



South Drive Project
Durham, New Hampshire

MAJOR IMPACT STANDARD DREDGE AND FILL APPLICATION

University of New Hampshire

March 2021

U0135-048A
March 3, 2021

NHDES Wetlands Bureau
Attn: Stefanie Giallongo
29 Hazen Dr, PO Box 95
Concord, NH 03302-0095

Re: **Major Wetland Impact Application**
University of New Hampshire, South Drive Project
Tax Map 13, Lot 7-2, Durham, NH

Dear Ms. Giallongo:

Tighe & Bond is pleased to submit this Major Impact Permit application on behalf of the University of New Hampshire (UNH) for impacts associated with the construction of a parking lot, road upgrades, and conversion of an old stormwater detention basin to a gravel wetland.

Project Description and Background

UNH is proposing wetland impacts associated with road upgrades and construction of a new Health Science Simulation Center (HSSC) along the western edge of the campus. Portions of the proposed work are closely related to wetland impacts permitted in the same area in 2014 (NHDES Permit 2014-00107). Only a portion of the project permitted in 2014 was completed before the permit expired, and only two of the three rain gardens in the mitigation package for that project have been installed.

Under the current project, UNH is proposing wetland impacts focused around construction of the new HSSC building in a previously developed area to the southwest of the South Drive/College Brook crossing, just north of Gregg Hall, and just east of the Chase Ocean Engineering building. The project also includes upgrades to South Drive and its extension through what is now Waterworks Road. The HSSC is on a fast track for completion due to the high demand for facilities associated with the nursing program and the project funding timeline. In fact, construction of the building is already underway to assure it will be completed in time for use for the fall 2021 semester.

Related to construction of the HSSC is the need for parking associated with the new building and completion of improvements to South Drive. The South Drive improvements include widening to help relieve flow from Main Street, as well as for pedestrian sidewalks and bike paths, which are expected to be highly utilized and will help reduce vehicular traffic and the need for additional parking. The new HSSC building and related parking lot will be located in an area previously designed for the extension of South Drive that was approved under the 2014 wetland impact permit. This has pushed the South Drive improvements from the 2014 location to what is presently Waterworks Road. Currently, portions of Waterworks Road fall within the adjacent railroad right-of-way. Since there is a need to improve and widen Waterworks Road to become South Drive, it was appropriate to take this opportunity to shift the road slightly to the west during construction to remove any potential future conflicts with the railroad.

Proposed wetland impacts include 14,008 square feet of permanent impacts and 5,118 square feet of temporary impacts, for a total of 19,126 square feet.

Jurisdictional Wetlands

The proposed project is located within an active part of the UNH campus, and the wetlands there were found to be highly disturbed, primarily consisting of palustrine emergent (PEM) wetlands, with lesser areas of palustrine scrub-shrub (PSS), and included College Brook, a perennial stream (RUB3). Descriptions of individual wetlands and their functions can be found in Appendix D and photographs can be found in Appendix E. A Natural Heritage Bureau (NHB) database check uncovered two potential rare plants in the area, but a determination was made that neither of them is likely to be impacted by the project (Appendix I).

Methods

Jurisdictional wetlands reviewed and delineated at the project on November 9, 2020 by Leonard A. Lord, PhD, NHCWS #14, NHCSS #19 of Tighe & Bond. Wetland criteria used included the following:

- *Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1* (January 1987)
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (January 2012).
- *Field Indicators for Identifying Hydric Soils in New England, Version 4* (2018)
- *U.S. Army Corps of Engineers Northcentral and Northeast 2016 Regional Wetland Plant List* (Lichvar et al., 2016).
- NHDES Wetlands Bureau Administrative Rules (2020)

Wetlands were classified based on *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). Functional analyses of the wetlands were based on *The Highway Methodology Workbook Supplement—Wetland Functions and Values: A Descriptive Approach*, NAEPP-360-1-30a, US Army Corps of Engineers, New England Division, September 1999, except that the Ecological Integrity function was based on the *Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire* (UNH Cooperative Extension, 2016).

Relationship to Standard Permit Conditions

The project will comply with the standard permit conditions required of all wetland impact permit applications, including the following:

- Env-Wt 307.02. The project will comply with the Army Corps New Hampshire State General Permit conditions.
- Env-Wt 307.03 & 307.04. Water quality will be protected by following appropriate BMPs for erosion and sediment control and stabilization of disturbed soils. Work within College Brook will be completed using stream diversion and/or cofferdams, utilizing additional turbidity controls if needed. Work will be completed during low flow conditions if practical.
- Env-Wt 307.05. Invasive plant BMPs will be utilized during construction (*BMPs For Invasive Plant Control*, NHDOT 2018).
- Env-Wt 307.06. No documented rare species will be impacted by the project.
- Env-Wt 307.07-307.09. N/A.
- Env-Wt 307.10. Dredging of the stormwater detention basin for renovation will be done during low flow/dry conditions as practical. Dredged materials will be properly dewatered and disposed of outside of jurisdictional areas.

- Env-Wt 307.11. Limits of filling and disturbance will be marked in the field, and erosion and sediment controls will be installed prior to commencement of work. Placement of fill will include the use of clean materials that will be stabilized upon placement.
- Env-Wt 307.12. All work in or adjacent to surface waters will be stabilized within three days of final grading or temporary suspension of work. Invasive species will not be used in any seed mixes or plantings, and successful revegetation of temporary impacts will meet NHDES standard conditions.
- Env-Wt 307.13. Consent for work on or within 10 feet of the adjacent railroad property will be obtained prior to that phase of construction. The initial phases of work will be completed further than 10 feet from the property line.
- Env-Wt 307.14. Any rocks that may need to be disturbed for installation of the open bottom box culvert will be replaced within the stream restoration area.
- Env-Wt 307.15. All requirements regarding the use of heavy equipment in wetlands will follow NHDES rules. Most or all of the temporary impacts should be able to be completed by reaching into jurisdictional areas from uplands.
- Env-Wt 307.16 & 307.17. All work shall follow the approved plans and permit conditions.
- Env-Wt 307.18. All reports required by permit conditions, including construction follow-up reports and wetland mitigation monitoring, shall be supplied to NHDES in a timely manner.

Project Need, Avoidance, and Minimization

Project Need

The HSSC building is on a fast track for completion due to the high demand for facilities associated with the nursing program and the project funding timeline. In fact, construction of the building is already underway. Related to construction of the HSSC building is the need for associated parking.

The South Drive improvements include widening to help relieve flow from Main Street, as well as for pedestrian sidewalks and bike paths, which are expected to be highly utilized and will help reduce vehicular traffic and need for additional parking. The need for construction of South Road as a way to relieve vehicular traffic congestion along Main Street was based on a study by Resource Systems Group (RSG) in 2010. These improvements, including the accommodation of more pedestrian and bicycle traffic, are consistent with the Durham Master Plan, which specifically mentions these types of goals (Town of Durham, NH 2015 Master Plan, e.g., pp. LU-7, VCC-15, and DCC-2).

Currently portions of Waterworks Road fall within the adjacent railroad right-of-way. Since there is a need to improve and widen Waterworks Road to become South Drive, it was appropriate to take this opportunity to shift the road slightly to the west during construction to remove any potential future conflicts with the railroad.

Avoidance and Minimization

This site was selected for the HSSC building due to the need for students to be within walking distance of related buildings and its proximity to the center of campus. UNH has limited land that could support new buildings on campus and no other site was available that would be appropriate for this project. The selected site clusters the HSSC with other buildings in a previously developed area rather than starting with pristine land. The location also ensured

minimal impacts to wetlands, and those wetlands that will be impacted are already highly disturbed with relatively low wetland functions and values. The installation and extension of South Drive reduced wetland impacts by upgrading primarily along existing roadways rather than selecting a new route. The need for such improvements to relieve traffic congestion along Main Street was supported by a traffic study completed in 2010. Grading along the road extension has also been steepened to 2:1 slopes to reduce wetland impacts. Furthermore, designing a crossing of College Brook at the existing Colovos Road crossing rather than at a new crossing minimizes impacts to the brook and provides an opportunity to replace a 52-inch concrete pipe with an 18-foot wide open bottom box culvert with stream simulation to accommodate aquatic passage.

In addition to the direct impacts associated with the HSSC parking lot, the College Brook crossing, and upgrades to Waterworks Road/South Drive, one small, human-made wetland needed to be impacted due to the configuration of stormwater structures. Wetland Impact Area #7 is a small, isolated ditch/swale that runs between a 10-inch cast iron culvert outlet and a catch basin. The placement of stormwater infrastructure in this area is limited by the presence of underground electric utility structures.

Impact Mitigation

Permanent wetland impacts from the project total 14,008 square feet, of which 2,744 square feet are associated with the stream crossing at College Brook. Based on the mitigation pre-application teleconference held with NHDES staff and the Army Corps held December 18, 2020, the stream crossing impacts are considered to be offset by replacing the existing 52-inch concrete pipe with an 18-foot wide open bottom box culvert with stream simulation. In addition to the culvert replacement, 311 square feet of stream channel at the crossing will be created or restored.

With the 2,744 square feet of permanent impact at the stream crossing accounted for, 11,264 square feet of permanent impact remain to be offset by additional mitigation. Apart from the stream crossing, impacts from the proposed project are to disturbed wetlands with functions related to flood storage, nutrient trapping, and sediment trapping (Appendix D). The need for enhancing these functions along College Brook is demonstrated by a 2016 EPA Section 303(d) listing that includes impairments for benthic-macroinvertebrates, chlorides, and dissolved oxygen saturation. For these reasons, we are presenting an Alternative Mitigation Proposal (Env-Wt 803.09), which does not meet the minimum compensation ratios of Env-Wt 803.08, but which do provide significant water quality treatment using engineered systems that provide these functions to a much greater extent than could be achieved in natural wetlands of similar size. This will be done by creating a rain garden and renovating an old stormwater detention structure to create a gravel wetland. These structures total 3,602 square feet of vegetated treatment area but will treat up to 12,171 cubic feet of stormwater per storm from a total of 21.86 acres (Table 1, and Appendix F).

TABLE 1
Engineered Mitigation Area Features

Treatment Measure	Rain Garden	Gravel Wetland	Total
Impervious Area Treated (ac)	9.97	2.19	12.16
Pervious Area Treated (ac)	7.91	1.79	8.61
Total Area Treated (ac)	17.88	3.98	21.86
Water Quality Volume Treated (cf)	4,361	7,810	12,171
Vegetated Treatment Base (sf)	1,557	2,045	3,602

Project Phasing

The primary focus and first phase of the project will be to complete the HSSC building and parking lot, which includes 350 square feet of temporary impacts and 2,349 square feet of permanent impacts, for a total of 2,699 square feet of wetland impacts, which is 14% of the total project impacts. The rush to complete this phase is necessary to ensure the project is completed on schedule to move into the building in August and be ready for use prior to the 2021 fall semester. The remainder of the project, including the South Drive improvements, College Brook Crossing, and wetland mitigation projects will then follow, with a scheduled completion date by the end of the permit period in the summer of 2026.

Agency Comments and Coordination

Correspondence from NH Natural Heritage Bureau regarding the unlikelihood of impacting rare plant species was received December 2, 2020 following the receipt of DataCheck results dated November 11, 2020 (Appendix I). An informal preapplication teleconference was held for this project with NHDES Wetlands Bureau Staff on December 7, 2020. This was followed by an expanded teleconference on December 18, 2020 that included mitigation pre-application discussions with NHDES staff and the Army Corps.

This wetland impact application is being submitted concurrently to the Durham Conservation Commission and the Oyster River Local Advisory Committee. No comments have been received from either agency, or from any federal agencies. Once a NHDES Wetlands Bureau file number is received, a Request for Project Review will be sent to the NH Division of Historical Resources as required by the Army Corps New Hampshire General Permit.

Appendices

The following supporting documents can be found appended to this submittal:

- Appendix A – Application Form, Attachment A, and Copy of the Fee Payment
- Appendix B – US Army corps of Engineers “Appendix B”
- Appendix C – USGS Locus Map
- Appendix D – Functional Assessment Summary and Worksheets
- Appendix E – Photographs
- Appendix F – Compensatory Mitigation Runoff Treatment Areas

- Appendix G – Tax Maps, Abutter Information, Certified Postal Receipts
- Appendix H - Work Sequence
- Appendix I – Natural Heritage Bureau Results and Correspondence
- Appendix J – Stream Crossing Worksheet and College Brook Floodplain Analysis
- Appendix K – Project Plans

Should you have any questions or require any additional information, please contact me at 603-312-0236.

Very truly yours,

TIGHE & BOND, INC.



Leonard A Lord, PhD, NHCWS, NHCSS
Sr. Environmental Scientist

Enclosures

Copy: Durham Town Clerk
Durham Conservation Commission
Durham Planning Board
Durham Board of Selectmen
University of New Hampshire – Paul Henry, Michele Heisner

J:\U\U0135 UNH General\U-0135-048A South Drive Wetland Permitting\Report_Evaluation\Permitting\NHDES Wetlands\Permit Application\Components for Permit Assembly\0.1c--UNH SDF Cover Letter.docx

Tighe&Bond

APPENDIX A

Official eCheck

Tighe & Bond, Inc.
53 Southampton Road
Westfield, MA 01085

This is a Deluxe eCheck. The PAY TO THE ORDER OF line designates the Payee. For questions, call Deluxe Payment Exchange customer support at 877-333-6964. Ref: 8D58-50CD

5122

Date **02/18/2021**

Void after 90 days

PAY TO THE ORDER OF **Treasurer, State of New Hampshire**

\$ 7,650.40

Seven thousand, six hundred fifty and 40/100

Dollars

TD Bank, NA

Memo **NHDES Wetlands Application Fee**

Verify check at <http://echecks.com/verify>

⑈005122⑈ ⑆211370545⑆



STANDARD DREDGE AND FILL WETLANDS PERMIT APPLICATION

Water Division/Land Resources Management
Wetlands Bureau
[Check the Status of your Application](#)



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

APPLICANT'S NAME: University of New Hampshire, Attn: Henry, Paul A. **TOWN NAME:** Durham

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

A person may request a waiver to the requirements in Rules Env-Wt 100-900 to accommodate situations where strict adherence to the requirements would not be in the best interest of the public or the environment. A person may also request a waiver of the standards for existing dwellings over water pursuant to RSA 482-A:26, III (b). For more information, please consult the [request form](#).

SECTION 1 - REQUIRED PLANNING FOR ALL PROJECTS (Env-Wt 306.05; RSA 482-A:3, I(d)(2))	
Please use the Wetland Permit Planning Tool (WPPT) , the Natural Heritage Bureau (NHB) DataCheck Tool , the Aquatic Restoration Mapper , or other sources to assist in identifying key features such as: priority resource areas (PRAs) , protected species or habitats , coastal areas, designated rivers, or designated prime wetlands.	
Has the required planning been completed?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Does the property contain a PRA? If yes, provide the following information:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> • Does the project qualify for an Impact Classification Adjustment (e.g. NH Fish and Game Department (NHF&G) and NHB agreement for a classification downgrade) or a Project-Type Exception (e.g. Maintenance or Statutory Permit-by-Notification (SPN) project)? See Env-Wt 407.02 and Env-Wt 407.04). <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No • Protected species or habitat? <ul style="list-style-type: none"> ○ If yes, species or habitat name(s): <input style="width: 100px;" type="text"/> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No ○ NHB Project ID #: <input style="width: 100px;" type="text"/> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No • Bog? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No • Floodplain wetland contiguous to a tier 3 or higher watercourse? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No • Designated prime wetland or duly-established 100-foot buffer? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No • Sand dune, tidal wetland, tidal water, or undeveloped tidal buffer zone? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 	
Is the property within a Designated River corridor? If yes, provide the following information:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<ul style="list-style-type: none"> • Name of Local River Management Advisory Committee (LAC): <input style="width: 200px;" type="text"/> Oyster River Local Advisory Comm. • A copy of the application was sent to the LAC on Month: <input style="width: 50px;" type="text"/> Day: <input style="width: 50px;" type="text"/> Year: <input style="width: 50px;" type="text"/> 	

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

For dredging projects, is the subject property contaminated? • If yes, list contaminant: [REDACTED]	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Is there potential to impact impaired waters, class A waters, or outstanding resource waters?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
For stream crossing projects, provide watershed size (see Wetland Permit Planning Tool or Stream Stats): 0.6 sq. mi = 384 ac.(see Ballestero report).	
SECTION 2 - PROJECT DESCRIPTION (Env-Wt 311.04(i))	
Provide a brief description of the project and the purpose of the project, outlining the scope of work to be performed and whether impacts are temporary or permanent. DO NOT reply "See attached"; please use the space provided below.	
<p>In 2014, UNH obtained a wetland impact permit that was focused on improvements to South Drive in the western portion of the campus near West (formerly Cowell) Stadium. That project included 15,900 square feet total temporary and permanent wetland impacts (NHDES Permit 2014-00107). The road construction impacts were deemed necessary to relieve traffic congestion on Main Street. Only a portion of that project, including 7,901 square feet of total wetland impacts, was completed before the permit expired.</p> <p>UNH is currently proposing new permanent wetland impacts that overlap with the previously permitted impacts, and which now include impacts for a parking lot associated with construction of the new Health Science Simulation Center (HSSC), as well as improvements to South Drive. The HSSC will be located just southwest of the proposed South Drive/College Brook crossing and is on a fast track for completion due to a high demand for facilities associated with the nursing program and the project funding timeline. Upgrades to South Drive include its extension through what is now Waterworks Road. Currently portions of Waterworks Road fall within the adjacent railroad right-of-way. Since there is a need to improve and widen Waterworks Road to become South Drive, it was appropriate to take this opportunity to shift the road slightly to the west during construction to remove any potential future conflicts with the railroad. The South Drive improvements include widening to help relieve flow from Main Street, as well as for pedestrian sidewalks and bike paths, which are expected to be highly utilized and will help reduce vehicular traffic and need for additional parking. The project and its associated wetland impacts will be phased, beginning first with the HSSC parking lot impacts, followed later by the South Drive improvements.</p>	
SECTION 3 - PROJECT LOCATION	
Separate wetland permit applications must be submitted for each municipality within which wetland impacts occur.	
ADDRESS: South Drive, Colovos Road, Waterworks Road	
TOWN/CITY: Durham	
TAX MAP/BLOCK/LOT/UNIT: 13/2 UNH, Block 7	
US GEOLOGICAL SURVEY (USGS) TOPO MAP WATERBODY NAME: College Brook <input type="checkbox"/> N/A	
(Optional) LATITUDE/LONGITUDE in decimal degrees (to five decimal places):	
	43.135861° North
	70.937389° West

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

SECTION 4 - APPLICANT (DESIRED PERMIT HOLDER) INFORMATION (Env-Wt 311.04(a))		
If the applicant is a trust or a company, then complete with the trust or company information.		
NAME: University of New Hampshire, Attn: Henry, Paul A.		
MAILING ADDRESS: 22 Colovos Road		
TOWN/CITY: Durham	STATE: NH	ZIP CODE: 03824
EMAIL ADDRESS: pahenry@christa.unh.edu		
FAX: 603-862-3927	PHONE: 603-862-0290	
ELECTRONIC COMMUNICATION: By initialing here: PAH, I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 5 - AUTHORIZED AGENT INFORMATION (Env-Wt 311.04(c))		
<input type="checkbox"/> N/A		
LAST NAME, FIRST NAME, M.I.: Lord, Leonard, A.		
COMPANY NAME: Tighe & Bond		
MAILING ADDRESS: 177 Corporate Drive		
TOWN/CITY: Portsmouth	STATE: NH	ZIP CODE: 03801
EMAIL ADDRESS: llord@tighebond.com		
FAX: [REDACTED]	PHONE: O: 603-294-9224 / C: 603-312-0236	
ELECTRONIC COMMUNICATION: By initialing here LAL, I hereby authorize NHDES to communicate all matters relative to this application electronically.		
SECTION 6 - PROPERTY OWNER INFORMATION (IF DIFFERENT THAN APPLICANT) (Env-Wt 311.04(b))		
If the owner is a trust or a company, then complete with the trust or company information.		
<input checked="" type="checkbox"/> Same as applicant		
NAME: [REDACTED]		
MAILING ADDRESS: [REDACTED]		
TOWN/CITY: [REDACTED]	STATE: [REDACTED]	ZIP CODE: [REDACTED]
EMAIL ADDRESS: [REDACTED]		
FAX: [REDACTED]	PHONE: [REDACTED]	
ELECTRONIC COMMUNICATION: By initialing here [REDACTED], I hereby authorize NHDES to communicate all matters relative to this application electronically.		

SECTION 7 - RESOURCE-SPECIFIC CRITERIA ESTABLISHED IN Env-Wt 400, Env-Wt 500, Env-Wt 600, Env-Wt 700, OR Env-Wt 900 HAVE BEEN MET (Env-Wt 313.01(a)(3))

Describe how the resource-specific criteria have been met for each chapter listed above (please attach information about stream crossings, coastal resources, prime wetlands, or non-tidal wetlands and surface waters):

Env-Wt 400: Wetlands and College Brook have been properly delineated and classified by a NH Certified Wetland Scientist.

Env-Wt 514: The project incorporates stream bank stabilization criteria where stream banks will be disturbed and created at the College Brook crossing.

Env-Wt 516: The project incorporates design and construction criteria for outflow structures where treated stormwater is discharged to College Brook.

Env-Wt 523: The project incorporates appropriate dredging criteria associated with the refurbishing of a stormwater detention wetland to construct a gravel wetland for stormwater treatment as compensatory mitigation for impacts.

Env-Wt 524: The project meets all requirements for commercial development projects.

Env-Wt 525: The project follows restoration/enhancement criteria related to the refurbishing of a stormwater detention wetland and the restoration of aquatic stream passage at the College Brook crossing as well as the appropriate stream restoration criteria of Env-Wt 806.04.

Env-Wt 900: The project follows all applicable criteria for the design and construction of the College Brook stream crossing.

SECTION 8 - AVOIDANCE AND MINIMIZATION

Impacts within wetland jurisdiction must be avoided to the maximum extent practicable (Env-Wt 313.03(a))* . Any project with unavoidable jurisdictional impacts must then be minimized as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#) and the [Wetlands Permitting: Avoidance, Minimization and Mitigation Fact Sheet](#). For minor or major projects, a functional assessment of all wetlands on the project site is required (Env-Wt 311.03(b)(10))* .

Please refer to the application checklist to ensure that you have attached all documents related to avoidance and minimization, as well as functional assessment (where applicable). You can use the [Avoidance and Minimization Checklist](#), the [Avoidance and Minimization Narrative](#), or your own avoidance and minimization narrative.

**See Env-Wt 311.03(b)(6) and Env-Wt 311.03(b)(10) for shoreline structure exemptions.*

SECTION 9 - MITIGATION REQUIREMENT (Env-Wt 311.02)

If unavoidable jurisdictional impacts require mitigation, a mitigation pre-application meeting must occur at least 30 days but not more than 90 days prior to submitting this Standard Dredge and Fill Permit Application.

Mitigation Pre-Application Meeting Date: Month: 12 Day: 18 Year: 2020

N/A - Mitigation is not required

SECTION 10 - THE PROJECT MEETS COMPENSATORY MITIGATION REQUIREMENTS (Env-Wt 313.01(a)(1)c)

Confirm that you have submitted a compensatory mitigation proposal that meets the requirements of Env-Wt 800 for all permanent unavoidable impacts that will remain after avoidance and minimization techniques have been exercised to the maximum extent practicable: I confirm submittal.

N/A – Compensatory mitigation is not required

SECTION 11 - IMPACT AREA (Env-Wt 311.04(g))

For each jurisdictional area that will be/has been impacted, provide square feet (SF) and, if applicable, linear feet (LF) of impact, and note whether the impact is after-the-fact (ATF; i.e., work was started or completed without a permit).

For intermittent and ephemeral streams, the linear footage of impact is measured along the thread of the channel. *Please note, installation of a stream crossing in an ephemeral stream may be undertaken without a permit per Rule Env-Wt 309.02(d), however other dredge or fill impacts should be included below.*

For perennial streams/ivers, the linear footage of impact is calculated by summing the lengths of disturbances to the channel and banks.

Permanent impacts are impacts that will remain after the project is complete (e.g., changes in grade or surface materials).

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

JURISDICTIONAL AREA		PERMANENT			TEMPORARY		
		SF	LF	ATF	SF	LF	ATF
Wetlands	Forested Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Scrub-shrub Wetland	2,253		<input type="checkbox"/>	42		<input type="checkbox"/>
	Emergent Wetland	5,253		<input type="checkbox"/>	3,028		<input type="checkbox"/>
	Wet Meadow	5,009		<input type="checkbox"/>	1,391		<input type="checkbox"/>
	Vernal Pool			<input type="checkbox"/>			<input type="checkbox"/>
	Designated Prime Wetland			<input type="checkbox"/>			<input type="checkbox"/>
	Duly-established 100-foot Prime Wetland Buffer			<input type="checkbox"/>			<input type="checkbox"/>
Surface Water	Intermittent / Ephemeral Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Perennial Stream or River	1,493	142	<input type="checkbox"/>	657	73	<input type="checkbox"/>
	Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - River			<input type="checkbox"/>			<input type="checkbox"/>
Banks	Bank - Intermittent Stream			<input type="checkbox"/>			<input type="checkbox"/>
	Bank - Perennial Stream / River	See Stream	See Stream	<input type="checkbox"/>	See Stream	See Stream	<input type="checkbox"/>
	Bank / Shoreline - Lake / Pond			<input type="checkbox"/>			<input type="checkbox"/>
Tidal	Tidal Waters			<input type="checkbox"/>			<input type="checkbox"/>
	Tidal Marsh			<input type="checkbox"/>			<input type="checkbox"/>
	Sand Dune			<input type="checkbox"/>			<input type="checkbox"/>
	Undeveloped Tidal Buffer Zone (TBZ)			<input type="checkbox"/>			<input type="checkbox"/>
	Previously-developed TBZ			<input type="checkbox"/>			<input type="checkbox"/>
	Docking - Tidal Water			<input type="checkbox"/>			<input type="checkbox"/>
TOTAL		14,008			5,118		

SECTION 12 - APPLICATION FEE (RSA 482-A:3, I)

<input type="checkbox"/> MINIMUM IMPACT FEE: Flat fee of \$400.
<input type="checkbox"/> NON-ENFORCEMENT RELATED, PUBLICLY-FUNDED AND SUPERVISED RESTORATION PROJECTS, REGARDLESS OF IMPACT CLASSIFICATION: Flat fee of \$400 (refer to RSA 482-A:3, 1(c) for restrictions).
<input checked="" type="checkbox"/> MINOR OR MAJOR IMPACT FEE: Calculate using the table below:
Permanent and temporary (non-docking): 19,126 SF × \$0.40 = \$ 7650.40
Seasonal docking structure: SF × \$2.00 = \$
Permanent docking structure: SF × \$4.00 = \$
Projects proposing shoreline structures (including docks) add \$400 = \$

Total = \$ 7650.40

The application fee for minor or major impact is the above calculated total or \$400, whichever is greater = \$

SECTION 13 - PROJECT CLASSIFICATION (Env-Wt 306.05)

Indicate the project classification.

Minimum Impact Project Minor Project Major Project

SECTION 14 - REQUIRED CERTIFICATIONS (Env-Wt 311.11)

Initial each box below to certify:

Initials: PAH _____ LAL	To the best of the signer's knowledge and belief, all required notifications have been provided.
----------------------------------	--

Initials: PAH _____ LAL	The information submitted on or with the application is true, complete, and not misleading to the best of the signer's knowledge and belief.
----------------------------------	--

Initials: PAH _____ LAL	The signer understands that: <ul style="list-style-type: none"> • The submission of false, incomplete, or misleading information constitutes grounds for NHDES to: <ol style="list-style-type: none"> 1. Deny the application. 2. Revoke any approval that is granted based on the information. 3. If the signer is a certified wetland scientist, licensed surveyor, or professional engineer licensed to practice in New Hampshire, refer the matter to the joint board of licensure and certification established by RSA 310-A:1. • The signer is subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641. • The signature shall constitute authorization for the municipal conservation commission and the Department to inspect the site of the proposed project, except for minimum impact forestry SPN projects and minimum impact trail projects, where the signature shall authorize only the Department to inspect the site pursuant to RSA 482-A:6, II.
----------------------------------	--

Initials: _____ N/A _____	If the applicant is not the owner of the property, each property owner signature shall constitute certification by the signer that he or she is aware of the application being filed and does not object to the filing.
------------------------------------	---

SECTION 15 - REQUIRED SIGNATURES (Env-Wt 311.04(d); Env-Wt 311.11)

SIGNATURE (OWNER): 	PRINT NAME LEGIBLY: Paul A Henry Jr, Project Manager, UNH	DATE: 3-01-21
SIGNATURE (APPLICANT, IF DIFFERENT FROM OWNER): _____	PRINT NAME LEGIBLY: _____	DATE: _____
SIGNATURE (AGENT, IF APPLICABLE): 	PRINT NAME LEGIBLY: Leonard A Lord	DATE: 3-03-21

SECTION 16 - TOWN / CITY CLERK SIGNATURE (Env-Wt 311.04(f))

As required by RSA 482-A:3, I(a),(1), 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.

TOWN/CITY CLERK SIGNATURE: <i>Rachel M. Deane</i>	PRINT NAME LEGIBLY: Rachel M. Deane
TOWN/CITY: <i>Durham</i>	DATE: <i>3/4/21</i>

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3, I(a)(1)

1. IMMEDIATELY sign the original application form and four copies in the signature space provided above.
2. 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.
3. 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.
4. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

Submit the original permit application form bearing the signature of the Town/City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery at the address at the bottom of this page. Make check or money order payable to "Treasurer – State of NH".

Keep this checklist for your reference; do not submit with your application.

APPLICATION CHECKLIST

Unless specified, all items below are required. Failure to provide the required items will delay a decision on your project and may result in denial of your application. Please reference statute RSA 482-A, Fill and Dredge in Wetlands, and the Wetland Rules Env-Wt 100-900, available [online](#).

- The completed, dated, signed, and certified application (Env-Wt 311.03(b)(1)).
- Correct fee as determined in RSA 482-A:3, I(b) or (c), subject to any cap established by RSA 482-A:3, X (Env-Wt 311.03(b)(2)). Make check or money order payable to "Treasurer – State of NH".
- The Required Planning actions required by Env-Wt 311.01(a)-(c) and Env-Wt 311.03(b)(3).
- [US Army Corps of Engineers \(ACE\) "Appendix B, New Hampshire General Permits \(GPs\), Required Information and Corps Secondary Impacts Checklist"](#) and its required attachments (Env-Wt 307.02). This includes the [US Fish and Wildlife Service IPAC review](#) and [Section 106 Historic/Archaeological Resource review](#).
- Project plans described in Env-Wt 311.05 (Env-Wt 311.03(b)(4)).
- Maps, or electronic shape files and meta data, and other attachments specified in Env-Wt 311.06 (Env-Wt 311.03(b)(5)).
- Explanation of the methods, timing, and manner as to how the project will meet standard permit conditions required in [Env-Wt 307](#) (Env-Wt 311.03(b)(7)).
- If applicable, the information regarding proposed compensatory mitigation specified in Env-Wt 311.08 and Chapter Env-Wt 800 - [Permittee Responsible Mitigation Project Worksheet](#), unless not required under Env-Wt 313.04 (Env-Wt 311.03(b)(8); Env-Wt 311.08; Env-Wt 313.04).
- Any additional information specific to the **type of resource** as specified in Env-Wt 311.09 (Env-Wt 311.03(b)(9); Env-Wt 311.04(j)).
- Project specific information required by Env-Wt 500, Env-Wt 600, and Env-Wt 900 (Env-Wt 311.03(b)(11)).
- A list containing the name, mailing address and tax map/lot number of each abutter to the subject property (Env-Wt 311.03(b)(12)).
- Copies of certified postal receipts or other proof of receipt of the notices that are required by RSA 482-A:3, I(d) (Env-Wt 311.03(b)(13)).
- Project design considerations required by Env-Wt 313 (Env-Wt 311.04(j)).
- Town tax map showing the subject property, the location of the project on the property, and the location of properties of abutters with each lot labeled with the name and mailing address of the abutter (Env-Wt 311.06(a)).
- Dated and labeled color photographs that:
 - (1) Clearly depict:
 - a. All jurisdictional areas, including but not limited to portions of wetland, shoreline, or surface water where impacts have or are proposed to occur.
 - b. All existing shoreline structures.
 - (2) Are mounted or printed no more than 2 per sheet on 8.5 x 11 inch sheets (Env-Wt 311.06(b)).
- A copy of the appropriate US Geological Survey map or updated data based on LiDAR at a scale of one inch equals 24,000 feet showing the location of the subject property and proposed project (Env-Wt 311.06(c)).
- A narrative that describes the work sequence, including pre-construction through post-construction, and the relative timing and progression of all work (Env-Wt 311.06(d)).

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

- For all projects in the protected tidal zone, a copy of the recorded deed with book and page numbers for the property (Env-Wt 311.06(e)).
- If the applicant is not the owner in fee of the subject property, documentation of the applicant's legal interest in the subject property, provided that for utility projects in a utility corridor, such documentation may comprise a list that:
- (1) Identifies the county registry of deeds and book and page numbers of all of the easements or other recorded instruments that provide the necessary legal interest; and
 - (2) Has been certified as complete and accurate by a knowledgeable representative of the applicant (Env-Wt 311.06(f)).
- The NHB memo containing the NHB identification number and results as well as any written follow-up communications such as additional memos or email communications with either NHB or NHF&G (Env-Wt 311.06(g)). See [Wetlands Permitting: Protected Species and Habitat Fact Sheet](#).
- A statement of whether the applicant has received comments from the local conservation commission and, if so, how the applicant has addressed the comments (Env-Wt 311.06(h)).
- For projects in LAC jurisdiction, a statement of whether the applicant has received comments from the LAC and, if so, how the applicant has addressed the comments (Env-Wt 311.06(i)).
- If the applicant is also seeking to be covered by the state general permits, a statement of whether comments have been received from any federal agency and, if so, how the applicant has addressed the comments (Env-Wt 311.06(j)).
- [Avoidance and Minimization Written Narrative](#) or the [Avoidance and Minimization Checklist](#), or your own avoidance and minimization narrative (Env-Wt 311.07).
- For after-the-fact applications: information required by Env-Wt 311.12.
- [Coastal Resource Worksheet](#) for coastal projects as required under Env-Wt 600.
- Prime Wetlands information required under Env-Wt 700. See [WPPT](#) for prime wetland mapping.
- Required Attachments for Minor and Major Projects**
- [Attachment A: Minor and Major Projects](#) (Env-Wt 313.03).
- [Functional Assessment Worksheet](#) or others means of documenting the results of actions required by Env-Wt 311.10 as part of an application preparation for a standard permit (Env-Wt 311.03(b)(3); Env-Wt 311.03(b)(10)). See [Functional Assessments for Wetlands and Other Aquatic Resources Fact Sheet](#). For shoreline structures, see shoreline structures exemption in Env-Wt 311.03(b)(10)).
- Optional Materials**
- [Stream Crossing Worksheet](#) which summarizes the requirements for stream crossings under Env-Wt 900.
- Request for [concurrent processing of related shoreland / wetlands permit applications](#) (Env-Wt 313.05).



STANDARD DREDGE AND FILL
WETLANDS PERMIT APPLICATION
ATTACHMENT A: MINOR AND MAJOR PROJECTS



Water Division/Land Resources Management
Wetlands Bureau

[Check the Status of your Application](#)

RSA/ Rule: RSA 482-A/ Env-Wt 311.10; Env-Wt 313.01(a)(1); Env-Wt 313.03

APPLICANT'S NAME: University of New Hampshire, Attn: Henry, Paul A. **TOWN NAME:** Durham

Attachment A is required for *all minor and major projects*, and must be completed *in addition* to the [Avoidance and Minimization Narrative](#) or [Checklist](#) that is required by Env-Wt 307.11.

For projects involving construction or modification of non-tidal shoreline structures over areas of surface waters having an absence of wetland vegetation, only Sections I.X through I.XV are required to be completed.

PART I: AVOIDANCE AND MINIMIZATION

In accordance with Env-Wt 313.03(a), the Department shall not approve any alteration of any jurisdictional area unless the applicant demonstrates that the potential impacts to jurisdictional areas have been avoided to the maximum extent practicable and that any unavoidable impacts have been minimized, as described in the [Wetlands Best Management Practice Techniques For Avoidance and Minimization](#).

SECTION I.I - ALTERNATIVES (Env-Wt 313.03(b)(1))

Describe how there is no practicable alternative that would have a less adverse impact on the area and environments under the Department's jurisdiction.

THIS SITE WAS SELECTED FOR THE HSSC BUILDING DUE TO THE NEED FOR STUDENTS TO BE WITHIN WALKING DISTANCE OF RELATED BUILDINGS AND ITS PROXIMITY TO THE CENTER OF CAMPUS. UNH HAS LIMITED LAND THAT COULD SUPPORT NEW BUILDINGS ON CAMPUS AND NO OTHER SITE WAS AVAILABLE THAT WOULD BE APPROPRIATE FOR THIS PROJECT. THE SELECTED SITE CLUSTERS THE HSSC WITH OTHER BUILDINGS IN A PREVIOUSLY DEVELOPED AREA RATHER THAN STARTING WITH PRISTINE LAND. THE LOCATION ALSO ENSURED MINIMAL IMPACTS TO WETLANDS, AND THOSE WETLANDS THAT WILL BE IMPACTED ARE ALREADY HIGHLY DISTURBED WITH RELATIVELY LOW WETLAND FUNCTIONS AND VALUES.

SECTION I.II - MARSHES (Env-Wt 313.03(b)(2))

Describe how the project avoids and minimizes impacts to tidal marshes and non-tidal marshes where documented to provide sources of nutrients for finfish, crustacean, shellfish, and wildlife of significant value.

The project only impacts highly disturbed wetlands, none of which are an important source of nutrients for fish and wildlife.

SECTION I.III - HYDROLOGIC CONNECTION (Env-Wt 313.03(b)(3))

Describe how the project maintains hydrologic connections between adjacent wetland or stream systems.

The project does not alter hydrologic connections between the existing wetlands and College Brook.

SECTION I.IV - JURISDICTIONAL IMPACTS (Env-Wt 313.03(b)(4))

Describe how the project avoids and minimizes impacts to wetlands and other areas of jurisdiction under RSA 482-A, especially those in which there are exemplary natural communities, vernal pools, protected species and habitat, documented fisheries, and habitat and reproduction areas for species of concern, or any combination thereof.

The installation and extension of South Drive reduced wetland impacts by upgrading primarily along existing roadways rather than selecting a new route. The need for such improvements to relieve traffic congestion along Main Street through Durham was supported by a traffic study. Selection of another route would have likely involved additional wetland impacts and an additional crossing of College Brook. Construction in this location allowed for the refurbishing of an existing crossing, converting it from a 52-inch concrete pipe to an open bottom box culvert. Grading of fill along the road extension has been steepened to 2:1 slopes to reduce wetland impacts.

Currently portions of Waterworks Road fall within the adjacent railroad right-of-way. Since there is a need to improve and widen Waterworks Road to become South Drive, it was appropriate to take this opportunity to shift the road slightly to the west during construction to remove any potential future conflicts with the railroad.

SECTION I.V - PUBLIC COMMERCE, NAVIGATION, OR RECREATION (Env-Wt 313.03(b)(5))

Describe how the project avoids and minimizes impacts that eliminate, depreciate or obstruct public commerce, navigation, or recreation.

The project will not hinder public commerce, navigation, or recreation. The project will enhance education opportunities through construction of the HSSC building and will enhance public commerce by relieving congestion on Main Street in Durham.

SECTION I.VI - FLOODPLAIN WETLANDS (Env-Wt 313.03(b)(6))

Describe how the project avoids and minimizes impacts to floodplain wetlands that provide flood storage.

The project will restore some floodplain function and storage of College Brook by replacing a 52-inch concrete culvert with an 18-foot open bottom box culvert.

SECTION I.VII - RIVERINE FORESTED WETLAND SYSTEMS AND SCRUB-SHRUB – MARSH COMPLEXES (Env-Wt 313.03(b)(7))

Describe how the project avoids and minimizes impacts to natural riverine forested wetland systems and scrub-shrub – marsh complexes of high ecological integrity.

The project will only impact disturbed wetland systems. No forested systems will be impacted and only minimal areas of scrub-shrub wetland will be affected.

SECTION I.VIII - DRINKING WATER SUPPLY AND GROUNDWATER AQUIFER LEVELS (Env-Wt 313.03(b)(8))

Describe how the project avoids and minimizes impacts to wetlands that would be detrimental to adjacent drinking water supply and groundwater aquifer levels.

The project will not impact drinking water supplies or groundwater aquifers.

SECTION I.IX - STREAM CHANNELS (Env-Wt 313.03(b)(9))

Describe how the project avoids and minimizes adverse impacts to stream channels and the ability of such channels to handle runoff of waters.

The project will restore some stream and floodplain function of College Brook by replacing a 52-inch concrete culvert with an 18-foot open bottom box culvert.

SECTION I.X - SHORELINE STRUCTURES - CONSTRUCTION SURFACE AREA (Env-Wt 313.03(c)(1))

Describe how the project has been designed to use the minimum construction surface area over surface waters necessary to meet the stated purpose of the structures.

The only construction over surface waters is the replacement of a 52-inch concrete culvert with an 18-foot open bottom box culvert at the crossing of College Brook.

SECTION I.XI - SHORELINE STRUCTURES - LEAST INTRUSIVE UPON PUBLIC TRUST (Env-Wt 313.03(c)(2))

Describe how the type of construction proposed is the least intrusive upon the public trust that will ensure safe docking on the frontage.

N/A

SECTION I.XII - SHORELINE STRUCTURES – ABUTTING PROPERTIES (Env-Wt 313.03(c)(3))

Describe how the structures have been designed to avoid and minimize impacts on ability of abutting owners to use and enjoy their properties.

N/A

SECTION I.XIII - SHORELINE STRUCTURES – COMMERCE AND RECREATION (Env-Wt 313.03(c)(4))

Describe how the structures have been designed to avoid and minimize impacts to the public’s right to navigation, passage, and use of the resource for commerce and recreation.

N/A

SECTION I.XIV - SHORELINE STRUCTURES – WATER QUALITY, AQUATIC VEGETATION, WILDLIFE AND FINFISH HABITAT (Env-Wt 313.03(c)(5))

Describe how the structures have been designed, located, and configured to avoid impacts to water quality, aquatic vegetation, and wildlife and finfish habitat.

N/A

SECTION I.XV - SHORELINE STRUCTURES – VEGETATION REMOVAL, ACCESS POINTS, AND SHORELINE STABILITY (Env-Wt 313.03(c)(6))

Describe how the structures have been designed to avoid and minimize the removal of vegetation, the number of access points through wetlands or over the bank, and activities that may have an adverse effect on shoreline stability.

N/A

PART II: FUNCTIONAL ASSESSMENT
<p>REQUIREMENTS</p> <p>Ensure that project meets the requirements of Env-Wt 311.10 regarding functional assessment (Env-Wt 311.04(j); Env-Wt 311.10).</p>
<p>FUNCTIONAL ASSESSMENT METHOD USED:</p> <p>The Highway Methodology Workbook Supplement—Wetland Functions and Values: A Descriptive Approach, NAEPP-360-1-30a, US Army Corps of Engineers, New England Division, September 1999, except that the Ecological Integrity function was based on the Method for Inventorying and Evaluating Freshwater Wetlands in New Hampshire (UNH 2016).</p>
<p>NAME OF CERTIFIED WETLAND SCIENTIST (FOR NON-TIDAL PROJECTS) OR QUALIFIED COASTAL PROFESSIONAL (FOR TIDAL PROJECTS) WHO COMPLETED THE ASSESSMENT: LEONARD A LORD, PHD, NHCWS, NHCSS</p>
<p>DATE OF ASSESSMENT: FIELD: 11/9 AND 12/16/20</p>
<p>Check this box to confirm that the application includes a NARRATIVE ON FUNCTIONAL ASSESSMENT:</p> <p><input checked="" type="checkbox"/></p>
<p>For minor or major projects requiring a standard permit without mitigation, the applicant shall submit a wetland evaluation report that includes completed checklists and information demonstrating the RELATIVE FUNCTIONS AND VALUES OF EACH WETLAND EVALUATED. Check this box to confirm that the application includes this information, if applicable:</p> <p><input type="checkbox"/></p> <p>Note: The Wetlands Functional Assessment worksheet can be used to compile the information needed to meet functional assessment requirements.</p>

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APPENDIX B



**US Army Corps
of Engineers**®
New England District

**New Hampshire General Permits (GPs)
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 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.*	X	
2. Wetlands	Yes	No
2.1 Are there are streams, brooks, rivers, ponds, or lakes within 200 feet of any proposed work?	X	
2.2 Are there proposed impacts to SAS, special wetlands. Applicants may obtain information from the NH Department of Resources and Economic Development Natural Heritage Bureau (NHB) DataCheck Tool for information about resources located on the property at https://www2.des.state.nh.us/nhb_datacheck/ . The book Natural Community Systems of New Hampshire also contains specific information about the natural communities found in NH.		X
2.3 If wetland crossings are proposed, are they adequately designed to maintain hydrology, sediment transport & wildlife passage?	X	
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.)		X
2.5 The overall project site is more than 40 acres?		X
2.6 What is the area of the previously filled wetlands? Unknown	Pre-regulation	
2.7 What is the area of the proposed fill in wetlands?	14,008 SqFt	
2.8 What is the % of previously and proposed fill in wetlands to the overall project site? 354.5 ac lot	0.09%	
3. Wildlife	Yes	No
3.1 Has the NHB & USFWS 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 an NHB ID number & a USFWS IPAC determination.) NHB DataCheck Tool: https://www2.des.state.nh.us/nhb_datacheck/ USFWS IPAC website: https://ecos.fws.gov/ipac/location/index	X	

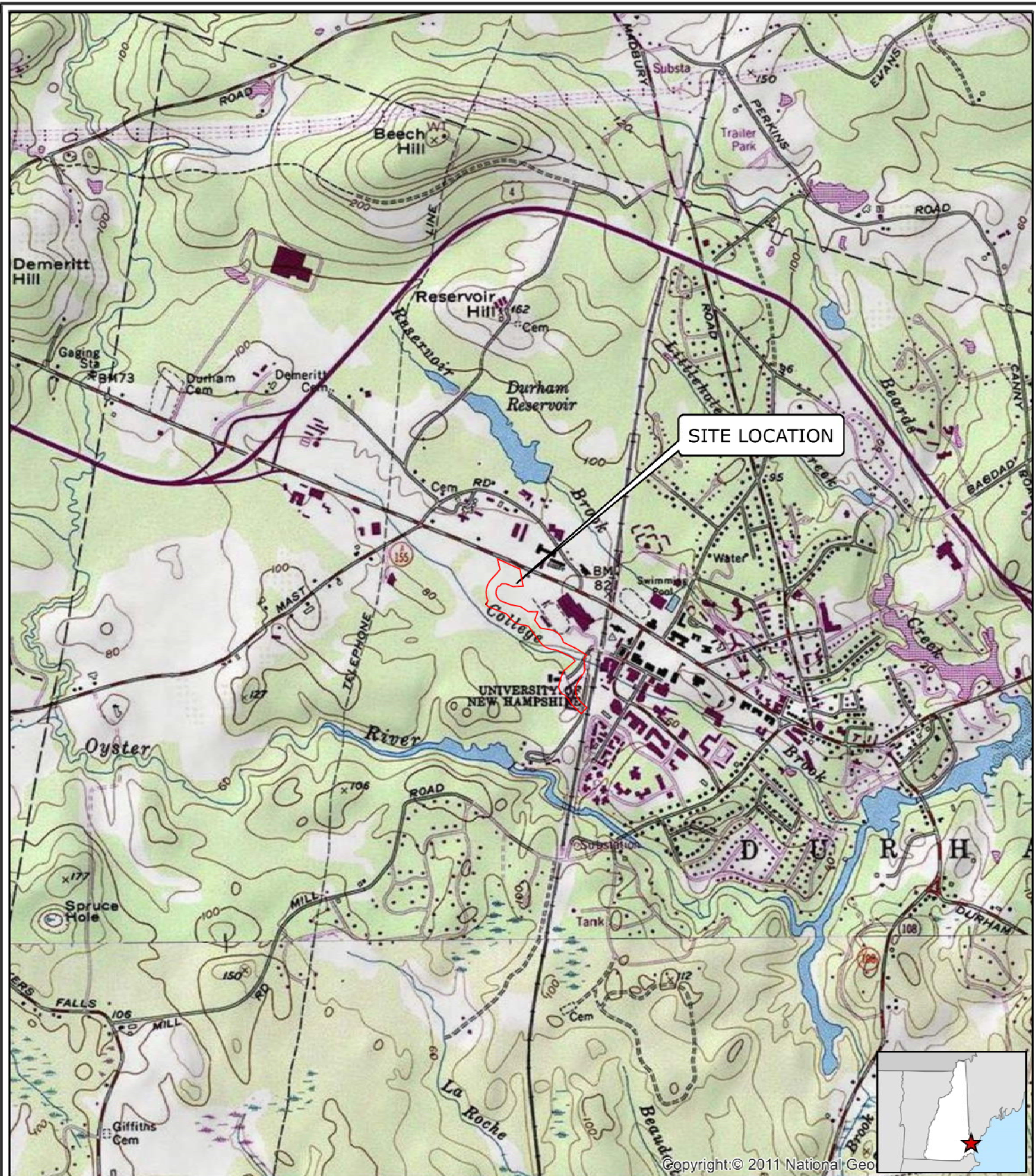
3.2 Would work occur in any area identified as either “Highest Ranked Habitat in N.H.” or “Highest Ranked Habitat in Ecological Region”? (These areas are colored magenta and green, respectively, on NH Fish and Game’s map, “2010 Highest Ranked Wildlife Habitat by Ecological Condition.”) Map information can be found at: <ul style="list-style-type: none"> • 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. 		X
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)?		X
3.4 Does the project propose more than a 10-lot residential subdivision, or a commercial or industrial development?		X
3.5 Are stream crossings designed in accordance with the GC 21?	X	
4. Flooding/Floodplain Values	Yes	No
4.1 Is the proposed project within the 100-year floodplain of an adjacent river or stream?	X	
4.2 If 4.1 is yes, will compensatory flood storage be provided if the project results in a loss of flood storage?	X	
5. Historic/Archaeological Resources		
For a minimum, minor or major impact project - a copy of the Request for Project Review (RPR) Form (www.nh.gov/nhdhr/review) with your DES file number shall be sent to the NH Division of Historical Resources as required on Page 11 GC 8(d) of the GP document**	X	

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

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

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APPENDIX C



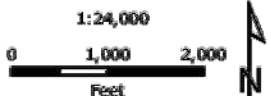
Copyright © 2011 National Geo

**FIGURE 1
SITE LOCUS**

South Drive
University of New Hampshire
Durham, New Hampshire



Based on USGS Topographic Map for
Dover West, NH



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APPENDIX D

UNH South Drive Project Wetland Descriptions

Wetland A, Impacts #1 and #2

Description:

Wetland A is a maintained vegetated swale dominated by mowed grasses (Photos 1 and 2, PEM1Cx).

Wetland Functions

This wetland provides some sediment trapping and nutrient attenuation.

Plant Species

Poaceae Mowed grasses

Wildlife

This wetland is likely to provide food for herbivores, but currently provides little cover, which limits its use. No wetland dependent wildlife are likely to rely on this system as habitat.

Wetland B, Permitted Existing Impact #3

Description

Wetland B is a small remnant of a human-created wetland that was permitted and filled as part of the extension of South Drive. It is dominated by broad-leaved cattail (Photo 3, PEM1E).

Wetland Functions

This wetland provides a small amount of sediment retention and nutrient attenuation, but these functions are limited by the size of the wetland and the area of the immediate upslope watershed.

Plant Species

Euthamia graminifolia Flat-top goldentop
Lythrum salicaria Purple loosestrife
Typha latifolia Broad-leaved cattail

Wildlife

This tiny wetland may be used as cover for small birds and mammals. With the exception of some invertebrates, no wetland dependent wildlife are likely to rely on this system as habitat.

Wetland C, Permitted Existing Impact #4

Description

Wetland C is the remnants of a human-created ditch that was permitted and filled as part of the extension of South Drive and connects to a forested wetland along College Brook. The area reviewed is predominantly lined with crushed stone and dominated by climbing bittersweet, a non-native species often found in disturbed wetlands (Photo 4, PEM1/PSS1E).

Wetland Functions

This wetland provides a small amount of sediment retention and nutrient attenuation, but these functions are limited by the size of the wetland and the area of the immediate upslope watershed.

Plant Species

<i>Ilex verticillata</i>	Winterberry holly
<i>Rhamnus frangula</i>	Glossy buckthorn
<i>Solanum dulcamara</i>	Creeping nightshade
<i>Typha latifolia</i>	Broad-leaved cattail

Wildlife

This small human-made ditch and swale provides negligible value as wildlife habitat due where it was evaluated along the recently expanded South Drive. Moving away from the road, the wetland provides habitat for numerous species that utilize multiple habitats. Water dependent wildlife use would be limited to where the wetland encompasses College Brook, roughly 250 feet to the south.

Wetland D, Impacts #5 and #6

Description

Wetland D includes College Brook and its bordering wetlands evaluated in the vicinity of the proposed South Drive upgrade. It is a perennial stream bordered by narrow emergent and shrub wetlands (Photos 5 and 6, RUB3/PSS1E/PEM1E)

Wetland Functions

This stream and associated wetland provide limited education potential, fish and aquatic life habitat, flood storage, shoreline anchoring, and water dependent wildlife habitat. These functions are limited due to the surrounding development and disturbance, which have degraded the wetland and resulted in an EPA 303(d) impaired waters listing. College Brook does fall within a FEMA 100 year floodplain designation. Though the floodplain has been filled in the immediate vicinity of the road crossing, there is a restricted outlet at the railroad crossing just downstream and flood storage capacity within the forested wetland just upstream of the evaluation area, which warrant designation of flood storage as a principal function.

Plant Species

<i>Acer rubrum</i>	Red maple
<i>Carex crinita</i>	Fringed sedge
<i>Cornus ammomum</i>	Silky dogwood
<i>Euthamia graminifolia</i>	Flat-top goldentop
<i>Impatiens capensis</i>	Jewelweed
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Phalaris arundinacea</i>	Reed canary grass
<i>Typha latifolia</i>	Broad-leaved cattail
<i>Ulmus americana</i>	American elm
<i>Viburnum cassinoides</i>	Northern wild raisin

Wildlife

This perennial stream and associated wetland is likely to be utilized by numerous wildlife species that utilize multiple habitats which include streams. Water dependent wildlife use is likely limited to amphibians, small fish, and aquatic invertebrates within College Brook.

Wetland E, Impact #7**Description**

Wetland D is a short ditch and swale that connects a culvert outlet and catch basin along Waterworks Road. It dominated by mowed grasses and purple loosestrife (Photo 7, PEM1Cx)

Wetland Functions

This small, human-made wetland provides negligible functions and values due to its size and location within a highly disturbed area.

Plant Species

<i>Lythrum salicaria</i>	Purple loosestrife
<i>Poaceae</i>	Mowed grasses

Wildlife

This small, human-made ditch and swale provides negligible value as wildlife habitat due to its size, regular mowing, and location within a highly disturbed area.

Wetland F, Impacts #9 and #11**Description**

Wetland F is a recently maintained ditch between the railroad tracks and Waterworks Road. It dominated by seeded erosion control grasses, with purple loosestrife and silky dogwood along its edges and to the north (Photo 8, PEM1Cx).

Wetland Functions

This wetland provides minimal flood storage, nutrient attenuation, and sediment trapping.

Plant Species

<i>Poaceae</i>	Recently seeded grasses
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Euthamia graminifolia</i>	Flat-top goldentop

Wildlife

This small, human-made ditch and provides little value as wildlife habitat due to its size, regular maintenance, and location within a highly disturbed area adjacent to a road and railroad bed.

Wetland G, Impacts #8, #10, #12, #13**Description**

Wetland G is a highly disturbed wetland ringed by roads and development. Vegetation is dominated by wet meadow and shallow marsh species, including a significant proportion of invasive reed canary grass as well as purple loosestrife. (Photos 9-14, PEM1/PSS1E)

Wetland Functions

This wetland provides significant nutrient and sediment trapping functions due to the surrounding development, even though the watershed is relatively small. It also supplies limited flood storage due to the small watershed and shallow topographic concavities.

Plant Species

<i>Cornus ammomum</i>	Silky dogwood
<i>Impatiens capensis</i>	Jewelweed
<i>Lythrum salicaria</i>	Purple loosestrife
<i>Phalaris arundinacea</i>	Reed canary grass
<i>Typha latifolia</i>	Broad-leaved cattail
<i>Viburnum dentatum</i>	Northern arrowwood

Wildlife

This wetland is located in an active, developed setting surrounded by roads and other impervious surfaces that limit the use by many animals. Stands of dense vegetation would provide cover for small birds and mammals. With the exception of some invertebrates, no wetland dependent wildlife are likely to rely on this system as habitat.

Wetland H, Impact #14

Description

Wetland H is an old stormwater detention basin that receives runoff from the Community Crossing parking lot and is strongly dominated by narrow-leaved cattail. This wetland will be refurbished to create a gravel wetland that provides better treatment of runoff before it enters College Brook (Photo 15, PEM1E)

Wetland Functions

The principal function of this wetland is for flood storage. It also provides nutrient attenuation and sediment trapping.

Plant Species

<i>Carex</i> spp.	Sedges
<i>Onoclea sensibilis</i>	Sensitive fern
<i>Typha angustifolia</i>	Narrow-leaved cattail

Wildlife

This small human-made wetland has low plant diversity, being strongly dominated by narrow-leaved cattail. It may provide cover for small birds and mammals. With the exception of some invertebrates, no wetland dependent wildlife are likely to rely on this system as habitat.



WETLANDS FUNCTIONAL ASSESSMENT WORKSHEET

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RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

As required by Env-Wt 311.03(b)(10), an application for a standard permit for minor and major projects must include a functional assessment of all wetlands on the project site as specified in Env-Wt 311.10. This worksheet will help you compile data for the functional assessment needed to meet federal (US Army Corps of Engineers (USACE); if applicable) and NHDES requirements. Additional requirements are needed for projects in tidal area; please refer to the [Coastal Area Worksheet \(NHDES-W-06-079\)](#) for more information.

Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Roads, mowed lawns, recreational fields	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): < 5 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: A, Impacts #1 and #2	LOCATION: (LAT/ LONG) 43.140103/-70.942152
WETLAND AREA: Part of the Oyster River Watershed Evaluated: 0.2 ac. at and adjacent to impact	DOMINANT WETLAND SYSTEMS PRESENT: Wet swale
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 1 other swale upslope	COWARDIN CLASS: PEM1Cx
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No if not, where does the wetland lie in the drainage basin? Mid. Ditch through upland connects to lower wetlands	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island? IS THE WETLAND HUMAN-MADE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PROPOSED WETLAND IMPACT TYPE: Fill	PROPOSED WETLAND IMPACT AREA: 770 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (NHM): 6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Excavated and partly filled swale adjacent to roads, lawns, and recreation areas
2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Education Potential: 8, 9, 10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Highly disturbed
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	N/A No watercourse
4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Flood Storage: 3, 7, 11,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sloping wet swale with mowed vegetation
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): No recharge rationale met	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is underlain by marine sediments with low permeability
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE Habitat):	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No rare species documented and no special habitat for know rare species
7	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention: 3, 4, 9, 10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Grassed swale provides some nutrient attenuation
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal detritus production-- lawn clippings
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Disturbed wet swale
10	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping: 1, 2, 4, 6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland provides opportunity for sediment trapping but is less effective when mowed
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No watercourse
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage: 2, 9, 17	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland has no local significance or importance. Highly disturbed
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: 10, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	No opportunity for wetland based recreation
14	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Water Dependent Wildlife: 6, 7, 8,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Mowed wet swale, no watercourse

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[Check the Status of your Application](#)

RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

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Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Lawns, road, recreation fields	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): 0 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: B, Permitted Existing Impact #3	LOCATION: (LAT/ LONG) 43.13862/-70.941248
WETLAND AREA: 0.03 ac	DOMINANT WETLAND SYSTEMS PRESENT: Marsh
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 0	COWARDIN CLASS: PEM1E
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No if not, where does the wetland lie in the drainage basin? [REDACTED]	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island? IS THE WETLAND HUMAN-MADE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PROPOSED WETLAND IMPACT TYPE: None	PROPOSED WETLAND IMPACT AREA: 0 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (from NHM):3, 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is the remnants of a human-created wetland that was permitted and filled as part of the extension of South Drive
2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Education Potential: 8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Flood Storage: 3, 4, 6, 8, 9, 15	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Provides negligible flood storage due to size of wetland and its immediate watershed.
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE Species): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention:3, 4, 7, 10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal nutrient attenuation due to size of wetland and its immediate watershed.
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 9, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
10	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping:1, 2, 4, 8,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal sediment trapping due to size of wetland and its immediate watershed.
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage:2, 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Water Dependent Wildlife: 7, 13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

As required by Env-Wt 311.03(b)(10), an application for a standard permit for minor and major projects must include a functional assessment of all wetlands on the project site as specified in Env-Wt 311.10. This worksheet will help you compile data for the functional assessment needed to meet federal (US Army Corps of Engineers (USACE); if applicable) and NHDES requirements. Additional requirements are needed for projects in tidal area; please refer to the [Coastal Area Worksheet \(NHDES-W-06-079\)](#) for more information.

Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Lawns, road, recreation fields, forest	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): 0 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: C, Permitted Existing Impact #4	LOCATION: (LAT/ LONG) 43.138225/-70.940942
WETLAND AREA: Part of the Oyster River Watershed Evaluated: 0.03 ac. at and adjacent to impact	DOMINANT WETLAND SYSTEMS PRESENT: Ditch
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 0	COWARDIN CLASS: PEM/PSS1E
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No if not, where does the wetland lie in the drainage basin? Mid	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island? IS THE WETLAND HUMAN-MADE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PROPOSED WETLAND IMPACT TYPE: None	PROPOSED WETLAND IMPACT AREA: 0 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (from NHM):3, 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is the remnants of a human-created ditch that was permitted and filled as part of the extension of South Drive
2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Education Potential: 8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Flood Storage: 3, 4, 6, 8, 9, 15	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE Species): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention:3, 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal nutrient attenuation due to size of wetland and its immediate watershed.
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 9, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
10	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping:1, 2, 4, 8,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal sediment trapping due to size of wetland and its immediate watershed.
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage:2, 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Water Dependent Wildlife: 7, 13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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WETLANDS FUNCTIONAL ASSESSMENT WORKSHEET

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[Check the Status of your Application](#)

RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

As required by Env-Wt 311.03(b)(10), an application for a standard permit for minor and major projects must include a functional assessment of all wetlands on the project site as specified in Env-Wt 311.10. This worksheet will help you compile data for the functional assessment needed to meet federal (US Army Corps of Engineers (USACE); if applicable) and NHDES requirements. Additional requirements are needed for projects in tidal area; please refer to the [Coastal Area Worksheet \(NHDES-W-06-079\)](#) for more information.

Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Roads, lawns, recreation fields, railroad tracks	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): 0 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: D, Impacts #5 and #6	LOCATION: (LAT/ LONG) 43.13657526/-70.93743521
WETLAND AREA: Part of the Oyster River Watershed Evaluated: ~0.25 ac. at and adjacent to impact	DOMINANT WETLAND SYSTEMS PRESENT: Perennial stream
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? Unknown	COWARDIN CLASS: RUB3/PSS1E/PEM1E
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No if not, where does the wetland lie in the drainage basin? Low	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island?
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	IS THE WETLAND HUMAN-MADE? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
PROPOSED WETLAND IMPACT TYPE: Road Crossing/Fill	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	PROPOSED WETLAND IMPACT AREA: 3,750 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input type="checkbox"/> No	Ecological Integrity:	<input type="checkbox"/> Yes <input type="checkbox"/> No	Stream and bordering wetland evaluations are combined below
2	<input type="checkbox"/> Yes <input type="checkbox"/> No	Education Potential:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3	<input type="checkbox"/> Yes <input type="checkbox"/> No	Fish & Aquatic Life:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
4	<input type="checkbox"/> Yes <input type="checkbox"/> No	Flood Storage:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5	<input type="checkbox"/> Yes <input type="checkbox"/> No	Groundwater Recharge (only):	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input type="checkbox"/> No	Noteworthiness (RTE):	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7	<input type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8	<input type="checkbox"/> Yes <input type="checkbox"/> No	Production Export:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input type="checkbox"/> No	Scenic Quality:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
10	<input type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11	<input type="checkbox"/> Yes <input type="checkbox"/> No	Shoreline Anchoring:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input type="checkbox"/> No	Uniqueness/Heritage:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
13	<input type="checkbox"/> Yes <input type="checkbox"/> No	Wetland Based Recreation:	<input type="checkbox"/> Yes <input type="checkbox"/> No	
14	<input type="checkbox"/> Yes <input type="checkbox"/> No	Water Dependent Wildlife:	<input type="checkbox"/> Yes <input type="checkbox"/> No	

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SECTION 5 - VERNAL POOL SUMMARY (Env-Wt 311.10)

Delineations of vernal pools shall be based on the characteristics listed in the definition of “vernal pool” in Env-Wt 104.44. To assist in the delineation, individuals may use either of the following references:

- *Identifying and Documenting Vernal Pools in New Hampshire 3rd Ed.*, 2016, published by the New Hampshire Fish and Game Department; or
- The USACE *Vernal Pool Assessment* draft guidance dated 9-10-2013 and form dated 9-6-2016, Appendix L of the USACE New England District *Compensatory Mitigation Guidance*.

All vernal pool ID numbers are to be displayed and located on the wetland delineation of the subject property.

“Important Notes” are to include documented reproductive and wildlife values, landscape context, and relationship to other vernal pools/wetlands.

Note: For projects seeking federal approval from the USACE, please attach a completed copy of The USACE “Vernal Pool Assessment” form dated 9-6-2016, Appendix L of the USACE New England District *Compensatory Mitigation Guidance*.

VERNAL POOL ID NUMBER	DATE(S) OBSERVED	PRIMARY INDICATORS PRESENT (LIST)	SECONDARY INDICATORS PRESENT (LIST)	LENGTH OF HYDROPERIOD	IMPORTANT NOTES
1					
2					
3					
4					
5					

SECTION 6 - STREAM RESOURCES SUMMARY

DESCRIPTION OF STREAM: College Brook, RUB3	STREAM TYPE (ROSGEN): B6? See stream worksheet***
HAVE FISHERIES BEEN DOCUMENTED? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	DOES THE STREAM SYSTEM APPEAR STABLE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
OTHER KEY ON-SITE FUNCTIONS OF NOTE: None	

The following table can be used to compile data on stream resources. “Important Notes” are to include characteristics the evaluator used to determine principal function and value of each stream. The functions and values reference number are defined in Section 4.

FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity: 3, 4, 8, 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Brook receives runoff from agricultural and developed areas, invasive species, Sec 303(d) listed
2	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Education Potential: 3, 8, 10, 11, 13,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The portion of the wetland evaluated is highly disturbed but has some value for education as part of UNH campus
3	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Fish & Aquatic Life: 2, 4, 8, 14, 17	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	303(d) impairments: benthic-macroinvertebrates, chlorides, and dissolved oxygen saturation
4	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Flood Storage:4, 6, 11, 13, 15, 16, 17, 18	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	There is flood storage related to the forested floodplain upstream and the restriction at the RR culvert downstream
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): No recharge rationale met	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is underlain by marine sediments with low permeability
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE): N/A	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Nutrient Trapping/Retention: 4, 5, 8, 9, 10,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Steep banks and lack of sediment trapping limits effectiveness
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export:1, 2, 4, 7, 8, 10, 12,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Some flushing expected during flooding events, but not significant
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 1, 3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Developed area
10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sediment Trapping: 1, 2, 4, 6, 8, 9, 10, 16	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Moderate water velocities and steep banks limit sediment trapping
11	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Shoreline Anchoring: 2, 3, 4, 8, 9, 12, 15	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The narrow bands of wetland bordering the stream are important but not principal
12	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Uniqueness/Heritage: 2, 4, 8, 9, 10, 11, 12, 22, 25	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Important as a potential education site, but is degraded
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation:1, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Small degraded stream limits use
14	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Water Dependent Wildlife: 6, 8, 13, 15	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Small degraded stream and proximity to human activity limit use
SECTION 7 - ATTACHMENTS (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)				

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[Check the Status of your Application](#)

RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

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Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Lawns, road, railroad track	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): <5 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: E, Impact #7	LOCATION: (LAT/ LONG) 43.1362268/-70.9374063
WETLAND AREA: 168 sf	DOMINANT WETLAND SYSTEMS PRESENT: Wet meadow
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 0	COWARDIN CLASS: PEM1Cx
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No if not, where does the wetland lie in the drainage basin? █	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island? IS THE WETLAND HUMAN-MADE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PROPOSED WETLAND IMPACT TYPE: Fill	PROPOSED WETLAND IMPACT AREA: 168 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (from NHM):3, 4,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is a ditch/swale between a culvert outlet and a catch basin that is regularly mown
2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Education Potential: 1, 9, 10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Flood Storage: 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Nutrient Trapping/Retention: 4, 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 9, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Sediment Trapping: 1, 4, 8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage: 2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Water Dependent Wildlife: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

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SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Lawns, road, utility lines, railroad track	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): 0 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: F, Impacts #9 and #11	LOCATION: (LAT/ LONG) 43.135451/-70.937375
WETLAND AREA: 2,800 sf	DOMINANT WETLAND SYSTEMS PRESENT: Ditch
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 0	COWARDIN CLASS: PEM1/PSS1Cx
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No if not, where does the wetland lie in the drainage basin? [REDACTED]	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island? IS THE WETLAND HUMAN-MADE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PROPOSED WETLAND IMPACT TYPE: None	PROPOSED WETLAND IMPACT AREA: 636 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (from NHM):3, 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is a recently maintained ditch between Waterworks Road and a railroad bed. Some shrubs remain in northern end of ditch.
2	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Education Potential: 8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Flood Storage: 3, 4, 6, 8, 9, 15	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Provides minimal flood storage due to size of wetland and its immediate watershed.
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE Species): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention:3, 4, 7, 10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal nutrient attenuation due to size of wetland and its immediate watershed.
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 9, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
10	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping:1, 2, 4, 8,	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Minimal sediment trapping due to size of wetland and its immediate watershed.
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage:2, 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Water Dependent Wildlife: 7	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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WETLANDS FUNCTIONAL ASSESSMENT WORKSHEET

Water Division/Land Resource Management
Wetlands Bureau



[Check the Status of your Application](#)

RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

As required by Env-Wt 311.03(b)(10), an application for a standard permit for minor and major projects must include a functional assessment of all wetlands on the project site as specified in Env-Wt 311.10. This worksheet will help you compile data for the functional assessment needed to meet federal (US Army Corps of Engineers (USACE); if applicable) and NHDES requirements. Additional requirements are needed for projects in tidal area; please refer to the [Coastal Area Worksheet \(NHDES-W-06-079\)](#) for more information.

Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Lawns, road, utility lines, railroad track	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): 0 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2015("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: G, Impacts #8, #10, #12, and #13	LOCATION: (LAT/ LONG) 43.135455/-70.937728
WETLAND AREA: 0.43 ac	DOMINANT WETLAND SYSTEMS PRESENT: Marsh/Wet Meadow
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 0	COWARDIN CLASS: PEM1E
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No if not, where does the wetland lie in the drainage basin? Mid	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island? IS THE WETLAND HUMAN-MADE? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
PROPOSED WETLAND IMPACT TYPE: Fill	PROPOSED WETLAND IMPACT AREA: 9,313 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (from NHM): 3, 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is highly altered, includes invasive species, and is surrounded by roads, a parking lot, and a utility line.
2	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Education Potential: 8, 9, 10, 13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Highly altered and degraded but could be studied as such and is part of UNH
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Flood Storage: 3, 4, 6, 7, 8, 9, 11, 15, 17, 18	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland provides some flood storage, but direct watershed area is limited.
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE Species): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention: 3, 4, 5, 6, 7, 8, 9, 10, 11	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Moderate nutrient trapping from developed uplands. Important because flow is indirectly associated with impaired College Brook through drainage structures.
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 1, 2, 7, 9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 2, 9, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
10	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping: 1, 2, 3, 4, 5, 6, 7, 8,	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Wetland provides moderate sediment trapping from paved uplands. Important because flow is indirectly associated with impaired College Brook through drainage structures.
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage: 1, 2, 5, 8, 9, 10, 11, 22, 31	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: 10, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Water Dependent Wildlife: 8, 11, 13, 14, 19	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Due to the limited, size, depth, and disturbance, the only water dependent wildlife likely to rely on this area are invertebrates.

SECTION 5 - VERNAL POOL SUMMARY (Env-Wt 311.10)

Delineations of vernal pools shall be based on the characteristics listed in the definition of “vernal pool” in Env-Wt 104.44. To assist in the delineation, individuals may use either of the following references:

- *Identifying and Documenting Vernal Pools in New Hampshire 3rd Ed.*, 2016, published by the New Hampshire Fish and Game Department; or
- The USACE *Vernal Pool Assessment* draft guidance dated 9-10-2013 and form dated 9-6-2016, Appendix L of the USACE New England District *Compensatory Mitigation Guidance*.

All vernal pool ID numbers are to be displayed and located on the wetland delineation of the subject property.

“Important Notes” are to include documented reproductive and wildlife values, landscape context, and relationship to other vernal pools/wetlands.

Note: For projects seeking federal approval from the USACE, please attach a completed copy of The USACE “Vernal Pool Assessment” form dated 9-6-2016, Appendix L of the USACE New England District *Compensatory Mitigation Guidance*.

VERNAL POOL ID NUMBER	DATE(S) OBSERVED	PRIMARY INDICATORS PRESENT (LIST)	SECONDARY INDICATORS PRESENT (LIST)	LENGTH OF HYDROPERIOD	IMPORTANT NOTES
1					
2					
3					
4					
5					

SECTION 6 - STREAM RESOURCES SUMMARY

DESCRIPTION OF STREAM:	STREAM TYPE (ROSGEN):
HAVE FISHERIES BEEN DOCUMENTED?	DOES THE STREAM SYSTEM APPEAR STABLE?

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WETLANDS FUNCTIONAL ASSESSMENT WORKSHEET

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RSA/Rule: RSA 482-A / Env-Wt 311.03(b)(10); Env-Wt 311.10

APPLICANT LAST NAME, FIRST NAME, M.I.: University of New Hampshire, Attn: Henry, Paul A.

As required by Env-Wt 311.03(b)(10), an application for a standard permit for minor and major projects must include a functional assessment of all wetlands on the project site as specified in Env-Wt 311.10. This worksheet will help you compile data for the functional assessment needed to meet federal (US Army Corps of Engineers (USACE); if applicable) and NHDES requirements. Additional requirements are needed for projects in tidal area; please refer to the [Coastal Area Worksheet \(NHDES-W-06-079\)](#) for more information.

Both a desktop review and a field examination are needed to accurately determine surrounding land use, hydrology, hydroperiod, hydric soils, vegetation, structural complexity of wetland classes, hydrologic connections between wetlands or stream systems or wetland complex, position in the landscape, and physical characteristics of wetlands and associated surface waters. The results of the evaluation are to be used to select the location of the proposed project having the least impact to wetland functions and values (Env-Wt 311.10). This worksheet can be used in conjunction with the [Avoidance and Minimization Written Narrative \(NHDES-W-06-089\)](#) and the [Avoidance and Minimization Checklist \(NHDES-W-06-050\)](#) to address Env-Wt 313.03 (Avoidance and Minimization). If more than one wetland/ stream resource is identified, multiple worksheets can be attached to the application. All wetland, vernal pools, and stream identification (ID) numbers are to be displayed and located on the wetlands delineation of the subject property.

SECTION 1 - LOCATION (USACE HIGHWAY METHODOLOGY)	
ADJACENT LAND USE: Parking lot, lawns, residence halls	
CONTIGUOUS UNDEVELOPED BUFFER ZONE PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
DISTANCE TO NEAREST ROADWAY OR OTHER DEVELOPMENT (in feet): <5 ft	
SECTION 2 - DELINEATION (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
CERTIFIED WETLAND SCIENTIST (if in a non-tidal area) or QUALIFIED COASTAL PROFESSIONAL (if in a tidal area) who prepared this assessment: Leonard Lord, PhD, CWS	
DATE(S) OF SITE VISIT(S): 8/8/2020, 11/9/20, 12/16/20	DELINEATION PER ENV-WT 406 COMPLETED? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
CONFIRM THAT THE EVALUATION IS BASED ON: <input checked="" type="checkbox"/> Office and <input checked="" type="checkbox"/> Field examination.	
METHOD USED FOR FUNCTIONAL ASSESSMENT (check one and fill in blank if "other"): <input checked="" type="checkbox"/> USACE Highway Methodology. <input checked="" type="checkbox"/> Other scientifically supported method (enter name/ title): NH Method, 2016("NHM" for Ecological Integrity Eval)	

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SECTION 3 - WETLAND RESOURCE SUMMARY (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
WETLAND ID: H, Impact #14	LOCATION: (LAT/ LONG) 43°07'59.3"N/70°55'42.1"W
WETLAND AREA: 2,029 sf	DOMINANT WETLAND SYSTEMS PRESENT: Marsh/Wet Meadow
HOW MANY TRIBUTARIES CONTRIBUTE TO THE WETLAND? 0	COWARDIN CLASS: PEM1E
IS THE WETLAND A SEPARATE HYDRAULIC SYSTEM? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No if not, where does the wetland lie in the drainage basin? [REDACTED]	IS THE WETLAND PART OF: <input type="checkbox"/> A wildlife corridor or <input type="checkbox"/> A habitat island?
IS THE WETLAND IN A 100-YEAR FLOODPLAIN? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	IS THE WETLAND HUMAN-MADE? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
ARE ANY WETLANDS PART OF A STREAM OR OPEN-WATER SYSTEM? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	ARE VERNAL POOLS PRESENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (If yes, complete the Vernal Pool Table)
PROPOSED WETLAND IMPACT TYPE: Fill	ARE ANY PUBLIC OR PRIVATE WELLS DOWNSTREAM/ DOWNGRADIENT? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
	PROPOSED WETLAND IMPACT AREA: 2,029 sf
SECTION 4 - WETLANDS FUNCTIONS AND VALUES (USACE HIGHWAY METHODOLOGY; Env-Wt 311.10)	
<p>The following table can be used to compile data on wetlands functions and values. The reference numbers indicated in the "Functions/ Values" column refer to the following functions and values:</p> <ol style="list-style-type: none"> 1. Ecological Integrity (from RSA 482-A:2, XI) 2. Educational Potential (from USACE Highway Methodology: Educational/Scientific Value) 3. Fish & Aquatic Life Habitat (from USACE Highway Methodology: Fish & Shellfish Habitat) 4. Flood Storage (from USACE Highway Methodology: Floodflow Alteration) 5. Groundwater Recharge (from USACE Highway Methodology: Groundwater Recharge/Discharge) 6. Noteworthiness (from USACE Highway Methodology: Threatened or Endangered Species Habitat) 7. Nutrient Trapping/Retention & Transformation (from USACE Highway Methodology: Nutrient Removal) 8. Production Export (Nutrient) (from USACE Highway Methodology) 9. Scenic Quality (from USACE Highway Methodology: Visual Quality/Aesthetics) 10. Sediment Trapping (from USACE Highway Methodology: Sediment /Toxicant Retention) 11. Shoreline Anchoring (from USACE Highway Methodology: Sediment/Shoreline Stabilization) 12. Uniqueness/Heritage (from USACE Highway Methodology) 13. Wetland-based Recreation (from USACE Highway Methodology: Recreation) 14. Wetland-dependent Wildlife Habitat (from USACE Highway Methodology: Wildlife Habitat) <p>First, determine if a wetland is suitable for a particular function and value ("Suitability" column) and indicate the rationale behind your determination ("Rationale" column). Please use the rationale reference numbers listed in Appendix A of USACE <i>The Highway Methodology Workbook Supplement</i>. Second, indicate which functions and values are principal ("Principal Function/value?" column). As described in <i>The Highway Methodology Workbook Supplement</i>, "functions and values can be principal if they are 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". "Important Notes" are to include characteristics the evaluator used to determine the principal function and value of the wetland.</p>	

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FUNCTIONS/ VALUES	SUITABILITY (Y/N)	RATIONALE (Reference #)	PRINCIPAL FUNCTION/VALUE? (Y/N)	IMPORTANT NOTES
1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Ecological Integrity (from NHM): 3, 4	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland is manmade and is surrounded by roads and a parking lot.
2	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Education Potential: 8, 9, 10, 13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	The wetland lies within the UNH campus.
3	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Fish & Aquatic Life: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
4	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Flood Storage: 3, 4, 6, 7, 8, 9, 11, 15, 17	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Old stormwater detention basin receiving runoff from the Community Crossing parking lot
5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Groundwater Recharge (only): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Noteworthiness (RTE): None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
7	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Nutrient Trapping/Retention: 3, 4, 5, 7, 8, 9, 10	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Moderate nutrient trapping occurs from surrounding developed areas before reaching College Brook.
8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Production Export: 1, 2, 7	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Scenic Quality: 2, 9, 11, 12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
10	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sediment Trapping: 2, 3, 4, 7, 8	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Moderate sediment trapping occurs from surrounding developed areas before reaching College Brook.
11	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Shoreline Anchoring: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
12	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Uniqueness/Heritage: 1, 2, 5, 8, 9, 10, 22, 31	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
13	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Wetland Based Recreation: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
14	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Water Dependent Wildlife: None	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

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Tighe&Bond

APPENDIX E

Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

Photograph No.: 1	Date: 8/22/20	Direction Taken: Southwest
Description: Wetland A, Impact Area 1		
		

Photograph No.: 2	Date: 8/22/20	Direction Taken: Northeast
Description: : Wetland A, Impact Area 2		
		

Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH




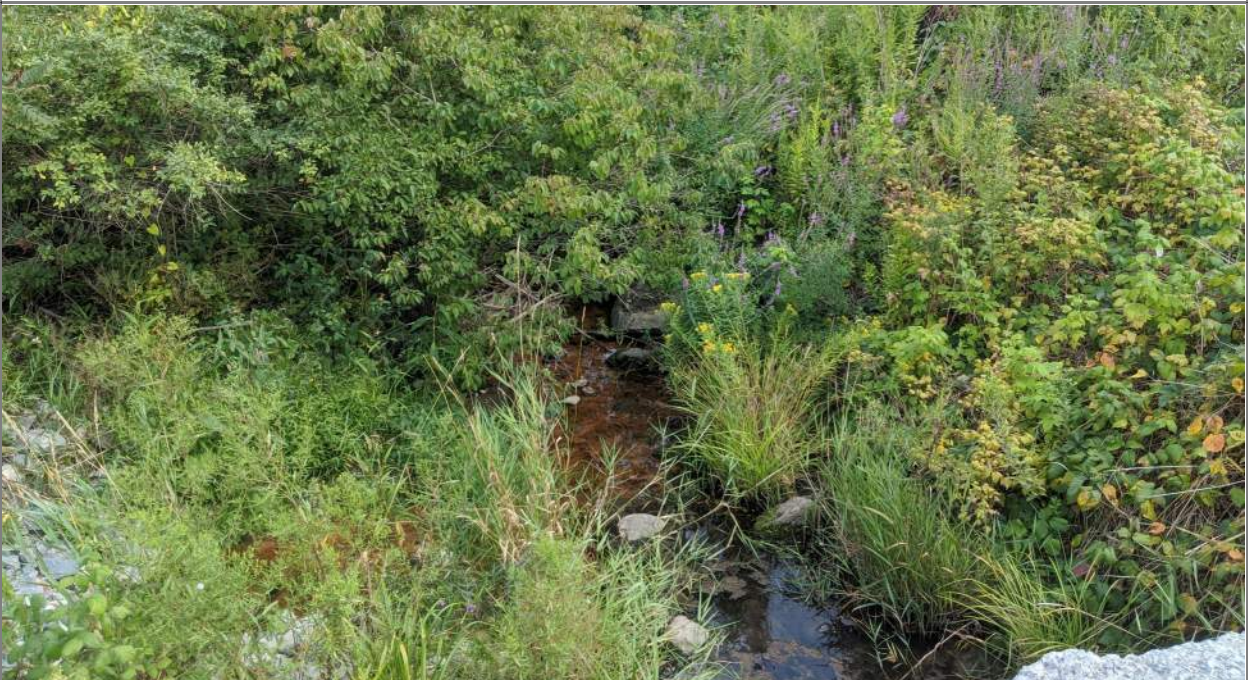
Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

Photograph No.: 5	Date: 8/22/20	Direction Taken: West
Description: West end of Wetland D at Impact #5 taken at College Brook facing upstream from the existing culvert crossing at Colovos Road		
		

Photograph No.: 6	Date: 8/22/20	Direction Taken: East
Description: : East end of Wetland D at Impact #6 taken at College Brook facing downstream from the existing culvert crossing at Colovos Road		
		

Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

Photograph No.: 7	Date: 8/22/20	Direction Taken: North
Description: Wetland E, ditch and swale at Impact #7 leading from a 10-inch iron culvert outlet to a catch basin off Waterworks Road		
		


Photograph No.: 8	Date: 8/22/20	Direction Taken: Southeast
Description: Wetland F, Impacts #9 and #11, is a recently maintained ditch between a railroad bed and Waterworks Road		
		


Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

Photograph No.: 9	Date: 8/22/20	Direction Taken: Southwest
Description: Wetland G with reed canary grass and broadleaf cattail dominated area of disturbed emergent wetland at northern portion of Impact #10 along Waterworks Road		
		

Photograph No.: 10	Date: 8/22/20	Direction Taken: Northwest
Description: Wetland G with a purple loosestrife and broadleaf cattail dominated area of disturbed emergent wetland at northern portion of Impact #10 along Waterworks Road		
		

Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

Photograph No.: 11	Date: 8/22/20	Direction Taken: Southwest
Description: Wetland G with reed canary grass and purple loosestrife dominating in eastern portion of Impact #10 along Waterworks Road		
		

Photograph No.: 12	Date: 8/22/20	Direction Taken: North
Description: Reed canary grass and cattail dominated southern portion of Wetland G1 along Waterworks road, with Impact #10 to the right (east) of the power lines		
		


Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

Photograph No.: 13	Date: 8/22/20	Direction Taken: East
Description: Wetland G showing runoff from the developed area around Gregg Hall in the southwestern portion of Impact #12 and #13.		
		

Photograph No.: 14	Date: 8/22/20	Direction Taken: East
Description: Shrub and purple loosestrife dominated southwestern portion of Wetland G at Impact #12, north of Gregg Hall		
		

Photographic Log

Client: University of New Hampshire

Job Number: U0135048A

Site: South Drive, Durham, NH

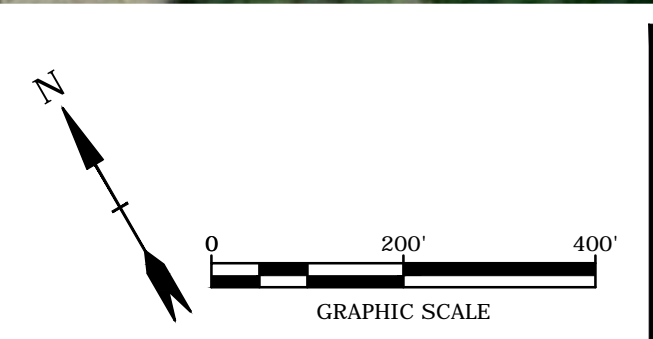
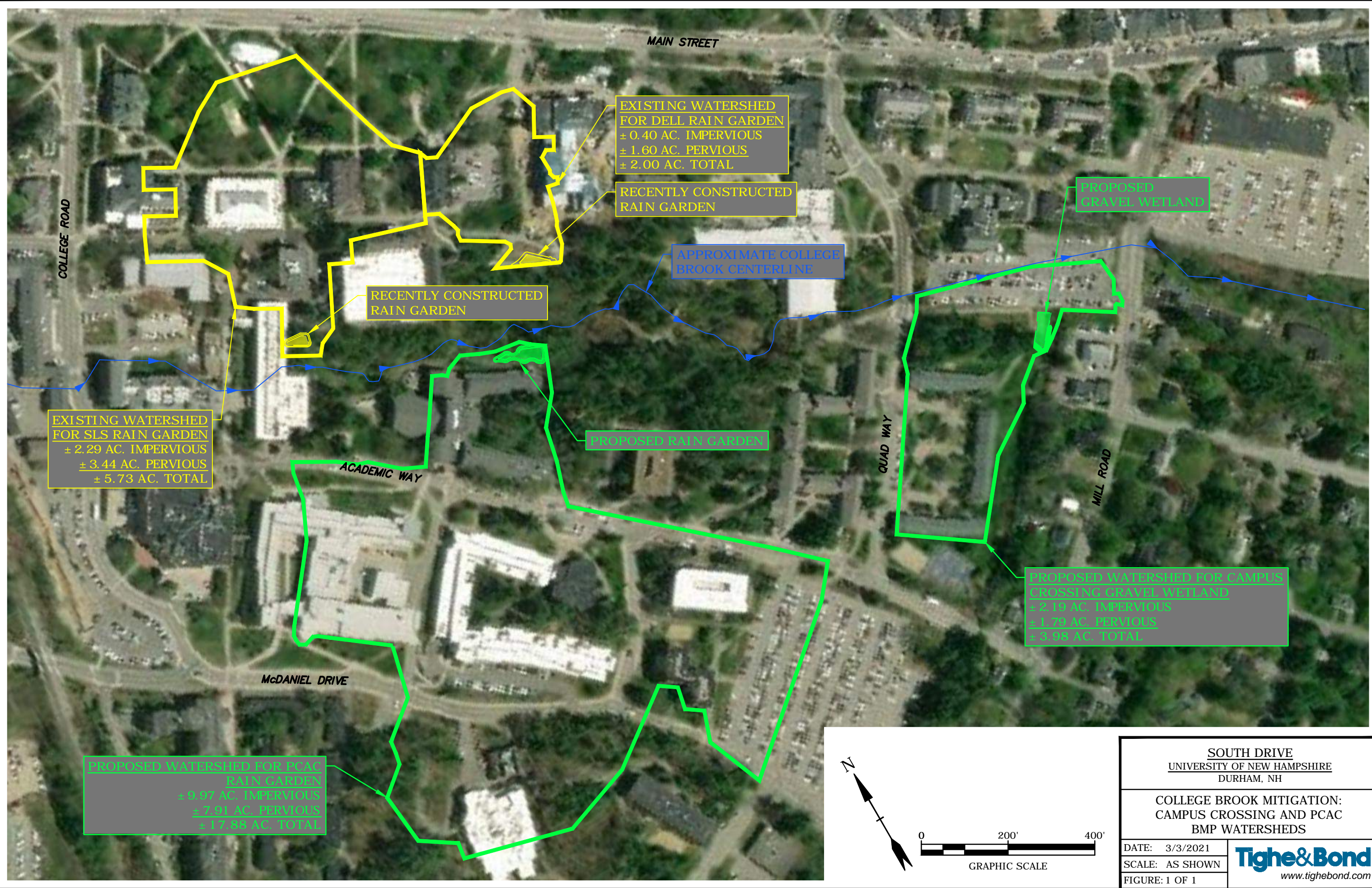
Photograph No.: 15	Date: 11/24/2020	Direction Taken: Southwest
Description: Wetland H, Impact #14 is an old detention basin along the Campus Crossing parking lot that will be transformed into a gravel wetland as mitigation to provide treatment of runoff		
		

Photograph No.: 16	Date: 8/22/20	Direction Taken: Northeast
Description: Proposed location of a rain garden behind Paul Creative Arts Center that will be created as mitigation to provide treatment of runoff		
		

Tighe&Bond

APPENDIX F

Mar 04, 2021 8:45am Plotted By: NSC
Tighe & Bond, Inc. J:\U0135 UNH General\U0135-048 South Drive\Drawings\Figures\AutoCAD\U-0135-048-C-HYDRO.dwg



SOUTH DRIVE UNIVERSITY OF NEW HAMPSHIRE DURHAM, NH	
COLLEGE BROOK MITIGATION: CAMPUS CROSSING AND PCAC BMP WATERSHEDS	
DATE: 3/3/2021	 www.tighebond.com
SCALE: AS SHOWN	
FIGURE: 1 OF 1	

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APPENDIX G

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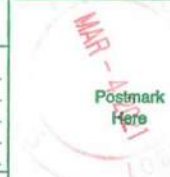
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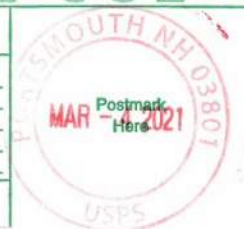
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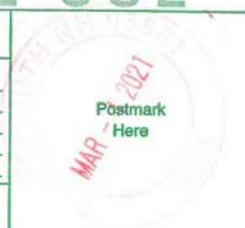
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Certified Mail Fee
 \$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

Return Receipt (hardcopy) \$

Return Receipt (electronic) \$

Certified Mail Restricted Delivery \$

Adult Signature Required \$

Adult Signature Restricted Delivery \$

Postage
 \$ **0.51**

Total Postage and
 \$ **4.11**

Sent To
 Street and Apt. No.
 City, State, ZIP+4

Brendaen and Jille Anne Makechnie
 392 Maple Street
 Andover, NH 03216



7018 1130 0001 0367 2796

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Extra Services & Fees (check box, add fee as appropriate)

Return Receipt (hardcopy) \$

Return Receipt (electronic) \$

Certified Mail Restricted Delivery \$

Adult Signature Required \$

Adult Signature Restricted Delivery \$

Postage
 \$ **0.51**

Total Postage and
 \$ **4.11**

Sent To
 Street and Apt. No.
 City, State, ZIP+4

James and Kristin Houle
 95 Mill Road
 Durham, NH 03824



7018 1130 0001 0367 3014

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 \$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

Return Receipt (hardcopy) \$

Return Receipt (electronic) \$

Certified Mail Restricted Delivery \$

Adult Signature Required \$

Adult Signature Restricted Delivery \$

Postage
 \$ **0.51**

Total Postage and
 \$ **4.11**

Sent To
 Street and Apt. No.
 City, State, ZIP+4

Carl E Manders Rev Trust
 40 Newfane Road
 Bedford, NH 03310



7018 1130 0001 0367 3038

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Extra Services & Fees (check box, add fee as appropriate)

Return Receipt (hardcopy) \$

Return Receipt (electronic) \$

Certified Mail Restricted Delivery \$

Adult Signature Required \$

Adult Signature Restricted Delivery \$

Postage
 \$ **0.51**

Total Postage and
 \$ **4.11**

Sent To
 Street and Apt. No.
 City, State, ZIP+4

Joshua and Heather Machanoff
 89 Mill Road
 Durham, NH 03824



7018 1130 0001 0367 3052

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 \$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

Return Receipt (hardcopy) \$

Return Receipt (electronic) \$

Certified Mail Restricted Delivery \$

Adult Signature Required \$

Adult Signature Restricted Delivery \$

Postage
 \$ **0.51**

Total Postage and
 \$ **4.11**

Sent To
 Street and Apt. No.
 City, State, ZIP+4

81 Mill Road LLC
 PO Box 83
 Durham, NH 03824



7018 0360 0000 2805 7915

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Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Steven and Melodye Merrill Rev Trust
13 Mill Road #6
Durham, NH 03824

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OFFICIAL USE

Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Kenneth and Vera Corpron
13 Mill Road #11
Durham, NH 03824

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Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Mark and Jean McPeak
13 Mill Road #12
Durham, NH 03824

7018 0360 0000 2805 7885

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Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Diane P Zirkle Rev Trust
13 Mill Road #5
Durham, NH 03824

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Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Tracy Hutch
13 Mill Road #7
Durham, NH 03824

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OFFICIAL USE

Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Carol Knox
13 Mill Road #8
Durham, NH 03824

7018 0360 0000 2805 7878

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OFFICIAL USE

Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Sunpreet and Berkley Sadana
97 Mill Road
Durham, NH 03824

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Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Nicholas and Stephanie Wright
99 Mill Road
Durham, NH 03824

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Certified Mail Fee	\$ 3.60
Extra Services & Fees (check box, add fee as appropriate)	
<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$



Postage	\$ 0.51
Total Postage and Fee	\$ 4.11

Sent To
Anthony DiBerto and Dana Magane
101 Mill Road
Durham, NH 03824

7018 1130 0001 0367 2994

7018 1130 0001 0367 2970

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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

PS Form 3800, A

Katherine Stryck
20107 Ivan Road
South Chesterfield, VA 23803



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

PS Form 3800, A

John Hart
PO Box 65
Durham, NH 03824



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\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

PS Form 3800, A

Barry and Denise Smith Rev Trust
84 Durham Point Road
Durham, NH 03824



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

PS Form 3800, A

Moses and Martha Swift
18 Mill Road
Durham, NH 03824



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

PS Form 3800, A

Peter and Lisa Lewis
20 Mill Road
Durham, NH 03824



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt.

City, State, ZIP+

PS Form 3800

Edward and Emily Brake
30 Mill Road
Durham, NH 03824



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

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Lighthouse Student Ministries
607 Calef Highway, Suite 400
Barrington, NH 03825



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

Sent To

Street and Apt. No.

City, State, ZIP+4®

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14 Mill Road Realty Trust
35 Scotland Road
Reading, MA 01867



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Certified Mail Fee
\$ **3.60**

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$	
<input type="checkbox"/> Return Receipt (electronic)	\$	
<input type="checkbox"/> Certified Mail Restricted Delivery	\$	
<input type="checkbox"/> Adult Signature Required	\$	
<input type="checkbox"/> Adult Signature Restricted Delivery	\$	

Postage
\$ **0.51**

Total Postage and Fees
\$ **4.11**

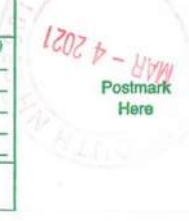
Sent To

Street and Apt. No.

City, State, ZIP+

PS Form 3800, A

Jill B Schoonmaker Rev Trust
24 Mill Road
Durham, NH 03824



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Certified Mail Fee
\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 0.51

Total Postage and Fees
\$ 4.11

Sent To
Fairpoint
770 Elm Street
Manchester, NH 03101

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Certified Mail Fee
\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 0.51

Total Postage and Fees
\$ 4.11

Sent To
United Campus Ministry of UNH
15 Mill Road
Durham, NH 03824

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\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 0.51

Total Postage and Fees
\$ 4.11

Sent To
Charles and Patricia Strogon
8 River Road
Rollinsford, NH 03869

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Certified Mail Fee
\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 6.51

Total Postage and Fees
\$ 4.11

Sent To
Evan Paris
26 Mill Road
Durham, NH 03824

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Certified Mail Fee
\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

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<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 0.51

Total Postage and Fees
\$ 4.11

Sent To
Scott and Lorie Jenkins
49 Old Country Road North
Francestown, NH 03043

PS Form 3800



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Certified Mail Fee
\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 0.51

Total Postage and Fees
\$ 4.11

Sent To
Candia Cheney
13 Mill Road #1
Durham, NH 03824

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Certified Mail Fee
\$ 3.60

Extra Services & Fees (check box, add fee as appropriate)

<input type="checkbox"/> Return Receipt (hardcopy)	\$
<input type="checkbox"/> Return Receipt (electronic)	\$
<input type="checkbox"/> Certified Mail Restricted Delivery	\$
<input type="checkbox"/> Adult Signature Required	\$
<input type="checkbox"/> Adult Signature Restricted Delivery	\$

Postage
\$ 0.51

Total Postage and Fees
\$ 4.11

Sent To
Deborah Penttila
13 Mill Road #2
Durham, NH 03824

PS Form 3800, A

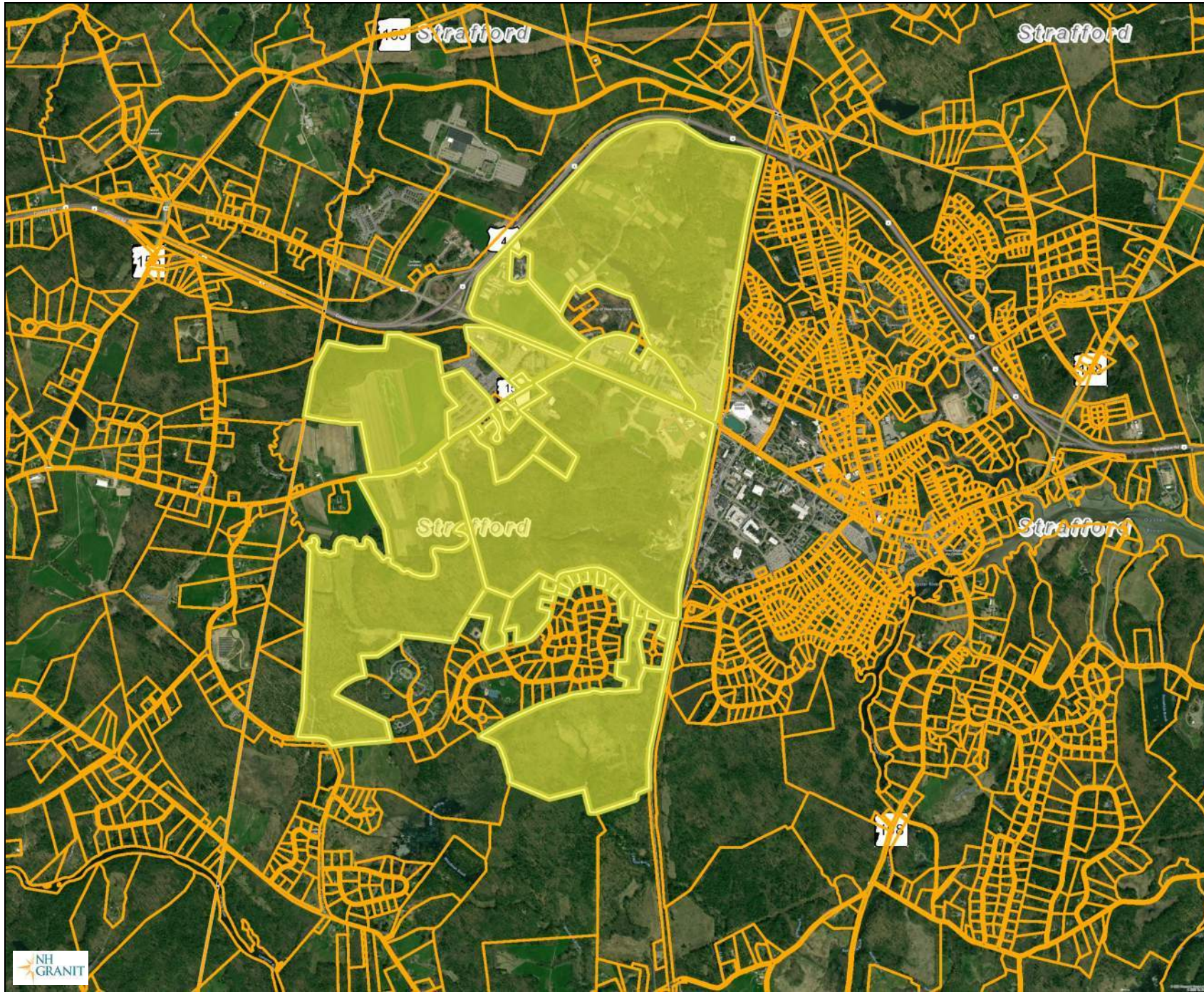


**Abutters List - UNH South Drive
Durham, NH**

Tax Map	Lot	Owner Name	Owner Address	Owner City	Owner State	Owner Zip
7	1-1	81 Mill Road LLC	P.O. Box 83	Durham	NH	03824
7	1-3	Brendaen and Jille Anne Makechnie	392 Maple Street	Andover	NH	03216
7	1-4	Joshua and Heather Machanoff	89 Mill Road	Durham	NH	03824
7	1-5	Julie and Michael Baldy	91 Mill Road	Durham	NH	03824
7	1-6	Carl E Manders Rev Trust	40 Newfane Road	Bedford	NH	03310
7	1-7	James and Kristin Houle	95 Mill Road	Durham	NH	03824
7	1-8	Sunpreet and Berkley Sadana	97 Mill Road	Durham	NH	03824
7	1-9	Nicholas and Stephanie Wright	99 Mill Road	Durham	NH	03824
7	1-10	Anthony DiBerto and Dana Magane	101 Mill Road	Durham	NH	03824
7	2-0	Charles & Trisha Waters II Rev Trust	83 Mill Road	Durham	NH	03824
7	2-1	Thomas and Karin Mullin	P.O. Box 658	Durham	NH	03824
13	2-0	David Sanborn	P.O. Box 332	Durham	NH	03824
13	5-0	Torrington Mast LLC	11 Elkins Street, Suite 420	Boston	MA	02127
13	6-1	HSRE Lodges at West Edge LLC	C/O Altus Group, P.O. Box 92129	Southlake	TX	76092
13	6-3	Chet Tecce Jr Rev Living Trust	240 Mast Road	Durham	NH	03824
13	14-2	Town of Durham	8 Newmarket Road	Durham	NH	03824
13	15-1	Martha Garland	110 Mill Road	Durham	NH	03824
13	15-2	Dennis and Shannon Magliozzi	114 Mill Road	Durham	NH	03824
13	15-3	Linda Stoxen and Louis Tisa	100 Mill Road	Durham	NH	03824
13	17-1	Hubbard Family Rev Trust	2 Hemlock Way	Durham	NH	03824
13	17-9	Mark and Kandie Bonica	3 Hemlock Way	Durham	NH	03824

All data obtained from the Durham NH Assessor Online Database (via Vision Government Solutions). All abutting properties owned by UNH (the applicant) have been removed.

UNH South Drive Abutter Parcels



Legend

- Polygons
- State
- County
- City/Town

Map Scale
1: 31,390

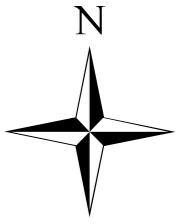


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Map Generated: 3/1/2021

Notes






Map 7



PROPERTY MAP DURHAM NEW HAMPSHIRE

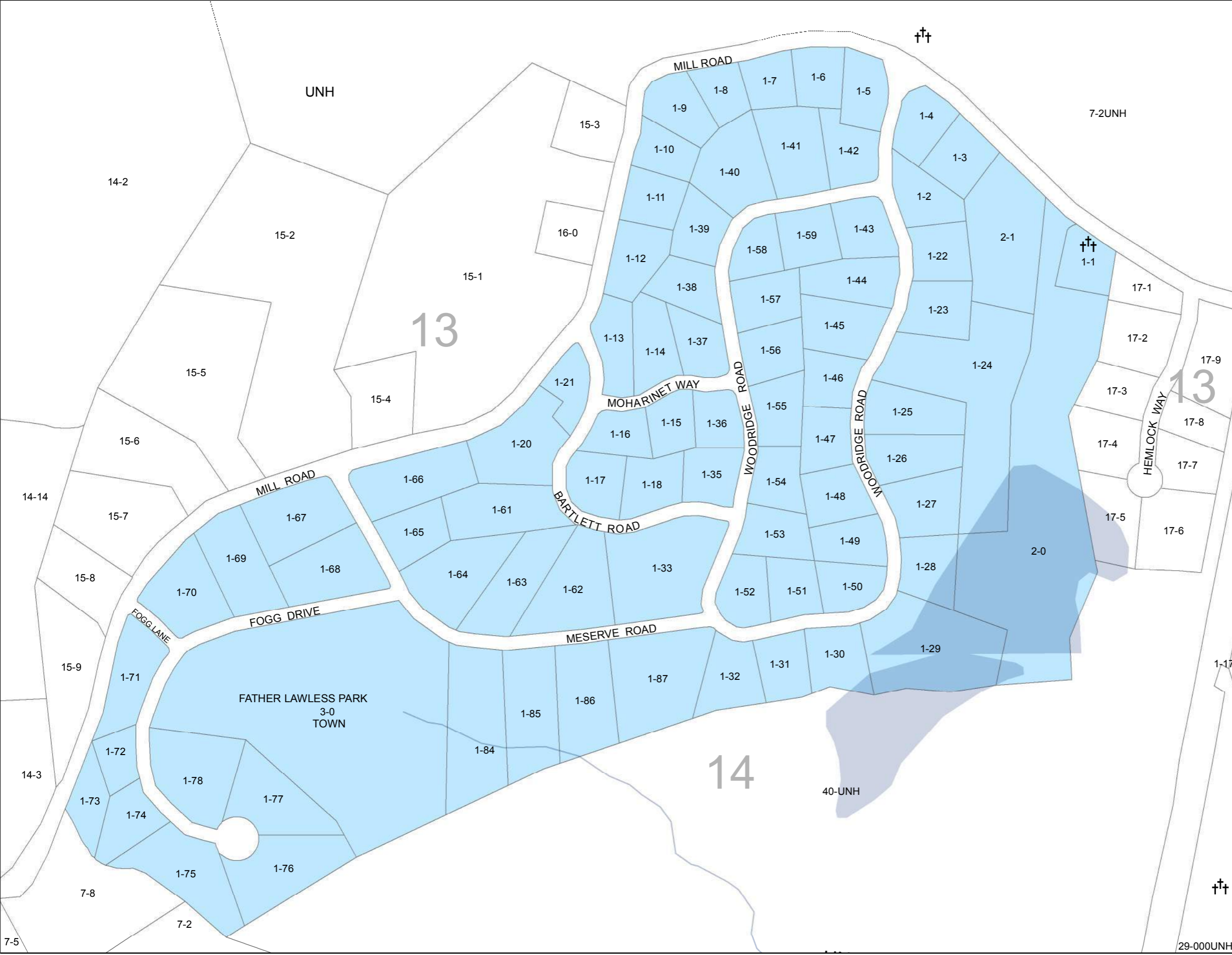
Legend

-  Adjacent Map Sheets
-  Current Map Sheet
-  Cemetery

1 inch = 340 feet

This map was updated by
Strafford Regional Planning
and the Town of Durham
February 2018.

**THIS MAP IS FOR ASSESSMENT
PURPOSES ONLY.
IT IS NOT INTENDED FOR
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Map 13



PROPERTY MAP DURHAM NEW HAMPSHIRE

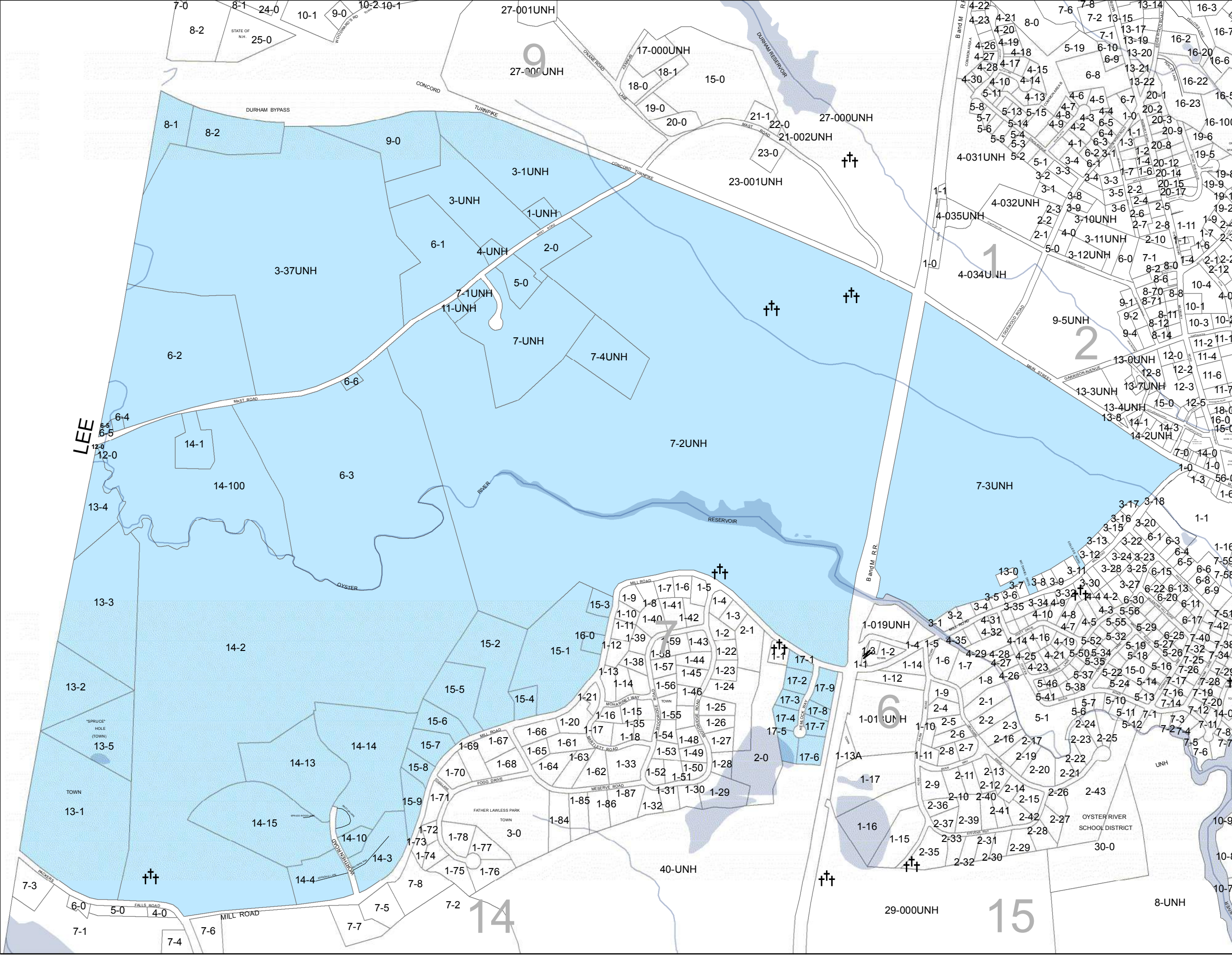
Legend

-  Adjacent Map Sheets
-  Current Map Sheet
-  Cemetery

1 inch = 935 feet

This map was updated by
Strafford Regional Planning
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February 2018.

**THIS MAP IS FOR ASSESSMENT
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LEGAL DESCRIPTION OR CONVEYANCE.**



**Abutters List - UNH Mitigation Area
Durham, NH**

Tax Map	Lot	Owner Name	Owner Address	Owner City	Owner State	Owner Zip
2	13-8	Town of Durham	8 Newmarket Road	Durham	NH	03824
2	14-1	Town & Campus Inc	105 Perkins Road	Madbury	NH	03823
2	14-1-1	Clark Properties LLC	28 Cedar Point Road	Durham	NH	03824
2	14-4	60 Main Street R.E. LLC	37 Main Street Unit O	Durham	NH	03824
2	14-5	Chittenden Corp c/o People's United Bank	Res Contract Manager BC05-451, 850 Main Street	Bridgeport	CT	06604
4	4-0	L&R Hayden Property LLC	P.O. Box 576	Durham	NH	03824
4	5-0	R&S Hayden Development LLC	P.O. Box 576	Durham	NH	03824
4	6-0	Young Family Rev Trust	235 Dover Point Road	Dover	NH	03820
4	7-0	Arrow 5054 Properties	14 Davis Avenue	Durham	NH	03824
5	1-0	Town of Durham	8 Newmarket Road	Durham	NH	03824
5	1-1	Colonial Durham Associates	7 Mill Road Unit L	Durham	NH	03824
5	1-2	Mary-Kyrils LLC	P.O. Box 777	Durham	NH	03824
6	1-4	Iago and Erin Hale	74 Mill Road	Durham	NH	03824
6	3-1	Matthew Brown and Victoria Jeffers	70 Mill Road	Durham	NH	03824
6	3-2	William Conk Rev Trust	68 Mill Road	Durham	NH	03824
6	3-4	Christian and Amy Sterndale	60 Mill Road	Durham	NH	03824
6	3-5	Paul and Linda Degross	P.O. Box 212	Durham	NH	03824
6	3-6	Daniel and Emilie Reagan	50 Mill Road	Durham	NH	03824
6	3-7	Pamela Allen	48 Mill Road	Durham	NH	03824
6	3-8	32 Mill Road LLC	21 Shearwater Street	Durham	NH	03824
6	3-9	Edward and Emily Brake	30 Mill Road	Durham	NH	03824
6	3-10	Scott and Lorie Jenkins	49 Old Country Road North	Francestown	NH	03043
6	3-11	Evan Paris	26 Mill Road	Durham	NH	03824
6	3-12	Jill B Schoonmaker Rev Trust	24 Mill Road	Durham	NH	03824
6	3-13	Peter and Lisa Lewis	20 Mill Road	Durham	NH	03824
6	3-14	Moses and Martha Swift	18 Mill Road	Durham	NH	03824
6	3-15	14 Mill Road Realty Trust	35 Scotland Road	Reading	MA	01867
6	3-16	Lighthouse Student Ministries	607 Calef Highway Suite 400	Barrington	NH	03825
6	3-17	Charles and Patricia Strogen	8 River Road	Rollinsford	NH	03869
6	3-20	United Campus Ministry to UNH	15 Mill Road	Durham	NH	03824
6	13-0	Fairpoint	770 Elm Street	Manchester	NH	03101
6	3-18-A	Candia Cheney	13 Mill Road #1	Durham	NH	03824
6	3-18-B	Deborah Penttila	13 Mill Road #2	Durham	NH	03824
6	3-18-C	Cheryl Davis	13 Mill Road #3	Durham	NH	03824
6	3-18-D	Barry and Denise Smith Rev Trust	84 Durham Point Road	Durham	NH	03824
6	3-18-E	Diane P Zirkle Rev Trust	13 Mill Road #5	Durham	NH	03824
6	3-18-F	Steven and Melodye Merrill Rev Trust	13 Mill Road #6	Durham	NH	03824
6	3-18-G	Tracy Hutch	13 Mill Road #7	Durham	NH	03824
6	3-18-H	Carol Knox	13 Mill Road #8	Durham	NH	03824
6	3-18-I	John Hart	P.O. Box 65	Durham	NH	03824
6	3-18-J	Katherine Stryck	20107 Ivan Road	South Chesterfield	VA	23803
6	3-18-K	Kenneth and Vera Corpron	13 Mill Road #11	Durham	NH	03824
6	3-18-L	Mark and Jean McPeak	13 Mill Road #12	Durham	NH	03824

All data obtained from the Durham NH Assessor Online Database (via Vision Government Solutions). All abutting properties owned by UNH (the applicant) have been removed.

Mitigation Area Abutter Parcels



Legend

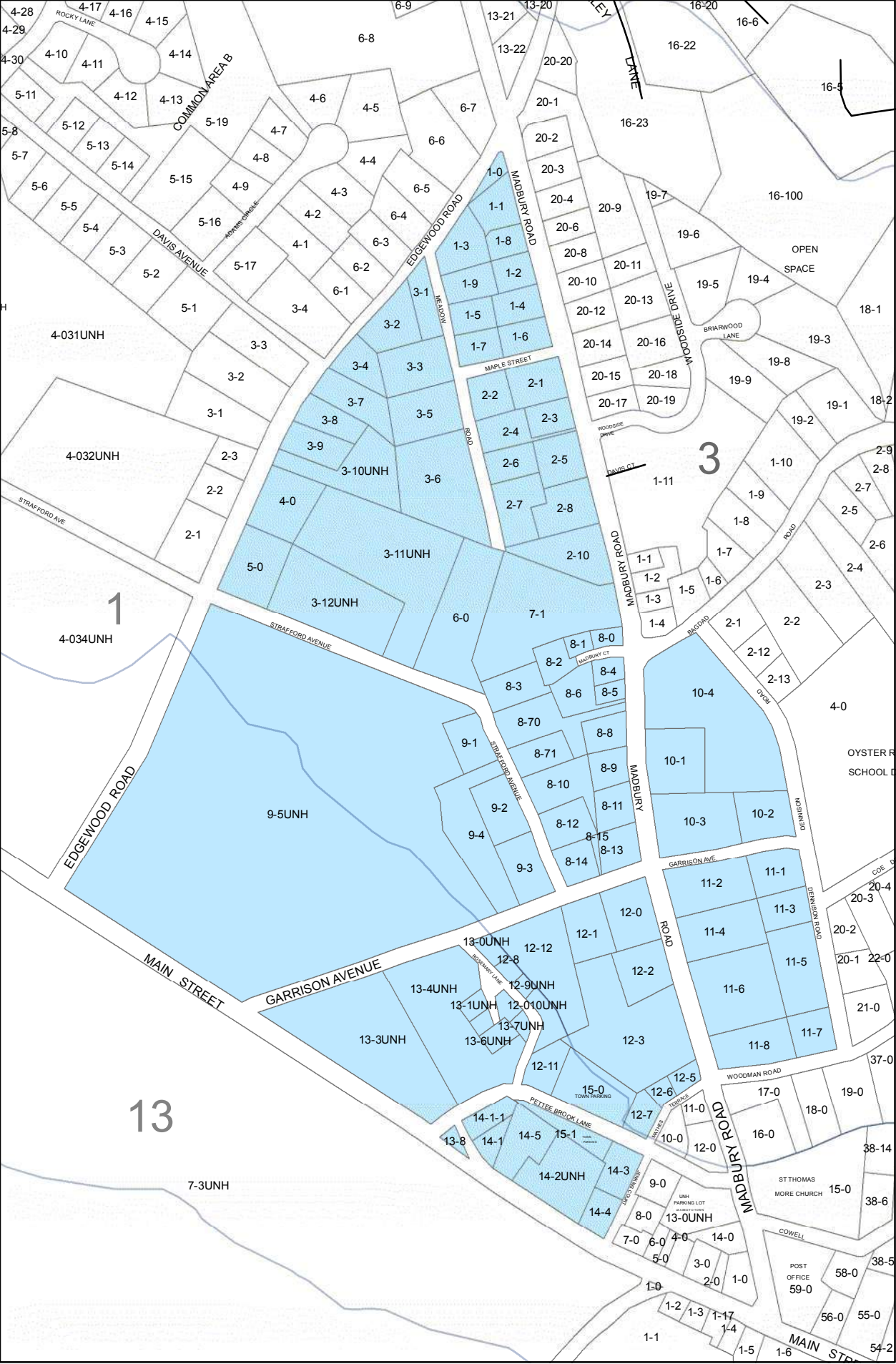
- Polygons
- State
- County
- City/Town

Map Scale
 1: 7,847
 © NH GRANIT, www.granit.unh.edu
 Map Generated: 3/1/2021



Notes





This map was updated by
 Strafford Regional Planning
 and the Town of Durham
 January 2019.

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

Legend

- Adjacent Map Sheets
- Current Map Sheet

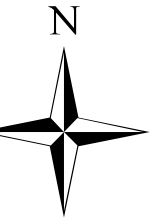
PROPERTY MAP
DURHAM
 NEW HAMPSHIRE



1 inch = 435 feet

Map 2

Map 4



PROPERTY MAP DURHAM NEW HAMPSHIRE

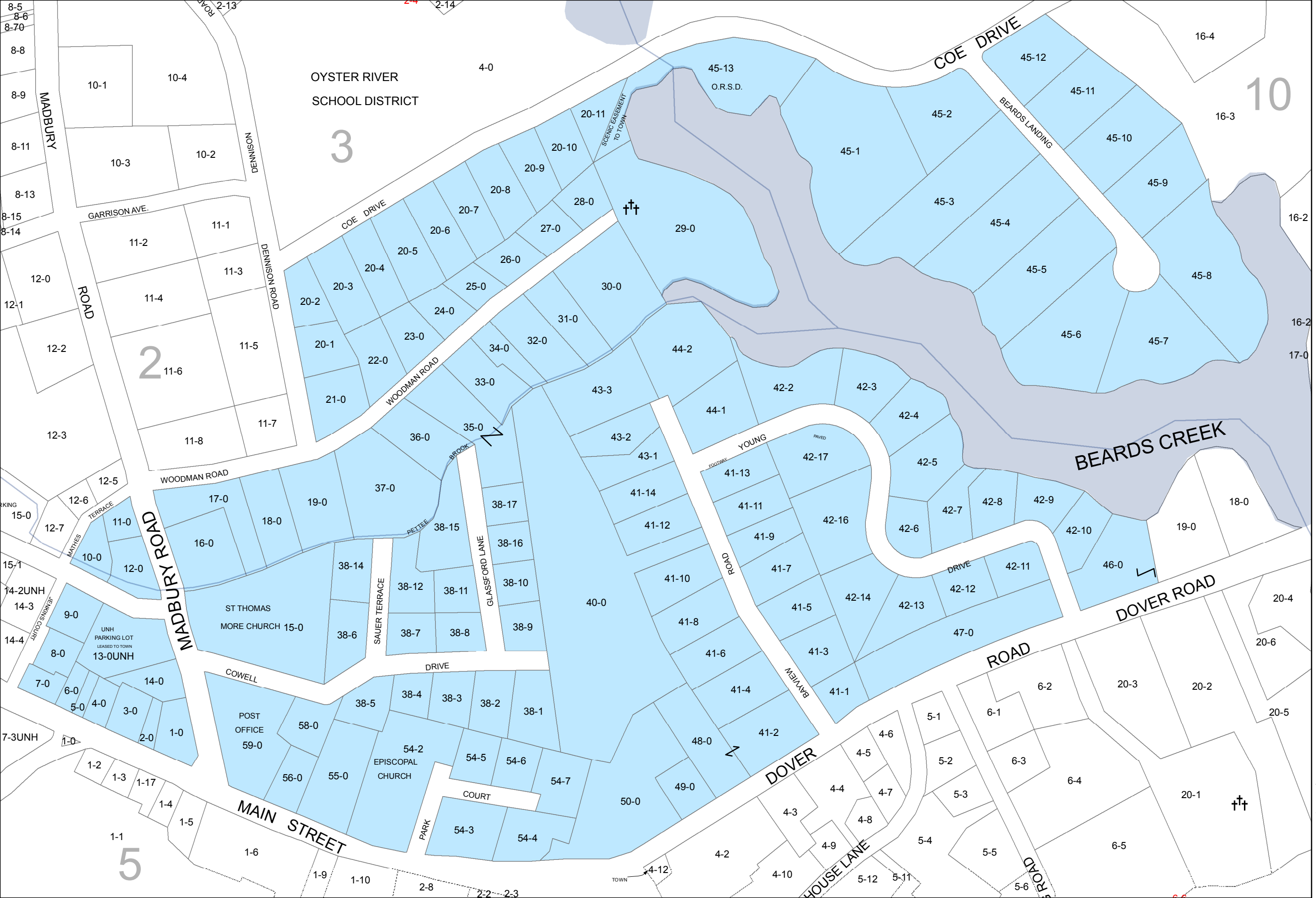
Legend

- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

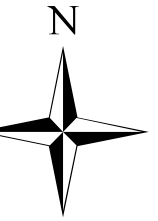
1 inch = 230 feet

This map was updated by
Strafford Regional Planning
and the Town of Durham
February 2018.

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ASSESSMENT PURPOSES.
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OR CONVEYANCE.**



Map 5



PROPERTY MAP DURHAM NEW HAMPSHIRE

Legend

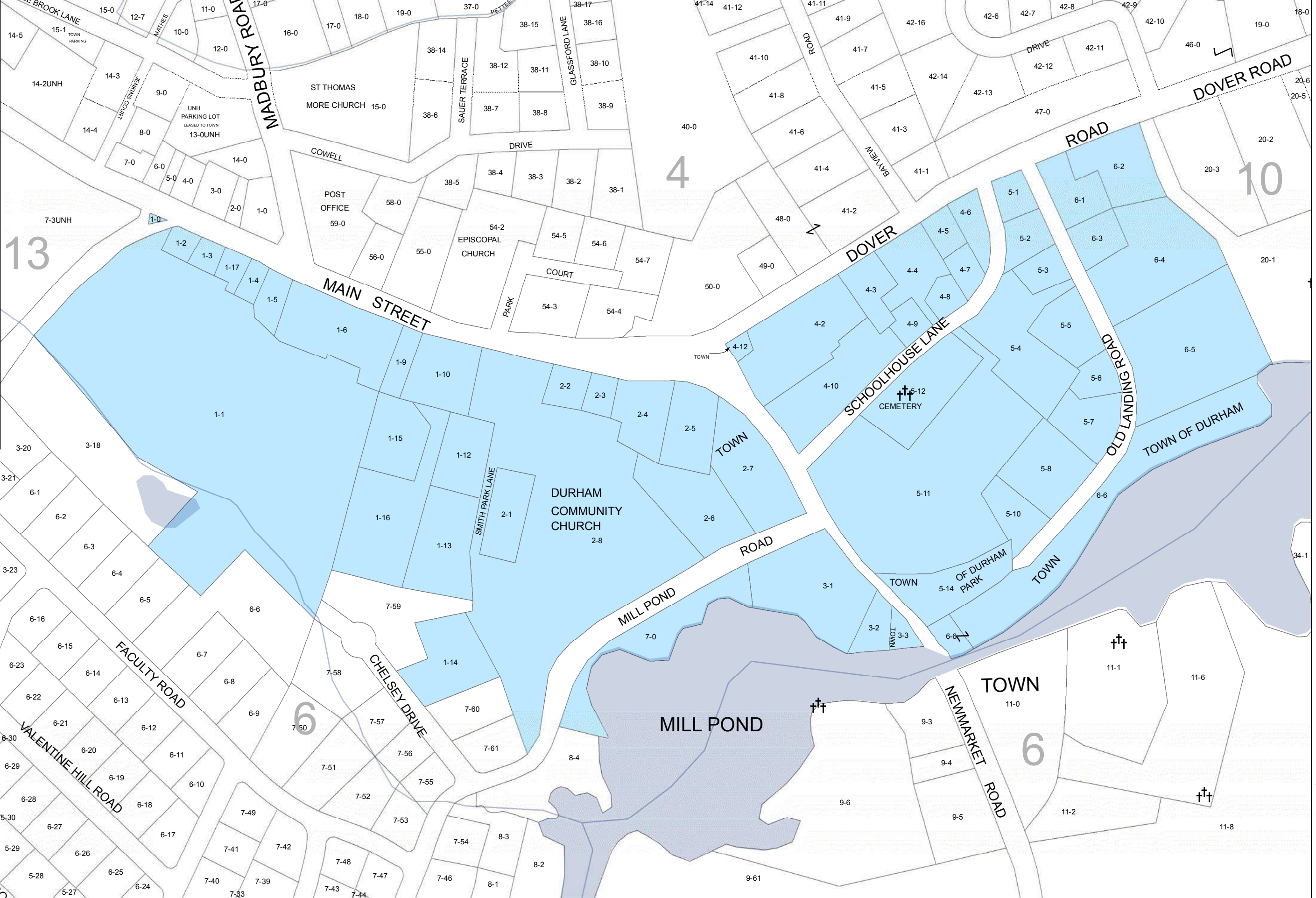
- Adjacent Map Sheets
- Current Map Sheet

†† Cemetery

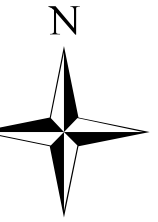
1 inch = 230 feet

This map was updated by
Strafford Regional Planning
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February 2018.

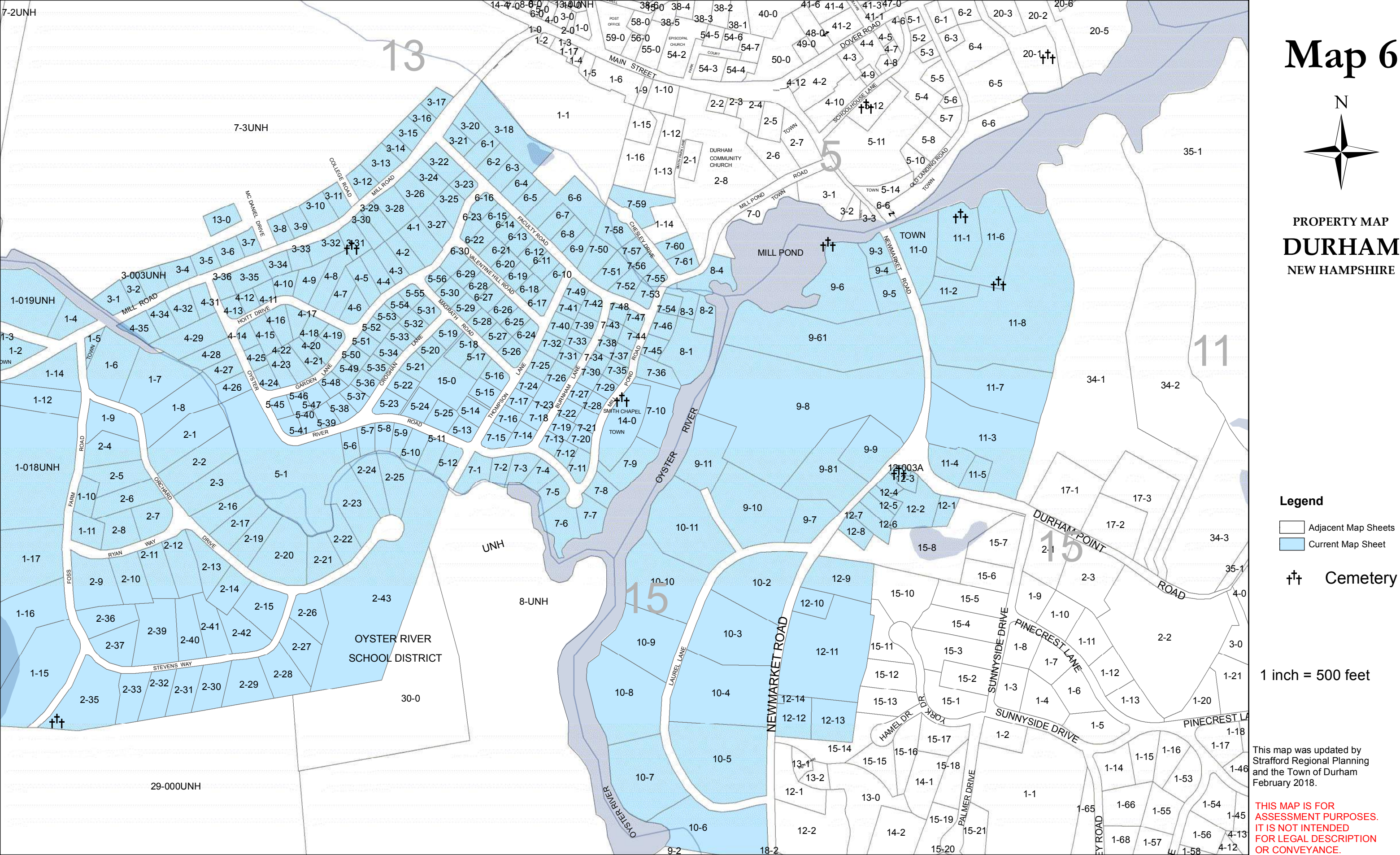
**THIS MAP IS FOR
ASSESSMENT PURPOSES.
IT IS NOT INTENDED
FOR LEGAL DESCRIPTION
OR CONVEYANCE.**



Map 6



PROPERTY MAP DURHAM NEW HAMPSHIRE



Legend

- Adjacent Map Sheets
- Current Map Sheet
- Cemetery

1 inch = 500 feet

This map was updated by
Strafford Regional Planning
and the Town of Durham
February 2018.

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OR CONVEYANCE.**

Tighe&Bond

APPENDIX H

CONSTRUCTION SEQUENCE OF MAJOR ACTIVITIES:

1. CUT AND CLEAR TREES.
2. CONSTRUCT TEMPORARY AND PERMANENT SEDIMENT, EROSION AND DETENTION CONTROL FACILITIES. MARK LIMITS OF APPROVED WETLAND DISTURBANCES AND INSTALL EROSION, SEDIMENT, AND DETENTION MEASURES PRIOR TO ANY EARTH MOVING OPERATIONS THAT WILL INFLUENCE STORMWATER RUNOFF SUCH AS:
 - NEW CONSTRUCTION
 - DEVELOPMENT OF BORROW PIT AREAS
 - DISPOSAL OF SEDIMENT SPOIL, STUMP AND OTHER SOLID WASTE
 - FLOOD PLAIN EXCAVATION WORK
 - STREAM CHANNEL MODIFICATIONS
 - CONTROL OF DUST
 - CONSTRUCTION OF ACCESS AND HAUL ROAD
 - NEARNESS OF CONSTRUCTION SITE TO RECEIVING WATERS
 - CONSTRUCTION DURING LATE WINTER AND EARLY SPRING
3. ALL FILL SHALL BE CLEAN AND SHALL NOT CONTAIN MATERIALS THAT COULD CONTAMINATE SURFACE OR GROUNDWATER.
4. BMPS REGARDING INVASIVE PLANT MATERIALS ON EQUIPMENT AND IN RESTORATION REVEGETATION WILL BE UTILIZED DURING CONSTRUCTION (BMPS FOR CONTROL OF INVASIVE SPECIES, NHDOT 2018).
5. ALL PERMANENT DITCHES, SWALES, DETENTION, RETENTION AND SEDIMENTATION BASINS TO BE STABILIZED USING THE VEGETATIVE AND NON-STRUCTURAL BMPS PRIOR TO DIRECTING RUNOFF TO THEM.
6. CLEAR AND DISPOSE OF DEBRIS.
7. CONSTRUCT TEMPORARY CULVERTS AND DIVERSION CHANNELS AS REQUIRED.
8. GRADE AND GRAVEL ROADWAYS AND PARKING AREAS - ALL ROADS AND PARKING AREA SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
9. BEGIN PERMANENT AND TEMPORARY SEEDING AND MULCHING. ALL CUT AND FILL SLOPES SHALL BE SEEDED AND MULCHED WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
10. DAILY, OR AS REQUIRED, CONSTRUCT TEMPORARY BERMS, DRAINS, DITCHES, PERIMETER EROSION CONTROL MEASURES, SEDIMENT TRAPS, ETC., MULCH AND SEED AS REQUIRED.
11. SEDIMENT TRAPS AND/OR BASINS SHALL BE USED AS NECESSARY TO CONTAIN RUNOFF UNTIL SOILS ARE STABILIZED.
12. FINISH PAVING ALL ROADWAYS AND PARKING LOTS.
13. INSPECT AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES.
14. COMPLETE PERMANENT SEEDING AND LANDSCAPING
15. WHERE EROSION CONTROL BLANKETS ARE UTILIZED, THEY SHALL BE BIODEGRADABLE AND SHALL NOT CONTAIN PLASTIC NETTING TO HELP AVOID WILDLIFE ENTANGLEMENT
16. REMOVE TRAPPED SEDIMENTS FROM COLLECTOR DEVICES AS APPROPRIATE AND THEN REMOVE TEMPORARY EROSION CONTROL MEASURES.

CONSTRUCTION SEQUENCE FOR STREAM CROSSING:

1. IF PRACTICAL, ALL STREAM CROSSING WORK SHALL OCCUR DURING LOW FLOW PERIODS OF THE BROOK.
2. INSTALL ALL EROSION AND SEDIMENT CONTROL BARRIERS AS FIRST ORDER OF WORK.
3. CONSTRUCT THE PROPOSED STREAM CHANNEL UTILIZING NATIVE STREAM BED MATERIALS. ANY ROCKS REMOVED FROM THE CHANNEL DURING CONSTRUCTION SHALL BE REPLACED WITHIN THE STREAM RESTORATION AREA.
4. CONSTRUCT ANY REQUIRED COFFERDAMS AND/OR DEWATERING PRACTICES REQUIRED FOR THE CONSTRUCTION OF THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION.
5. CONSTRUCT THE PRECAST CONCRETE CULVERT, HEADWALLS, WINGWALLS AND FOUNDATION AND REMOVE ANY COFFERDAMS AND/OR DEWATERING MEASURES.
6. CONSTRUCT THE FINAL GRADING ABOVE AND ADJACENT TO THE STREAM CROSSING.
7. WHEN THE AREA IS COMPLETELY STABILIZED, REMOVE THE EROSION AND SEDIMENT CONTROL

Tighe&Bond

APPENDIX I

From: Lamb, Amy <Amy.E.Lamb@dncr.nh.gov>
Sent: Wednesday, December 2, 2020 7:50 PM
To: Leonard Lord <LLord@TigheBond.com>
Cc: Joseph M. Persechino <JMPersechino@tigheBond.com>
Subject: RE: NHB review: NHB20-3257, UNH South Drive, Durham

Hi Lenny,

Thank you for sending this supplemental information; it is very helpful.

Based on the information provided, it is unlikely that greater fringed gentian (*Gentianopsis crinita*) occurs within the project area.

There is a slightly greater likelihood that crested sedge (*Carex cristatella*) could occur within the project area, as it has been documented in multiple locations in Durham, occurs in a variety of wetland habitats (swamps, marshes, wet meadows, wetlands in utility rights-of-way), and was documented to the south in another portion of the utility right-of way that passes through the project area. Where it occurs in the nearby utility corridor, it is associated with similar species to those visible in photos of the Waterworks Road wetland, including some invasive species.

However, the Waterworks Road wetland was surveyed twice for this species for the Seacoast Reliability Project, and was not found to occur here. Given the highly developed surrounding area, altered hydrology, and likely runoff impacts from surrounding development, it is likely that this area is no longer conducive to supporting this species, which prefers circumneutral wetlands.

Additionally, the College Brook crossing area contains minimal habitat for this species. As such, NHB will not request surveys for crested sedge within the proposed project area. NHB also does not expect impacts to the *herbaceous seepage marsh* or *hemlock-beech-oak-pine forest* based on the plans provided.

Thank you for the opportunity to review.

Best,
Amy

CONFIDENTIAL – NH Dept. of Environmental Services review

Memo



NH Natural Heritage Bureau
HB Datacheck Results Letter

To: Leonard Lord, Tighe & Bond
177 Corporate Dr
Portsmouth, NH 03042

From: Amy Lamb, NH Natural Heritage Bureau
Date: 11/6/2020 (valid for one year from this date)

Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB20-3257 Town: Durham
Description: Improvements to South Drive

Location: Tax Maps: 13-7-2

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

Comments: Please send NHB a site plan that details existing and proposed conditions, and wetland impact areas, including wetland types to be impacted. Please send photos of wetland impact areas. Crested sedge and greater fringed gentian have been documented in nearby wetlands (wet meadows, ditches, and scrub-shrub wetlands).

Natural Community

	State ¹	Federal	Notes
Hemlock - beech - oak - pine forest	--	--	Threats include logging, introduction of invasive species, and direct destruction due to development.
Herbaceous seepage marsh*	--	--	As this wetland is strongly influenced by groundwater seepage, it could be affected by landscape alterations which modify groundwater movement or increase stormwater flow into it.

Plant species

	State ¹	Federal	Notes
crested sedge (<i>Carex cristatella</i>)	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.
greater fringed-gentian (<i>Gentianopsis crinita</i>)*	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).

¹Codes: "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.

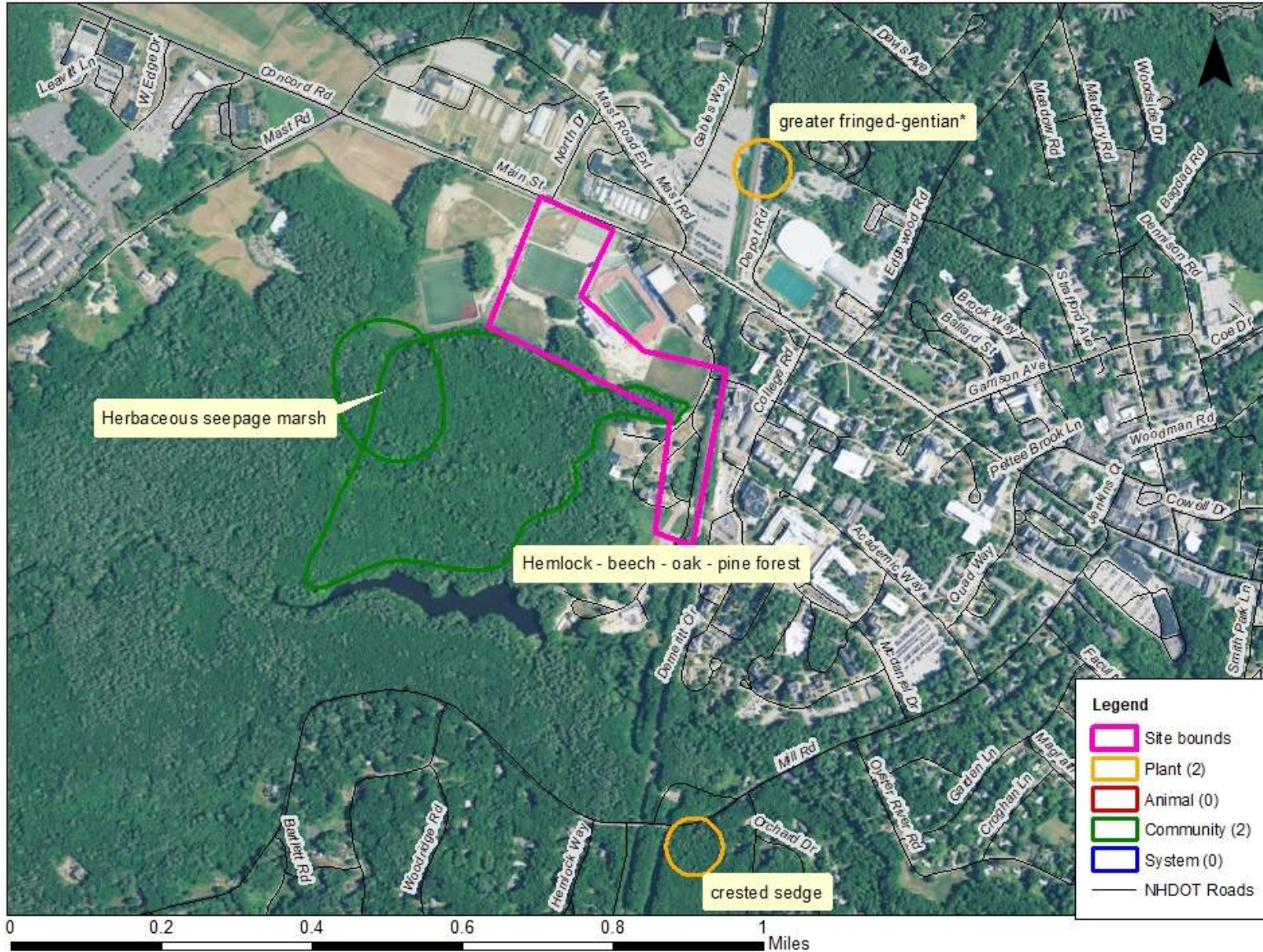
A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

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

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

CONFIDENTIAL – NH Dept. of Environmental Services review

NHB20-3257



New Hampshire Natural Heritage Bureau - Community Record

Hemlock - beech - oak - pine forest

Legal Status

Federal: Not listed
State: Not listed

Conservation Status

Global: Not ranked (need more information)
State: Demonstrably widespread, abundant, and secure

Description at this Location

Conservation Rank: Good quality, condition and landscape context ('B' on a scale of A-D).
Comments on Rank: --

Detailed Description: 2006: Community observed and photographed. Many large hemlocks and white pines. 1982: Has *Pinus strobus* (white pine) to 300 years old and 40 inches dbh. 1969: A diversified tract of old growth *Pinus strobus* (white pine) and *Tsuga canadensis* (hemlock) is intermixed with an abundance of young mixed hardwood species. Concentrations of big pines and hemlocks remain. Tree ring counts show that the older trees are close to 300 years of age while the hardwood trees are probably between 30-50 years of age. Species of deciduous trees are *Betula lenta* (black birch), *Betula alleghaniensis* (yellow birch), *Betula papyrifera* (paper birch), *Acer saccharum* (sugar maple), *Acer rubrum* (red maple), *Fagus grandifolia* (American beech), *Quercus rubra* (red oak), *Quercus alba* (white oak), *Quercus velutina* (black oak), *Tilia americana* (basswood), *Carya ovata* (shagbark hickory), *Ulmus americana* (American elm), *Fraxinus americana* (white ash), *Fraxinus nigra* (black ash), *Ostrya virginiana* (ironwood), and *Carpinus caroliniana* ssp. *virginiana* (musclewood). There are shrubs of many species and a variety of herbaceous plants.

General Area: 2006: Bordered to the north by athletic fields (on the other side of College Brook), to the east by buildings and parking lots, and to the south by the Oyster River. 1969: Extensive woodland area known as College Woods. Adjoining areas are covered with younger successional forest.

General Comments: 1982: 1938 hurricane brought down most of the large trees. Re-growth of hardwoods has occurred since then.

Management
Comments: --

Location

Survey Site Name: College Woods
Managed By: UNH - College Woods

County: Strafford
Town(s): Durham
Size: 56.6 acres

Elevation:

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

Directions: Durham. College Woods. The forestland due south of the intersection of Mast Road (Rte. 155A) and College Bk. From Pettee Hall, walk down Colovos Road and under the railroad trestle. Then take a left, walk along the road until you reach a fork in the road. Look off the road to the right and there is a path (behind the center field fence) this is the beginning of College Woods. 2006: Obtain a permit (or pay for the meters) and park at the UNH Visitors Parking Lot on Mast Rd Ext., north of Main St. Walk south and cross Main St. The entrance to College Woods is at a sign by a small parking area just south of College Brook, ca. 0.1 mile west of the RR tracks. This natural community begins soon after entering the woods on the wide walking path.

Dates documented

First reported: 1969
Last reported: 2006-05-24

New Hampshire Natural Heritage Bureau - Community Record

Herbaceous seepage marsh

Legal Status

Federal: Not listed
State: Not listed

Conservation Status

Global: Not ranked (need more information)
State: Rare or uncommon

Description at this Location

Conservation Rank: Good quality, condition and landscape context ('B' on a scale of A-D).
Comments on Rank: --

Detailed Description: 1996: A combination of common marsh species and species indicative of cold, active seepage water and weakly acidic to circumneutral conditions. Common marsh species that dominate the marsh include *Onoclea sensibilis* (sensitive fern; 80% cover), *Equisetum arvense* (field-horsetail; 25%), *Leersia oryzoides* (cutgrass; 5%), *Aster puniceus* (purple stemmed aster), *Thelypteris palustris* (marsh fern), and *Scirpus cyperinus* (wool-grass). Species indicative of seepage and/or circumneutral conditions include *Saxifraga pensylvanica* (swamp saxifrage; 3-5%), *Senecio schweinitzianus* (= *S. robbinsii*) (robbin's ragwort), *Chrysosplenium americanum* (golden saxifrage), *Philonotis fontana* (a moss of circumneutral swamps), and other so-called brown mosses (non-Sphagnum mosses of more or less enriched wetland soils). Active seepage maintains saturated and enriched conditions throughout the growing season (somewhat uncommon in New Hampshire).

General Area: 1996: Adjacent to a **hemlock-beech-oak-pine forest** (College Woods).

General Comments: --

Management: --

Comments:

Location

Survey Site Name: Oyster River/College Woods

Managed By: UNH - College Woods

County: Strafford

Town(s): Durham

Size: 14.1 acres

Elevation:

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

Directions: Route 4 to University of New Hampshire exit, ca. 0.5 miles toward campus.

Dates documented

First reported: 1996-09

Last reported: 1996-09

New Hampshire Natural Heritage Bureau - Plant Record

crested sedge (*Carex cristatella*)**Legal Status**

Federal: Not listed
 State: Listed Endangered

Conservation Status

Global: Demonstrably widespread, abundant, and secure
 State: Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
 Comments on Rank: --

Detailed Description: 2015: CC-1: 16 plants with 117 flowering stems. CC-2: 6 plants with 27 flowering stems. CC-3: 31 plants with 147 flowering stems. CC-4: 2 plants with 5 flowering stems. 1943: Specimen collected.

General Area: 2015: 2015: Plants are in power line right-of-way in moist or wet areas. Associated species include fringed sedge (*Carex crinita*), tall white-aster (*Doellingeria umbellata*), blunt broom sedge (*Carex tribuloides*), wrinkle-leaved goldenrod (*Solidago rugosa*), pointed broom sedge (*Carex scoparia*), meadowsweet (*Spiraea alba* var. *latifolia*). Invasives, heavy in spots, include glossy false buckthorn (*Frangula alnus*), Asian bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), and reed canary grass (*Phalaris arundinacea*). 1943: Wet pasture (swale).

General Comments: --
 Management: --
 Comments:

Location

Survey Site Name: Mill Road South
 Managed By: UNH - Foss Farm East

County: Strafford
 Town(s): Durham
 Size: 3.1 acres Elevation:

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

Directions: 2015: Park at the Doe Farm conservation area parking lot, located on the south side of Bennett Road, just east of the railroad crossing and approximately 1 mile west of Route 108. Cross Bennett Road and walk north in the powerline corridor for approximately 1,540 feet (0.3 miles) to reach the southernmost patch. There are four patches of plants, within an approximately 0.6 mile stretch of ROW corridor. Durham. West Foss Farm.

Dates documented

First reported: 1943 Last reported: 2015-07-24

New Hampshire Natural Heritage Bureau - Plant Record

greater fringed-gentian (*Gentianopsis crinita*)**Legal Status**

Federal: Not listed
 State: Listed Threatened

Conservation Status

Global: Demonstrably widespread, abundant, and secure
 State: Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
 Comments on Rank: --

Detailed Description: 2006, 2002, 2001, 2000: Search for, not found. 1978: Specimen collected.

General Area: 1978: Ditch.

General Comments: 2000: Found 3 plants of *Gentiana clausa* (closed gentian) along railroad tracks within a pile of railroad ties ca. 0.25 miles from dairy bar.

Management: --
 Comments:

Location

Survey Site Name: Railroad Track Ditch
 Managed By: UNH - Horticulture Farm

County: Strafford
 Town(s): Durham
 Size: 2.8 acres

Elevation:

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

Directions: 1978: 0.25 mi from University of New Hampshire Dairy Bar toward Madbury town line, in ditch beside railroad tracks.

Dates documented

First reported: 1978-10-13 Last reported: 1978-10-13

Tighe&Bond

APPENDIX J



**WETLANDS PERMIT APPLICATION
STREAM CROSSING WORKSHEET**
Water Division/Land Resources Management
Wetlands Bureau



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

This worksheet can be used to accompany Wetlands Permit Applications when proposing stream crossings.

SECTION 1 - TIER CLASSIFICATIONS

Determine the contributing watershed size at [USGS StreamStats](#).

Note: Plans for tier 2 and 3 crossings shall be designed and stamped by a professional engineer who is licensed under RSA 310-A to practice in New Hampshire.

Size of contributing watershed at the crossing location: **384** acres See Streamworks/Ballestero Report

Tier 1: A tier 1 stream crossing is a crossing located on a watercourse where the contributing watershed size is less than or equal to 200 acres.

Tier 2: A tier 2 stream crossing is a crossing located on a watercourse where the contributing watershed size is greater than 200 acres and less than 640 acres.

Tier 3: A tier 3 stream crossing is a crossing that meets **any** of the following criteria:

On a watercourse where the contributing watershed is more than 640 acres.

Within a [designated river corridor](#) unless:

a. The crossing would be a tier 1 stream based on contributing watershed size, or

b. The structure does not create a direct surface water connection to the designated river as depicted on the national hydrography dataset as found on GRANIT.

Within a [100-year floodplain](#) (see Section 2 below).

In a jurisdictional area having any protected species or habitat ([NHB DataCheck](#)).

In a [prime wetland or within a duly-established 100-foot buffer](#), unless a waiver has been granted pursuant to RSA 482-A:11,IV(b) and Env-Wt 706.

Tier 4: A tier 4 stream crossing is a crossing located on a tidal watercourse.

SECTION 2 - 100-YEAR FLOODPLAIN

Use the [FEMA Map Service Center](#) to determine if the crossing is located within a 100-year floodplain. Please answer the questions below:

No: The proposed stream crossing *is not* within the FEMA 100-year floodplain.

Yes: The proposed project *is* within the FEMA 100-year floodplain. Zone = **AE**
Elevation of the 100-year floodplain at the inlet: **54.91** feet (FEMA El. or Modeled El.)

SECTION 3 - CALCULATING PEAK DISCHARGE

Existing 100-year peak discharge (Q) calculated in cubic feet per second (CFS): **130** CFS

Calculation method: **FEMA FIS**

Estimated bankfull discharge at the crossing location: **24.7** CFS

Calculation method: **Streamworks Report**

irm@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

➔ **Note: If tier 1, then skip to Section 10** ➔

SECTION 4 - PREDICTED CHANNEL GEOMETRY BASED ON REGIONAL HYDRAULIC CURVES

For tier 2, tier 3 and tier 4 crossings only.

Bankfull Width: 11.0 feet Mean Bankfull Depth: 1.0 feet

Bankfull Cross Sectional Area: 6.5 square feet (SF)

SECTION 5 - CROSS SECTIONAL CHANNEL GEOMETRY: MEASUREMENTS OF THE EXISTING STREAM WITHIN A REFERENCE REACH

For tier 2, tier 3 and tier 4 crossings only.

Describe the reference reach location: **See Streamworks, LLC report in Appendix

Reference reach watershed size: **See Streamworks acres

Parameter	Cross Section 1 Describe bed form ** (e.g. pool, riffle, glide)	Cross Section 2 Describe bed form ** (e.g. pool, riffle, glide)	Cross Section 3 Describe bed form ** (e.g. pool, riffle, glide)	Range
Bankfull Width	** feet	** feet	** feet	** feet
Bankfull Cross Sectional Area	** SF	** SF	** SF	** SF
Mean Bankfull Depth	** feet	** feet	** feet	** feet
Width to Depth Ratio	**	**	**	**
Max Bankfull Depth	** feet	** feet	** feet	** feet
Flood Prone Width	** feet	** feet	** feet	** feet
Entrenchment Ratio	**	**	**	**

Use **Figure 1** below to determine the measurements of the Reference Reach Attributes

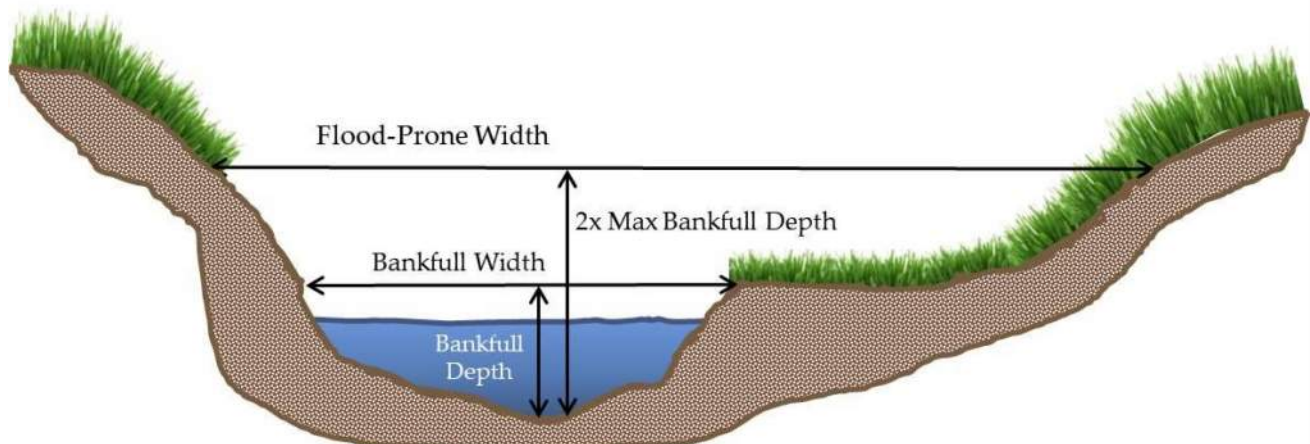


Figure 1: Determining the Reference Reach Attributes.

SECTION 6 - LONGITUDINAL PARAMETERS OF THE REFERENCE REACH AND CROSSING LOCATION

For tier 2, tier 3 and tier 4 crossings only.

Average Channel Slope of the Reference Reach: **See Streamworks

Average Channel Slope at the Crossing Location: **See Streamworks

SECTION 7 - PLAN VIEW GEOMETRY

Note: Sinuosity is measured a distance of at least 20 times bankfull width, or 2 meander belt widths.

For tier 2, tier 3 and tier 4 crossings only.

Sinuosity of the Reference Reach: **See Streamworks

Sinuosity of the Crossing Location: **See Streamworks

SECTION 8 - SUBSTRATE CLASSIFICATION BASED ON FIELD OBSERVATIONS	
<i>For tier 2, tier 3 and tier 4 crossings only.</i>	
% of reach that is bedrock:	**See Streamworks %
% of reach that is boulder:	**See Streamworks %
% of reach that is cobble:	**See Streamworks %
% of reach that is gravel:	**See Streamworks %
% of reach that is sand:	**See Streamworks %
% of reach that is silt:	**See Streamworks %
SECTION 9 - STREAM TYPE OF REFERENCE REACH	
<i>For tier 2, tier 3 and tier 4 crossings only.</i>	
Stream Type of Reference Reach:	**See Streamworks

Refer to Rosgen Classification Chart (Figure 2) below:

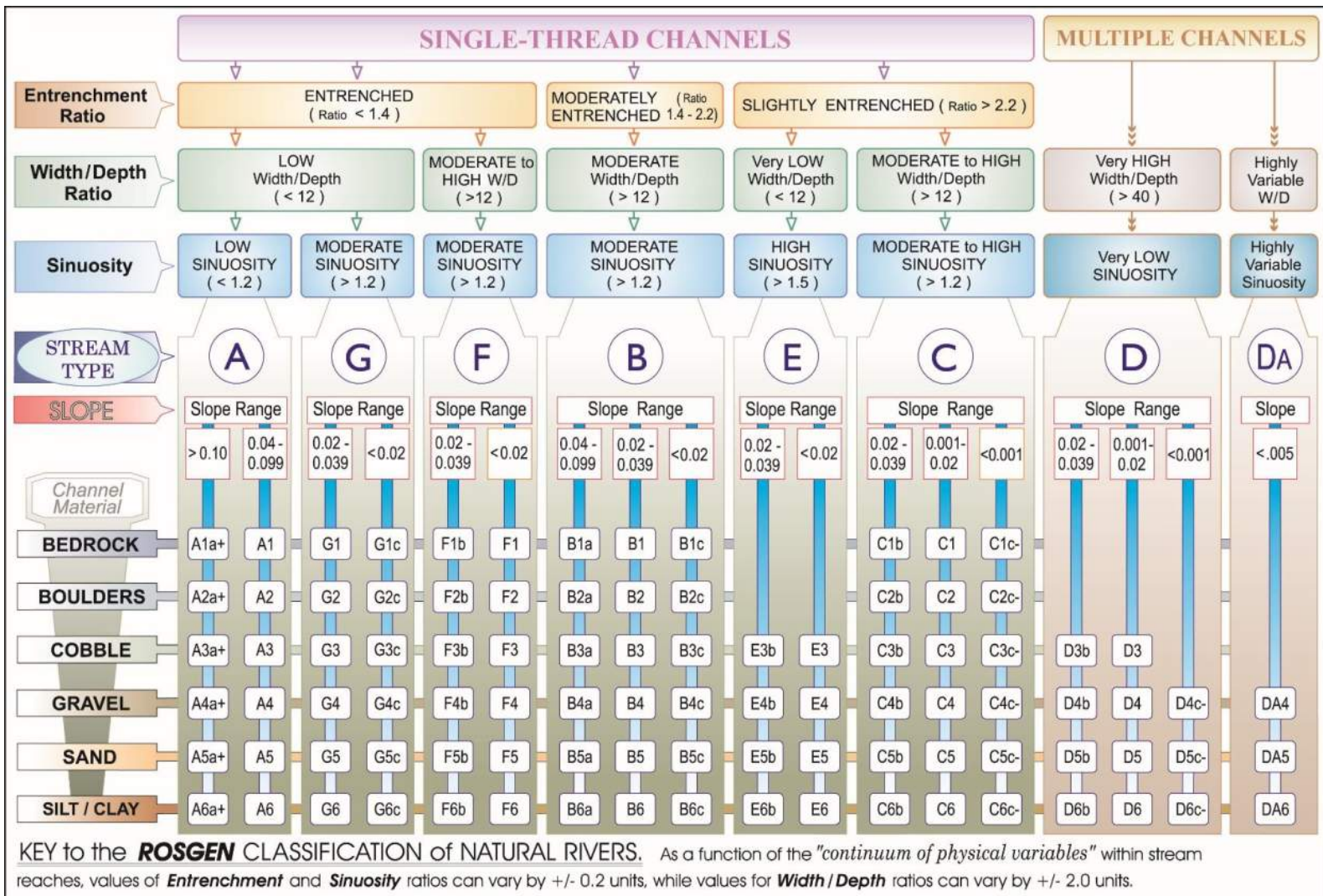


Figure 2: Reference from Applied River Morphology, Rosgen, 1996.

lrn@des.nh.gov or (603) 271-2147

NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095

www.des.nh.gov

SECTION 10 - CROSSING STRUCTURE METRICS

Existing Conditions	Existing Structure Type: <input type="checkbox"/> Bridge span <input type="checkbox"/> Pipe arch <input type="checkbox"/> Open-bottom culvert <input checked="" type="checkbox"/> Closed-bottom culvert <input type="checkbox"/> Closed-bottom culvert with stream simulation <input type="checkbox"/> Other: <input type="text"/>				
	Existing Crossing Span: <i>(perpendicular to flow)</i>	N/A feet	Culvert Diameter: 4.33 feet Inlet Elevation: El. 48.2 feet		
	Existing Crossing Length: <i>(parallel to flow)</i>	24.6 feet	Outlet Elevation: El. 48.4 feet Culvert Slope: -0.008		
Proposed Conditions	Proposed Structure Type:	Tier 1	Tier 2	Tier 3	Alternative Design
	Bridge Span	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Pipe Arch	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Closed-bottom Culvert	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
	Open-bottom Culvert	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Closed-bottom Culvert with stream simulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Proposed Structure Span: <i>(perpendicular to flow)</i>	18.0 feet	Culvert Diameter: 5'-10" rise feet Inlet Elevation: El. 48.10 feet		
Proposed Structure Length: <i>(parallel to flow)</i>	86.5 feet	Outlet Elevation: El. 47.55 feet Culvert Slope: 0.006			
Proposed Entrenchment Ratio:* 1.50 <i>For Tier 2, Tier 3 and Tier 4 Crossings Only. To accommodate the entrenchment ratio, floodplain drainage structures may be utilized.</i>					

* Note: Proposed Entrenchment Ratio must meet the minimum ratio for each stream type listed in **Figure 3**, otherwise the applicant must address the Alternative Design criteria listed in Env-Wt 904.10.

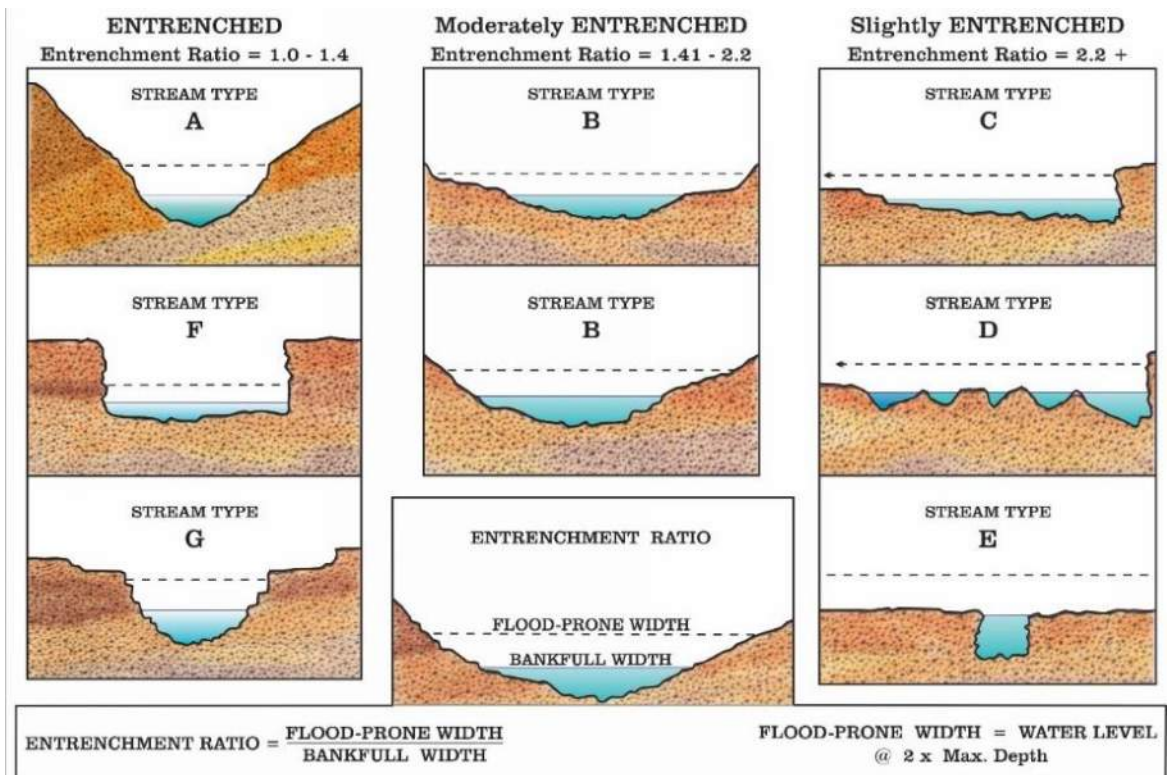


Figure 3: Reference from Applied River Morphology, Rosgen, 1996.

SECTION 11 - CROSSING STRUCTURE HYDRAULICS		
	Existing	Proposed
100 year flood stage elevation at inlet:	54.91	54.94
Flow velocity at outlet in feet per second (FPS):	0.63	0.88
Calculated 100 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		130
Calculated 50 year peak discharge (Q) for the <i>proposed</i> structure in CFS:		109
SECTION 12 - CROSSING STRUCTURE OPENNESS RATIO		
<i>For tier 2, tier 3 and tier 4 crossings only.</i>		
Crossing Structure Openness Ratio* = 0.29 * Openness box culvert = (height x width)/length Openness round culvert = (3.14 x radius ²)/length		
SECTION 13 - GENERAL DESIGN CONSIDERATIONS		
Env-Wt 904.01 requires all stream crossings to be designed and constructed according to the following requirements. Check each box if the project meets these general design considerations.		
All stream crossings shall be designed and constructed so as to:		
<input checked="" type="checkbox"/> Not be a barrier to sediment transport.		
<input checked="" type="checkbox"/> Prevent the restriction of high flows and maintain existing low flows.		
<input checked="" type="checkbox"/> Not obstruct or otherwise substantially disrupt the movement of aquatic life indigenous to the waterbody beyond the actual duration of construction.		
<input checked="" type="checkbox"/> Not cause an increase in the frequency of flooding or overtopping of banks.		
<input checked="" type="checkbox"/> Maintain or enhance geomorphic compatibility by:		
a. Minimizing the potential for inlet obstruction by sediment, wood, or debris, and		
b. Preserving the natural alignment of the stream channel.		
<input checked="" type="checkbox"/> Preserve watercourse connectivity where it currently exists.		
<input checked="" type="checkbox"/> Restore watercourse connectivity where:		
a. Connectivity previously was disrupted as a result of human activity(ies), and		
b. Restoration of connectivity will benefit aquatic life upstream or downstream of the crossing, or both.		
<input checked="" type="checkbox"/> Not cause erosion, aggradation, or scouring upstream or downstream of the crossing.		
<input checked="" type="checkbox"/> Not cause water quality degradation.		
SECTION 14 - TIER-SPECIFIC DESIGN CRITERIA		
Stream crossings must be designed in accordance with the tier specific design criteria listed in Part Env-Wt 904.		
<input checked="" type="checkbox"/> The proposed project meets the tier specific design criteria listed in Part Env-Wt 904 and each requirement has been addressed in the plans and as part of the wetland application.		
SECTION 15 - ALTERNATIVE DESIGN		
NOTE: If the proposed crossing does not meet all of the general design considerations, the tier specific design criteria, or the minimum entrenchment ratio for each given stream type listed in Figure 3 , then an alternative design plan and associated requirements must be addressed pursuant to Env-Wt 904.10.		
<input type="checkbox"/> I have submitted an alternative design and addressed each requirement listed in Env-Wt 904.10.		

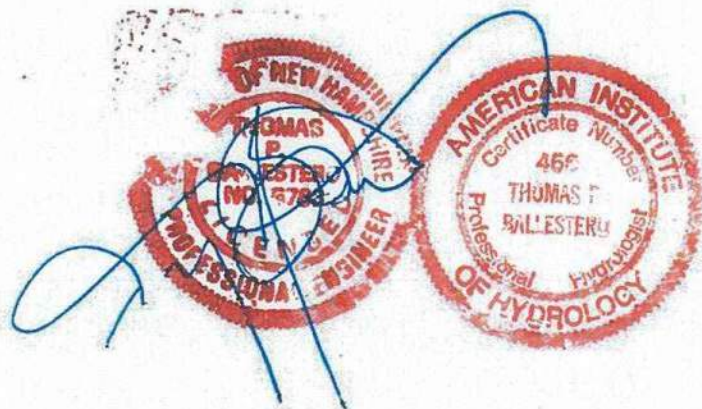
COLLEGE BROOK FLOODPLAIN ANALYSIS

COLLEGE BROOK BETWEEN LOWER FIELD AND THE RAILROAD TRACKS IN DURHAM, NH

TOM BALLESTERO

JOEL BALLESTERO

27 NOVEMBER 2013



Site Description

The site under study is a section of College Brook that is approximately 1800 feet in length and is sandwiched between the athletic fields near the UNH field house and the College Woods natural area, also property of the school, in Durham, NH. The stream starts where a 30" culvert conveys the stream from one side of an artificial turf athletic field to the other. On the downstream side of this field, there is also another 15" culvert that drains into the stream, as well as a small drainage ditch that drains the fields immediately adjacent. The stream leaves the project location via a culvert under the railroad that is 4 ft wide and 4 ft tall, with an extra foot of height in the form of an arched roof. Within this study reach there is only one stream crossing and that is the 52" culvert under the existing road that is to be replaced with a culvert under the new proposed road. This existing culvert is located about 100 ft upstream of the railroad culvert and is going to be replaced with a more geomorphically-designed natural-bottom crossing. The proposed road is going to be constructed in the floodplain to river left, along the existing fields, while the College Brook natural area to river right will remain undisturbed.

Watershed Delineation

The watershed was initially delineated using the USGS' software package StreamStats for New Hampshire. Since the program uses 10 meter contours taken from USGS topos for watershed delineation and the watershed is relatively small, the watershed delineation was checked to ensure accuracy. This check was performed by obtaining offline LIDAR data which was used to create a topographic surface at close to 0.3 meter resolution. The contours of this surface were used to better delineate the watershed. Any locations that were still suspect were checked in the field, and all final edits were made to the watershed boundary. The watershed as it was delineated by StreamStats was found to be much larger than the actual watershed due to infrastructure (culverts) diverting a large section of the northern part of the watershed. The new delineation of the watershed was found to be about 0.6 square miles at the downstream end of the project. This new watershed boundary was then input into StreamStats to generate the expected flood flows.

Flood Insurance Study

FEMA previously completed a study on College Brook and published flood stages for locations downstream of the project, as found on FEMA map numbers 33017C0314D and 33017C0318D. The only controlling factor from the FIS that relates to the present project is the published 100-year flow of 130 cfs at the culvert out of the project at the railroad tracks. This value is very similar to what was found with StreamStats, and is the flow used in the hydraulic models (HEC-RAS) at that location.

Flood Flows

Expected flood flows were determined using StreamStats. It was assumed that using a small watershed and the program's regression equations would not give as accurate of results as a full watershed routing model that includes hydrograph routing, however the StreamStats results were determined to be conservative. The field-delineated watershed area was inserted into StreamStats, and the resulting 2-, 5-, 10-, 25-, 50-, 100-, and 500-yr flood flows were estimated by the program. There were four locations along the section of stream under study that were determined to have the large tributary contributions to flows; XS1, XS2, XS5, and XS8. The flood flows at the previously mentioned return periods were determined at each of these locations, and these flows were then used as input to the Steady Flow

section of the HEC-RAS models, except for the flow of 130 cfs at the outlet for the 100-yr storm, which was taken directly from the FEMA Flood Insurance Study. At the location of the culvert replacement, the bankfull discharge was estimated to be 24.7 cfs, as given from StreamStats. This was used as the design flow for the geomorphically-sized channel for the proposed structure.

Manning's Roughness Values

The Manning's n values were determined for each stream section in the field, and horizontal variations were noted and input into the HEC-RAS model. The values were determined using Chow's method for both the channel and the floodplain. Values within the channel banks were considered to be even across the section, but the values varied horizontally across certain cross sections in the floodplain. An example of this would be where the mowed and maintained fields lie adjacent to the floodplain of the channel in the middle part of the length of stream.

Cross Sections

A total of 9 cross sections were taken along the length of the stream; 6 upstream of the culvert to be replaced and 3 downstream. The cross sections were surveyed to 5' above the thalweg of each section. Where necessary, the cross sections were augmented on left by the surveyed surface and on the right by a surface created from LIDAR data. Cross section 1 starts at the upstream beginning of the project and cross section 9 ends at the upstream face of the railroad outlet culvert. Cross sections 6 and 7 are at the upstream and downstream faces of the existing culvert, respectively, and cross sections 5.5 and 7 are at the faces of the proposed culvert. Cross section 5.5 was not actually surveyed in the field, but was a cross section that was created to be closer to the proposed culvert location upstream, which helps with the HEC-RAS analysis. The cross section is 50 feet downstream of cross section 5. Cross section 5 was copied, and the elevations were lowered slightly to correspond to the average slope, and this was used as the new cross section 5.5 at this location.

Rating Curve

A hydraulic rating curve was developed for the existing railroad culvert. This rating curve was used as the downstream boundary condition in the HEC-RAS model for this study. The railroad culvert is very long and flat, has various cross sectional changes along its length, has a surveyed slope of 0.16%, and the expected flow of 130 cfs during the 100-year storm is not calculated to pass until the culvert is submerged. Therefore a combination of pipe flow and orifice flow were used to develop the final rating curve; pipe flow calculations being used up until the culvert was full, then orifice flow calculations used with the pipe submerged.

Bank Erosion Hazard Index

In accordance with WARSSS procedures, bank stability was analyzed for the entire length of the stream under study. BEHI ratings were calculated from the field-collected data, and each similar section of stream was rated. Most sections were rated as Moderate, with a couple of the sections being rated as High erosion potential.

Pebble Counts

Pebble counts were performed just upstream and downstream of the existing culvert. The particle size distributions vary slightly, with the downstream having smaller and larger diameter sediment than the upstream, and the upstream being slightly more homogenous. There was not a large difference between the median particle sizes, the upstream having a D_{50} of 5 mm, and the downstream 8 mm. Overall, both locations were sands and gravels, with a few silts/clays mixed in.

Reference Reaches

Reference reaches were observed to aid in the design of a desirable proposed channel. In all there were two empirical references and six stream reaches. Of the six stream reaches, three were likely good indicators, while three were likely more suspect. All the reference reaches varied in location, but had similar watershed sizes and properties. The three best reference reaches were Pettee Brook in Durham, Beards Creek in Madbury, and Thompson Brook in Greenland. These reaches are likely less impaired than the other ones, and have more desirable or natural metrics than the others. These three were factored much more heavily in the final design values for the proposed geomorphically-sized channel.

Proposed Channel Design

The proposed stream design was determined using Rosgen natural channel design methods. Reference reaches were analyzed and design metrics were calculated. The proposed stream section is to be a B3c type stream, meaning that it has the dimensions of a type B sand-bed stream with the slope of a type C channel. The proposed section was determined to be 1.0 feet deep and 11 feet wide at bankfull. The entrenchment ratio from the reference reaches was calculated to be slightly above 1.5, which was the value used for the design. This resulted in a floodprone width of 16.5 feet at a floodprone depth of 2.0 feet. The average slope of the stream through this section was found to be about 0.5%, and is designed to keep that slope. Using these metrics, it was calculated that the stable particle size during the bankfull flow would be about 24 mm (0.93 inches), and at the floodprone depth, it would be about 49 mm (1.92 inches).

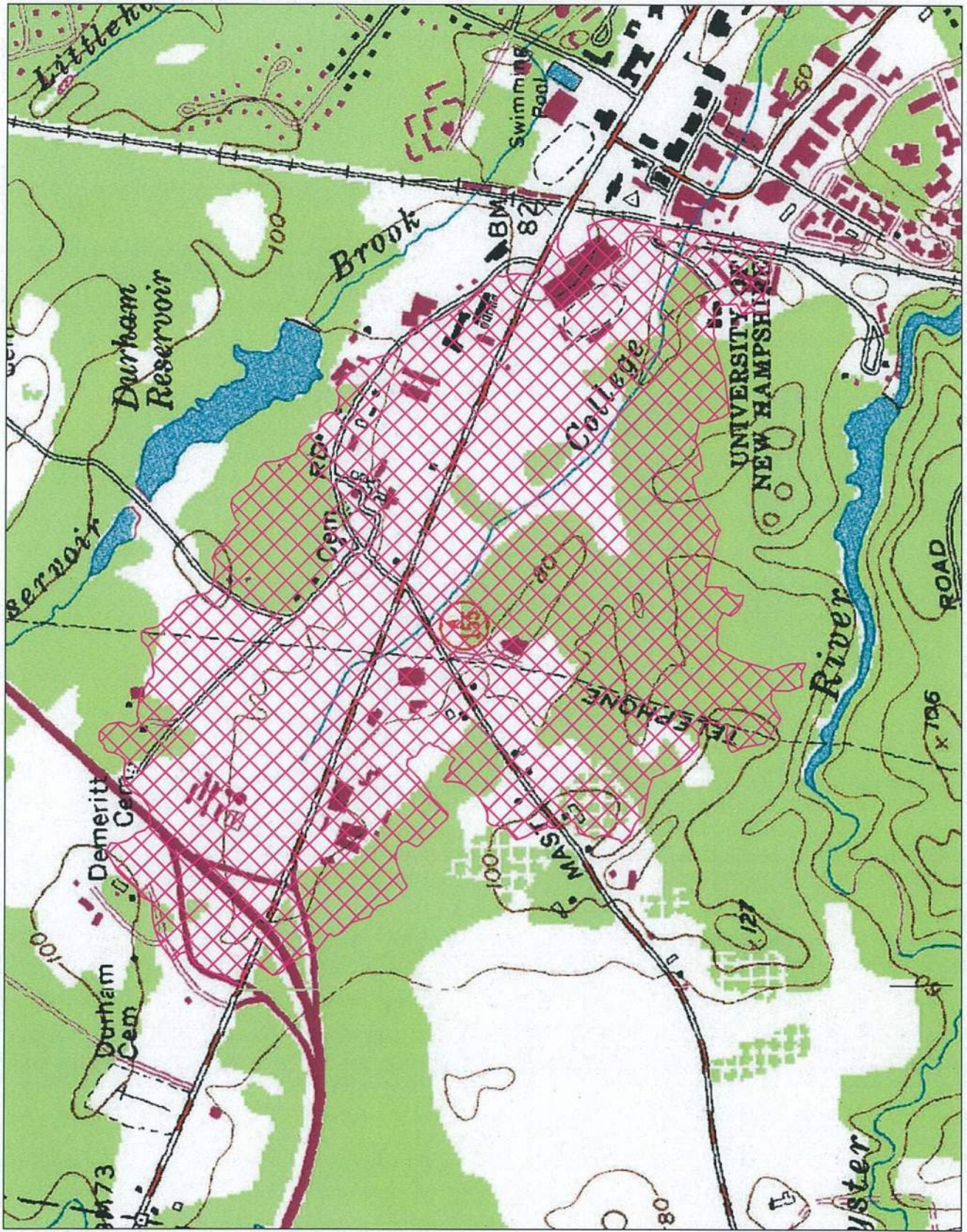
Proposed Stream Crossing

The proposed crossing was designed to span at least the floodprone width of 16.5 feet. The most common manufactured span to accommodate this is 18 feet, with a rise of 5 feet. This span is expected to have a crown that sits about 6.5 feet above the thalweg of the stream. This allows the culvert about 1.7 feet of cover above it for the road and sub-grade to be constructed, as the proposed grading brings the road elevation up about 2 feet to get it out of the 100-yr flood elevations. The proposed inlet elevation of the stream at the culvert is 48.15 feet and the proposed outlet elevation is 47.60 feet. The culvert length will be 110 feet, sitting just between cross-sections 5.5 and 7.

HEC-RAS Models

With all the collected, calculated, and designed data, HEC-RAS models were run for existing and proposed conditions. The existing model shows that during the 100-yr storm, the two culverts at the end of the project back up water in the stream, and that water flows over the existing road. The proposed stream crossing opens up the channel below the road elevation quite a bit, which passes flows better and more naturally during the lower, more frequent floods. However, during the large flow events, the

flood stages are raised very slightly compared to the FIS estimates. This is due to the road elevation being increased from the existing to the proposed. The railroad culvert out of the project simply cannot pass the large flows, thereby backing up water and reducing the capacity of the proposed crossing. With the reduced capacity of the proposed culvert, the water backs up where it formerly would flow over the road. With the proposed rise in the road elevation, the flood stage is raised, though only slightly, to 0.03 feet (one-third of an inch) higher at the upstream end of the proposed culvert (cross section 5.5). The flood stage is also raised 0.03 feet at cross sections 5 and 4. At cross section 3 the stage is only raised 0.02 feet, and at sections 2 and 1, it is only raised 0.01 feet.. The effects of this change in flood elevation on the floodplain lines from cross section 4 on upstream are almost undetectable. From cross section 4 and downstream, they differ much more, but this is all due to the proposed final floodplain grading. The entirety of the project on both sides of the stream, plus all upstream and downstream property, is on land owned by the University of New Hampshire. Therefore, the change in 100-year flood elevation occurs only on their property, affecting no abutters, and having no adverse effects on properties upstream or downstream of the project.

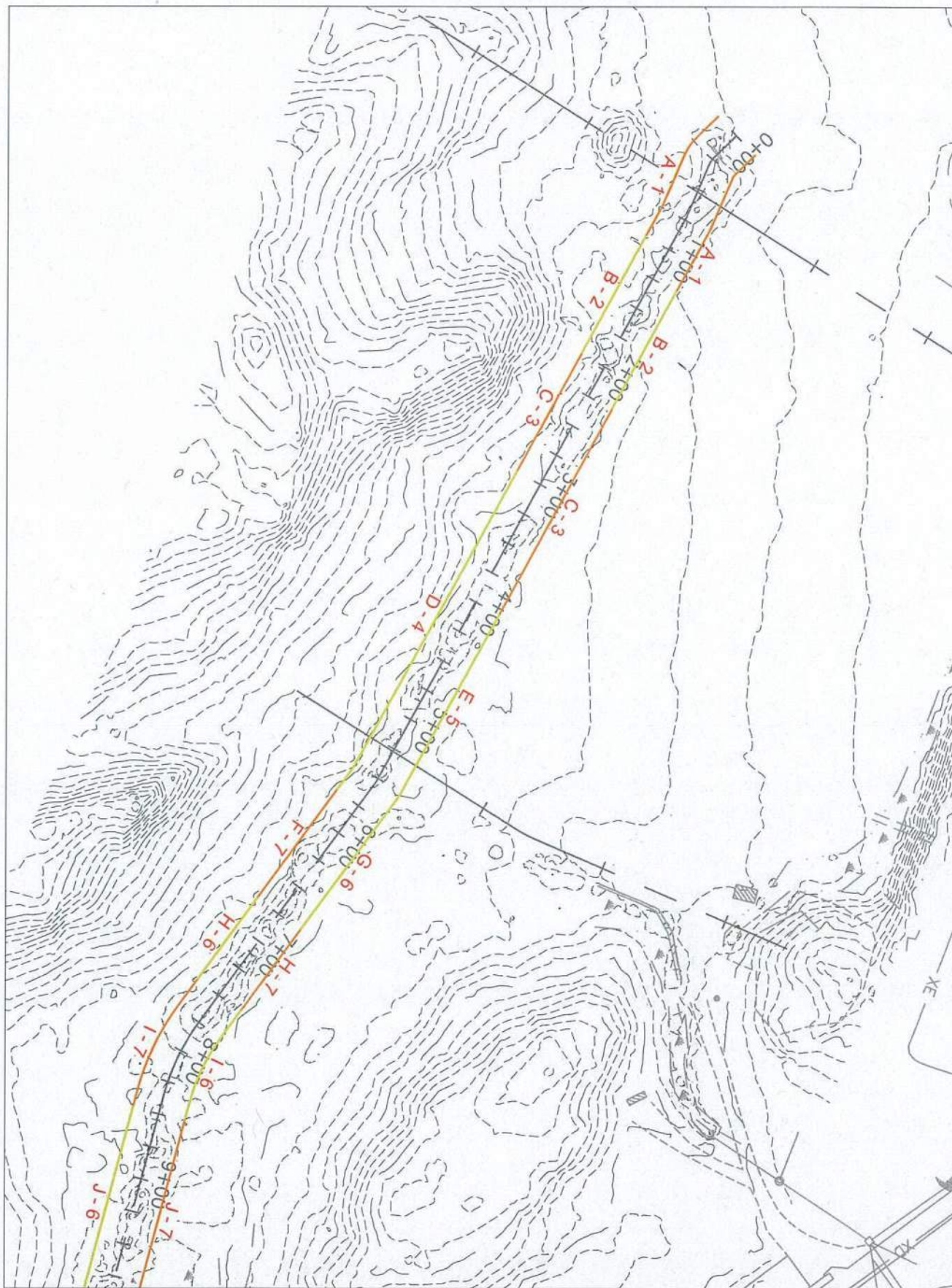


Flood Flows from StreamStats for HEC-RAS					
XSEC	2-yr	10-yr	50-yr	100-yr	500-yr
1	16.9	42.6	76.8	96.8	151
2	20.7	51.6	92.4	116	181
5	24.7	61.5	109	137	212
8	26.2	65.2	116	145	223

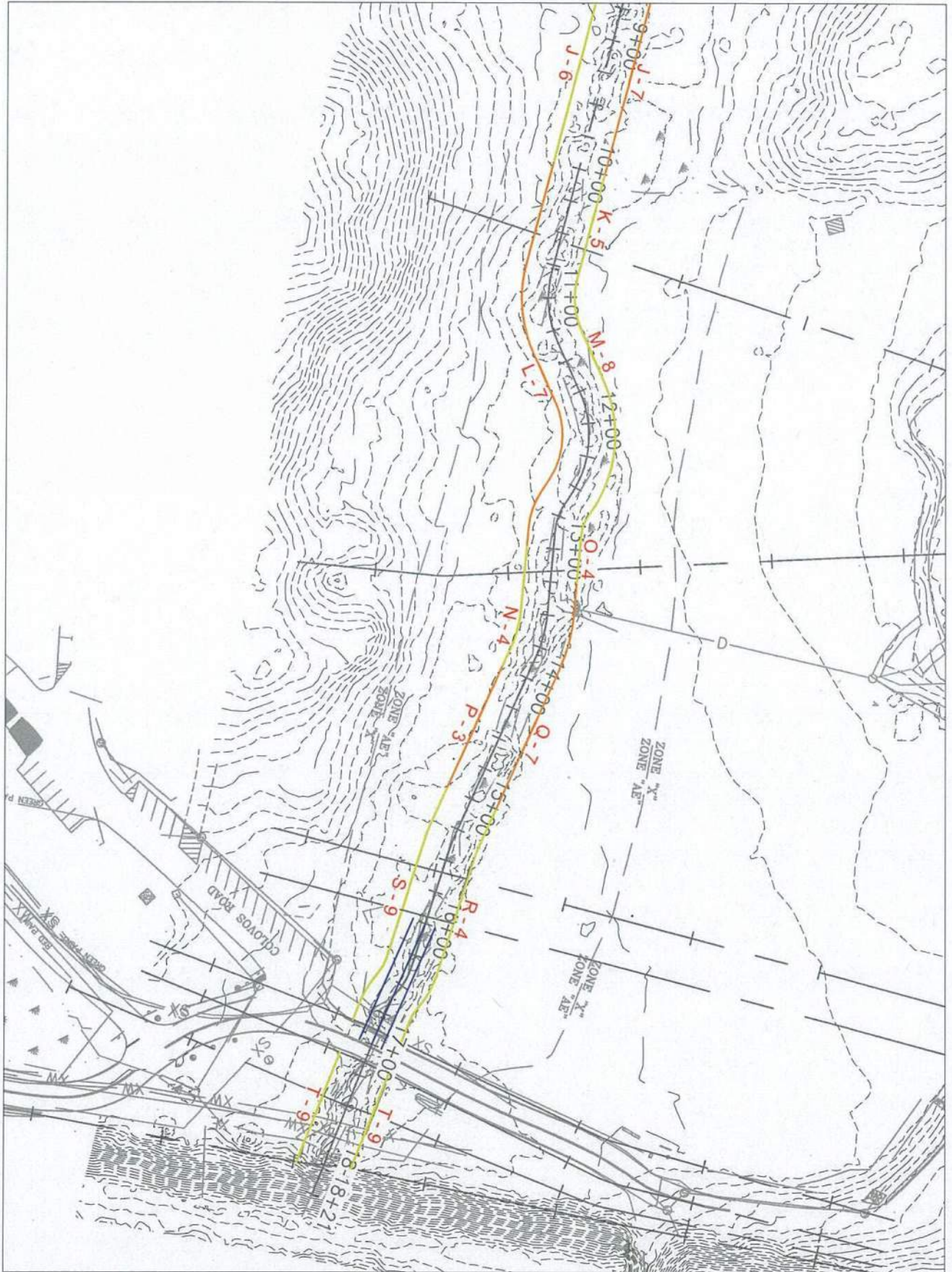
Outlet Rating Curve		
Depth (ft)	WSEL (ft)	Flow (cfs)
0.25	47.56	1.17
0.50	47.81	3.61
0.75	48.06	6.89
1.00	48.31	10.80
1.25	48.56	15.22
1.50	48.81	20.06
2.00	49.31	30.75
2.50	49.81	42.46
3.00	50.31	54.94
3.50	50.81	68.01
4.00	51.31	81.57
4.13	51.44	85.15
5.13	52.44	93.67
5.53	52.81	100.00
6.17	53.44	110.00
6.86	54.13	120.00
7.62	54.88	130.00
8.44	55.69	140.00
9.32	56.56	150.00
10.26	57.49	160.00
11.26	58.48	170.00
12.32	59.53	180.00
13.44	60.64	190.00
14.62	61.81	200.00
15.87	63.04	210.00
18.53	65.68	230.00
21.44	68.56	250.00
24.59	71.68	270.00
27.99	75.04	290.00

Bank Erosion Hazard Index Ratings										
Reference	BEHI ID	1	2	3	4	5	6	7	8	9
Variable	Unit	Value	Value	Value	Value	Value	Value	Value	Value	Value
Study Bank Height	ft	0.7	1.9	1.44	1.25	2.75	2.8	3.3	1.85	3
Bankfull Height	ft	0.7	1.4	0.65	0.65	1.25	0.6	0.5	1.1	1
Bank Height/Bankfull		1.00	1.36	2.22	1.92	2.20	4.67	6.60	1.68	3.00
Variable Potential		Very Low	Moderate	Very High	High	Very High	Extreme	Extreme	High	Extreme
BEHI Value		1.1	5	8.2	7.8	8.2	10	10	6.4	10
Root Depth	ft	0.15	1.40	0.30	0.30	0.60	1.80	1.00	0.60	1.00
Root Depth/Bank Height		0.21	0.74	0.21	0.24	0.22	0.64	0.30	0.32	0.33
BEHI Rating		High	Low	High	High	High	Low	Moderate	Moderate	Moderate
BEHI Value		6.7	2.5	6.7	7.4	6.8	3.2	6	5.9	4.3
Root Density	%	30	60	30	40	60	40	60	40	40
Weighted Root Density		6.4	44.2	6.3	9.6	13.1	25.7	18.2	13.0	13.3
BEHI Rating		Very High	Moderate	Very High	Very High	Very High	High	High	Very High	Very High
BEHI Value		8.8	4.7	8.8	8.5	8.2	6.9	7.6	8.2	7
Bank Angle	deg	90	45	30	30	30	10	35	35	30
BEHI Rating		Very High	Low	Low	Low	Low	Very Low	Low	Low	Low
BEHI Value		8	3.2	2.5	2.5	2.5	1.5	2.6	2.6	2.5
Surface Protection	%	50	10	30	60	75	60	50	50	80
BEHI Rating		Moderate	Extreme	High	Low	Low	Low	Moderate	Moderate	Low
BEHI Value		10	10	6	3.7	2.2	3.7	4.3	4.3	2
Bank Material		Clay	Silt	Clay	Clay	Clay	Clay	Clay	Clay	Silt
BEHI Value		0	0	0	0	0	0	0	0	0
Stratification		No	No	No	No	No	No	No	No	No
BEHI Value		0	0	0	0	0	0	0	0	0
BEHI Rating		34.6	25.4	32.2	29.9	27.9	25.3	30.5	27.4	25.8
BEHI Potential		High	Moderate	High	Moderate	Moderate	Moderate	High	Moderate	Moderate

BEHI RATINGS

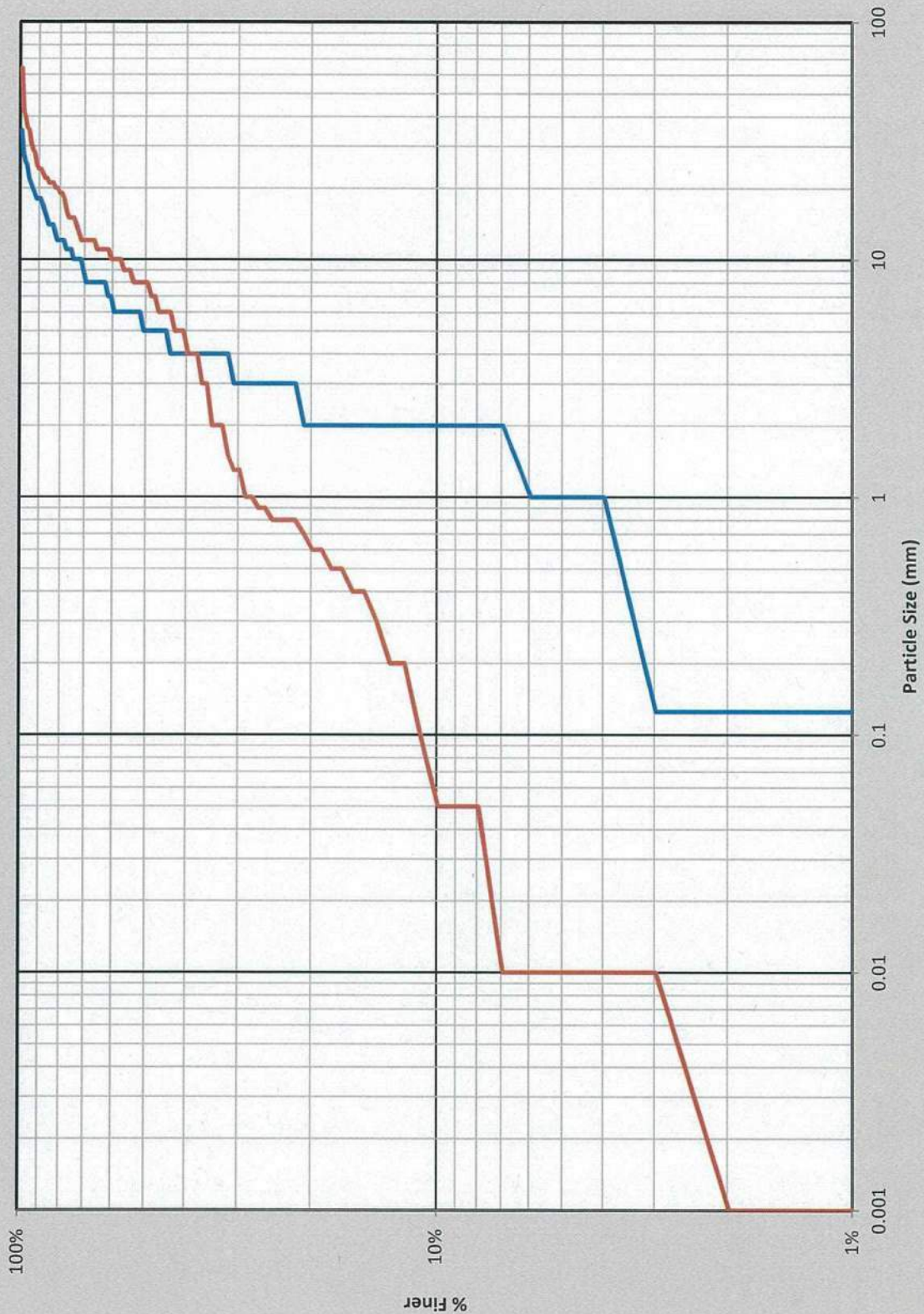


BEHI RATINGS



Reference Particle Sizes		
Reference	Size (mm)	
	Upstream	Downstream
D5	1	0.01
D20	2	0.6
D50	5	8
D80	12	19
D95	21	31

Particle Size Distributions

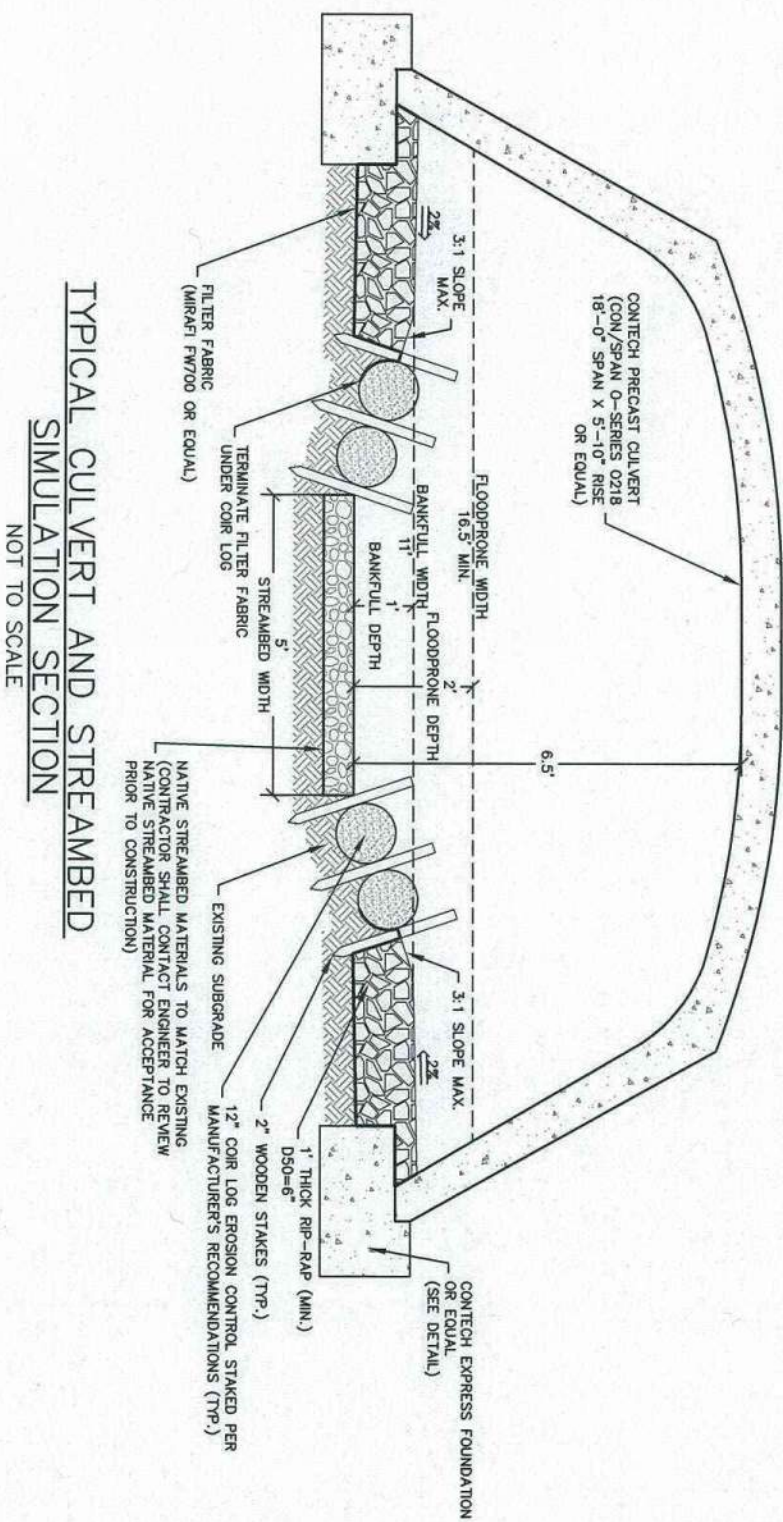


Morphological Characteristics of the Reference Reaches and the Proposed Channel for College Brook												
College Brook in Durham, NH												
Restoration Site												
Variable	Unit	Abbr.	Rosgen Values	NH Regional Curves	Upper Pettee	Beards Creek	Thompson Brook	College Brook - Mike	Drew Brook	College Brook - Ann	Proposed Values	
Stream Type			B#c				F	F5	C5	F4	B3c	
Drainage Area	mi ²	DA		0.750	0.75	0.72	1.20	0.42	0.28	1.03	0.60	
Bankfull (Riffle) Depth	ft	d _{bkf}		1.20	1.05	0.83	0.97	1.25	1.58	1.32	1.00	
Riffle Width	ft	W _{bkf}		10.83	13.92	10.58	11.76	11.75	7.19	11.41	11.00	
Width/Depth Ratio		W _{bkf} /d _{bkf}	>12	9.02	13.26	12.74	12.13	9.40	4.55	8.64	11.00	
Riffle Cross-Sectional Area	ft ²	A _{bkf}		12.89	8.11	6.53		10.38	4.73	10.58	9.00	
Depth of Floodprone Area	ft	d _{fp}		2.40	2.10	1.66	1.94	2.5	3.16	2.64	2.00	
Width of Floodprone Area	ft	W _{fp}			27.81	17.49	14.07	15.00	91.00	19.47	16.5	
Entrenchment Ratio		W _{fp} /W _{bkf}	1.4-2.2		2.00	1.65	1.20	1.28	12.66	1.71	1.5	
Bankfull Discharge	ft ³ /s	Q _{bkf}		33.97	26	26.6	30	66.12	19.8	17.63	24.70	
Stream Length	ft	SL			283		314.57			12471	482.08	
Valley Length	ft	VL			253		279.19			11336	479.33	
Valley Slope		VS			0.0079		0.0078				0.0052	
Avg Water Surface Slope (=VS/k)		S	<.02		0.007	0.008	0.0070			0.0052	0.0051	
Sinuosity (SL/VL)		k	>1.2		1.119		1.127	1.017	1.05	1.100	1.006	

Proposed Morphological Characteristics Table

Category	Variable	Unit	Abbr.	Proposed Values
Watershed and Bedload Variables	Drainage Area	mi ²	DA	0.6
	Bankfull Discharge	ft ³ /s	Q _{bkf}	24.7
	Stream Type			B4c
	Sable Particle Size at Bankfull Stage	in	D100 _{bkf}	0.92
	Stable Particle Size at Floodprone Stage	in	D100 _{fp}	1.90
	Avg Water Surface Slope (=VS/k)	ft/ft	S	0.0051
Cross Section Variables	Width/Depth Ratio		W _{bkf} /d _{bkf}	11.00
	Bankfull (Riffle) Depth	ft	d _{bkf}	1.00
	Riffle Width	ft	W _{bkf}	11.00
	Entrenchment Ratio		W _{fpa} /W _{bkf}	1.50
	Depth of Floodprone Area	ft	d _{fp}	2.00
	Width of Floodprone Area	ft	W _{fpa}	16.50
	Riffle Cross-Sectional Area	ft ²	A _{bkf}	9.00

College Brook Proposed Channel Competence Calculations			
Description	Symbol	Value	Units
Specific weight of water	γ	62.4	pcf
Channel slope	S	0.0051	ft/ft
Bankfull depth	d_{bkf}	1.00	ft
Shear stress on the channel during bankfull	τ_o	0.318	psf
Stable particle size at bankfull flow	D_{bkf}	23.6	mm
Stable particle size at bankfull flow	D_{bkf}	0.93	in
Floodprone depth	d_{fld}	2.00	ft
Shear stress on the channel during flood stage	τ_o	0.636	psf
Stable particle size at the flood flow	D_{fld}	48.7	mm
Stable particle size at the flood flow	D_{fld}	1.92	in



**TYPICAL CULVERT AND STREAMBED
SIMULATION SECTION**

NOT TO SCALE

NATIVE STREAMBED MATERIALS TO MATCH EXISTING
(CONTRACTOR SHALL CONTACT ENGINEER TO REVIEW
NATIVE STREAMBED MATERIAL FOR ACCEPTANCE
PRIOR TO CONSTRUCTION)

TERMINATE FILTER FABRIC
UNDER COIR LOG

FILTER FABRIC
(MIRAFI FV700 OR EQUAL)

1' THICK RIP-RAP (MIN.)
D50=6"

2" WOODEN STAKES (TYP.)

12" COIR LOG EROSION CONTROL STAKED PER
MANUFACTURER'S RECOMMENDATIONS (TYP.)

CONTECH EXPRESS FOUNDATION
(SEE DETAIL)

CONTECH PRECAST CULVERT
(CON/SPAN O-SERIES 0218
18-0-SPAN X 5'-10" RISE
OR EQUAL)

FLOODPRONE WIDTH
16.5' MIN.

FLOODPRONE DEPTH
2'

6.5'

3:1 SLOPE MAX.

2%

3:1 SLOPE MAX.

2%

BANKFULL WIDTH
11'

BANKFULL DEPTH
1'

STREAMBED WIDTH
5'

HEC-RAS Existing Model Results - With 130 FIS Flow out of Project

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	W.S. Elev (ft)	Sta W.S. Lft (ft)	Sta W.S. Rgt (ft)
-1	96.8	53.39	55.64		55.81	0.003502	3.71	34.24	40.14	55.64	325.72	370.79
-2	116	51.1	55.08	52.78	55.14	0.000778	2.13	73.51	65.52	55.08	283.61	349.13
-3	116	49.98	54.95	51.72	54.96	0.000167	1.12	156.45	67.91	54.95	318.21	386.12
-4	116	49.78	54.92	51.42	54.93	0.000081	0.91	219.76	123.23	54.92	271.69	394.92
-5	130	48.31	54.91	50.71	54.91	0.00005	0.8	297.47	196.61	54.91	330.07	526.68
-5.5	130	48.12	54.91	50.52	54.91	0.000042	0.74	320.44	244.27	54.91	285.1	529.37
-6	130	48.07	54.9	50.15	54.91	0.000063	1.04	254.07	284.11	54.9	240.83	524.94
-6.1	Culvert											
-7	130	48	54.9		54.9	0.00003	0.63	321.43	285	54.9	231.08	516.08
-8	130	47.31	54.9		54.9	0.000015	0.54	446.74	284.33	54.9	253.09	537.42
-9	130	47.31	54.9	49.57	54.9	0.000019	0.59	426.5	284.22	54.9	253.13	537.35

HEC-RAS Proposed Model Results - 110' long CONSPAN O Series Arch Culvert with 18' span and 5' rise, with the crown about 6.5' above the thalweg

River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	W.S. Elev (ft)	Sta W.S. Lft (ft)	Sta W.S. Rgt (ft)
-1	96.8	53.39	55.65		55.82	0.003469	3.69	34.4	40.22	55.65	325.71	370.81
-2	116	51.1	55.09	52.78	55.15	0.000764	2.12	74.43	66.07	55.09	283.13	349.2
-3	116	49.98	54.97	51.72	54.99	0.000149	1.06	170.27	76.63	54.97	309.61	386.24
-4	116	49.78	54.95	51.42	54.96	0.000082	0.92	224.26	119.98	54.95	275.22	395.21
-5	130	48.31	54.94	50.21	54.94	0.000037	0.75	302.94	105.47	54.94	421.65	527.12
-5.5	130	48.12	54.94	50.02	54.94	0.000032	0.71	323.23	108.74	54.94	421.08	529.81
-6.1	Culvert											
-7	130	47.4	54.9	49.3	54.91	0.000042	0.88	209.53	69.52	54.9	371.62	441.14
-8	130	47.31	54.9		54.9	0.000017	0.51	432.34	247.61	54.9	253.09	500.69
-9	130	47.31	54.9	49.56	54.9	0.000019	0.59	426.5	284.22	54.9	253.13	537.35

100-yr WSEL Comparison			
Section	Existing 100-yr WSEL	Proposed 100-yr	Difference
1	55.64	55.65	0.01
2	55.08	55.09	0.01
3	54.95	54.97	0.02
4	54.92	54.95	0.03
5	54.91	54.94	0.03
5.5	54.91	54.94	0.03
7	54.90	54.90	0
8	54.90	54.90	0
9	54.90	54.90	0

Tighe&Bond

APPENDIX K