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February 28, 2017

<u>Via Hand Delivery and Email</u>
Dori Wiggin, Administrator
Water Division
New Hampshire Department of Environmental Services
29 Hazen Drive
PO Box 95
Concord, NH 03302-0095

Re: SEC Docket No. 15-04, Application of Public Service Company of New Hampshire d/b/a Eversource Energy for a Certificate of Site And Facility for the Construction of a New 115 kV Transmission Line from Madbury Substation to Portsmouth Substation – Comments to Department of Environmental Services

Dear Ms. Wiggin:

This is a follow up to the meeting which we had with you and Gregg Comstock earlier this month. Enclosed are the comments of the Town of Durham regarding the above-captioned matter and more specifically with regard to the portion of this Project that would impact on Little Bay. These comments represent preliminary concerns raised by consultants hired by the Town of Durham with regard to prefiled testimony and reports that have been filed by the Applicant in this matter with the Site Evaluation Committee concerning the impact on Little Bay.

As you will see in the attached documents there are a number of specific concerns with the analyses that have been done by the Applicant to date. Based on the preliminary review by our consultants, given the gaps in data as well as limitations of analysis provided so far by the Applicant, it is Durham's position that it cannot assure the residents of Durham that there are no unreasonable adverse ecological effects or that the impact on natural resources will be manageably limited in the Little Bay, and that unreasonable adverse effects in the worst case will not migrate up north towards the mouth of Oyster River or down south beyond the mouth of the Great Bay. Durham has arrived at this preliminary position in part because the Applicant has not provided what Durham's consultants consider to be adequate sensitivity analysis of a set of variables that could impact the plume dispersion, refloatation of sediments and/or of contaminants within or associated with such sediments. The Applicant has done modeling only with very few "snapshot" data points for some variables it has incorporated into its modeling, and has also not incorporated some other variables at all in the modeling. Thus, a consequence of the Applicant's study so far is that it has left unresolved a very large envelope of uncertainty around potential ecological impact from a host of relevant variables. More importantly, it appears that no one, including the Applicant, could put in place adequate control measures during cable installation and/or mitigation measures to control risks because of large uncertainties that still persist. It is Durham's position that such uncertainties need to be reduced by the Applicant through further suggested data collection, analysis and sensitivity analysis of driving variables. Only thereafter can anyone design adequate controls and mitigation measures. In summary, from Durham's viewpoint, there is insufficient evidence and analysis to assess potential unreasonable adverse ecological impacts, and Durham therefore lacks confidence that adequate controls/mitigation measures could be designed without first reducing the envelope of uncertainties.

The Town of Durham is submitting these comments to you, making them available to the Applicant and the service list in this docket, and making them available to the public in the interest of full disclosure. These comments are being provided in light of the role that your Department plays as a permitting authority in this process, which includes reviewing proposals, identifying issues of concern and submitting recommended draft permit terms and conditions to the Site Evaluation Committee pursuant to RSA 162-H:7 and 7-a, Admin. Rule Site 301.12, and consistent with orders issued by the SEC in this docket.

Durham reserves its right to change its position on any of these issues as it works its way through the Site Evaluation Committee process.

If you have any questions, please do not hesitate to contact me. Thank you for considering these comments.

Sincerely,

Douglas L. Patch

DLP/eac

Enclosures

cc (via email): Service List in SEC Docket 2015-04; Gregg Comstock, Water Division

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On behalf of the Town of Durham (the Town), GeoInsight is the project director for a consulting team consisting of geologists and hydrogeologists from GeoInsight and ecological risk assessors and engineers from Woods Hole Group (WHG, as a team: GIWHG). The team's primary objective is to review application documents presented to the New Hampshire Site Evaluation Committee (SEC) for the Seacoast Reliability Project (SRP), prepared on behalf of Public Service Company of New Hampshire d/b/a Eversource (the Applicant), and advise the Town regarding the adequacy and scientific validity of such documents in demonstrating that potential environmental and ecological risks associated with SRP were adequately and accurately assessed.

This document presents a summary of GeoInsight's preliminary comments and opinions regarding the SRP, and specifically regarding the potential environmental and ecological risk associated with the suspension and deposition of sediments resulting from cable laying activities in Little Bay. This document focuses on the sedimentological aspects of the available data; however, it also considers the broader ecological ramifications presented in documents prepared by WHG.

This preliminary evaluation is primarily based upon a review of the following SEC documents and associated references:

1. Pre-Filed Direct Testimony J. Jiottis
    a. Attachment Jiottis
2. Pre-Filed Direct Testimony A. Pembroke
3. Pre-Filed Direct Testimony A. Godfrey
    a. Attachment Godfrey
4. Appendix 1 USGS Project Overview Map
5. Appendix 2 SRP Environmental Maps
6. Appendix 3 Existing Conditions Maps
7. Appendix 7 SRP Natural Resource Existing Conditions Report
8. Appendix 13 Joint NHDES USACE Wetlands Permit Application
9. Appendix 14 NH DES Section 401 Water Quality Certification Request
10. Appendix 34 Natural Resource Impact Assessment
11. Appendix 35 Modeling Sediment Dispersion from Cable Burial for SRP Little Bay, NH
12. Pre-filed Testimony of Marc Dodeman as substitution for Anthony Godfrey
13. Characterization of Sediment Quality Along Little Bay Crossing, Durham to Newington, NH (December 1, 2016)

Based upon GeoInsight's review of the report titled *Modeling Sediment Dispersion from Cable Burial for SRP Little Bay, NH,* (Sediment Dispersion Report), references provided in the Sediment Dispersion Report, and associated SEC documents listed above, it is our opinion that the Sediment Dispersion Report does not adequately represent potential sediment dispersion and associated deposition related to the proposed cable-laying activities.

The report states that wind currents were not considered because of the small surface area (i.e. fetch) at the location of the crossing. However, while fetch can be a limiting factor for wave height and corresponding depth of impact in the water column, the 0.9-mile long crossing and 2-mile north-south length of Little Bay is sufficient fetch to generate wind-driven currents, particularly during periods of sustained winds from a consistent direction. Wind-driven currents can enhance or mute tidal current velocities, so a persistent wind from the southeast or southwest across the approximately 2.7-mile north-south length of Little Bay during an ebb tide would increase the velocity of northward flowing currents, which, in turn, potentially increases bottom shear stress, thus increasing sediment transport and possible entrainment into the water column.

Wind driven currents have the largest potential impact to current velocities and bottom shear stress in shallow intertidal mudflat and upper slope areas. The Sediment Dispersion Report states that hand jetting (and silt curtains) will be used on 296 feet of the western mudflat area, indicating that the remaining approximately 1,700 feet of the western mudflat will be subject to jet plowing, presumably without silt curtains. Using the stated jet plow advance rate of 328 feet per hour, 1,700 feet of the western mud flat would be traversed in 5.2 hours. The model assumes that it takes 7 hours to proceed from high slack, when jet plowing is proposed to begin and when the approximate depth of water over the mudflats would be 8 to 9 feet, through the ebb cycle to the subsequent flood cycle; therefore, work would proceed across the western mudflat for 4 to 5 hours in ebbing conditions and in progressively decreasing water depths. Therefore, the later segments of jet plowing across the western mud flats would be most subject to potential impacts from wind currents that could both disperse suspended sediments and potentially entrain bottom sediments.

The Sediment Dispersion Report assumes that 25% of the material in the jet plow cross-sectional area will likely be suspended during the jet plowing process, but also acknowledges that redeposited sediments will be re-suspended during subsequent tidal cycles. The sediment dispersion model does not consider the fate of re-suspended sediments. However, sediment re-suspension, particularly in the deeper part of the channel where tidal velocities are high and previously cohesive fine-grained sediments have been liquefied by jet plowing, may be particularly significant. Based upon a review of vibracore logs from the 2014 and 2016 coring programs, channel stratigraphy generally consists of a thin veneer (<2 feet thick) of fine- to medium-grained sand overlying silt and clay. The silt and clays are of glaciomarine origin and are characteristically dense, stiff, moderately to highly cohesive, and plastic. These characteristics present three potential concerns pertaining to jet plowing the channel crossing:

1. The inability of jet plow to penetrate dense silts and clays to target depths without increasing jetting pressures, which may result in additional sediment suspension, the effects of which were not modeled.
2. The inability of jet plow to penetrate to the target depths or to the regulatory-required depth and defaulting to the use of concrete mats. The use of concrete mats in the channel environment and their potential impacts to the benthic environment and sedimentation patterns was not considered by the applicant.

3. By liquefying stiff, cohesive silts and clays during the jetting process the deposit's cohesiveness and bulk density are significantly reduced, and these properties are directly related to its shear strength. Cohesive silts and clays have higher shear strengths than unconsolidated silts and clays, which is why cohesive silts and clays can exist in high-energy channel environments while unconsolidated, liquefied silts and clays will be eroded and entrained into the water column. This physical change potentially makes liquefied silts and clays occupying the cross-sectional area of the cable trench available for re-suspension during multiple tidal cycles until trench sediments are in equilibrium with the channel flow regime.

   The fate of the re-suspended sediments and the degree, geographic spread, and duration to which turbidity in the water column will be increased was not addressed by the applicant.

Another concern regarding the 2014 and 2016 vibracore program and associated sediment sampling, that has a potential bearing on sediment dispersion during jet plowing, is that the amount of flocculation (i.e., the "clumping" and deposition of clay minerals) assumed by the model does not consider actual variations in grain size or mineralogy. The degree of flocculation is important because incorrectly high flocculation assumptions can under-estimate the amount of suspended sediment.

The assumed flocculation in the model was based upon approximated volumes of clays in the samples, but the fine-grain size fraction of the samples was not differentiated between silts and clays using testing methods (e.g., pipette or hydrometer analysis). The estimations provided in the Sediment Dispersion Report are based upon methods that use cutoff criteria for grain sizes that are different from the suspended sediment model. For example, the classification from Flemming (2000) used in the report specifies 2 micrometers (μm) as the silt/clay boundary, but SSFATE considers clay to be up to 7 μm (more than three times the particle size used in the Flemming classification). Therefore, using diagrams from Flemming (2000) to estimate grain size fractions for the SSFATE model can be inaccurate. The visual approximations used in the report also suggest the assumed percentage of clay may be too high because grain size analysis of comparable units in Great Bay indicated more silt and less clay (Trainer, 1997) than assumed in the report.

The mineralogy of the sediment is also important in evaluating flocculation because not all clay minerals flocculate in the same degree. Some clay minerals (e.g., smectites) are expected to readily flocculate, while other clay minerals (e.g., illiltes and kaolinites) are not expected to flocculate and may remain suspended in the water column. The Sediment Dispersion Report uses a simplified flocculation assumption that is not supported with data regarding actual grain sizes or mineralogy of the fine-grained sediment at the study site.

Ecological aspects of the Sediment Quality Report are addressed in a separate preliminary report by Woods Hole Group, but because the Sediment Quality Report relies upon data presented in the Sediment Dispersion Report, the Sediment Quality Report cannot adequately address issues pertaining to sediment quality.

Some specific concerns about the Sediment Quality Report are as presented as follows.

The Sediment Quality Report states that "Each sediment sample was tested for the parameters shown on Table 1 which were taken from the recommended testing limits outlined in the Regional Implementation Manual (RIM; U.S. EPA and U.S. Army corps of Engineers 2004), a document that delineates how estuarine and marine sediments being proposed for dredging and aquatic disposal should be tested for contaminants." The RIM includes pesticides in the list of chemicals of concern, but pesticides were not analyzed in the samples collected from Little Bay. This is a particular concern for sediments that were deposited prior to 1980 (Partnership, 2013), before compounds such as DDT were banned or became highly regulated. Presumably, these buried sediments will be suspended during hand jetting and jet plowing activities; therefore, potential ecological impacts from pesticides should be evaluated, as specified in the RIM.

The 2016 vibracore program was completed to collect the samples so that sediment quality could be evaluated. However, as with the 2014 vibracore program, channel cores failed to penetrate to the target trench depth of 8 feet, which raises the concern previously described that jet plowing may not attain target depths, and that the potential response (i.e. higher jetting pressure, concrete mats in the channel) to not attaining target depths are not adequately addressed in the Sediment Dispersion Report or the Sediment Quality Report.

In conclusion, based on the three testimonies of the GIWHG team, and given the gaps in data and the narrowly focused data interpretation provided so far by Eversource, it is GeoInsight's opinion that:

- As of now, the identified data gaps do not allow the Town of Durham to conclude that there are no significant environmental risks; and,

- Based upon the Applicant documents presented to date, there are significant data and evaluation deficiencies that preclude the Applicant from designing adequate control measures or mitigation measures to mitigate potential risks associated with the proposed cable crossing in Little Bay. Such uncertainties need to be reduced through further suggested data collection and analysis; only thereafter can adequate controls and mitigation measures be designed and implemented.

This document provides Woods Hole Group's preliminary evaluation and analysis of the Seacoast Reliability Project (SRP), proposed by the Public Service Company of New Hampshire d/b/a Eversource (the Applicant) and submitted for approval to the New Hampshire Site Evaluation Committee (SEC). The evaluation focuses on the modeling conducted to assess impacts related to the proposed burial of transmission cables in Little Bay. The evaluation relates to unresolved concerns with the methods applied and underlying assumptions used to assess the sediment dispersion and associated impacts that would occur with the proposed cable burial activities, specifically with the use of a jet plow and hand jetting.

The preliminary evaluation is based on a review of the following SEC documents and associated references:

1. Pre-Filed Direct Testimony J. Jiottis
   a. Attachment Jiottis
2. Pre-Filed Direct Testimony A. Pembroke
3. Pre-Filed Direct Testimony A. Godfrey
   a. Attachment Godfrey
4. Appendix 7 SRP Natural Resource Existing Conditions Report
5. Appendix 14 NH DES Section 401 Water Quality Certification Request
6. Appendix 34 Natural Resource Impact Assessment
7. Appendix 35 Modeling Sediment Dispersion from Cable Burial for SRP Little Bay, NH
8. Pre-filed Testimony of Marc Dodeman as substitution for Anthony Godfrey
9. Characterization of Sediment Quality Along Little Bay Crossing, Durham to Newington, NH (December 1, 2016)

In my opinion, there is an overarching concern with the modeling conducted to assess the sediment dispersion, transport, and deposition that would occur as a result proposed cable installation within Little Bay, NH. Many assumptions were made with regard to the environmental conditions at the time of the burial and the sediment release that would occur as a result of the cable burial process. Specifically, assumptions were made in the hydrodynamic and sediment transport modeling conducted for the cable burial process in Little Bay with regards to the following:

1. degree of water mixing in Great Bay (the model assumes that the Great Bay estuary is well-mixed),
2. discharge values used for river inflow,
3. effect of winds (with or without gusts) on currents in Little Bay,
4. water depth for variable tidal conditions during each of the three cable installations,
5. current velocity for variable tidal conditions during each of the three cable installations,
6. sediment characteristics for sediment layers that were not sampled,
7. degree of sediment flocculation for different sediment mineralogy (further discussed in GeoInsight comments),
8. volume of sediment released from a jet plow,
9. height of sediment release and vertical distribution above the seafloor,
10. jet plow advance rate,
11. water flow rate at exit nozzles of the jet plow,
12. water pressure at exit nozzles of the jet plow, and
13. resuspension of sediments after initial deposition.

No sensitivity analyses were conducted to assess these assumptions, and the impact of varying these parameters on the model results of plume formation and sediment deposition. Thus, the modeled plume results shown in the report using the assumed parameters may not be representative of what occurs in this dynamic estuarine environment. Conducting a sensitivity analysis of the above parameters would provide a better understanding of the range of sediment plume and deposition variations that may occur during the cable installation.

While some of the assumptions related to the jet plow installation method are based on past studies, they are not founded based on analyses conducted for Little Bay and/or the Great Bay Estuarine system. The validity of these underlying assumptions could be evaluated by validating the results produced by the SSFATE model used to simulate the sediment dispersion. The validation would be done using actual turbidity and plume measurements made during previous installations or a demonstration project in similar sediments, using the same jet-plow method. No evidence has been provided that the SSFATE model results have been validated.

Because of the assumptions used and lack of sensitivity testing conducted combined with the lack of SSFATE model validation in a similar environment, the accuracy of the sediment plume and deposition results presented for cable burial process is not known and the uncertainty cannot be quantified. The model results are therefore inadequate for evaluating the potential impacts to resources within Little Bay and the larger Great Bay Estuary.

Based on what was presented in SEC Appendix 35 - "Modeling Sediment Dispersion from Cable Burial for SRP Little Bay, NH", there are shortcomings in the application of the BELLAMY hydrodynamic model that should be addressed to fully understand the sediment dispersion that would occur as a result of the burial process.

Specifically, with regards to the selection of the hydrodynamic model, there is no justification made or data shown to support the use of a two-dimensional (2-D), depth-averaged model for the Great Bay estuarine system rather than a three-dimensional (3-D) model. A 2-D model is appropriate for estuarine systems that are well mixed (i.e. little vertical stratification), while a 3-D model should be applied for estuaries that have vertical salinity gradients in order to capture density-driven circulation patterns (due to combined fresh water and tidal inflow). In past studies where the BELLAMY model was used, it is stated the estuary is well mixed and references are made to a field data collection program conducted in the late 1970s[1]. However, a review of the data from this study at Adams Point in the upper estuary shows vertical variability in current velocities of up to 20 cm/sec. In addition, any observations made regarding the characteristics of the estuary are specific to the measurement period of this study (summer of 1975) which is a typical dry season with relatively little river inflow. Because the cable burial installation process will release sediments in the bottom layers of the water column, characterizing the vertical profile of current velocities is important to how the sediment will be dispersed both vertically and laterally within the estuary. There is no data shown to indicate whether the upper portion of the Great Bay estuary is well mixed during the season when the installation will occur to preclude the use of a three-dimensional hydrodynamic model.

For rivers feeding into the Great Bay estuary, average freshwater discharge values were applied as constant inputs to the model simulations. There is no comparison given, however, as to how these average values compare with the time period over which the cable burial is expected to occur. It has been noted elsewhere in the permit application that the installation is proposed for the fall season when historically there is an increase in precipitation (based on a review of discharge data from USGS gauge 01073500 at Lamprey

[1] Swenson, E., Brown, W.S., Trask, R., 1977. Great Bay Estuarine Field Program 1975 Data Report Part 1: currents and sea levels. UNH Sea Grant Technical Report # UNH-SG-157, University of New Hampshire, New Hampshire, USA, 109 pp.

River near Newmarket, NH). There is no analysis or discussion of how a significant precipitation event occurring prior to or during installation may affect the river flow contributions and how that could increase stratification in the upper estuary and change the hydrodynamics where the cable will be installed. A range of river discharge values which are representative of the period when the cables are to be installed should be applied in the model.

It was stated in the pre-filed testimony of Ann E. Pembroke that a spring tidal cycle was used in the model simulations. The sediment dispersion model report shows example model currents (Figures 2-2 and 2-3) which appear to be from September 2nd of 2014 which is representative of a neap tidal cycle. There is no documentation of the start date and time of the predicted tides used in the 13-hour model simulations of the jet plow or the 10-day and 20-day simulations of the hand jetting. The type of spring tide level simulated (for jet plowing) and the window of time simulated (for hand jetting) is important as it will directly affect the tidal currents and dispersion of sediments. Additionally, it has been documented that the three cables will be installed via jet plow subsequently over a 3- to 4-week period. Hand jetting for the west and east shallow sections will follow for subsequent periods of 10 and 20 days per cable. The three subsequent cable installations will, therefore, be completed at different tidal cycles (including spring and neap). Installing the three cables subsequently at different tidal cycles will result in different plume dynamics and deposition patterns for each cable installation, however no modeling was done to assess these differences.

A statement is made in the sediment dispersion model report that "*No wind forcing was applied to be consistent with previous studies, which showed the wind effect is short term and minimal, particularly since the modeling focused on steady state conditions.*"
In reviewing the previous studies cited (Bilgili et al., 2005; McLaughlin et al., 2003; Swanson et al., 2015)[2,3,4] there are no comparisons made to establish that wind effects are minimal and do not impact currents within the estuarine system. The modeling and simulations being conducted for the SRP cable burial are of a dynamic varying tidal condition and the construction activity being proposed via jet plow occurs over a 13-hour period and hand-jetting will occur over a 4-hour period. These installation periods are of sufficient duration for changes in wind patterns (speed and direction) to affect surface water currents and sediment plume movement, especially in the shallow water tidal flats where the model results of the sediment plume show suspended sediments reach nearly to the water surface. Additionally, the resuspension of sediments will continue to occur for hours after

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2 Bilgili A., Proehl J. P., Lynch D. R., Smith K., Swif, M. R., 2005. Estuary-Ocean Exchange and Tidal Mixing in a Gulf of Maine Estuary: A Lagrangian Modeling Study, Estuarine, Coastal and Shelf Science Volume 65, No. 4, 607-624 pp. doi:10.1016/j.ecss.2005.06.027

3 McLaughlin JM, Bilgili A, Lynch DR (2003) Dynamical Simulation of the Great Bay Estuarine System Tides with Special Emphasis on N2 and S2 Tidal Components, Estuarine, Coastal and Shelf Science, Volume 57, No. 1-2, pp. 283-296.

4 Swanson, C., A. Bilgili and D. Lynch, 2015. Long Term Simulations of Wastewater Treatment Facility Discharges into the Great Bay Estuarine System (New Hampshire). Water Quality, Exposure and Health, Volume 7, Issue 1, pp. 67-77.

the construction activity. SEC Appendix 14 – Application for Water Quality Certification pg.10 acknowledges the contribution of wind-induced currents and how it can affect the resuspension of sediments in the tidal flat areas. Given the duration of proposed construction activity, the potential resuspension, and the measured fetch length of Little Bay from north-to-south being approximately 2.7 miles (a sufficient distance over which winds can be sustained to produce surface stresses and induce currents), the modeling should include the expected range of wind conditions that will occur during the burial process.

Based on what was presented SEC Appendix 35 - "Modeling Sediment Dispersion from Cable Burial for SRP Little Bay, NH", the methods applied and assumptions made in the SSFATE model are not sufficient for characterization of the potential sediment dispersion that may occur as a result of the cable burial process.

With regard to the sediment characteristics, the April 2014 sediment cores in the deeper channel (LB-6-A, LB-7-B, LB-8-B) did not penetrate to the proposed trench depth of 8 feet. An assumption was thus made as to the sediment characteristics below the core penetration depth and what would be released during the jetting process. It has been documented in the December 2016 Characterization of Sediment Quality report that the 2016 sediment cores in the channel did not hit target recoveries due to the "density of the underlying clay layer". It was not specified what the assumed sediment characteristics were for this this dense clay under-layer in the SSFATE model simulations. Conservative higher fine fractions should be used for the clay layer that could not be penetrated to examine the maximum potential for sediment suspension and dispersion that may occur due to jetting.

The reference cited for the sediment release fraction from jet plow activity (Foreman, 2002)[5] states 10 to 35% of the trench volume is entrained in the water column and is based on sediment characteristics from New York Harbor. A 25% sediment release fraction was used in the SSFATE model for the cable burial in Little Bay, although it does not appear an analysis was conducted to justify the sediment release fraction based on sediment characteristics within Little Bay. The reference cited also states "*The analysis performed assumes that there is no variation in soil properties with trench depth.*" and "*If the sediment is more consolidated, it will require a greater volume of water to fluidize it leading to a larger amount of sediment being resuspended*". As shown in the 2014 and 2016 sediment core data acquired by the Applicant, there are variations in the sediment layers with depth in Little Bay and evidence of stiff and/or consolidated clays. Additionally, as the stiff clay layers found (and those found to be impenetrable) in the core samples are encountered, an increase in the jet water flow rate is likely required, which will result in an increased amount of sediment released to the water column. A higher sediment release

[5] Foreman, J., 2002. Resuspension of sediment by the jet plow during submarine cable installation. Submitted to GenPower, LLC, Needham, MA. Submitted by Engineering Technology Applications, Ltd, Romsey, Great Britain, May, 2002

fraction should be evaluated to assess a worst-case scenario and the sensitivity on the sediment plume and deposition.

With regard to the sediment being released by the jet-plow burial activity, no information is given as to the vertical distribution of the sediment released to the water column that was specified in the SSFATE model to represent the sediment source. The vertical distribution of sediment above the trench will vary based on the sediment characteristics and ambient currents. It is not clear how the vertical distribution of the sediment release was determined, how it was specified in the model, and if it was varied along the cable route. The model sensitivity to the vertical release distribution should also be evaluated.

The jet-plow advance rate for the cable burial process was specified as a constant rate of 100 m/hr in the SSFATE model. While a constant advance rate may be desirable, it has been documented there are stiff layers of sediment that may require adjustment of the jetting pressure, the Applicant is proposing to adjust the cable burial depth from 3.5 to 8 feet when moving from the western shallow flats to the deeper portion of the channel within Little Bay, and there are potential unknown obstacles along the route. In addition, if water quality criteria are exceeded while operating, adjustments to the jetting process may be required. Any potential delay incurred during the burial operation (i.e. due to equipment failure/adjustments, obstructions, exceedance of water quality criteria, etc.) was not taken into account. If there is a delay in the cable burial process, the suspended sediment plume, dispersion, and deposition patterns all will be affected due to the varying tidal currents and flow reversals with flood and ebb tides. The model and resulting plume dynamics should be evaluated for unforeseen changes and potential varying of the plow advance rate.

It is stated in the sediment dispersion model report that one cable route was simulated, however, the combined deposition results for all three cable routes are presented. It is not specified how the combined deposition results for all three cable routes were determined and if an assumption was made that the initial bed composition and post-installation deposition would be the same for all three cable runs. As sediments are disturbed by the first cable installation, any deposited sediments within the subsequent cable routes are subject to being remobilized by the jetting process. It is likely that these disturbed and deposited unconsolidated sediments would be the higher fine fractions that are more likely mobilized and would tend to generate larger plume sizes. The subsequent cable installations should be modeled explicitly to give a better characterization of the expected plume and deposition.

In the sediment dispersion model report, a number of technical reports are referenced that demonstrate successful application of the SSFATE model to dredging. However, it has not been shown how the SSFATE model performs in its simulations of cable and pipeline burial operations via jet plow and hand jetting. As there are past submarine cable burial studies of this type where suspended solid concentrations have been monitored during installation, the SSFATE model results can be validated to show its capability in simulating the jetting burial process. This would help test some of the underlying assumptions made in the model's application for Little Bay, if the validation was performed for a similar estuarine environment having similar sediment characteristics. The model validation would provide some level of confidence in the predicted sediment plume and deposition and allow for quantification of the amount of uncertainty that should be taken into account when evaluating the results. Without any documentation of how the SSFATE model has been validated in similar settings for studies of this type, there is little assurance the model results are reasonable in predicting the sediment plume characteristics and resulting deposition that would occur with the cable burial process.

There is a discussion of the stability of deposited sediments in the sediment dispersion model report and it was determined that most of the fine deposited sediments would be mobilized and re-suspended on subsequent tides. There is no analysis or modeling performed, however, to assess the increased suspended sediment concentrations, duration of exposure, and ultimately where these sediments would likely be distributed after the initial deposition. Re-suspension of unconsolidated fine-grained material disrupted by jet plow activity is expected to occur where tidal velocities are high and where newly deposited sediments will not be in equilibrium with the channel flow regime. Until an equilibrium is reached, the disrupted fine-grained material will be continually entrained into the water column, transported and deposited on subsequent tidal cycles. This would lead to increased suspended sediment concentrations, an extended period of exposure, and a larger area of deposition than what was shown in the model results presented by the Applicant, which could pose additional potential impacts. The re-suspended sediments would be transported to areas of natural deposition within the estuarine system and likely south into Great Bay proper, which has shallow depths and lower current velocities. Additionally, the jetting process for the three submarine cable installations will result in a depression or scar on the seabed as a result of the jetting process. The potential impacts of sediment dispersion cannot be fully assessed unless an analysis is conducted to characterize the resuspension that would occur, the ultimate fate of those sediments, and to estimate how long the scars will take to recover under ambient conditions.

Additional concerns relate to the proposed cable installation methods and whether an alternate approach using a mechanical plow was considered for the Little Bay cable crossing. There is no information given or analysis shown to justify why the use of a mechanical/shear plow was not considered to minimize potential impacts. Based on a review of past studies[6,7], a mechanical plow has been proposed for shallow burial depths (less than 7 feet) and the sediment release fraction used for a mechanical plow is 2-15%, which would pose reduced impacts than a jet plow which has been suggested to have a sediment release fraction of 10-35%. A 42-inch (3.5-foot) burial depth is already planned

[6] HDR, 2014. Lake Champlain Water Quality Modeling Report, New England Clean Power Link, December, 2014.

[7] HDR, 2014. Application for Construction of the Rockaway Delivery Lateral Project Appendix G - Hydrodynamic and Sediment Transport Analyses for Rockaway Delivery Lateral Project, January, 2014.

for the western tidal flats and in Welsh Cove. It was stated by the Applicant in a January 12th, 2017 public meeting presenting the Sediment Quality Report, that the required burial depth is 42 inches, and that the Applicant was targeting additional burial to 96 inches (8 feet) in the deeper channel voluntarily. If there is no requirement to bury the cable to a depth of 8 feet (i.e. 42" burial across the entire project area), the use of a mechanical plow could be considered. If the Applicant can show that a mechanical plow is not a feasible approach for the entire cable burial route, a mechanical plow, or zero to little jetting, should be considered to minimize impacts in the shallow tidal flat areas where the sediments properties support this method. The pocket penetrometer test results from the April 2014 sediment boring logs for the western flats (LB1 through LB-5) show sediment shear strengths in the top 48-inches of sediment are less than 14 kPa, the maximum shear strength allowable for use of a mechanical/shear plow based on a shear plow analysis completed for cable burial in Lake Champlain (ETA, 2010)[8]. This data suggests the alternative of using a mechanical plow (zero/reduced jetting) for the cable burial process in Little Bay was not adequately addressed. Additionally, the applicant has not addressed the comparative impacts of the proposed deeper burial and what are the differences in water quality impacts from a 42-inch burial compared to a 96-inch burial.

[8] Engineering Technology Applications, 2010. Southern Lake Champlain Plough Feasibility, Issue 2, October, 2010.

This document, prepared by Joseph Famely, provides Woods Hole Group's preliminary evaluation and analysis of the Seacoast Reliability Project (SRP), proposed by the Public Service Company of New Hampshire d/b/a Eversource (the Applicant) and submitted for approval to the New Hampshire Site Evaluation Committee (SEC). The evaluation focuses on potential ecological impacts related to the proposed burial of transmission cables in Little Bay, and is based on a review of the following SEC documents:

1. Pre-Filed Direct Testimony J Jiottis
   a. Attachment Jiottis
2. Pre-Filed Direct Testimony A Pembroke
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6. Appendix 3 Existing Conditions Maps
7. Appendix 7 SRP Natural Resource Existing Conditions Report
8. Appendix 13 Joint NHDES USACE Wetlands Permit Application
9. Appendix 14 NH DES Section 401 Water Quality Certification Request
10. Appendix 34 Natural Resource Impact Assessment
11. Appendix 35 Modeling Sediment Dispersion from Cable Burial for SRP Little Bay, NH
12. Appendix 37 Rare, Threatened and Endangered Species and Exemplary Natural Communities Report – Partially Confidential
13. Appendix 38 Essential Fish Habitat (EFH) Assessment
14. Pre-filed Testimony of Marc Dodeman, as substitution for Anthony Godfrey
15. Characterization of Sediment Quality Along Little Bay Crossing, Durham to Newington, NH

In reviewing these documents, I noted significant deficiencies in the Applicant's submittal due to various data gaps and analysis gaps which are described in the body of this evaluation. It is my opinion that these gaps resulted from the Applicant dismissing potential impacts or exposure pathways as insignificant without providing sufficient analyses to support these conclusions. The impact of these deficiencies is that the Applicant's SEC documentation does not contain sufficient information upon which to judge whether the SRP, specifically the burial of transmission cable under Little Bay, will have an unreasonable adverse effect on water quality or the natural environment.

Failure to follow an established risk assessment framework

The "*Characterization of Sediment Quality Along Little Bay Crossing*" report (Sediment Quality Report) relies entirely on "Appendix A: Ecological Risk Analysis" for the assessment of potential ecological risk from SRP installation activities in Little Bay. Appendix A purports to be an ecological risk assessment but fails to identify the ecological risk assessment guidance under which the analyses were conducted. By failing to identify and follow an established risk assessment framework, and instead borrowing some of the steps and procedures from the formalized and deliberate process of ecological risk assessment, the Sediment Quality Report's Ecological Risk Analysis misses important potential contaminants and exposure pathways for the proposed work in Little Bay. These deficiencies and gaps in both data and analysis result in a document that does not address the potential ecological impacts of disturbing and mobilizing sediments as proposed for the SRP.

There are well established standards of practice for conducting ecological risk assessments provided by the State of New Hampshire, the United States Environmental Protection Agency, the United States Army Corps of Engineers, the International Navigation Association, the Tri-Services Commission, and the National Forest Service (among others). Had the Applicant followed any one of these established risk assessment frameworks, the analyses would have produced a complete and representative assessment of potential ecological risks from cable burial (and associated) activities. The most critical (but not the only) elements, currently deficient in SRP documentation, that the Applicant would have been required to consider in adhering to an established risk assessment framework are:

- Development of the Site Conceptual Model would have required the Applicant to consider and address the ramifications of jet plowing and hand jetting activities in terms of mobilizing potential contaminants into the water column;
- Detailed consideration of the operational effects of jet plows and hand jets (i.e. the portion of sediments in the trench that are fluidized in place vs. the portion of sediments that are mobilized to the water column) would have formed the basis for the recommended sediment compositing plan;
- An understanding of the potential current and historical contaminants affecting Little Bay would have highlighted the importance of investigating parameters such as pesticides, herbicides, nitrogen, and bacteria;
- Integrated consideration of the aforementioned elements would have highlighted the importance of a robust investigation of the fine organic sediment fractions because of their propensity for contaminant adsorption and their vulnerability to water column suspension.

By not identifying the regulatory framework for the risk assessment (or standard guidance and associated technical updates), the Sediment Quality Report does not provide a sound basis upon which to judge whether the data and assessment are sufficient to justify conclusions regarding potential ecological risk.

As an ecological risk assessment professional, I recommend that the Sediment Quality Report and supporting analyses unambiguously follow the standards of practice for ecological risk assessment provided by any one of the many state or federal agencies. This would provide the reviewer with a standard "checklist" of whether the analysis has been conducted in an environmentally protective manner; clearly define the regulatory program under which the risk assessment is being performed; and assure the general public that the assessment has been done under some well-reviewed and universally accepted standards.

It is my opinion that, of all the available ecological risk assessment frameworks, the most applicable to the SRP is the USACE Regional Implementation Manual (RIM) and associated USACE technical publications for assessing the environmental impacts of dredged material management sites. Because the proposed cable installation techniques (jet plowing and hand jetting) disturb and partially suspend sediments in the water column until such time that the suspended particles resettle, it is functionally equivalent to a dredging and dredged material disposal project. This approach would place the analysis within a well-recognized standard of practice. If the analysis followed the requirements of the Tiered process in the RIM, it would provide a deliberate and standardized analysis that two federal agencies (USACE and USEPA) have reviewed and consider environmentally protective. This approach would also provide any reviewers of the documents a regulatory context and standardized format against which to assess the adequacy of the work. Finally, it would provide the general public with some assurance that the methods employed have been accepted by the engineering and scientific community as protective for this type of project.

Had the Applicant followed the RIM guidelines, the currently available data would not have been satisfactory for a Tier I evaluation. Current sediment chemistry data are not appropriate for Tier I evaluation because the 4-foot composite samples are not representative of the potential disturbance and mobilization of sediment to the water column (see below discussion of sediment compositing plan) or the post-construction benthic exposure zone. Additionally, the SRP analyses omitted pesticides, a standard group of contaminants recommended in Tier I RIM evaluations "based on their toxicity, their persistence in the environment, their ability to bioaccumulate and their widespread and consistent occurrence in New England estuarine, marine and freshwater sediments and organisms."[1] Further, because the proposed cable burial method will mobilize sediments to the water column, RIM would require a Tier II evaluation of compliance with state water quality standards using sediment concentrations and a numerical mixing model, as well as an evaluation of potential bioaccumulation for non-polar organic contaminants. If these numerical evaluations indicated potential risk, the RIM would then require a standard elutriate toxicity test. If Tier II analyses were inconclusive, further analysis would be required (such as water column and sediment toxicity tests, sediment bioaccumulation tests, long term bioassays and bioaccumulation tests, and risk modeling).

Neglect of water column exposure and potential impacts

[1] U.S. EPA New England and U.S. Army Corps of Engineers, New England District. 2004. Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters.

The "*Modeling Sediment Dispersion from Cable Burial for SRP*" report (Sediment Dispersion Modeling report) assumes that 25% of sediments are suspended by jet plow operation (the assumption for hand jetting is 50%). The literature cited in the Sediment Dispersion Modeling Report suggests that jet plow sediment suspension rates can vary between 10% and 35%.[2] Despite a direct acknowledgement in the Sediment Quality Report that the proposed cable installation methods "will necessarily disturb sediments and suspend them into the water column", there is no analysis (nor discussion in the conceptual site model) of the potential for contaminants to desorb from sediment particles and become suspended or dissolved in water column, nor of the potential for exposure of aquatic organisms to these contaminants (whether in dissolved or particulate phase).

The State of New Hampshire has established surface water quality standards (New Hampshire Code of Administrative Rules, Chapter Env-Wq 1700), which include criteria not only for the parameters assessed in the SRP Application for Water Quality Certification (Benthic Deposits [1703.08] and Turbidity [1703.11]) but also for bacteria, nutrients, metals, semi-volatile organic compounds (including PAHs), pesticides, and PCBs. Although the Applicant measured some of these contaminants in sediments (see also critique of sediment compositing plan), no modeling of potential water column concentrations was performed. The SRP Application for Water Quality Certification incorrectly assumed that no pollutant loading analysis was necessary because "the project proposes no increase in impervious surfaces and thus no changes in pollutant loading," ignoring the fact that the installation will mobilize historically buried sediments (to which pollutants could be adsorbed, suspended as particulates, and subsequently dissolved) to the water column.

The direct result of this gap in analysis is that, apart from turbidity and benthic deposits, there is no information available upon which to judge whether or not the proposed SRP activities in Little Bay could constitute a water quality violation.

In addition, Little Bay and surrounding waterbodies (Adams Point and Great Bay) are on New Hampshire's 2012 §303(d)[3] Clean Water Act list of water quality limited segments. The parameters upon which these impairment listings are based include:

- Light Attenuation Coefficient
- pH
- Dissolved Oxygen
- Nitrogen (Total)
- *Enterococcus*

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[2] Foreman, J., 2002. Resuspension of sediment by the jet plow during submarine cable installation. Submitted to GenPower, LLC, Needham, MA. Submitted by Engineering Technology Applications, Ltd, Romsey, Great Britain, May, 2002.

[3] http://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/a08-303d-list.pdf

- Fecal Coliform
- Polychlorinated biphenyls
- Dioxin (including 2,3,7,8-TCDD)
- Mercury

Because these waterbodies are currently being regulated on these parameters, the Applicant should demonstrate that SRP installation activities will not cause further impairment from construction-related sediment suspension.

Sediment compositing plan was based on inadequate information

The Sediment Quality Report was based on chemical analyses of 12 sediment cores from the planned cable installation corridor. The sampling plan called for the characterization of the top 4 feet of each vibracore in areas where the planned cable burial depth is 3.5 ft., and separate characterization of the upper (top 4 feet) and lower segments of each vibracore in areas where the planned cable burial depth is 8 ft. (unless physical stratification was observed and subsampling was required, which did not occur).

This sample compositing plan was not informed by the specific technologies to be used for cable installation, and therefore produced a dataset that is limited in its utility for determining potential impacts to biological communities from exposure to contaminants in suspended and resettled sediments. The Sediment Dispersion Modeling report assumes that 25% of sediments are suspended by jet plow operation, and that 50% of sediments are suspended by hand jetting. Based on a review of available literature[4] and consultation with an engineer with expertise in submarine cable projects[5], it is reasonable to assume that the portion of the sediment column that is suspended in the water column is the upper portion, and that deeper sediments fluidized in the trench stay in place. Thus, based on the assumptions used in the SRP model, it is reasonable to assume that the jet plow will suspend approximately the top 0.9 ft. of sediment in areas of 3.5 ft. burial, and will suspend approximately the top 2 ft. of sediment in areas of 8 ft. burial. Similarly, based on the assumptions used in the SRP model, it is reasonable to assume that hand jetting will suspend approximately the top 1.75 ft. of sediment in areas of 3.5 ft burial. The post-construction biologically active layer is potentially a mixture of the resettled sediments and adjacent surficial sediments which have sloughed in to the trench. Sediment sample compositing should be informed by the jetting suspension rates and the expected remnant surficial sediments in order to realistically quantify potential exposure and risk. Further consideration should be given to the fraction of those suspended sediments that remain suspended in the water column and subsequently may make contaminants available in the water column. The specific consideration of the fine silt and clay particles suspended by jetting is of

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[4] Foreman, J., 2002. Resuspension of sediment by the jet plow during submarine cable installation. Submitted to GenPower, LLC, Needham, MA. Submitted by Engineering Technology Applications, Ltd, Romsey, Great Britain, May, 2002.

[5] Personal communication, Payson Whitney, ESS Group. February 15, 2017.

particular importance because higher levels of contamination are typically associated with these fine organic fractions. For these reasons, the 4-foot composites analyzed for the Sediment Quality Report are inappropriate for characterizing ecological risk and not grounded in the physical and technological processes of the jetting installation processes.

Further, the Sediment Quality Report's compositing plan yielded sediment data that is not comparable to either the National Coastal Condition Assessment (NCCA) data or the ecological sediment benchmarks referenced in the Sediment Quality Report. The standard operating procedures for the National Coastal Condition Assessment specify the use of Young-modified Van Veen Grab (or similar) samplers which collect surficial (7 cm) sediment samples[6] for chemical and other analyses. The comparisons made between NCCA data and SRP cores are inappropriate because the sampling and compositing methods were different. Therefore, the conclusion that sediment conditions in the planned cable installation corridor are consistent with NCCA sediment conditions for Little Bay (classified as "good") is not valid. Similarly, the ecological sediment benchmarks used as an "initial screening level review" in the Sediment Quality Report – the Effects Range Low (ER-L) and Effects Range Median (ER-M)[7] – were developed from sediment toxicity test data using benthic organisms that inhabit the top 6 to 12 inches of sediment. It is therefore inappropriate to compare a 4-foot composite sample to these benchmarks unless the cable installation process homogeneously mixed all sediments within the trench, and that completely homogeneous mixture was representative of the post-construction biologically active layer. Since all accounts of the jetting process presented by the Applicant and in the literature suggest that jet plows are designed to minimize sediment disturbance and suspension, comparison of a 4-foot composite sample to the ER-L or ER-M is not valid. Therefore, there is not sufficient information upon which to base a judgment of whether post-construction sediment passes the Applicant's proposed "initial screening level review".

Finally, it is likely that the compositing plan resulted in physical averaging over the 4-foot horizon. Therefore, any signal from legacy contamination associated with a particular (historical) sediment layer would have been lost due to mixing with other (cleaner) layers.

For these reasons, the conclusion that the sediments in the planned cable installation corridor do not pose a potential risk to ecological receptors is predicated on a faulty and misinformed sample compositing scheme and non-compatible comparisons.

Incomplete list of constituents of potential concern

The Sediment Quality Report lists the constituents of potential concern for sediments as the parameters required by the USACE Regional Implementation Manual (RIM), plus a selection of

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[6] USEPA. 2014. National Coastal Condition Assessment: Field Operations Manual. EPA-841-R-14-007. U.S. Environmental Protection Agency, Washington, DC.

[7] Long E.R., L.G. Morgan, 1990. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52. National Oceanic and Atmospheric Administration. Seattle, Washington. 1990

other contaminants (total petroleum hydrocarbons, dioxins/furans, perfluoro compounds) in response to regional concerns. The list of contaminants analyzed by the Applicant is incomplete for two reasons: the list excludes some contaminants required by the RIM, and it excludes some other contaminants that are of particular concern for Little Bay. These omissions represent data gaps in the SRP evaluation that inhibit the complete assessment of potential ecological risks from exposure to reworked and suspended sediments due to SRP cable burial activities.

First, the Applicant omitted the following contaminants – which are listed as the required contaminants in the RIM[8] – from its list of parameters analyzed in Little Bay sediment cores:

- Aldrin
- cis- and trans-Chlordane
- cis- and trans-Nonachlor
- Oxychlordane
- 4,4'-DDT, DDE, DDD
- Dieldrin
- alpha- and beta-Endosulfan
- Endrin
- Heptachlor
- Heptachlor epoxide
- Hexachlorobenzene
- Lindane
- Methoxychlor
- Toxaphene

The omission of these pesticides, which are routinely required for analysis under the RIM, is a major data gap because it ignores a significant class of contaminants that falls under regulatory jurisdiction. These contaminants were included in the RIM framework "based on their toxicity, their persistence in the environment, their ability to bioaccumulate and their widespread and consistent occurrence in New England estuarine, marine and freshwater sediments and organisms"[9]. The disturbance and potential mobilization of legacy pesticides, both within the biologically active benthic zone and to the water column, is a potentially significant exposure pathway that should have been addressed.

Second, the Applicant omitted the following contaminants – which could occur and potentially impact benthic and aquatic organisms, if released – from its list of parameters analyzed in Little Bay sediment cores:

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[8] U.S. EPA New England and U.S. Army Corps of Engineers, New England District. 2004. Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters.

[9] U.S. EPA New England and U.S. Army Corps of Engineers, New England District. 2004. Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters.

- Herbicides, because they have potentially been introduced historically to Little Bay via stormwater runoff
- Nitrogen, because it is listed as a source of impairment for Little Bay, Adams Point, and Great Bay in New Hampshire's 2012 §303(d)[10] Clean Water Act list of water quality limited segments. Additionally, recent studies[11] demonstrated that resuspension of sediments leads to a release of nitrogen to the water column in concentrations that suggest desorption from resuspended particles. Quantification of this release is critical given the §303(d) listing and current efforts to limit nitrogen input to Little Bay.
- *Enterococcus* bacteria, because it is listed as a source of impairment for Little Bay, Adams Point, and Great Bay in New Hampshire's 2012 §303(d)[12] Clean Water Act list of water quality limited segments.
- Pathogens (e.g. *Clostridium perfringens* and *Vibrio*), because of potential impacts to shellfishing and oyster aquaculture if mobilized from sediments under certain enabling conditions.
- Fecal coliform, because it is listed as a source of impairment for Little Bay, Adams Point, and Great Bay in New Hampshire's 2012 §303(d)[13] Clean Water Act list of water quality limited segments.

Due to these data gaps, it impossible to make a wholly informed judgment as to the potential for ecological risk from SRP activities in Little Bay.

Potential Impacts to Oysters

The Natural Resource Impact Assessment concludes that there will be no impact from suspended sediments to oysters in natural and restored beds or in aquaculture because exposure to suspended sediments would be too low to elicit any effects, and because sedimentation in the vicinity of the oyster beds and aquaculture areas would be ≤0.5 mm. These conclusions were based on the findings in Wilber and Clarke (2001)[14]. The Applicant should re-examine potential impacts to oysters considering both the model sensitivity analysis (recommended by

[10] http://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/a08-303d-list.pdf

[11] Percuoco, VP, LH Kalnejais, and LV Officer. 2015. Nutrient release from the sediments of the Great Bay Estuary, NH. USA. Estuarine, Coastal and Shelf Science. 161:76-87.

[12] http://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/a08-303d-list.pdf

[13] http://www.des.nh.gov/organization/divisions/water/wmb/swqa/2012/documents/a08-303d-list.pdf

[14] Wilber, D. H. and D. G. Clarke. 2001. Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with a Relation to Dredging Activities in Estuaries. North American Journal of Fisheries Management 21: 855-875.

M. Shultz, Woods Hole Group) and in light of more recent literature review[15] by the same authors. The assessment of potential impacts due to excess turbidity and sedimentation should focus especially on sensitive life stages.

Additionally, the mobilization of sediments to the water column could expose oysters to various chemical and bacterial constituents which could have adverse effects on sensitive life stages or on commercially viable stocks. These potential impacts need to be reviewed in order to ensure the ecological health of oyster (and other shellfish) populations/stocks as well as to safeguard against potential public health issues.

Assessment of Life-cycle Impacts of the Cable Burial Incomplete

The Sediment Dispersion Modeling report and the derivative impact assessment documents focus on the potential impacts of SRP construction in Little Bay. Based on the various critiques of these assessments presented in this preliminary analysis and in the preliminary analyses of M. Schultz (Woods Hole Group) and M. Dacey (GeoInsight), it is my opinion that cable installation impacts have not been sufficiently addressed by the Applicant because there are significant gaps in data and analyses in the Applicant's evaluation of cable installation impacts. In addition, the other components of the project that are lacking in quantitative impact analysis are:

- Removal of sections of existing out of service cables from Little Bay prior to SRP construction
- Excavation of SRP cables from Little Bay during project service life for repair and maintenance
- Removal of SRP cables from Little Bay at their end of service life

The assessment of the cumulative life cycle impacts of the SRP cable burial in Little Bay is incomplete because it ignores these activities which "will necessarily disturb sediments and suspend them into the water column". The Applicant should discuss the methods, timing, and spatial extent of these activities, and quantitatively assess their impacts because the SRP impact assessments are inadequate in their absence.

Water Quality Monitoring Plan is Inadequate

The water quality monitoring plan (the Monitoring Plan) presented in the Little Bay Environmental Monitoring Plan (Appendix D of SRP "*Application for Water Quality Certification*") is inadequate because it is predicated on unsubstantiated assumptions, is too permissive in its definition of what conditions constitute a water quality violation, and does not

[15] Wilber, D. H., and D. G. Clarke. 2010. "Dredging activities and the potential impacts of sediment resuspension and sedimentation on oyster reefs." Proceedings of the Western Dredging Association Thirtieth Technical Conference, San Juan, Puerto Rico. Vol. 6169.

provide a framework for real-time adaptive management of water quality during construction activities.

The Applicant proposes to implement a mixing zone because the construction activities are expected to cause exceedances of the water quality criterion for turbidity (increases greater than 10 NTU above background). The Monitoring Plan asserts that the proposed mixing zone "complies with all Minimum Criteria established in Env-Wq 1707.02" but does not present evidence to substantiate this claim. Although some of this information may be presented in various other parts of the SRP application, the relevant information should be summarized (at minimum) in the Application for Water Quality Certification to substantiate the claim that the proposed mixing zone:

a) Meets the criteria in Env-Wq 1703.03(c)(1);
b) Does not interfere with biological communities or populations of indigenous species;
c) Does not result in the accumulation of pollutants in the sediments or biota;
d) Allows a zone of passage for swimming and drifting organisms;
e) Does not interfere with existing and designated uses of the surface water;
f) Does not impinge upon spawning grounds and/or nursery areas of any indigenous aquatic species;
g) Does not result in the mortality of any plants, animals, humans, or aquatic life within the mixing zone;
h) Does not exceed the chronic toxicity value of 1.0 TUc at the mixing zone boundary; and
i) Does not result in an overlap with another mixing zone.

The Monitoring Plan lists the following procedures for the determination of compliance with the turbidity criterion based on field monitoring of turbidity 1,000 ft. up-current and 1,000 ft. down-current of the construction activity:

- The three water column measurements collected at each impact and each reference station will be averaged for each hour
- Average values at an impact station will be compared to the range of reference station averages for that hour
- If average turbidity at any impact station exceeds the highest reference station value by <10 NTUs at a given time, the difference between values will be considered to be insignificant
- If average turbidity at any impact station exceeds the highest reference station value by more than 10 NTUs for that particular hour, but does not exceed the highest reference station value the following hour, then the exceedance is considered to be insignificant
- If average turbidity at any impact station exceeds the highest reference station value by more than 10 NTUs for two consecutive hours, then further evaluation will be required

These procedures for the determination of compliance with the turbidity criterion are too permissive in their design and are not grounded in an understanding of the potential impacts of SRP construction or the regulations. The Monitoring Plan proposes that turbidity will be measured at the near-surface, mid-depth, and near-bottom. It is reasonable to monitor these three strata in the water column because many factors (including temperature, salinity, currents, sediment particle size) can influence where suspended sediments migrate in the water column after initial entrainment. What is unreasonable, however, is that the Applicant intends to average these three measurements for comparison to similar water column averages from the reference stations. Averaging both dilutes the signal in the impact area and ignores the very different assemblages of organisms that may be exposed to the turbidity plume during construction. In addition, the Applicant proposes that the determination of significance should be based solely on the duration of exceedance – an exceedance lasting less than 2 hours is judged to be insignificant. This determination is not appropriate because Env-Wq 1708.09 does not allow for a determination of significance based on duration. The State regulations regarding the determination of significance assert that an activity is significant if it is "projected to use 20% or more of the remaining assimilative capacity for a water quality parameter". Thus, the Applicant should base the determination of significance on an assessment of assimilative capacity for Little Bay.

The Applicant's Monitoring Plan allows for further permissiveness in the determination of significance because turbidity exceedances of more than 10 NTU above background for more than 2 hours are not automatically judged to be significant, but rather will be passed along to the regulatory agencies for comparison to the range of available historical data (for Fall months) from the CICEET buoy[16] in Great Bay. Judgment of the significance of water quality criterion exceedances should not be based on post-hoc data analysis by regulatory agencies. These determinations are regulated under the New Hampshire Surface Water Quality Regulations (Env-Wq 1700), promulgated by the New Hampshire Department of Environmental Services, and the Applicant should present an analysis of remaining assimilative capacity rather than proposing alternative methods for these determinations.

Finally, the Monitoring Plan asserts that it is not feasible to stop and re-start jet plow operations without risking additional sediment disturbance, and therefore the results of the water quality monitoring for the first installation will inform adjustments to subsequent installations. This argument is flawed because it is entirely within the contractor's control to adjust the water pressure and rate of advancement of the jet plow during installation[17]. Thus, the Monitoring Plan should be modified such that it allows for real-time adaptive management of the jet plow operation in response to ongoing turbidity monitoring. Instead of a turbidity criterion exceedance triggering further post-hoc comparisons, any exceedance should trigger real-time management measures to reduce turbidity in addition to post-hoc analysis to inform subsequent installation parameters.

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[16] The "CICEET buoy" referenced in the Applicant's Monitoring Plan is now managed by the Northeastern Regional Association of Coastal Ocean Observing Systems (NERACOOS). Another useful source of regional turbidity data is the Great Bay National Estuarine Research Reserve (GBNERR) buoy in Great Bay, which is referenced in the Natural Resource Existing Conditions Report but omitted from the Monitoring Plan.

[17] Personal communication, Payson Whitney, ESS Group. February 15, 2017.

The Applicant should revise and expand the proposed water quality monitoring plan in order to ensure that all anticipated impacts from the project are documented and evaluated against the appropriate criteria. The plan should expand the duration of pre- and post-disturbance monitoring. Because of the high variability in ambient turbidity presented by the Applicant, it is important to know what the conditions are more than just one hour before commencing construction. Because the sediment plume can remain suspended in the water column, and this suspension may be influenced by environmental conditions, it is important to confirm the model's prediction that the plume dissipates two hours after termination of construction by extending post-disturbance monitoring until downstream turbidity is not significantly different from upstream (reference) turbidity. Most importantly, turbidity should not be the only parameter monitored during construction. In order to effectively detect and manage potential impacts, the Applicant should design the monitoring plan to account for all parameters under the jurisdiction of the State of New Hampshire surface water quality standards (New Hampshire Code of Administrative Rules, Chapter Env-Wq 1700) as well as the parameters listed as limiting factors on New Hampshire's 2012 §303(d) listings for Little Bay and adjoining segments.

Lack of Electromagnetic Field Monitoring Plan

The Natural Resource Impact Assessment acknowledges that little is known about how benthic invertebrates respond to electromagnetic fields (EMFs), citing a BOEMRE (prepared by Normandeau) study[18] on EMFs from submarine power cables. This BOEMRE study recommends monitoring EMF once the cable is powered in order to verify the modeled level of exposure and determine if any impacts have occurred, however an EMF monitoring plan is not included in any monitoring plans reviewed in the SEC application. The Applicant should follow its own consultant's published recommendations regarding monitoring the effectiveness of EMF mitigation measures, and design an EMF monitoring plan for the SRP accordingly.

Turbidity and TSS Data Used to Establish Ambient Range Should be Thoroughly Vetted

The SRP "*Natural Resource Existing Conditions Report*" (Existing Conditions Report) presents very large ranges for turbidity and total suspended solids (TSS) in the vicinity of the SRP planned cable installation corridor. These measurements need to be thoroughly vetted in order to develop an accurate and representative understanding of ambient water quality conditions in immediate and adjacent waterbodies, especially for the time of year of planned SRP construction (late Fall and early Winter). Although these turbidity and TSS measurements do not directly frame the threshold upon which to judge a water quality violation (the Environmental Monitoring Plan sets up turbidity monitoring up-current and down-current of the construction area), their accuracy is nonetheless important because Applicant has proposed a contingency for judging exceedance significance based on historical turbidity data.

[18] Normandeau, Exponent, T. Tricas, and A. Gill. 2011. Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Regulation, and Enforcement, Pacific OCS Region, Camarillo, CA. OCS Study BOEMRE 2011-09.

The Existing Conditions Report presents turbidity data for Great Bay over four years (2009-2013) from the months April – December, omitting data from January – March. Although mean turbidity is generally low, maximum values can exceed the mean by two orders of magnitude. These data are not representative of the expected conditions during SRP construction because they include Spring and Summer data, when no construction activity will take place. Further, factors such as precipitation, wind, waves, currents and ice scour can affect turbidity, but the Applicant does not present an analysis correlating turbidity to any of these factors. Therefore, given the data presented by the Applicant, it would be impossible for a regulatory agency to judge the significance of a water quality exceedance in the short window of time between individual cable burials.

The Existing Conditions Report also presents TSS data for Adams Point (Table 3.4-8), indicating that TSS was statistically higher during 2001-2008 than during 1974-1981. The standard deviations of these datasets were very high. Additionally, it has been reported[19] that Winter (January – March) TSS data from Adams Point collected between approximately 2003 and 2014 are biased high due to the method of sampling. For these years, when the floating docks at Jackson Estuarine Lab were removed to prevent ice damage, TSS samples were collected via wading instead of by boat (in the channel). Investigators comparatively demonstrated that these nearshore data are not comparable to channel data (historically taken at end of pier or by boat) because wading samplers could not avoid the back eddies and shallow water resuspension. Therefore, some of the data presented in Table 3.4-8 are likely biased high and should not be relied upon to establish the ambient conditions for Little Bay without further investigation.

The Applicant should address this variability in greater detail and present an expected possible range of turbidity (or TSS) levels for the period of SRP construction in order to best anticipate potential impacts of additional suspended solids from construction. Also, the applicant should more thoroughly explain other factors affecting background turbidity levels (precipitation, wind, waves, currents, ice scour).

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[19] Personal communication, Dr. Stephen Jones, UNH. February 15, 2017.