**THE STATE OF NEW HAMPSHIRE**

**BEFORE THE**

**SITE EVALUATION COMMITTEE**

**DOCKET NO. 2015-04**

# PRE-FILED DIRECT TESTIMONY OF ANN E. PEMBROKE

**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**

**April 12, 2016**

## ***Qualifications and Purpose of Testimony***

**Q. Please state your name and business address.**

A. My name is Ann E. Pembroke. My business address is 25 Nashua Rd., Bedford, NH 03110.

**Q. Who is your current employer and what position do you hold?**

A. My current employer is Normandeau Associates, an environmental consulting firm. I am Vice President and Technical Director of the Marine Group.

**Q. Briefly summarize your educational background and work experience.**

A. I have been employed as a marine biologist for my entire professional career. I received my Bachelor of Science in Biology from Hobart and William Smith College in 1973 after which I attended the College of Marine Studies, University of Delaware, receiving my Master of Science in Marine Studies (Biology) in 1976. Subsequently, I worked for the environmental consulting firm Pandullo Quirk Associates and then for the University of Delaware.

I have previously worked on many projects similar to the current proposed Project. I have worked with NextEra, as the Project Manager, to provide technical expertise on the potential effects of electromagnetic fields emitted from a proposed HVDC cable between islands in Hawaii. I also served as the Project Manager and Benthic Ecologist for the Block Island Wind Farm project in Narragansett, RI. I assisted in developing specialized study plans to characterize and assess impacts to benthic, shellfish, and fisheries resources. A complete list of the previous projects I have worked on is contained in my *curriculum vitae*, which is attached hereto. *See* Attachment A.

**Q. Have you testified before the New Hampshire Site Evaluation Committee previously?**

A. No, I have not.

**Q. Are you familiar with the Seacoast Reliability Project (the "Project")?**

A. Yes, I am familiar with the Project.

**Q. Please describe your role in the Project.**

A. On behalf of the Applicant, Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH"), I prepared the characterization and impact

assessments for marine resources, including sediment, benthos, shellfish, and aquaculture. I designed site specific surveys for shellfish (and participated in the field effort) and benthic infauna. I oversaw the characterization and impact assessment for Essential Fish Habitat ("EFH") and other fishes. I directed and oversaw a water quality modeling effort that was implemented by a subconsultant and was conducted to evaluate the effects of the proposed submarine cable installation methods. I initiated coordination with the National Oceanic and Atmospheric Administration ("NOAA") Fisheries regarding EFH and protected resources under the Endangered Species Act and with the New Hampshire Fish and Game Department.

**Q. What is the purpose of your testimony?**

A. The purpose of my testimony is to support the marine resource information described in PSNH's Application for a Certificate of Site and Facility. I have provided technical expertise related to effects of in-water construction on marine/estuarine resources and developed site-specific investigations for those resources. My testimony describes the resources mapped and evaluated for impacts within the proposed crossing in Little Bay. These resources include substrate, water quality, eelgrass, macroalgae, benthic infauna, benthic epifauna (e.g. lobsters and horseshoe crabs), shellfish, finfishes, and aquaculture. Sarah Allen's testimony describes salt marsh habitat in the Project area. My testimony describes the Applicant's efforts to reduce impacts to marine resources and identifies the unavoidable impacts resulting from the final design. Additionally, I describe the Applicant's proposed compensatory mitigation for those unavoidable impacts.

**Q. Please describe the assessment of wetland resources completed for the Little Bay cable crossing.**

A. Normandeau conducted four site-specific surveys relevant to the in-water resources along the Little Bay cable crossing. A survey using vibracore, a technology for collecting core samples for underground sediments and wetland soils, was conducted to examine the sediments along the route. The primary purpose of this study was to provide samples for cable engineers to determine their thermal properties. The study was also completed to characterize the types of sediments through which the cables will be installed.

A towed video survey was conducted to examine the shallow subtidal zone in the vicinity of the eastern cable landing for evidence of eelgrass to confirm findings of the annual aerial survey conducted for the Piscataqua Region Estuaries Partnership ("PREP"). The Project's eelgrass video survey was conducted in mid-October 2013, after the period of peak productivity but before winter die-off. *See* Natural Resources Existing Conditions Report, Appendix 7.

A benthic infauna survey was conducted along three transects running perpendicular to the cable crossing to characterize the invertebrate community that would be disturbed during cable installation. The survey of each transect included five sampling locations including two that were outside the cable area shown on NOAA chart 13285 and three that were within the area that would be disturbed by cable installation. This sampling design provided data that placed the impact area information in context with nearby areas in Little Bay. This sampling also provided data that was useful for evaluating the potential duration of temporary impacts to benthic infauna. A visual survey of the western tidal flat was conducted by canoe at low tide to document the presence of infaunal shellfish species in the Project area. The purpose of this survey was to characterize resources in the Project area. *See* Natural Resources Existing Conditions Report, Appendix 7.

In addition to site studies, Normandeau engaged RPS ASA, a global science and technology solutions company, to conduct modeling to characterize the effects of the proposed cable installation methods on water quality and nearby substrates where sediments suspended by the installation will resettle.

Two in-water installation methods will be used for the Project, jet plowing across the majority of the crossing and diver-assisted hand-jetting nearshore. Jet plowing will be used for the majority of the crossing. Jet plowing simultaneously trenches and buries the cables to the required depth (3.5 feet nearshore and 8 feet in the channel). Burial by divers using handheld water jets will occur at either end of the cable lay as it approaches the shoreline. Very close to both shores, the submarine cable will be buried using an excavator working from timber mats in the Project corridor as the cable transitions to land.

I directed the modeling prepared by RPS ASA. The results of this model were used to evaluate impacts to living estuarine resources in the water column and on the substrate.

**Q. Please explain the results of your sediment studies.**

A. The vibracore survey provided visual descriptions of the sediments present throughout the depth of the substrate that will be affected by cable installation. Results generally confirmed observations made during collection of benthic grabs samples in the Project area and sediment data collected by UNH south of the Project area. Sediments on the western tidal flat were predominantly silt-clay and sediments in the channel and eastern channel slope were predominantly sand. Sediments in Welsh Cove, where the eastern cable landfall is located, were sandy clay.

**Q. Please explain the results of your eelgrass survey.**

A. Water clarity during the eelgrass video survey was good and substrate conditions were very discernable. There was no evidence of attached (viable) eelgrass plants along the five transects conducted. This corroborated the conclusions of the PREP aerial survey for eelgrass in the Project Area.

**Q. Please explain the results of your benthic and shellfish studies.**

A. The benthic infaunal survey provided characterization of the invertebrate community that would be affected by cable installation. Findings included the following:

- Infaunal abundance was generally highest at the stations on the western tidal flat, most variable in the channel, and most consistent along the channel slope.
- Total number of taxa was most consistent on the tidal flat and most variable among the stations in the channel and along the channel slope.
- Within each of the three depth zones, eight or nine taxa together comprised more than 90% of the total abundance in each zone.
- Four taxa were among the dominants in each of the three depth zones; other dominants differed among the three depth zones.
- The dominant taxa are a mixture of short-lived, rapidly reproducing, surface dwelling species that are indicative of habitats experiencing regular perturbations and longer-lived, deeper dwelling species that indicate a relatively stable habitat. This

combination of taxa provides a resiliency to the community and indicates it is likely to recover from environmental disturbances.

The visual inspection of the western tidal flat for shellfish had two primary results:

- Softshell clams and razor clams are present on the flat.
- No oysters were observed on the flat and the areas examined did not provide preferred habitat (hard substrate) for this species.

**Q. Please explain the results of your evaluation of the water quality impacts from the installation of the submarine cable.**

A. The water quality modeling characterized both excess suspended sediments ("SS") (i.e., those in addition to ambient levels) generated by jet plowing and by hand jetting as well as re-deposition of these sediments suspended by both construction activities on the estuary floor. The jet plow model was run using spring tides to identify the greatest potential extent of the plume and using a conservative advance rate (100 meters per hour) to identify the longest potential duration of the plume. The model results indicate that excess SS concentrations would be highest directly above and adjacent to the jet plow and the plume would essentially follow the jet plow across Little Bay. That is, the plume would be narrow and run downcurrent (generally north during ebb tides and south during flood tides) from the jet plow. Highest SS concentrations would occur directly above the substrate and concentrations would decrease higher in the water column and with horizontal distance from the jet plow. The model also showed that the highest levels of excess SS would dissipate within an hour and that virtually all evidence of the jet plow passage would disappear within less than two hours after the completion of each cable installation. Most of the SS is predicted to be re-deposited on the estuary floor in the immediate vicinity of the installed cable. The installation of the three cables required for the Project is predicted to result in a layer of sediments 10 to >50 mm (0.4 to > 2 inches) thick being deposited over a 5.9 acre area. A layer of sediments 0.1 to >0.5 mm (0.004 to 0.02 inch) thick is likely to be deposited over an 87.9 acre area. Because these sediments will not be consolidated, they may be re-suspended

and redistributed by currents. *See* Appendix 35 for a copy of the RPS ASA Suspended Sediment Modeling Report.

It is possible, according to Caldwell Marine Inc., that the substrate conditions along the crossing will allow a higher advance rate. If this happens, more of the crossing will occur during ebb tide and the resulting suspended sediment plume will flow primarily to the north. Suspended sediment concentrations in the plume would likely be higher but the areal extent of the plume would likely be smaller than the model predicted.

A portion of the cable route on each side of Little Bay will not be accessible for the jet plow. All of this work on the west side and along the section of the cable route within Welsh Cove will be conducted inside a silt curtain enclosure to contain suspended sediments. In these locations there will be virtually no sediment plume outside of the silt curtains and sediments suspended during burial will be redeposited within the enclosure. There is another section of the cable route offshore of Welsh Cove requiring burial by divers where the tidal currents are too swift for silt curtains to be used effectively. The diver burial activity in this area will generate a small sediment plume flowing towards the north because the work must be conducted around slack high tide. Suspended sediments will be redeposited primarily in the immediate vicinity of the cables.

It may not be feasible to achieve the required burial depth for the cables in the sections of the Little Bay crossing adjacent to the rocky shorelines. In this case, articulated concrete mattresses will be installed over the cables to provide the necessary protection. This will result in the permanent conversion of habitat from unconsolidated substrate to hard substrate. Over time, it is likely that the artificial hard substrate will be colonized by macroalgae (similar to adjacent shoreline) and associated invertebrate fauna.

Normandeau used the results of these studies and of desktop studies, researching estuarine resources of Little Bay, to evaluate the potential impacts associated with the installation and operation of transmission cables within the seafloor. These are described later in this testimony.

**Q. Please describe the consideration that the Applicant and its consultants have given to marine issues associated with the Project.**

A. The Seacoast Reliability Project team has engineered and designed the Project to avoid and minimize impacts to aquatic and marine resources. Siting the cable crossing in a previously identified cable area will limit the impacts to a previously disturbed area. Reduction of the number of cables from six to three by increasing the size of individual cables further minimizes the temporary footprint of the Project within Little Bay. The selection of jet plowing as the preferred primary installation method will minimize the duration of in-water construction. The cables will be buried to a shallower depth (3.5 feet) on the tidal flats compared to the channel (8 feet), reducing the amount of sediment disturbance. In the nearshore areas, the cables will be angled together to reduce the footprint in the salt marsh and rocky shore. Installation of the cables during the fall will avoid impacts to horseshoe crabs and winter flounder during their critical spring spawning periods.

**Q. Will the Project monitor suspended sediments produced by the cable installation?**

A. Yes, to ensure that the installation of the Project is in line with the modeled estimates, PSNH has proposed a water quality monitoring plan to be implemented during the jet plow installation of the cables. The plan has been incorporated as part of the Section 401 Water Quality Certification request, Appendix 14. The plan includes decision criteria for determining if the installation is in compliance with water quality standards and a protocol for implementing changes in installation procedures if needed.

**Q. What steps has PSNH taken to mitigate permanent impacts of the Project on estuarine wetlands?**

A. Permanent conversion of up to about 0.15 acre of intertidal unconsolidated bottom to artificial hard substrate (concrete mattresses) may be necessary and would require mitigation. This is included in the in-lieu fee calculation for the Project. For additional information on the in-lieu fee calculation, please reference the pre-filed testimony of Sarah Allen.

**Q. In your opinion will this Project have a significant adverse effect on marine and estuarine resources?**

A. In my opinion, this Project will not have a significant adverse effect on the resources of Little Bay along the cable crossing.

- Jet-plowing minimizes the surface area directly disturbed during installation and that disturbance will be temporary.
- Water quality effects from jet-plowing are temporary and limited in space.
- Benthic infaunal species that would be disturbed are widespread in the general area and are, therefore, highly likely to repopulate the disturbed sediments quickly.
- The only potential permanent impact would be conversion of habitat from unconsolidated bottom ("mud") to hard substrate (concrete mattresses) in two small areas, if the required burial depth cannot be achieved. Concrete, although manmade, is a surface that is readily colonized by organisms such as macroalgae, mussels, and oysters so it is expected that this artificial substrate will provide some habitat value.
- There are no established eelgrass beds in the immediate Project area so there will be no direct impacts to this important resource.
- The closest eelgrass beds to the Project are located in Great Bay, beyond the farthest reach of the suspended sediment plume predicted by the model so there will be no indirect impacts to these beds.
- Impacts to macroalgae will be minimal, primarily restricted to the rocky shoreline. Once cable installation has been completed and the shoreline restored to its preconstruction physical condition, the hard substrate will be available for recolonization by macroalgal species common in this habitat in Little Bay.
- Major natural oyster beds or restored oyster beds will not be impacted by the Project because the sediment plume created by the jet plow will not reach them. Smaller, unmapped, oyster beds may be exposed to the sediment plume but the ephemeral nature of the plume will result in there being negligible effects to these resources.
- Although the sediment plume may come near or intersect with oyster farms (Joe King Oyster Cooperative, Fat Dog Shellfish Co., and Bay Point Oyster Company), exposure of the aquaculture stock at these operations to sediment plumes will

be extremely limited in both concentration and duration. Impacts to these resources will be minor for two reasons. First, the suspended sediment concentrations to which the oysters would be exposed are predicted to be only slightly higher than typical ambient conditions. Second, the duration of exposure to the sediment plume will be very short. Research has shown that elevated suspended sediments do not cause detrimental effects in oysters at the exposure levels (concentration times duration) predicted to occur during jet plowing in the vicinity of the aquaculture farm.

- The jet plow will require water withdrawal from the Bay to operate. The volume of water required is less than 0.3% of the volume of Little Bay and entrainment of planktonic organisms, such as early life stages of shellfish and fishes will, therefore, result in insignificant losses to these species.
- Impacts to EFH of demersal fishes, fishes dwelling at or near the bottom of Little Bay, will be negligible because the substrate will recover to its preexisting condition quickly.
- Impacts to EFH of pelagic fishes, fishes in the water column not specifically associated with the substrate, will be negligible because the sediment plume will be limited in duration and spatial extent.
- Although diadromous fishes, fishes that spend time in both fresh and salt water, may be in the vicinity of the proposed crossing during cable installation and, thus, may be exposed to elevated levels of suspended sediments, this exposure is very unlikely to cause significant effects because of the limited spatial and temporal extent of the plume. The most likely response of individual diadromous fishes would be a short-term avoidance of the plume. This is unlikely to impede passage of the fish through Little Bay because the plume will never encompass the width of the Bay.

In sum, the short duration and small footprint of jet plow installation, the primary technology to be used, minimizes potential effects to marine resources.

**Q. Does this conclude your pre-filed testimony?**

A. Yes.