	-	-	-	-
NW102	0	0	PEM/PFO/PSS	33,836	Newington	S	-	-	S	S	-	-	-	-	-	-	-	-
NW104	0	0	PEM	716	Newington	S	S	-	S	S	-	-	-	-	-	-	-	-
NW105	0	0	PEM	3,070	Newington	S	-	-	S	S	-	-	-	-	-	-	-	-
NW106	0	0	PEM/PSS	6,017	Newington	S	S	-	S	S	-	-	-	-	-	-	-	-
PW1	0	0	PEM/PSS	2,440	Portsmouth	S	-	-	S	S	-	-	-	-	-	-	-	-
PW2	0	648	PEM1/SS1/FO1B	51,333	Portsmouth	P	S	-	S	S	-	-	P	-	-	-	-	-
PW3	0	0	PEM1B	2,132	Portsmouth	P	S	-	S	S	-	-	P	-	-	-	-	-
PW4	0	0	PEM1E	535	Portsmouth	P	S	-	P	P	-	-	S	-	-	-	-	-
PW5	0	203	PEM1/SS1E	2,760	Portsmouth	S	-	-	S	S	-	-	-	-	-	-	-	-

^ GW= Groundwater Recharge/Discharge; FF= Floodflow Alteration; FSH= Fish/Shellfish Habitat; STR= Sediment/Toxicant Retention; NUT= Nutrient Removal; PE= Production Export; SSS= Sediment/Shoreline Stabilization; WH= Wildlife Habitat; REC= Recreation; EDU= Education/Scientific Value; UH= Uniqueness/Heritage; VQ= Visual Quality/Aesthetics; RTE= Endangered Species
* Prime Wetland

Appendix B. Memorandum: Environmental Mitigation Project along the Wagon Hill Farm Shoreline, Town of Durham, NH.

Department of Public Works
Town of Durham
100 Stone Quarry Drive
Durham, N.H. 03824
_603-868-5578_
Fax 603-868-8063

MEMORANDUM

TO: Sarah Allen, Normandeau Associates Inc.

FROM: Michael Lynch, Public Works Director

DATE: September 3, 2015

RE: Environmental Mitigation Project along the Wagon Hill Farm Shoreline

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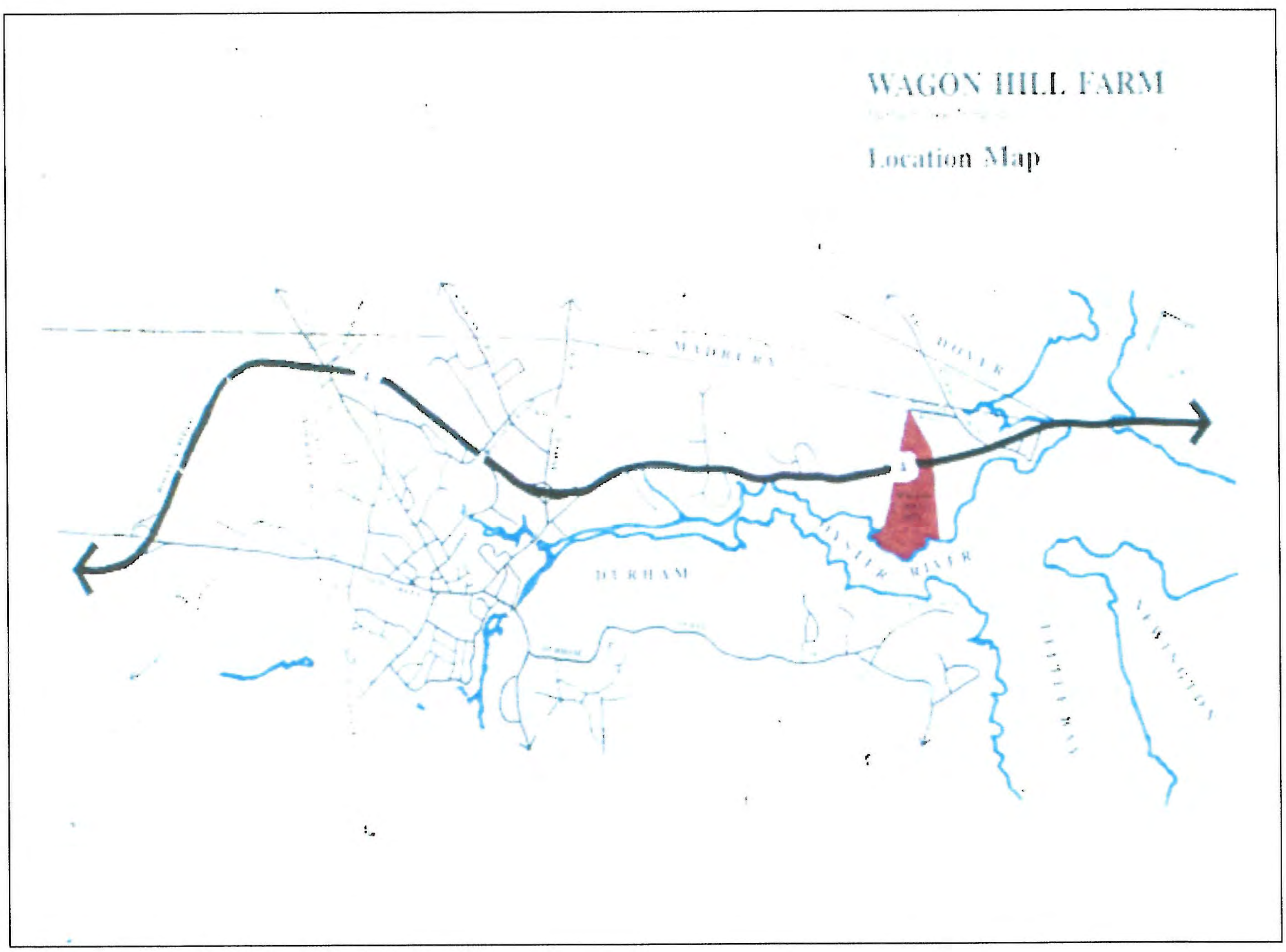
The Town of Durham in cooperation with Eversource (previously Public Service of New Hampshire) is partnering to propose an Environmental Mitigation Project which will eliminate a significant amount of erosion from the Wagon Hill Farm shoreline along the Great Bay Estuary and the Oyster River.

BACKGROUND

The Wagon Hill Farm consists of 139 acres. It consists of a 99 acre parcel on the south side of Route 4 and a 40 acre parcel on the north side of Route 4. It has approximately 1100 feet of frontage on Little Bay.

The farm was purchase by the Town of Durham in 1989. The land was purchased by the Town ***"to preserve its scenic vistas, provide for future municipal purposes, preserve open space, provide a healthful and attractive outdoor environment for work and recreation, and to conserve land, water, forest and wildlife resources."***

In 1995 the Strafford Regional Planning Commission and the Town of Durham received a grant from the New Hampshire Office of State Planning, New Hampshire Coastal Program to hire a consultant to prepare a master and a management plan for the process. The Strafford Regional Planning Commission issued a Request for Proposals for the work. It received four proposals from consulting firms. After reviewing three of the firms who submitted proposals it selected one of the firms, The Cavendish Partnership Inc., to perform the work. The following documents, the planning process and planning and management recommendations for the Wagon Hill Farm.



Existing Site Conditions

The 139 acre site is located three miles from downtown Durham on Route 4. The site is bisected east to west by Route 4 with 99 acres to the south and 40 acres to the north. The farm has not been used agriculturally for several years and indigenous plants have begun to reclaim the pastures north of Route 4 to some degree around the perimeter of the southern parcel. Gently rolling fields are the dominant feature of the parcel south of Route 4. (See location map)

The openness of the meadows affords distant views to Little Bay to the south and Oyster River to the southwest. The high knolls create an opportunity for significant views across the 99 acre parcel. The views from the shores of the Oyster River are exceptionally good. The views of Route 4 may be considered undesirable due to the heavy volume of automobile and truck traffic. The "wagon" is the focal point on the property for motorists traveling on Route 4.

There are a number of important historic sites and structures on the property. The most prominent historic feature of this site is the Bickford-Chesley farmhouse and its surrounding foundations. The Davis graveyard and the area where the garrison house once stood are also important features. On the northern parcel are the remains of a school house close to Route 4. The history of the site could be interpreted to provide a strong focus for future improvements.

The existing trails system traverses the southern portion of the site with trails in both meadows and wooded areas. Overall the trails are in excellent condition however, some degradation has occurred due to excessive use in sensitive areas by pedestrians and equestrians. Improved surfaces and the introduction of some structures in sensitive areas could prevent future degradation in wet and shoreline areas. If the number of visitors continues to increase, the trails will have to be surfaced with a material that will help define and maintain the walking surfaces while at the same time providing a surface suitable for physically and visually impaired visitors.

Elevation and Surface Hydrology

The site has two distinct high points. The northern high point is at the most northerly portion of the 40 acre parcel along Watson Road. Water drains from this area and collects in the wetland adjacent to Route 4. The other high point is on the 99 acre parcel and is where the wagon is located. Water drains from this ridge north to the wetlands along Route 4 and south to Davis Creek. Water that collects in the wetland along Route 4 eventually exits under the Wagon Hill driveway westerly to Smith Creek and into the Oyster River.

Slope Analysis

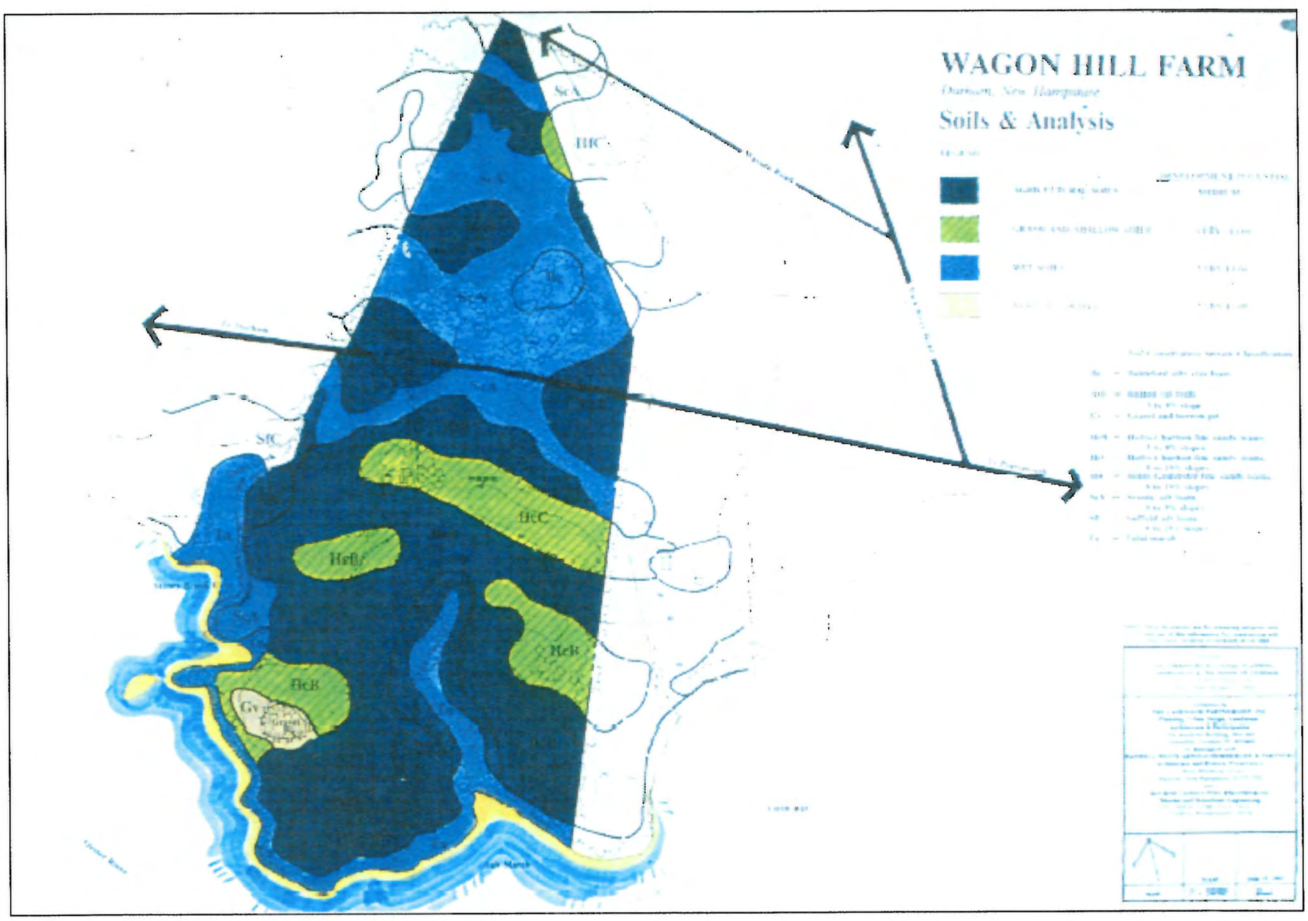
The slope analysis data was derived from United States Geological Survey mapping and site observations. The slopes are generally gradual to moderate on the 40 acre parcel with no areas above 10% gradient. The steepest slopes, in excess of 10% are on the 99 acre parcel around the farmhouse; along the southerly and westerly shorelines; in the gravel pit; adjacent to the knoll with the wagon; and along Davis Creek. The remainder of the 99 acre parcel has gradients within the 2 to 10% range. (See Slope Analysis Map)

Soils Analysis

Soil information was derived from the Soil Survey of Strafford County, New Hampshire prepared by the United States Department of Agriculture- Soil Conservation Service and the Soils Potential Report, prepared by the Strafford County Conservation District. The following soil types have been identified on the Wagon Hill Farm site. (See Soils Analysis Map)

Be	Biddeford Silty Clay on a small portion of the 40 acre parcel
BzB	Buxton Silt Loam- 3 to 8% gradients on the 99 and 40 acre parcels
GV	Gravel Pit located on in the southwest portion of the 99 acre parcel
HcB	Hollis-Charlton- fine sandy loams on top of the knoll on the 99 acre parcel
HcH	Hollis-Charlton- on 8 to 15% gradients on the 99 acre parcel
HfC	Hollis-Gloucester- fine sandy loams, on 8 to 15% gradients on the northeast portion of the 40 acre parcel
ScA	Scantic silt loams on 0 to 3% slopes on the majority of the 40 acre parcel and in the low lands adjacent to Route 4 on the 99 acre parcel
Ta	Tidal Marsh- along the shores of the Oyster River

The Soils Potential Report identified 48 acres on the 99 acre parcel (BzB and SfC) as having medium potential for recreational development. The remaining 92 acres were poorly drained with low to no potential for recreational development.



Vegetation

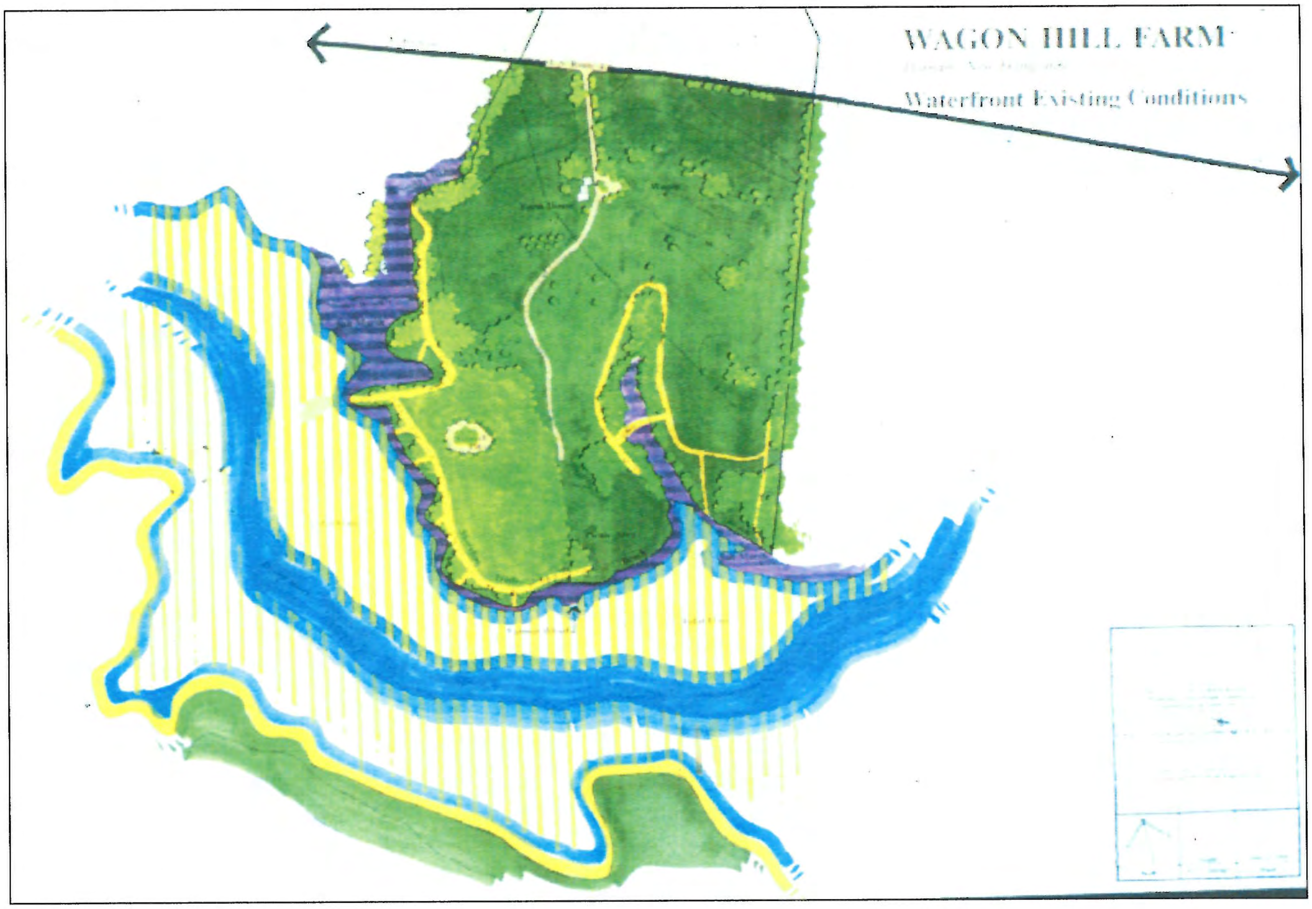
This information was derived from a report entitled, Summary of Existing Potential Bio-diversity of Wagon Hill Farm, Durham, New Hampshire, by Auchly, Jones, Kimmel, Midura, 1990. The report identified forty four different plants. The types of vegetation are indicative of the micro climatic and soil conditions of the site. The white pine stand is significant in that historically the British Navy harvested white pines for ships masts from this region. The diverse plant material also provides food for a variety of wildlife that lives on or in close proximity to the site. The site may be suitable for an arboretum or coastal botanical garden.

Wildlife and Domesticated Animals

This information was also derived from the Summary of Existing and Potential Bio-diversity of Wagon Hill Farm, Durham, New Hampshire report that identified birds, mammals, and coastal flora and fauna. There were fourteen bird species identified on the site and in addition another 28 species were identified as having the potential to utilize the site. Eleven mammals and two sea creatures were also identified. The site is used extensively by visitors walking and running dogs. Dogs (domesticated or otherwise) are natural predators for a variety of animal species and they are naturally perceived as a threat by mammals and birds, even if they don't physically harm them. Dogs may threaten other species by leaving a scent, making noise or by disturbing habitat areas. Dogs running loose can trample plants and unattended leave scat throughout the site. It is recommended that the management plan should provide an opportunity for dog owners to continue to bring their dogs to the farm if specific areas are designated for walking dogs with leashes and for allowing dogs to run free. In addition, existing leash laws should be strictly enforced and owners should be responsible for removing scat from the farm. Preservation and enhancement of the wildlife should be encouraged to create a balance in natural, economic and social use of the site.

Shoreline Conditions

The existing shoreline conditions are a result of soil and ice and tidal forces and human intervention. Segments of the shoreline indicate over use by visitors which has created erosion. These unnatural conditions (pathways) are exacerbated by natural conditions including wind, tidal and ice forces. This erosion, unchecked, has and will continue to result in degradation of the shoreline and salt marshes, negative impacts on wildlife, shell fish and fish habitats. It is recommended that a shoreline stabilization program be implemented as soon as possible. The measures taken should as minimally as possible, emulating the natural conditions of the shoreline. Rip-rapping should only be used where absolutely necessary and whenever possible plant materials or erosion control fabrics should be used. The farm site is susceptible to flooding during the 100-year flood stage and flooding should not impact most recreational uses. (See Waterfront Existing Conditions Map)



Water-based Recreation

The farm is primarily used for land-based recreation. The potential for boating is limited due to tidal conditions, water depths and shoreline that are naturally limited for launching boats. The installation of piers and boar landings may be difficult to permit and implement due to the currents, ice and tidal conditions. Swimming is now taking place on the 99 acre parcel on a limited basis. The site is not ideal for swimming due to tidal conditions and the water currents and it is not recommended that this activity be encouraged to expand for both safety and environmental reasons. Environmentally the salt marshes are particularly sensitive to pedestrian activity which may result from the unplanned expansion of existing swimming areas. Limited access from the water by canoes and kayaks is now taking place and has minimal impact on the farm as long as the access points are defined and controlled. (See Waterfront Existing Conditions Map)

SHORELINE RESTORATION RECOMMENDATIONS

1. The shoreline is in a state of deterioration and it is not anticipated that it will stabilize itself naturally. Shoreline stabilization along the water's edge should take two forms: a hardened edge installation of a rip rap slope. This would be appropriate in limited areas above the salt marsh fringe to prevent continued erosion. Rip rap would include filter

fabric insulation- $410 per linear foot, $451,000. (This project recommends rip rap in limited areas.)

A softer form of shoreline stabilization would require the installation of vegetated fiber roll along the toe of the slope backfilled with soil suitable for the salt marsh plantings. The system would include palette mats that are pre-vegetated to begin the initial re-vegetation of shoreline areas. This method is most desirable where the salt marsh has eroded and replacement is required to prevent further degradation of the salt marsh. Vegetated shoreline stabilization- $205 per linear foot= $225,500. (This project recommends substantial salt marsh plantings.)

2. Protecting the pristine marsh system involves two steps:
First areas of limited degradation should be re-vegetated using a pre-seeded mesh to reestablish plants quickly. The area around the point needs to be rip rapped to protect the area from further erosion.

Secondly, the area known as "The Point" where Davis Creek meets the Oyster River will require some type of structure and/or protection to prevent any further erosion. The area is a part of the pristine marsh system identified by the Durham Coastal Method Inventory & Evaluation Project (DCMT & EP). The structure will be a valuable spot to observe wildlife in the river and marsh. Some of the shoreline degradation is caused by ice and tides, however, most of the impact in this area is from human intervention. Estimate is $20,000

3. There is a desire to short cut the present trail system at Davis Creek bringing people through sensitive wetland habitats. Building a bridge structure will help prevent erosion from occurring at the crossing and will create a wildlife and habitat observation point along the trail. The construction of the bridge should begin by flagging the wetlands in the area and then creating a structure that effectively keeps people above the grasses.

A footbridge at Davis Creek would help protect the wetlands that are now being jeopardized by people crossing the creek. The cost could be minimized by donations- $50 per square foot or approximately $10,000.

4. Trail system improvements include the spreading mulch to help keep people on the trail and to prevent root compaction through wooded areas. The new surface will help prevent people from tripping over tree roots or into holes as well. Areas such as the steep bank down to the beach in the southeast shoreline should either be closed off to prevent further erosion or re-vegetated with plant mats to help protect the bank from further degradation. Simplifying the trails through the area south of the orchard will help keep environmental impact to a minimum. If a phasing program is needed to defer the costs, the areas closet to the river and through any wet areas should be the first to receive the bark mulch. No cost- in house project.

Project Details

Location: Route 4
Tax Map: Map 12, Lot 8-2
Acreage: Entire Property 139 acres
Road Frontage: 1,341' +/- of frontage on Piscataqua Road (US Route 4)
River Frontage: 1,100' +/- of tidal frontage on the Oyster River and Smith Creek
Zoning: Residence Coastal, with a minimum lot size of 150,000 square feet and road frontage requirement of 300 feet.

Wagon Hill Farm consists of high quality working farmland, healthy forest, and significant coastal and estuarine resources along the Oyster River in Durham, NH. The tract has important ecological resources including significant undeveloped coastal shoreline, tidal and estuarine riparian conservation values, and water quality protection attributes.

With 1100 feet of tidal frontage on Little Bay, Oyster River and Smith Creek, and 8.5 acres of tidal and freshwater wetlands, this project will permanently protect important on and off-site aquatic resources. The project will help protect the water quality and aquatic habitats of the Great Bay estuary including the adjacent NHB-documented "sparsely vegetated intertidal system", an exemplary natural community. Wagon Hill Farm has critical pollutant (e.g. nitrogen) attenuation characteristics (NH DES). Historically abundant oyster populations occurred in the Oyster River and Great Bay which The Nature Conservancy and others are working to restore to mitigate water quality impairments of Great Bay. This project will remove the threat of sediment loading from incompatible uses on the property that could smother oyster reefs. The Oyster River and Smith Creek are part of the Piscataqua River Network, classified as having "high relative resilience" according to a recent scientific analysis of predicted resilience to the impacts of climate change (TNC 2013). This project will incorporate significant riparian buffers to protect the estuarine and coastal resources of Smith Creek and the Oyster River.

Maintain Prominent Scenic Vista:

This project provides a very prominent viewshed for commuters along the heavily traveled corridor of Route 4 and boat traffic along the Oyster River. In fact, this parcel is the most visible and recognized parcel due to the prominent fields and the wagon on the hill.

The Durham Master Plan (2000) identifies this viewshed as one part of "the entrance to Durham as you pass Wagon Hill Farm, Emery Farm, Johnson Creek, Old Piscataqua River, and Bunker Creek" . . . protection of these viewsheds should be and will continue to be a high priority for Durham.

Draft Project Budget

Expenses

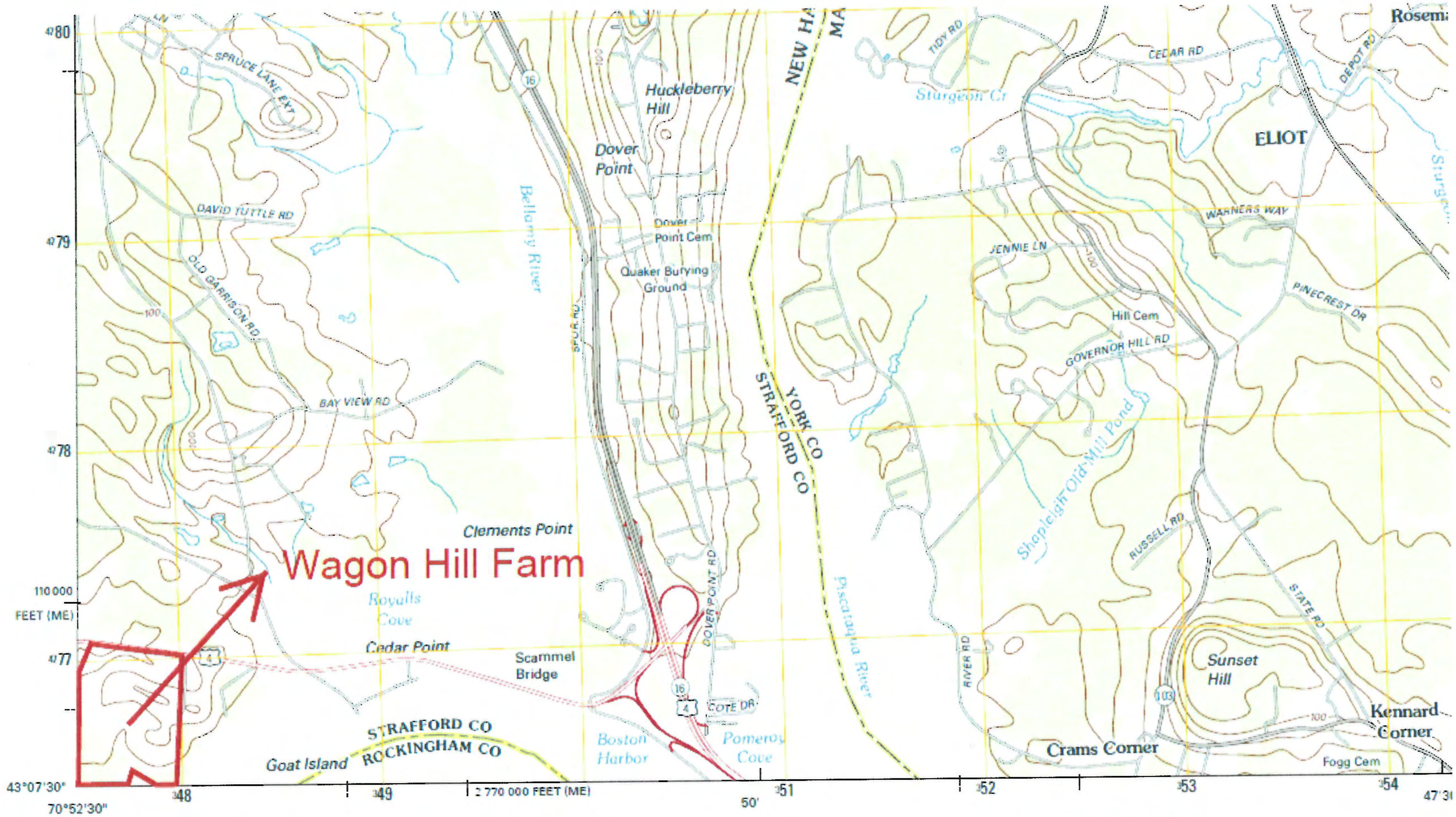
Shoreline Restoration	$338,250	(mix of hardened edge and soft re-vegetated stabilization.)
Bridge (Davis Creek)	$10,000	
Davis Creek Point	$20,000	
TOTAL EXPENSES	**$368,250**	

Revenues

Eversource Mitigation Project	$170,000
Lois Brown Trust	$115,000
Town of Durham	$83,250
TOTAL INCOME	**$368,250**

Attachments:

USGS Map
Current Erosion Photos (9/3/15)



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
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10 000-foot ticks: Maine Coordinate System of 1983 (west
zone), New Hampshire Coordinate System of 1983

Imagery....NAIP, July 2009 - July 2011
Roads....©2006-2011 TomTom
Names....GNIS, 2011
Hydrography....National Hydrography Dataset, 2009
Contours....National Elevation Dataset, 2005
Boundaries....Census, IBWC, IBC, USGS, 1972 - 2010

UTM GRID AND 2012 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
CH
Grid Zone Designation
19T

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.2

EROSION PHOTOS 9/3/15

Appendix C: Rare, Threatened, and Endangered Species and Exemplary Natural Community Report

NORMANDEAU ASSOCIATES
Environmental Consultants

Public Service of New Hampshire
Seacoast Reliability Project

Madbury, Durham, Newington & Portsmouth, NH

Rare, Threatened, and Endangered Species and Exemplary Natural Community Report

CONFIDENTIAL INFORMATION REMOVED

Prepared For:
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d/b/a Eversource Energy
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Submitted:
March 2016

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Executive Summary

Normandeau Associates ("Normandeau") performed assessments for rare, threatened and endangered ("RTE") species and exemplary natural communities potentially occurring within the approximately 152-acre study area in the existing Project Area. Assessments were conducted based on records of RTE species and exemplary natural communities received from the New Hampshire Natural Heritage Bureau ("NHNHB") in 2013 and 2014, and U.S. Fish and Wildlife Service ("USFWS") and National Marine Fisheries Service ("NMFS") in 2014. Collectively, the agencies provided records for 33 listed species with a total of 41 occurrences. Field surveys were performed for most of the listed RTE plant species and natural communities, invertebrate species and one wildlife species. The rest of the wildlife and fish were either assumed to be present based on their known distributions, or assumed to be absent based on the historic nature of the NHNHB records and/or the lack of suitable habitat for them within the Project Area.

One state-listed plant species was observed within the Project Area, the state-Endangered crested sedge. Four exemplary natural communities or natural community systems were confirmed within the Project Area in Little Bay: *High salt marsh, Salt marsh system, Sparsely vegetated intertidal system* and *Subtidal system*.

The ringed boghaunter, a state Endangered dragonfly, occurs in a sedge meadow near the Project Area. Some marginally suitable larval habitat for this species was identified during a field survey, but no exuvia were observed.

Two federally listed fish species, shortnosed sturgeon (Endangered) and Atlantic sturgeon (Threatened), may use the Project Area in Little Bay as feeding habitat. Neither species is known to breed in New Hampshire, but adults could occasionally feed in Great Bay, including the Project Area. Short-nosed sturgeon is considered extirpated in New Hampshire. Three state-listed Special Concern fish species, American eel, swamp darter and banded sunfish, are known to occur upstream and downstream of several streams crossing the Seacoast Reliability Project ("SRP") corridor, including the Oyster River. These species are assumed to periodically use the Project Area.

Three state-listed reptiles, northern black racer (Threatened), Blanding's turtle (Endangered), and spotted turtle (Threatened), and two state listed bird species, bald eagles (Threatened), and osprey (Special Concern) are likely to occur in the Project Area based on their relatively large home ranges and use of varied habitats. Two listed mammals, northern long-eared bat (Federally threatened; state threatened) and New England cottontail (state Endangered species) have habitat potential within the Project Area. New England cottontail is also under consideration for federal listing.

In general, impacts to protected species will be avoided and minimized through Best Management Practices ("BMPs") during construction. BMP examples include pre-construction surveys to ensure the absence of nesting bald eagles and osprey (if either species is breeding within or near the Project Area, time-of-year restrictions may apply); cable installation in the fall to minimize impacts to marine species; surveys during

construction to clear the work area of turtles and snakes; handcutting in the vicinity of the ringed boghaunter habitat; tree clearing between October and April to avoid impacting northern long-eared bats; and minimization of clearing preferred shrubby areas in high priority New England cottontail habitat.

Unavoidable temporary impacts to the fringing salt marsh will be restored following burial of the cable. Restoration techniques will include salvaging the intact peat prior to trenching for replacement after the cables are buried.

The intertidal flats and subtidal bottom will be allowed to restore and recolonize naturally after completion of the cable installation. The jetplow process will disturb sediments while laying the cable, but the water pressure of the jets and the speed of the plow will be controlled to maximize the return of sediments to the trench and minimize sediments going into suspension in the water column. The currents within the channel and wave and ice action on the tidal flats are expected to restore existing bottom contours in the vicinity of the trenches, followed by recolonization of benthic infauna and shellfish after completion of construction.

Monitoring of all impacted RTE habitats will occur both during and after construction to assess the success of the habitat restoration.

1.0 Introduction

Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH") is proposing to construct a new 13-mile 115 kilovolt ("kV") transmission line between the existing Madbury and Portsmouth substations. The Seacoast Reliability Project would be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. The new 115 kV transmission line will be approximately 12.9 miles long, including a 0.9 mile crossing under Little Bay. The proposed route parallels Pan Am Railroad tracks for approximately 4 miles in Madbury and Durham. The majority of line will be constructed within existing electric corridors, with minor adjustments to Project Area widths in several locations. The Project Area ranges from 40 to 130 feet wide, but is predominantly 100 feet wide. The cable crossing in Little Bay will affect a corridor approximately 100 feet wide lies within a charted Cable Area approximately 1000 feet wide. For most of the length of the SRP, a mowed area approximately 60 feet in width has been maintained by PSNH in support of the existing electric distribution line. The edges of the existing corridor are unmaintained and frequently support forest (20 feet on either side) which will need to be cleared for the SRP.

The majority of the SRP will be constructed aboveground on overhead structures between 65 and 120 feet in height above ground. Underground sections are proposed in Durham crossing Main St, on either shore of Little Bay, and in the road at Gundalow Landing. The cable will be buried 3.5-8 feet under Little Bay using jetplow technology. For this crossing, the transmission line will necessarily be split into three cables to maintain the required transmissivity for the Reliability Project. East of Little Bay, the line will remain underground until it crosses Little Bay Road in Newington, after which it will emerge to cross overland until it terminates at the Portsmouth substation. In most locations, the existing distribution line will be co-located on the new structures and the existing distribution structures will be removed. In several locations, the existing distribution line will remain and the new structures will carry the new transmission cables only. A short portion of an existing transmission line will need to be relocated to accommodate the new SRP alignment at Crossings at Fox Run Mall in Newington. Substation improvements in Madbury and Portsmouth will be confined to the existing substation footprints. No other substation modifications are proposed.

Normandeau was contracted by PSNH to assess the SRP Project Area for the potential presence of RTE species and exemplary natural communities. The evaluations that were conducted involved:

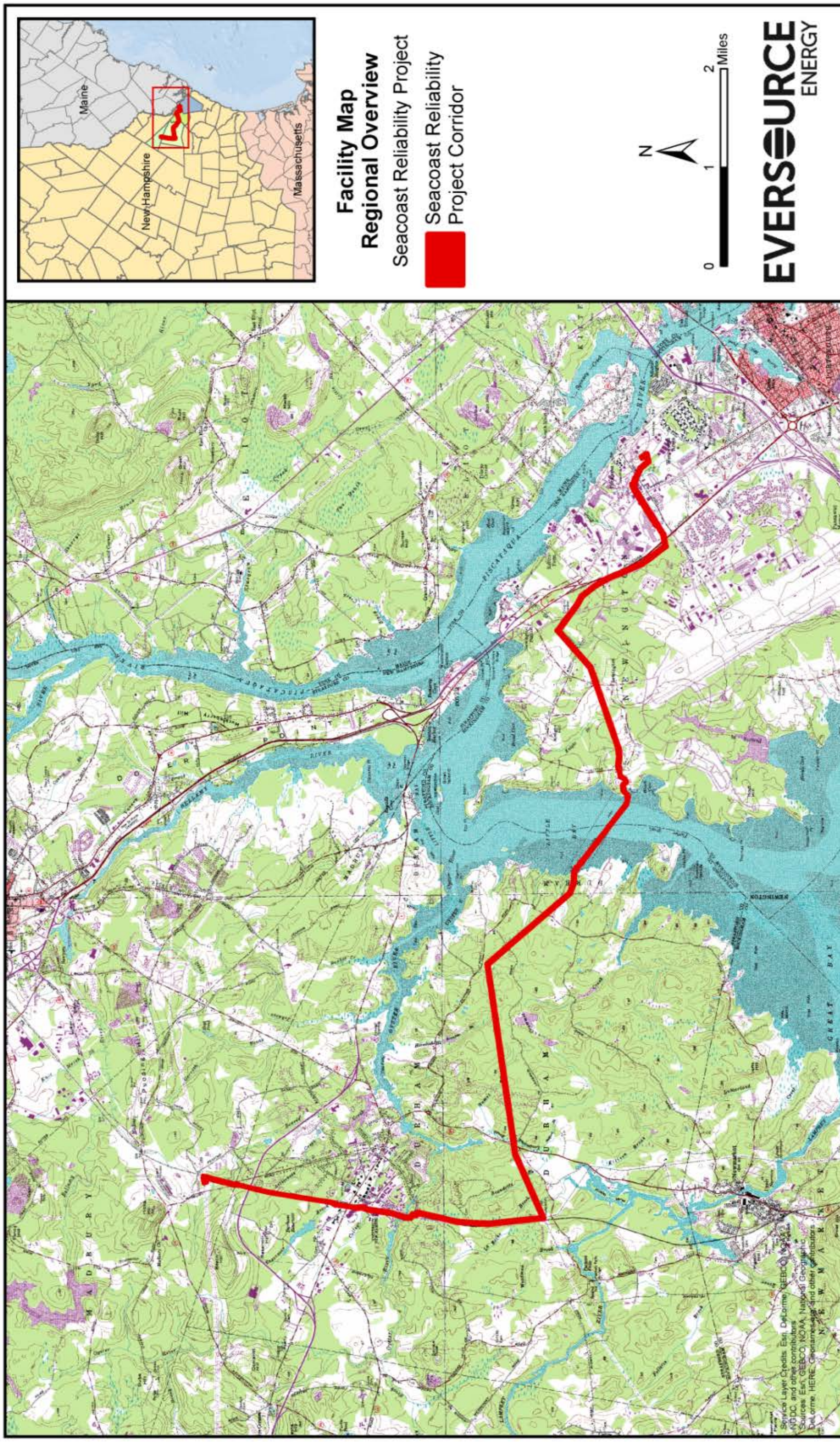

Figure 1-1. Regional Overview of the Seacoast Realiability Project

(1) consultation with the New Hampshire NHNHB, New Hampshire Fish and Game Department ("NHFG"), USFWS and NMFS to obtain a list of RTE species and exemplary communities occurring or potentially occurring in the vicinity of the site,

(2) review of Geographic Information Systems ("GIS") data (such as aerial photographs, topographic maps, soils data, field delineated wetlands/streams, etc.) to assess potential habitats within the Project Area, and

(3) field surveys for RTE species, communities or potential habitat, as applicable.

In 2013, NHNHB provided Normandeau with a list of RTE species and exemplary natural communities documented in the vicinity of the Project Area (NHNHB 2013; Appendix A). This list included seven plant species, four natural communities, seven vertebrate species, and one invertebrate. Normandeau biologists evaluated these species and communities during 2013 and early 2014, through field and/or desktop studies. In September 2014, Normandeau requested updated NHNHB data for the site. The updated list, which includes an addendum (NHNHB 2014a, b; Appendix A) contained an additional two plant species, two natural communities, and eight vertebrate species. Normandeau evaluated the potential of these species to occur within the Project Area using available data and ground surveys in 2015. Normandeau subsequently requested an updated list in October 2015, also provided in Appendix A. The update confirmed the previous lists, although several species were dropped because they were on the edge of the project review area. Since Normandeau had already completed the assessments, the information for all species is included.

Table 1-1 lists the RTE species and exemplary natural community element occurrences mapped in the vicinity of the site for state and federal agencies. For each of the listed occurrences, Table 1-1 summarizes its listing status, known location, preferred habitat, date of last observation, the approximate distance of the mapped occurrence from the Project Area, and the date and results of Normandeau's survey for the species or community.

The following sections describe the evaluations conducted for the plant, natural community, wildlife, fish and invertebrate species mapped in the vicinity of the Project Area.

Table 1-1. Rare, threatened and endangered species and plant communities mapped within 0.5 miles of the SRP Project Area.

Species or Community	Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
Plants					
Black Maple (*Acer nigrum*)	T	floodplain forests, rich mesic forests, often in moist high pH soils (FACU)	1996	within ~ 500 ft of corridor	Searched 9/24/13. Not observed within SRP Project Area.
Bulbous Bitter-cress (*Cardamine bulbosa*)	E	swamps, stream shores, ditches (OBL) (permanently wet, seepy, or submerged soil)	1996	mapped immediately south of corridor, partially in corridor	Searched 5/20/14. Not observed within SRP Project Area.
Crested Sedge (*Carex cristatella*)	E	mesic to hydric soils of meadows, marshes, open swamps, stream banks (FACW). (Univ. of New Hampshire)	1946/ historical; current condition unknown	along E edge of corridor; partially inside corridor	Searched 9/25/13 and 7/22/15. Not observed within SRP corridor. Area is currently developed, UNH campus area.
Crested Sedge (*Carex cristatella*)	E	(Mill Road South)	1943/ historical; current condition unknown	along E edge of corridor; partially inside corridor	Searched 9/25/13, 10/30/13, 7/22/15, and 7/24/15. Observed within SRP corridor in four locations in Durham.
Engelmann's Quillwort (*Isoetes engelmannii*)	E	Shallow waters of lakes and rivers; sometimes emergent (muddy bottom of old reservoir; in 1 ft of water)	1947/ historical; current condition unknown	approx. 500 ft west of corridor (lots of development here now)	Searched 9/25/13. Not observed in SRP corridor and no suitable habitat observed.
Great Bur-reed (*Sparganium eurycarpum*)	T	Shorelines and shallow circumneutral to basic still or slow moving water	2007	Immed. N of corridor	Searched 9/24/13. Not observed within SRP corridor.
Greater Fringed-gentian (*Gentianopsis crinita*)	T	Wet meadows, woods, stream borders (OBL)	1978/ historical; current condition unknown	mapped in corridor	Searched 9/25/13 and 10/30/13. Not observed within SRP corridor. Area is currently developed, UNH campus area.

(continued)

Table 1-1. (Continued)

Species or Community	State Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
Rigid Sedge (*Carex tetanica*)	Tracked but not listed	Calcareous/ circumneutral fens, wet meadows, graminoid marshes, moist to wet woods (FACW)	1942/ historical; current condition unknown	within ~ 2000 ft of corridor (now highly developed)	Searched 9/25/13 and 6/30/15. Not observed within SRP corridor. Area is currently developed, UNH campus area.
Marsh Elder (*Iva frutescens*)	T	Salt marshes, at the limit of normal high tide	2004	approx. 3,000 feet north of corridor	Searched on 9/10/14. Not observed within SRP corridor.
Small whorled pogonia (*Isotria medeoloides*)	T, T*	Deciduous or mixed forest, with appropriate soils and slopes	Not provided by NHNHB	approx. 0.5 mile northwest of corridor	Searched on 6/30/15. Two areas of marginally suitable habitat within the corridor were surveyed based on habitat guidance from USFWS, but species was not found.
Communities					
Hemlock - beech - oak- pine forest	Tracked but not listed	N/A	2006	along western edge of corridor	Searched 9/25/13. Not observed within SRP corridor. Area is currently developed, UNH campus area.
Red maple - sensitive fern swamp	Tracked but not listed	N/A	2006	mapped immed south of corridor; may extend into corridor	Searched 5/20/14. Not observed within SRP corridor.
Red maple - sensitive fern swamp	Tracked but not listed	N/A	1990/ historical; current condition unknown	within few thousand feet south of corridor	Searched 5/20/14. Not observed within SRP corridor.
Salt marsh system	Tracked but not listed	N/A	2010	occurs intermittently along the margins and shores of Great Bay.	9/10/14 and 4/22/15. Field delineated boundaries of fringing marsh on eastern and western shores of Little Bay

(continued)

Table 1-1. (Continued)

Species or Community	State Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
High salt marsh	Tracked but not listed	N/A	2008	within approx. 1500 feet of corridor	9/10/14. Field delineated small high marsh on western shore of Little Bay.
Sparsely vegetated intertidal system	Tracked but not listed	N/A	2010	crosses Project Area	Delineated boundaries using aerial photography and bathymetry.
Subtidal system	Tracked but not listed	N/A	2010	crosses Project Area	Delineated boundaries using aerial photography and bathymetry.
Invertebrates					
Ringed Boghaunter (*Williamsonia lintneri*)	E	Sphagnum peatlands and surrounding upland or mesic forests. Breeding and larvae in dwarf shrub fens, graminoid fens, sphagnum filled pools or basins	2008	immed. N of Project Area	Searched for appropriate habitat on 5/20/14. Wetland DW40 identified as marginal habitat. No adults or exuvia observed.
Fish					
Short-nosed Sturgeon (*Acipenser brevirostrum)*	Ext, E*	Freshwater, estuarine, marine (Little Bay)	1971	Within Great Bay Estuary	No survey conducted; presence is assumed and impacts will be avoided with BMPs
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)*	T*	Marine, estuarine (Little Bay)	Andecdotal	Within Great Bay Estuary	No survey conducted; presence is assumed and impacts will be avoided with BMPs
American Eel (*Anguilla rostrata*)	SC	Marine, estuarine, freshwater (Oyster River)	1998	within 0.5 miles east of corridor	No survey conducted; presence is assumed and impacts will be avoided with BMPs

(continued)

Table 1-1. (Continued)

Species or Community	State Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
American Eel (*Anguilla rostrata*)	SC	Described above (Lamprey River)	2003	within 0.5 miles southwest of corridor	No surveys conducted. presence is assumed. Lamprey River is outside of project Project Area, but species may use LaRoche Brook. No direct impacts and indirects will be avoided using BMPs.
Banded Sunfish (*Enneacanthus obesus*)	SC	Vegetated areas of lakes, ponds and backwaters of lowland streams; tolerate acid water (Oyster River)	2007	Approx 300′ south of SRP corridor	No survey conducted; presence is assumed. No direct impacts, habitat impacts will be avoided with BMPs
Swamp Darter (Etheostoma fusiforme)	SC	Weedy, freshwater swamps, ponds, and slow-moving streams. Usually muddy bottoms with a layer of detritus, and plenty of aquatic vegetation. Occasionally open sandy bottoms. Tolerates low oxygen levels and acidic conditions. (Oyster River)	2005	approx. 1 mile downstream, and within ~500 ft upstream of corridor	No surveys conducted; presence is assumed. No direct impacts, habitat impacts will be avoided with BMPs
Reptiles					
Eastern Hognose Snake (*Heterodon platirhinos*)	E	Sandy soils, open woodlands	1960s/ historical; current condition unknown	Approximately 4000′ south of corridor	Not observed during routine surveys; no known locations of this species in seacoast region
Northern Black Racer (*Coluber constrictor constrictor*)	T	Variety of habitats including dry brushy pastures, powerline corridors, rocky ledges, and woodlands (grassy roadside) (Beards Creek)	2011	mapped in corridor	Surveys conducted 10-31-13 and 4-2215 . Not observed but habitat is suitable, presence is assumed and impacts will be avoided with BMPs
Northern Black Racer (*Coluber constrictor constrictor*)	T	(Packers Falls/Bennet Rd)	2013	approx. 0.5 mile southwest of corridor	Not observed during routine surveys, presence is assumed and impacts will be avoided with BMPs

(continued)

Table 1-1. (Continued)

Species or Community	State Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
Blanding's Turtle (*Emydoidea blandingii*)	E	Wetlands with permanent shallow water and emergent vegetation, vernal pools, may use slow rivers and streams for travel between wetlands; terrestrial habitats for nesting and travel among wetlands (Crommet Creek)	1997	Approximately 1000′ south of corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs
Blanding's Turtle (*Emydoidea blandingii*)	E	Described above	2006	Approximately 1000′ south of corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs
Spotted Turtle (*Clemmys guttata*)	T	marshes, vernal pools, wet meadows, swamps, ponds, and slow-moving streams and rivers, terrestrial habitat (small wetland near Langmaid Rd)	1993-1998/ historical; current condition unknown	Approximately 500′ south of corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs
Spotted Turtle (*Clemmys guttata*)	T	Described above (S. of Crommet Creek, Dame Rd)	2012	long linear polygon crosses corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs
Spotted Turtle (*Clemmys guttata*)	T	Described above (La Roche Brook/UNH Foss Farm West)	2002	Approximately 1000′ west of corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs
Spotted Turtle (*Clemmys guttata*)	T	Described above (Hicks Hill)	2006	approx. 0.5 mile northwest of corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs
Birds					
Bald Eagle (*Haliaeetus leucocephalus*)	T	Large bodies of water containing abundant fish, large trees for nesting, perching and roosting (Wilcox Point)	2011	within 1 mile south of corridor	Not observed during routine surveys; presence is assumed and impacts will be avoided with BMPs

(continued)

Table 1-1. (Continued)

Species or Community	State Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
Bald Eagle (*Haliaeetus leucocephalus*)	T	(Great Bay Megasite, Cedar Point, Woodman Point)	1993	Presumed north of corridor (not shown on map)	Adult observed over Great Bay; impacts will be avoided with BMPs
Osprey (*Pandion haliaetus*)	SC	Elevated nest sites near water with abundant fish	2010	within 0.5 mile south of corridor	No nests on existing structures. Nest survey prior to construction season to confirm presence/absence
Golden-winged Warbler (Vermivora chrysoptera)	SC	Brushy open areas, especially clearings in deciduous woodlands with saplings, forbs, grasses	1984/ historical; current condition unknown	within 0.5 mile south of corridor	Not observed during routine surveys; NHNHB records are historic,
Least Bittern (*Ixobrychus exilis*)	SC	Freshwater wetlands with tall, dense vegetation	1995	approx. 0.5 mile north of corridor	No survey conducted; records are not current, not within SRP corridor and habitat within corridor is marginal.
Roseate Tern	E, E*	Nests in small numbers on offshore islands, is observed feeding off NH seacoast	No records in Great Bay	East to open ocean	No survey conducted; may occasionally feed in Great Bay, though no observations of such
Sedge Wren (*Cistothorus platensis*)	E	wetlands dominated by sedges and grasses with shrub cover (wet hayfields, spagnum moss bogs, pond margins); Don't use wetlands with sparse cover or ones dominated by cattails (wet meadow/field)	2001	Approximately 1000' west of corridor	No survey conducted; records are not current, not within corridor and habitat within corridor is marginal.
Upland Sandpiper (*Bartramia longicauda*)	E	Open habitats with low vegetation/ large grassy areas	2002	approx. 0.5 mile south of corridor	No survey conducted; the SRP corridor does not provide suitable habitat for this species

(continued)

Table 1-1. (Continued)

Species or Community	State Status[1]	Preferred Habitat[2]	Last Observed	Proximity of Record to SRP Project Area	Survey Results
Mammals					
Northern Long-eared Bat (*Myotis septrionalis)*	T, T*	Various forest types that include trees and snags with suitable roosting structures (crevices, hollows, loose bark)	n/a - no NHB record	n/a - no NHB record	No survey conducted; suitable summer habitat is present throughout the corridor
New England Cottontail (*Sylvilagus transitionalis)*	E	Dense shrubs and regenerating clear cuts	n/a - no NHB record	n/a - no NHB record	No survey conducted; 2014-2015 NHFG survey did not find this species. Parcels directly adjacent to the corridor are actively managed to benefit this species.

Notes:

1. E-State Endangered
   T- State Threatened
   SC-State Special Concern
   Ext - Extirpated
   *-Federal status
2. N/A – Not applicable
   FACU –facultative upland species
   OBL – obligate wetland species
   FACW- facultative wetland species

2.0 Results

2.1 Plants and Natural Communities

According to data Normandeau received from NHNHB in 2013 and 2014 (NHNHB 2014a,b; Appendix A), nine RTE plant species and six exemplary natural communities are on record as occurring in the vicinity of the Project Area (Table 1).

During 2013 through 2015, Normandeau botanists searched for all RTE plant species and exemplary communities listed in Table 1 in targeted areas of the SRP Project Area. Areas of the Project with appropriate habitat and located within approximately half mile, or in some cases up to one mile of NHNHB records for state-listed species or communities were surveyed. Locations proximal to mapped natural communities were visited to determine whether the communities extend into the Project Area.

Only one state-listed plant species, crested sedge, *Carex cristatella*, was found within the SRP Project Area. In addition, four exemplary natural communities or natural community systems were identified within the Project Area: *High salt marsh (shallow peat variant)*, *Salt marsh system*, *Sparsely vegetated intertidal system* and *Subtidal system.*

The RTE plant species and natural communities that were surveyed for are described below.

Black Maple

A population of the state-threatened black maple (*Acer nigrum*) is mapped south of, and within approximately 500 feet of the the Project Area in Durham (NHNHB 2014b; Appendix A; Table 1). This species is typically found in rich mesic forests and riparian forests, often in locations with high-pH bedrock (Haines 2011). The plants mapped near the Project Area, which were last observed in 1996, typically occur in semi-rich mesic forest, circumneutral talus forest, semi-rich dry-mesic Appalachian oak-hickory forest, hardwood forested seep, semi-rich oak-hickory-sugar maple forest, and streamside swamp (NHNHB 2014b). On September 24, 2013 a Normandeau botanist searched for this species within half a mile of the mapped population. No plants of black maple or its close congener, sugar maple (*Acer saccharum*), were observed.

Bulbous Bitter-cress

The state endangered bulbous bitter-cress (*Cardamine bulbosa*) is a spring-flowering species that typically occurs in wet woods (Magee and Ahles 2007). This species is mapped immediately south and west of the Project Area and partly within the Project Area in Newington (NHNHB 2014a; Appendix A; Table 1). The population in this area was last observed in 1996 (NHNHB 2014a). A Normandeau botanist searched the Project Area within half a mile of this population on May 20, 2014 (excluding developed areas); however, this species was not found.

Crested Sedge

Two historic records exist for the state endangered crested sedge (*Carex cristatella*) in the vicinity of the Project Area in Durham (NHNHB 2014a; Appendix A; Table 1). Both populations are mapped immediately east of, and partly within, the Project Area. One population, last observed in 1946, is mapped on the University of New Hampshire ("UNH") campus, in an area that is currently developed. The second population, last observed in 1943, is mapped further south, in a less developed area. Crested sedge occurs in mesic to hydric soils of meadows, marshes, open swamps and stream banks (Haines 2011). The best time to identify this species is during summer (July 4 – August 4 [Seymour 1969]).

A Normandeau botanist conducted initial surveys for this species on September 25 and October 30, 2013 in Project Areas within approximately half mile of the mapped populations. Additional surveys were conducted on July 22 and 24, 2015 within approximately 1 mile of the historic populations. During the July surveys, Normandeau personnel observed and delineated four patches of this plant species in the Project Area south of the historic populations (Confidential Figure 2-1). The patches are located within an approximately 0.6 mile stretch of corridor in the Town of Durham; they occur within the cleared portions of the corridor under the existing distribution line. A voucher specimen was collected on August 21, 2015 and submitted to NHNHB on October 1, 2015. In addition, a Rare Species Occurrence Record field form (Special Plant form) was completed and submitted to NHNHB.

Engelmann's Quillwort

According to NHNHB, an historic (1947) record for the state endangered Engelmann's quillwort (*Isoetes engelmannii*) is located approximately 500 feet west of the Project Area in Durham (NHNHB 2014b; Appendix A; Table 1). Engelmann's quillwort was observed on the muddy bottom of an old reservoir, in 1 foot of water. Much development has occurred in the general vicinity and the current condition of the population is unknown. This species is usually found submerged in shallow water of lakes and rivers; it is sometimes emergent (Haines 2011). On September 25, 2013 a Normandeau botanist searched the Project Area within half a mile of the historic record. Engelmann's quillwort was not observed and no appropriate habitat was found.

Great Bur-reed

A population of the state threatened great bur-reed (*Sparganium eurycarpum*), last observed in 2007, is mapped immediately north of the Project Area in Durham (2014a; Appendix A; Table 1). Great bur-reed is known to occur along shorelines and in shallow, circumneutral to basic, still or slow-moving water (Haines 2011). On September 24, 2013, a Normandeau botanist searched the Project Area within half mile of the mapped population; however, this species was not observed and little or no appropriate habitat was found.

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Figure 2-1. Locations of crested sedge observed within the SRP corridor.

Greater Fringed-gentian

Greater fringed-gentian (*Gentianopsis crinita*) is a state threatened species found in fields, meadows, roadsides, and clearings (Haines 2011). Its flowering period is generally from mid to late August through October (Seymour 1969). According to NHNHB, an historic population of greater fringed gentian is mapped in the vicinity of the Project Area in Durham (NHNHB 2014a; Appendix A; Table 1). The population was last observed in 1978. On September 25 and October 30, 2013, a Normandeau botanist conducted surveys for this species in the Project Area within half a mile of the historic population, but this species was not found.

Rigid Sedge

An historic (1942) population of rigid sedge (*Carex tetanica*) is mapped approximately 2,000 feet east of the Project Area in Durham, in an area that is currently developed (UNH campus) (NHNHB 2014a; Appendix A; Table 1). Rigid sedge is believed to be extirpated in the state. This species occurs in meadows, moist to wet woods and bogs (usually calcareous) and is most easily identified from May to July (Magee and Ahles 2007). On September 25, 2013 and June 30, 2015, a Normandeau botanist searched for rigid sedge within a half mile of the mapped population; however this species was not found.

Marsh Elder

The state threatened marsh elder (*Iva frutescens*) occurs in salt marshes, usually near the limit of high tide (Haines 2011). According to NHNHB, a population of marsh elder is located in Durham, approximately 3,000 feet north of the project ROW (NHNHB 2014a; Appendix A; Table 1). On September 10, 2014, a Normandeau botanist searched appropriate habitat for this species within the Project Area, but this species was not found.

Small Whorled Pogonia

Small whorled pogonia (*Isotria meleloides*) is a state and federally threatened species mapped within one-half mile of the Project Area in Madbury (NHNHB 2014a; Appendix A; Table 1). USFWS was consulted and two sites with potentially appropriate habitat for the sensitive plant species were identified within the Project Area based on soils data and aerial photography. A Normandeau botanist searched these sites on June 30, 2015, but this species was not found.

Hemlock – Beech – Oak – Pine Forest

According to data from NHNHB, an exemplary *Hemlock – beech – oak – pine forest* is mapped immediately west of the Project Area in Durham (NHNHB 2014a; Appendix A; Table 1). This community type has a state ranking of S5 (demonstrably widespread and secure) and is one of the most common upland forest communities in southern and central parts of the state (NHNHB 2015). The community mapped in the vicinity of the Project Area is considered to be of good quality ('B' on a scale of A-D) and was last observed in 2006 (NHNHB 2014a; Appendix A). On September 25, 2013, a Normandeau botanist surveyed the Project Area in the vicinity of this mapped natural community. The community occurs within College Woods, a recreational hiking area and is located west of Colovos Road. The SRP corridor, which extends east from Colovos Road in this area, does not overlap with the natural community.

Red Maple – Sensitive Fern Swamp

Two exemplary *Red maple – sensitive fern swamps* are mapped in the vicinity of the Project Area in Newington (NHNHB 2014a; Appendix A; Table 1). This community type has a state ranking of S3S4 (a range rank indicating a range of uncertainty from S3 [very rare and local, local in a restricted range, or vulnerable due to other factors] to S4 [widespread and apparently secure]). It is considered to be a common type of (weakly) minerotrophic red maple swamp in central and southern New Hampshire (NHNHB 2015). The portions of the ProjectArea located near these mapped communities were surveyed by a Normandeau botanist on May 20, 2014, but these communities were not found to extend into the Project Area.

Estuarine Natural Communities and Systems

Four exemplary estuarine natural communities/systems are mapped in the Project Area where it crosses Little Bay: *High salt marsh*, *Salt marsh system*, *Sparsely vegetated intertidal system*, and *Subtidal system* (NHNHB 2014a; Appendix A; Table 1). The *High salt marsh* natural community has a state ranking of S3 (very rare and local or vulnerable). Natural community systems are not generally ranked.

The *High salt marsh* occurs within a narrow fringing *Salt marsh system*, so these two community types occupy the same area within the Project. The limits of *High salt marsh* and the complete *Salt marsh system* were field located b on the west shore on September 10, 2014, and on the east shore on April 22, 2015. The boundaries of the *Sparsely vegetated intertidal system* and *Subtidal system* were delineated from aerial photography and site-specific bathymetry based on the approximate elevation of Mean Lower Low Water.

2.2 Invertebrates

Ringed Boghaunter

According to NHNHB (2014b; Appendix A), the state endangered ringed boghaunter dragonfly (*Williamsonia lintneri*) is mapped just north of the Project Area in Durham (Table 1). The ringed boghaunter lays its eggs and develops as larvae in sphagnum pools, acidic sedge fens and dwarf shrub fens, which are surrounded by upland forest (NHFG 2005a, MA NHESP 2012). All breeding habitats used by this species contain at least some sphagnum moss and typically hold 6 to 12 inches of water (or otherwise hold water long enough for larvae to complete development) (NHFG 2005a, MA NHESP 2012). The preferred breeding areas contain open water with some emergent vegetation; permanent standing water is not required. The adults use upland forests surrounding the breeding areas (NHFG 2005a).

On May 20, 2014 Normandeau biologists surveyed for potential ringed boghaunter habitat within a segment of the Project Area located within the mapped occurrence of this species (i.e, between Long Marsh Road and Sandy Brook Drive). One wetland was identified that appeared to contain marginally suitable habitat for ringed boghaunter. This wetland was located adjacent to upland forest. It contained open water at least six inches deep, some emergent graminoids, and many shrubs along the edges where emerging larvae could attach. The ringed boghaunter is typically described as occurring in *Sphagnum* pools or troughs, whereas this wetland had a mineral substrate, and *Sphagnum* was observed only along the edges of the wetland. Also, unlike typical peatlands, the shrub species in this wetland did not include heath species. Given these characteristics, this wetland appeared to be less acidic and more nutrient-enriched than usual ringed boghaunter habitat. The edges of the wetland were inspected but no dragonfly exuviae were observed. No adult ringed boghaunters were observed within the SRP woodlands. The flight period for ringed boghaunters occurs between mid-April and mid-June (Nikula et al., 2003).

2.3 Fish

The proposed Project, which includes the terrestrial Project Area and the Little Bay cable crossing, potentially contains habitat for multiple fish Species of Special Concern (SC) as identified by the NHFG and NMFS (Appendix A). Atlantic sturgeon and short-nosed sturgeon are federally listed species. American Eel and the freshwater species Banded Sunfish and Swamp Darter state-listed Species of Special Concern are classified as Category A or B. Species with Category A designation are considered 'Near-threatened' presently, but may become 'Threatened' in the near future if conservation actions are not taken. Sub-category A1 describes species susceptible to further decline. Sub-category A2 identifies species that are considered recovered and were recently down-listed from the state Endangered and Threatened list. Category B Species of Special Concern are described as 'Responsibility Species', with a major portion of the total global population existing with New Hampshire.

Shortnose Sturgeon

Shortnose sturgeon (*Acipenser brevirostrum*) is a designated federally endangered species in the Gulf of Maine that may occur in the Project Area (Pers. Comm., Edith Carson NOAA 12/2/2014). Shortnose sturgeon range from Saint John River, New Brunswick, to the Saint Johns River, Florida, and are smaller than their congener, Atlantic sturgeon, with a maximum length of around 1 meter (3 feet) (Musick 2002). Shortnose sturgeon are about as long-lived as Atlantic sturgeon with a maximum age of around 60 years, and they reach maturity in about 10-13 years in the northern part of their range. Threats to Shortnose sturgeon include construction of dams which limit access to spawning grounds, water pollution, habitat alteration, dredging and disposal activities, and development in estuaries, mudflats and marshes, and commercial exploitation (NOAA 2014).

Shortnose sturgeon are amphidromous fish meaning they spend most of their lives in freshwater but will periodically visit estuarine or salt water. They spawn in freshwater on hard substrates where they deposit demersal adhesive eggs. The larvae remain in freshwater as they mature into the juvenile stage. Keiffer and Kynard (1993) tracked the movements of shortnose sturgeon in the Merrimack River and found that they were typically found in the freshwater portion of the river at salinities less than 1.0 ppt. Post-spawning males were captured 32-31 km upstream of the mouth of the Merrimack River in Haverhill, Massachusetts, in April and larvae were captured in the same area in May indicating that this is a spawning area. Shortnose sturgeon are opportunistic benthic foragers (Musick 2002) and primary food items in estuaries include mollusks, shrimp, and polychaete worms (Dadswell 1979).

Shortnose sturgeon have not been observed in New Hampshire since 1971 (NHFG 2005b). Populations of shortnose sturgeon exist in the Kennebec River system to the north of the Project Area and the Merrimack River to the south so it is possible that they could transit the Project Area, although they do not wander as far from their natal rivers as Atlantic sturgeon. There is no spawning, egg, or larval habitat for shortnose sturgeon in the Project Area, although it is possible that wandering shortnose sturgeon could use the area as feeding habitat. They are considered to be extirpated in New Hampshire (NHFG 2005b).

Atlantic Sturgeon

The Atlantic sturgeon is designated a federally listed threatened species in the Gulf of Maine and it is possible that members of the endangered Distinct Population Segment from New York Bight could occur in the Project Area (Pers. Comm. Edith Carson, NOAA, 12/15/2014). Atlantic sturgeon are large (up to 5.5 meters), long-lived (up 60 years) anadromous fish that range from Labrador to northern Florida (Musick 2002). Maturity occurs at 22-24 years for males and 27-28 years for females in the northern part of their range. Threats to Atlantic sturgeon include loss of spawning habitat in freshwater, bycatch mortality, loss of habitat due to locks and dams, mortality due to dredging activities, and possible ship strikes. Perhaps the greatest threat is commercial overfishing prior to a moratorium introduced in 1997 and 1998 (NOAA 2010). Because this fish matures at such a late age the beneficial results of the fishing moratorium may not be detected for more than 20 years after the cessation of fishing.

Atlantic sturgeon spawn in the tidal freshwater or slightly brackish portions of estuaries (Musick 2002). The eggs are demersal and adhesive and are attached to hard substrate. As the larvae mature, they start to disperse downstream but juveniles may remain in the natal river for several years. Keiffer and Kynard (1993) tracked the movements of juvenile Atlantic sturgeon in the Merrimack River and found that they were typically found in the estuarine portion of the river at salinities greater than 10 ppt. No Atlantic sturgeon of adult size were captured in that study.

There are anecdotal reports of Atlantic sturgeon occurring in the Great Bay complex (B. Smith NHFG Pers. Comm.12/15/2014; NHFG 2005b) and they may transit the Project Area. The Project Area is not spawning, egg or larval habitat, although juvenile and adult Atlantic sturgeon may use the area for feeding. Atlantic sturgeon are opportunistic benthic feeders (Musick 2002) and will feed on polychaetes, isopods, decapod crustaceans, and amphipods, with bivalves and small fish making small contributions to the diet (Johnson et al. 1997).

American Eel

American eel (*Anguilla rostrata*) is currently designated as a Species of Special Concern Category A1 (SC-A1) due to declines in most populations relative to historic levels, and limited access to historic spawning grounds (NHFG 2009).

The American Eel is a catadromous species found from Greenland to South America (Collette and Klein-MacPhee 2002). Spawning occurs in the winter and spring in the ocean, as does larval development. In the spring, juveniles ("elvers") migrate into estuaries as transparent "glass eels", where they develop into pigmented juveniles ("browns"). Elvers then continue upstream migration into freshwater to develop into adults and remain for up to 25 years as "yellow" eels before migrating back to sea to spawn as "silvers".

Ongoing surveys in the Oyster River (yellow eels) and Lamprey River (glass eels/elvers) indicate that the Great Bay Estuary and its tributaries should be considered currently viable American eel habitat (NHFG 2013b, Enterline *et al*. 2013). From late-April through late-September 2012, a total of 4,092 glass eels and 121 browns were collected during a NHFG survey of the Lamprey River in Newmarket, New Hampshire (NHFG 2013b). Therefore, the proposed Project Area may contain both freshwater and marine habitat for American eels. The SRP crosses the Oyster River (freshwater) in Durham, New Hampshire where American eels were reported in 1985 and 1998 (NHNHB 2014). Additionally, American eels were reported in 2003 in the Lamprey River (freshwater) in Durham, N ew Hampshire (NHNHB 2014). The Project Area crosses LaRoche Brook, a tributary of the Lamprey River, in Durham, New Hampshire . There are no barriers that would prevent American eels access from the Lamprey River to the LaRoche Brook segment within the Project Area. The La Roche Brook segment within the Project Area can be considered to provide habitat for juvenile and adult American eels.

Although the SRP does not cross the Lamprey River, access to the Lamprey River and its tributaries from the Atlantic Ocean requires passage through the Little Bay cable corridor. The reported occurrence of American eel in the Lamprey River indicates that Little Bay had provided temporary habitat for migrating glass eels and elvers during their transition into freshwater. Assuming survival to reproductive age within the Lamprey River, Little Bay would also provide temporary habitat for adults migrating back to the ocean for spawning.

In New England, juvenile American eel migration into freshwater may occur from March through June (Greene *et al*. 2009). Glass eels progress into estuaries by drifting on flood tides and holding position near the bottom during ebb tides (McCleave and Wippelhauser 1987). Migrating elvers are mainly active at night, and may burrow into soft undisturbed bottom sediments or remain in deep waters during the day (Facey and Van den Avyle 1987). Spawning in the ocean occurs during the winter and the spring (McCleave and Kleckner. 1985), indicating that Little Bay has the potential be used by out-migrating adults in the fall and winter. Based on this, the habitat at Little Bay Project location may be considered American eel habitat during the spring for juveniles and during fall and winter for adults. The portion of the Oyster River within the Corridor may be considered year-round habitat for adult (yellow) American eels. Adult eels present in the Oyster River would have the ability to avoid the SRP crossing of the river during any temporary disturbance caused by construction activities.

The Little Bay Cable Area may also provide staging habitat for juvenile American eels (glass eels and brown elvers) as they migrate upstream (Table 2-1).

Table 2-1. Potential seasonal occurrence of American eels within the proposed SRP Project Area.

Species	Designation*	Life Stage	Spring	Summer	Fall	Winter
American Eel	SC-A1	Juveniles (Elvers)	X			
		Adults (Yellow)	X	X	X	X
		Adults (Silver)	X			X

* New Hampshire Fish and Game Department - Nongame and Endangered Species Program (NHFG 2009).

Banded Sunfish

The banded sunfish (*Enneacanthus obesus*) is currently designated as SC-A1B and described as a species of Northeast Regional Conservation Concern due to increasing habitat threats in southern NH. These threats include shoreline development in rapidly expanding areas that may impact the intact, vegetated shoreline habitat of which the banded sunfish is highly dependent (NHFG 2009).

The preferred habitat of the banded sunfish is weedy areas of lakes and lowland stream backwaters (Sarcola 1987). This species has been found in the Upper Oyster River (2007), Oyster River (1985, 2005), and Longmarsh Brook (2005; NHNHB 2014). In the Upper Oyster River, the habitat was vegetated margins of small streams flowing through abandoned beaver ponds. The SRP crosses Longmarsh Brook approximately 300 feet downstream of the sampling location where banded sunfish were found in 2005. Aerial imagery from 2013 indicates a vegetated shoreline habitat in the portion of Longmarsh Brook within the Project Area (ESRI 2014). The likely presence of optimal habitat combined with occurrence of the species documented nearby in the same stream indicates that banded sunfish has a high probability of occurrence within the Project Area in Longmarsh Brook. The documented species occurrence in the Upper Oyster River and Oyster River upstream and downstream of the Project Area suggests that banded sunfish has the potential to occupy the Oyster River within the Project Area if habitat conditions are adequate.

Swamp Darter

Swamp darter (*Etheostoma fusiforme*) is currently designated as SC-A1 due to increasing habitat threats, especially fragmentation, in developing areas of southern New Hampshire (NHFG 2009). Swamp darter habitat includes soft substrates in shallow vegetated areas of lakes and ponds (NHFG 2005b). Although more abundant in ponds, the species can also be found in swift or slow streams that contain patches of dense vegetation. Stream populations are typically associated with a nearby pond population, and spawning has not been observed in streams (Schmidt and Whitworth 1979, NHFG 2005b). Swamp darters were observed in the Oyster River in 1985 and 2005 (NHNHB 2014). In 1985, three swamp darters were observed below the Oyster River Reservoir Dam, approximately 0.2 miles upstream from the Project Area. In 2005, one individual was observed approximately 1 river-mile downstream from the Project Area. Aerial imagery from 2013 indicates the Oyster River habitat within the Project Area is similar to the habitats in other portions of the Oyster River where swamp darters have been observed (ESRI et al. 2014).

2.4 Reptiles

Eastern Hog-nosed Snake

Records from NHNHB indicate that the eastern hognose snake (*Heterodon platirhinos*; State Endangered) was historically (prior to 1993) recorded in the Town of Durham. This species requires sandy, gravely soils and usually occurs in open fields, river valleys, pine forests, and upland hillsides where these types of soils are present. Toads are their preferred prey, although frogs, salamanders, small mammals, birds and invertebrates are also taken. Because toads are favored, good habitat for hog-nosed snakes also includes good breeding habitat for amphibians (wetlands, vernal pools). Hog-nosed snakes hibernate in mammal burrows, under woody debris, or under trash piles. Mating generally occurs in spring, and eggs that are deposited in June and July hatch in August and September. Females typically deposit 15-25 eggs in a depression under rocks or logs, in sandy soil, or in mulch piles. Power line corridors are known to provide suitable habitat for this species.

The nearest known, current occurrence of eastern hog-nosed snake to the Project Area is in a power line corridor in the Concord/Pembroke area. This is the eastern-most known occurrence of the species in New Hampshire. During project construction, BMPs should be implemented to prevent impacts to all special status reptiles potentially present in the Project Area, and construction of this Project may improve habitat for eastern hog-nosed snake by reducing canopy cover which will improve basking and nesting opportunities in the Project Area.

Northern Black Racer

Records from NHNHB indicate that an adult northern black racer (*Coluber constrictor constrictor;* State Threatened) was recently observed within the project Area in Madbury, as well as in the Project vicinity in Durham. The black racer in Madbury was observed on the grassy roadside area of the Madbury Road overpass of Boston-Maine RR at the Madbury/Durham town line. The NHNHB data indicates that a black racer was first reported at this location in 2004, and last reported in 2011. It is unclear if there were additional reports in the intervening years. The Durham specimen was observed in 2013 about 0.5 miles from the Project corridor south of the Packers Falls substation.

Northern black racers are habitat generalists, but are usually terrestrial, and may use relatively sparsely vegetated areas. They use a variety of habitats including dry brushy pastures, power line corridors, rocky ledges, and woodlands. They are often found in edge habitats, such as forest edges, old fields, and wetland edges. They have large home ranges (10-20 hectares) and therefore require a relatively large patch of suitable habitat. Black racers are only active during the daytime and are most active in warm weather. At night and during cool weather they take refuge in underground burrows, rock crevices, or under cover such as boards or tin. Black racers hibernate in rock crevices or mammal burrows, and they often den communally with other black racers or with other snake species. They may use the same den for years.

Because the specimen reported from Madbury occurred within the Project corridor, a survey of this location was conducted two occasions. A Certified Wildlife Biologist® visited the Madbury Road overpass of Boston-Maine RR at the Madbury/Durham town line on October 31, 2013, and on April 22, 2015. The October visit was primarily to assess the habitat suitability of the area for northern black racers. Although it is possible that black racers would still be basking outside their hibernacula in late October, the weather on the day of the site visit was cold (40°F) and overcast, negating the likelihood of observing snakes directly. Conversely, April 22 was a sunny day with temperatures ranging from about 58°F to 68°F degrees during the visit, which was conducted from 10:30 to 12:30. No racers were observed on either visit.

During the October visit, the biologist examined the vegetation and substrate around the overpass, and then observed the area northward along the corridor by walking to the substation along the railroad tracks. During the April visit, the biologist examined the same area, but spent the majority of the time observing the rocky embankment (described below) where snakes would be likely to bask.

The SRP abuts a railroad corridor which contains a single track laid on supporting cobble, and an adjacent access road for wheeled vehicles, consisting of hard-packed dirt, sand, and gravel. The Project Area spans wetlands and uplands, and supports dense shrub vegetation and /or regenerating hardwood forest species in both the wetland and upland areas. The embankments of the overpass area are mowed periodically, and were densely vegetated with grassy species growing about 10 inches high. At the base of the embankment, exposed large rocks placed as part of the embankment construction were partly to mostly overgrown by forbs and shrubby vegetation. Loose piles of discarded railroad ties were present at the interface of the power line and railroad corridors, about 600 feet north of the overpass.

The survey indicated that the area provides useful resources to northern black racers and any individual with a home range that includes this area would likely use this portion of the Project Area. Within the survey area relatively dense vegetation abuts the unvegetated railroad corridor creating a distinct edge. Because northern black racers are habitat generalists with an affinity for edges, the Project Area potentially offers suitable habitat for this species. The diverse mix of uplands and wetland cover types provides high quality foraging opportunities for this generalist predator. Additionally, the open, packed dirt and stones of the railroad corridor offers high quality basking opportunities for snakes while the overgrown power line corridor offers escape cover. The large rocks at the base of the overpass embankment also offer plenty of nooks and crannies for snakes to spend the night in, or to escape hot temperatures on summer days. There is also some possibility that these rocks could provide overwintering habitat. The discarded railroad ties also potentially offer suitable summer thermoregulatory or escape cover for snakes. Similar conditions occur in a number of places where the Project Area abuts the railroad Project corridor. Given that the two NHNHB records of this species bookend the section of the SRP that coincides with the rail line, it is possible that black racers may use this entire area.

Blanding's and Spotted Turtles

Records from NHNHB indicate both that Blanding's turtle (*Emydoidea blandingii*; State Endangered) and spotted turtle (*Clemmys guttata*; State Threatened) were historically present in various locations in Durham near the Project, and that spotted turtles have recently been recorded within the Project Area. All New Hampshire turtles overwinter in permanent water bodies (i.e., ponds, streams, wetlands) with preference for a certain type of water body varying by species and to some degree by availability. During their active season, Blanding's and spotted turtles are semi-aquatic, using a mix of wetland, open water and upland habitats. Both species also use upland habitats to varying degrees to forage, and to travel between wetland habitats. Additionally, they lay their eggs in upland areas in late spring and early summer, digging shallow nests where they leave their eggs unattended to develop and hatch in two to three months.

Based on their known distribution, both Blanding's and spotted turtles are likely to be present within the Project Area at some time during the year. In particular, power line corridors have the potential to provided suitable nesting habitat. Habitat quality for turtle nesting depends on vegetation density and soil type. Loose, sandy soils with sparse vegetation have the highest habitat quality for nesting turtles, allowing them to dig nests easily and minimize the shading of nests. Any area, with an open canopy and loose, relatively dry soils located within 1,000 meters of a suitable water body has the potential to be used by turtles for nesting.

Species-specific surveys were not conducted for these two species, and none were encountered during other project work. However, based on their known distribution, it should be assumed that both turtles use portions of the Project Area in Durham during portions of their life cycle. During project construction, BMPs should be implemented to prevent impacts to all special status reptiles potentially present in the Project Area. In the long term, construction of this project may enhance habitat for turtles by reducing canopy cover which may improve nesting conditions in the Project Area.

2.5 Birds

Bald Eagle

Records from NHNHB indicate that bald eagles (*Haliaeetus leucocephalus*; State Threatened) are currently present near the Project Area, but have not been recorded within it. This species is present in New Hampshire year-round, and uses a wide variety of habitats that combine large bodies of water containing abundant fish, and large trees for nesting, perching and roosting. There may be marked shifts in the locations of habitats used between summer and winter. High quality habitats may be used repeatedly from year to year, but this species continues to expand its range in New Hampshire and continues to adopt new nesting and winter roosting locations. Bald eagles are reported to e-bird in and around the Great Bay area on a consistent basis, and are potentially present anywhere within the Project Area. Based on this species' known distribution, surveys were not conducted although bald eagles were incidentally observed flying over Great Bay. However, in the season prior to construction, potential nesting or roosting areas should be surveyed to determine if they are currently being used. If eagle nests are within 0.25 miles of the Project Area, timing restrictions on construction activity within the 0.25-mile radius should be implemented to prevent disturbance. The transmission lines have been designed to Avian Power Line Interaction Committee's ("APLIC") bird-safe standards to minimize the possibility of electrocuting all types of raptors including eagles, and other large birds (APLIC 2006).

Osprey

Records from NHNHB indicate that ospreys (*Pandion haliaetus*; Species of Special Concern) was recently recorded nesting in the vicinity of the Project. This species breeds in New Hampshire during the spring and summer, then migrates south during the colder months of the year. Ospreys use habitats that combine large bodies of water containing abundant fish, and suitable structures for nesting and perching. This species is known to be present in and around the Great Bay area, and has nested on other features in the vicinity of the Project (NHNHB 2014). Based on the small size of the existing poles, species-specific surveys were not conducted along the SRP corridor. PSNH staff and Normandeau biologists surveying the Project Area for other purposes did not report existing osprey nests. However, in the season prior to construction, the Project Area should be reviewed to determine if it is currently being used. If ospreys are present, construction activities should be modified to prevent disturbance. The transmission lines have been designed to APLIC's bird-safe standards to minimize the possibility of electrocuting all types of raptors including eagles, and other large birds (APLIC 2006).

Golden-winged Warbler

Records from NHNHB indicate that the golden-winged warbler (*Vermivora chrysoptera*; Species of Special Concern) was historically recorded adjacent to the Project Area in Durham. This species uses semi-open park-like habitats and shrublands. Power line corridors potentially provide good quality habitat for this species (Confer et al. 2011), and expanding the SRP clearing could improve habitat conditions for this species. NHNHB does not require surveys for historic species. Because the most recent record for this species in the Project Area is from 1984, and there no current records in the vicinity of the Project, no survey was conducted for this species.

Grasshopper Sparrow

Records from NHNHB indicate that grasshopper sparrow (*Ammodramus savannarum*; State Threatened) was recently present near the Project in Newington, but has not been recorded within it. This species requires breeding sites of at least 30 acres and prefer sites greater than 99 acres. These areas are primarily dry upland sites, composed of short native bunch grasses, minimal litter cover, patches of bare ground, scattered forbs, and short shrubs. Fence posts and shrubs are used as song perches. Bare ground is important for allowing adult birds and young to run and escape predators and to search for insects. Hayfields and other agricultural uses do not generally provide suitable vegetative structure for this species. (Vickery 1996, Mass Audubon 2013). There are no suitable habitat areas for this species within the Project Area.

Henslow's Sparrow

Records from NHNHB indicate that Henslow's sparrow (*Ammodramus savannarum*) was historically present near the Project in Newington, but has not been recorded within it. This species is tracked by NHNHB but is not listed by State of New Hampshire. Preferred breeding habitats in the Northeast are wet meadows with tall, dense vegetation and thick litter. Hayfields and other agricultural uses do not generally provide suitable vegetative structure for Henslow's sparrow (Herkert 2003). No survey for this species was conducted as the NHNHB records are historic and not within the Project Area.

Least Bittern

Records from NHNHB indicate that least bittern (*Ixobrychus exilis*; Species of Special Concern) was historically present near the Project in Durham, but has not been recorded within it. This species is associated with various types of shallow and deep marsh dominated by grass-like species, including cattails, bulrushes, and sedges. Some woody or shrubby vegetation is usually also present. This species is most likely to be present in wetlands at least 12 acres in size, but will use wetlands as small as one acre (Poole et al. 2009). Ideal habitat consists of an equitable mix of open water and dense vegetation patches. No survey for this species was conducted as the NHNHB records are historic and not within the Project Area, and habitat within the Project Area is marginal.

Roseate Tern

The northeast population of the roseate tern (*Sterna dougallii*) is listed as endangered under both federal and New Hampshire State Endangered Species Acts. Records from NHNHB indicate that this species has not been observed in the vicinity of the Project Area. This species breeds in small numbers (<100 pairs) on New Hampshire's coastal islands during the spring and summer, then migrates south during the colder months of the year. Roseate terns feed on a variety of fish and smaller invertebrates, generally hunting over open ocean, but sometimes hunting or loafing in coastal locations, including shorelines and estuaries. The Great Bay could potentially offer some foraging resources to this species. Based on e-bird reports form the last 10 years, this species is seen regularly in coastal locations in Rye and New Castle. There are no inland reports of this species, including no reports from Great Bay.

Sedge Wren

Records from NHNHB indicate that the Sedge wren (*Cistothorus platensis*; State Endangered) was historically present near the Project in Durham, but has not been recorded within it. This species nests among dense, tall growths of sedges and grasses in wet meadows, hayfields, retired croplands, upland margins of ponds and marshes, coastal marshes, and sphagnum bogs. Sedge wrens usually avoid short, sparse, or open vegetative cover, flooded areas, and wetlands dominated by cattails (Herkert et al. 2011). This species reaches its greatest densities in the grassland regions of the upper midwest and adjacent Canada, in the early part of the breeding season. Later in the breeding season it appears in lower densities in other regions, including New England, but it is notorious for its erratic and inconsistent distribution outside its core upper midwest range (Herkert et al. 2011).

Based on its erratic and inconsistent distribution in New England, the historic nature of the records for it, and the small amount of suitable habitat, this species is unlikely to be present in the Project Area. No survey was conducted.

Upland Sandpiper

Records from NHNHB indicate that upland sandpiper (*Bartramia longicauda*; State Endangered) was historically present near the Project in Newington, but has not been recorded within it. This species requires extensive grassland (>30 hectares) breeding sites. Habitat requirements consist of dry grasslands with low to moderate forb cover, low woody cover, moderate grass cover, moderate to high litter cover, and little bare ground (Dechant et al. 2003). Fence posts may be used song perches, but even sparse shrub cover is avoided. Regularly mowed fields (hay) do not generally provide suitable vegetative structure for this species. There is no suitable habitat for this species within the Project Area, and no surveys were conducted for it.

2.6 Mammals

Northern Long-eared Bat

The northern long-eared bat (NLEB; *Myotis septrionalis*) is state and federally threatened. Therefore, a formal consultation with the USFWS is required as part of the permitting process (See NLEB Biological Assessment, in appendices). The USFWS rules and guidance on this species is still evolving. The interim 4(d) rule published as part of the NLEB's April 2, 2015 listing allows tree clearing for expansions of transmission corridors up to 100 feet from the edge of an existing cleared Project Area, but the final rule may contain different or additional requirements. PSNH is committed to meeting the USFWS rules when finalized.

Existing information about NLEB summarized in the NHWAP indicates that this species has been recorded in Carroll, Coos, Cheshire, Grafton, Hillsborough and Rockingham counties (Preston 2015). Unpublished data also indicates that this species was detected at Great Bay NWR in 2014. Additionally, the known range of the NLEB encompasses the entire Northeast, making it almost certainly a resident throughout New Hampshire. The USFWS considers all coastal towns in New Hampshire to be known NLEB habitat.

NLEB summer roosts have been documented in forested habitats, primarily in deciduous trees under loose bark, tree hollows, and crevices, and sometimes in wooden structures such as barns (Preston 2015). In New Hampshire, data from the White Mountain National Forest (WMNF) indicated that the majority of NLEB summer roosts were in large snags, but live trees were also used. Large, tall trees/snags with intact bark and moderate levels of decay were commonly used, especially if they had hollows. Maternity roosts were almost always in hardwood trees and generally in trees that were taller than the stand average, with a preponderance of 'recently dead' trees being used (Sasse 1995). Summer habitat is considered widespread and abundant for this species across its range.

Female NLEBs form maternity colonies ranging from a few to more than 100 individuals roosting in cavities within snags or under exfoliating bark of live or dead trees. Although these colonies are generally located in closed forest locations, exposure to sunlight and consequently warmer temperatures are preferred, as warmer temperatures promote more rapid development of young. Throughout much of their range, female NLEBs typically switch roost trees every few days and may travel up to two kilometers between successive roost trees, but roosts are commonly clustered in small (less than 20 hectares) areas (Johnson et al. 2009).

These bats are non-migratory and hibernate locally in caves, rock overhangs, and mines. In summer they use forested habitats and are adapted for flight in more cluttered environments than other bat species. This allows NLEB to forage more extensively under the forest canopy then other bat species, as well as in forest openings, and only uncommonly over open water.

New England Cottontail

Records from NHNHB indicate that New England Cottontail (*Sylvilagus transitionalis*; State Endangered) has not been recorded within the vicinity of Project. However, there are parcels being actively managed to create suitable habitat for New England cottontail (described below) in the Towns of Lee, Durham, and Dover. Two of the parcels being managed in Durham abut the Project Area, UNH's Foss Farm and NHFG's LaRoche Brook parcels.

The New England cottontail requires early successional habitats, and depends more upon vegetation structure (form, height, and density) rather than specific species (Litvaitis and Jakubas 2004). Preferred habitats include shrubby old fields and regenerating clear cuts. Regenerating clear cuts used by New England cottontail usually include hardwoods such as birch, aspen, and red maple; conifer regeneration does not seem to attract New England cottontail (newenglandcottontail.org 2012). Studies indicate that New England cottontails are reluctant to venture more than 5 meters (16 feet) from cover within their habitat patches (Barbour and Litvaitis 1993). Adult rabbits stay within their home range and make few long distance movements. However, sub-adult males normally make long one-way movements outside of their natal patch. Long-range movements for sub-adult females are less common. In summer, diets of the New England cottontail consist of a wide variety of herbaceous plant. During winter months, New England cottontail feeds mainly on woody browse from small trees, shrubs, and vines (Litvaitis and Jakubas 2004). New England cottontail are preyed upon by a wide variety of predators and individuals have a life expectancy of less than 2 years (newenglandcottontail.org 2012)

The SRP currently contains an existing narrow cleared corridor, abutted by a railroad corridor along the western side. Power line corridors in New England are one of the best sources of shrubby habitats in a landscape which is largely forested. Regular vegetation maintenance in these corridors creates shrubby conditions that New England cottontails require, and the extensive, linear nature of a corridor can provide connections to other patches of shrubland. The proposed SRP will widen the existing power line corridor, creating incrementally more shrub habitat. The current habitat quality offered by the existing power line corridor is likely to be improved by the additional width. PSNH currently collaborates with NHFG during maintenance on transmission corridors to improve habitat for this species, and will do so on this project.

3.0 Discussion

The results of field surveys and desktop analyses indicate that the Project Area currently provides habitat for several state and federally protected species, including: 1 plant, 4 natural communities, 1 invertebrate, 5 fish, 3 reptiles, 2 birds and 2 mammals (Table 3-1). Permanent impacts of the Project include placement of new transmission structures, removal of existing wooden poles, and vegetation clearing to remove trees to clear a maximum corridor width of 100 feet. Temporary impacts include mowing the work area, timber mats placed in work areas in wetlands and other sensitive resources to provide access for construction equipment, trenching (cut and cover) in the sections proposed for underground cable on land, and use of a jetplow to bury three cables under Little Bay.

In general, impacts to protected species will be managed through Best Management Practices during construction. Examples include pre-construction surveys to ensure the absence of nesting bald eagles and osprey (if either species is breeding within or near the Project Area, time-of-year restrictions may apply); repeated searches during construction to clear the active work area of turtles and snakes; hand cutting in the vicinity of the ringed boghaunter habitat in the unlikely case that larvae use the marginal habitat in the Project Area; and minimization of clearing preferred shrubby areas in New England cottontail habitat.

Approximately 0.02 acres of unavoidable temporary impacts to the fringing salt marsh will be restored following burial of the cable. Restoration techniques will include salvaging the intact peat prior to trenching for replacement after the cables are buried. Temporary impacts to rocky shore may also occur. The extent of impacts will depend on the most suitable approach to traversing the rocky shore, and will in turn depend on the type of ledge and the installer. Possibilities include cut and cover, and surface burial in a protective cover. The resulting impacted area will be restored to its original configuration to the extent possible. Recolonization by macroalgae on rocky substrates is expected to occur naturally.

The intertidal flats and subtidal bottom will be allowed to restore and recolonize naturally after completion of the cable installation. The jetplow process will disturb sediments while laying the cable, but the water pressure of the jets and the speed of the plow will be controlled to minimize sediments going into suspension in the water column. The currents within the channel and wave and ice action on the tidal flats are expected to restore existing bottom contours in the vicinity of the trenches, followed by recolonization of benthic infauna and ultimately shellfish after completion of construction.

Monitoring of all impacted tidal and freshwater resources will occur both during and after construction to assess the success of the habitat restoration.

Table 3-1. Protected species and Exemplary Vegetation Communities known to, or likely to occur, in the SRP corridor.

Species	Status[1]	Species Management
Crested Sedge (*Carex cristatella*)	E	Possible impacts during tree clearing, minimize by clearing in dormant season.
Salt marsh system	Tracked but not listed	Temporary impacts, restore habitat
High salt marsh	Tracked but not listed	Temporary impacts, restore habitat
Sparsely vegetated intertidal system	Tracked but not listed	Temporary impacts, restore habitat
Subtidal system	Tracked but not listed	Temporary impacts, restore habitat
Ringed Boghaunter (*Williamsonia lintneri*)	E	Marginal habitat; hand cut along stream to avoid impacts to larvae
Short-nosed Sturgeon (*Acipenser brevirostrum)*	Ext, E*	Not likely to be adversely affected – will avoid jetplow and can tolerate high TSS
Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus)*	T*	Not likely to be adversely affected – will avoid jetplow and can tolerate high TSS
American Eel (*Anguilla rostrata*)	SC	No impacts anticipated – all streams avoided or bridged. Fall construction period will avoid silver migrants.
Banded Sunfish (*Enneacanthus obesus*)	SC	No impacts anticipated – construction and clearing in all known habitat avoided
Swamp Darter (*Etheostoma fusiforme*)	SC	No impacts anticipated – no construction or clearing in Oyster River
Northern Black Racer (*Coluber constrictor constrictor*)	T	Survey to remove individuals from construction area; wider maintained corridor may benefit species
Blanding's Turtle (*Emydoidea blandingii*)	E	Survey to remove individuals from construction areas
Spotted Turtle (*Clemmys guttata*)	T	Survey to remove individuals from construction areas
Bald Eagle (*Haliaeetus leucocephalus*)	T	Nest survey before construction
Osprey (*Pandion haliaetus*)	SC	Nest survey before construction

(continued)

Table 3-1. (Continued)

Species	Status[1]	Species Management
Northern Long-eared Bat (*Myotis septrionalis)*	T, T*	The current 4(d) rule issued as part of the federal listing of this species allows expansion of existing transmission corridors of 100 feet or less if there are no impacts to known maternity roosts; there are no known roosts in the Project Area.
New England Cottontail (*Sylvilagus transitionalis)*	E	No known occurrence. Use BMPs to minimize adverse habitat impacts; work with NHFG to enhance habitat during corridors maintenance.

1. E-State Endangered
   T- State Threatened
   SC-State Special Concern
   Ext - Extirpated
   *-Federal status

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Appendix A (separate doc in Draft due to file size)

Protected Species Records from NH Natural Heritage Bureau, US Fish and Wildlife Service and National Marine Fisheries Service

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 3301
PHONE: (603)223-2541 FAX: (603)223-0104
URL: www.fws.gov/newengland

Consultation Tracking Number: 05E1NE00-2015-SLI-0118 November 20, 2014
Project Name: PSNH Seacoast Reliability Project

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project.

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at:
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm;
http://www.towerkill.com; and
http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment

United States Department of Interior
Fish and Wildlife Service

Project name: PSNH Seacoast Reliability Project

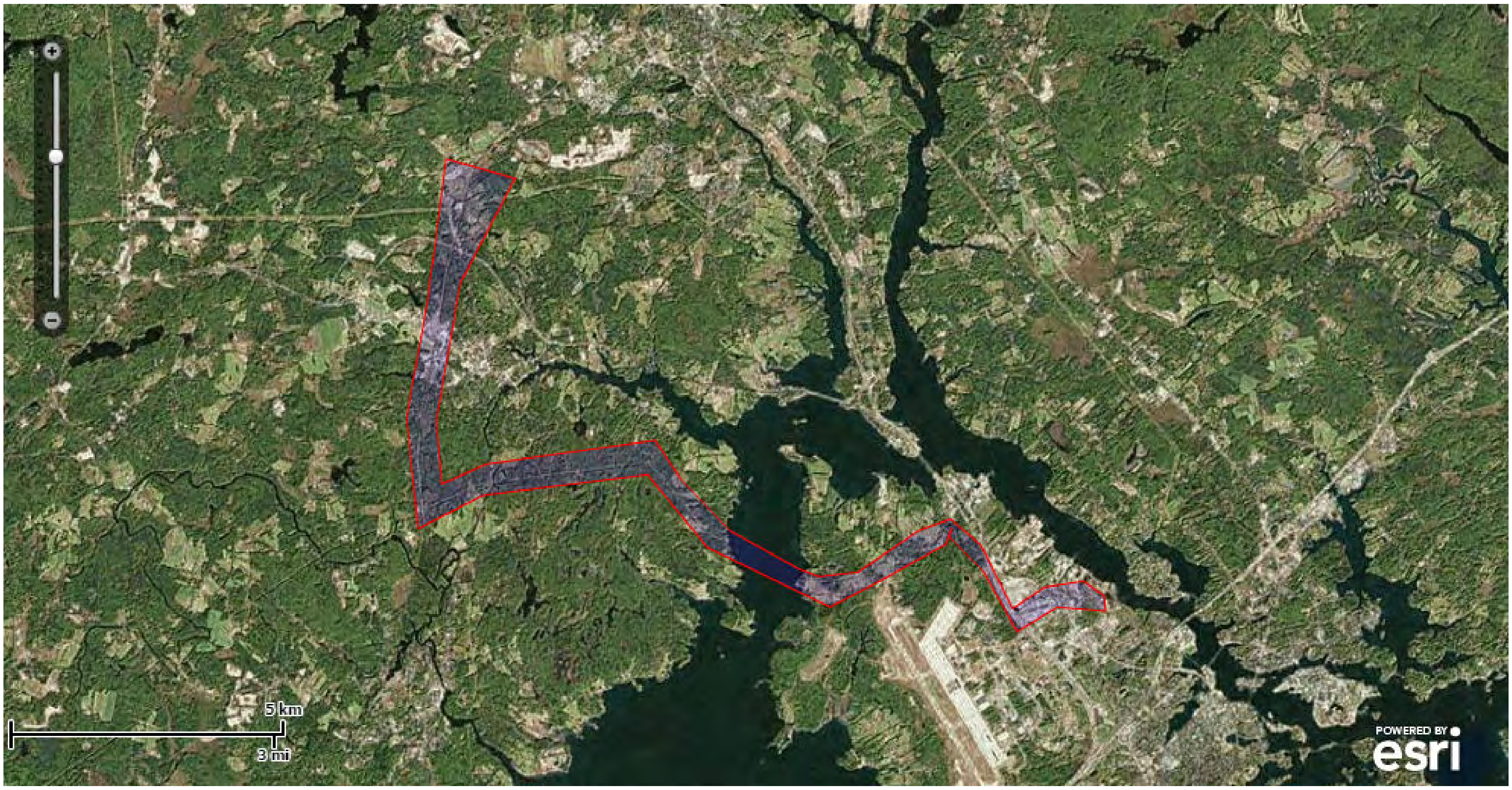
Official Species List

Provided by:

New England Ecological Services Field Office
70 COMMERCIAL STREET, SUITE 300
CONCORD, NH 3301
(603) 223-2541
http://www fws.gov/newengland

Consultation Tracking Number: 05E1NE00-2015-SLI-0118
Project Type: Transmission Line
Project Description: PSNH is proposing to construct a new 13-mile 115kV transmission line between their Madbury and Portsmouth substations. It will
predominantly follow existing ROW. It will cross the Great Bay National Wildlife Refuge and have a submarine segment under
Little Bay

Project Location Map:



Project Coordinates: MULTIPOLYGON (((-70.9179682 43.1648082, -70.9182446 43.164808, -70.9306041 43.1475873, -70.9360124 43.1249784, -70.9348108 43.1145158, -70.9246825 43.1178352, -70.8865746 43.1217195, -70.8809107 43.1154562, -70.8697527 43.1068719, -70.8541315 43.1005426, -70.8495825 43.0992892, -70.8407419 43.1000413, -70.8269223 43.1069346, -70.8198842 43.1087518, -70.8131036 43.1045534, -70.8058938 43.0940246, -70.798684 43.0975344, -70.7898435 43.0985372, -70.7852944 43.0961556, -70.7851228 43.0956542, -70.7848825 43.0935828, -70.7904442 43.093962, -70.7957657 43.0942754, -70.8048637 43.0902013, -70.812434 43.1001008, -70.8202265 43.1058694, -70.8196256 43.1071853, -70.8196256 43.107248, -70.8208273 43.1046787, -70.8369634 43.0980985, -70.8470915 43.0942722, -70.8747353 43.1040522, -70.8882965 43.1160829, -70.9253754 43.1126995, -70.9401382 43.1071854, -70.9427046 43.1254802, -70.9378809 43.1450221, -70.933761 43.1680635, -70.9179682 43.1648082)))

Project Counties: Rockingham, NH | Strafford, NH

Endangered Species Act Species List

There are a total of 2 threatened or endangered species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. Critical habitats listed under the **Has Critical Habitat** column may or may not lie within your project area. See the **Critical habitats within your project area** section further below for critical habitat that lies within your project. Please contact the designated FWS office if you have questions.

Birds	**Status**	**Has Critical Habitat**	**Condition(s)**
Roseate tern *(Sterna dougallii dougallii)* Population: northeast U.S. nesting pop.	Endangered		
Flowering Plants			
Small Whorled pogonia *(Isotria medeoloides)*	Threatened		

Critical habitats that lie within your project area

There are no critical habitats within your project area.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930-2276

DEC - 2 2014

Ann E. Pembroke
Vice President
Normandeau Associates, Inc.
25 Nashua Rd.
Bedford, NH 03110

**Re: Public Service of New Hampshire
Seacoast Reliability Project**

Dear Ms. Pembroke:

This is in response to your letter received November 24, 2014 requesting information on the presence of species listed under the Endangered Species Act by NOAA's National Marine Fisheries Service (NMFS) in the proposed project area. The proposed project involves constructing a new 115 kilovolt (kV) transmission line between the existing Madbury and Portsmouth substations. The 12.9 mile long project begins at the existing Public Service of New Hampshire (PSNH) Madbury Substation in Madbury, traverses Durham, crosses Little Bay via an underwater cable into Newington, and then continues east before ending in Portsmouth. The method of installing the underwater cable has not been decided.

The following endangered species may occur in Little Bay and Oyster River: Shortnose sturgeon (*Acipenser brevirostrum*) and Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) (Distinct Population Segments [DPS]: New York Bight, Chesapeake Bay, Carolina, South Atlantic).

The following threatened species may occur in Little Bay and Oyster River: Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) (Distinct Population Segments [DPS]: Gulf of Maine).

Conclusion

As listed species of sturgeon may occur in Little Bay and Oyster River, and thus, within the vicinity of your proposed project, any proposed in-water work has the potential to impact these species. If your project involves dredging or sediment disturbance, we would recommend placing a turbidity curtain around the project area. This will not only contain suspended sediment within the affected area, but will also prevent sturgeon from coming in contact with any increased turbidity or mechanical activity associated with the project. We would also recommend using the Horizontal Directional Drilling (HDD) method in installing the underwater cable as it would also prevent sturgeon from coming into contact with any mechanical activity.

As project details become finalized, a consultation, pursuant to section 7 of the Endangered Species Act (ESA) of 1973, as amended, may be necessary as any discretionary federal action, such as the approval or funding of a project by a federal agency, that may affect a listed species must undergo consultation pursuant to section 7 of the ESA of 1973, as amended. If the proposed project has the potential to affect listed species, and it is being approved, permitted or funded by a Federal agency, the lead Federal agency, or their designated non-Federal representative, is responsible for determining whether the proposed action is likely to affect the listed species. The Federal agency would submit their determination along with justification for their determination and a request for concurrence, to the attention of the ESA Section 7 Coordinator, NMFS Greater Atlantic Fisheries Regional Office, Protected Resources Division, 55 Great Republic Drive, Gloucester, MA 01930. After reviewing this information, NMFS would then be able to conduct a consultation under section 7 of the ESA. Should you have any questions about these comments or about the section 7 consultation process in general, please contact Edith Carson at 978-282-8490 or by email Edith.Carson@noaa.gov.

Essential Fish Habitat (EFH)
NMFS Habitat Conservation Division (HCD) is responsible for conducting consultations with State and Federal agencies for proposed actions that may adversely affect EFH and other NOAA trust resources. HCD's Mike Johnson sent you an email on November 24, 2014 regarding EFH in your proposed project area. If you have any further questions regarding EFH, please contact Mike Johnson at 978-281-9130 or by email at Mike.R.Johnson@noaa.gov.

Sincerely,

for

Kimberly Damon-Randall
Assistant Regional Administrator
for Protected Resources

EC: Carson, NMFS/PRD
File Code: Section 7/Nonfisheries/Private Firms/Technical Assistance/2014/ Normandeau Public Service of NH Seacoast Reliability Project

Memo

NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

To: Susan Hegarty, Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

From: Amy Lamb, NH Natural Heritage Bureau
Date: 11/9/2015 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB15-3561 Town: Madbury, Durham, Newington, Portsmouth Location:

Description: Eversource is proposing to construct a new 13-mile 115kV transmission line between their Madbury and Portsmouth substations. It will predominantly follow existing ROW. It will consist primarily of overhead structures, but will have an underground section at UNH in Durham and will have a submarine segment under Little Bay. This is an update request. Our previously requested data expired on 10/2/2015. NHB file ID: NHB14-3618.

cc: Kim Tuttle

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

Comments: This review is a follow-up to NHB14-3618 (9/24/2014) and the NHB14-3618 Addendum (10/2/2014). Continued coordination with NHB and NH Fish & Game is needed as this project progresses through permitting.

Invertebrate Species	**State[1]**	**Federal**	**Notes**
Ringed Boghaunter (*Williamsonia lintneri*)	E	--	Contact the NH Fish & Game Dept (see below).

Natural Community	**State[1]**	**Federal**	**Notes**
Hemlock - beech - oak - pine forest	--	--	Threats include logging, introduction of invasive species, and direct destruction due to development.
High salt marsh	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as ditching or tidal restrictions that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.
Red maple - sensitive fern swamp	--	--	These swamps are influenced by groundwater seepage and springs which moderate water fluctuations and maintain conditions favorable for the accumulation of organic matter. The primary threats are changes to the hydrology of the wetland complex, particularly raising or lowering the water levels, and increased nutrient and pollutant input carried in by stormwater runoff.

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

DRED/NHB
172 Pembroke Rd.
Concord, NH 03301

Salt marsh system	--	--	Threats are primarily changes to the hydrology of the system, introduction of invasive species, and increased input of nutrients and pollutants.
Sparsely vegetated intertidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.
Subtidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.

Plant species	**State[1]**	**Federal**	**Notes**
Black Maple (*Acer nigrum*)	T	--	Threats are primarily damage to its floodplain or riverbank habitat, including changes to local hydrology, land conversion and fragmentation, introduction of invasive species, and increased input of nutrients and pollutants.
bulbous bitter-cress (*Cardamine bulbosa*)	E	--	This species occurs in forested swamps, low floodplain forest, and moist thickets.. Threats to the plants include canopy removal and destruction (draining) of its habitat.
crested sedge (*Carex cristatella*)*	E	--	This wetland species, which occurs in bogs, fens, seeps, and wet meadows, would be threatened by changes to local hydrology, including increased nutrient input from stormwater runoff, and sedimentation from nearby disturbance.
Engelmann's Quillwort (*Isoetes engelmannii*)*	E	--	Primarily vulnerable to changes to the hydrology of its wetland habitat, especially alterations that change water levels. It may also be susceptible to increased pollutants and nutrients carried in stormwater runoff.
great bur-reed (*Sparganium eurycarpum*)	T	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
greater fringed-gentian (*Gentianopsis crinita*)*	T	--	Vulnerable to shading by invading trees and to disturbances that destroy plants or impede their ability to reproduce (such as mowing in the mid-summer while the plants are in bloom).
Marsh Elder (*Iva frutescens*)	T	--	Threats are primarily alterations to the hydrology of the wetland, such as ditching or tidal restrictions that might affect the sheet flow of tidal waters across the intertidal flat, activities that eliminate plants, and increased input of nutrients and pollutants in storm runoff.
Rigid Sedge (*Carex tetanica*)*	--	--	This plant relies on open habitat, and maintenance of the hydrology of any wetland where it occurs.
Sensitive species	T	T	Please contact NH Natural Heritage (271-2215 x 323) if project impacts could occur

in the area shown on the map.

Vertebrate species	State[1]	Federal	Notes
American Eel (*Anguilla rostrata*)	SC	--	Contact the NH Fish & Game Dept (see below).
Bald Eagle (*Haliaeetus leucocephalus*)	T	--	Contact the NH Fish & Game Dept (see below).
Banded Sunfish (*Enneacanthus obesus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).
Eastern Hognose Snake (*Heterodon platirhinos*)*	E	--	Contact the NH Fish & Game Dept (see below).
Grasshopper Sparrow (*Ammodramus savannarum*)	T	--	Contact the NH Fish & Game Dept (see below).
Least Bittern (*Ixobrychus exilis*)	SC	--	Contact the NH Fish & Game Dept (see below).
Northern Black Racer (*Coluber constrictor constrictor*)	T	--	Contact the NH Fish & Game Dept (see below).
Osprey (*Pandion haliaetus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Sea Lamprey (*Petromyzon marinus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Sedge Wren (*Cistothorus platensis*)	E	--	Contact the NH Fish & Game Dept (see below).
Spotted Turtle (*Clemmys guttata*)	T	--	Contact the NH Fish & Game Dept (see below).
Swamp Darter (*Etheostoma fusiforme*)	SC	--	Contact the NH Fish & Game Dept (see below).
Upland Sandpiper (*Bartramia longicauda*)	E	--	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.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

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

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

DRED/NHB
172 Pembroke Rd.
Concord, NH 03301

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Susan Hegarty, Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

From: Melissa Coppola, NH Natural Heritage Bureau
Date: 9/24/2014 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB14-3618 Town: Madbury, Durham, Newington, Portsmouth Location: new 13-mile 115kv transmission line

Description: PSNH is proposing to construct a new 13 mile 115kV transmission line between their Madbury and Portsmouth substations. It will predominantly follow existing right-of-way. It will cross Great Bay National Wildlife Refuge and have a submarine segment under Little Bay.

cc: Kim Tuttle, Maria Tur

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

Comments: NHB recommends a pre-application meeting to discuss the details of the project and to address NHB and Fish and Game concerns and survey needs.

Natural Community	State[1]	Federal	Notes
Hemlock - beech - oak - pine forest	--	--	Threats include logging, introduction of invasive species, and direct destruction due to development.
High salt marsh	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as ditching or tidal restrictions that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.
Red maple - sensitive fern swamp	--	--	These swamps are influenced by groundwater seepage and springs which moderate water fluctuations and maintain conditions favorable for the accumulation of organic matter. The primary threats are changes to the hydrology of the wetland complex, particularly raising or lowering the water levels, and increased nutrient and pollutant input carried in by stormwater runoff.
Salt marsh system	--	--	Threats are primarily changes to the hydrology of the system, introduction of invasive species, and increased input of nutrients and pollutants.
Sparsely vegetated intertidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal

			flat) and increased input of nutrients and pollutants in storm runoff.
Subtidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.

Plant species	**State[1]**	**Federal**	**Notes**
bulbous bitter-cress (*Cardamine bulbosa*)	E	--	This species occurs in forested swamps, low floodplain forest, and moist thickets.. Threats to the plants include canopy removal and destruction (draining) of its habitat.
crested sedge (*Carex cristatella*)*	E	--	This wetland species, which occurs in bogs, fens, seeps, and wet meadows, would be threatened by changes to local hydrology, including increased nutrient input from stormwater runoff, and sedimentation from nearby disturbance.
great bur-reed (*Sparganium eurycarpum*)	T	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
greater fringed-gentian (*Gentianopsis crinita*)*	T	--	Vulnerable to shading by invading trees and to disturbances that destroy plants or impede their ability to reproduce (such as mowing in the mid-summer while the plants are in bloom).
Marsh Elder (*Iva frutescens*)	T	--	Threats are primarily alterations to the hydrology of the wetland, such as ditching or tidal restrictions that might affect the sheet flow of tidal waters across the intertidal flat, activities that eliminate plants, and increased input of nutrients and pollutants in storm runoff.
Rigid Sedge (*Carex tetanica*)*	--	--	This plant relies on open habitat, and maintenance of the hydrology of any wetland where it occurs.
Sensitive species	T	T	Please contact NH Natural Heritage (271-2215 x 323) if project impacts could occur in the area shown on the map.

Vertebrate species	**State[1]**	**Federal**	**Notes**
American Eel (*Anguilla rostrata*)	SC	--	Contact the NH Fish & Game Dept (see below).
Bald Eagle (*Haliaeetus leucocephalus*)	T	--	Contact the NH Fish & Game Dept (see below).
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).
Eastern Hognose Snake (*Heterodon platirhinos*)*	E	--	Contact the NH Fish & Game Dept (see below).
Golden-winged Warbler (*Vermivora chrysoptera*)*	SC	--	Contact the NH Fish & Game Dept (see below).
Grasshopper Sparrow (*Ammodramus savannarum*)	T	--	Contact the NH Fish & Game Dept (see below).

Henslow's Sparrow (*Ammodramus henslowii*)*	--	--	Contact the NH Fish & Game Dept (see below).
Least Bittern (*Ixobrychus exilis*)	SC	--	Contact the NH Fish & Game Dept (see below).
Northern Black Racer (*Coluber constrictor constrictor*)	T	--	Contact the NH Fish & Game Dept (see below).
Osprey (*Pandion haliaetus*)	SC	--	Contact the NH Fish & Game Dept (see below).
Sedge Wren (*Cistothorus platensis*)	E	--	Contact the NH Fish & Game Dept (see below).
Spotted Turtle (*Clemmys guttata*)	T	--	Contact the NH Fish & Game Dept (see below).
Swamp Darter (*Etheostoma fusiforme*)	SC	--	Contact the NH Fish & Game Dept (see below).
Upland Sandpiper (*Bartramia longicauda*)	E	--	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.

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544. Contact for federally-listed animals: Anthony Tur, US FWS, at (603) 223-2541. Contact for federally-listed species: Maria Tur, US FWS, at (603) 223-2541.

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

Memo

NH NATURAL HERITAGE BUREAU
NHB DATACHECK RESULTS LETTER

To: Susan Hegarty, Normandeau Associates, Inc.
25 Nashua Road
Bedford, NH 03110

ADDENDUM TO NHB14-3618

From: Melissa Coppola, NH Natural Heritage Bureau
Date: 10/2/2014 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau

NHB File ID: NHB14-3618 Addendum
Town: Madbury, Durham, Newington, Portsmouth
Location: new 13-mile 115kv transmission line

Description: PSNH is proposing to construct a new 13 mile 115kV transmission line between their Madbury and Portsmouth substations. It will predominantly follow existing right-of-way. It will cross Great Bay National Wildlife Refuge and have a submarine segment under Little Bay.

cc: Kim Tuttle

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

Comments: NHB recommends a pre-application meeting to discuss the details of the project and to address NHB and Fish and Game concerns and survey needs.

Invertebrate Species	State[1]	Federal	Notes
Ringed Boghaunter (*Williamsonia lintneri*)	E	--	Contact the NH Fish & Game Dept (see below).

Plant species	State[1]	Federal	Notes
Black Maple (*Acer nigrum*)	T	--	Threats are primarily damage to its floodplain or riverbank habitat, including changes to local hydrology, land conversion and fragmentation, introduction of invasive species, and increased input of nutrients and pollutants.
Engelmann's Quillwort (*Isoetes engelmannii*)*	E	--	Primarily vulnerable to changes to the hydrology of its wetland habitat, especially alterations that change water levels. It may also be susceptible to increased pollutants and nutrients carried in stormwater runoff.

Vertebrate species	State[1]	Federal	Notes
Banded Sunfish (*Enneacanthus obesus*)	SC	--	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.

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

DRED/NHB
PO Box 1856
Concord NH 03302-1856

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

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

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

DRED/NHB
PO Box 1856
Concord NH 03302-1856

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Sarah Allen, Normandeau Associates
25 Nashua Rd
Bedford, NH 03110

From: Melissa Coppola, NH Natural Heritage Bureau
Date: 8/13/2013 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB13-2434 Town: Madbury, Durham, Newington, Portsmouth Location: Tax Maps: multiple

Description: PSNH is proposing to construct a new 13-mile 115kV transmission line between their Madbury and Portsmouth substations. It will predominantly follow existing ROW. It will cross the Great Bay National Wildlife Refuge and have a submarine segment under Little Bay.

cc: Kim Tuttle

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

Comments: NHB recommends a pre-application meeting to discuss the details of the project and to address NHB and NH Fish and Game concerns.

Invertebrate Species	**State[1]**	**Federal**	**Notes**
Ringed Boghaunter (*Williamsonia lintneri*)	E	--	Contact the NH Fish & Game Dept (see below).

Natural Community	**State[1]**	**Federal**	**Notes**
Hemlock - beech - oak - pine forest	--	--	Threats include logging, introduction of invasive species, and direct destruction due to development.
Red maple - sensitive fern swamp	--	--	These swamps are influenced by groundwater seepage and springs which moderate water fluctuations and maintain conditions favorable for the accumulation of organic matter. The primary threats are changes to the hydrology of the wetland complex, particularly raising or lowering the water levels, and increased nutrient and pollutant input carried in by stormwater runoff.
Sparsely vegetated intertidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.
Subtidal system	--	--	Threats to these communities are primarily alterations to the hydrology of the wetland (such as alterations that might affect the sheet flow of tidal waters across the intertidal flat) and increased input of nutrients and pollutants in storm runoff.

Plant species	State[1]	Federal	Notes
Black Maple (*Acer nigrum*)	T	--	Threats are primarily damage to its floodplain or riverbank habitat, including changes to local hydrology, land conversion and fragmentation, introduction of invasive species, and increased input of nutrients and pollutants.
bulbous bitter-cress (*Cardamine bulbosa*)	E	--	This species occurs in forested swamps, low floodplain forest, and moist thickets.. Threats to the plants include canopy removal and destruction (draining) of its habitat.
crested sedge (*Carex cristatella*)*	E	--	This wetland species, which occurs in bogs, fens, seeps, and wet meadows, would be threatened by changes to local hydrology, including increased nutrient input from stormwater runoff, and sedimentation from nearby disturbance.
Engelmann's Quillwort (*Isoetes engelmannii*)*	E	--	Primarily vulnerable to changes to the hydrology of its wetland habitat, especially alterations that change water levels. It may also be susceptible to increased pollutants and nutrients carried in stormwater runoff.
great bur-reed (*Sparganium eurycarpum*)	T	--	Threats to aquatic species include changes in water quality, e.g., due to pollution and stormwater runoff, and significant changes in water level.
greater fringed-gentian (*Gentianopsis crinita*)*	T	--	Vulnerable to shading by invading trees and to disturbances that destroy plants or impede their ability to reproduce (such as mowing in the mid-summer while the plants are in bloom).
Rigid Sedge (*Carex tetanica*)*	--	--	This plant relies on open habitat, and maintenance of the hydrology of any wetland where it occurs.

Vertebrate species	State[1]	Federal	Notes
American Eel (*Anguilla rostrata*)*	SC	--	Contact the NH Fish & Game Dept (see below).
Banded Sunfish (*Enneacanthus obesus*)	SC	--	Contact the NH Fish & Game Dept (see below).
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).
Sedge Wren (*Cistothorus platensis*)	E	--	Contact the NH Fish & Game Dept (see below).
Spotted Turtle (*Clemmys guttata*)	T	--	Contact the NH Fish & Game Dept (see below).
Swamp Darter (*Etheostoma fusiforme*)	SC	--	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.

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

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

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

DRED/NHB
PO Box 1856
Concord NH 03302-1856

Appendix D: Biological Assessment for the Northern Long-eared Bat for the Seacoast Reliability Project

Public Service of New Hampshire
Seacoast Reliability Project

Strafford and Rockingham Counties, NH

Biological Assessment for the Northern Long-eared Bat

Prepared For:
Public Service Company of New Hampshire
d/b/a Eversource Energy
780 North Commercial Street
Manchester, NH 03101

Submitted:
February 2016

Prepared By:
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25 Nashua Road
Bedford, NH 03110

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1.0 Introduction

This Biological Assessment ("BA") documents potential effects of the Seacoast Reliability Project ("Proposed Action") on the Northern Long-eared bat ("NLEB", *Myotis septrionalis*). The Seacoast Reliability Project ("SRP") is a new 115 kilovolt ("kV") transmission line proposed to be located in the Towns of Madbury, Durham and Newington as well as the City of Portsmouth, in Strafford and Rockingham Counties, New Hampshire. The SRP will be built within an existing power line corridor, but will require some additional tree clearing within the corridor limits to accommodate the new line.

The federal nexus for this BA is the 404 permit required under the Clean Water Act for the Proposed Action. The applicant is Public Service of New Hampshire d/b/a Eversource Energy ("PSNH"), which engages in electric delivery to businesses and residences throughout New Hampshire. PSNH has extensive experience constructing and operating transmission lines and operates New England's largest utility system, which serves more than 3.6 million electric and natural gas customers in Connecticut, Massachusetts, and New Hampshire.

2.0 Project Description

2.1 Construction

The SRP will be approximately 12.9 miles long and include a combination of overhead, underground, and underwater components. It will travel through existing electric utility corridors,[1] including a submarine cable crossing from Durham to Newington under Little Bay (Figure 1). The Project will not change existing land uses within or along the corridor. Most of the project's route is within or along the edge of forested areas. The entire line will be constructed within existing electric corridors, with minor adjustments to the corridor widths in several locations. The corridor ranges from 50-300 feet wide, but is predominantly 100 feet wide. For most of the length of the corridor, a cleared area approximately 60 feet in width is currently maintained by PSNH by periodic mowing in support of the existing electric distribution line. Construction will require expanding this cleared area by up to 40 feet, to a maximum width of 100 feet in some locations. This expansion will result in the removal of approximately 31 acres of forest cover.

The majority of the SRP will be constructed aboveground on overhead structures between 85 and 120 feet in height. It will cross under Little Bay by being buried 3.5-8 feet in the substrate using a combination of jetplow and hand-jet technology. In most locations, the existing distribution line will be co-located on the new structures and the existing distribution structures will be removed. In several locations, the existing distribution line

[1] The Project corridor is defined as the combination of the existing PSNH owned utility easements, PSNH fee owned property, and any and all other easements, licenses or the PanAm railway right-of-way, in which the Project facilities will be located.

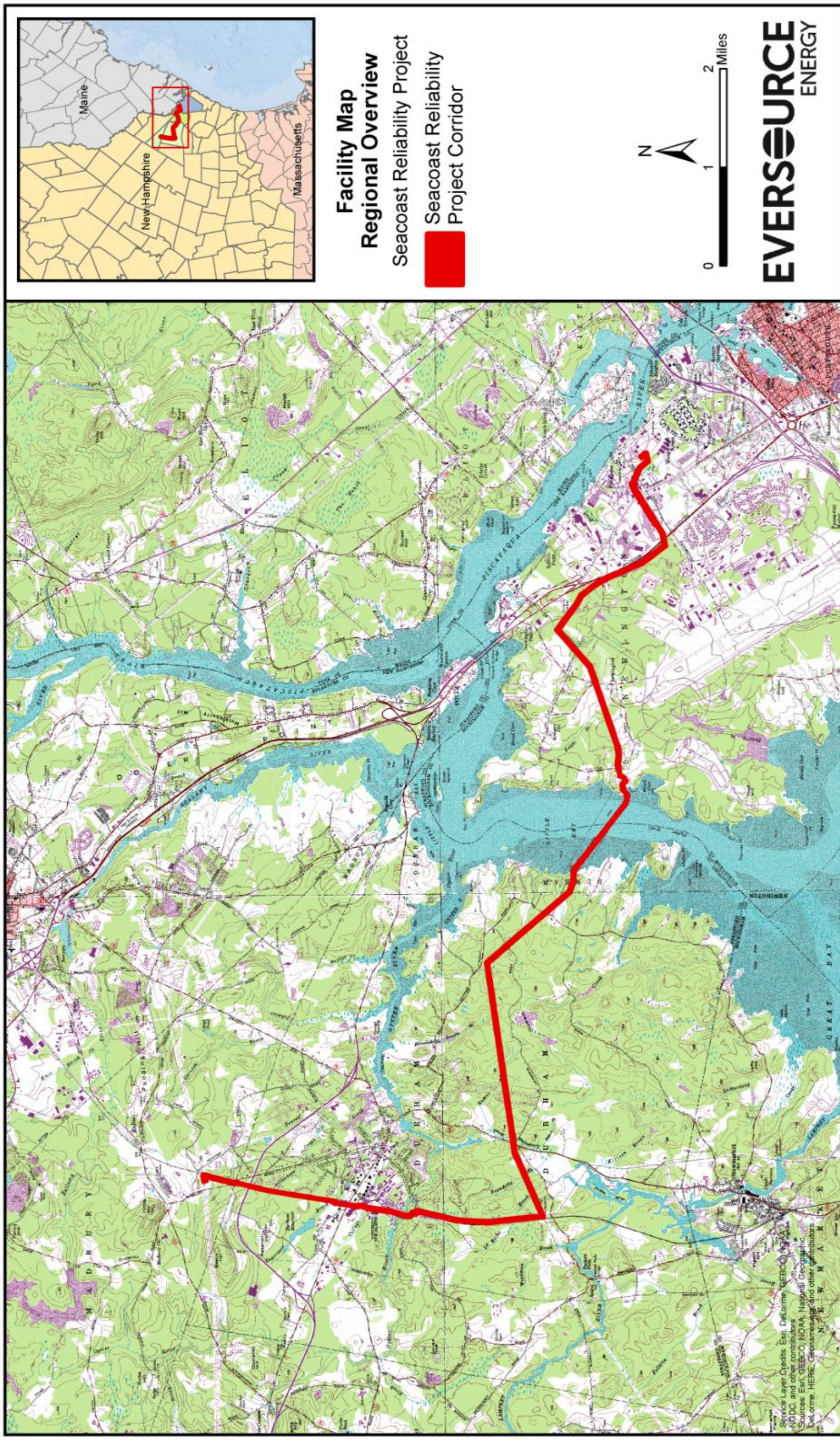

Figure 1. Seacoast Reliability Project Location Map.

will be relocated to the side of the project corridor and the new structures will carry the new transmission cables only. A short portion of an existing transmission line will need to be relocated to accommodate the new SRP alignment at The Crossings at Fox Run Mall in Newington. Substation improvements in Madbury and Portsmouth will be confined to the existing substation footprints. No other substation modifications are proposed.

The SRP is a reliability project, providing a parallel path to enhance the existing 115 kV loop between the Deerfield and Scobie Pond Substations. It is designed to address reliability concerns in the New Hampshire Seacoast Region, which have previously been identified by the Independent System Operator – New England ("ISO-NE"). PSNH, working with ISO-NE, conducted a needs assessment study which concluded that the New Hampshire Seacoast Region requires additional transmission capacity to support the reliable delivery of electric power to meet the Region's current demand and future increased demand.

2.2 Operations

After construction of the Project is complete, periodic mowing of the cleared right-of-way ("ROW") will be required to maintain grassy and/or shrubby vegetation conditions. Tree trimming and removal of hazard trees may also be required to protect the transmission line from encroaching branches and tree fall. Repairs to the structures/line will be performed as needed.

2.3 Conservation Measures

PSNH has designed the SRP to avoid environmental impacts where possible. Extensive environmental surveys were conducted by an experienced team of consultants and in consultation with the regulatory agencies. The results of these studies were incorporated into the siting, design and construction aspects of the Project, resulting in a final design that avoids and minimizes environmental impacts to the greatest extent possible, while still achieving the goals of the Project. Specific to avoiding impacts to NLEBs, the tree clearing standards put forth in the final 4(d)rule pertaining to this species, which are in effect as of February 16, 2016 will be followed (81 FR 1900, 2016). Based on this directive, no trees will be cleared within ¼ mile of known, occupied hibernacula at any time of the year, or within 150 feet of a known, occupied maternity roost during the June 1 – July 31 pup season. Note that there are no known, occupied hibernacula or maternity roost trees within the applicable radii of the Project.

3.0 Action Area

3.1 Location and Extent of the Action Area

The Action Area is the footprint of the Project where construction will occur, as well as a buffer of the footprint which encompasses an area equal to the known summer range of an NLEB at any point on the ROW centerline. The U.S. Fish and Wildlife Service ("USFWS" 2014) indicated that a three mile buffer drawn around any point will encompass the expected home range of an NLEB. The Action Area encompasses approximately 62,323 acres, and is the area where cumulative impacts may occur. As described above, the SRP transmission line will be approximately 12.9 miles long, including a 1 mile crossing under Little Bay (Figure 1). The entire line will be constructed within existing electric corridors, with minor adjustments to the corridor widths in several locations. This Project area encompasses 149.7 acres, which is less than 0.01 percent of the Action Area. The Action area consists of a wide variety of developed and undeveloped lands, including forested and unforested natural habitats, the town centers of Durham, Newington, and Portsmouth, suburban development, the University of New Hampshire, and the Pease Tradeport.

3.2 Existing Conditions within the Action Area

The Project corridor is located within the Coastal Plain ecological region of New Hampshire. The highest elevation along the project corridor is approximately 130 feet above sea level near the Madbury Substation. The corridor ranges from 40-130 feet wide, but is predominantly 100 feet wide. For most of the length of the corridor, a cleared area approximately 60 feet in width is currently maintained by PSNH by periodic mowing in support of the existing electric distribution line. The vegetation in the maintained area consists of grasses, herbaceous plants and shrubs (described in detail below). The edges of the corridor are unmaintained and frequently support forest, and it is these trees which will need to be cleared for the SRP. The lands surrounding the SRP corridor have a low to moderate amount of development, including some protected conservation lands, substantial areas of low density residential development, and some areas of higher intensity development associated with Durham and Newington/Portsmouth. The undeveloped areas and low density residential areas are primarily forested while the vegetation maintenance practices conducted in the existing cleared corridor create grass and/or shrubby habitat types.

Based on the New Hampshire Fish and Game Department ("NHFG") 2015 Wildlife Action Plan ("WAP") cover type map and field observations, habitat cover types which the Project passes through consist mostly of Appalachian oak-pine forest, with smaller areas of marshes, floodplain forest and grasslands. The Appalachian oak-pine forests are found across the subtle ridges and rises within the landscape, with the depressions and low areas consisting mostly of larger wetland complexes. These forests have a mix of canopy species including white, black, scarlet and red oaks (*Quercus* spp.), shagbark hickory (*Carya ovata*), white ash (*Fraxinus americana*), white pine (*Pinus strobus*), and other species common in more northern portions of New Hampshire such as birches (*Betula* spp.), maples (*Acer* spp.) and beech (*Fagus grandifola*) (Sperduto and Kimball, 2011). The Project also passes through residential and open areas (generally hayfields) are also present within the Action Area. The residential areas are planted with common landscaping species and lawn grasses and escaped ornamental species are common in close proximity to residential areas.

Under the existing electric lines, the vegetation is shrub and grasses as a result of periodic mowing in contrast with the adjacent forested communities. Common upland forest species found along the edge of the corridor include white pine, red and white oak (*Q. rubra* and *Q. alba*), quaking aspen (*Populus tremuloides*) and gray birch (*B. populifolia*). The sizes of trees vary from mature to early successional depending on the adjacent land use. Common shrub species within upland areas include glossy and common buckthorn (*Rhamnus frangula* and *R. cathartica*), multi-flora rose (*Rosa multiflora*), sumacs (*Rhus* spp.), barberries (*Berberis* spp.), honeysuckles (*Lonicera* spp.) and dogwoods (*Cornus* spp.). Many of these species are non-native invasives in New Hampshire. Clovers (*Trifolium* sp.), hayscented fern (*Dennstaedtia punctilobula*), sweet fern (*Comptonia peregrina*), goldenrods (*Solidago* spp.), common juniper (*Juniperus communis*), raspberries and blackberries (*Rubus* spp.), little bluestem (*Schizachyrium scoparium*), and plantain species (*Plantago* sp.) were frequently noted upland herbaceous plants in the maintained portion of the corridor.

Wetlands identified within the project corridor were generally dominated by both scrub-shrub and emergent (herbaceous) plant species. Common woody species include red maple, glossy buckthorn, silky dogwood (*Cornus amomum*), speckled alder (*Alnus incana*) and several meadowsweet (*Spiraea* sp.) species. Herbaceous species include sedges (*Carex* sp.), cattails (*Typha* sp.), several hydrophytic fern species including sensitive (*Onoclea sensibilis*), cinnamon and interrupted varieties (*Osmunda cinnamomea* and *O. claytoniana*), rushes (*Scirpus* sp.), and other species such as tearthumb (*Polygonum* sp.), asters (*Symphyotrichum* sp.), and purple loosestrife (*Lythrum salicaria*), which is an invasive species. Trees were observed within the wetland along the edges of the corridor, including red maple (*Acer rubrum*), swamp white oak (*Quercus bicolor*), and cedar (*Thuja* sp.).

The SRP corridor crosses though some areas designated as Highest Priority Habitat by the 2015 WAP (Map 5). The remainder of the corridor passes primarily though areas that are designated as Supporting Landscapes or that have no designation at all. The relative proportion of these habitat types in the corridor reflects their wider distribution in the surrounding landscape.

4.0 Northern Long-eared Bat

This section summarizes existing information about the NLEB. In Section 5.0, this information is applied to information about known existing and proposed conditions in the Project Area to determine the potential impact of the Project.

4.1 Species Biology

Range: The known range of the NLEB includes the entire Northeastern United States and extends northward into central Quebec Province, making this species almost certainly resident throughout New Hampshire. Additionally, recent survey data indicates that NLEBs may be more abundant/prevalent in coastal New England, including all towns on the coast of New Hampshire (USFWS 2015a), including the four municipalities crossed by the SRP.

Life History: NLEBs are a non-migratory forest bat, adapted to flying in cluttered environments. As described by the USFWS (USFWS 2014, 2015c), NLEBs emerge at dusk to forage in upland and lowland woodlots and tree-lined corridors, feeding on insects, which they catch while in flight using echolocation. This species also feeds by gleaning insects from vegetation and water surfaces. NLEBs overwinter in caves or mines and spend the summer in local forests. A single pup is born in June or July in the Northeast, and volant (capable of flying) young have been observed as early as three weeks following birth. During the maternity period, the sexes separate, with females roosting in small (commonly 30-60 individuals) maternity colonies and males roosting singly. Lactating females switch roost trees every two to five days. In New Hampshire, volant sub-adults were captured as early as July (Sasse and Pekins 1996).

Winter Habitat: As described in the USFWS (USFWS 2014, 2015c), suitable winter habitat (hibernacula) for the NLEB includes underground caves and cave-like structures (e.g. abandoned or active mines, railroad tunnels). These hibernacula typically have large passages with significant cracks and crevices for roosting; relatively constant, cool temperatures (32-48°F) and with high humidity and minimal air currents. Bats in New Hampshire use mines or talus caves to hibernate, but there are few places humid enough for them and most New Hampshire cave bats fly to Vermont, Massachusetts or New York to hibernate (NHFG 2015).

Spring Staging and Fall Swarming Habitat: As described by the USFWS (USFWS 2014, 2015c), spring staging and fall swarming habitat consist of forested habitats within five miles of a hibernaculum entrance. Forested areas with suitable roost trees would likely provide the best habitat.

Summer Habitat: As described by the (USFWS 2014, 2015c), suitable summer habitat for NLEB consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (described below), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit characteristics of suitable roost trees and are within 1,000 feet of other forested/wooded habitat. NLEB has also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses.

Roost Trees: As described in the (USFWS 2014, 2015c), suitable NLEB roosts are trees (live, dying, dead, or snag) with a diameter at breast height ("dbh") of 3 inches or greater that exhibits any of the following characteristics: exfoliating bark, crevices, cavity, or cracks. Isolated trees are considered suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1,000 feet from the next nearest suitable roost tree within a woodlot, or wooded fencerow. NLEBs do not appear to prefer a certain species of tree, instead choosing trees based on structural suitability for roosting.

4.2 White-nose Syndrome

As described in in the USFWS's July 2015 Fact Sheet (USFWS 2015b), white-nose syndrome ("WNS") is a disease affecting hibernating bats, including NLEBs. Named for a white fungus that appears on the muzzle and other parts of bats, WNS is associated with extensive mortality of these animals in eastern and mid-western North America. First documented in New York in the winter of 2006-2007, WNS has spread rapidly across the eastern and Midwestern United States and eastern Canada. Evidence of WNS has been documented in most New Hampshire hibernacula (NHFG 2015).

WNS is deadly to bats for a variety of reasons. In winter, bats with WNS may fly outside their hibernacula during the day and/or cluster near the entrances of caves and other hibernation areas. These behaviors lead to starvation and death due to exposure. Additionally, WNS is documented to create an immune response in bats that can be lethal, and damage to wing membranes due to WNS can make bats unable to fly, precluding them from foraging. Bats have been found sick and dying in unprecedented numbers in and around caves and mines. WNS is estimated to have killed more than 5.5 million bats in the Northeast and Canada. In some areas, 90 to 100 percent of cave hibernating bats have died. WNS is the number one threat to NLEBs (USFWS 2015a, 2015c) and if this disease had not emerged, it is unlikely that this species would be experiencing such dramatic declines. Since symptoms were first observed in New York in 2006, white-nose syndrome has spread rapidly across the core of the NLEB's range. Based on hibernacula counts, NLEBs have declined by up to 99 percent in the Northeast (USFWS 2015c).

4.3 Status within the Action Area

The forested habitats within the Action Area almost certainly provide suitable habitat for NLEBs. No assessment of the level of suitability or the distribution of most suitable habitat has been conducted, and there are no known roost trees within the Action Area. However, given the relatively general habitat requirements of this species (describe in Section 4.1), and the extensive amount of forested habitat available within the Action Area, areas of suitable habitat are almost certainly present to varying degrees throughout the Action Area. There are no known hibernacula in the Action Area.

A comprehensive assessment of the NLEB population within the Action Area has also not been conducted. However, given the known distribution of this species discussed in Section 4.1, it is assumed to be present, and limited acoustic survey conducted at the Great Bay National Wildlife refuge in 2014 did document the presence of NLEBs (Svedlow 2015). Given the known status and spread of WNS throughout the Northeast, numbers of NLEBs within the Project area are expected to be low.

5.0 Effects Analysis

Based on the known range, habitat preference and life history of the NLEB, as described in Section 4.0, and the existing conditions within the Action Area, described in Section 3.0, NLEBs are potentially present within the Action Area and have the potential to be affected by the Proposed Action. The primary effect of the Proposed Action is the removal of trees to widen the existing, cleared corridor during construction.

5.1 Impacts Due to Construction

The primary effect of the Proposed Action on NLEBs is the removal of trees to widen the existing cleared corridor during construction, as described in Section 2.1. Approximately 31 acres of forest will be removed along the length of the SRP corridor, clearing an average of 20 feet on either side of the existing 60-foot wide (average) corridor. Tree clearing that occurs when NLEBs are present and using affected trees for roosting has the potential to impact NLEBs directly via disturbance of roosting adults and mortality of any young non-flying bats present, although no maternity roosts are known to occur in the Action Area. Indirect impacts are also possible due to tree clearing. Indirect effects consist of the loss of summer habitat, including foraging habitat and roost trees, due to the removal of trees. Due to the narrow corridor clearing, both direct and indirect impacts are anticipated to be minor. Tree removal will therefore not affect swarming habitat, and project construction does not have the potential to affect wintering habitat.

Direct permanent terrestrial wetland impacts are limited to the footprints of 27 structures totaling 792 square feet that were unavoidably located in wetlands. Approximately 317,800 square feet of indirect impacts will result from wetland conversion due to tree removal in forested wetlands and an additional 87,225 square feet of tree removal within upland stream buffers. Temporary wetland impacts will occur due to construction and have some small potential to impact NLEBs during their active season. Wetlands pools may provide water for drinking and may be a source of insects that NLEBs forage upon. However, the Project was designed to minimize temporary wetland impacts to the extent practicable, and best management practices, such as timber mats for access roads and work pads will be used where impacts are unavoidable. PSNH has developed a compensatory mitigation plan through participation in the Aquatic Resource Mitigation Fund (i.e. in-lieu fee) to compensate for permanent and indirect wetland impacts.

5.2 Impacts Due to Operations

Impacts due operations are secondary impacts. During operations maintenance of vegetation in the corridor and repair of the Project infrastructure, if needed, have some potential to affect NLEBs. Vegetation maintenance consists of periodically mowing the corridor to maintain it in a shrubby state, removal of tree limbs that protrude into the clear zone that must be maintained for the safe operation of power lines, and removal of hazard trees at the edge of the cleared corridor that have the potential to strike the lines if they fall due to natural causes. Mowing will have no effect on NLEBs as it removes woody vegetation that is too small in height and diameter to provide foraging or roosting habitat for NLEBs. Tree trimming and hazard tree removal would have little to no impact on the amount of foraging habitat, but does have the potential to remove suitable roosting habitat. No new tree clearing will be required for any needed Project infrastructure repairs, and all repair activities will be conducted in a manner that minimizes environmental impacts, similar to initial construction of the Project.

5.3 Cumulative Impacts

Cumulative impacts within the Action Area will occur due to removal of forest cover for a variety of types of development, including home building, commercial development, and other infrastructure projects (e.g., roadways, power lines, pipelines). The removal of approximately 31 acres of forest cover due to Project construction will contribute to these cumulative impacts, but is unlikely to be a major contributor to forest removal in the Action Area, given the current density of development in it, and the high likelihood that development in the region will continue to expand. Additionally, the narrow, linear, incremental nature of the clearing for the Project minimizes the impact of this clearing at any given location.

6.0 Conclusion

The conclusion of the BA is that the effect of construction and operation of the SRP on this species is so small as to be inconsequential to the population that may be present in the Action Area based on PSNH's commitment to meet the USFWS final guidance and the limited tree removal proposed. This conclusion is based on the following rationale:

1. The tree clearing required for construction of the Proposed Action will be conducted in compliance with the final 4(d) rule which goes into effect on February 16, 2016.
2. Direct impacts associated with the felling of trees will be relatively minor due to the narrow corridor to be cleared (20 feet on either side of an existing 60-foot wide (average) corridor) and the reduction of forest cover in the Action Area will be negligible. In total, just less than 31 acres of forest cover will be removed. This is an insignificant amount of potentially suitable forest habitat, compared to the total amount of potentially suitable forest habitat for NLEBs available in the Action Area.
3. Secondary impacts will include maintenance removal of limbs and hazard trees during operations. The Interim 4(d) Rule published in conjunction with the formal listing of the NLEB categorizes the removal of hazard trees as an exempt activity that is not considered to impact this species.
4. The Project will contribute to the cumulative removal of forest within the Action Area, but this contribution is likely to be minimal, as compared to the existing and future development likely to occur in the Region.

7.0 References

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Appendix E: Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Little Bay, New Hampshire

RPS

Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Little Bay, New Hampshire

Prepared for: Normandeau Associates, Inc., Bedford, NH

Authors: Craig Swanson, Tatsu Isaji, Chris Galagan

Date: December 14, 2015

Project Number: 2014-270

RPS ASA | 55 Village Square Drive | South Kingstown, RI 02879

Executive Summary

Public Service of New Hampshire d/b/a Eversource Energy (PSNH) has proposed the construction of an electrical cable system to increase the reliability of the electrical transmission grid in southern New Hampshire. This cable, known as the Seacoast Reliability Project, would cross the Little Bay portion of the Great Bay Estuarine System. The crossing would entail burial of three separate but parallel cable bundles by jet plowing, which is a technique that liquefies the sediment with high pressure water jets and simultaneously allows the cable to be buried at a predetermined depth. The cable sections in the shallow areas near the western and eastern landfalls will be buried by diver. The environmental consultant for the Project, Normandeau Associates, Inc., contracted with RPS ASA to supply its modeling capabilities to simulate the jet plowing and diver burial processes along the cable route to determine both the likely suspended sediment concentrations generated in the water column above the cable route and the resulting re-deposition of the sediments in and along the route.

Two computer models were used in the analysis: BELLAMY, a hydrodynamic model used for predicting the currents in Little Bay, and SSFATE, a sediment dispersion model used for predicting the fate and transport of sediment resuspended by the jet plowing operation. BELLAMY, a finite element, two-dimensional, vertically averaged, time stepping circulation model developed at Dartmouth College and previously applied to the Great Bay Estuarine System (GBES) (McLaughlin et al. 2003; Swanson et al. 2014) was used in this analysis. The model can calculate the time varying surface elevation and currents under the influence of tides, winds and river flow on a model domain discretized by a large number of finite element triangles. Due to the fact that Great Bay is tidally dominated (currents up to 2 m/s [6.6 ft/s] and much of it consists of narrow channels in which the tidal currents mostly flow in flood and ebb directions, the effect of wind is expected to show only in areas with relatively larger surface areas such as Great Bay proper and not Little Bay where the cable burial will occur. The model includes simulation of wetting and drying of tidal flats. All simulation parameters were set to be consistent with previously published work. The reader is referred to Swanson et al., (2014), Bilgili et al. (2005) and McLaughlin et al. (2003) for more detailed information.

The SSFATE (Suspended Sediment FATE) model was utilized to predict the excess suspended sediment concentration and the dispersion of suspended sediment resulting from jetting and diver activities. Since ambient suspended sediment concentrations are variable and generally unpredictable, the model predicts excess concentration, which is defined as the concentration above ambient suspended sediment concentration generated by the jetting activities. In addition SSFATE calculates the resulting deposition thickness of resuspended sediments that have resettled back on the bottom. The sediment grain size information necessary to characterize the sediment was extracted from vibracore data logs taken in April 2014. Some of the cores exhibited high (70 to 90%) fractions of fines (clays and silts) while others exhibited equally high (70 to 90%) of sands. A single representative cable route among the three cable bundles crossing Little Bay was chosen for modeling since the cables will be installed in sequence and are proposed to be separated by only about 9.4 m (30 ft) and all were parallel except when they approached the landfalls.

The cables in the offshore areas are to be buried by jet plowing to minimum depths of 1.07 m (42 in) deep in the shallows on the western but offshore section of Little Bay and 2.7 m (8 ft) in the center and east sections. For ease of discussion, this report refers to the jet plow disturbance as a trench although while the jet plow will be occupying a three-dimensional space, the “trench” is very temporary as it will

fill in immediately behind the jet plow. The total depth of the trench was 1.42 m (96 in) for the western section and 2.79 m (110 in) for the central and eastern sections. Based on Caldwell's specification the trench width was defined as 0.32 m (12.75 in) resulting in a vertical-walled trench cross sectional area of 0.46 m^2 (4.96 ft^2) in the shallow western portion and an area of 0.90 m^2 (9.69 ft^2) in the deeper central and eastern portions. The lengths of the trenches were defined by Caldwell to be 559 m (1,835 ft) for the shallow burial and 741 m (2,431 ft) for the deeper burial. The jet plow rate of advance was provided by the cable installer, Caldwell Marine International, LLC to be 100 m/hr (330 ft/hr). The model run was started on the west side of Little Bay at slack high water which is the beginning of the ebb tide. It was also conservatively assumed, based on past experience, that 25% of the material in the trench would be resuspended into the water column by the jetting activity.

The cables in the nearshore areas are to be buried by divers in trenches with a minimum depth of 1.07 m (42 in) deep in the shallows on both the western and eastern portions of Little Bay with lengths of 90 m (296 ft) in the western portion and 178 m (584 ft) in the eastern portion. The total depth of the trench was 1.22 m (48 in). Based on Caldwell's specification the trench width was defined as 1.22 m (48 in) resulting in a trench cross sectional area of 1.49 m^2 (16 ft^2). The diver rate of advance was much slower than the jet plowing at 2.3 m/hr (7.5 ft/hr) with an operational time restriction of 4 hr/dy. It was also conservatively assumed, based on past experience, that 50% of the material in the trench would be resuspended into the water column by the diver activity. The model run was started around two hours before high slack water and continued for four hours due to diver requirements of lower currents and deeper water. An option to use silt curtains for the diver burial operations in the western and eastern portions was also examined.

Jet Plowing

The size of the resulting excess suspended sediment (SS) concentration plume in the lower water column is defined as a series of areas enclosed by different concentration levels. The water column concentration contours shown, which are defined by a single concentration level, totally surround an enclosed area where concentrations are at or above the specified concentration, i.e., the area is cumulative. The entire area encompassed by the plume (as defined by the 10 mg/L excess SS concentration contour) averaged over time was 14.8 ha (36.58 ac) ranging from a low of 5.91 ha (14.61 ac) at 1 hr to a high of 22.36 ha (55.25 ac) at 10 hrs. These total enclosed areas dropped dramatically for the higher concentrations, averaging 1.94 ha (4.79 ac) at 100 mg/L, 0.28 ha (0.68 ac) at 1,000 mg/L and 0.02 ha (0.05 ac) at 5,000 mg/L. indicating that the extent of the plume is limited for higher concentrations. In the shallows, suspended sediments from the jet plow activity are likely to reach nearly to the water surface. In the channel, excess suspended sediments will be restricted to the lower half of the water column.

An important metric defining the plume is its duration for different concentrations, which could have biological significance if exposure (duration multiplied by concentration) is sufficiently elevated. The maximum plume size and duration at 10 mg/L excess SS concentration in the area that is totally enclosed by the contour is 90.20 ha (222.89 ac) but lasts for only 1 hr. This short duration continues for all the concentration contour thresholds through 1,000 mg/L. The enclosed areas quickly drop in time for a given concentrations so by 2 hrs the 10 mg/L area has dropped to 32.20 ha (79.57 ac) and the plume has completely dissipated within 6 hrs. The area coverages drop dramatically for the higher concentrations near the jet plow indicating that the duration and extent of the plume is relatively limited. Once the jet plow reaches the eastern terminus and shuts down no additional sediment will be suspended and the residual plume will quickly dissipate.

The bottom deposition was calculated based on all three cable routes being jet plowed and assuming that any sediment deposited on the bottom remained in place. The bottom deposition thickness is defined for the area exclusively between the range of thicknesses described, i.e., the area is not cumulative. As with the water column concentrations of suspended sediment the sizes of the deposition thickness patterns generally drop in size, but not always. At the range of 0.1 to 0.5 mm (0.004 to 0.02 in) thickness the area is 35.6 ha (87.9 ac) due to jet plowing the three cable routes. These areas drop overall for the high deposition thicknesses (e.g., 2.4 ha [5.9 ac] for the 5 to 10 mm (0.2 to 0.4 in) thickness range) near the jet plow indicating that the extent of the plume is relatively limited.

Diver Burial Assuming No Use of Silt Curtains

The size of the excess SS concentration plumes for the west and east diver burial sections were also examined. It was assumed that no silt curtains were used during this activity (if they had been modeled the amount of excess SS and would be reduced 10-fold outside the silt curtained area). Typically, at 10 mg/L excess SS concentration, the instantaneous total area enclosed by the contour is 8.4 ha (20.7 ac) for the west section and 1.9 ha (4.7 ac) for the east section. However, these total enclosed areas drop dramatically for the higher concentrations near the diver burial activities, i.e., the area at 1,000 mg/L is only about 0.2 ha (0.6 ac) for the west section and 0.0 ha (0.1 ac) for the east section, indicating that the extent of the plume is again relatively limited.

Assuming no silt curtains were used, the total area in the west section that is enclosed by the 10 mg/L excess SS concentration contour is 14.6 ha (36.1 ac) but lasts for only 1 hr. This short duration continues through all the concentration contour thresholds through 5,000 mg/L. The enclosed areas decrease in time for a given concentrations so by 6 hrs the 10 mg/L area has dropped to 8.6 ha (21.2 ac). The 10 mg/L area persists for two days because the initial buildup occurs near slack water with grain size distribution indicating mostly fines (silts and clays). The area coverages decrease for higher concentrations near the diver burial activities. At the east section the 10 mg/L excess SS concentration total area that is enclosed by the contour is 8.2 ha (20.2 ac) but lasts for only 1 hr. This short duration continues through all the concentration contour thresholds through 500 mg/L. The enclosed areas decrease in time for a given concentration so by 6 hrs the 10 mg/L area has dropped to 4.1 ha (10.2 ac). The 10 mg/L area persists for two days because the initial buildup occurs near slack water with grain size distribution indicating mostly fines (silts and clays). The area coverages decrease for higher concentrations near the diver burial activities.

The sizes of the deposition thickness patterns also dropped as the deposition increased. At the 0.1 to 0.5 mm (0.004 to 0.02 in) thickness range the area is 3.4 ha (8.5 ac) for the west and 4.4 ha (10.8 ac) for the east, both including the three cable routes combined. These areas drop dramatically for the higher deposition thicknesses (e.g., 0.5 ha [1.2 ac] for the 10 to 50 mm (0.4 to 2 in) thickness on the west section and 1.2 ha (2.9 ac) for the east section indicating that the extent of the plume is limited.

Diver Burial Assuming Use of Silt Curtains

The effects of using silt curtains were estimated by assuming that 90% of the suspended sediment resuspended from diver burial operations would be trapped by the curtains. That being the case, the results based on no silt curtain use can be reduced by a factor of 10 to estimate the concentrations outside the silt curtain. At 10 mg/L excess SS concentration the area enclosed by the contour was 1.2 ha (3.0 ac) for the west section and 0.4 ha (0.9 ac) for the east section.

In terms of exposure, for the west section at 10 mg/L excess SS concentration the area that is enclosed by the contour is 5.9 ha (14.7 ac) but lasts for only 1 hr. The areas decrease in time for a given concentrations so by 6 hrs the 10 mg/L area has dropped to 2.3 ha (5.7 ac). For the east section at 10 mg/L excess SS concentration the area that is enclosed by the contour is 2.1 ha (5.1 ac) but lasts for only 1 hr. The areas decrease in time for a given concentration so by 6 hrs the 10 mg/L area has dropped to 1.4 ha (3.6 ac). The area within the silt curtain area would, of course, see a significant increase in concentration until the material has settled out.

With the use of silt curtains the bottom deposition thickness outside the silt curtains can also be reduced by a factor of 10. At the 0.1 -> 0.5 mm (0.004 -> 0.02 in) thickness the area enclosed by the contour is 1.9 ha (4.6 ac) for the west and 1.1 ha (2.6 ac) for the east. Based on the trench geometry for diver burial 90% of the entire west resuspension volume or 181.0 m^3 (6,394 ft^3) spread over the area enclosed by the silt curtain results in an average deposition thickness of 94 mm (3.71 in) while 90% of the entire partial east resuspension volume or 224.5 m^3 (7,927 ft^3) spread over the enclosed area results in an average deposition thickness of 110 mm (4.32 in). Larger thicknesses would be found closest to the burial routes (including in the trenches) and smaller thicknesses found closer to the silt curtains distant from the routes.

Stability of Deposited Sediments

A measure of the stability of deposited sediments to the seabed is a function of the erosion velocity for each grain size in the sediment. Since the freshly deposited sediment is unconsolidated, the fine grains (clay and silt) and sand are eroded at a velocity of about 20 cm/s (0.4 kt). Maximum tidal currents exceed this minimum speed across most of Little Bay except in the shallows very near the shore. Thus sediment particles deposited along much of the route will likely be resuspended on subsequent tides and dispersed from the areas initially affected by deposition.

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1 Introduction

Public Service of New Hampshire d/b/a Eversource Energy (PSNH) has proposed the construction of an electrical cable system to increase the reliability of the electrical transmission grid in southern New Hampshire. This cable, known as the Seacoast Reliability Project, would cross the Little Bay portion of the Great Bay Estuarine System as shown in Figure 1-1. The crossing would entail burial of three separate but parallel cable bundles by jet plowing, which is a technique that liquefies the sediment with high pressure water jets and simultaneously allows the cable to be buried at a predetermined depth. The cable sections in the shallow areas near the western and eastern landfalls will be buried by diver. The environmental consultant for the Project, Normandeau Associates, Inc. (Normandeau), contracted with RPS ASA to supply its modeling capabilities to simulate the jet plowing process along the cable route to determine both the likely suspended sediment concentrations generated in the water column above the cable route and the resulting re-deposition of the sediments in and along the route.

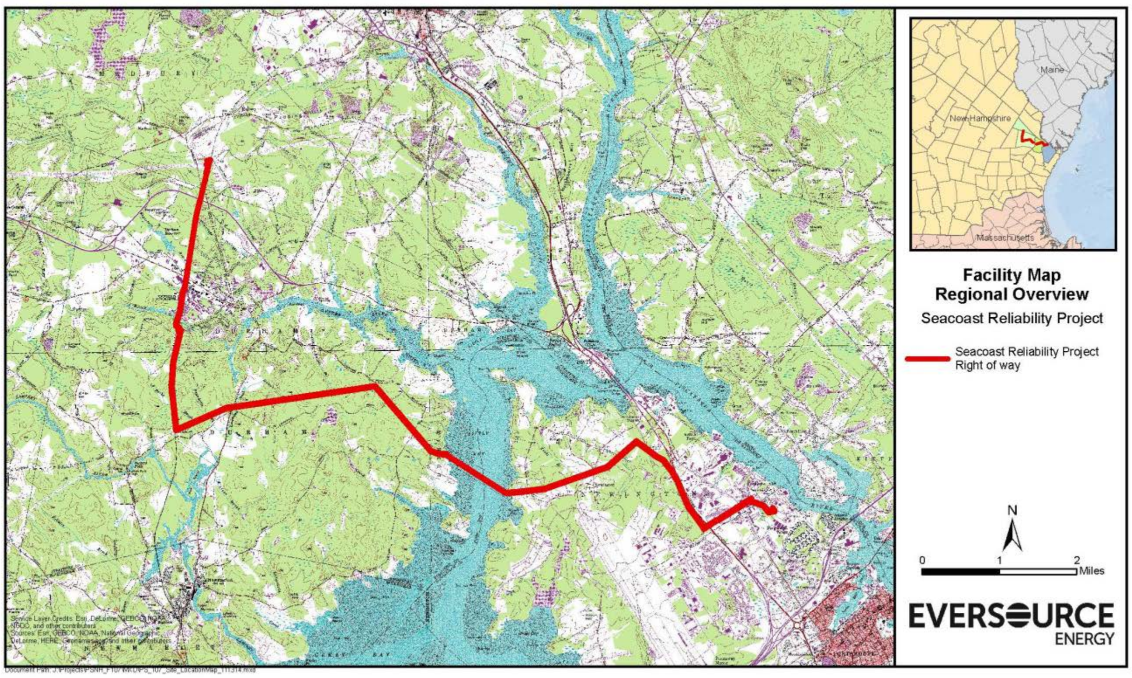

Figure 1-1. Location of the proposed cable route across Little Bay in the Great Bay Estuarine System (image from Normandeau Associates).

This report documents the hydrodynamic and sediment dispersion modeling activities performed to assess the effects from installation of the electrical cable using jet plowing and diver burial. Specifically, Section 1 provides an introduction to the effort by RPS ASA documented in the report, Section 2 presents the hydrodynamic modeling performed, and Section 3 presents the sediment dispersion modeling performed. Section 4 consists of conclusions drawn from the study and references are listed in Section 5.

2 BELLAMY Hydrodynamic Model

2.1 Model Description

A computer model system developed at Dartmouth College and previously applied by RPS ASA to the Great Bay Estuarine System (GBES) (McLaughlin et al. 2003) was used in this analysis and was based on the recent work of Swanson et al. (2014). The model system includes a finite element, two-dimensional, vertically averaged, time stepping circulation model. The circulation model, known as BELLAMY, can calculate the time varying surface elevation and currents under the influence of tides, winds and river flow on a model domain discretized by a large number of finite element triangles. Due to the fact that Great Bay is tidally dominated (currents up to 2 m/sec) and much of it consists of narrow channels in which the tidal currents mostly flow in flood and ebb directions, the effect of wind is expected to show only in areas with relatively larger wet surface areas such as Great Bay proper and not Little Bay where the cable burial will occur. The model includes simulation of wetting and drying of tidal flats.

All simulation parameters were set to be consistent with previously published work. The reader is referred to Swanson et al. (2014), Bilgili et al. (2005) and McLaughlin et al. (2003) for more detailed information. Sensitivity analyses previously reported are the basis for some of the values chosen. Some key assumptions and resulting parameter values are summarized as follows:

- The model domain consists of the entire GBES plus a stretch of the coastal Atlantic Ocean extending from Portland, ME, in the north to the tip of Cape Ann, MA, in the south to incorporate the effect of the Gulf of Maine coastal current. The Little Bay region is shown in Figure 2-1 between the Lower Piscataqua River-North to the east and Great Bay to the south.
- Tidal forcing used the constituent set of M2, N2, S2, O1, K1 and Z0 as described in previously published work (Bilgili et al. 2005).
- No wind forcing was applied to be consistent with previous studies, which showed the wind effect is short term and minimal, particularly since the modeling focused on steady state conditions.
- The model includes annually averaged freshwater discharges from the major rivers as constant values (Bilgili et al. 2005). The effect of time varying discharges is not investigated due to the fact that the total freshwater volume entering the estuary is less than 2% of the tidal prism (Reichard and Celikkol, 1978). The yearly averaged discharges from the WWTF outfalls are also incorporated as constants since these are considered as additional fresh water sources (Trowbridge, 2009).
- The internal hydrodynamic model time step was 99.36 seconds with model predicted velocities output on a 30 min interval. The model was run to capture the 15-day spring-neap cycle.

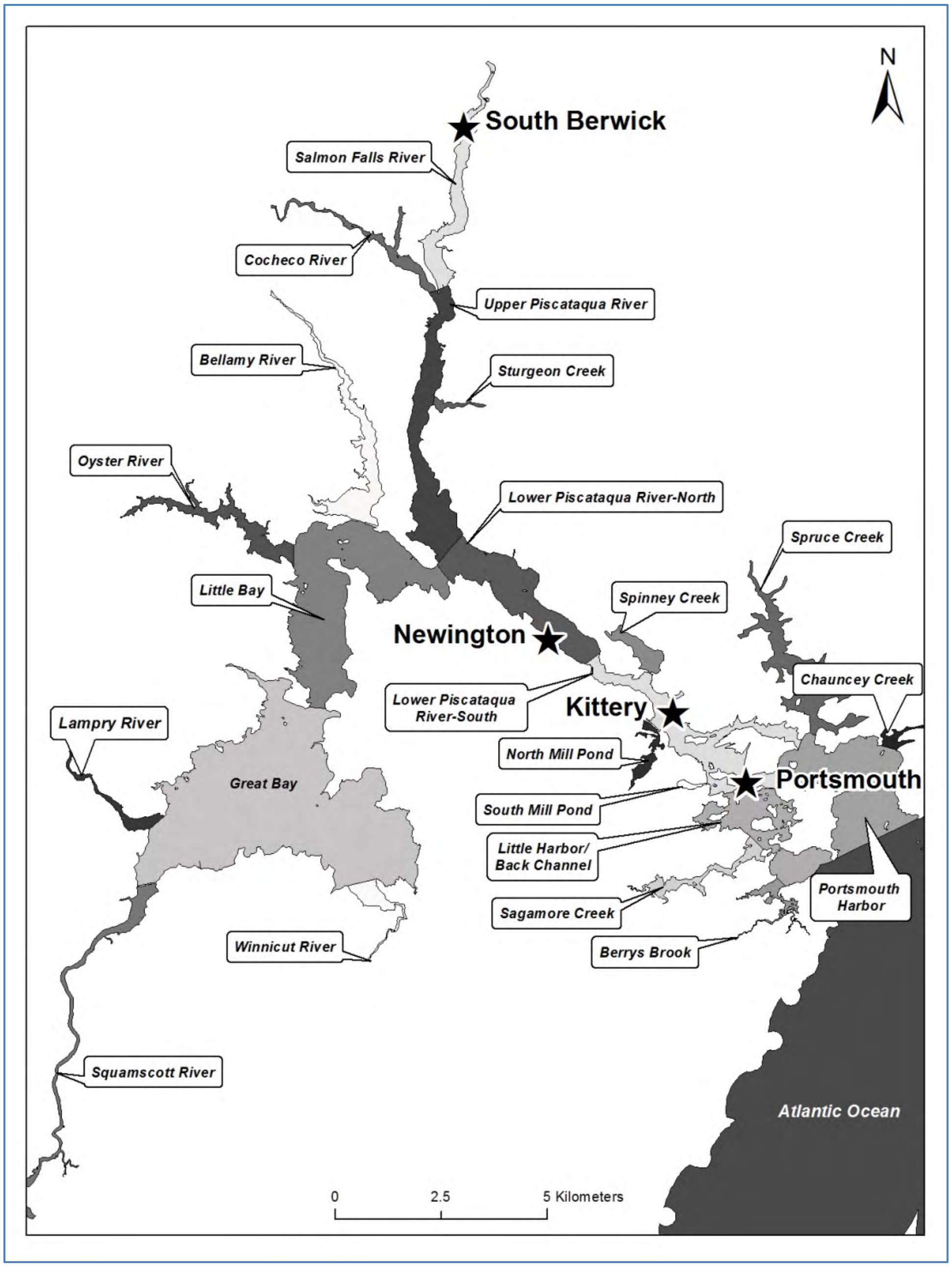

Figure 2-1. Great Bay Estuarine System regions used for previous modeling (Swanson et al., 2014). Little Bay is located in the central portion of the System.

BELLAMY has been tested and calibrated extensively in the Great Bay estuary over the past two decades (Ip et al. 1998; Erturk et al. 2002; McLaughlin et al. 2003; Bilgili et al. 2005). One quantitative statistical measure indicating how well the model reproduces observed currents is “skill”, with 0 indicating no match to data and 1 indicating perfect match with data. McLaughlin et al. (2003) report a mean skill of 0.918 while the Bilgili et al. (2005) work improves this to 0.942 for cross-section averaged current velocity comparisons. Point velocity comparisons also show good fit (McLaughlin et al. 2003; Bilgili et al. 2005), especially considering the inherent variability in this type of measurements.

2.2 Model Results

As noted above the current velocities to be used to disperse the excess suspended sediment were based on previous hydrodynamic modeling of the Great Bay System. Example current vectors for flood and ebb tides in lower Little Bay are shown in Figures 2-2 and 2-3. The vectors are scaled as displayed in the window in the upper left portion of the figures. The line shown across the Bay is a representative approximation of the route of the cables. The strength of the currents is similar in both flood and ebb directions at about 50 cm/s (1 kt) except at the shallow areas located on both sides of the Bay where the currents are reduced.

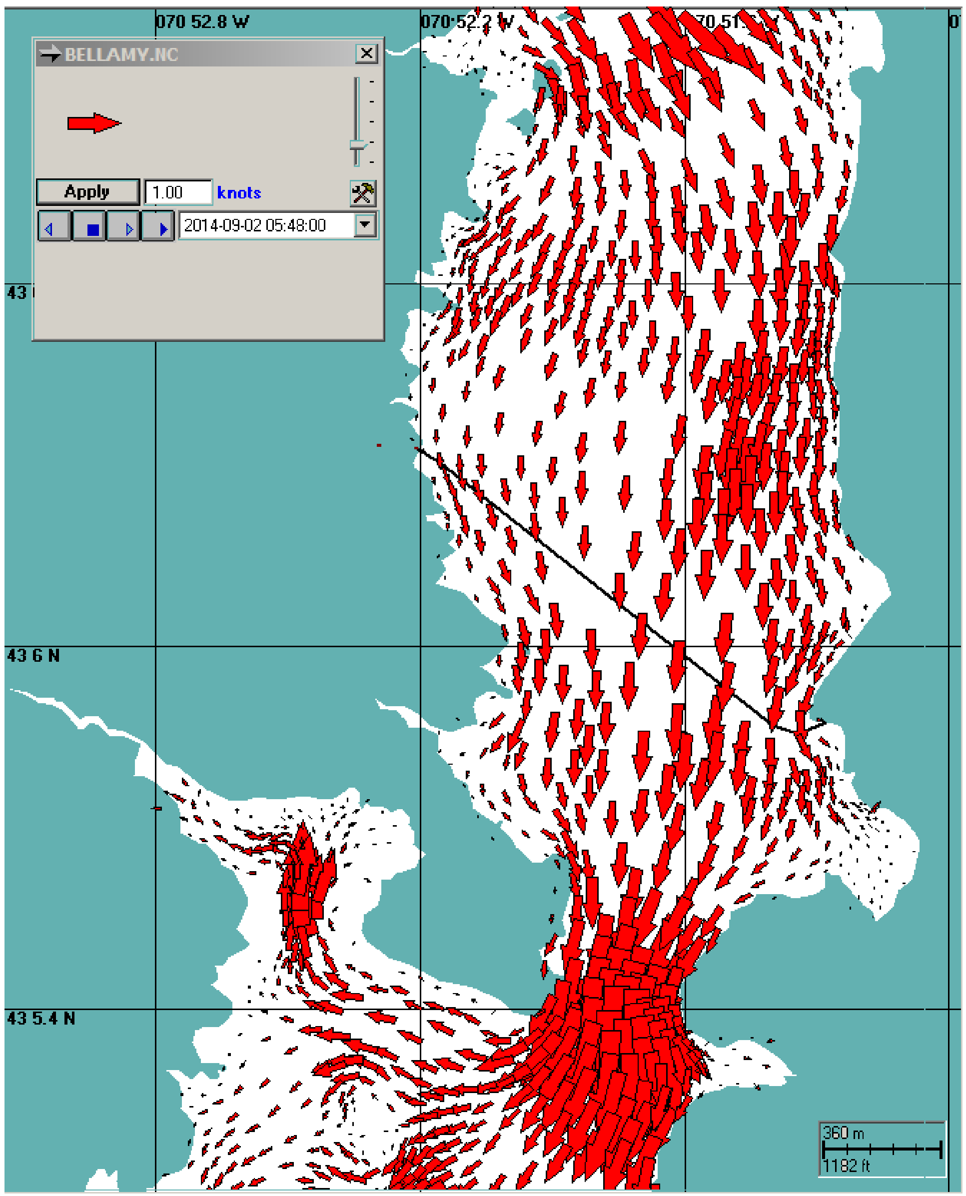

Figure 2-2. Example flood tide currents for lower Little Bay with the solid black line indicating the approximate cable route.

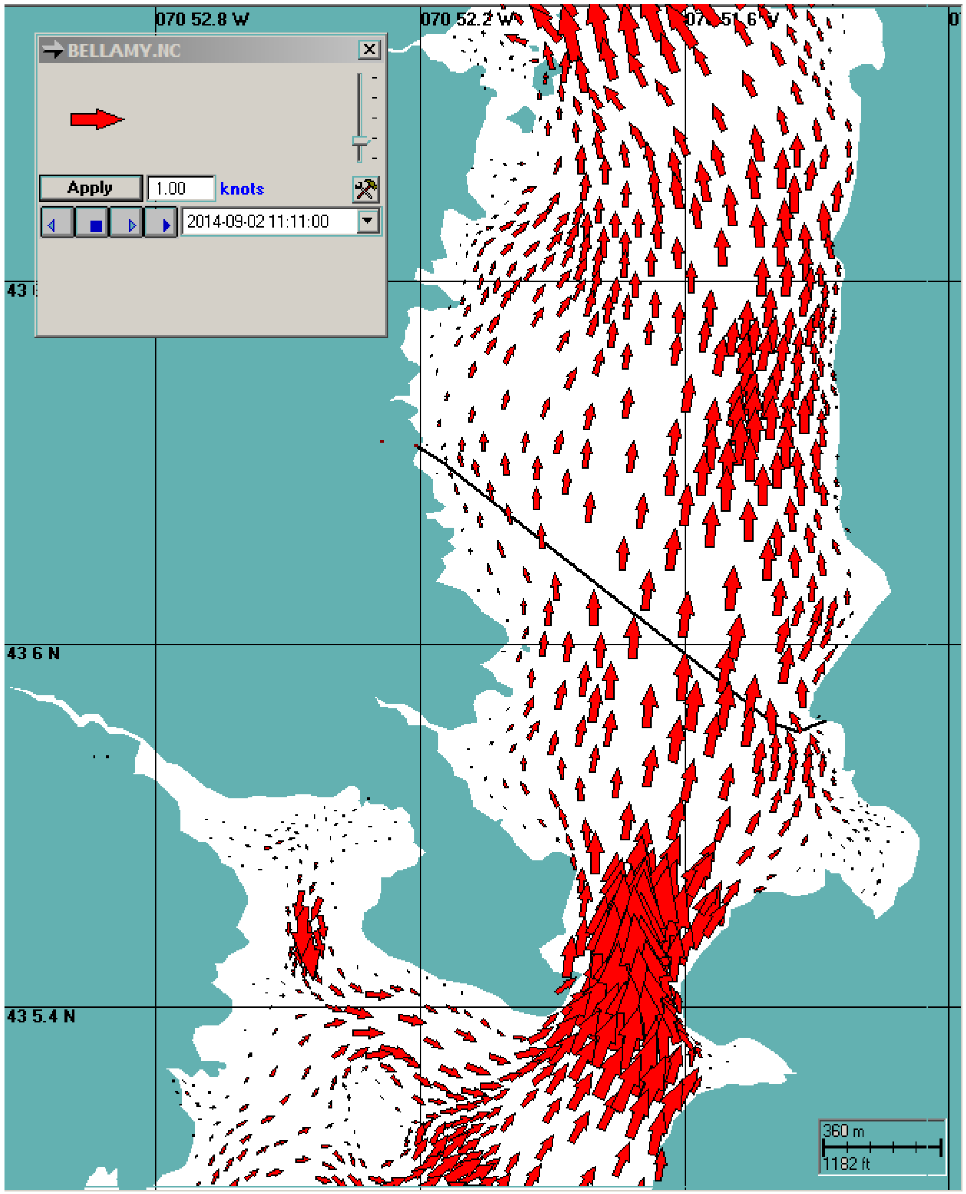

Figure 2-3. Example ebb tide currents for lower Little Bay with the solid black line indicating the approximate cable route.

3 SSFATE Sediment Dispersion Model

3.1 Model Description

The SSFATE (Suspended Sediment FATE) model was utilized to predict the excess suspended sediment concentration and the dispersion of suspended sediment resulting from jetting and diver activities. SSFATE addresses the short term movement of sediments where sediment is introduced into the water column and predicts the path and fate of the sediment particles using the local currents. Excess concentration is defined as the concentration generated by the jetting or diver activities above ambient suspended sediment concentration. In addition SSFATE calculates the resulting deposition thickness of resuspended sediments that have resettled back on the bottom.

SSFATE was jointly developed by ASA and the U.S. Army Corps of Engineers (USACE) Environmental Research and Development Center (ERDC) to simulate the sediment suspension and deposition from jetting operations. It has been documented in a series of USACE Dredging Operations and Environmental Research (DOER) Program technical notes (Johnson et al. 2000 and Swanson et al. 2000); at a previous World Dredging Conference (Anderson et al. 2001) and a series of Western Dredging Association Conferences (Swanson et al., 2004; Swanson and Isaji, 2006). A number of ASA technical reports have been prepared that demonstrate successful application to dredging. In addition SSFATE has been extended to include the simulation of dredged material disposal as well as cable and pipeline burial operations using water jet plows (Swanson et al., 2006; Mendelsohn et al., 2012), diver activities and mechanical plows.

The SSFATE modeling system computes suspended sediment distributions and deposition patterns resulting from various seabed activities. The suspended sediment concentrations are computed in three dimensions while the depositional patterns are computed in two dimensions. The model contains the following features:

- Ambient currents can be imported from a variety of numerical hydrodynamic models;
- The procedure which is a standard numerical approach that mimics the mixing of sediment within the water column due to turbulence;
- SSFATE simulates suspended sediment source strength and vertical distribution from mechanical (e.g., clamshell, long arm excavator) or hydraulic (e.g., cutterhead, hopper) dredges; and water jet plows, divers and mechanical plows;
- SSFATE assumes a continuous release of sediments over time, and calculates average excess sediment concentrations within each grid cell (minimum cell dimension of 10 to 25 m) at each time step;
- Multiple sediment types (different grain sizes) or fractions can be simulated simultaneously;
- SSFATE output consists of excess suspended sediment concentration contours in both horizontal and vertical planes, time series plots of concentrations, and the spatial distribution of sediment deposited on the sea floor.

In far field calculations the mean transport and turbulence associated with ambient currents dominate the distribution of the sediment particles. SSFATE, a particle-based model, predicts the transport and dispersion of the suspended material generated by seabed activities. Particle advection (i.e., transport) is based on the simple relationship that a particle moves linearly with a local velocity, obtained from the hydrodynamic model, for a specified model time step. Particle diffusion (i.e., dispersion) is assumed to follow a simple random walk process frequently used in simulating the dispersion of particles.

The particle model allows the user to predict the transport and dispersion of the different size classes of particles e.g., sands, silts, and clays. The particle-based approach is extremely robust and independent of the grid spacing. Thus, the method is not subject to artificial diffusion near sharp concentration gradients and is easily interfaced with all types of sediment sources including dredging, jet plowing, and backfilling operations.

In addition to transport and dispersion, sediment particles also settle at some rate through the water column to the bottom. Settling of mixtures of particles, some of which may be cohesive in nature, is a complex but predictable process with the different size classes interacting, i.e., the settling of one particle size is not independent of the other sizes. In addition, the clay-sized particles, typically cohesive, undergo enhanced settling due to flocculation. These processes have been implemented in SSFATE using empirically based formulations based on previous USACE studies (Teeter, 1998).

At the end of each time step, the concentration of each sediment class, as well as the total concentration, is computed on a concentration numerical grid. The size of all grid cells is the same, with the total number of cells increasing as the excess suspended sediment moves away from the source. The settling velocity of each particle size class is computed along with a deposition probability based on shear stress. Finally, the deposition of sediment from each size class from each bottom cell during the current time step is computed and the calculation cycle begins anew. Deposition is calculated as the mass of sediment particles that accumulate over a unit area.

Outputs from the model are sediment concentrations for each grid cell and deposition thickness for each grid cell that shares a boundary with the bottom of the river or bay. Concentrations and thicknesses are available for every time step during the period that the model is run.

3.2 Seabed Sediment Characterization

The sediment grain size information was extracted from vibracore data logs taken during a survey for the project in April 2014 by Normandeau (personal communication). The survey consisted of 12 sampling stations shown in Figure 3-1. The qualitative descriptions of each vibracore sediment sample were converted into fractions of sand, silt and clay based on a classification scheme presented by Flemming (2000). The classification scheme uses a ternary diagram where text descriptions of sediment texture (for example, “silty sand”), as summarized in Table 3-1, are mapped onto the diagram and assigned a sand-silt-clay ratio. If a vibracore contained only one sediment sample, the ratio obtained from the diagram defined the size fractions used in the SSFATE model simulations (Table 3-2). If more than one sediment sample was taken from a vibracore, a composite of the size fractions was calculated based on the relative quantities each sample contributed to the whole. Since the SSAFTE classification scheme divides silt into medium-fine and fine silt, the silt fraction obtained from the ternary diagram was equally divided.

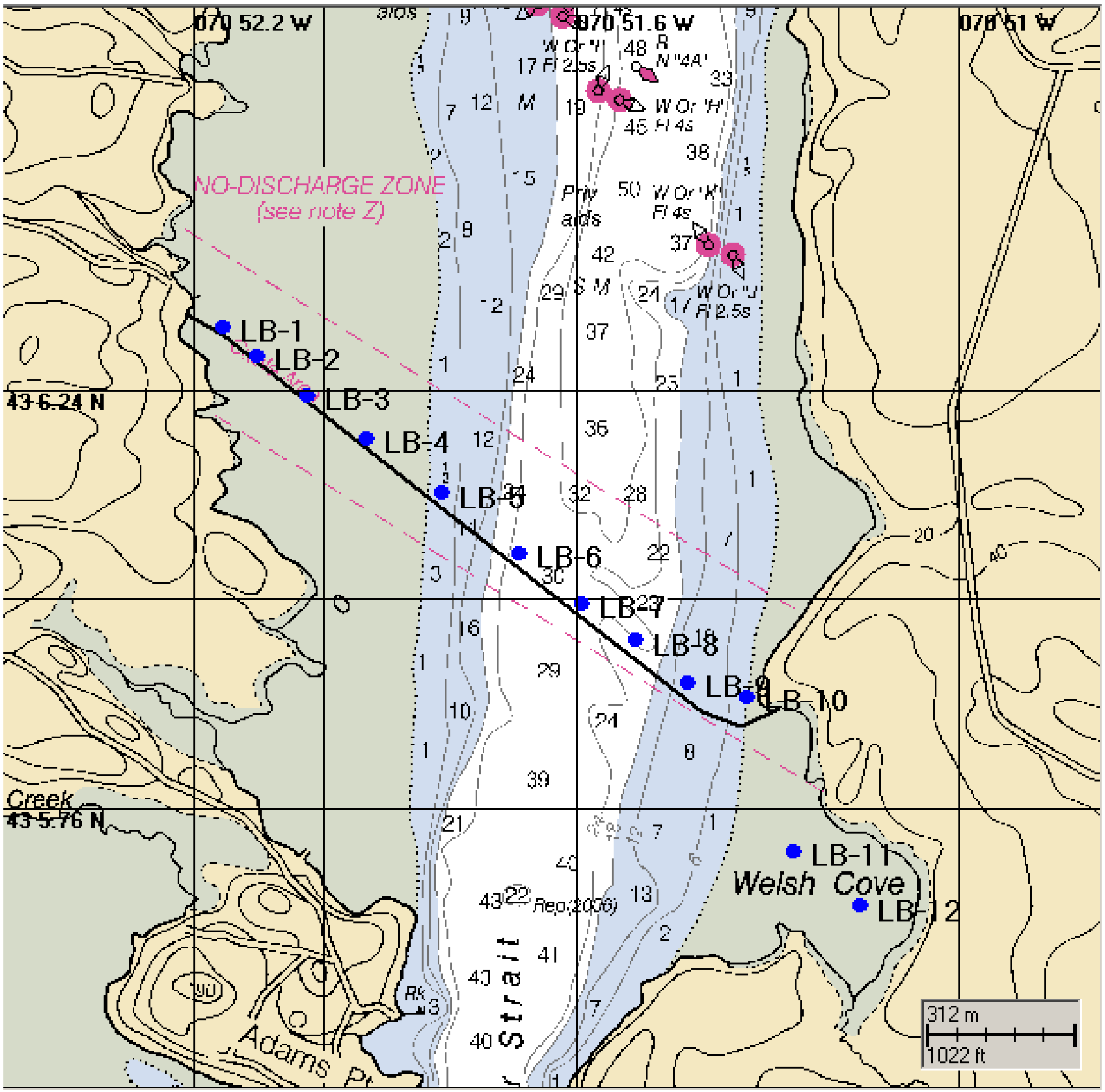

Figure 3-1. Location of vibracore borings across Little Bay along route of cable crossing (indicated by solid line).

Table 3-1 summarizes the vibracore data logs by location across the Bay from tidal flats at the western shore to Welsh Cove at the eastern shore, the Station number, penetration depth and sediment description. Table 3-2 and Figure 3-2 show the resulting sediment grain size distributions for each boring.

Table 3-1. Qualitative description of sediments along cable route from vibracore data logs from survey conducted in April 2014.

Zone	Station	Penetration Depth	Sediment Description
Tidal Flat (west)	LB-1-A	94”	Cohesive Clay with silt
	LB-2-B	104”	
	LB-3-B	104”	
	LB-4-A	120”	Cohesive Clay with silt and trace of fine sands
	LB-5-B	86”	
Channel	LB-6-A	44”	Cohesive Fine to medium sand with small amount of clay and silt
	LB-7-B	63”	0-19”: Cohesive Fine to medium sand with small amount of clay and silt
			19-63”: cohesive Clay with silt
	LB-8-B	29”	0-15”: cohesive Fine to medium sand with small amount of clay and silt
			15-22”: cohesive Fine sand and clay, shell fragments present
			22-29”: cohesive Clay
Slope	LB-9-A	97”	0-22”: cohesive Fine to medium sand with small amount of clay and silt
			22-97”: cohesive Clay with silt, minor shell fragments throughout
Tidal Flat (east)	LB-10-D	44”	Cohesive Fine to medium sand with small amounts of clay

Zone	Station	Penetration Depth	Sediment Description
Welsh Cove	LB-11-B	103"	Cohesive Clay and fine sand with silt
	LB-12-B	46"	0-18": cohesive Clay and fine sand with silt
			Cohesive Fine to medium sand with little clay and silt; minor amount of wood debris and shell fragments

Table 3-2. Grain size distributions (in percent) for vibracore stations (composited over vertical).

CORE	Coarse Sand	Fine Sand	Med Fine Silt	Fine Silt	Clay
LB-1-A	0.00	0.00	10.00	10.00	80.00
LB-2-B	0.00	0.00	10.00	10.00	80.00
LB-3-B	0.00	0.00	10.00	10.00	80.00
LB-4-A	0.00	5.00	7.50	7.50	80.00
LB-5-B	0.00	5.00	7.50	7.50	80.00
LB-6-A	9.00	81.00	2.50	2.50	5.00
LB-7-B	1.78	16.03	10.52	10.52	61.15
LB-8-B	1.41	17.03	2.32	2.32	76.93
LB-9-A	2.06	18.56	10.21	10.21	58.96
LB-10-D	9.00	81.00	2.50	2.50	5.00
LB-11-B	0.00	20.00	2.50	2.50	75.00
LB-12-B	7.31	69.56	2.50	2.50	18.13

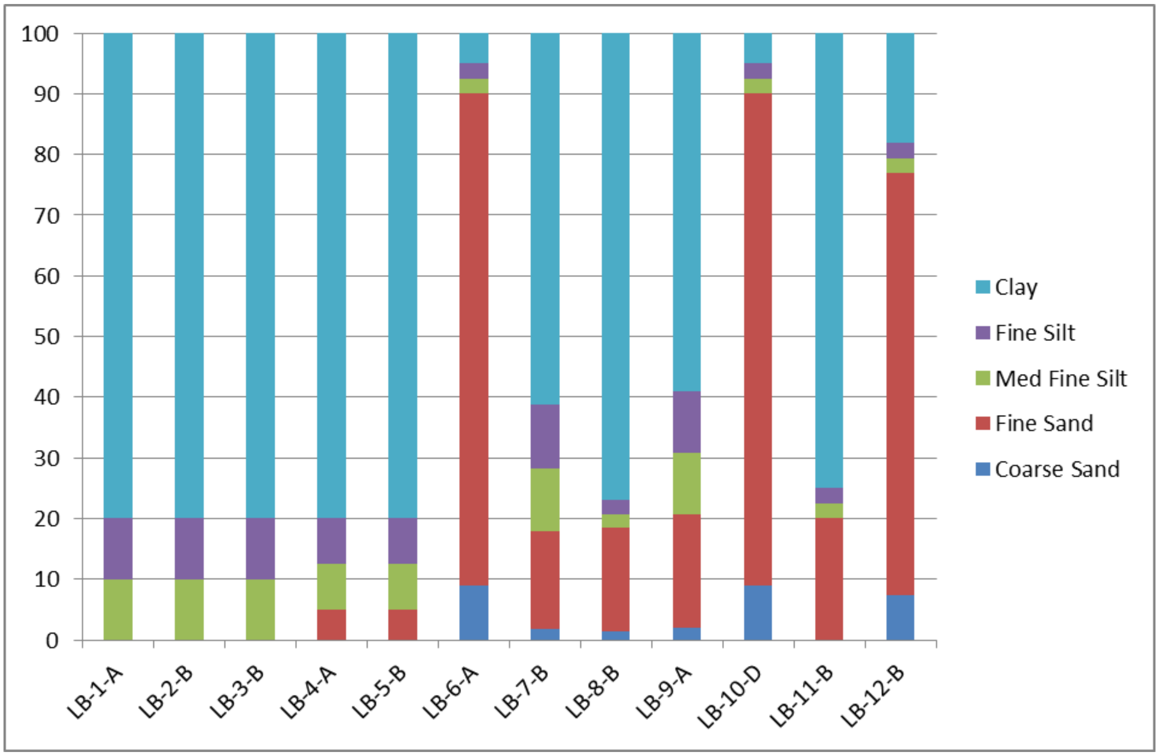

Figure 3-2. Histogram of grain size distributions (in percent) for vibracore stations in Little Bay.

The first five cores exhibit a large fraction (80%) of clay with smaller fractions of fine silt, medium fine silt and fine sand. In contrast cores LB-6-A and LB-10-D show 81% fine sand followed by LB-12-B with 70% fine sand, all within a range of 7 to 9% coarse sand. Cores LB-7-B, LB-8_B, LB-9-A and LB-11-B show clay fractions between 59 and 77% clay and between 16 and 20% fine sand. In general the cores with higher fines fractions will tend to generate larger suspended sediment plumes while those with higher sand fractions smaller plumes.

3.3 Model Input Parameters

The details of the planned route across Little Bay are shown in Figure 3-3 with the upper panel showing the western half of the route and the lower panel showing the eastern half. The three angled parallel lines represent the jet plow portion of the crossing for the three bundled cables with a separation of 9.4 m (30 ft). The western and eastern ends connecting the jet plowing portions to the land are represented by non-parallel routes ending at the shore which use diver burial.

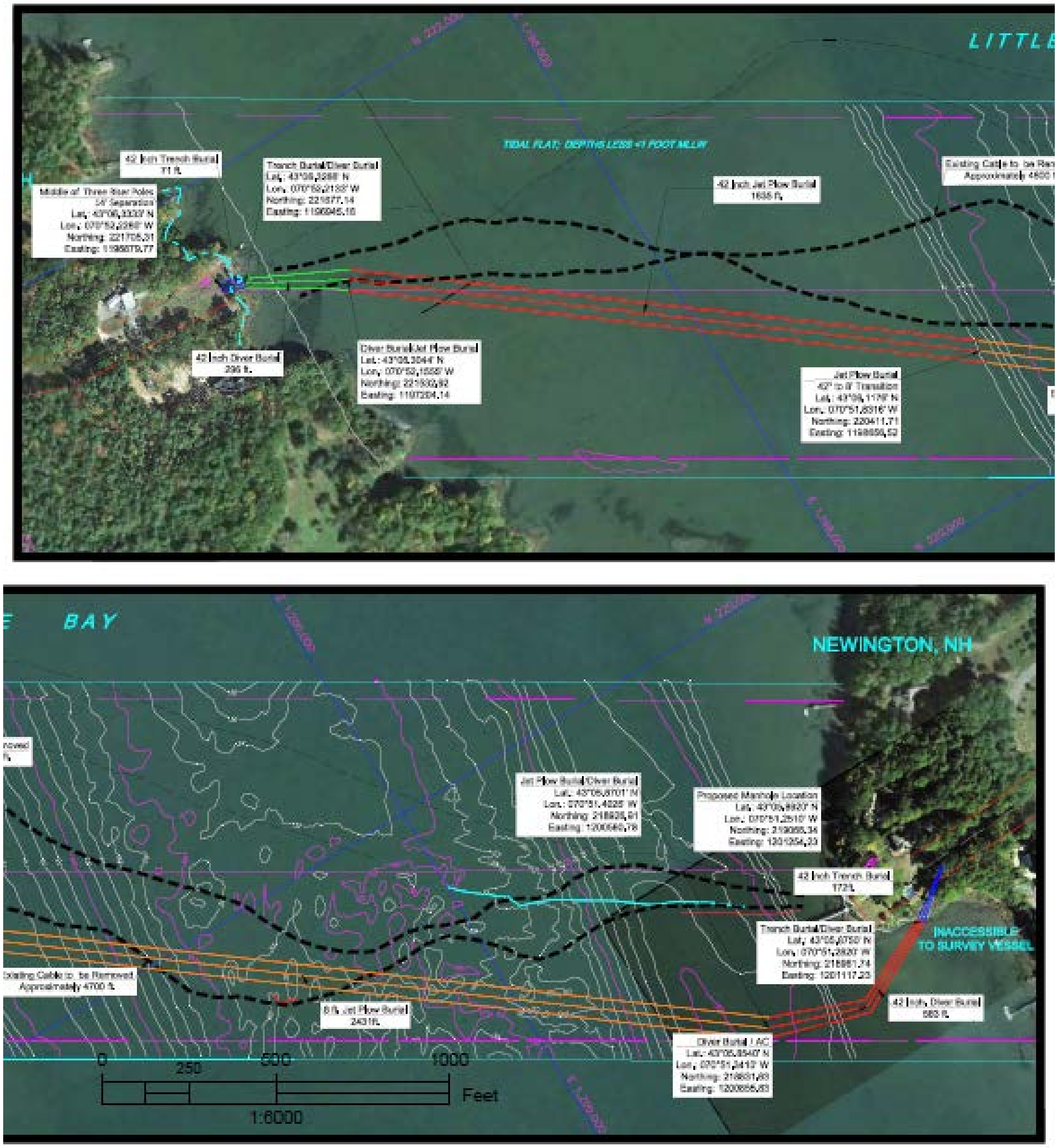

Figure 3-3. Details of proposed cable routes across Little Bay developed by Caldwell (Rev 6 Issue 01 – 20150424). Upper panel shows western half and lower panel shows eastern half.

3.3.1 Jet Plow Burial

The jet plow rate of advance was provided by the cable installer, Caldwell Marine International, LLC to be 100 m/hr (328 ft/hr). The central cable route among the three cable bundles crossing Little Bay was chosen for modeling since the cables are to be separated by only 9.4 m (30 ft).

The cables are to be buried by jet plowing to minimum depths of 1.07 m (42 in) deep in the shallows on the western but offshore section of Little Bay and 2.44 m (8 ft) in the center and east sections. For ease of discussion, this report refers to the jet plow disturbance as a trench although while the jet plow will be occupying a three-dimensional space, the "trench" is very temporary as it will fill in immediately behind the jet plow. The total depth of the trench included the minimum burial depth plus the cable diameter of 0.15 m (6 in) and an overage of 0.20 m (8 in) totaling 1.42 m (96 in) for the western section and 2.79 m (110 in) for the central and eastern sections. Based on Caldwell's specification the vertical-walled trench width was defined as 0.32 m (12.75 in) resulting in a trench cross sectional area of 0.46 m^2 (5.0 ft^2) in the shallow western portion and an area of 0.90 m^2 (9.7 ft^2) in the deeper central and eastern portions. The length of the each trench was defined by Caldwell to be 559 m (1,835 ft) for the shallow burial and 741 m (2,431 ft) for the deeper burial. The model run was started on the west side of Little Bay at slack high water which is the beginning of the ebb tide.

It was assumed that 25% of the material in the trench would be resuspended into the water column by the jetting activity. This is a conservative estimate consistent with previous studies that found a range of 10 to 35% (Foreman, 2002). Caldwell indicated that the jet plow technology they will be using generates significantly lower resuspension rates, closer to about 10%.

Table 3-3 summarizes the trench dimensions and SSFATE input parameters used in the jet plow simulation.

Table 3-3. Summary of trench dimensions and SSFATE input parameters for the jet plow portion of the cable burial simulation.

Parameter	Shallow Jet Plow Burial	Deep Jet Plow Burial
Cable burial depth	1.07 m 3.50 ft	2.44 m 8.00 ft
Cable diameter	0.15 m 0.5 ft	0.15 m 0.5 ft
Overage amount	0.2 m 0.67 ft	0.2 m 0.67 ft
Total trench depth	1.42 m 4.67 ft	2.79 m 9.17 ft
Trench width	0.32 m 12.75 in	0.32 m 12.75 in
Trench cross sectional area	0.46 m^2 4.96 ft^2	0.90 m^2 9.7 ft^2
Route distance	559 m 1835 ft	741 m 2431 ft
Advance Rate	100 m/hr 328 ft/hr	100 m/hr 328 ft/hr
Duration	5.6 hr	7.4 hr
Timing	Start at high slack	Continue after shallow portion
Resuspension Fraction	25% of trench volume	25% of trench volume

3.3.2 Diver Burial

The diver rate of advance was much slower than the jet plow at 2.3 m/hr (7.5 ft/hr). Again the central cable route among the three cable bundles crossing Little Bay was chosen for modeling since the cables are to be separated by a maximum of 9.4 m (30 ft) and decreased as they approached the landfalls.

The cables are to be buried by divers in trenches with a minimum depth of 1.07 m (42 in) deep in the shallows on both the western and eastern portions of Little Bay with lengths of 90 m (296 ft) in the western portion and 178 m (584 ft) in the eastern portion. The total depth of the trench included the minimum burial depth plus the cable diameter of 0.15 m (6 in) which equals 1.22 m (48 in). Based on Caldwell's specification the trench width was defined as 1.22 m (48 in) resulting in a trench cross sectional area of 1.49 m^2 (16.0 ft^2). The model run was started two hours before high slack water and continued for four hours due to diver requirements of working in lower currents and deeper water. It was also assumed, based on past experience, that 50% of the material in the trench would be resuspended into the water column by the diver activity. This rate is twice the rate for jet plowing because the technology used, high pressure water hoses, is expected to cause a higher resuspension rate. Modeling was done assuming that silt curtains would not be employed during the diver installation.

Table 3-4 summarizes the trench dimensions and SSFATE input parameters used in the diver portion of the simulation.

Table 3-4. Summary of trench dimensions and SSFATE input parameters for the diver portion of the single cable burial simulation.

Parameter	West Diver Burial	East Diver Burial
Cable burial depth	1.07 m 3.50 ft	1.07 m 3.50 ft
Cable diameter	0.15 m 0.5 ft	0.15 m 0.5 ft
Total trench depth	1.22 m 4.00 ft	1.22 m 4.00 ft
Trench width	1.22 m 4.00 ft	1.22 m 4.00 ft
Trench cross sectional area	1.49 m^2 16.0 ft^2	1.49 m^2 16.0 ft^2
Route distance	90 m 296 ft	178 m 583 ft
Advance Rate	2.29 m/hr 7.5 ft/hr	2.29 m/hr 7.5 ft/hr
Duration	4 hr/day for 9.9 days	4 hr/day for 19.4 days
Timing	Start at 2 hrs before high slack	Start at 2 hrs before high slack
Resuspension Fraction	50% of trench volume (no silt curtains used)	50% of trench volume (no silt curtains used)

3.4 Model Results

3.4.1 Jet Plow Results

3.4.1.1 Water Column Concentrations

The total duration of the cable burial by jet plowing is 13 hours based on an average advance rate of 100 m/hr (328 ft/hr) and a route distance of 1,300 m (4,266 ft) (see Table 3-3). To best display the resulting water column concentration a series of figures were generated for each hour of the crossing resulting in 13 "snapshots" of the submerged plume at that time. Figures 3-4 through 3-7 shows the plan view of the predicted instantaneous excess SS concentration in 1-hr increments after the start of jet plowing at high slack tide with four panels shown per page. The submerged SS concentration plume extends north of the cable route for hours 1 through 7 indicating an ebb condition and south of the route for hours 8 through 13 indicating a flood condition. The water column concentration contours shown, which are defined by a single concentration level, totally surround an enclosed area where concentrations are at or above the specified concentration, i.e., the area is cumulative. Thus the areas with higher concentrations must be smaller than areas with lower concentrations since those areas are enclosed within the lower concentration contour.

The contours show a decreasing concentration away from the immediate location of the jet plow on the cable route as material dilutes and settles out. The colored contours can be identified from the legend in the upper left corner of each panel showing concentrations from 10 mg/L and higher. A larger SS concentration legend is shown in the upper left panel of Figure 3-4.

A vertical section view defined along the cable route looking north is inserted at the bottom left of each hourly panel. The insert shows that the highest concentrations occur just above the jet plow near the bottom with reduced concentrations extending up into the water column above the plow. In the shallows, suspended sediments from the jet plow activity are likely to reach nearly to the water surface. In the channel, excess suspended sediments will be restricted to the lower half of the water column.

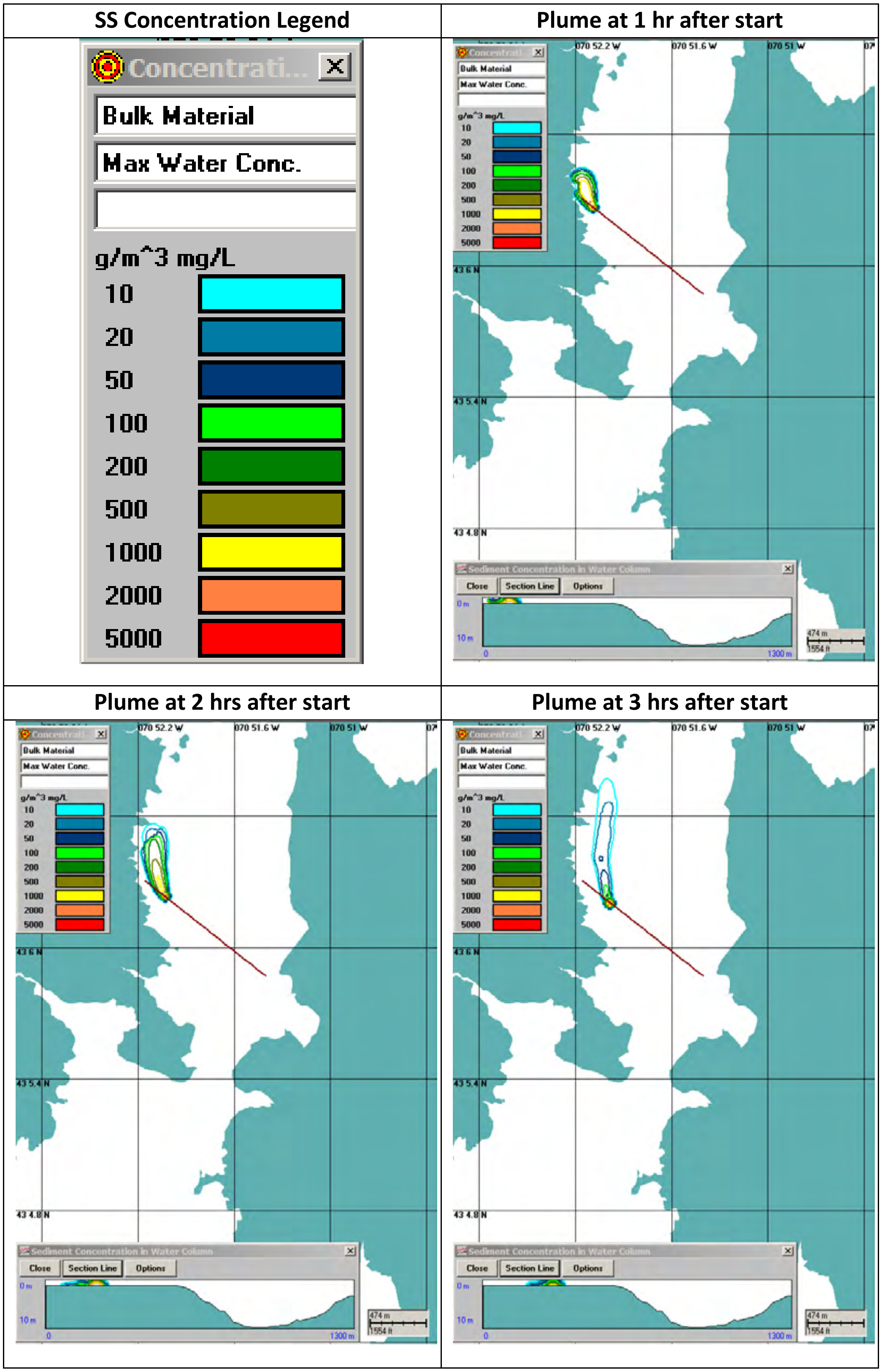

Figure 3-4. Plan view of instantaneous excess SS concentrations at 1 through 3 hrs after start of jet plowing. Vertical section view at lower left of each panel.

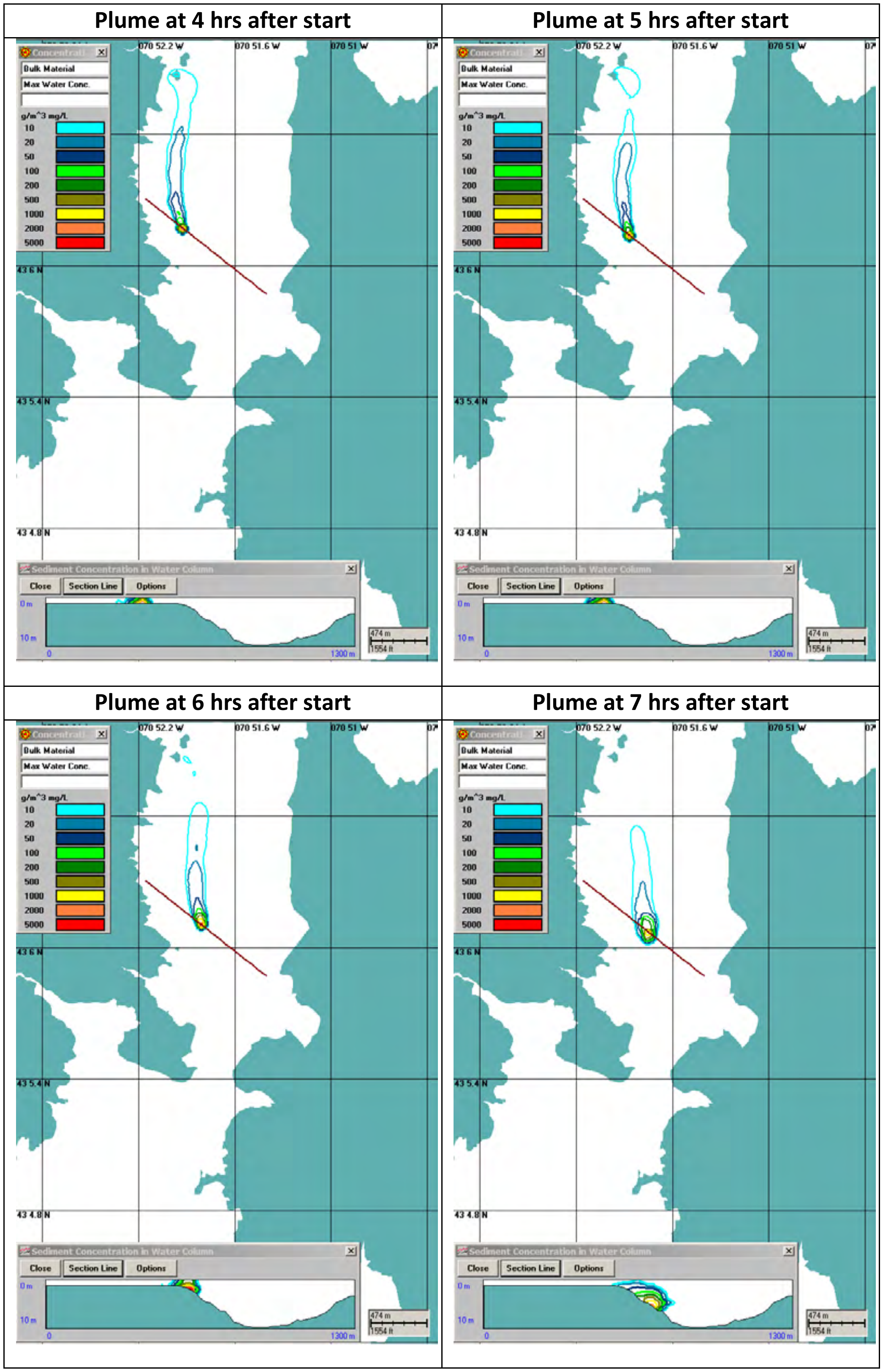

Figure 3-5. Plan view of instantaneous excess SS concentrations at 4 through 7 hrs after start of jet plowing. Vertical section view at lower left of each panel.

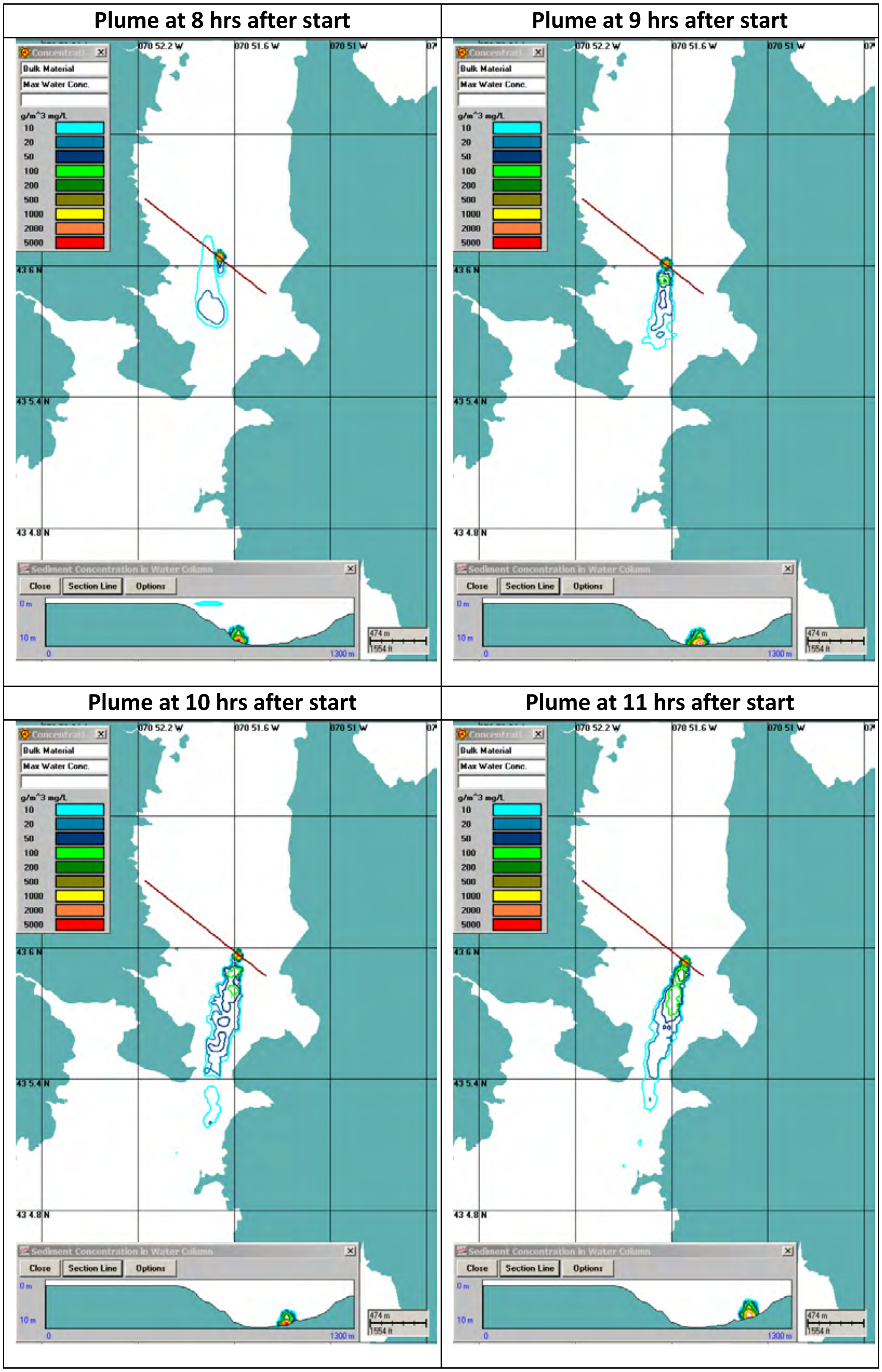

Figure 3-6. Plan view of instantaneous excess SS concentrations at 8 through 11 hrs after start of jet plowing. Vertical section view at lower left of each panel.

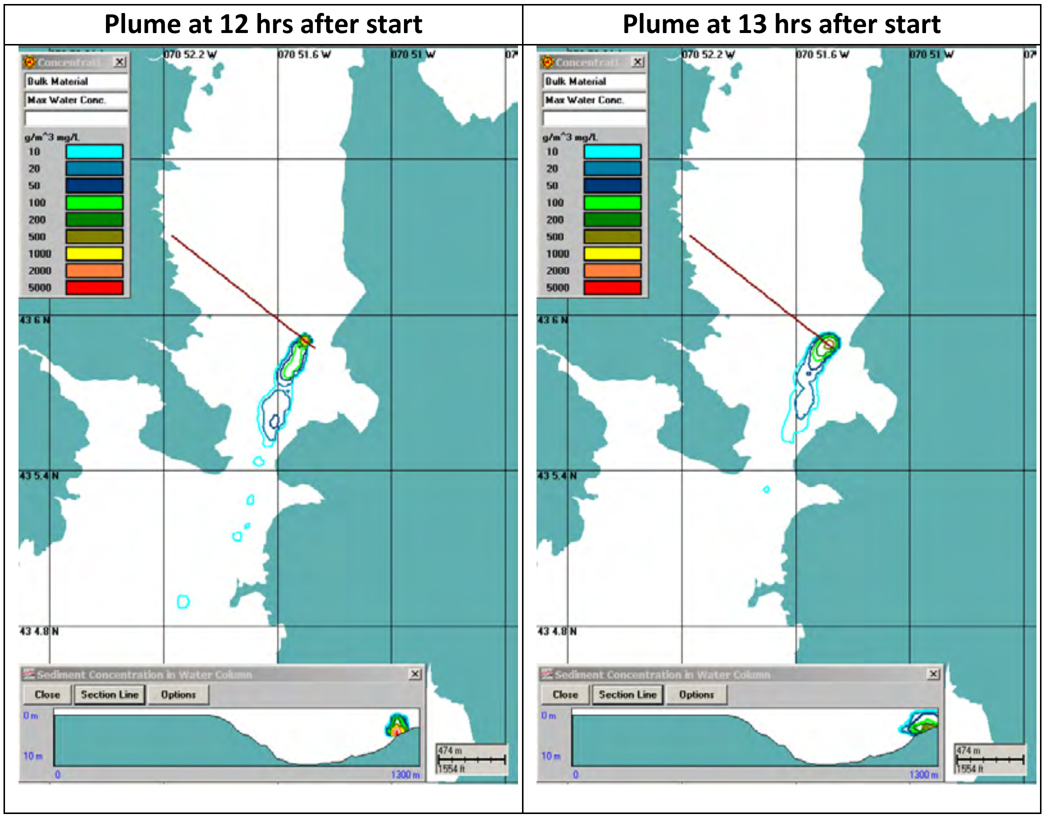

Figure 3-7. Plan view of instantaneous excess SS concentrations at 12 through 13 hrs after start of jet plowing. Vertical section view at lower left of each panel.

Since the currents are smaller right after slack water, the extent of the plume is smaller for hrs 1 and 2. The plume is at its greatest northern extent for hrs 4, 5, and 6. By hr 8 the tide has turned and the plume reaches its maximum southern extent by hrs 10, 11, and 12.

The instantaneous total enclosed area of the excess SS concentration plumes seen in Figures 3-4 through 3-7 is quantitatively summarized in Tables 3-5 (in area units of hectares) and 3-6 (in units of acres) for each 1-hr increment identified at the top of each figure panel. On average the entire area encompassed by the plume (as defined by the 10 mg/L excess SS concentration contour) was 14.8 ha (36.58 ac), ranging from a low of 5.91 ha (14.61 ac) at 1 hr to a high of 22.36 ha (55.25 ac) at 10 hrs. These total enclosed areas dropped dramatically for the higher concentrations, averaging 1.94 ha (4.79 ac) at 100 mg/L, 0.28 ha (0.68 ac) at 1,000 mg/L and 0.02 ha (0.05 ac) at 5,000 mg/L. indicating that the extent of the plume is limited for higher concentrations.

Table 3-5. Summary of the total area (hectares) enclosed by the excess SS threshold concentration contours shown in Figures 3-4 through 3-7 due to jet plowing. Hours start at high slack tide.

TSS (mg/L)	Area (ha) 1 hr Ebb	Area (ha) 2 hr Ebb	Area (ha) 3 hr Ebb	Area (ha) 4 hr Ebb	Area (ha) 5 hr Ebb	Area (ha) 6 hr Ebb	Area (ha) 7 hr Ebb
10	5.91	11.66	14.42	18.73	16.77	15.38	15.14
20	5.47	9.55	8.43	7.59	7.23	5.91	5.99
50	4.55	7.59	2.24	2.08	1.68	1.96	2.64
100	3.87	6.43	0.88	0.64	0.72	1.24	1.84
200	3.16	4.59	0.28	0.28	0.44	0.72	1.24
500	2.32	1.92	0.20	0.20	0.20	0.48	0.32
1000	1.44	0.44	0.20	0.20	0.20	0.28	0.08
2000	0.08	0.04	0.04	0.04	0.04	0.08	0.04
5000	0.00	0.00	0.04	0.00	0.00	0.04	0.00

TSS (mg/L)	Area (ha) 8 hr Flood	Area (ha) 9 hr Flood	Area (ha) 10 hr Flood	Area (ha) 11 hr Flood	Area (ha) 12 hr Flood	Area (ha) 13 hr Flood	Area (ha) Average
10	13.62	11.30	22.36	20.13	13.74	13.26	14.80
20	4.95	5.99	15.14	14.22	9.07	7.71	8.25
50	0.52	2.24	5.63	5.75	3.44	3.24	3.35
100	0.32	0.80	1.36	3.36	1.84	1.92	1.94
200	0.16	0.28	0.20	0.72	0.28	1.28	1.05
500	0.16	0.20	0.16	0.20	0.20	0.32	0.53
1000	0.16	0.16	0.16	0.08	0.20	0.00	0.28
2000	0.04	0.04	0.04	0.04	0.04	0.00	0.04
5000	0.04	0.04	0.04	0.00	0.04	0.00	0.02

Table 3-6. Summary of the total area (acres) enclosed by the excess SS threshold concentration contours shown in Figures 3-4 through 3-7 due to jet plowing.

TSS (mg/L)	Area (ac) 1 hr Ebb	Area (ac) 2 hr Ebb	Area (ac) 3 hr Ebb	Area (ac) 4 hr Ebb	Area (ac) 5 hr Ebb	Area (ac) 6 hr Ebb	Area (ac) 7 hr Ebb
10	14.61	28.81	35.63	46.28	41.44	38.00	37.41
20	13.52	23.59	20.82	18.75	17.86	14.61	14.80
50	11.25	18.75	5.53	5.13	4.14	4.84	6.51
100	9.57	15.89	2.17	1.58	1.78	3.06	4.54
200	7.80	11.35	0.69	0.69	1.09	1.78	3.06

TSS (mg/L)	Area (ac) 1 hr Ebb	Area (ac) 2 hr Ebb	Area (ac) 3 hr Ebb	Area (ac) 4 hr Ebb	Area (ac) 5 hr Ebb	Area (ac) 6 hr Ebb	Area (ac) 7 hr Ebb
500	5.72	4.74	0.49	0.49	0.49	1.18	0.79
1000	3.55	1.09	0.49	0.49	0.49	0.69	0.20
2000	0.20	0.10	0.10	0.10	0.10	0.20	0.10
5000	0.00	0.00	0.10	0.00	0.00	0.10	0.00

TSS (mg/L)	Area (ac) 8 hr Flood	Area (ac) 9 hr Flood	Area (ac) 10 hr Flood	Area (ac) 11 hr Flood	Area (ac) 12 hr Flood	Area (ac) 13 hr Flood	Area (ac) Average
10	33.66	27.92	55.25	49.74	33.95	32.77	36.58
20	12.24	14.80	37.41	35.14	22.40	19.05	20.38
50	1.28	5.53	13.91	14.21	8.49	7.99	8.27
100	0.79	1.97	3.36	8.29	4.54	4.74	4.79
200	0.39	0.69	0.49	1.78	0.69	3.16	2.59
500	0.39	0.49	0.39	0.49	0.49	0.79	1.31
1000	0.39	0.39	0.39	0.20	0.49	0.00	0.68
2000	0.10	0.10	0.10	0.10	0.10	0.00	0.11
5000	0.10	0.10	0.10	0.00	0.10	0.00	0.05

The simulation was continued for an additional six hours after jet plowing was completed (hour 13 after the start of installation) to ensure that all residual concentrations had dissipated. Figure 3-8 showing the plan view of the maximum time-integrated excess SS concentration contours includes that additional post operational period. The time-integrated maximum concentration is generated from the model results by determining the highest concentration in each SSFATE grid cell which overlays Little Bay during the entire simulation. This plot shows only the maximum excess SS concentration integrated over time and would not be actually seen in the Bay (the results shown in Figures 3-4 through 3-7 are representative of what would be seen instantaneously). The advance rate is sufficiently slow that one sees the ebb-directed plume heading north on the west side of the Bay at the beginning of the simulation, then the flood-directed plume heading south in the center of the Bay and finally another ebb-directed plume heading north on the east side of the Bay (after the jetting operation has ceased and the plume is dissipating). The contours again show decreasing concentration from either side of the cable route with higher concentrations adjacent to the jet plow route.

A vertical section view defined by the jet plow route is shown at the bottom left of the figure. The highest concentrations, between 2,000 and 5,000 mg/L occur just above the bottom at the jet plow with reduced concentrations extending up into the water column along the route.

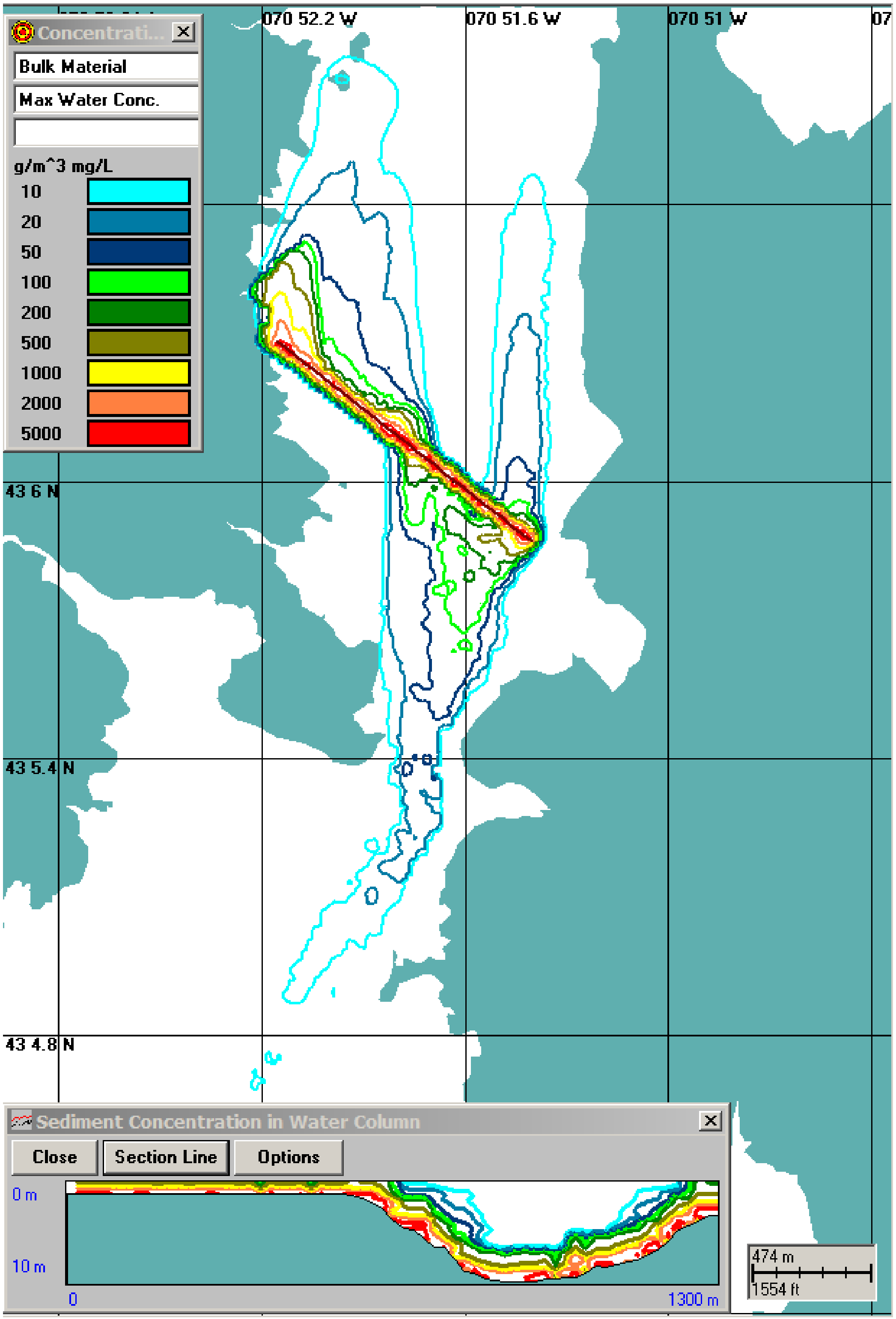

Figure 3-8. Plan view of maximum time integrated excess SS concentration contours over the entire jet plowing operation and the post operational period (while concentrations dissipate). Vertical section view at lower left.

Table 3-7 summarizes the total area enclosed by the maximum time-integrated excess SS concentration contours over the entire jet plowing operation and the post operational period (while concentrations dissipate) shown in Figure 3-8. This table shows that during the operation and post operational period an area of 165.1 ha (408.0 ac) sees a 10 mg/L concentration for a minimum of 5 minutes (the SSFATE model output timestep) but at different times during the simulation. The 5,000 mg/L time integrated enclosed area is 1.9 ha (4.6 ac) and is restricted to the area averaging about 14 m (46 ft) wide straddling the cable route and lasting only a short time.

Table 3-7. Summary of the total area (hectares and acres) enclosed by the maximum time-integrated excess SS concentration contours over the entire jet plowing operation and the post operational period (while concentrations dissipate) in Figure 3-8.

TSS (mg/L)	Area (ha)	Area (ac)
10	165.1	408.0
20	107.4	265.4
50	56.2	138.9
100	35.9	88.7
200	22.0	54.3
500	14.2	35.1
1000	9.3	23.1
2000	4.2	10.3
5000	1.9	4.6
10000	0.0	0.0

An important metric defining the plume is its duration for different concentrations, which could have biological significance if exposure (duration multiplied by concentration) is sufficiently elevated. Figure 3-9 and Table 3-8 summarize the area that experiences a specific exposure (duration at or above concentration) due to jet plow operations. Areas totaling 90.20 ha (222.89 ac), 32.2 ha (79.57 ac), 3.57 ha (8.82 ac) are exposed to a concentration of 10 mg/L or greater for 1 hr, 2 hrs and 4 hrs respectively while no areas are exposed to such a concentration for a duration of six hours; note that these areas are summations and not necessarily contiguous. The area coverages drop dramatically for the exposures of higher concentrations near the jet plow indicating that the duration and extent of the plume is relatively limited. Furthermore, once the jet plow stops operating, no additional sediments will be dispersed into the water column and concentrations above 10 mg/L dissipate within approximately 2 hrs (Figure 3-10).

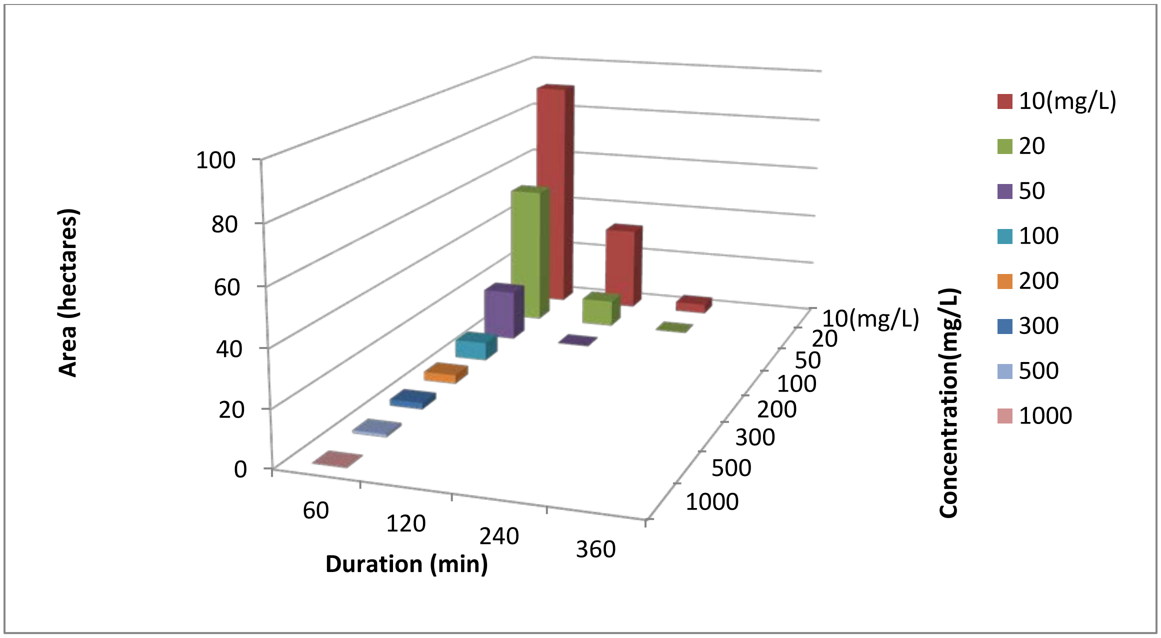

Figure 3-9. Duration (minutes) and total enclosed area (hectares) of maximum time integrated excess SS concentration contours over the entire jet plowing operation and the post operational period (while concentrations dissipate).

Table 3-8. Duration (minutes) and total enclosed area (hectares and acres) of maximum time integrated excess SS concentration contours over the entire jet plowing operation and the post operational period (while concentrations dissipate).

SS Concentration (mg/L)	Hectares				Acres			
	60 (min)	120 (min)	240 (min)	360 (min)	60 (min)	120 (min)	240 (min)	360 (min)
10	90.20	32.20	3.57		222.89	79.57	8.82	
20	52.60	10.00	0.12		129.98	24.71	0.30	
50	18.70	0.16			46.21	0.40		
100	6.72				16.61			
200	3.20				7.91			
300	2.24				5.54			
500	1.04				2.57			
1000	0.08				0.20			

Plume ½ hr after Jet Plow Stops	Plume 1 hr after Jet Plow Stops

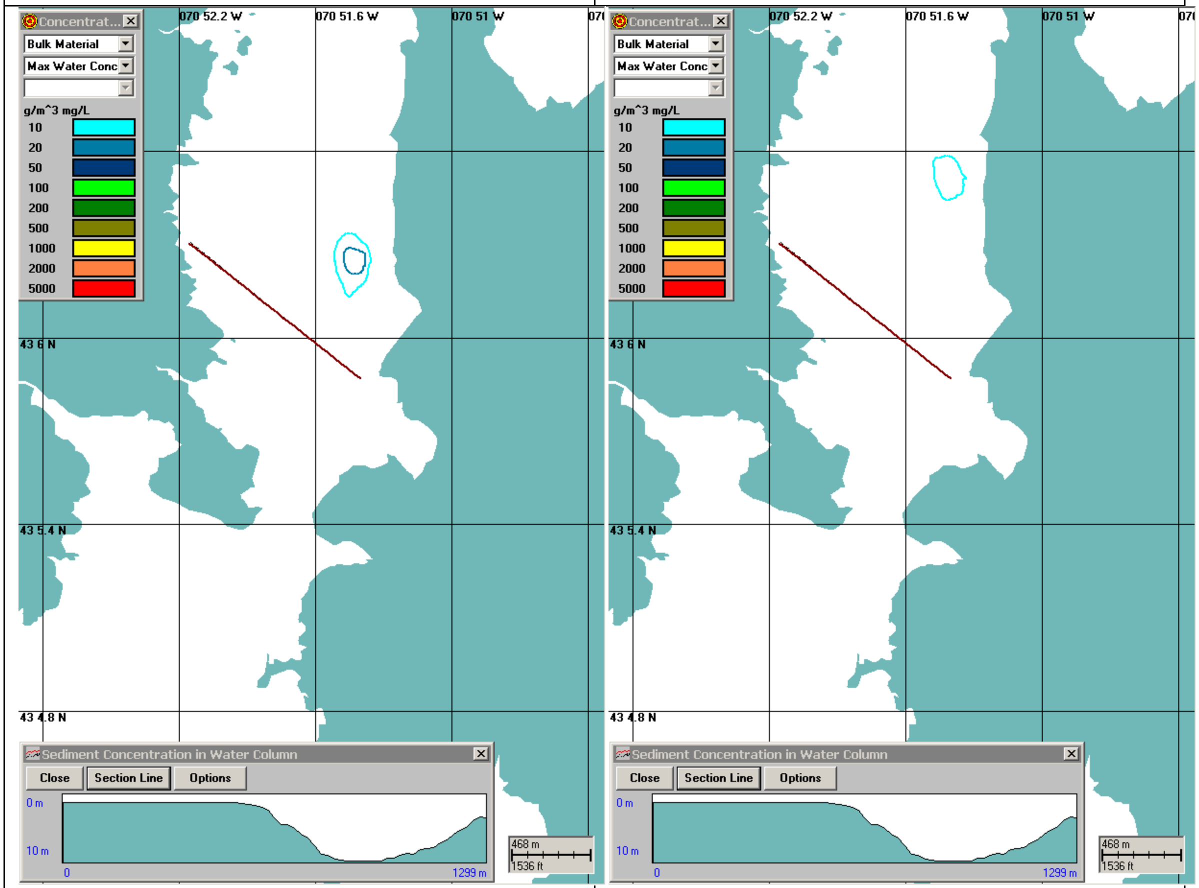

Figure 3-10. Plan view of instantaneous excess SS concentrations at 0.5 and 1 hour after cessation of jet plowing (13.5 and 14 hrs after start of jet plowing). Vertical section view at lower left of each panel.

3.4.1.2 Bottom Deposition

Figure 3-11 shows the plan view of the bottom deposition thickness distribution from 0.1 to 10 mm (0.004 to 0.4 in) due to jet plowing all three cable routes combined and assuming that any sediment deposited on the bottom remains in place. The color filled areas are defined by the legend for different deposition thickness ranges, e.g., 1 mm to 5 mm (0.04 to 0.2 in) denoted by yellow. In contrast to the water column concentration contours, which are defined by a single concentration value totally surrounding an enclosed area where concentrations are at or above the specified concentration (i.e., the area is cumulative), the bottom deposition thickness is defined for the area exclusively between the range of thicknesses described (i.e., the area is not cumulative). Thus the areas with larger thicknesses are not necessarily smaller than areas with smaller thicknesses. The shape of the distribution pattern is generally similar to the water column plume (ebb-then-flood) but reduced in extent. The higher deposition areas are at and adjacent to the cable route and occur when the sediment distribution is weighted toward the sand fractions. There are a few non-contiguous areas of 0.1 to 0.5 mm (0.004 to 0.02 in) deposition further south of the cable route that are due to the slight changes in current direction transporting water column plumes from slightly different locations on the route so that they happen to form a thin deposit at the same place.

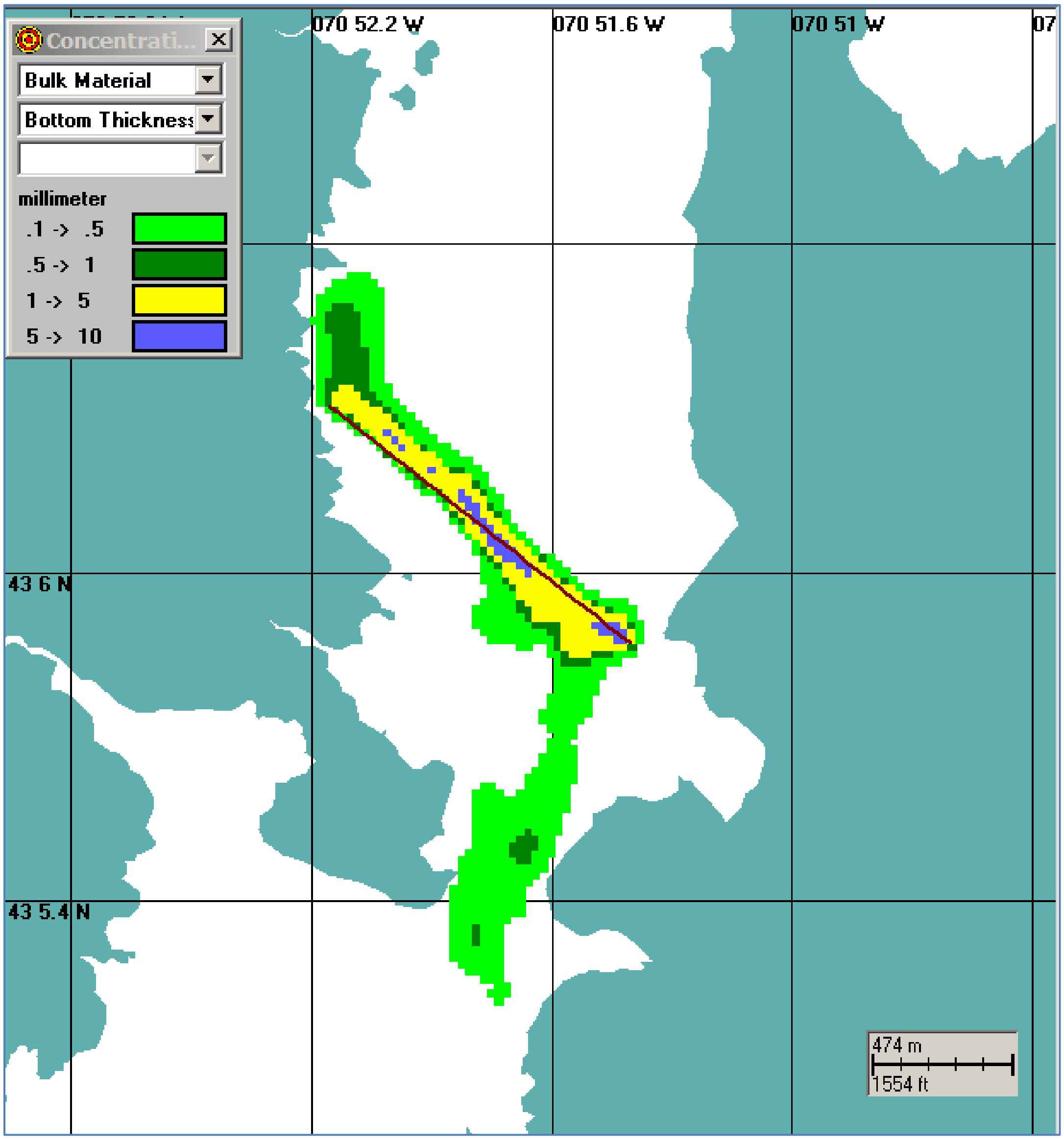

Figure 3-11. Plan view of integrated bottom thickness (mm) distribution due to jet plowing for the three cable trenches combined.

The areal sizes of the deposition thickness patterns seen in Figure 3-11 are summarized in Table 3-9 for each thickness increment range. At the range of 0.1 to 0.5 mm (0.004 to 0.02 in) thickness range the area is 35.6 ha (87.9 ac) due to jet plowing the three cable routes. These areas generally drop in size, but not always, for the higher deposition thicknesses. For example, the area of 12.4 ha [30.7 ac] for the 1 to 5 mm [0.04 to 0.2 in) thickness range is larger than the 0.5 to 1 mm (0.02 to 0.04 in) area of 8.1 ha (20.0 ac).

Table 3-9. Bottom thickness (millimeter and inch) areal distribution (hectare and acre) due to jet plowing for the three cable routes combined.

Thickness (mm)	Area (ha)	Thickness (in)	Area (ac)
0.1 to 0.5	35.6	0.004 to 0.02	87.9
0.5 to 1	8.1	0.020 to 0.04	20.0
1 to 5	12.4	0.04 to 0.2	30.7
5 to 10	2.4	0.2 to 0.4	5.9
Totals 0.1 to 10	58.5	0.004 to 0.4	144.5

3.4.2 Diver Burial Results

3.4.2.1 Water Column Concentrations

The total duration of the cable burial by divers is 4 hr/day for 9.9 days for the west area and 4 hr/day for 19.4 days for the east area for each of the three cable bundles to be buried. This is based on an estimated advance rate of 2.29 m/hr (7.5 ft/hr) for the 4 hrs around high slack water for a 90 m (296 ft) route distance for the west area and 178 m (583 ft) for the east area (see Table 3-4). To best display the resulting water column concentration a figure was generated for each area for 1 day at a representative location in the area. Figure 3-12 shows the plan view of the predicted instantaneous excess SS concentration contours for both the west and east area. The submerged SS concentration plumes extend both north and south of the cable route due to the timing of operations before and after slack water. Again, the water column concentration contours shown, which are defined by a single concentration level, totally surround an enclosed area where concentrations are at or above the specified concentration, i.e., the area is cumulative. Thus the areas with higher concentrations must be smaller than areas with lower concentrations since those areas are enclosed within the lower concentration contour.

The contours in Figure 3-12 show a decreasing concentration away from the location of the diver activities on the cable route as material dilutes and settles out. The colored contours can be identified from the legend in the upper right corner of the figure showing concentrations from 10 mg/L and higher. Modeling was done assuming that silt curtains would not be employed during the diver installation.

A vertical section view defined along the cable route looking north is inserted at the bottom left of the figure. The insert shows that the highest concentrations occur near the bottom with reduced concentrations extending up into the water column. In the western shallows, suspended sediments from the diver burial activity are likely to reach nearly to the water surface. In the somewhat deeper eastern area, excess suspended sediments will be restricted to the lower half of the water column.

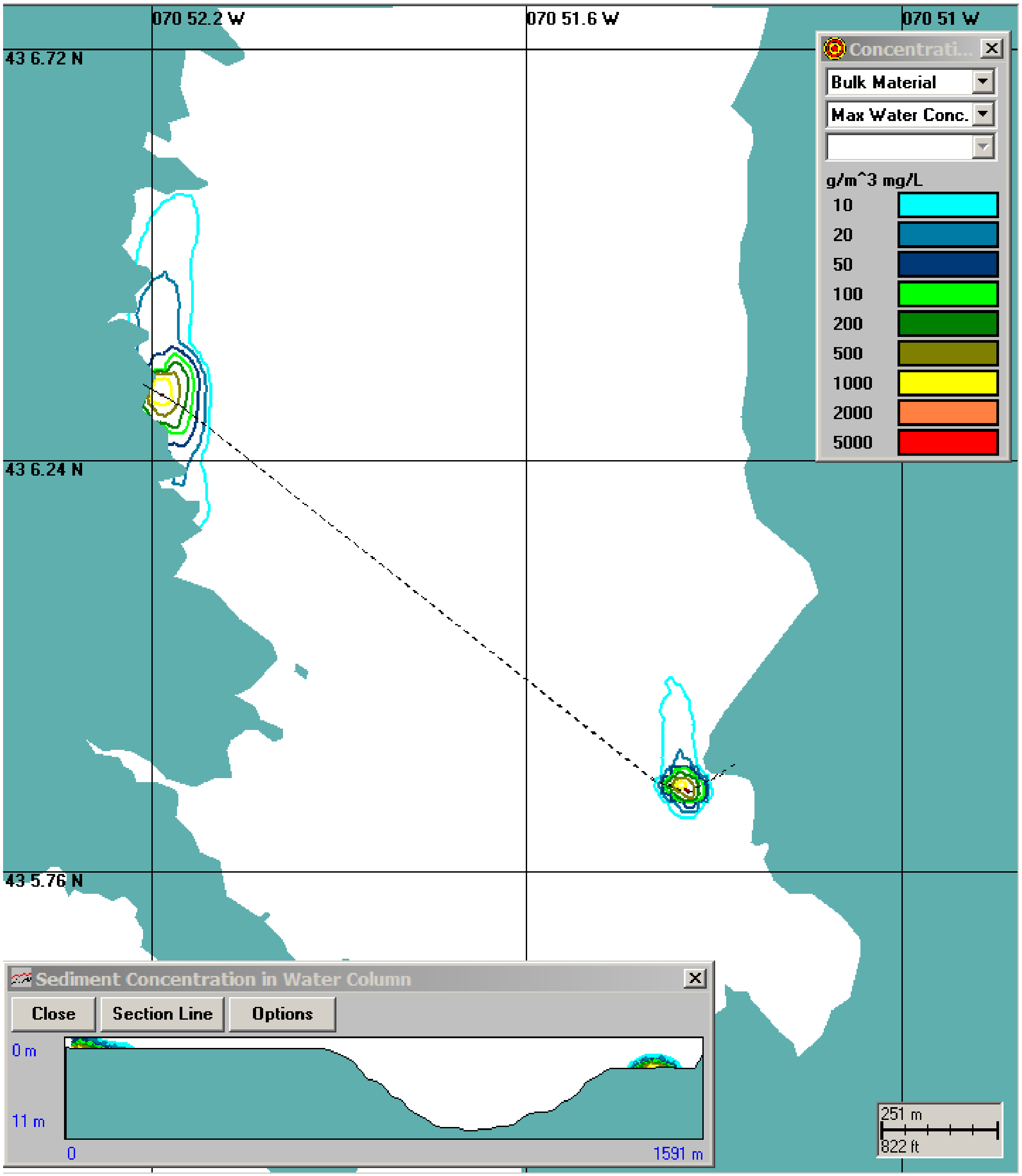

Figure 3-12. Plan view of instantaneous maximum excess SS concentration contours for 1 day approximately midway across the west and east diver burial sections. Vertical section view at lower left. Assumes silt curtains were not used.

The instantaneous total enclosed area of the excess SS concentration plumes for the west and east diver burial sections seen in Figure 3-12 is summarized in Table 3-10 for each increment identified in the color legend. At 10 mg/L excess SS concentration the total area enclosed by the contour is 8.4 ha (20.7 ac) for the west section and 1.9 ha (4.7 ac) for the east section. However, these total enclosed areas drop dramatically for the higher concentrations near the diver burial activities, i.e., the area at 1,000 mg/L is only about 0.2 ha (0.6 ac) for the west section and 0.0 ha

(0.1 ac) for the east section, indicating that the extent of the plume is again relatively limited for higher concentrations.

Table 3-10. Summary of the total area (hectares and acres) enclosed by the excess SS threshold concentration contours shown in Figure 3-11 due to diver burial. Assumes silt curtains were not used.

	West Section	West Section	East Section	East Section
TSS	Area	Area	Area	Area
(mg/L)	(ha)	(ac)	(ha)	(ac)
10	8.4	20.7	1.9	4.7
20	4.5	11.0	0.8	2.0
50	2.0	4.9	0.5	1.2
100	1.2	3.0	0.4	0.9
200	1.0	2.5	0.3	0.7
500	0.5	1.2	0.1	0.3
1000	0.2	0.6	0.0	0.1

Figure 3-13 shows the plan view of the maximum time-integrated excess SS concentration contours for both diver burial sections. As before, these concentrations are generated from the model results by determining the highest concentration in each SSFATE grid cell during the entire simulation, approximately 10 and 20 days for the west and east sections, respectively. This plot shows only the maximum excess SS concentration integrated over time and would not be actually seen in the Bay. The contours again show decreasing concentration from either side of the cable route with higher concentrations adjacent to the jet plow route. This model run assumed silt curtains were not used.

A vertical section view defined by the jet plow route is shown at the bottom left of the figure. The highest concentrations, above 5,000 mg/L on the west side, occur just above the bottom with dramatically reduced concentrations extending up into the water column along the route. The same is true for the east section but the highest concentrations there are between 500 and 1,000 mg/L.

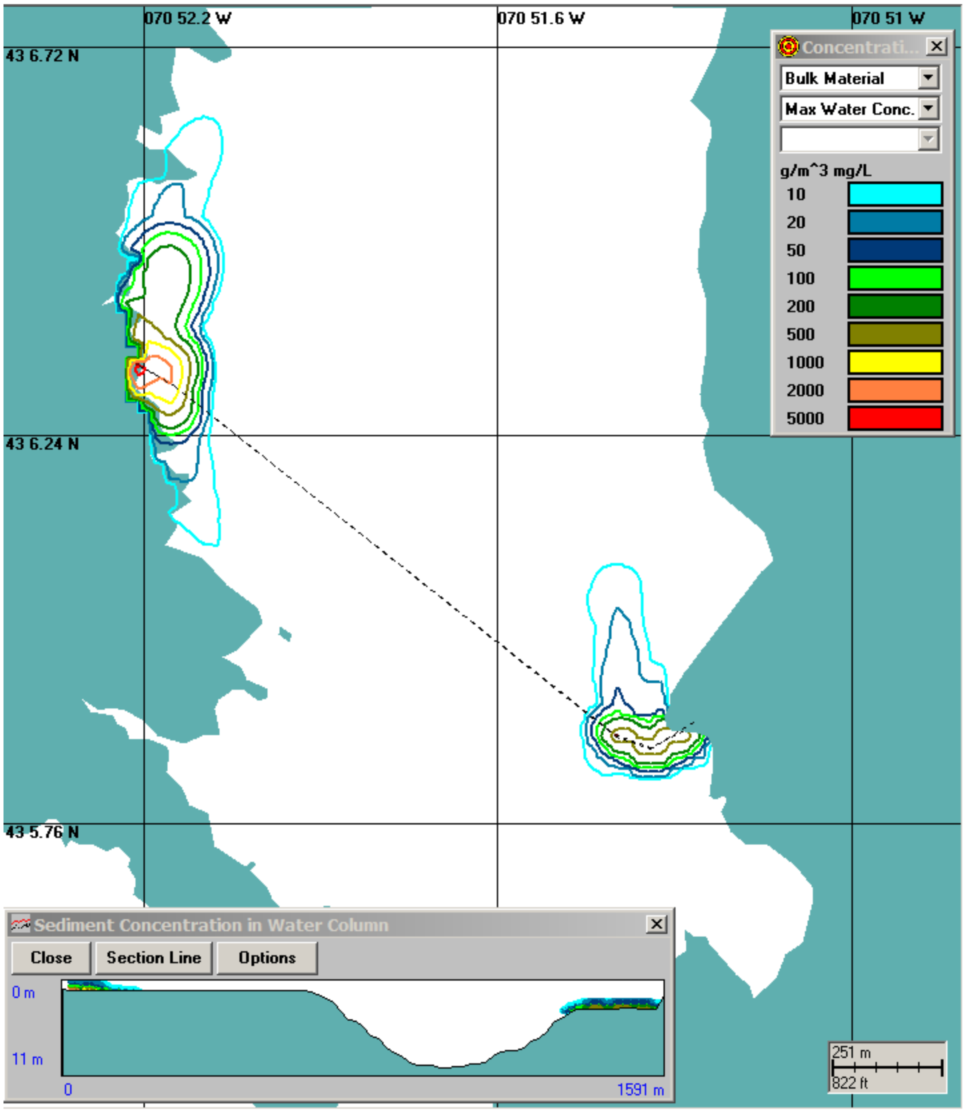

Figure 3-13. Plan view of maximum time integrated excess SS concentration contours over both diver burial operations. Vertical section view at lower left. Assumes silt curtains were not used.

Table 3-11 summarizes the total western and eastern areas enclosed by the maximum time-integrated excess SS concentrations over the diver burial operations shown in Figure 3-13. This table shows that during the diver burial activities on the west side, a total enclosed area of 14.5 ha (35.9 ac) sees a minimum 10 mg/L concentration for a minimum of 5 minutes (the SSFATE model output timestep) but at different times during the simulation. For the east side the 10 mg/L concentration contour encloses a total area of 8.2 ha (20.2) ac.

Table 3-11. Summary of the total area (hectares and acres) enclosed by the maximum time-integrated excess SS threshold concentration contours shown in Figure 3-13 due to diver burial for the west and east sections. Assumes silt curtains were not used.

TSS (mg/L)	West Area (ha)	West Area (ac)	East Area (ha)	East Area (ac)
10	14.5	35.9	8.2	20.2
20	9.7	24.0	5.1	12.5
50	7.2	17.7	2.9	7.1
100	5.9	14.6	2.1	5.1
200	4.5	11.1	1.6	3.9
500	2.0	4.9	0.5	1.2
1000	1.2	3.1		
2000	0.6	1.4		
5000	0.1	0.2		
10000				

An important metric defining the plume is its duration for different concentrations, which could have biological significance if exposure (duration multiplied by concentration) is sufficiently elevated. The total enclosed area and duration of the time-integrated maximum west section plume seen in Figure 3-13 is summarized in Figure 3-14 and Table 3-12 for each contour identified in the color legend. At 10 mg/L excess SS concentration the total area that is enclosed by the contour is 14.6 ha (36.1 ac) but lasts for only 1 hr. This short duration continues through all the concentration contour thresholds through 5,000 mg/L. The enclosed areas decrease in time for a given concentrations so by 6 hrs the 10 mg/L area has dropped to 8.6 ha (21.2 ac). The 10 mg/L area persists for two days because the initial buildup occurs near slack water with grain size distribution indicating mostly fines (silts and clays). The area coverages decrease for higher concentrations near the diver burial activities.

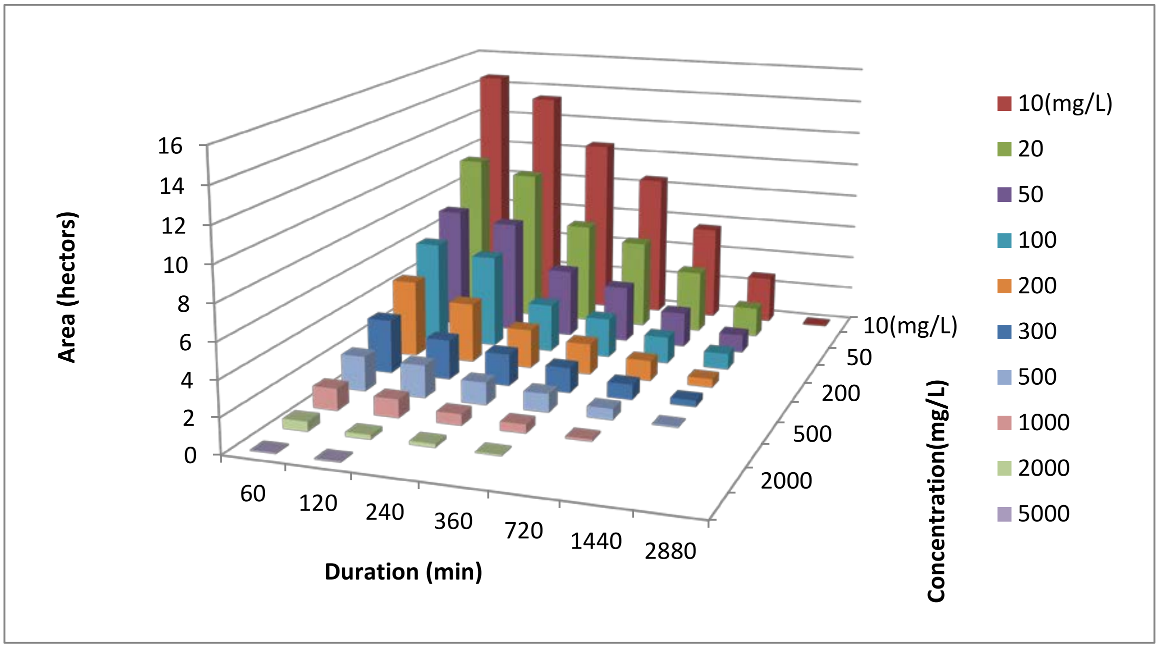

Figure 3-14. **Duration (minutes) and total enclosed area (hectares) of maximum time integrated excess SS concentration due to diver burial for west section with total duration of 9.9 4-hour days (2,368 min). Assumes silt curtains were not used.**

Table 3-12. Duration (minutes) and total enclosed area (hectares and acres) of maximum time integrated excess SS concentration due to diver burial for west section with total duration of 9.9 4-hour days (2,368 min). Assumes silt curtains were not used.

West	Area (ha)						
Max SS (mg/L)	Minutes						
	60	120	240	360	720	1440	2880
10	14.6	13.4	10.5	8.6	5.6	2.8	0.1
20	9.8	9.1	6.0	5.3	3.7	1.8	
50	7.2	6.7	4.0	3.3	2.1	1.1	
100	5.9	5.4	2.8	2.3	1.6	0.9	
200	4.5	3.5	2.3	1.8	1.2	0.5	
300	3.1	2.3	1.9	1.4	0.9	0.4	
500	2.0	1.9	1.3	1.1	0.6	0.1	
1000	1.3	1.1	0.6	0.5	0.1		
2000	0.6	0.3	0.2	0.1			
5000	0.1	0.1					

West	Area (ac)						
Max SS (mg/L)	Minutes						
	60	120	240	360	720	1440	2880
10	36.1	33.1	26.0	21.2	13.9	6.8	0.2
20	24.1	22.4	14.9	13.0	9.1	4.3	

West	Area (ac)						
Max SS	Minutes						
(mg/L)	60	120	240	360	720	1440	2880
50	17.8	16.5	9.9	8.2	5.1	2.6	
100	14.7	13.4	7.0	5.7	3.9	2.3	
200	11.1	8.6	5.6	4.5	2.9	1.2	
300	7.7	5.7	4.6	3.6	2.2	0.9	
500	4.9	4.6	3.2	2.6	1.5	0.2	
1000	3.1	2.6	1.6	1.2	0.3		
2000	1.4	0.6	0.5	0.2			
5000	0.2	0.2					

The total enclosed area and duration of the time-integrated maximum east section plume seen in Figure 3-13 is summarized in Figure 3-15 and Table 3-13 for each contour identified in the color legend. At 10 mg/L excess SS concentration the total area that is enclosed by the contour is 8.2 ha (20.2 ac) but lasts for only 1 hr. This short duration continues through all the concentration contour thresholds through 500 mg/L. The enclosed areas decrease in time for a given concentration so by 6 hrs the 10 mg/L area has dropped to 4.1 ha (10.2 ac). The 10 mg/L area persists for two days because the initial buildup occurs near slack water with grain size distribution indicating mostly fines (silts and clays). The area coverages decrease for higher concentrations near the diver burial activities. These results assumed silt curtains were not used.

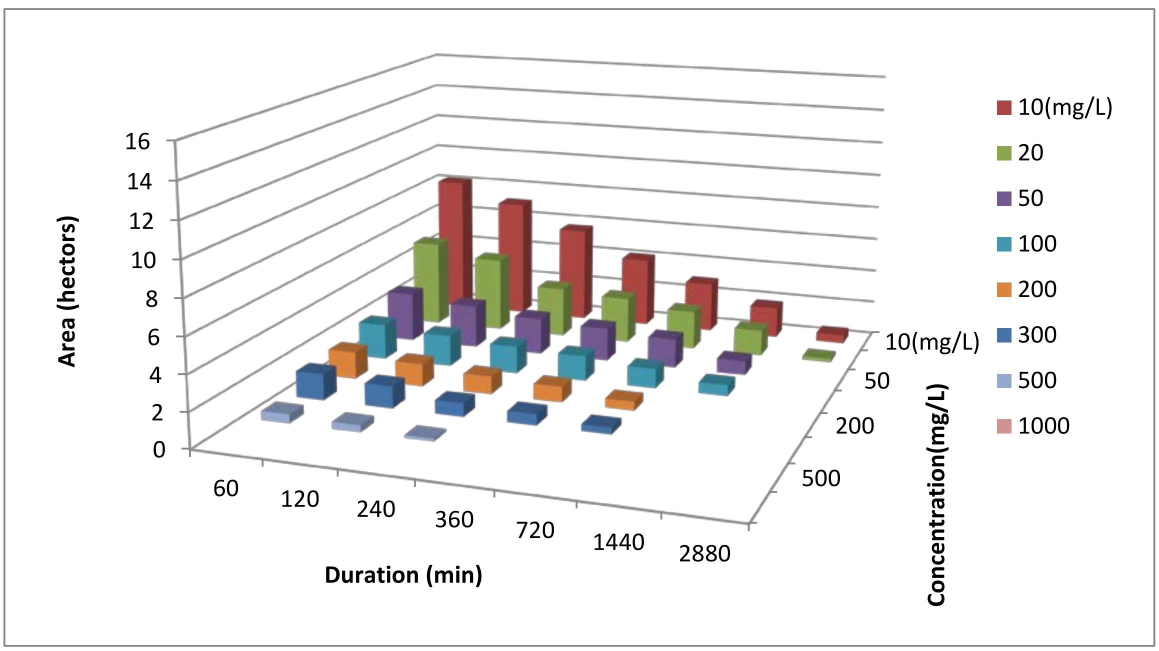

Figure 3-15. Duration (minutes) and total enclosed area (hectares) of maximum time integrated excess SS concentration due to diver burial for east section with total duration of 19.4 4-hour days (4,664 min). Assumes silt curtains were not used.

Table 3-13. Duration (minutes) and total enclosed area (hectares and acres) of maximum time integrated excess SS concentration due to diver burial for east section with total duration of 19.4 4-hour days (4,664 min). Assumes silt curtains were not used.

East	Area (ha)						
Max SS	Minutes						
(mg/L)	60	120	240	360	720	1440	2880
10	8.2	7.1	5.7	4.1	2.9	1.8	0.5
20	5.1	4.4	2.9	2.7	2.3	1.5	0.2
50	2.9	2.5	2.1	1.9	1.7	0.8	
100	2.1	1.8	1.6	1.4	1.1	0.6	
200	1.6	1.3	1.0	0.9	0.5		
300	1.5	1.3	0.8	0.6	0.4		
500	0.5	0.4	0.1				
1000							

East	Area (ac)						
Max SS	Minutes						
(mg/L)	60	120	240	360	720	1440	2880
10	20.2	17.4	14.0	10.2	7.3	4.5	1.2
20	12.5	10.8	7.2	6.6	5.6	3.7	0.5
50	7.1	6.2	5.3	4.8	4.2	2.0	
100	5.1	4.5	3.9	3.6	2.8	1.5	
200	3.9	3.2	2.5	2.2	1.2		
300	3.7	3.1	1.9	1.5	0.9		
500	1.2	0.9	0.3				
1000							

Use of Silt Curtains

The effects of using silt curtains can greatly reduce the size of the water column areas affected which has been described above. The US Army Corps of Engineers refers to reductions in loss rates up to 80 to 90% when silt curtains are correctly employed (Francingues and Palermo, 2005). A recent model application by the USACE (Lackey, et. al., 2012) assumed reductions of 90 to 100% in loss rates due to the use of silt curtains to be protective of coral reefs in Guam.

If a 90% reduction is assumed with the use of silt curtains then the excess suspended sediment concentration results presented above can be reduced by a factor of 10 for areas outside the silt curtains. This means that the legend appearing in Figures 3-12 through 3-15 showing concentration levels ranging from 10 to 5000 mg/L can be reduced to 1 to 500 mg/L to be representative of the results from using silt curtains. In addition, Tables 3-10 through 3-13 can also be reinterpreted for the use of silt curtains by reducing the listed concentrations by a factor of 10. The area inside the silt curtains adjacent to the cable routes will, of course, see a local increase in concentrations.

3.4.2.2 Bottom Deposition

Figure 3-16 shows the plan view of the bottom deposition thickness distribution from 0.1 mm to 50 mm (0.004 to 2 in) due to diver activity for both the west and eastern sections of all three cable routes combined and assumed that any sediment deposited on the bottom remained in place. The color filled areas are defined by the legend for different deposition thickness ranges, e.g., 1 mm to 5 mm (0.04 to 0.2 in) denoted by yellow. The bottom deposition thickness is defined for the area exclusively between the range of thicknesses described, i.e., the area is not cumulative. Thus the areas with larger thicknesses are not necessarily smaller than areas with smaller thicknesses. The distribution pattern is generally similar to the water column plume (ebb) but much reduced in extent. The higher deposition areas are adjacent to the cable route.

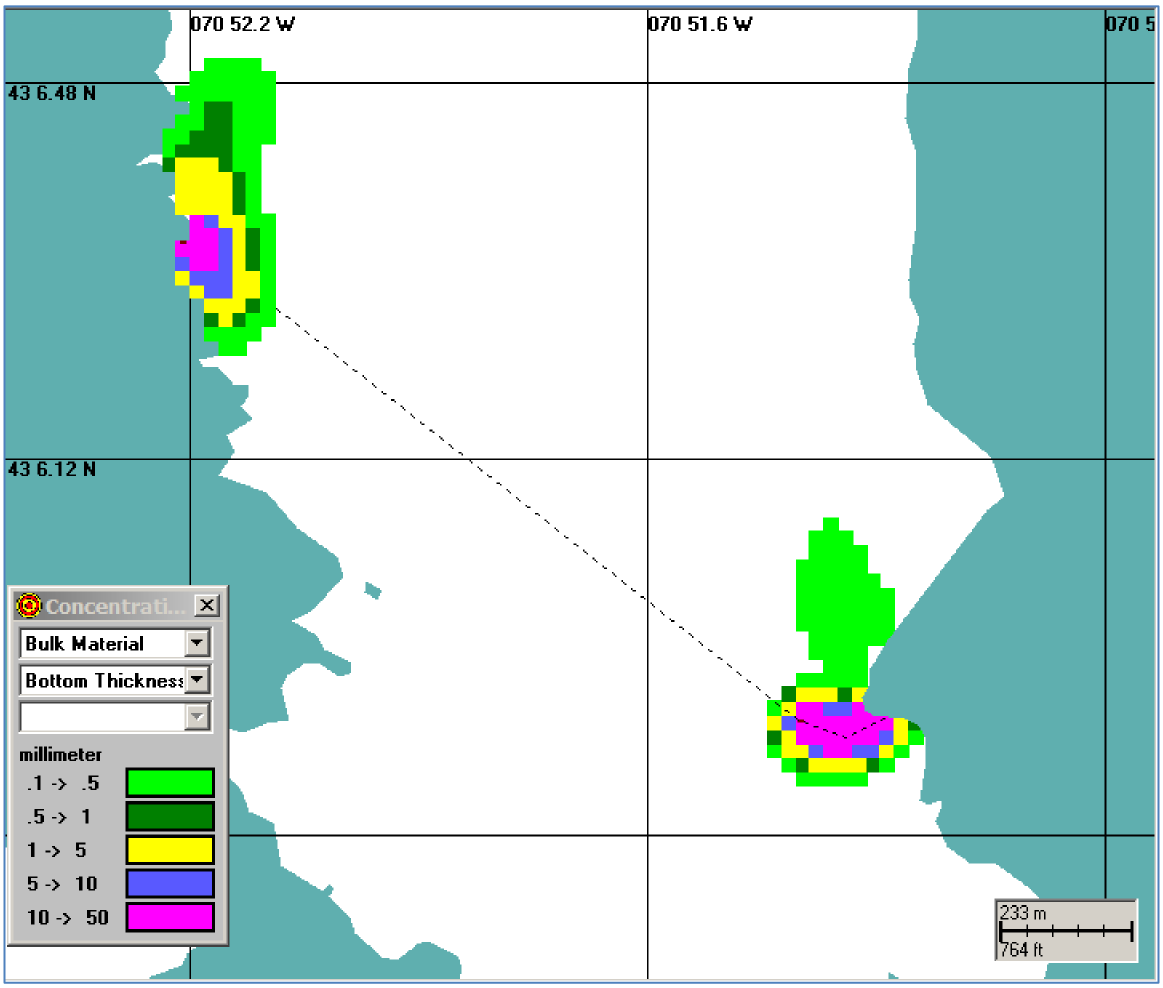

Figure 3-16. Plan view of time integrated bottom thickness (mm) distribution due to diver burial for west and east sections for three cable routes combined. Assumes that silt curtains were not used.

The areal sizes of the deposition thickness patterns seen in Figure 3-16 for both the west and east sections are summarized in Table 3-14 for each thickness increment range. At the 0.1 to 0.5 mm (0.004 to 0.02 in) thickness range the area is 3.4 ha (8.5 ac) for the west and 4.4 ha (10.8 ac) for the east, both including the three cable routes combined. These areas generally drop in size, for example, the west area of 1.9 ha [4.6 ac] and the east area of 1.1 ha [2.6 ac] for the 1 to 5 mm [0.04 to 0.2 in) thickness range is larger than the 0.5 to 1 mm (0.02 to 0.04 in) areas but not always, for the higher deposition thicknesses.

Table 3-14. Bottom thickness (millimeter and inch) areal distribution (hectare and acre) due to diver burial for west and east sections for the three cable routes combined. Assumes silt curtains were not used.

Thickness (mm)	West Area (ha)	East Area (ha)	Thickness (in)	West Area (ac)	East Area (ac)
0.1 to 0.5	3.4	4.4	0.004 to 0.02	8.5	10.8
0.5 to 1	1.4	0.4	0.02 to 0.04	3.4	0.9
1 to 5	1.9	1.1	0.04 to 0.2	4.6	2.6
5 to 10	0.6	0.5	0.2 to 0.4	1.5	1.2
10 to 50	0.5	1.2	0.4 to 2	1.2	2.9
Totals 0.1 to 50	7.8	7.6	0.004 to 2	19.2	18.4

Use of Silt Curtains

As with the 10-fold reduction in suspended sediment concentrations with the use of silt curtains, the results shown for bottom deposition can also be reduced by a factor of 10. This means that the legend appearing in Figure 3-16 showing bottom thickness levels ranging from 0.1 to 50 mm (0.004 to 2 in) can be reduced to 0.01 to 5 mm (0.0004 to 0.2 in) to be representative of the results from using silt curtains. In addition, Table 3-14 can also be reinterpreted for the use of silt curtains by reducing the listed thickness ranges by a factor of 10.

The area inside the silt curtains adjacent to the cable routes will, of course, see a significant local increase in bottom deposition thickness. Current velocities in the area where diver burial will be required on the western tidal flat and in the intertidal portion of the diver burial area on the eastern side are in the range for which silt curtains can be used effectively. In the more exposed portion of the diver burial area on the eastern end of the route, currents are likely to exceed those for which silt curtains can be used. The project proposes that silt curtains will be used to enclose the entire three western diver burial routes 90 m (296 ft) long with an area of 1,923 m^2 (20,695 ft^2) and also used along a portion (112 m [367 ft]) of the three eastern diver burial routes enclosing an area of 2,046 m^2 (22,021 ft^2). Approximately 66 m (216 ft) of each of the three cables on the eastern end of the route will not be enclosed during diver burial. Based on the trench geometry for diver burial summarized in Table 3-4 90% of the entire west resuspension volume or 181.0 m^3 (6,394 ft^3) spread over the enclosed area results in an average deposition thickness of 94 mm (3.71 in) while 90% of the entire partial east resuspension volume or 224.5 m^3 (7,927 ft^3) spread over the enclosed area results in an average deposition thickness of 110 mm (4.32 in). Larger thicknesses would be found closest to the burial routes (including the trenches) and smaller thicknesses found closer to the silt curtains distant from the routes.

3.5 Effects of Multiple Cable Laying Operations

Since there are three cable bundles to be laid in individual trenches the question arises as to what happens to the water column concentration and bottom deposition created by a single pass and whether it might affect the subsequent pass. The schedule to embed each cable by jet plowing is planned to occur on a 5 to 7 day interval. The water column concentration duration analysis shows that the excess concentration will drop to zero within approximately 6 hours. Thus there will be no cumulative increases in suspended sediment concentrations as a result of these installations.

A measure of the stability of deposited sediments to the seabed is a function of the erosion velocity for each grain size in the sediment. This relationship is shown via a Hjulstrom diagram as shown in Figure 3-17. Here the y-axis is the current velocity in Little Bay and the x-axis is sediment grain size. Since the freshly deposited sediment is unconsolidated, the fine grains (clay and silt) and sand would be eroded at a velocity of about 20 cm/s (0.4 kt). Examining the example figures of flood and ebb tide velocities in Figures 2-2 and 2-3, respectively, this minimum speed is exceeded across most of Little Bay except in the shallow tidal flat very near the shore where there could be some accumulation. Thus most of the fine sediment is likely to be resuspended on subsequent tides and dispersed from the areas initially affected by deposition unless flocculation of the clay particles occurs and they remain in place. The larger grain sizes will quickly drop back into the channel when first resuspended by the jetting process.

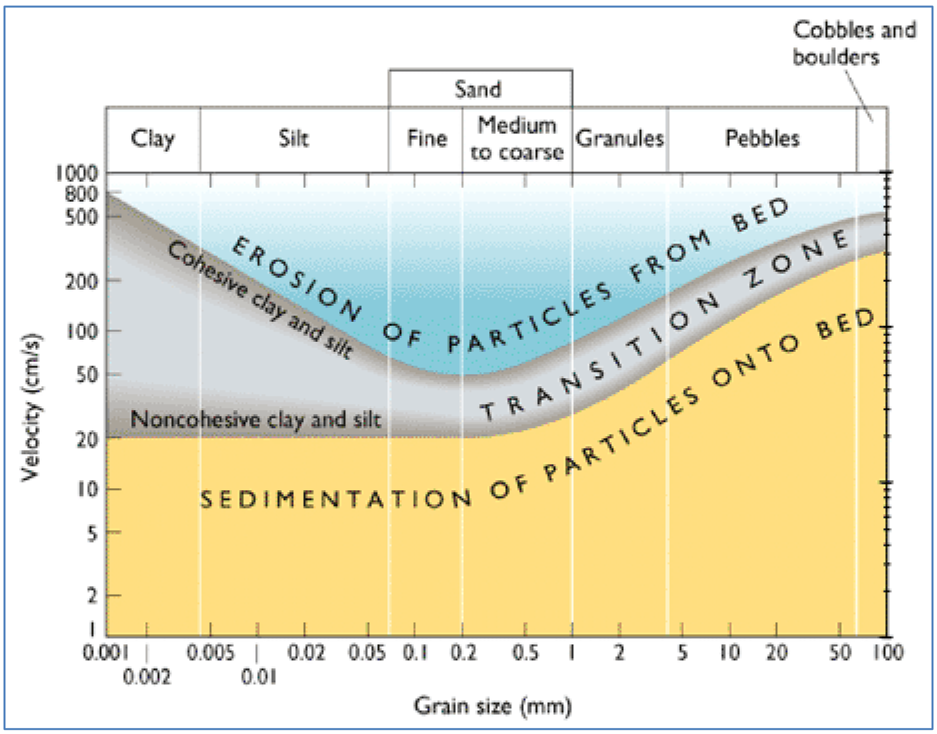

Figure 3-17. Hjulstrom diagram showing relationship between velocity and gran size (from http://eesc.columbia.edu/courses/ees/lithosphere/homework/hmwk1_s08.html).

4 Conclusions

Two computer models were used in the analysis: BELLAMY, a hydrodynamic model used for predicting the currents in Little Bay, and SSFATE, a sediment dispersion model used for predicting the fate and transport of sediment resuspended by the jet plowing and diver burial operations. BELLAMY is a finite element, two-dimensional, vertically averaged, time stepping circulation model developed at Dartmouth College and previously applied to the Great Bay Estuarine System. The SSFATE (Suspended Sediment FATE) model was utilized to predict the excess suspended sediment concentration and the dispersion of suspended sediment resulting from jetting activities. The model predicts excess concentration, which is defined as the concentration above ambient suspended sediment concentration generated by the seabed activities. The SSFATE model results are summarized below for the jetting and diver burial activities.

Jet Plowing

The size of the resulting excess suspended sediment (SS) concentration plume in the lower water column is defined as a series of areas enclosed by different concentration levels. The water column concentration contours shown, which are defined by a single concentration level, totally surround an enclosed area where concentrations are at or above the specified concentration, i.e., the area is cumulative. The entire area encompassed by the plume (as defined by the 10 mg/L excess SS concentration contour averaged over time was 14.8 ha (36.58 ac) ranging from a low of 5.91 ha (14.61 ac) at 1 hr to a high of 22.36 ha (55.25 ac) at 10 hrs. These total enclosed areas dropped dramatically for the higher concentrations, averaging 1.94 ha (4.79 ac) at 100 mg/L, 0.28 ha (0.68 ac) at 1,000 mg/L and 0.02 ha (0.05 ac) at 5,000 mg/L. indicating that the extent of the plume is limited for higher concentrations. In the shallows, suspended sediments from the jet plow activity are likely to reach nearly to the water surface. In the channel, excess suspended sediments will be restricted to the lower half of the water column.

An important metric defining the plume is its duration for different concentrations, which could have biological significance if exposure (duration multiplied by concentration) is sufficiently elevated. The maximum plume size and duration at 10 mg/L excess SS concentration in the area that is totally enclosed by the contour is 90.20 ha (222.89 ac) but lasts for only 1 hr. This short duration continues for all the concentration contour thresholds through 1,000 mg/L. The enclosed areas quickly drop in time for a given concentrations so by 2 hrs the 10 mg/L area has dropped to 32.20 ha (79.57 ac) and by 6 hrs the plume is completely gone. The area coverages drop dramatically for the higher concentrations near the jet plow indicating that the duration and extent of the plume is relatively limited.

The areal sizes of the deposition thickness patterns also generally drop in size, but not always. At the range of 0.1 to 0.5 mm (0.004 to 0.02 in) thickness the area is 35.6 ha (87.9 ac) due to jet plowing the three cable routes. These areas drop overall for the higher deposition thicknesses (e.g., 2.4 ha [5.9 ac] for the 5 to 10 mm (0.2 to 0.4 in) thickness range) near the jet plow indicating that the extent of the plume is relatively limited.

Diver Burial Assuming No Use of Silt Curtains

The total enclosed area of the excess SS concentration plumes for the west and east diver burial sections were also examined, specifically assuming that silt curtains were not used. Typically, at

10 mg/L excess SS concentration the instantaneous total area enclosed by the contour is 8.4 ha (20.7 ac) for the west section and 1.9 ha (4.7 ac) for the east section. However, these total enclosed areas drop dramatically for the higher concentrations near the diver burial activities, i.e., the area at 1,000 mg/L is only about 0.2 ha (0.6 ac) for the west section and 0.0 ha (0.1 ac) for the east section, indicating that the extent of the plume is again relatively limited.

Assuming no silt curtains were used, the total area in the west section that is enclosed by the 10 mg/L excess SS concentration contour is 14.6 ha (36.1 ac) but lasts for only 1 hr. This short duration continues through all the concentration contour thresholds through 5,000 mg/L. The enclosed areas decrease in time for a given concentrations so by 6 hrs the 10 mg/L area has dropped to 8.6 ha (21.2 ac). The 10 mg/L area persists for two days because the initial buildup occurs near slack water with grain size distribution indicating mostly fines (silts and clays). The area coverages decrease for higher concentrations near the diver burial activities. At the east section the 10 mg/L excess SS concentration total area that is enclosed by the contour is 8.2 ha (20.2 ac) but lasts for only 1 hr. This short duration continues through all the concentration contour thresholds through 500 mg/L. The enclosed areas decrease in time for a given concentration so by 6 hrs the 10 mg/L area has dropped to 4.1 ha (10.2 ac). The 10 mg/L area persists for two days because the initial buildup occurs near slack water with grain size distribution indicating mostly fines (silts and clays). The area coverages decrease for higher concentrations near the diver burial activities.

The sizes of the deposition thickness patterns also dropped as the deposition increased. At the 0.1 to 0.5 mm (0.004 to 0.02 in) thickness range the area is 3.4 ha (8.5 ac) for the west and 4.4 ha (10.8 ac) for the east, both including the three cable routes combined. These areas drop dramatically for the higher deposition thicknesses (e.g., 0.5 ha [1.2 ac] for the 10 to 50 mm (0.4 to 2 in) thickness on the west section and 1.2 ha (2.9 ac) for the east section indicating that the extent of the plume is limited.

Diver Burial Assuming Use of Silt Curtains

The effects of using of silt curtains were estimated by assuming that 90% of the suspended sediment resuspended from diver burial operations would be trapped by the curtains. That being the case, the results based on no silt curtain use can be reduced by a factor of 10 to estimate the concentrations outside the silt curtain. At 10 mg/L excess SS concentration the area enclosed by the contour was 1.2 ha (3.0 ac) for the west section and 0.4 ha (0.9 ac) for the east section.

In terms of exposure, for the west section at 10 mg/L excess SS concentration the area that is enclosed by the contour is 5.9 ha (14.7 ac) but lasts for only 1 hr. The areas decrease in time for a given concentrations so by 6 hrs the 10 mg/L area has dropped to 2.3 ha (5.7 ac). For the east section at 10 mg/L excess SS concentration the area that is enclosed by the contour is 2.1 ha (5.1 ac) but lasts for only 1 hr. The areas decrease in time for a given concentration so by 6 hrs the 10 mg/L area has dropped to 1.4 ha (3.6 ac). The area within the silt curtain area would, of course, see a significant increase in concentration until the material has settled out.

With the use of silt curtains the bottom deposition thickness outside the silt curtains can also be reduced by a factor of 10. At the 0.1 -> 0.5 mm (0.004 -> 0.02 in) thickness the area enclosed by the contour is 1.9 ha (4.6 ac) for the west and 1.1 ha (2.6 ac) for the east. Based on the trench geometry for diver burial 90% of the entire west resuspension volume or 181.0 m^3 (6,394 ft^3)

spread over the area enclosed by the silt curtain results in an average deposition thickness of 94 mm (3.71 in) while 90% of the entire partial east resuspension volume or 224.5 m^3 (7,927 ft^3) spread over the enclosed area results in an average deposition thickness of 110 mm (4.32 in). Larger thicknesses would be found closest to the burial routes (including in the trenches) and smaller thicknesses found closer to the silt curtains distant from the routes.

Stability of Deposited Sediments

A measure of the stability of deposited sediments to the seabed is a function of the erosion velocity for each grain size in the sediment. Since the freshly deposited sediment is unconsolidated, the fine grains (clay and silt) and sand are eroded at a velocity of about 20 cm/s (0.4 kt). This minimum speed is exceeded across most of Little Bay except in the shallow very near the shore. Thus sediment particles deposited along much of the route will likely be resuspended on subsequent tides and dispersed from the areas initially affected by deposition.

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Appendix F: Memorandum: Environmental Mitigation Project along the Wagon Hill Farm Shoreline, Town of Durham Department of Public Works

Department of Public Works
Town of Durham
100 Stone Quarry Drive
Durham, N.H. 03824
603-868-5578
Fax 603-868-8063

MEMORANDUM

TO: Sarah Allen, Normandeau Associates Inc.

FROM: Michael Lynch, Public Works Director

DATE: September 3, 2015

RE: Environmental Mitigation Project along the Wagon Hill Farm Shoreline

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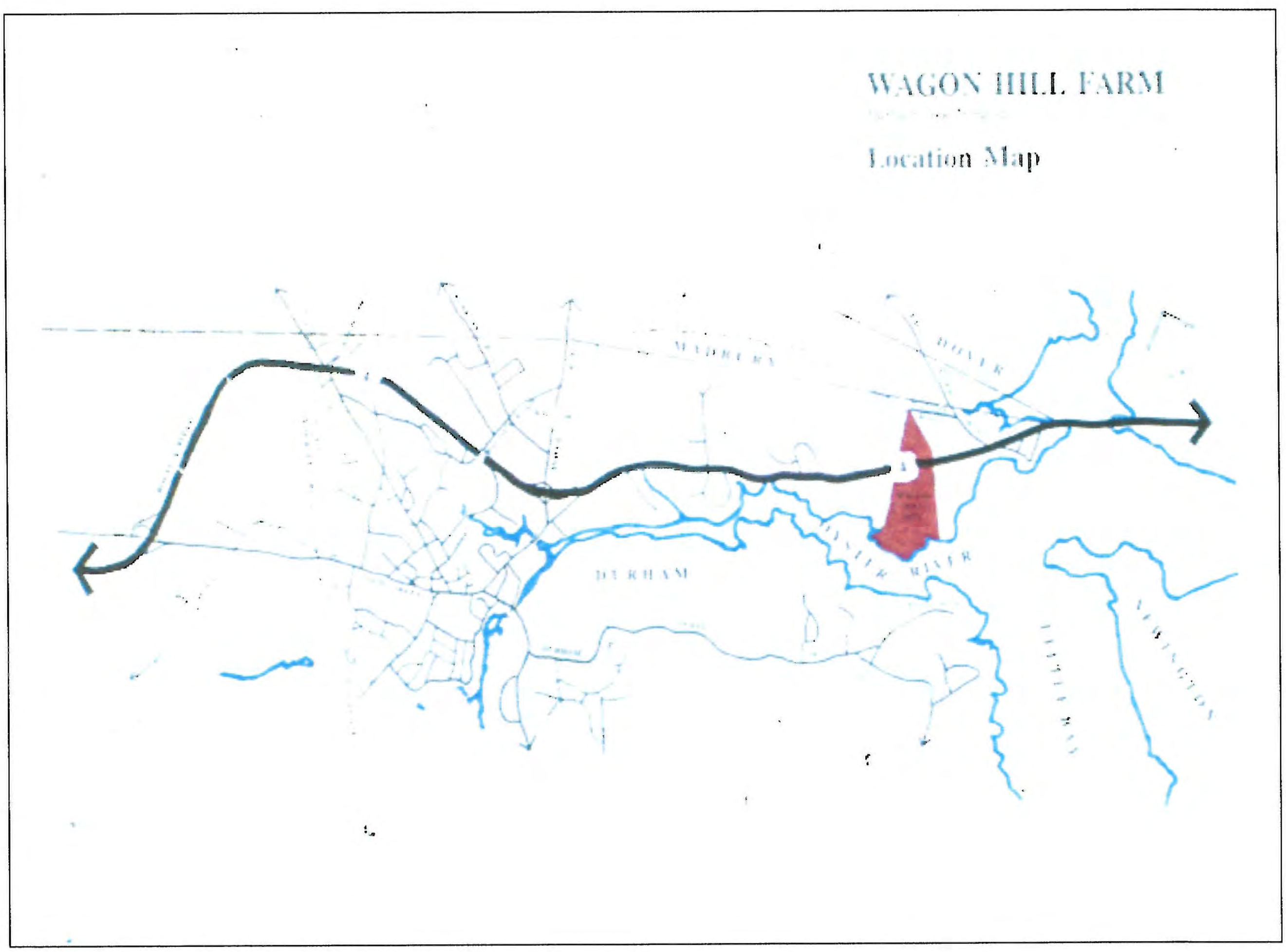
The Town of Durham in cooperation with Eversource (previously Public Service of New Hampshire) is partnering to propose an Environmental Mitigation Project which will eliminate a significant amount of erosion from the Wagon Hill Farm shoreline along the Great Bay Estuary and the Oyster River.

BACKGROUND

The Wagon Hill Farm consists of 139 acres. It consists of a 99 acre parcel on the south side of Route 4 and a 40 acre parcel on the north side of Route 4. It has approximately 1100 feet of frontage on Little Bay.

The farm was purchase by the Town of Durham in 1989. The land was purchased by the Town ***"to preserve its scenic vistas, provide for future municipal purposes, preserve open space, provide a healthful and attractive outdoor environment for work and recreation, and to conserve land, water, forest and wildlife resources."***

In 1995 the Strafford Regional Planning Commission and the Town of Durham received a grant from the New Hampshire Office of State Planning, New Hampshire Coastal Program to hire a consultant to prepare a master and a management plan for the process. The Strafford Regional Planning Commission issued a Request for Proposals for the work. It received four proposals from consulting firms. After reviewing three of the firms who submitted proposals it selected one of the firms, The Cavendish Partnership Inc., to perform the work. The following documents, the planning process and planning and management recommendations for the Wagon Hill Farm.



Existing Site Conditions

The 139 acre site is located three miles from downtown Durham on Route 4. The site is bisected east to west by Route 4 with 99 acres to the south and 40 acres to the north. The farm has not been used agriculturally for several years and indigenous plants have begun to reclaim the pastures north of Route 4 to some degree around the perimeter of the southern parcel. Gently rolling fields are the dominant feature of the parcel south of Route 4. (See location map)

The openness of the meadows affords distant views to Little Bay to the south and Oyster River to the southwest. The high knolls create an opportunity for significant views across the 99 acre parcel. The views from the shores of the Oyster River are exceptionally good. The views of Route 4 may be considered undesirable due to the heavy volume of automobile and truck traffic. The "wagon" is the focal point on the property for motorists traveling on Route 4.

There are a number of important historic sites and structures on the property. The most prominent historic feature of this site is the Bickford-Chesley farmhouse and its surrounding foundations. The Davis graveyard and the area where the garrison house once stood are also important features. On the northern parcel are the remains of a school house close to Route 4. The history of the site could be interpreted to provide a strong focus for future improvements.

The existing trails system traverses the southern portion of the site with trails in both meadows and wooded areas. Overall the trails are in excellent condition however, some degradation has occurred due to excessive use in sensitive areas by pedestrians and equestrians. Improved surfaces and the introduction of some structures in sensitive areas could prevent future degradation in wet and shoreline areas. If the number of visitors continues to increase, the trails will have to be surfaced with a material that will help define and maintain the walking surfaces while at the same time providing a surface suitable for physically and visually impaired visitors.

Elevation and Surface Hydrology

The site has two distinct high points. The northern high point is at the most northerly portion of the 40 acre parcel along Watson Road. Water drains from this area and collects in the wetland adjacent to Route 4. The other high point is on the 99 acre parcel and is where the wagon is located. Water drains from this ridge north to the wetlands along Route 4 and south to Davis Creek. Water that collects in the wetland along Route 4 eventually exits under the Wagon Hill driveway westerly to Smith Creek and into the Oyster River.

Slope Analysis

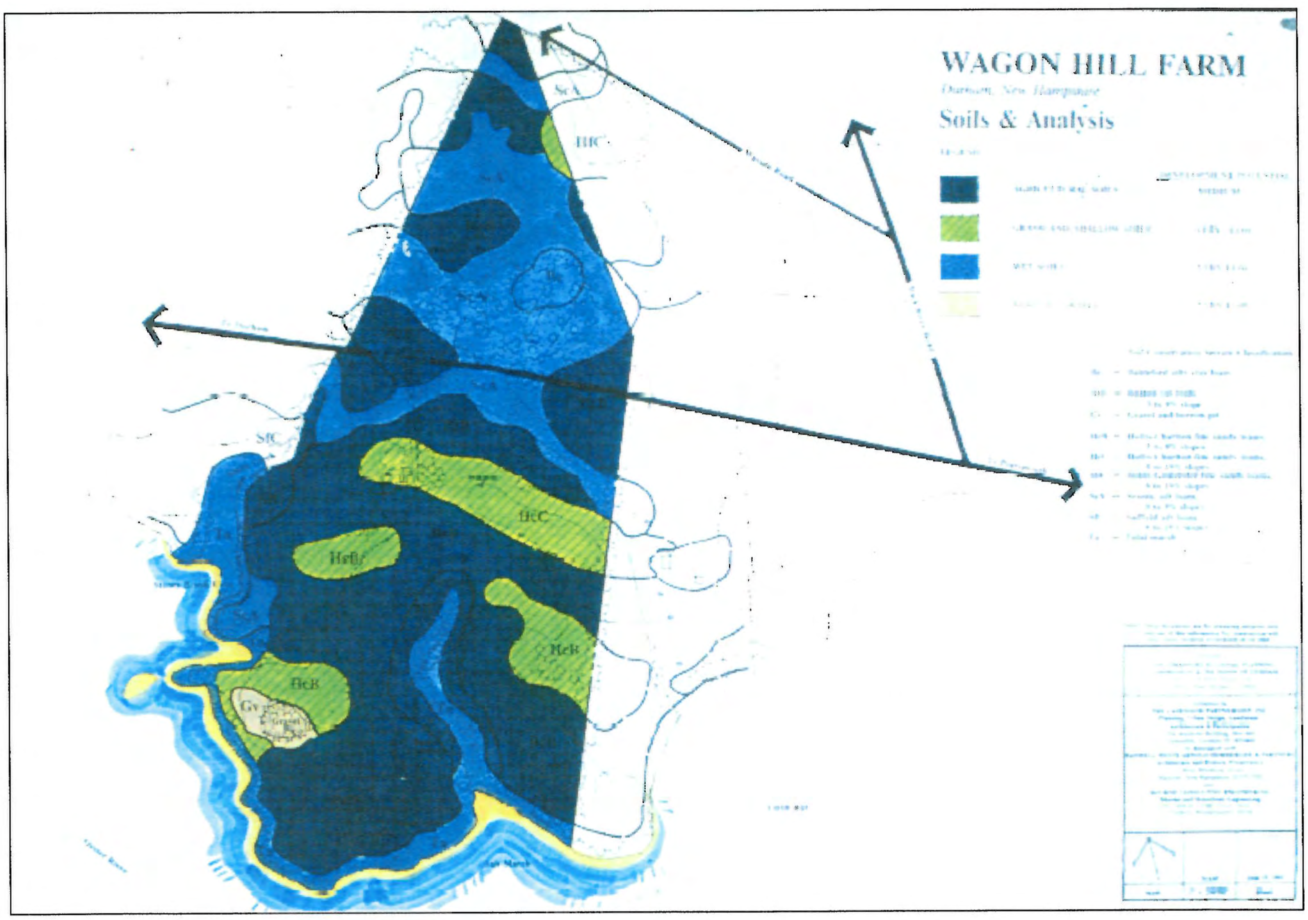
The slope analysis data was derived from United States Geological Survey mapping and site observations. The slopes are generally gradual to moderate on the 40 acre parcel with no areas above 10% gradient. The steepest slopes, in excess of 10% are on the 99 acre parcel around the farmhouse; along the southerly and westerly shorelines; in the gravel pit; adjacent to the knoll with the wagon; and along Davis Creek. The remainder of the 99 acre parcel has gradients within the 2 to 10% range. (See Slope Analysis Map)

Soils Analysis

Soil information was derived from the Soil Survey of Strafford County, New Hampshire prepared by the United States Department of Agriculture- Soil Conservation Service and the Soils Potential Report, prepared by the Strafford County Conservation District. The following soil types have been identified on the Wagon Hill Farm site. (See Soils Analysis Map)

Be	Biddeford Silty Clay on a small portion of the 40 acre parcel
BzB	Buxton Silt Loam- 3 to 8% gradients on the 99 and 40 acre parcels
GV	Gravel Pit located on in the southwest portion of the 99 acre parcel
HcB	Hollis-Charlton- fine sandy loams on top of the knoll on the 99 acre parcel
HcH	Hollis-Charlton- on 8 to 15% gradients on the 99 acre parcel
HfC	Hollis-Gloucester- fine sandy loams, on 8 to 15% gradients on the northeast portion of the 40 acre parcel
ScA	Scantic silt loams on 0 to 3% slopes on the majority of the 40 acre parcel and in the low lands adjacent to Route 4 on the 99 acre parcel
Ta	Tidal Marsh- along the shores of the Oyster River

The Soils Potential Report identified 48 acres on the 99 acre parcel (BzB and SfC) as having medium potential for recreational development. The remaining 92 acres were poorly drained with low to no potential for recreational development.



Vegetation

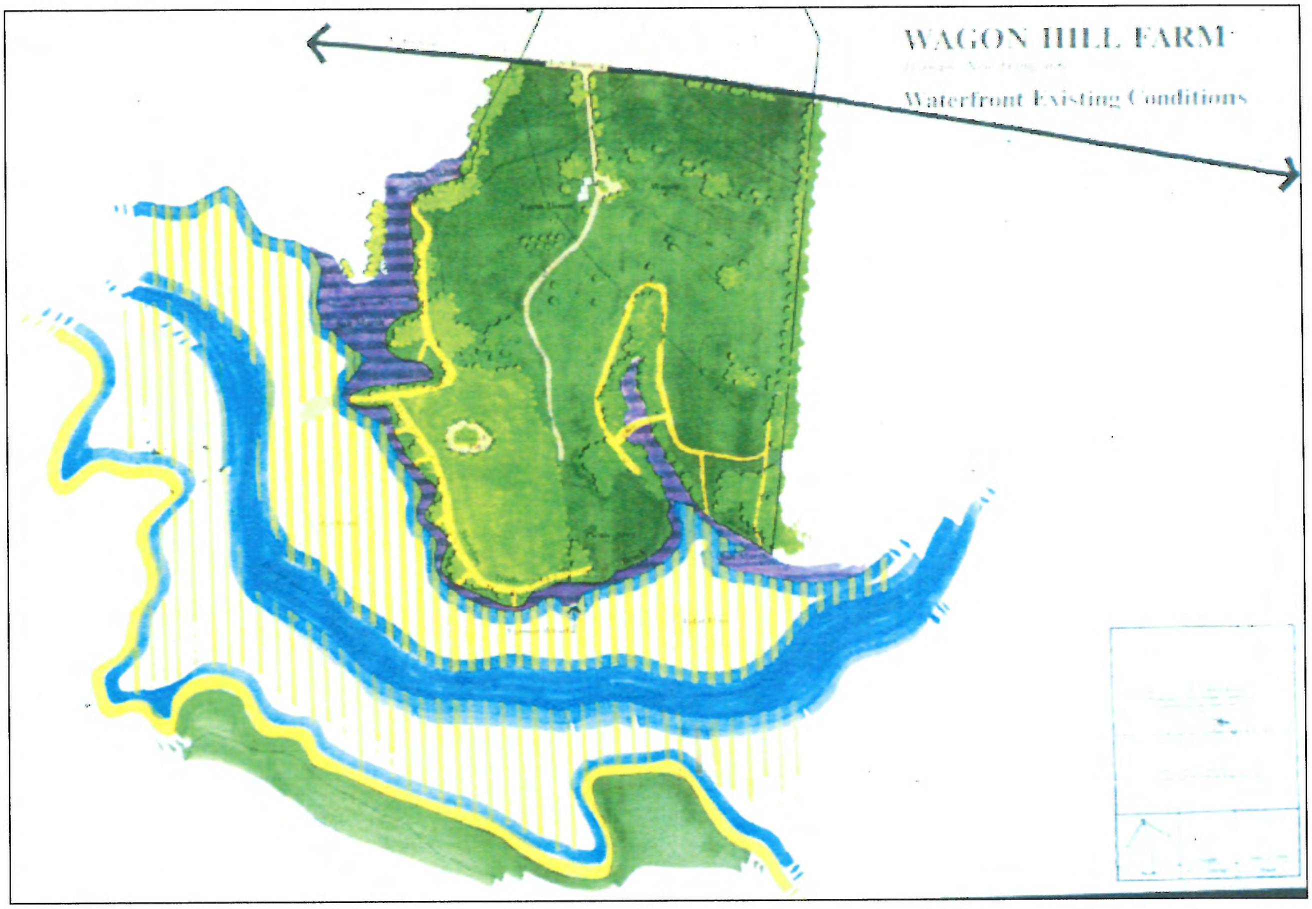
This information was derived from a report entitled, Summary of Existing Potential Bio-diversity of Wagon Hill Farm, Durham, New Hampshire, by Auchly, Jones, Kimmel, Midura, 1990. The report identified forty four different plants. The types of vegetation are indicative of the micro climatic and soil conditions of the site. The white pine stand is significant in that historically the British Navy harvested white pines for ships masts from this region. The diverse plant material also provides food for a variety of wildlife that lives on or in close proximity to the site. The site may be suitable for an arboretum or coastal botanical garden.

Wildlife and Domesticated Animals

This information was also derived from the Summary of Existing and Potential Bio-diversity of Wagon Hill Farm, Durham, New Hampshire report that identified birds, mammals, and coastal flora and fauna. There were fourteen bird species identified on the site and in addition another 28 species were identified as having the potential to utilize the site. Eleven mammals and two sea creatures were also identified. The site is used extensively by visitors walking and running dogs. Dogs (domesticated or otherwise) are natural predators for a variety of animal species and they are naturally perceived as a threat by mammals and birds, even if they don't physically harm them. Dogs may threaten other species by leaving a scent, making noise or by disturbing habitat areas. Dogs running loose can trample plants and unattended leave scat throughout the site. It is recommended that the management plan should provide an opportunity for dog owners to continue to bring their dogs to the farm if specific areas are designated for walking dogs with leashes and for allowing dogs to run free. In addition, existing leash laws should be strictly enforced and owners should be responsible for removing scat from the farm. Preservation and enhancement of the wildlife should be encouraged to create a balance in natural, economic and social use of the site.

Shoreline Conditions

The existing shoreline conditions are a result of soil and ice and tidal forces and human intervention. Segments of the shoreline indicate over use by visitors which has created erosion. These unnatural conditions (pathways) are exacerbated by natural conditions including wind, tidal and ice forces. This erosion, unchecked, has and will continue to result in degradation of the shoreline and salt marshes, negative impacts on wildlife, shell fish and fish habitats. It is recommended that a shoreline stabilization program be implemented as soon as possible. The measures taken should as minimally as possible, emulating the natural conditions of the shoreline. Rip-rapping should only be used where absolutely necessary and whenever possible plant materials or erosion control fabrics should be used. The farm site is susceptible to flooding during the 100-year flood stage and flooding should not impact most recreational uses. (See Waterfront Existing Conditions Map)



Water-based Recreation

The farm is primarily used for land-based recreation. The potential for boating is limited due to tidal conditions, water depths and shoreline that are naturally limited for launching boats. The installation of piers and boar landings may be difficult to permit and implement due to the currents, ice and tidal conditions. Swimming is now taking place on the 99 acre parcel on a limited basis. The site is not ideal for swimming due to tidal conditions and the water currents and it is not recommended that this activity be encouraged to expand for both safety and environmental reasons. Environmentally the salt marshes are particularly sensitive to pedestrian activity which may result from the unplanned expansion of existing swimming areas. Limited access from the water by canoes and kayaks is now taking place and has minimal impact on the farm as long as the access points are defined and controlled. (See Waterfront Existing Conditions Map)

SHORELINE RESTORATION RECOMMENDATIONS

1. The shoreline is in a state of deterioration and it is not anticipated that it will stabilize itself naturally. Shoreline stabilization along the water's edge should take two forms: a hardened edge installation of a rip rap slope. This would be appropriate in limited areas above the salt marsh fringe to prevent continued erosion. Rip rap would include filter

fabric insulation- $410 per linear foot, $451,000. (This project recommends rip rap in limited areas.)

A softer form of shoreline stabilization would require the installation of vegetated fiber roll along the toe of the slope backfilled with soil suitable for the salt marsh plantings. The system would include palette mats that are pre-vegetated to begin the initial re-vegetation of shoreline areas. This method is most desirable where the salt marsh has eroded and replacement is required to prevent further degradation of the salt marsh. Vegetated shoreline stabilization- $205 per linear foot= $225,500. (This project recommends substantial salt marsh plantings.)

2. Protecting the pristine marsh system involves two steps:
First areas of limited degradation should be re-vegetated using a pre-seeded mesh to reestablish plants quickly. The area around the point needs to be rip rapped to protect the area from further erosion.

Secondly, the area known as "The Point" where Davis Creek meets the Oyster River will require some type of structure and/or protection to prevent any further erosion. The area is a part of the pristine marsh system identified by the Durham Coastal Method Inventory & Evaluation Project (DCMT & EP). The structure will be a valuable spot to observe wildlife in the river and marsh. Some of the shoreline degradation is caused by ice and tides, however, most of the impact in this area is from human intervention. Estimate is $20,000

3. There is a desire to short cut the present trail system at Davis Creek bringing people through sensitive wetland habitats. Building a bridge structure will help prevent erosion from occurring at the crossing and will create a wildlife and habitat observation point along the trail. The construction of the bridge should begin by flagging the wetlands in the area and then creating a structure that effectively keeps people above the grasses.

A footbridge at Davis Creek would help protect the wetlands that are now being jeopardized by people crossing the creek. The cost could be minimized by donations- $50 per square foot or approximately $10,000.

4. Trail system improvements include the spreading mulch to help keep people on the trail and to prevent root compaction through wooded areas. The new surface will help prevent people from tripping over tree roots or into holes as well. Areas such as the steep bank down to the beach in the southeast shoreline should either be closed off to prevent further erosion or re-vegetated with plant mats to help protect the bank from further degradation. Simplifying the trails through the area south of the orchard will help keep environmental impact to a minimum. If a phasing program is needed to defer the costs, the areas closet to the river and through any wet areas should be the first to receive the bark mulch. No cost- in house project.

Project Details

Location: Route 4
Tax Map: Map 12, Lot 8-2
Acreage: Entire Property 139 acres
Road Frontage: 1,341' +/- of frontage on Piscataqua Road (US Route 4)
River Frontage: 1,100' +/- of tidal frontage on the Oyster River and Smith Creek
Zoning: Residence Coastal, with a minimum lot size of 150,000 square feet and road frontage requirement of 300 feet.

Wagon Hill Farm consists of high quality working farmland, healthy forest, and significant coastal and estuarine resources along the Oyster River in Durham, NH. The tract has important ecological resources including significant undeveloped coastal shoreline, tidal and estuarine riparian conservation values, and water quality protection attributes.

With 1100 feet of tidal frontage on Little Bay, Oyster River and Smith Creek, and 8.5 acres of tidal and freshwater wetlands, this project will permanently protect important on and off-site aquatic resources. The project will help protect the water quality and aquatic habitats of the Great Bay estuary including the adjacent NHB-documented "sparsely vegetated intertidal system", an exemplary natural community. Wagon Hill Farm has critical pollutant (e.g. nitrogen) attenuation characteristics (NH DES). Historically abundant oyster populations occurred in the Oyster River and Great Bay which The Nature Conservancy and others are working to restore to mitigate water quality impairments of Great Bay. This project will remove the threat of sediment loading from incompatible uses on the property that could smother oyster reefs. The Oyster River and Smith Creek are part of the Piscataqua River Network, classified as having "high relative resilience" according to a recent scientific analysis of predicted resilience to the impacts of climate change (TNC 2013). This project will incorporate significant riparian buffers to protect the estuarine and coastal resources of Smith Creek and the Oyster River.

Maintain Prominent Scenic Vista:

This project provides a very prominent viewshed for commuters along the heavily traveled corridor of Route 4 and boat traffic along the Oyster River. In fact, this parcel is the most visible and recognized parcel due to the prominent fields and the wagon on the hill.

The Durham Master Plan (2000) identifies this viewshed as one part of "the entrance to Durham as you pass Wagon Hill Farm, Emery Farm, Johnson Creek, Old Piscataqua River, and Bunker Creek" . . . protection of these viewsheds should be and will continue to be a high priority for Durham.

Draft Project Budget

Expenses

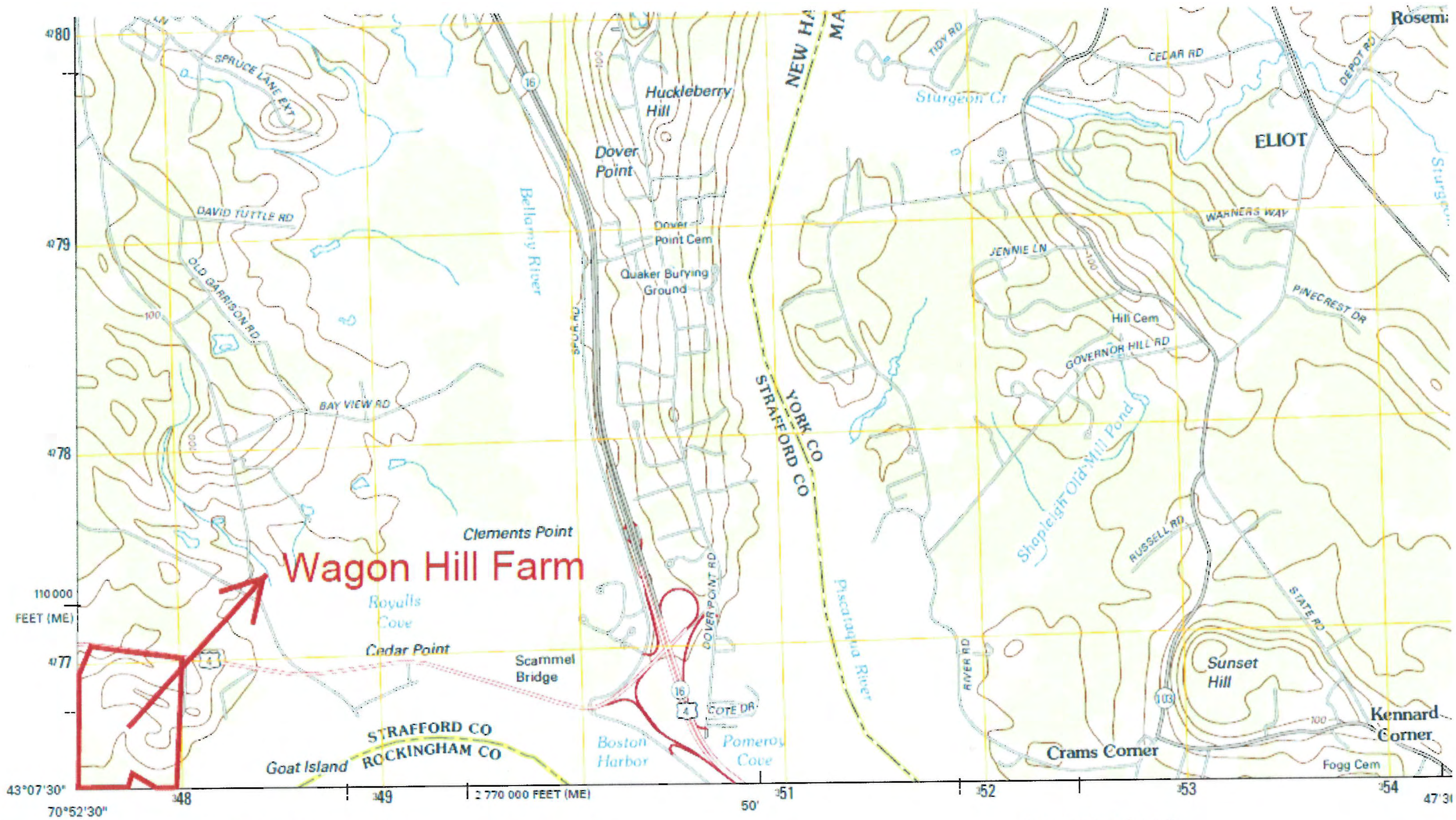
Shoreline Restoration	$338,250	(mix of hardened edge and soft re-vegetated stabilization.)
Bridge (Davis Creek)	$10,000	
Davis Creek Point	$20,000	
TOTAL EXPENSES	**$368,250**	

Revenues

Eversource Mitigation Project	$170,000
Lois Brown Trust	$115,000
Town of Durham	$83,250
TOTAL INCOME	**$368,250**

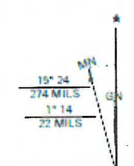
Attachments:

USGS Map
Current Erosion Photos (9/3/15)



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid: Universal Transverse Mercator, Zone 19T
10 000-foot ticks: Maine Coordinate System of 1983 (west
zone), New Hampshire Coordinate System of 1983

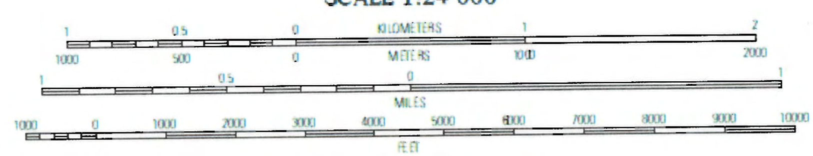
Imagery....NAIP, July 2009 - July 2011
Roads....©2006-2011 TomTom
Names....GNIS, 2011
Hydrography....National Hydrography Dataset, 2009
Contours....National Elevation Dataset, 2005
Boundaries....Census, IBWC, IBC, USGS, 1972 - 2010



UTM GRID AND 2012 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000-m Square ID
CH
Grid Zone Designation
19T

SCALE 1:24 000



CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.2

EROSION PHOTOS 9/3/15