THE STATE OF NEW HAMPSHIRE

BEFORE THE

SITE EVALUATION COMMITTEE

DOCKET NO. 2015-04

JOINT PRE-FILED TESTIMONY OF ANN PEMBROKE, SARAH ALLEN, AND KURT NELSON

APPLICATION OF PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE D/B/A EVERSOURCE ENERGY FOR A CERTIFICATE OF SITE AND FACILITY FOR CONSTRUCTION OF A NEW 115 kV TRANSMISSION LINE

THE SEACOAST RELIABILITY PROJECT

July 1, 2018

General Background

Q. Please state your names, titles, and business address.

A. My name is Ann Pembroke. I am Vice President and Technical Director of the Marine Group at Normandeau Associates, Inc. My business address is 25 Nashua Rd, Bedford, NH 03110. My curriculum vitae was provided as Attachment A of my pre-filed testimony dated April 12, 2016.

My name is Sarah D. Allen. I am a Senior Principal Wetland Scientist at Normandeau Associates, Inc. My business address is 25 Nashua Road, Bedford, NH 03110. My curriculum vitae was provided as Attachment A of my pre-filed testimony dated April 12, 2016.

My name is Kurt Nelson. I am a Senior Land Use Licensing & Permitting Specialist at Eversource Energy. My business address is 13 Legends Drive, Hooksett, NH 03106. My curriculum vitae is attached hereto. See Attachment A.

Q. Please describe the purpose of your supplemental pre-filed testimony.

A. The purpose of our combined supplemental pre-filed testimony is to address and respond to specific portions of the New Hampshire Department of Environmental Services' ("NHDES" or the "Department") Final Decision dated February 28, 2018. Specifically, we understand that the Department recommended that the New Hampshire Site Evaluation Committee ("NHSEC") "consider having the Applicant conduct a more thorough evaluation of the Horizontal Direction Drilling (HDD) method for installing cable under Little Bay." This testimony focuses on the environmental aspects of that issue.

Q. Have you reviewed the pre-filed testimony submitted by Counsel for the Public and the interveners in this matter?

A. Yes, we have. We understand that the Town of Durham and Conservation Law Foundation have suggested that HDD may be a better construction alternative for the Project than crossing Little Bay using jet plow technology.

Q. Are you familiar with the New Hampshire Department of Environmental Services Final Decision and the DES request for a further evaluation of HDD?

A. Yes. The Department issued a final recommended approval for construction of the project using jet plow technology. The recommended approval suggested that the SEC consider requiring the applicant to conduct a further evaluation of HDD. The Final Decision also listed certain criteria that the Applicant should consider as part of an HDD evaluation, including, assessing the possibility of using HDD for crossing all of Little Bay and using HDD only in the areas where hand-jetting is proposed (i.e. using HDD for shore landings).

Q. What work has Eversource done to assess the possibility of constructing the Project using full HDD or shore landing HDD?

A. Eversource assessed, with the assistance of experienced engineers and contractors, the feasibility of HDD for trenchless cable installation below Little Bay by analyzing cable design and installation requirements, concept-level HDD geometries specific to the site surface constraints and subsurface conditions, and cable installation methodologies. As part of this assessment Eversource contractors, particularly Normandeau, were retained to review potential environmental impacts that may occur during an HDD installation.

Assessment of Full HDD

Q. Describe the water quality impacts associated with a full HDD installation.

A. As discussed in the supplemental joint pre-filed testimony of Kenneth Bowes, David Plante, Marc Dodeman, and Nick Strater ("Technical and Managerial HDD Testimony"), if the construction of the Project using a full HDD installation method proceeds flawlessly, it is expected that surface waters and high value resources within the vicinity of the construction would not be adversely affected. However, as discussed in the Technical and Managerial HDD Testimony, due to the length of the drill and the composition of the bedrock in the crossing area, an inadvertent return (IR) of drilling fluid needed for HDD drilling operations is possible. The environmental concerns associated with inadvertent returns are discussed further below.

Q. Provide an overview of the potential environmental impacts associated with a full HDD installation for the Project.

A. Known impacts to Little Bay resulting from full HDD consist of temporary barge and drilling impacts from geotechnical investigations for final design of the HDD, impacts to freshwater wetlands, and the potential for an inadvertent return.

Q. Describe the environmental impact associated with geotechnical investigations in Little Bay.

A. As described in the report titled *Horizontal Directional Drilling and Jet Plow: A Comparison of Cable Burial Installation Options for a 115-kV Electric Transmission Line in Little Bay*, a full HDD installation will likely require approximately 7 geotechnical borings in the Bay to characterize the sediments and rock to a depth of approximately 20 feet below the planned borehole depth (up to 90 feet below the bay bottom). Each test bore is expected to take approximately 3 days to complete, for a total of 21 days. Environmental impacts from this operation include sediment disturbance and direct impacts to organisms from the spuds used to hold the barge stationary, and minor turbidity from the drilling process itself. Should HDD be required, Eversource would work with NHDES to acquire the appropriate permits for the geotechnical investigations, if necessary.

Q. Describe the potential environmental risks associated with an inadvertent return in Little Bay.

A. In the event of an IR, the bentonite clay-based drilling fluid has the potential to smother marine organisms. The bentonite clay is a finer particle than commonly occurs in Little Bay sediments, and an IR has the potential to clog the gills and filters of small embedded or attached organisms in the bottom sediments. A more substantial release could result in injury or death to larger non-mobile organisms such as shellfish and oysters. It is expected that more mobile species such as fish, lobsters and crabs could avoid the bentonite plume. No eelgrass currently occurs in the vicinity of the Project, therefore an IR is not expected to adversely affect eelgrass, however, several eelgrass beds are mapped south of the Project, and depending on the time of year and the volume of the IR, the bentonite plume could reach and settle on live eelgrass blades. A coating of clay particles could hinder photosynthesis and productivity of the eelgrass. It could also decrease the palatability to organisms feeding on the blades. If bentonite was not removed, the affected plants could potentially die.

The extent and concentration of bentonite resulting from an IR would depend on the severity of the IR, and the location and tide stage in Little Bay. In relatively quiet waters (e.g., shallow water and/or slack tides), the bentonite from an IR is likely to settle quickly to the bottom due to its high density. This could result in a thicker deposit over a relatively confined area. In waters with stronger currents (e.g., the channel during flood and ebb conditions), the bentonite will be carried further and diluted. This means deposition will likely be thinner, but spread over a larger area and potentially affecting more resources. While information on IRs on other projects are generally not publicly available, a recent HDD in Lake Champlain resulted in at least two IR deposits in VT waters, with the depth of bentonite deposition ranging up to 12 inches.

Q. Describe the typical clean-up process following an inadvertent return and its potential for additional environmental impacts.

A. The clean-up required for an IR is also potentially environmentally damaging. Typically, agencies ask the installer to confine the plume with a gravity cell and to suction up any detectable bentonite in the water column or settled on the bottom. The gravity cell results in a bottom disturbance within the footprint of the gravity cell, and a loss of substrate as the surface sediments are suctioned up. This results in the mortality of organisms within those surface sediments, including benthic macroinvertebrates and shellfish. Similarly, suctioning of the bottom sediments to recover the bentonite not contained by the gravity cell results in sediment loss and mortality of benthic organisms. It is expected that most fish and larger mobile crabs and lobsters could avoid the suction. The eggs and larval stages of fish and shellfish, plankton and other floating organisms would be entrained (vacuumed up) during the suction process. The magnitude of entrainment would be dependent on the size of the IR and the degree of clean-up required.

Similar to impacts from the proposed jet plow operation, HDD impacts to Little Bay are expected to be relatively minor and temporary, with recovery expected by the next growing season. The exception would be a large IR, in which large amounts of bentonite are released into the water column and are carried by tides to potentially affect benthic organisms, eelgrass, natural shellfish beds and oyster reefs, and/or oyster aquaculture sites.

Q. Can an inadvertent return occur on the land-based portion of the HDD. If so, describe how an inadvertent return would be contained.

A. Yes. For land-based portions of the HDD, an IR can be contained using hay bales and shallow surface excavations, and removed by hand tools and vacuum trucks. This remediation activity may result in additional surface disturbance, including impacts to surface water, vegetation and soils. If an IR occurs in a wetland resource, the Project would have to fully restore and mitigate damages from the spill and the clean-up.

Q. Describe the freshwater wetland impacts associated with full HDD.

A. Temporary impacts from a complete HDD installation are expected to be approximately 2.7 acres of freshwater wetland and one stream. These impacts are anticipated due to land-based equipment and set-up requirements in Durham. The work space required for full HDD includes a 30,000 square foot drilling site on each side of the bay. On the Durham side, a 65-foot wide laydown area for the entire length (6,000 feet) of steel casing and conduit is proposed along the ROW to allow each component to be pulled through in its entirety without stopping. In Newington, the workspace is sited in uplands only and does not include a pipe laydown area, therefore no wetland impacts due to the full HDD are anticipated in Newington.

Wetlands in the work space would be protected with timber mats and erosion controls, but given the length of time anticipated for the HDD work (up to 28 months), the vegetation underneath the mats is not likely to survive. Upon completion of the work and the removal of equipment, the impacted wetland areas would be stabilized and re-established with soil enhancement and plantings.

Q. Will a full HDD impact salt marshes or require concrete mattresses?

A. Assuming no IR, a full HDD would not result in impacts to the salt marshes on either side of Little Bay. Because the cables are deep underground with a full HDD, concrete mattresses would not be required to protect any cable sections.

Q. Will a full HDD affect wildlife?

A. The full HDD workspace includes a pipe and conduit assembly area equivalent in length to the full HDD bore (approximately 6,000 feet) on the Durham side. The contractors have requested that this workspace to accommodate the simultaneous assembly of the 2 steel casings and 8 conduits, plus supporting equipment and vehicles. The work corridor is estimated to be 65 feet wide, and would be on timber mats in wetlands. The environmental monitors would sweep the areas to remove wildlife such as small mammals, snakes and turtles prior to establishing the workspace, but disturbance and some mortality would likely occur during the 28 months of construction due to smaller animals attempting to cross the workspace and either getting caught in equipment or crushed by traffic. Larger animals, birds and bats would temporarily lose some habitat, but would be better able to avoid injury or mortality.

Assessment of HDD at Shore Landings

Q. Describe the water quality impacts associated with HDD shore landings.

A. As discussed in the Technical and Managerial HDD Testimony, potential water quality impacts could result from the HDD shore landing operations due to geotechnical borings and the water-based portions of construction, including the jet plow portion of this installation approach. In addition, as discussed in the HDD Technical Report and the Technical and Managerial HDD Testimony , the risk for an inadvertent return is higher for a shore landing HDD as compared to a full HDD.

Q. Describe the environmental impacts associated with HDD shore landings.

A. Similar to the full HDD design, geotechnical borings will also be required for the HDD shore landings, but due to the shorter drill paths, only 4 borings in Little Bay are anticipated. Impacts and permit requirements are expected to be the same as full HDD, including temporary disturbance to bottom substrates and organisms, and turbidity resulting from the use of spuds to hold the barge stationary, and test bores up to 80 feet deep.

Environmental impacts specific to the HDD shore landings are associated with the four exit points proposed in Little Bay. The impacts are associated with the barge spuds, and the 54" diameter conductor casings proposed to be placed at each exit point to control the drill and drilling fluid when the drill reaches the surface. The barge spuds and conductor casings will

cause physical disturbance to the floor of Little Bay, resulting in minor turbidity and the mortality of bottom-dwelling organisms within the footprints of the barge spuds and conductor casings. These impacts are expected to be relatively minor and temporary, with recovery expected by the next growing season.

Q. Describe the potential environmental risks associated with an inadvertent return during the HDD shore landing.

A. In general, the risk of an IR in Little Bay is considered higher for the HDD shore landing design than the full HDD. This is due to HDD shore landing's four boreholes exiting within the Bay, whereas the full HDD bore path will remain in bedrock below the Bay. Impacts from the bentonite in the drilling fluid and the necessary clean-up would be as described for full HDD, and include mortality of bottom-dwelling organisms resulting from placement of a gravity cell to confine the IR. The suctioning necessary to remove the bentonite would also result in mortality of bottom-dwelling organisms, as well as loss of bottom sediments and entrainment by the suction of eggs and larval stages of fish and shellfish, plankton and other floating organisms. These impacts are expected to be relatively minor and temporary, with recovery expected by the next growing season. The exception would be a large IR, in which large amounts of bentonite are released into the water column and are carried by tides to potentially affect benthic organisms, eelgrass, natural shellfish beds and oyster reefs, and/or the oyster aquaculture sites.

Q. Describe any other additional environmental impacts associated with the HDD shore landings.

A. If conductor casings are used, vibratory hammers are typically used to drive casings through the unconsolidated sediments to bedrock. Vibrations resulting from these hammers can be of sufficient strength to affect the behavior of, or cause injury to, fishes. Data are not available to estimate the radial distance between the sound source and NOAA's thresholds for effects on fishes (150 dB for behavioral modifications; 183-187 cSEL [cumulative sound exposure level] for potential injury, depending on the size of the fish) but a 2018 study on conductor casing installation with a hydraulic hammer in deep water in California provides some insight. Based on these findings, it is likely that noise levels would exceed the behavioral threshold at an undetermined distance from the source, resulting in fish avoidance of the work

area during hammering. Data from the study are not appropriate to evaluate the likelihood that the SRP installation would reach the injury threshold because the sound characteristics differ substantially between hydraulic (concussive) and vibratory (non-concussive) hammers. However, because the vibratory hammer is not concussive, injuries to fish are not anticipated.

Marine impacts will also result from the jet plowing needed to bury the 6 cables under the channel (approximately 3.7 acres of temporary impacts). The suspended sediments resulting from each jet plow pass will generate a smaller plume than estimated for the full jet plow proposal because of the shorter distance travelled (approximately 2000 feet vs 4900 feet per pass). However, 6 jet plow passes will be required to install the 6 cables required under the shore landing scenario, therefore deposition in the channel is expected to be greater. The extent of hand jetting would be limited to the connections between the shore landing HDD and the jet plow. Silt curtains could not be deployed to contain the suspended sediments in these hand-jetting locations due to the high velocity currents that occur in the channel.

With HDD shore landings, no impacts to salt marsh would occur and no concrete mattresses would be needed in the shallows.

Q. Describe the wetland impacts associated with the HDD shore landings.

A. Temporary impacts to 2.9 acres of wetland are anticipated due to land-based equipment and set-up requirements in Durham and Newington. The work space required for HDD shore landings is similar to that for full HDD, and includes a 30,000 square foot drilling site on each side of the bay. A 65-foot wide laydown area for the length of steel casing and conduit is proposed in each town (approximately 2700 feet in both Durham and Newington) along the ROW to allow each component to be pulled through in its entirety without stopping.

Wetlands in the work space would be protected with timber mats and erosion controls, but given the length of time anticipated for the HDD shore landing work (up to 10 months), the vegetation underneath the mats is not expected to survive. Upon completion of the work and the removal of equipment, the impacted wetland areas would be stabilized and re-established with soil enhancement and plantings.

As described above, the shore landing HDD option would include temporary impacts to 3.7 acres of subtidal wetlands from installing the six cables via jet plow between the HDD exit points in Little Bay.

Q. Will the HDD shore landing approach affect wildlife?

A. The workspace for the HDD shore landings includes a casing and conduit assembly area equivalent to the HDD bore length on each side of the bay (approximately 2700 feet in both Durham and Newington). Similar to the full HDD, the contractors have requested that this workspace accommodate the simultaneous assembly of the 2 steel casings and 8 conduits, plus supporting equipment and vehicles. The work corridor is estimated to be 65 feet wide, and would be on timber mats in wetlands. The environmental monitors would sweep the areas to remove wildlife such as small mammals, snakes and turtles prior to establishing the workspace, but disturbance and some mortality would likely occur during the 10 months of construction due to smaller animals attempting to cross the workspace and either getting caught in equipment or crushed by traffic. Larger animals, birds and bats would temporarily lose some habitat, but would be better able to avoid injury or mortality.

Environmental Concerns Related to Both Full HDD and Shore Landing HDD

Q. What are Eversource's current disposal practices for spoils and spent bentonite fluid from drilling following a HDD installation? Please describe the disposal practices that Eversource would employ for an HDD across Little Bay.

A. Eversource currently requires that all Eversource contractors handle and dispose of spoils and spent bentonite fluid in accordance with applicable Federal, State and local requirements.

Given the large volume of drilling spoils that would be generated for an HDD across Little Bay, it is anticipated that they would be disposed of offsite at a landfill or other permitted receiving facility. Drilling water would also need to be transported offsite to an acceptable permitted receiving facility, such as a waste water treatment facility.

Prior to disposal, dry spoils and drilling water would need to be chemically analyzed to confirm that they meet disposal acceptance criteria.

Q. What plans does Eversource routinely have in place to deal with inadvertent returns?

A. Eversource requires that HDD contractors prepare a site-specific drilling fluid release contingency plan. Where environmental permitting is required, such as drilling beneath a surface water body, this plan is typically conditioned to be reviewed and approved by the necessary permitting agencies.

Q. What plans would Eversource propose to address an inadvertent return if one were to occur in Little Bay?

A. For land-based portions of an HDD, an inadvertent return could be contained using hay bales and shallow surface excavations, and removed by hand tools and vacuum trucks.

Depending on depth and location, an inadvertent return within Little Bay could be contained by silt booms and a gravity cell. This operation would require a dedicated standby vessel to be anchored over the inadvertent return area; a gravity-cell containment system to be placed over the inadvertent return location with a barge mounted crane; and a diver-operated vacuum operation to be conducted until all bentonite is transferred up to frac-tanks on the barge.

Conclusion

Q. Please provide a comparison of the environmental effects of installing the cables via HDD versus the proposed jet plow method.

A. Both jet plowing and HDD will result in temporary environmental impacts to Little Bay. Jet plowing will also result in permanent impacts from the placement of concrete mattresses in the nearshore areas. Jet plowing and hand jetting will suspend local sediments temporarily into the water column during installation. Modeling of the suspended sediment plumes demonstrates that impacts to the water column and bottom of Little Bay will be short-term and minimal. Results from sediment analyses performed by both USEPA and Eversource are similar and demonstrate no contaminants were found above thresholds of ecological concern. Eversource is working with NHDES to develop monitoring criteria that will confirm conditions during and after the cable installation, and identify appropriate mitigation for any unexpected exceedances.

Small invertebrates and shellfish in the vicinity of the cable route will be impacted by the jet plow equipment and sediment deposition, but these habitats are expected to recover and be recolonized by the next growing season. Where concrete mattresses are placed, small invertebrates and shellfish may suffer mortality; however, it is anticipated that the mattresses will provide suitable substrate for future colonization by macroalgae and other shellfish species such as oysters, mussels and barnacles. Trenching at the shorelines as part of the jet plow installation will directly impact small areas of salt marsh fringing both shores. The salt marsh peat in these areas will be salvaged and stored for the duration of the construction period, followed by restoration upon completion of the work and removal of all construction equipment.

The environmental impacts of HDD to Little Bay consist mainly of impacts to water quality, sediments and marine organisms from geotechnical investigations, and the potential for an IR. The impacts from geotechnical work will include a stationary barge on spuds and drilling at up to 7 sites over a period of 21 days, resulting in disturbance to bottom substrates and organisms, and turbidity.

Drilling entirely under Little Bay should theoretically eliminate impacts to water quality or the ecology of Little Bay. However, many HDD operations experience some degree of IR of drilling fluids, either through the bore hole or through bedrock fractures or substrate ruptures. Preliminary geological analyses indicate an IR is possible in Little Bay. Following an IR, the bentonite used in the drilling fluid typically settles very quickly to the bottom and has the potential to smother sedentary organisms, including shellfish. Additional bedrock sampling is required to more thoroughly assess the risk of an IR in this location.

Eversource also considered HDD shore landings on both shorelines connected by jet plowing in the deeper part of Little Bay. The shallow bores for HDD shore landings increase the risks of an IR and the environmental impacts of suspended sediments remain for jet plowing. Both HDD proposals eliminate impacts to salt marsh (assuming no IR in or near the marshes) and the need for concrete mattresses in the shallows.

HDD also results in additional temporary impacts to wetlands and potentially wildlife, due to the need to establish a workspace on each side of the bay for drilling and the support equipment. A work area for assembling the full length of the 2 steel casings and 8 conduits is

needed immediately behind the workspace to allow a single, steady pull of the pipes into the borehole. These areas will be within the existing right-of-way, and are estimated to be 65 feet wide and will affect freshwater wetlands and streams.

In summary, both jet plow and HDD result in temporary impacts to natural resources in Little Bay. The full jet plow proposal will also result in 0.2 acres of permanent impacts from concrete mattresses. With the exception of an IR, HDD impacts are expected to be minor and temporary. The bentonite in drilling fluid associated with an IR does not naturally occur in Little Bay, and can have detrimental physical effects to affected organisms. An IR and its associated clean-up could result in substantial impacts if large enough to impact natural or farmed oysters, other shellfish beds, eelgrass, or other benthic organisms.

Q. Does this conclude your supplemental pre-filed testimony on HDD?

A. Yes, it does.

Attachment A

Resume of Kurt Nelson

CIRRICULUM VITAE

KURT I. NELSON
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EMPLOYMENT

2015-2018 Licensing and Permitting Specialist, Eversource Hooksett, NH

Responsible for coordinating, tracking and managing Federal, State and local permitting and licensing for utility projects, ensuring regulatory compliance and interfacing with regulators, property owners and other stakeholders on environmental issues.

2008-2015 Transmission Arborist, Eversource, Hooksett, NH

Managed and administrated the Transmission Right of Way Vegetation Maintenance Program in New Hampshire overseeing a 750 mile transmission right of way system. Responsibilities included contractor management and oversight, field inspections and data collection, environmental permitting for wetlands and endangered species, budgeting, and regulatory compliance.

2000-2008 Senior Environmental Scientist, Tighe & Bond, Westfield, MA

Conducted wetlands delineations, prepared wetland permit applications and designed wetlands mitigation areas in support of private and municipal projects

1999-2000 Environmental Scientist, Handex of New England, Marlborough, MA

Responsible for environmental assessments, sampling, compliance reporting and operation and maintenance of remediation systems for contaminated sites in New England

1994-1995 Research Assistant, University of Massachusetts, Amherst

Operated and maintained a tropospheric ozone monitoring station, deployed remote passive samplers and conducted surveys for phytotoxic injury on native vegetation in the White Mountain National Forest

EDUCATION

1995-1999 Master of Science, Plant Pathology, University of Massachusetts, Amherst

- *Thesis: Effects of Tropospheric Ozone on the Growth and Development of the Plant Arabidopsis thaliana*
- *Teaching Assistant – Environmental Science Program*

1991-1994 Bachelor of Science, Environmental Science, University of Massachusetts, Amherst

PUBLICATIONS

Manning WJ, Krupa SV, Bergweiler CJ & Nelson KI (1996) Ambient ozone (O_3) in three Class I wilderness areas in the northeastern USA: Measurements with Ogawa passive samplers. Environmental Pollution. Vol 91, No. 3, pp. 399-403.