NORMANDEAU ASSOCIATES
Environmental Consultants

Eversource Energy

Seacoast Reliability Project
Water Quality Monitoring Plan
Revised Final

Prepared For:
Eversource Energy
13 Legends Drive
Hooksett, NH 03106

Submitted On:
September 6, 2019

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

www.normandeau.com

Table of Contents

Page

List of Figures

Page

List of Tables

Page

1.0 Introduction

Eversource's Seacoast Reliability Project (SRP) will involve burying three cables in the sediments crossing Little Bay north of Adams Point within a corridor previously identified as "Cable Area" on navigation charts. The planned installation methods, primarily jet plow and hand burial, will release some sediment into the water column creating a turbidity plume that will move with the tides and with the progress of installation along the route. Analysis of the sediments along the route indicated that, while various organic and inorganic contaminants are present they are typically at low levels and within the ranges observed elsewhere in Little Bay. All contaminants were below the concentrations likely to cause ecological impairment with the exception of arsenic which averaged slightly above levels shown to have a potential for ecological response. Arsenic is naturally occurring in bedrock in NH, and the levels observed are not uncommon for the state.

Eversource's consultant RPS prepared hydrodynamic models predicting the extent of the resulting turbidity plume based on different construction conditions described by representatives of a firm highly experienced with the operation of a jet plow. These models showed that the plume would be tidally-driven and ephemeral, occupying only a narrow, elongated area in the bay at any given time. Appendix A shows the hourly progression of the plume across the bay as the jet plow advances at different rates.

Models were run for two operating scenarios that differed primarily on the rate at which the jet plow advanced across Little Bay (RPS 2016, 2017). Based on the jet plow advance rates provided by the installer, the two models estimated that each cable installation via jet plow could take between 7 and 13 hours; this was then combined with tidal conditions to show the likely range of the resulting suspended sediment plume. These predictions were used to determine the proposed boundaries of the project mixing zone for turbidity (Figure 1), defined by the regulatory turbidity criterion of 10 NTUs above background (roughly equivalent to 20 mg/L TSS based on a site specific study for which results are summarized in Appendix B). Based on these modeling results and the sediment contaminant analysis, Eversource concluded that the plume has the potential to cross portions of some aquaculture lease sites at very low concentrations of suspended sediments for short periods of time (minutes to a few hours). In order to adhere to NHDES' condition that the mixing zone not cross any aquaculture areas containing product (oysters), Eversource has worked with the licensees to coordinate with their production schedule. Eversource has coordinated with the license holders of the two aquaculture operations closest to the cable area to ensure that they will be empty of oysters at the time of cable installation. The southernmost and western lease areas for Fat Dog Oyster are expected to be empty of oysters at the installation time. Fat Dog's wintering area is not expected to be affected but will be monitored for water quality. Joe King Oysters will also be monitored.

NH DES's primary requirements related to water quality monitoring are addressed in four conditions:

- Condition 40 – Independent Environmental Monitor
- Condition 44 – Mixing Zone
- Condition 45 - Water Quality Monitoring and Adaptive Management Plan
- Condition 60b – Jet Plow Trial Run

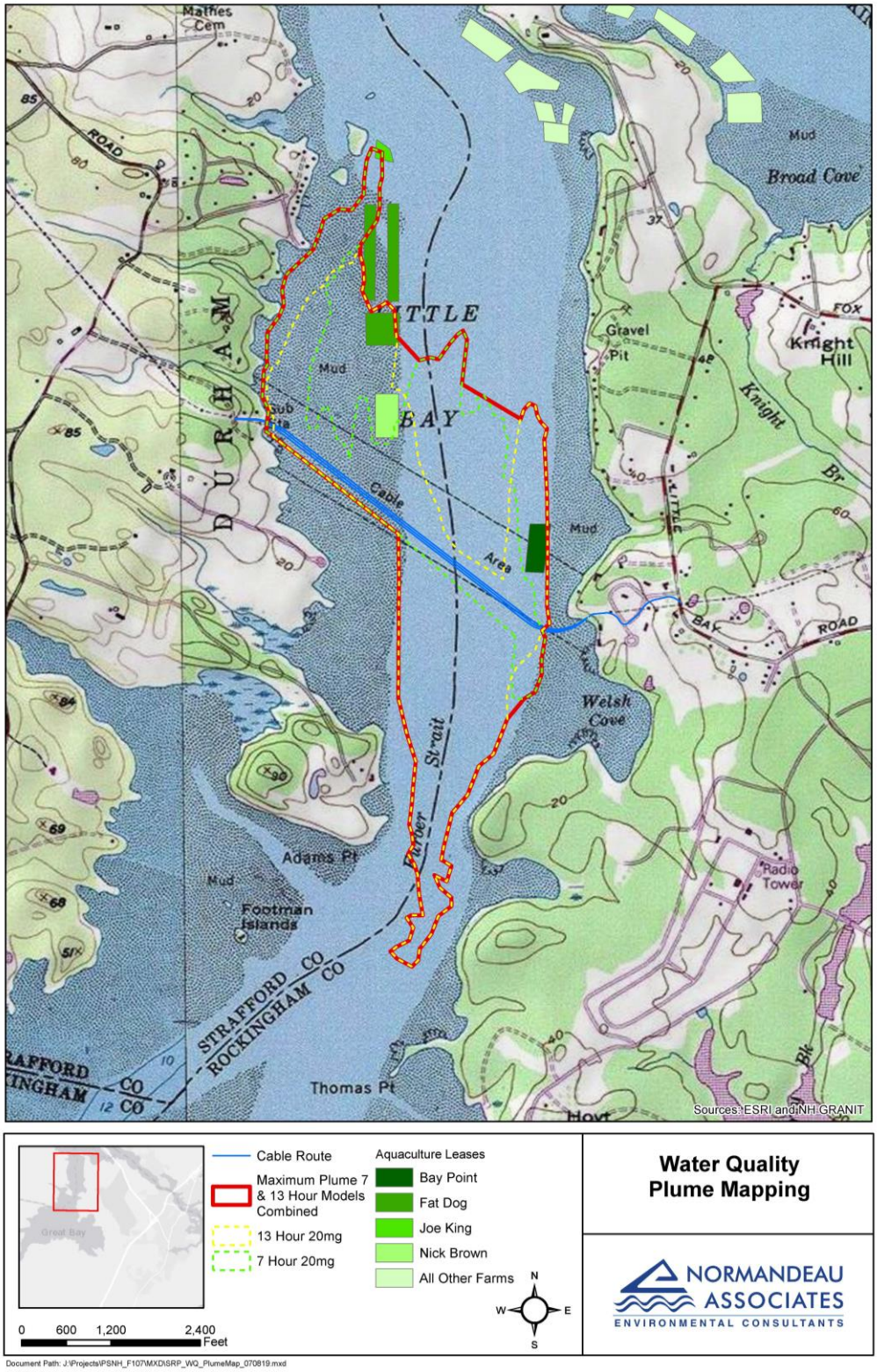


Figure 1. **SRP Modeled extents of sediment plumes for 7 and 13 hour jet plow crossings, and proposed mixing zone.**

This document addresses each of these conditions and specifies the monitoring and adaptive management protocols to be followed during the jet plow trial run, jet plow installation of cables, and hand jetting. See these and other relevant conditions in Appendix C.

Eversource plans to follow this schedule in fall 2019 for installation of the cables in Little Bay:

- Jet plow trial run – early September
- Cable installation
    - 1st cable
        - Jet plow – three weeks after trial run (early October)
        - Hand jet – eastern offshore section (no silt barrier) – for several days immediately following installation in accordance with Condition 58 in Appendix C
    - 2nd cable
        - Jet plow – 5-7 days after 1st cable (mid-October)
        - May be divided over 2 days due to adverse tides.
        - Hand jet – eastern offshore section (no silt barrier) – for several days immediately following installation in accordance with Condition 58 in Appendix C
    - 3rd cable
        - Jet plow – 5-7 days after 2nd cable (mid-late October)
        - Hand jet – eastern offshore section (no silt barrier) – for several days immediately following installation in accordance with Condition 58 in Appendix C
    - Hand jetting within silt barriers – after 3rd cable has been plowed in (late October-mid-November) in accordance with Condition 58 in Appendix C

2.0 Independent Environmental Monitor (Condition 40)

NHDES Condition 40 states that: *At least sixty (60) days prior to installing cable in Little Bay, the Applicant shall retain an Independent Environmental Monitor for work in Little Bay at the Applicant's expense. The selection of the Independent Environmental Monitor shall be approved by NH DES. The Independent Environmental Monitor shall be empowered to order corrective actions related to surface water quality and to order the temporary cessation of construction activities until corrective action has been implemented.*

Eversource has engaged a qualified Independent Environmental Monitor (IEM) who has been approved by NH DES. The IEM is becoming familiar with the planned project activities including the environmental monitoring plans. This has enabled the IEM to gain full understanding of all of the environmental conditions placed on the project, interact with the construction operators and environmental monitoring crew members, and NH DES. The IEM will participate in the training required under Condition 50. The training program will include both an oral and a written presentation of all of the environmental concerns associated with in-water installation of the cables and will take place about 30 days prior to the planned jet plow trial run.

The IEM will typically be stationed on the main construction vessel so s/he will have immediate access to the operator(s). As described in Section 5.1 of this document, the IEM will be in constant communication with the field monitoring crew, the environmental manager for the construction contractor, and the construction operator(s). The IEM will also have direct communication with NHDES during all in-water sediment disturbing operations.

As will be documented during the pre-construction training (Condition 50), the IEM will be involved in review of weather and wind conditions (Conditions 53 and 54) to ensure that appropriate decisions are made for allowing in-water construction to proceed on a given day. The IEM will maintain a daily log of all activities to be submitted to NHDES on a weekly basis unless NHDES determines that another schedule is preferable.

3.0 Mixing Zone (Condition 44)

NHDES Condition 44 states: *"At least sixty (60) days prior to the start of construction in Little Bay, the Applicant shall submit a mixing zone request to the NHDES Watershed Management Bureau for approval that includes a description and map showing the proposed mixing zone in Little Bay, justification for the proposed limits of the mixing zone and documentation demonstrating that the proposed mixing zone complies with the minimum criteria in administrative rules Env-Wq 1707.02.*

The mixing zone shall be established for all jet plow and hand-jetting activities. Prior to submitting the proposed mixing zone request, the Applicant shall determine if there are any new aquaculture operations in Little Bay. Unless otherwise authorized by NH DES, the mixing zone shall not include any portion of an aquaculture site that has aquaculture product (i.e., oysters, etc.) in the water during and up to 24 hours following jet plow and hand-jetting activities."

3.1 Proposed Mixing Zone

Eversource's Seacoast Reliability Project (SRP) will require burying three cables in the sediments crossing Little Bay north of Adams Point within a corridor previously identified as "Cable Area" on navigation charts (Figure 1). The planned installation methods, primarily jet plow and hand burial, will release sediments into the water column creating an ephemeral turbidity plume that will move with the tides and with the progress of installation along the route. Analysis of the sediments along the route indicated that, while various organic and inorganic contaminants are present, they are typically within the ranges observed elsewhere in Little Bay. With the exception of arsenic which was slightly elevated (but in a similar range to that observed elsewhere in upper Little Bay), all contaminants were below the concentrations likely to cause ecological impairment.

As described in information provided to the Site Evaluation Committee (SEC) during its proceedings and to the NHDES during the project application process, based on the regression analysis for turbidity versus total suspended solids (TSS) developed in a site-specific study for the SRP (see Appendix B), turbidity measurements of 10 NTUs were determined to convert to TSS concentrations of approximately 20 mg/L in Little Bay. Therefore the turbidity compliance standard in Env-Wq

1703.11(b)[1] of 10 NTUs above background at the proposed turbidity mixing zone compliance boundary converts to approximately 20 mg/L of TSS above background.

The predicted extent of the mixing zone based on the combined plume extents from the models depicting the rapid (7-hour crossing) and slow (13-hour crossing) jet plow advance rates is presented in Figure 1. The actual areal extent of the mixing zone where TSS of greater than 20 mg/L above background (equivalent to 10 NTUs above background) is predicted to occur will be temporary, relatively localized and narrow at any given time (see hourly plume depictions in Appendix A). The mixing zone is predicted to move with the jet plow as it moves across the bay. Therefore, while Figure 1 demonstrates the potential overall area where 20 mg/l of TSS above background may be exceeded, the mixing zone at any given time is predicted to be much smaller. The dynamic and relatively narrow nature of the impacts to surface water quality by jet plow operations also have been considered in the development of SRP's proposed water quality monitoring plan.

The three cable installations via jet plow operations will occur in 5 to 7 day intervals over several weeks. Eversource anticipates that both spring and neap tides will be encountered during the jet plow installation. Modeling assumed spring tide conditions in order to identify the farthest extent of the potential turbidity plume; these conditions are also assumed for the purposes of selecting station locations at the edge of and within the mixing zone and for reference stations. Modeling examined the likely extremes in terms of duration – as short as seven hours and as long as thirteen hours. Under the semi-diurnal tidal conditions existing in the bay and the logistical requirement that jet plowing be initiated at about slack high tide, the crossing is likely to occur primarily on an ebbing tide with a northerly flowing plume, however the crossing will encounter a change from ebb to flood tide at some point. Because it is not possible to predict the actual duration of the jet plow crossing, Eversource utilized the estimated position of the turbidity mixing zone compliance boundary (i.e., the estimated location of the turbidity contour line of 20 mg/L TSS above background, which is equivalent to 10 NTU above background during the jet plow crossing) from the maximum time integrated plan for both the 7-hour and 13-hour crossing durations to identify station locations.

The requested mixing zone for compliance with turbidity water quality standards based on the above summary and referenced studies is represented by the red line in Figure 1. The requested mixing zone for compliance with water quality criteria for the protection of aquatic life for dissolved oxygen, dissolved arsenic (acute and chronic levels), dissolved copper (acute and chronic levels), and ammonia (acute and chronic levels) is located 500 feet to the north and south of the proposed cable centerline (i.e., at the near-field stations discussed in Section 4).

3.2 Compliance with the Minimum Criteria in Env-Wq 1707.02

SRP will meet the criteria in Env-Wq 1703.03(c)(1) (Env-Wq 1707.02(a).
These criteria will be met because:

- No formation of harmful benthic deposits, foams or other visible substances will occur. Although the model predicts that there will be some redeposition of disturbed sediments beyond the footprint of the jet plow this is will not be harmful to the Little Bay ecosystem because

[1] Env-Wq 1703.11 (d) For purposes of state enforcement actions, if a discharge causes or contributes to an increase in turbidity of 10 NTUs or more above the turbidity of the receiving water upstream of the discharge or otherwise outside of the visible discharge, a violation of the turbidity standard shall be deemed to have occurred.

i. The sediments do not contain contaminants in higher concentrations than in other places in Little Bay
ii. The sediment grain size in the jet plow footprint is comparable to nearby substrates and will therefore be suitable for recolonization by benthic infauna

- No flotation of foam or other visible substances will occur.
- No odors, color or turbidity that would render the water unsuitable for designated uses will occur after project completion. Turbidity will be present temporarily in the mixing zone during construction as allowed by Env-Wq 1700.
- No nuisance species intrusion or interference with recreational activities will occur except as allowed by the SEC during construction when recreation will be prohibited for public safety in a small area of Little Bay during jet plowing.

SRP will not interfere with biological communities or populations of indigenous species (Env-Wq 1707.02 (b)):

- The disturbed sediments do not contain concentrations of contaminants that have the potential to elicit lethal or sublethal effects in exposed organisms for within the short duration of potential exposure.
- Redeposited sediments will be available and suitable for recolonization by a similar benthic infaunal community to that observed locally. The benthic monitoring plan will demonstrate the Project's compliance with this requirement.
- The highly ephemeral and localized nature of the sediment plume means that the majority of the width of Little Bay will be unaffected by the plume at any given time and therefore be available for passage across the cable route by organisms.
- Highest concentrations of excess TSS will be restricted to the area immediately around the jet plow and will dissipate rapidly so that the exposure of organisms to elevated suspended sediments will be unlikely to reach a duration that would elicit sublethal or lethal effects (Wilbur and Clarke (2001).

SRP will not result in the accumulation of pollutants in the sediments or biota (Env-Wq 1707.02 (c));

- The project will not introduce contaminants into Little Bay. The "discharge" from the jet plow will consist of Bay water. Although sediments will be redistributed to the immediately adjacent substrate, sediment contaminant loads along the route are similar to other places in upper Little Bay (Normandeau 2017a).
- The shellfish tissue monitoring plan will demonstrate the Project's compliance with this requirement.

SRP will provide zone of passage for swimming and drifting organisms (Env-Wq 1707.02 (d));

- As shown in Appendix A, RPS 2015 (Figures 3-4 through 3-7) described the sediment plume associated with a slow passage (13 hour) across Little Bay and RPS 2017 (Figures 3-7 through 3-9) depicted a fast passage (7 hour) across Little Bay. Both scenarios indicated the plume will be localized and generally be narrow and elongated. At no point during the jet plow transit will the plume extend across more than a small portion of the bay's width. In addition, the highest TSS concentrations will be restricted to near bottom waters in the immediate vicinity of the jet plow. Mobile organisms will be able

to avoid areas where TSS levels are highest by either moving laterally or vertically above these areas (Normandeau 2016).

SRP will not interfere with existing and designated uses of the surface water (Env-Wq 1707.02 (e));

- Effects of SRP on Little Bay water quality will be restricted to construction with the primary effects occurring during the jet plow installations, a process that will be limited to less than one day for the jet plow trial run and for one day for each of the three cable installations.

SRP will not impinge upon spawning grounds or nursery areas, or both, of any indigenous aquatic species (Env-Wq 1707.02 (f));

- There are no identified anadromous fish spawning or nursery grounds in the immediate project area. While winter flounder could spawn in the project area, construction will take place well after the winter-spring spawning period for this species. Oysters typically spawn in the summer in the Great Bay system and most planktonic larvae will have metamorphosed and settled to the substrate by mid-September when the jet plow will start (Normandeau 2016 and Normandeau 2017b).

SRP will not result in the mortality of any plants, animals, humans, or aquatic life within the mixing zone (Env-Wq 1707.02 (g));

- A small percentage of the planktonic organisms occurring in Little Bay will be pulled into the jet plow water system and will be killed. Given the small volume of water required for operation of the jet plow it is unlikely this mortality will be discernable from natural mortality.

The chronic toxicity value of 1.0 TUc is not a concern at the mixing zone boundary for the project (Env-Wq 1707.02 (h));

- The disturbed sediments do not contain concentrations of contaminants that have the potential to elicit lethal or sublethal effects in exposed organisms for the short duration of potential exposure. This standard is intended primarily for continuous discharges of toxics from wastewater treatment plants to receiving waters that could cause chronic exposure to toxins for aquatic organisms. For SRP, turbidity caused by disturbance of bottom sediments for short durations by jet plow operations is the only concern at the mixing zone boundary. Chronic toxicity is not a concern for these sediments and for short term jet plow operations.
- The water quality monitoring plan will demonstrate compliance with this requirement.

3.3 No Aquaculture Product Within the Mixing Zone during the Project

The SEC has required that the mixing zone *"not include any portion of an aquaculture site that has aquaculture product (i.e., oysters, etc.) in the water during and up to 24 hours following jet plow and hand-jetting activities."* To address this concern, Eversource has had discussions with the aquaculture leaseholders potentially affected (Fat Dog Shellfish, Joe King Oysters, Bay Point Oysters, and Nick Brown) to ensure that they will not have oysters in the mixing zone during jet plowing and hand jetting. The closest cultured oysters are expected to be in Fat Dog's winter lease area, the easternmost rectangle directly north of fixed station 32 on Figure 2.

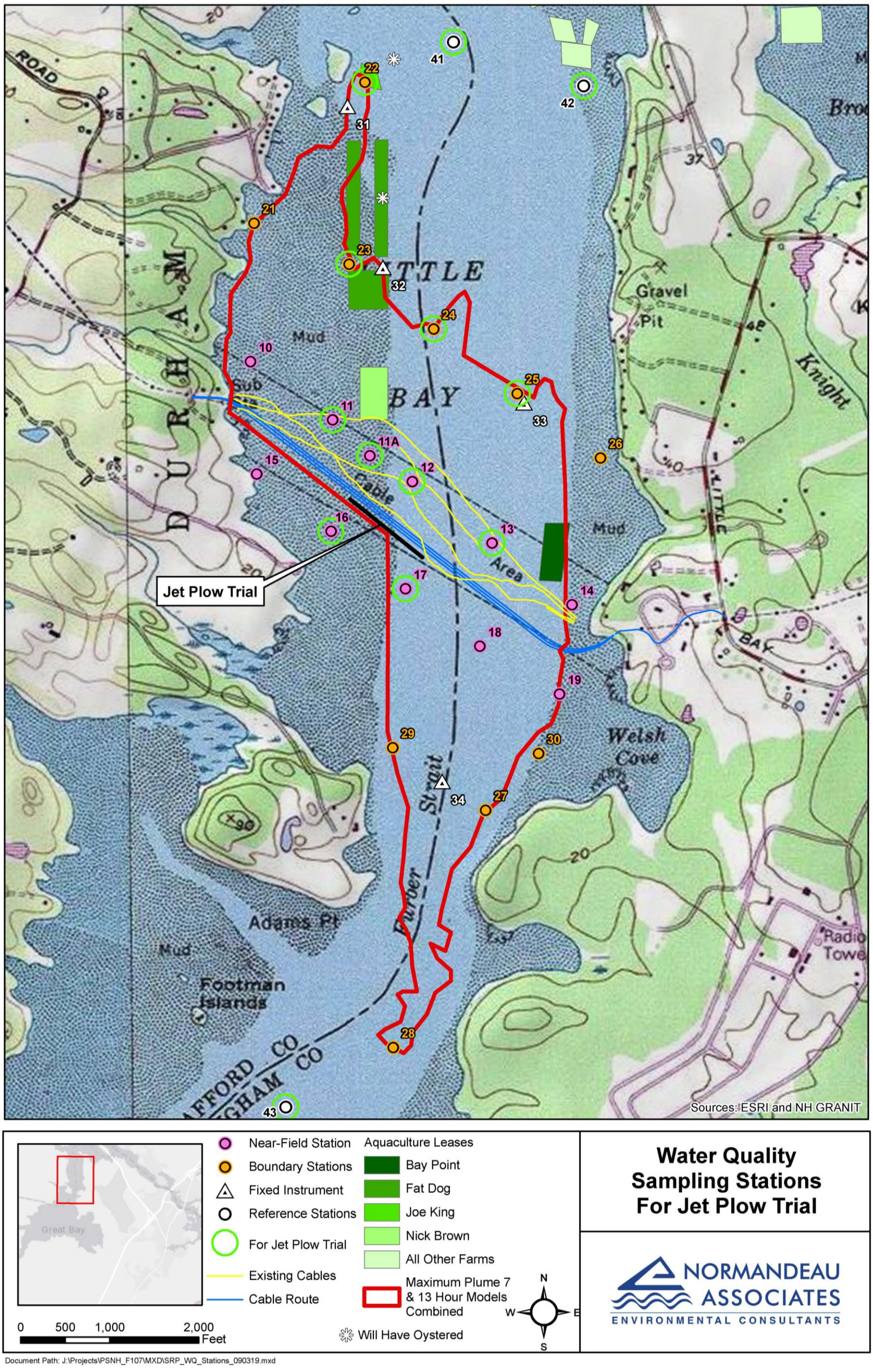


Figure 2. **SRP water quality monitoring stations for jet plow trial run and cable installation.**

4.0 Water Quality Monitoring Design (Conditions 45 and 60b)

Jet plow operations to install the three cables will occur over several consecutive weeks with five to seven-day intervals between each of the cables. As a result of this timing, Eversource anticipates that both spring and neap tides will be encountered during the jet plow installation. Modeling assumed spring tide conditions in order to identify the farthest extent of the plume and these conditions are assumed for the purposes of selecting station locations. In addition, many factors can influence the duration of each crossing. Modeling examined the likely extremes in terms of duration – as short as seven hours and as long as thirteen hours. Under the semi-diurnal tidal conditions existing in the bay and the logistical requirement that jet plowing be initiated at about slack high tide, the crossing is likely to occur primarily on an ebbing tide with a northerly flowing plume (shorter duration), however the crossing could encounter a change from ebb to flood tide at some point. Because it is impossible to predict the actual duration of the jet plow crossing, Eversource assumed that the full range of conditions were possible and overlaid the position of the 20 mg/L contour line (roughly equivalent to 10 NTUs) above ambient from the maximum time integrated plan for both the 7-hour and 13-hour crossing durations to assist in identifying station locations (Figure 1). The water quality monitoring plan described in Sections 4.1 and 4.2 was designed to demonstrate the SRP's compliance with NHDES water quality criteria for:

- Turbidity (<10 NTUs above ambient background conditions)
- Dissolved oxygen (> 5mg/L)
- Dissolved arsenic (acute 1-hr exposure < 69 µg/L; chronic 4-day exposure < 36 µg/L)
- Dissolved copper (acute 1-hr exposure < 4.8 µg/L; chronic 4-day exposure < 3.1 µg/L)
- Ammonia (criteria are included in Env-Wq 1703.28 through Env-Wq 1703.32 and are temperature, pH and salinity dependent; acute is based on 1-hr average and chronic is based on 4-day average)

Results from the jet plow trial and subsequent cable installation runs may suggest revisions to this plan. Any proposed revisions will be submitted to, and receive NHDES approval prior to, implementation.

4.1 Jet Plow and Jet Plow Trial Monitoring

As described in Section 3.0, the mixing zone for turbidity associated with jet plowing was derived based on the location of the 20 mg/L excess TSS contour in maximum time-integrated plume predicted by RPS (2016, 2017) for two jet plow advance rates. As the plume will be generated by a moving source (the jet plow), its location will vary temporally. Eversource proposes that the compliance boundary for the DO and the acute and chronic criteria for dissolved arsenic, dissolved copper and ammonia will be located 500 ft north and south of the centerline of the cable route.

In order to characterize the plume it will be necessary to incorporate several types of stations during both the jet plow trial and jet plow installation (Figure 2). The jet plow trial (scheduled for early September 2019) plan is presented in Appendix D and its associated monitoring plan is included in this section. Review of the jet plow trial results will inform the water quality monitoring protocols for the three cable installations (see Section 6.1). A decision process for modifying the field program,

if appropriate (e.g., cessation of sampling at a particular station; reduction of water sample testing) is presented at the end of Section 4.1).

Coordinates for the proposed monitoring stations are provided in Table 1 and their locations are shown on Figure 2. Station 11a has been added to provide additional information during the jet plow trial; it will not be sampled during the cable installations. The sampling protocols for each type of station are summarized in Tables 2 (jet plow trial) and 3 (jet plow installation). Additional sampling and analysis protocols that address all of the items specified in Condition 45 (See Appendix C) are included in Appendix E. A description of the location and purpose of each type of station follows:

- **Nearfield stations** – five near-field stations will be located about 500 ft north and another five will be located south of the cable route centerline within the mixing zone. Although other parameters will be monitored, the primary purpose is to document if the project complies with water quality criteria for the protection of aquatic life for dissolved oxygen, dissolved copper (acute or chronic), dissolved arsenic (acute or chronic) and ammonia (acute or chronic) and to characterize the temporal and spatial extent of these parameters. Turbidity will also be monitored at these stations to provide additional information on mid-plume suspended sediments for validating the suspended sediment model and as a means to provide early warning if turbidity results are much higher than expected. Other parameters will also be measured as shown on Table 2.

  A subset of these stations (with an additional nearfield station 11a located between Stations 11 and 12) will be monitored during the jet plow trial and all will be monitored during the jet plow cable installation by field crews on small boats with appropriate meters and water collection devices. Because the jet plow trial will encompass a 1,000 ft long path (about 20% of the cable route) starting about 500 ft west of the western channel edge, the eastern-most stations will not be sampled during the trial. Water samples for chemical analysis will be collected at the monitoring stations whenever they are occupied. When water depths are greater than or equal to 7 feet, all samples will be taken at near-surface (1 ft below), mid-depth, and near-bottom (1 ft above). When water depths are less than 7 feet, water sampling will decrease to a near-surface and near-bottom sample. When water depths are equal to or less than 3 feet, a single near-bottom sample will be collected. No samples will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

  Each of the nearfield stations will be monitored during jet plow installations during the period when the plume is expected to be in the vicinity of a particular station as well as for a period before and after the plume's predicted presence. Model predictions (see Appendix A) and results from the jet plow trial will be used to characterize the rate at which the plume progresses across the bay and assist in determining when sampling should be initiated at each nearfield station. Monitoring at a given station will start one hour before the plume is expected to reach the station. The duration that monitoring continues at a given station will depend on the speed at which the jet plow advances. Tables A1 (jet plow trial) and A2 (cable installation) in Appendix A provide estimates of these durations for the two jet plow advance rates modelled. These tables are for guidance only and sampling effort will be adjusted according to actual construction rates. Water samples for chemical analysis will be collected at the nearfield stations whenever they are occupied. When water depths are

greater than or equal to 7 feet, all samples will be taken at near-surface (1 ft below), mid-depth, and near-bottom (1 ft above). When water depths are less than 7 feet, water sampling will decrease to a near-surface and near-bottom sample. When water depths are equal to or less than 3 feet, a single near-bottom sample will be collected. No samples will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

- **Boundary stations** – these will be located at the edge of the mixing zone north and south of the route and are planned to demonstrate that no water quality, primarily turbidity, exceedances occur due to jet plowing. These will be actively monitored during the jet plow trial run and the jet plow cable installation using crews on small boats with appropriate meters and water collection devices. Similar to the near-field stations, the eastern-most stations will not be sampled during the jet plow trial, as it occurs in the western side of Little Bay. Water samples for chemical analysis will be collected at these stations when turbidity at any depth exceeds the reference value for that depth by $\geq$10 NTUs unless results of the jet plow trial suggests otherwise and approval is obtained in advance from NHDES. When water depths are greater than or equal to 7 ft, all samples will be taken at near-surface (1 ft below), mid-depth, and near-bottom (1 ft above). When water depths are less than 7 feet but greater than 3 ft, sampling will decrease to a near-surface and near-bottom measurement. When water depths are equal to or less than 3 feet, a single near-bottom measurement will be collected. No measurements will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

  Each of the boundary stations will be monitored during jet plow installations during the period when the plume is expected to be in the vicinity of a particular station as well as for a period before and after the plume's predicted presence. Model predictions (see Appendix A) and results from the jet plow trial will be used to characterize the rate at which the plume progresses across the bay and assist in determining when sampling should be initiated at each nearfield station. Monitoring at a given station will start one hour before the plume is expected to reach the station. The duration that monitoring continues at a given station will depend on the speed at which the jet plow advances. Tables A1 (jet plow trial) and A2 (cable installation) in Appendix A provide estimates of these durations for the two jet plow advance rates modelled. These tables are for guidance only and sampling effort will be adjusted according to actual construction rates. Water samples for chemical analysis will be collected at the boundary stations whenever they are occupied. When water depths are greater than or equal to 7 feet, all samples will be taken at near-surface (1 ft below), mid-depth, and near-bottom (1 ft above). When water depths are less than 7 feet, water sampling will decrease to a near-surface and near-bottom sample. When water depths are equal to or less than 3 feet, a single near-bottom sample will be collected. No samples will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

Table 1. Coordinates for SRP Water Quality Monitoring Stations. Stations with an asterisk will be sampled during the jet plow trial. All stations will be sampled during the cable installations.

Station	Habitat	Latitude	Longitude
Near-Field Stations			
10	Tidal flat	43.10662	-70.8692
11*	Tidal flat	43.10481	-70.8658
11a*	Tidal flat	43.1036	-70.8642
12*	Channel	43.10289	-70.8624
13*	Channel	43.10097	-70.8591
14	Tidal flat	43.09905	-70.8558
15	Tidal flat	43.10317	-70.869
16*	Tidal flat	43.10138	-70.8659
17*	Channel	43.09959	-70.8628
18	Channel	43.0978	-70.8597
19	Tidal flat	43.09631	-70.8563
Boundary Stations			
21	Tidal flat	43.11088	-70.869
22*	Channel	43.11519	-70.8643
23*	Tidal flat	43.10959	-70.865
24*	Channel	43.10758	-70.8615
25*	Channel	43.10557	-70.858
26	Tidal flat	43.10356	-70.8545
27	Channel	43.09275	-70.8595
28	Channel	43.08548	-70.8635
29	Channel	43.0947	-70.8634
30	Tidal flat	43.09448	-70.8572
Fixed Instrument Stations			
31*	Channel	43.11446	-70.8650
32*	Tidal flat	43.10949	-70.8636
33*	Channel	43.10529	-70.8577
34*	Channel	43.09365	-70.8613
Reference Stations			
41*	Channel	43.1164	-70.8605
42*	Tidal flat	43.11501	-70.8551
43*	Channel	43.08367	-70.868

*monitored during jet plow trial that will be started 2 hours after high slack and continue for approximately 7 hours (i.e., for two hours after trial run is complete) . Note that additional stations may be sampled prior to the jet plow trial for inclusion in the reference database.

Table 2. Description of Water Quality Monitoring During Jet Plow Trial

Type	Purpose	Location	Stations	Frequency[a]	Depths[b]	Parameters
Near-field	Model validation; compliance with mixing zone for toxics (dissolved arsenic and copper; ammonia); early alert to elevated plume	500 ft from cable route	11, 11a, 12, 13, 16, and 17	Trial run will start about 2 hours after high slack (ebbing tide) so that it occurs during the same tide stage that the jet plow would be in this location during cable installation Starting 2 hrs before trial starts sample each station at least once, then sample every hour during trial; continue for two hours after trial complete or for 2 hrs after background turbidity is reached. Tables A1 and A2 (Appendix A) provide guidelines for when sampling should occur at each station based on plume models. Actual sampling will be adjusted according to the rate of jet plow advancement to ensure that the appropriate downstream stations are sampled to reflect changes in tide direction. Estimated 8 sampling periods	Near surface (-1 ft) Mid-depth Near bottom (1 ft above) (note: fecal coliform samples to be collected only near-surface)	***In* situ measurements:** Turbidity DO Salinity Temperature **Water samples:** Nitrogen species, TSS, Cu, As Fecal coliforms (surface only)
Boundary	Compliance with turbidity mixing zone; model validation	Edge of turbidity mixing zone	22, 23, 24, 25	Starting 2 hrs before jet plow trial starts sample each station at least once, then sample hourly and continue for 2 hrs after trial complete or for 2 hours after background turbidity is reached Tables A1 and A2 provide guidelines for when sampling should occur at each station based on plume models. Actual sampling will be adjusted according to the rate of jet plow advancement to ensure that the appropriate downstream stations are sampled to reflect changes in tide direction. Estimated 8 sampling periods	Near surface (-1 ft) Mid-depth Near bottom (1 ft above) (note: fecal coliform samples to be collected only near-surface)	***In* situ measurements:** Turbidity DO Salinity Temperature **Water samples**:Nitrogen species, TSS Fecal coliforms (surface only)
Fixed	Continuous turbidity, DO, salinity,	In channel and nearest active aquaculture	31, 32, 33, 34	Continuous (15-minute intervals) from 1 week before jet plow trial run to 1 week after completion of hand	Near-bottom 1 ft above substrate	***In* situ measurements:** Turbidity DO

Type	Purpose	Location	Stations	Frequency[a]	Depths[b]	Parameters
	temperature & pH monitoring	lease		jetting.		pH Salinity Temperature
Refer-ence	Background conditions	Beyond extent of plume	41, 42, 43	Sample once before jet plow trial and once after sampling at all mobile stations has been completed Estimated 2 sampling periods	Near surface (-1 ft) Mid-depth Near bottom (1 ft above) (note: fecal coliform samples to be collected only near-surface)	***In* situ measurements**: Turbidity DO Salinity Temperature **Water samples:** Nitrogen species, TSS, Cu As Fecal coliforms (surface samples only)

Background turbidity level is equal to the 90th percentile of the reference data for that station habitat (i.e., tidal flat or channel) as discussed in Section 5.2.

[b] When water depths are less than 7 feet, water sampling will decrease to a near-surface and near-bottom sample. When water depths are equal to or less than 3 feet, a single near-bottom sample will be collected. No samples will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

Table 3. Description of Water Quality Monitoring During Jet Plow Installations

Type	Purpose	Location	Stations	Frequency[a]	Depths[b]	Parameters
Near-field	Model validation; compliance with mixing zone for toxics (dissolved arsenic and copper; ammonia); early alert to elevated plume	500 ft from cable route	10, 11, 12, 13, 14, 15, 16, 17, 18, 19	Starting 2 hrs before jet plow sample each station at least once, then sample hourly and continue for 2 hrs after reaching background turbidity levels as long as water depth > 2 ft. Tables A1 and A2 (Appendix A) provide guidelines for when sampling should occur at each station based on plume models. Actual sampling will be adjusted according to the rate of jet plow advancement to ensure that the appropriate downstream stations are sampled to reflect changes in tide direction. Estimated up to 6 sampling events per station; timing will vary depending on location of jet plow and plume	Near surface (-1 ft) Mid-depth Near bottom (1 ft above) If results of water analyses from trial run and first cable installation warrant and NHDES approves, limit sampling during subsequent installations to the depth where turbidity is highest	***In situ* measurements:** Turbidity DO Salinity Temperature **Water samples, if needed:** Nitrogen species, TSS, Cu, As) Fecal coliforms (surface only)
Boundary	Compliance with turbidity mixing zone; model	Edge of turbidity mixing zone	21, 22, 23, 24, 25, 26, 27, 28, 29, 30	Starting 2 hrs before jet plow sample each station at least once, then sample hourly and continue for 2 hrs	Near surface (-1 ft) Mid-depth Near bottom (1 ft above)	***In situ* measurements:** Turbidity DO

Type	Purpose	Location	Stations	Frequency[a]	Depths[b]	Parameters
	validation			after reaching background levels of turbidity Tables A1 and A2 provide guidelines for when sampling should occur at each station based on plume models. Actual sampling will be adjusted according to the rate of jet plow advancement to ensure that the appropriate downstream stations are sampled to reflect changes in tide direction. Estimated up to 6 sampling events per station; timing will vary depending on location of jet plow and plume	If results of water analyses from trial run and first cable installation warrant and NHDES approves, limit sampling during subsequent installations to the depths where turbidity exceeds turbidity threshold	Salinity Temperature **Water samples, if needed:** Nitrogen species, TSS Fecal coliforms (surface only)
Fixed	Continuous turbidity, DO, salinity, temperature and pH monitoring	In channel and nearest active aquaculture lease	31, 32, 33, 34	Continuous (15-minute intervals) from 1 week before jet plow trial run to 1 week after completion of hand jetting.	1 ft above substrate	***In situ* measurements:** Turbidity DO Salinity Temperature pH
Refer-ence	Background conditions	Beyond extent of plume	41, 42, 43	Collected 3 times in course of each installation – before jet plow, once during, after jet plow	Near surface (-1 ft) Mid-depth Near bottom (1 ft above)	***In situ* measurements:** Turbidity DO Salinity Temperature **Water samples:** nitrogen species, TSS, Cu As Fecal coliforms (surface samples only)

[a] Background turbidity level is equal to the 90th percentile of the reference data for that station habitat (i.e., tidal flat or channel) as discussed in Section 5.2.

[b] When water depths are less than 7 feet, water sampling will decrease to a near-surface and near-bottom sample. When water depths are equal to or less than 3 feet, a single near-bottom sample will be collected. No samples will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

- **Fixed stations** – these are located north and south of the route in the channel (Stations 33 and 34), at the northern edge of the eastern tidal flat near the predicted northern extent of the plume (Station 31) and adjacent to Fat Dog Shellfish's winter storage lease (Station 32). Fixed stations required a minimum water depth of 7 ft MLLW to ensure the instruments remain submerged. Three additional fixed stations will be located near the shellfish bioaccumulation study locations. The fixed stations will consist of moored In Situ Aquatroll 600 sondes collecting turbidity, DO, salinity, pH and temperature, approximately 1 foot above the substrate. The fixed stations will be installed at least one week before the jet plow trial run and will remain in place through the completion of the hand jetting. The data will be downloaded weekly. No manual water samples will be collected at these stations.
- **Reference stations** – reference stations will be established well outside the mixing zone to provide additional information on ambient conditions against which to compare data from the affected stations during the jet plow installations. These will be periodically monitored during the jet plow trial and the jet plow cable installation using crews on small boats with appropriate meters and water collection devices. Reference stations will be located both in the channel and on the tidal flat. Water samples will be collected at these stations two times during the jet plow trial run, and three times during cable installation using jet plow. Turbidity measurements from the reference stations will be incorporated into the background database and used to develop the boundary station action level (see Development of Reference Database below and Section 5.2 Jet Plow – Determination of Compliance with turbidity Criterion).

A field SOP is provided in Appendix E. The field crew will be required to review the entire water quality monitoring plan and SOP as part of the training required under Condition 50 when procedures and the construction activities will be discussed in detail.

Development of Reference Database

Real-time turbidity readings will be compared to the reference database to determine whether adaptive management protocols need to be implemented. As the estuary is dynamic and historical data have shown that turbidity can be highly variable, it will be important to use a robust reference database to ensure that decisions to alter jet plow operations are truly required. While Eversource recognizes that the turbidity water quality criterion is meant to be applied to the ambient conditions at the time that in-water activity is taking place, making a decision to alter installation activities based on instantaneous measurements has the potential to interrupt the construction process in a way that could increase the potential for impacting Little Bay by prolonging an installation. Eversource, therefore, plans not to rely solely on data collected on a specific day but to build the reference database from several sources:

- Near-bottom turbidity data collected at the fixed stations for approximately one month prior to the jet plow trial run, and updated weekly throughout the cable installation process
- A one-day (multiple tidal stages) turbidity survey within the area (i.e., multiple stations) covered by the water quality monitoring program conducted up to one week prior to the jet plow trial
- Sampling at all monitoring stations conducted during the two hours prior to the start of in-water work for the jet plow trial and the jet plow cable installation.

- This database will be updated routinely after each sampling event. For the jet plow trial, the data from the pre-installation data (fixed stations, one-day turbidity survey and 2 hours pre-installation) will be used to calculate the BSAL for tidal flat and channel stations. For the subsequent jet plow cable installation, the reference database will be expanded by adding data from the reference fixed stations and mobile stations from the previous sampling events (i.e., the turbidity data from the reference stations collected during the jet plow trial will be incorporated into the reference database for use during the first cable installation). Similarly, data from the second installation will be added for the third installation.
- The database will be maintained as an excel file that is sortable by date, depth, tidal stage, and station. These data will be used to calculate separate Boundary Station Action Levels (BSAL) for tidal flat stations and channel stations (Figure 2 and Table 1). The BSAL will be based on all of the data collected in each of these habitats regardless of collection depth. Reference data from tidal flat stations will be grouped by measurement increments (Bin 1 = 0-10 NTUs; Bin 2 = 10.1-20 NTUs; etc.). Within each bin, the data will be arranged in descending order, regardless of collection depth and the value of the 90th percentile (i.e., the value that 10% of the reference data points exceeds) will be identified. The BSAL for that bin will equal the 90th percentile value plus 10 NTUs. Identification of the BSAL for channel stations will follow the same steps. For information on how this database will be used on each day of monitoring, see Section 5.2. This approach may be re-examined with NHDES following the jet plow trial.

Field Program

Mobile monitoring at the near-field, boundary and reference stations will be initiated approximately two hours prior to the startup of the jet plow and continue for two hours after jet plowing has been completed or longer if indicated by turbidity results. Data collected prior to jet plow startup is considered to be reference data regardless of the location of the station. Water quality monitoring will be conducted using YSI ProDSS and In Situ Aquatroll 600 multiparameter sondes with a turbidity resolution of 0.1 NTU and accuracy of +/- 2% (minimum 0.3 NTU accuracy). QA/QC procedures will follow manufacturer guidelines as well as the USGS publication “Guidelines and Standard Procedures for Continuous Water Quality Monitors: Station Operation, Record Computation, and Data Reporting” (USGS, 2006).

Implementation of the field program will require up to five sampling crews on shallow draft boats, each equipped with the appropriate electronic probes, pumps for water collection, sample containers and data sheets. In addition, because of the potentially large number of water samples required and the short holding time of the fecal coliform samples, there will be an additional boat to shuttle samples from the water quality field crews to the sample coordinator on shore. Duration of the jet plow crossing may require a change in field personnel during the day. All personnel involved in any aspect of the field program will participate in project-wide environmental and safety training at which the purpose of the field program and communication protocols will be fully explained as well as review the contents of this monitoring plan and the SOP.

Decision Points for Modifying Jet Plow Installation Field Monitoring Program

During the jet plow trial, water samples will be collected for laboratory analysis every time a boundary, nearfield or reference station is occupied. Water chemistry results from the trial run will be evaluated in comparison to turbidity and TSS levels in order to determine if relationships are

apparent. If these comparisons demonstrate a consistent relationship between turbidity and water chemistry, then Eversource would like the option to propose changes in the water quality monitoring during the installation stage. If the comparisons made for the jet plow trial run are suggestive but not conclusive, Eversource may re-examine these relationships after the first cable installation. There are several situations where a proposal for reduced water chemistry samples may be appropriate.

- If the turbidity averaged over depth at a boundary station lies below relevant BASL threshold while the plume from the jet plow is in the general vicinity of the station, then we may propose that no water chemistry samples be collected.
- If the jet plow has traversed beyond a particular boundary or near-field station, and two consecutive sampling events measure turbidity averaged over depth below the BASL threshold, then all sampling at this station will be terminated for the duration of that installation

  Data from the jet plow trial will be used to examine the relationship between turbidity and dissolved copper, dissolved arsenic and ammonia. If a linear regression of the results of the jet plow trial indicate that there is a clear correlation between turbidity and dissolved copper, dissolved arsenic and ammonia such that a turbidity threshold below which these parameters are always below chronic water quality criteria can be identified, Eversource will discuss with NHDES whether collection of water samples at the **near-field stations** can be limited to water depths where turbidity exceeds that derived threshold. If this relationship is not clear from the jet plow trial run results, this adjustment to the program would be re-evaluated after the first cable installation. No change in sampling protocols will be made without NHDES approval.

4.2 Monitoring Hand Jetting

Hand jetting will be required in nearshore waters on both sides of the bay where the jet plow cannot navigate (Figure 3). The entire portion of the route where hand jetting will be necessary on the western side of the bay will be enclosed within a turbidity barrier that is expected to contain an estimated 90% of the suspended sediments. Similarly, the shallowest portion of the area to be hand jetted on the eastern side of the bay will also be enclosed within a turbidity barrier. An approximate 230 foot-long segment on the eastern end, however, is exposed to tidal currents too swift for successful use of turbidity barriers. Each of these segments will be monitored for water quality compliance as summarized in Table 4.

RPS conducted predictive modeling for these hand jetting scenarios (RPS 2015, 2017). Because hand jetting will be restricted to a period from around slack tide, any plume emanating from this activity will extend only a short distance from the activity (if at all where turbidity barriers are feasible) and will dissipate before the next hand jetting effort the following day.

Based on the current plans by the cable installer, hand jetting in the area on the east side of the bay where silt barriers cannot be used will be conducted for 3 days during the 5-7 day window in between each cable installation. This will shorten the overall duration of construction by allowing each cable to be buried in this segment after it has been plowed and before the next cable is installed. Monitoring will continue daily for the duration of hand jetting in this segment for each cable. As the model predicted that unconfined hand jetting would produce a plume that dissipates

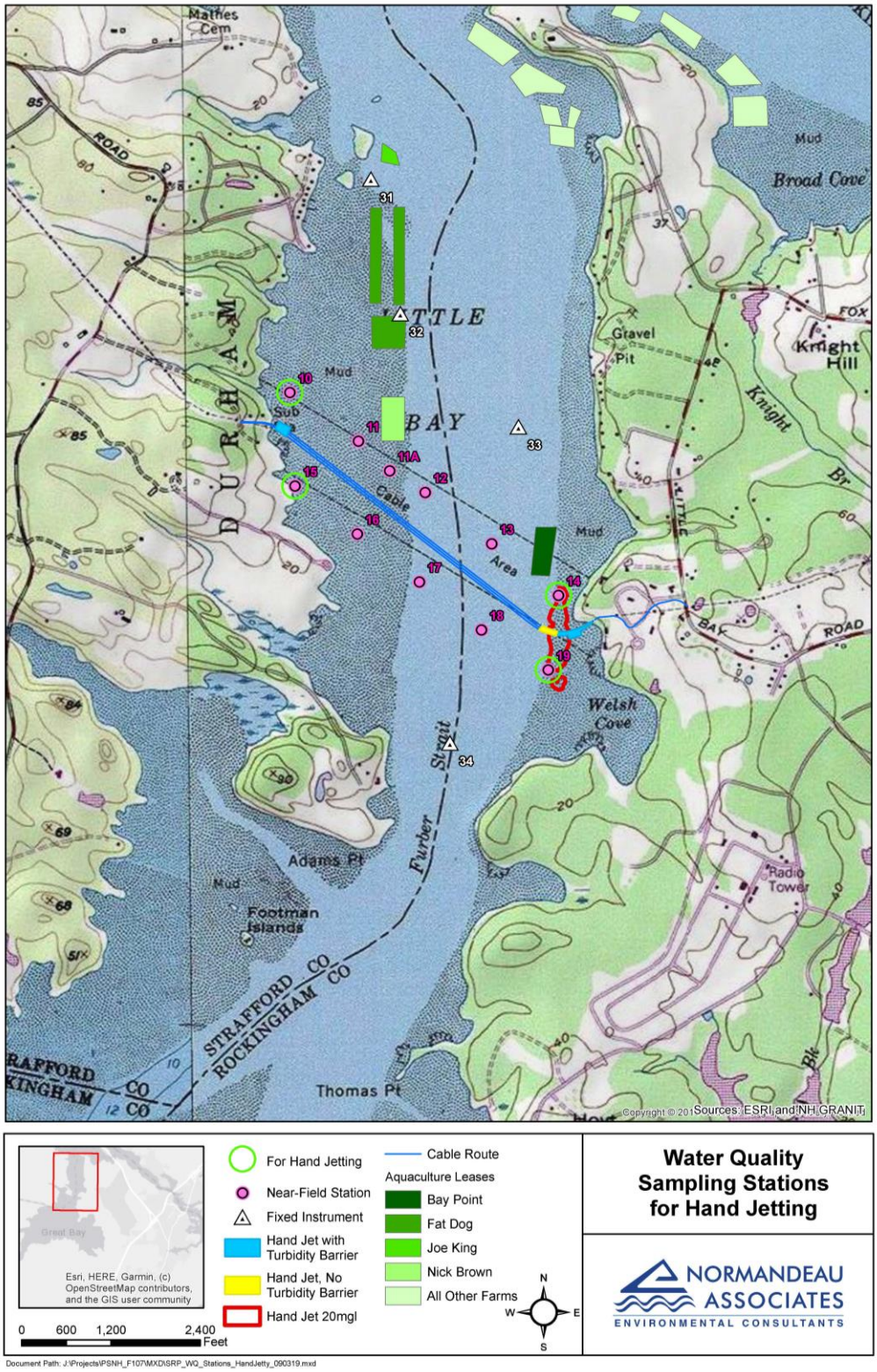


Figure 3. SRP water quality monitoring stations during hand jetting cable burial.

Table 4. Description of Hand Jet Water Quality Monitoring Stations

Type	Purpose	Location	Monitoring Protocols			
			Stations	Frequency	Depths[a]	Parameters
Boundary/ Near-field	Compliance with mixing zone	500 ft from activity = edge of mixing zone	West – 10, 15 East - 14, 19	Hourly starting before hand jet; during hand jetting; continue for 2 hrs after hand jet complete for day or until background turbidity levels reached	Near surface (-1 ft) Near bottom (1 ft above)	***In situ* measurements:** Turbidity DO Salinity Temperature **Water samples:** (nitrogen species, TSS, Cu, As) Fecal coliforms (near-surface only)
Fixed	Continuous turbidity monitoring	Edge of mixing zone; near shellfish reference station	32, northern shellfish reference station	Continuous (15 minute intervals) from 1 week before to 1 week after installation complete	Near-bottom	***In situ* measurements:** Turbidity DO Salinity Temperature pH
Reference	Ambient conditions	Beyond extent of plume	West – 21 East – 26, 30	Hourly starting before hand jet; continue for 2 hrs after hand jet complete for day or until boundary/nearfield stations completed	Near surface (-1 ft) Near bottom (1 ft above)	***In situ* measurements:** Turbidity DO Salinity Temperature **Water samples:** (nitrogen species, TSS, Cu, As) Fecal coliforms (near-surface only)

[a] When water depths are less than 7 feet, water sampling will decrease to a near-surface and near-bottom sample. When water depths are less than 3 feet, a single near-bottom sample will be collected. No samples will be collected when water depths are less than 2 feet to avoid disturbing bottom sediments with the motor propeller.

to ambient levels in a short distance, boundary and nearfield stations would be virtually indistinguishable. Therefore, in addition to the fixed stations, monitoring will entail sampling reference stations, a nearfield station and a boundary station for turbidity, DO, salinity, temperature measurements and water samples for nitrogen species, TSS, dissolved and total Cu and As well as fecal coliforms. Sampling will be conducted hourly at all stations.

After jet plow installation is complete for all cables and the cables are secured on both sides of the bay, turbidity barriers will be placed on both the east and the west shores for the final burial using hand jets. Duration of monitoring outside the turbidity barriers will be guided by the results from the initial few days of monitoring these hand jetted areas. If results indicate that hand jetting does not release contaminants into the water column, Eversource may request that monitoring the segments where turbidity barriers are installed be reduced.

If directed by NHDES, turbidity monitoring will also be conducted as the silt curtains are removed.

4.3 Drone Tracking of Turbidity

A drone will be used to track the visual extent of the plume during each jet plow operation. The drone proposed for this work is a DJI Phantom 4 Pro, approximately 3.2 pounds, with a range of over 1.3 miles (with visibility) and a flight time of 25 minutes. It is capable of flying in wind speeds of up to 15-20 mph, but cannot fly in precipitation. It is GPS-enabled with a hover accuracy of 1.5 m, carries both video and still cameras, and has a still image resolution of about 20M pixels. The images can be viewed in real time from shore to direct the drone's position, and are stored with GPS coordinates and a time stamp. Doucet Survey is investigating if internet streaming of the images is feasible.

The drone operator will be an FAA Certified Part 107 Remote Pilot in Command. Due to proximity to Pease Air Force base, drone flights are restricted to an altitude between 50 and 200 feet along the cable route, with approximately half of the route restricted to 100 feet. At an altitude of 50 feet, the image width is approximately 75 feet. At 100 feet altitude, image width is 150 feet. At 200 feet altitude, image width is 300 feet.

Drone flights will occur hourly, flying north-south over the jet plow to track the length of the visible plume, and east-west to document its width. The drone will then fly the periphery of the work area to observe the progress of the jet plow and the dissipation of the plume. The drone operator will work with a Normandeau environmental monitor to follow the plume and determine photo locations. After each flight, the image data will be downloaded and representative images will be provided with the interim and final monitoring reports.

5.0 Field Decisions

5.1 Communication during Operations

Coordination among sampling teams and the IEM are critical to ensure that appropriate decisions necessary to protect water quality in Little Bay can be made in a timely manner. Communication protocols will be discussed during the training session conducted in advance of the jet plow trial run.

Field crews will report turbidity readings to the onshore field coordinator periodically through the day. If a turbidity exceedance occurs, the onshore field coordinator will immediately notify the IEM

and will confirm with each field crew what the next course of action will be (see Sections 5.2 and 5.3).

5.2 Jet Plow - Determination of Compliance with Turbidity Criterion

The field team performing the water quality monitoring will communicate with the IEM (located on the jet plow barge) via the onshore field coordinator. Should an exceedance of the Background Station Action Level (BSAL) occur, the onshore field coordinator will inform the IEM to coordinate an immediate response. Because Eversource plans to install the three cables in close proximity to one another, results of water quality monitoring during the first installation can be used to make adjustments to the two subsequent installations should NHDES approve these adjustments.

Turbidity monitoring data will be evaluated as follows:

- The section title "Development of a Reference Database" in Section 4.1 describes how a reference (or baseline) database will be developed, which data will be used to populate it, how the data will be separated by habitat (i.e., tidal flat or channel), how the data for each habitat will be grouped into Bins (Bin 1 = 0-10 NTU, Bin 2 = 10.1-20 NTU, etc.), and how the 90th percentile + 10 NTU) will be calculated for each Bin for each habitat.

- On the day of each monitoring event, the appropriate Bin for determining the BSAL for each habitat on that day will be based on the average of all measurements taken that day for each habitat ***prior*** to the start of in-water work associated with jet plowing. For example, if the average turbidity of all tidal flat stations measured prior to in-water work associated with jet plowing on Day 1 is 3.2 NTU, the 90th percentile from Bin 1 (0-10 NTUs) for tidal flats would be used for all tidal flat stations on Day 1 and the BSAL would be equal to the 90th percentile from Bin 1 plus 10 NTU. The 90th percentile and BSAL for the channel stations would be calculated in a similar manner for Day 1. The same procedure for determining the appropriate Bin, 90th percentile and BSAL will be followed each day that monitoring occurs. Based on the above, it is apparent that the 90th percentile and BSAL for each day of monitoring may be different for the tidal flat stations as well as the channel stations. This approach may be re-examined with NHDES following the jet plow trial.

- Boundary Station Action Levels (BSALs) for each station will be provided to the field crew at the beginning of each sampling day although the BSALs may be updated during the day as reference station data are acquired.

- Near-field, boundary and reference station monitoring will document turbidity at three depths in the water column (near-surface, mid-column, and near-bottom as depths allow) but turbidity will be averaged over depth at a given station for comparison to the BSAL by the onshore field coordinator.

- If turbidity at any boundary station exceeds the BSAL during or after jet plow activities, then the following actions will occur:

    - the onshore field coordinator will notify the IEM. The onshore field coordinator will instruct the boat crew at the affected station to resample within 15 minutes to

determine if the exceedance persists and the boat crew responsible for sampling the appropriate reference stations to sample the reference stations within 30 minutes to determine if background turbidity has increased warranting recalculation of the BSAL.

- If after resampling the BSAL is still exceeded, the onshore field coordinator will notify the IEM who will determine whether sediment suspension reduction methods should be implemented or whether additional sampling is warranted. Sediment suspension reduction measures include:
  - Requiring the jet plow operator to alter the advance rate;
  - requiring the jet plow operator to alter the water volume through the jets; or
  - requiring the jet plow operator to stop for a period of time until the boundary stations where exceedances occurred are in compliance with the BSALs.
- In addition, the onshore field coordinator will instruct the boat crew to characterize the extent of the turbidity exceedance by taking turbidity measurements at the three depths (near-bottom, mid-depth and near-surface) at 100 ft intervals downcurrent of the boundary station where the BSAL exceedance occurred until compliance with the BSAL is reached. Following characterization of the exceedance, monitoring at the boundary station will proceed as before.

The IEM will rely on monitoring data, including drone footage, collected up to that point to help determine the most appropriate action.

5.3 Hand Jetting

Similarly to jet plowing, hand jetting will be subject to adaptive management decision making by the IEM. In the event of a BSAL exceedance, the field crew will increase the monitoring frequency to 15-minute intervals, reporting results immediately to the IEM. Should excess turbidity continue for 1/2 hour after the exceedance is first observed, the IEM will determine the best course of action that could include:

- continue more frequent monitoring;
- tracking the maximum extent of the excess turbidity plume;
- reducing the water pressure through the jets used by divers;
- limiting the time frame during which the divers can operate the hand jets; or
- requiring use of an alternative method for burying the cables (potentially including additional concrete mattresses) and stopping work until the alternative can be implemented.

6.0 Laboratory Analysis

Laboratory analyses will be conducted by Enthalpy Analytical, Hampton, NH. Enthalpy will provide courier services from the field site for each sampling event. During jet plow installations, samples will be picked up both mid-way through and at the end of the monitoring event. For at least the jet plow trial run, when rapid turn-around is necessary, Enthalpy plans to run multiple shifts to accommodate the large number of samples. Analytical methods are presented on Table 5.

Table 5. Analytical methods for water quality samples.

Analyte	RL	MDL	Units	Method
Total Nitrogen	NA	NA	mg/L as N	Calculation
TKN	0.5	0.3	mg/L as N	SM4500-NC
NO_3	0.05	0.005	mg/L as N	SM4500-NO3 F
NO_2	0.05	0.005	mg/L as N	SM4500-NO3 F
NH_3	0.1	0.06	mg/L as N	SM-4500NH3
TSS	1	0.6	mg/L	SM2540D
Copper, dissolved	0.5	0.03	µg/L	EPA 200.8
Copper, total	0.5	0.09	µg/L	EPA 200.8
Arsenic, dissolved	0.5	0.02	µg/L	EPA 200.8
Arsenic, total	0.5	0.13	µg/L	EPA 200.8
Fecal coliforms	1	1	MPN/100mL	Colilert-18

7.0 Data Reporting and Actions

7.1 Jet Plow Trial

As described in the Jet Plow Trial Plan, parameters collected instantaneously (turbidity, DO, temperature, pH and salinity) will be summarized immediately for a preliminary assessment of the effects of jet plow operation. Water samples will be sent to the analytical laboratory immediately and the fastest turn-around time will be requested. Rapid turn-around times for most parameters will be 24 hours from receipt at the laboratory although nitrogen and fecal coliform analyses may require up to two days. Enthalpy has committed to processing 110 water samples within the initial 24 hour period, followed by 80 samples in subsequent days. The samples will be prioritized based on turbidity levels, such that the samples with the highest turbidity levels are processes first, followed by a mix of impact stations and reference stations. Once laboratory results are validated, the data will be tabulated. As described in Appendix D, Section 4.0 a written report addressing the items in condition 60b of the SEC approval (see Appendix C) and including a complete data package will be submitted the NHDES no later than one week after the jet plow trial, which will allow NHDES approximately 2 weeks for review before the first scheduled cable installation using the jet plow). Data on fecal coliforms will be submitted to the NHDES Shellfish Program as soon as it is available. Eversource's review will include an evaluation of vertical patterns in the results, particularly at the nearfield stations. The analytical results will be compared to turbidity levels to determine whether there is a statistically significant linear relationship (in particular, the potential for exceedance of acute or chronic toxicity criteria). Consecutive samples from each nearfield station will be compared

for compliance with chronic toxicity criteria for ammonia, dissolved copper and dissolved arsenic. If results show that chronic criteria for any of these parameters has been exceeded over the entire time the station has been sampled then the field crew will return to the site within four days of the jet plow trial to collect additional water for analysis. If results show it is warranted, Eversource will request that the water collection plan for the installation be modified to be limited to those depths linked to high turbidity.

7.2 Jet Plow Cable Installation and Hand Jetting

Preliminary data (field measurement: turbidity, temperature, pH, DO and salinity) will be provided to regulatory agencies within 48 hours of completion of the jet plow crossing to enable further evaluations if required. Analyses for this data submittal will be limited to whether turbidity exceedances were observed at the boundary stations. Any data that do not meet regulatory criteria will be highlighted. If it is determined that the impact station results are outside the range of natural variability, then the marine contractor may be required to modify their operation of the jet plow for the subsequent installation(s). The most likely factors that could be changed are the advancement rate across the bay and the pressure directed through the water chambers on the plow blade. This decision will be made jointly by NHDES and Eversource.

Data from early monitoring events will be evaluated to determine whether future monitoring can be reduced (for example as suggested in Sections 5.2 and 6.1 of this plan). Eversource will assess the data for patterns that indicate the accuracy of the model and make appropriate requests to NHDES for modifications to the monitoring plan. For example, should near-field monitoring show that nitrogen and fecal coliform levels at these stations are insignificant, then water sampling for those variables could be eliminated from turbidity exceedance events at the boundary stations. If metals data clearly indicate the lack of risk of acute or chronic exposure, then it may be reasonable to reduce the number or frequency of stations sampled. Similarly if boundary station monitoring after the jet plow has ceased operating demonstrates the rapid dissipation of the plume then the duration of post-plow monitoring could be reduced. All such requests will be submitted to NHDES for approval.

Final quality controlled monitoring data will be formatted as requested by NHDES for submission to the NHDES Environmental Monitoring Database within one month of completion of the construction monitoring.

8.0 Literature Cited

Normandeau. 2016. Natural Resource Impact Assessment. Appendix 34 in Application of Public Service Company of New Hampshire d/b/a Eversource Energy for Certificate of Site and Facility for the Construction of a New 115 kV Electrical Transmission Line from Madbury Substation to Portsmouth Substation. Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. April 12, 2016.

Normandeau. 2017a. Supplement to Characterization of Sediment Quality Along Little Bay Crossing. For Public Service of New Hampshire, Seacoast Reliability Project. Document 2 in SEC Supplement dated June, 2017, SEC Docket No.2015-04. June 30, 2017.

Normandeau. 2017b. Essential Fish Habitat Assessment. For Public Service of New Hampshire, Seacoast Reliability Project. Document in SEC Supplement dated September 19, 2017, SEC Docket No.2015-04. September 19, 2017.

RPS. 2016. Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Little Bay, New Hampshire. Appendix 35 in Application of Public Service Company of New Hampshire d/b/a Eversource Energy for Certificate of Site and Facility for the Construction of a New 115 kV Electrical Transmission Line from Madbury Substation to Portsmouth Substation. Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. April 12, 2016.

RPS. 2017. Revised Modeling Sediment Dispersion from Cable Burial for Seacoast Reliability Project, Upper Little Bay, New Hampshire. Document 1 in Supplemental Information, Application to the New Hampshire Site Evaluation Committee, SEC Docket No.2015-04. June 30, 2017.

Wilbur, 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.

Appendices

Appendix A

Hourly Plume Maps from 7 hour and 13 hour Model Runs Used to Plan Sampling Schedule During Jet Plow Trial and Cable Installation by Jet Plow

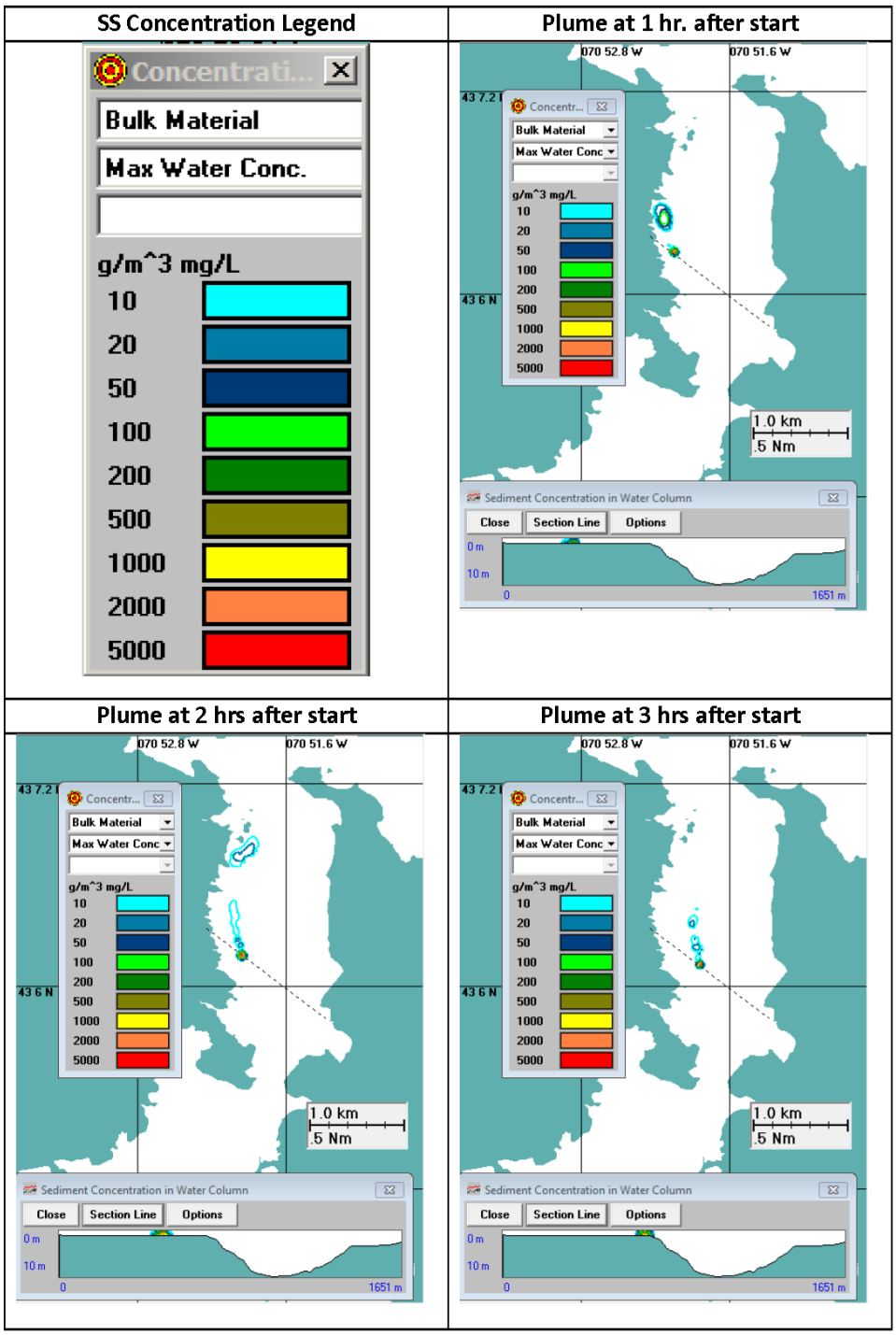


Figure 3-7. Plan view of instantaneous excess SS concentrations at 1 through 3 hrs after start of jet plowing for base case with spring tide. Vertical section view at bottom of each panel.

7 Hour Sediment Dispersion Model

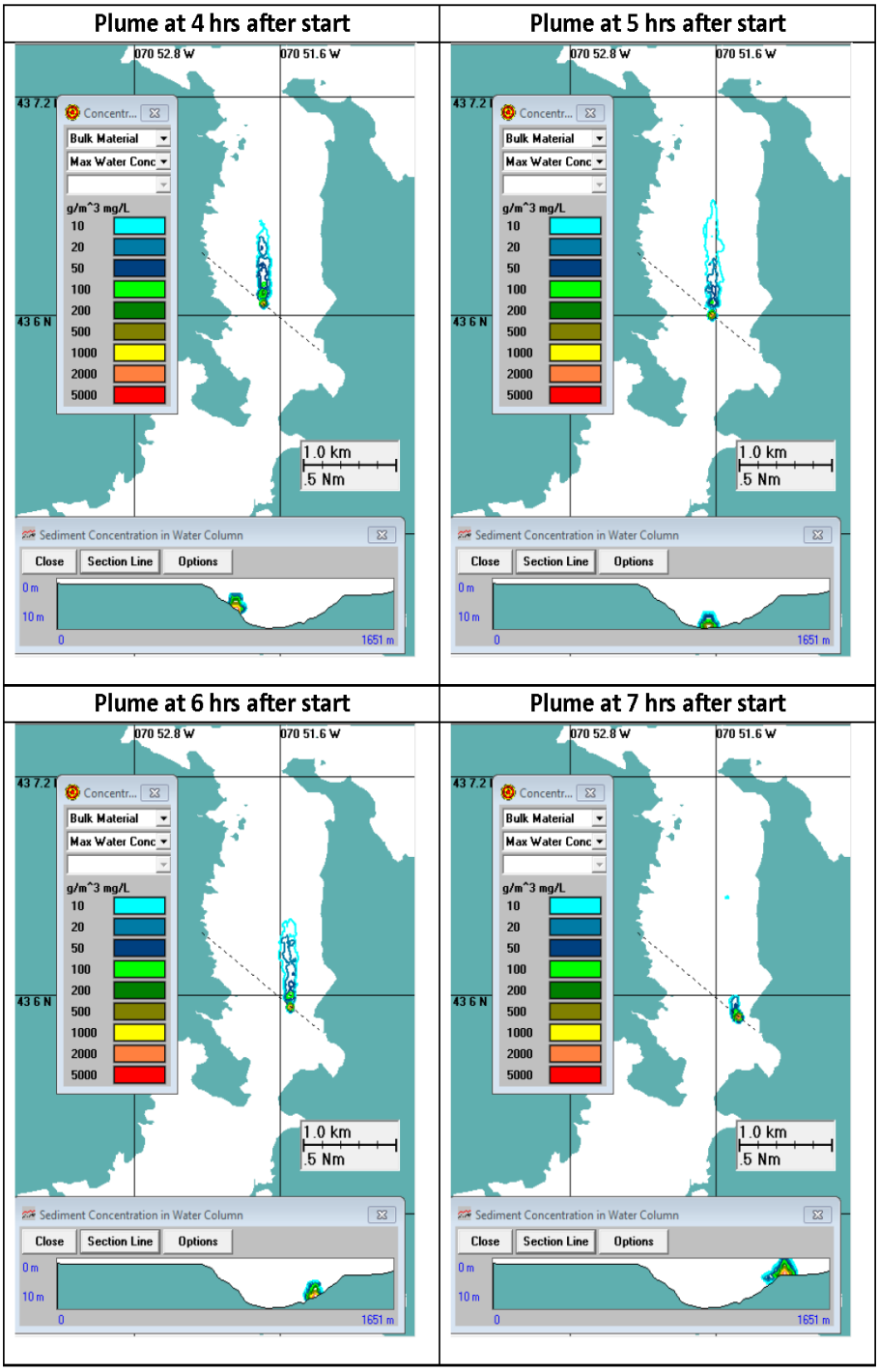


Figure 3-8. Plan view of instantaneous excess SS concentrations at 4 through 7 hrs after start of jet plowing for base case with spring tide. Vertical section view at lower portion of each panel.

7 Hour Sediment Dispersion Model

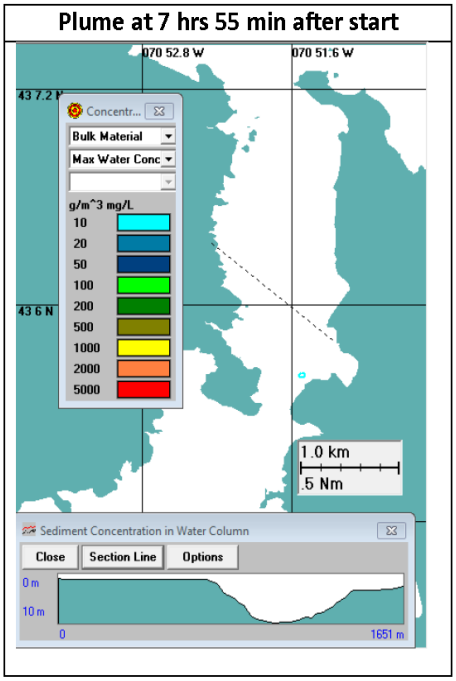


Figure 3-9. Plan view of instantaneous excess SS concentrations at 7 hrs and 55 minutes after start of jet plowing for base case with spring tide. Vertical section view at bottom of each panel. Last time step with concentrations.

7 Hour Sediment Dispersion Model

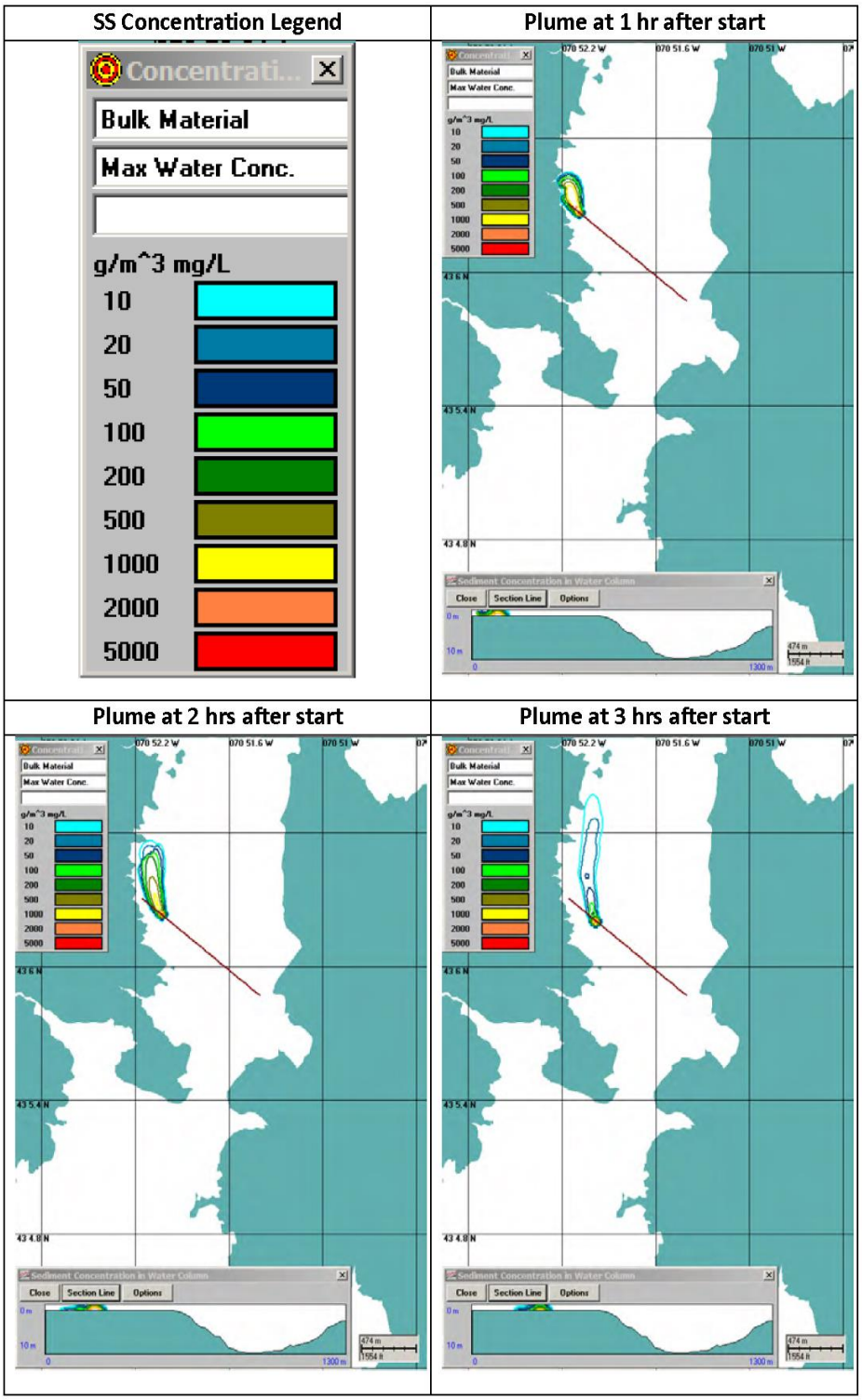


Figure 3-4. Plan view of instantaneous excess SS concentrations at 1 through 3 hrs after start of jet plowing. Vertical section view at lower left of each panel.

13 Hour Sediment Dispersion Model

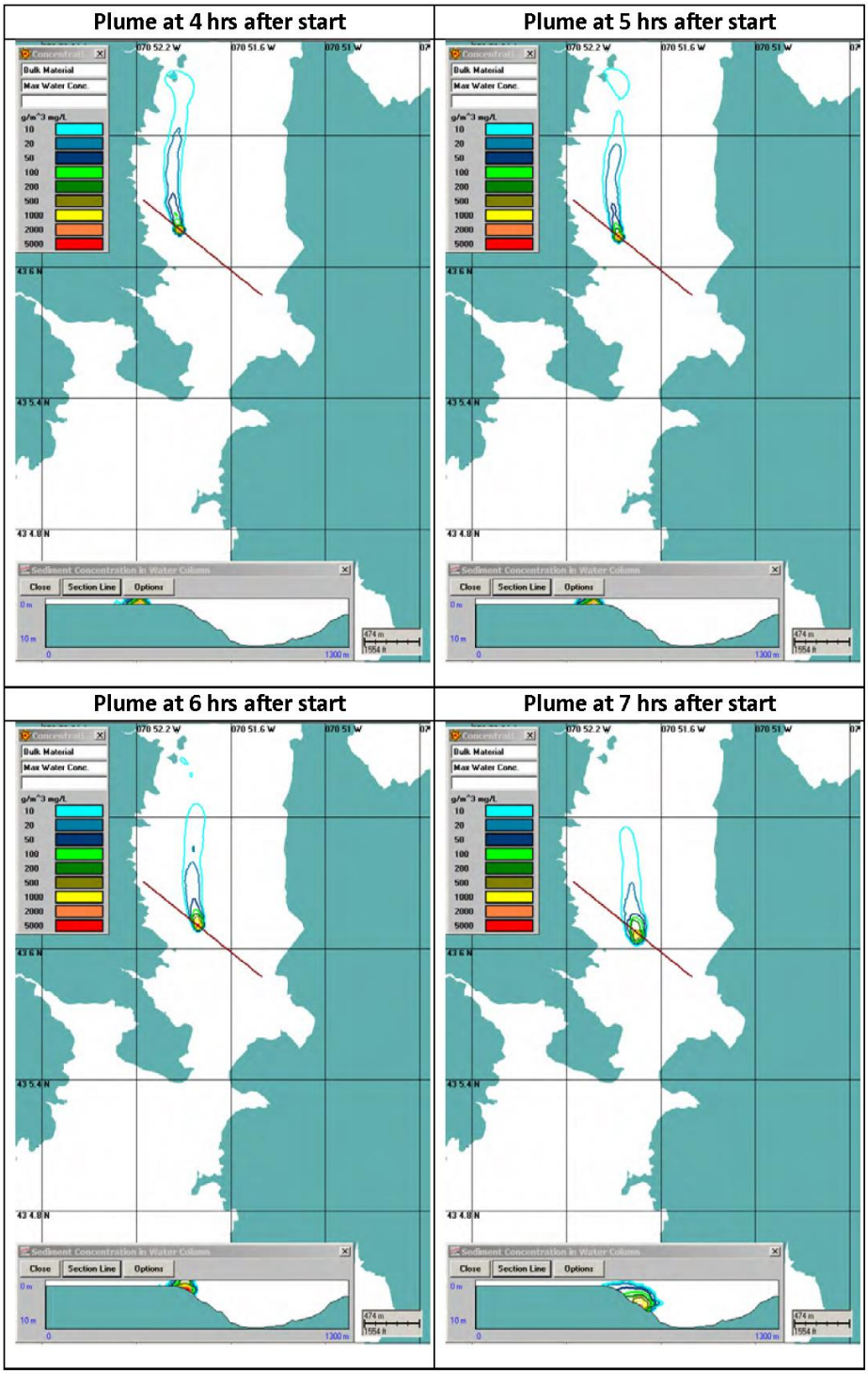


Figure 3-5. Plan view of instantaneous excess SS concentrations at 4 through 7 hrs after start of jet plowing. Vertical section view at lower left of each panel.

13 Hour Sediment Dispersion Model

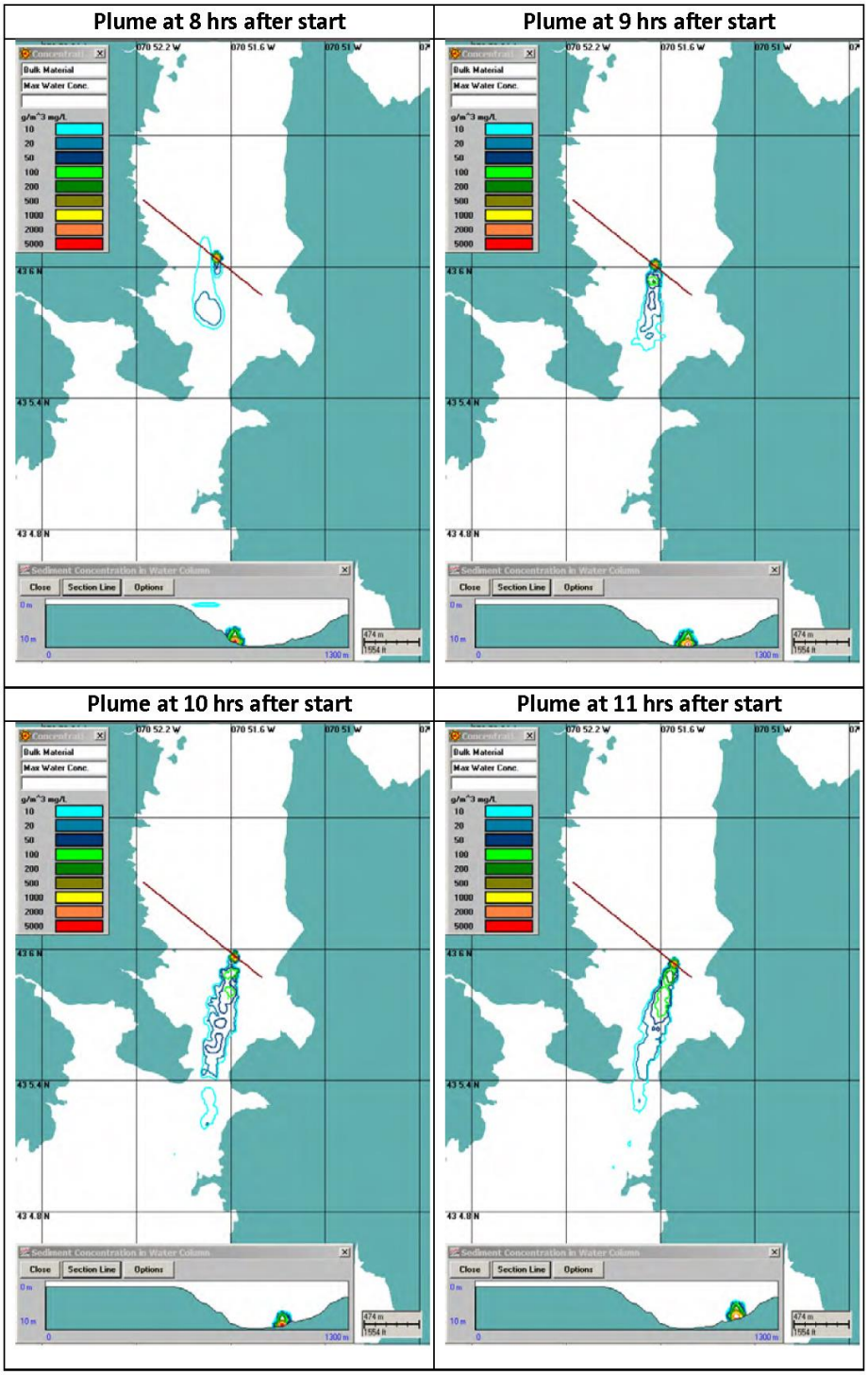


Figure 3-6. Plan view of instantaneous excess SS concentrations at 8 through 11 hrs after start of jet plowing. Vertical section view at lower left of each panel.

13 Hour Sediment Dispersion Model

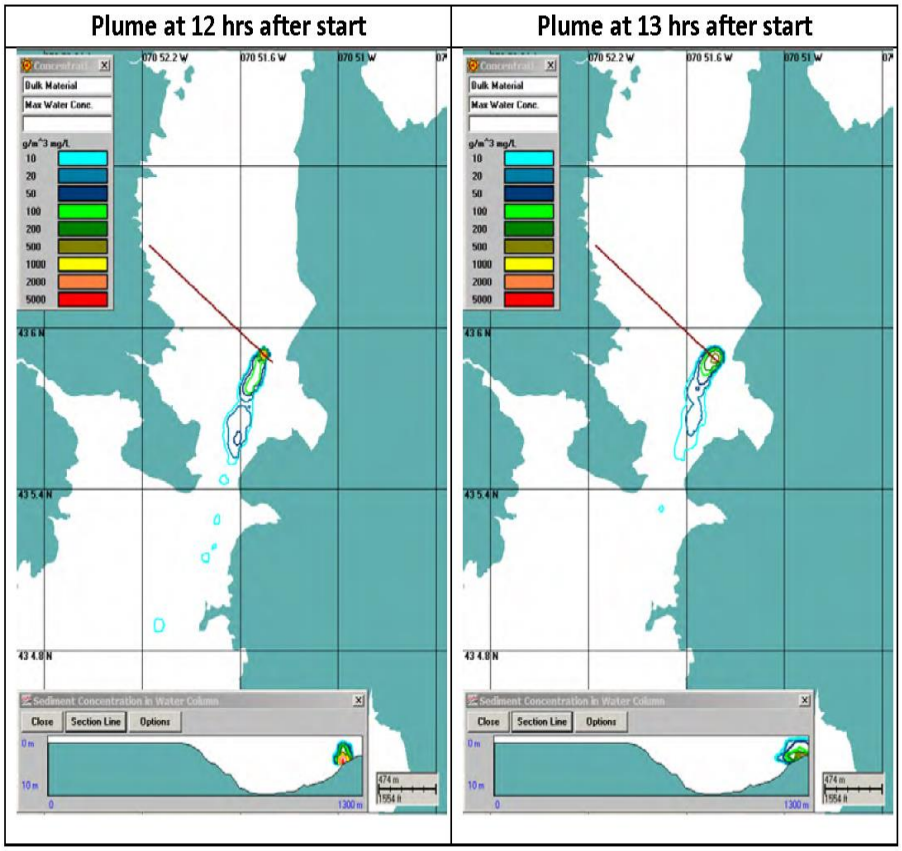


Figure 3-7. Plan view of instantaneous excess SS concentrations at 12 through 13 hrs after start of jet plowing. Vertical section view at lower left of each panel.

13 Hour Sediment Dispersion Model

Table A- 1. Sampling effort during jet plow trial.

Station[a]	Time (hrs) relative to start of jet plow -start 2 hours after high tide, 3 hours for 1000', assumes 1 anchor change at end							
Activity	Pre-jet plow		Active jet plow			Anchor move	Post jet plow monitoring	
Tide Stage	0.5 ebb	1.5 ebb	2 ebb	3 ebb	4 ebb	5 ebb	6 ebb	slack
Time relative to start of trial (hrs)	-1.5	-0.5	1	2	3	4	5	6
	Number of Depths Sampled (Samples Collected)[b]							
Boundary								
22	3		3	3	3			
23		2	2	2	1			
24	3			3	3	3	3	3
25		3			3	3	3	3
Nearfield								
(north) 11	2		2	2	1			
11a		2	2	2	1	1		
12	3			3	3	3	3	3
13		3			3	3	3	3
(south) 16	2		2	2	1			
17		3		3	3	3	3	3
Reference								
41	3				3			3
42		2		2				
43	3		3					3
No. Sta. sampled	7	6	6	9	11	6	5	7
No. sta. X sample depths	19	15	14	22	25	16	15	21

[a] **Highlighted stations are located on tidal flats**

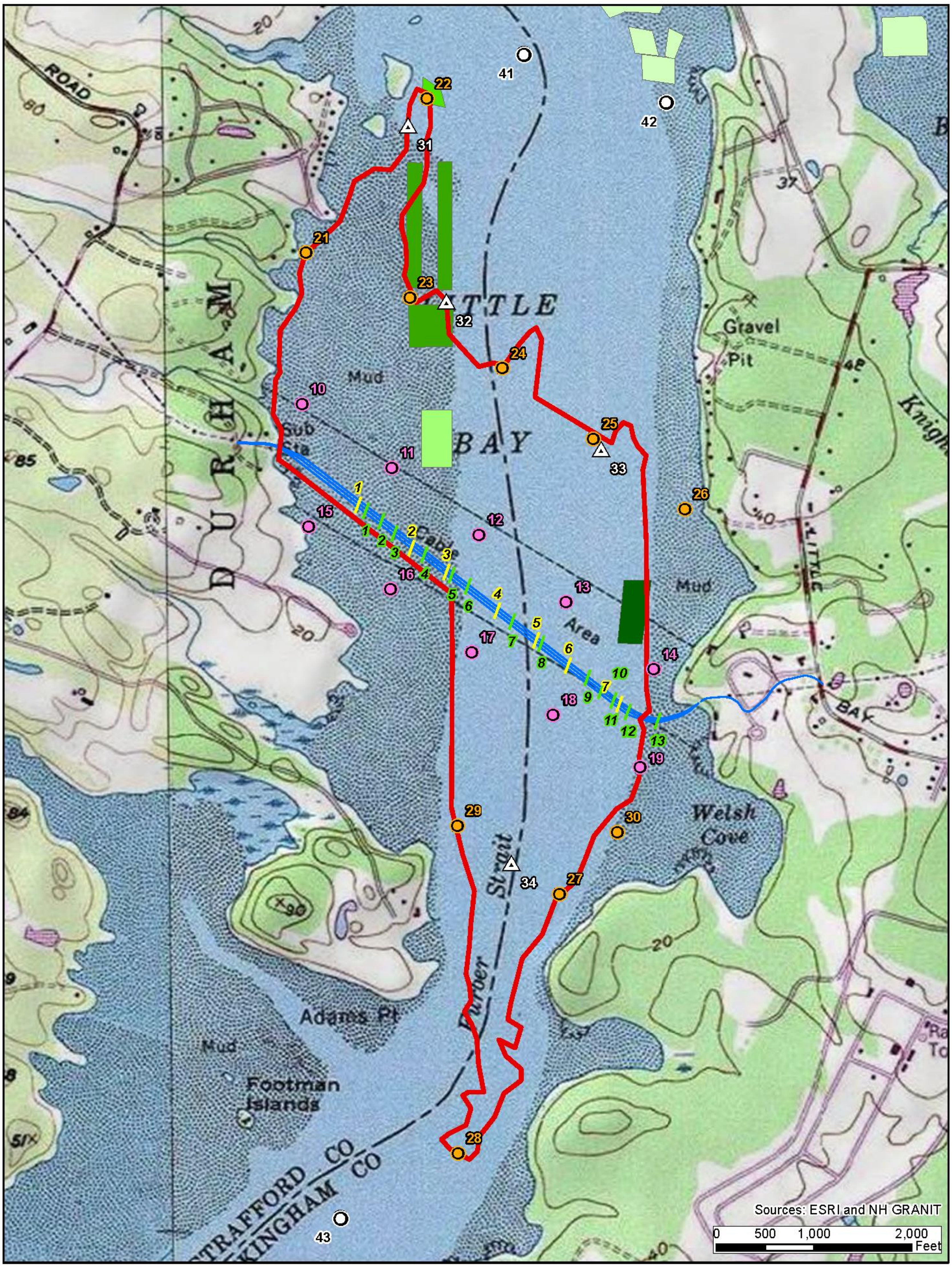
[b] **In addition to the samples listed, each mobile station crew will also collect at least one replicate sample for each parameter for the jet plow trial as well as a field blank for the lab parameters. At the fixed stations, measurements will be taken adjacent to the dataloggers using hand-held meters for the field parameters during deployment and retrieval of the dataloggers to serve as a check of the datalogger results.**

Table A- 2. Sampling effort during cable installation assuming fast jet plow advance rate.

Station[a]	Time (hrs) relative to start of jet plow - fast passage (7 hours of jetting + 3 hours of anchor changes) assumes anchor changes occur at hours 3, 6 and 9 of the fast hour scenario																
Activity	**Pre-jet plow**		**Active jet plow**		**Anchor move**	**Active jet plow**		**Anchor move**	**Active jet plow**		**Anchor move**	**Active jet plow**	**Post jet plow monitoring**		**Or if the fastest jet plow rate is not achievable, monitoring continues**		
Time relative to start of installation (hrs)	**-1.5**	**-0.5**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
	Number of Depths Sampled (Samples Collected)[b]																
Boundary																	
21 (north)	2		2	2	2												
22		3	3	3	3	3	3										
23	2		2	2	2	2	1										
24		3			3	3	3	3	3								
25	3							3	3	3	3	3	3				
26		2										2	2	2	2	2	
29 (south)	3								3	3	3	3	3				
28		3						3	3	3	3	3	3	3			
27	3										3	3	3	3	3	3	
30		3										3	3	3	3	3	
Nearfield																	
10 (north)	2		2	2	2	1	0										
11		2	2	2	2	2	1										
12	3				3	3	3	3									
13		3						3	3	3	3						
14	2									2	1	2	2	2	2	3	
15 (south)		2	2	2	2	1	0										
16	2		2	2	2	2	1										
17		3			3	3	3	3									
18	3							3	3	3	3						
19		2								2	2	2	2	2	2	2	
Reference																	
41	3								3					3			
42		2							2					2			
43	3								3					3			
No. Sta. sampled	12	11	7	7	10	9	9	7	9	7	8	8	8	9	5	5	
No. sta. X est. sample depths	31	28	15	15	24	20	15	21	26	19	21	21	21	23	12	13	

[a] Highlighted stations are located on tidal flats

[b] In addition to the samples listed, each mobile station crew will also collect at least one replicate sample for each parameter for each day of the jet plowing as well as a field blank for the lab parameters. At the fixed stations, measurements will be taken adjacent to the dataloggers using hand-held meters for the field parameters during deployment and retrieval of the dataloggers to serve as a check of the datalogger results.



Legend		N / W E / S
Eastern Edge of Plume (7 hours)	Maximum Plume 7 & 13 Hour Models Combined	
Eastern Edge of Plume (13 Hours)	Aquaculture Leases	
Near-Field Station	Bay Point	
Boundary Stations	Fat Dog	
Fixed Instrument	Joe King	
Reference Stations	Nick Brown	
Cable Route	All Other Farms	

EVERSOURCE ENERGY — **Seacoast Reliability Project**

NORMANDEAU ASSOCIATES ENVIRONMENTAL CONSULTANTS — **Water Quality Sampling Stations Approximate Eastern Edge of Plumes**

Document Path: J:\Projects\PSNH_F107\MXD\SRP_WQ_Stations_Plumes_072319.mxd

Appendix B

Comparison of Turbidity and TSS in Little Bay

Comparison of Turbidity and TSS in Little Bay

Suspended sediments cannot be measured directly *in situ* so turbidity is proposed as a surrogate and is the parameter that NHDES uses as a criterion for water quality. According to Env-Wq 1700.11, turbidity in Class B waters such as Little Bay shall not exceed naturally occurring levels by more than 10 NTUs, specifically stating "For purposes of state enforcement actions, if a discharge causes or contributes to an increase in turbidity of 10 NTUs or more above the turbidity of the receiving water upstream of the discharge or otherwise outside of the visible discharge, a violation of the turbidity standard shall be deemed to have occurred." As the installation operation via jet plow will take place over a discrete period of time (about 7-13 hours for each cable depending on jet plow advance rate) and the activity will constantly progress across the bay (rather than remaining in one location), Eversource believes that monitoring should document conditions along the mixing zone boundaries to demonstrate the project meets water quality criterion.

As allowed under New Hampshire Surface Water Quality Regulation Env-Wq 1707, Eversource proposes to establish a mixing zone for monitoring during construction, and for a period of one week following completion of each cable installation using fixed turbidity probes to account for a period when resuspension of sediments redeposited after initial disturbance by the jet plow may occur. Within the mixing zone, exceedances of turbidity increases over 10 NTUs above background levels could occur. The proposed mixing zone complies with all Minimum Criteria established in Env-Wq 1707.02. Monitoring will take place at the edge of the proposed mixing zone, as determined by model results presented in RPS 2017. The mixing zone boundaries are justified based on the suspended sediments modeling results which show values of 20 mg/L or more of total suspended sediments occurring, for brief periods (1 hour or less) during peak currents, within the proposed mixing zone in some locations. Total suspended solids (TSS) samples collected in 2016 and 2017 on the cable corridor show poor correlation with turbidity (R^2 = 0.46, n = 32 samples), however a conservative estimate based on those data is that 20 mg/L TSS is likely less than 10 NTU turbidity at this site (no sample less than or equal to 21 mg/L TSS had a corresponding turbidity reading higher than 8.8 NTU). Therefore, the predicted 20 mg/L suspended sediments contour is used as a conservative estimate of TSS to define the mixing zone boundary based on the sediment dispersion modeling. Based on the sediment dispersion model, brief water quality exceedances in some areas of the monitoring transect may occur, but are not anticipated to exceed 1 hour. See full text and turbidity report in Normandeau 2017.

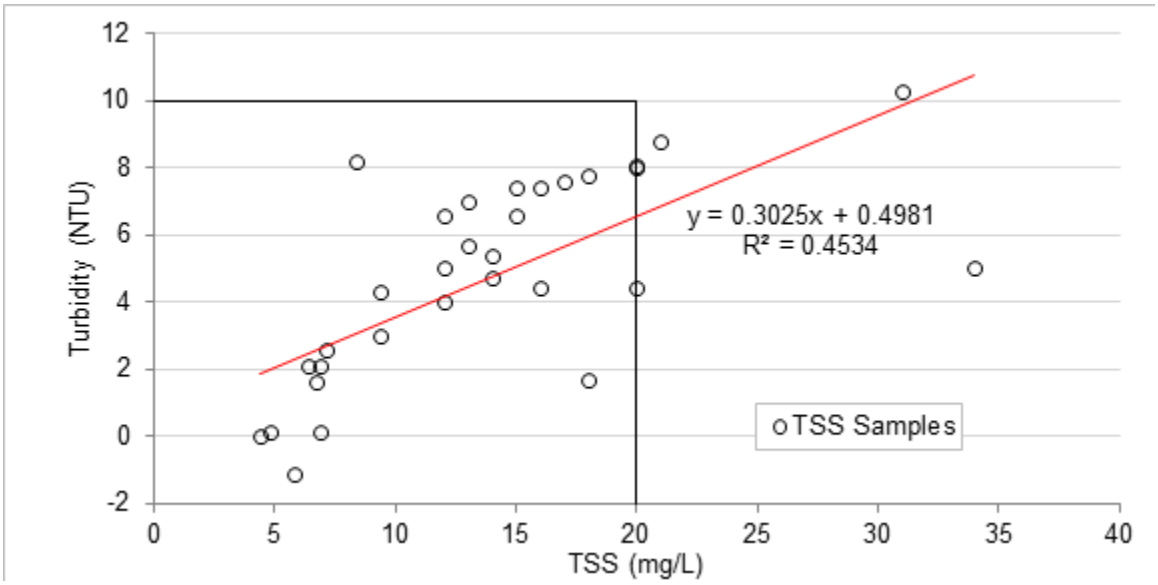


Figure 1-1. Comparison of TSS and Turbidity from 32 samples collected in Little Bay in 2016 and 2017. 20 mg/L TSS and 10 NTU turbidity lines highlighted for reference

Literature Cited

Normandeau. 2017. Revised Environmental Monitoring Plan for Little Bay, Appendix A. For Public Service of New Hampshire, Seacoast Reliability Project. Document 4 in SEC Supplement dated June, 2017, SEC Docket No.2015-04. June 30, 2017.

Appendix C

NHDES Permit Conditions in the SEC Approval Pertaining to Water Quality Monitoring

Condition 40. Independent Environmental Monitor

At least sixty (60) days prior to installing cable in Little Bay, the Applicant shall retain an Independent Environmental Monitor for work in Little Bay at the Applicant's expense. The selection of the Independent Environmental Monitor shall be approved by NH DES. The Independent Environmental Monitor shall be empowered to order corrective actions related to surface water quality and to order the temporary cessation of construction activities until corrective action has been implemented.

Condition 44. Mixing Zone Plan

At least sixty {60) days prior to the start of construction in Little Bay, the Applicant shall submit a mixing zone request to the NHDES Watershed Management Bureau for approval that includes a description and map showing the proposed mixing zone in Little Bay, justification for the proposed limits of the mixing zone and documentation demonstrating that the proposed mixing zone complies with the minimum criteria in administrative rules Env-Wq 1707.02.

The mixing zone shall be established for all jet plow and hand-jetting activities. Prior to submitting the proposed mixing zone request, the Applicant shall determine if there are any new aquaculture operations in Little Bay. Unless otherwise authorized by NH DES, the mixing zone shall not include any portion of an aquaculture site that has aquaculture product (i.e., oysters, etc.) in the water during and up to 24 hours following jet plow and hand-jetting activities.

Condition 45. Water Quality Monitoring and Adaptive Management Plan

At least ninety (90) days prior to inwater work in Little Bay, the Applicant shall submit to the NH DES Watershed Management Bureau for approval, a Water Quality Monitoring and Adaptive Management Plan for work in Little Bay.

The Applicant shall then implement the approved plan.

In general, the plan shall include, but not be limited to, the following for jet plow and hand-jetting activities:

- parameters that will be monitored;
- monitoring locations (including latitude, longitude and a plan showing the locations);
- how and when sampling will be conducted;
- the number of sampling teams;
- when and how training will be conducted;
- the lab methods and field equipment that will be used (including meter accuracy);
- quality assurance/quality control provisions;
- how monitors will communicate real-time monitoring information to jet plow operators;
- the use of drones (especially in the shallower areas) to assist with real-time tracking of sediment plumes;
- how decisions will be made and communicated to modify jet plow operation based on real-time monitoring results to minimize sediment resuspension due to jet plow operation;
- how and when results will be reported;
- when data will be input electronically in the NHDES Environmental Monitoring Database.
- Parameters shall include, but not be limited to, the following:

Field measurements:

- Turbidity (reported as NTU), dissolved oxygen and salinity.
- Samples for Laboratory Analysis:
- Total nitrogen, nitrate/nitrite nitrogen, total Kjeldahl nitrogen (TKN) and, ammonia nitrogen;
- TSS;
- Dissolved copper and arsenic (filtered in the field using a 0.45-micron filter prior to collection);
- Total copper and arsenic (unfiltered);
- Fecal coliform; and
- Other parameters (if directed by NHDES).

The plan shall include criteria, based on real-time turbidity measurements, that will be used in the field to determine when jet plow operations must stop or otherwise be modified to minimize sediment resuspension, as well as when operations can resume. The plan shall also include all methods that can be used to minimize sediment resuspension due to jet plow operation (including but not limited to changing the jet speed and pressure) and how long work can be temporarily suspended.

Sample collection shall include samples taken at multiple depths and times as well as at multiple locations, including, but not limited to, stations at the mixing zone boundary and stations within the mixing zone. Results for parameters specified by NH DES from samples collected for an individual cable installation shall be received and distributed to NH DES and the Independent Environmental

Monitor prior to subsequent cable installations. The Applicant shall not conduct subsequent cable installations unless authorized by NH DES. NH DES may require modifications to the plan based on water quality results.

Condition 50. Training

Not more than thirty (30) days prior to the scheduled start of construction in Little Bay, the Applicant shall conduct a training program for construction staff, contractors, sub-contractors environmental inspectors, the independent environmental monitor, and NHDES staff. The training program shall include, but not limited to, a review of the cable installation methods, spill prevention and cleanup responses, allowable environmental conditions and measures (i.e, contingency plans) that will be implemented in the event that environmental conditions are exceeded.

Condition 53. Weather

At least seven (7) days prior to the start of cable installation across Little Bay, the Applicant shall check the weather forecast for the area, shall maintain a written weather log, and shall not proceed with jet plowing for cable installation if the forecast predicts a storm event or excessive wind, which, in combination with tidal influences shall exacerbate the sediment turbidity plume beyond that predicted in the turbidity plume modeling presented in the application.

Condition 54. Wind

Beginning at least twelve {12) hours prior to planned cable installation activities, the independent environmental monitor shall monitor the latest National Weather Service weather forecast for Great Bay/ Adams Point. If sustained wind speeds in excess of fifteen (15) mph are forecast, the environmental monitor shall, based upon predicted and observed conditions within Little Bay, and in conjunction with NH DES, decide if cable installation should be allowed to commence.

Condition 58. Timing of Hand-Jetting and Jet Plowing

Unless otherwise authorized by NH DES, and to limit the combined impacts of construction activities on Little Bay water quality, hand-jetting shall not be conducted for the period beginning six hours before and ending six hours after jet plow cable installation or within six hours of turbidity criterion exceedances at the mixing zone boundary in the vicinity of the hand-jetting operation(s).

Condition 59. Minimum Time Between Cable Installations

Unless otherwise authorized by NHDES, after a cable is buried by jet plowing, installation of the next cable by jet plowing shall not commence for at least five (5) days.

Condition 60. Screen on Jet Plow Intake

The end of the jet plow intake pipe shall be equipped with a screen with openings no greater than 2 inches in diameter.

Condition 60b. Jet Plow Trial Run

If the SEC determines that jet plowing should be allowed for submarine cable installation in Little Bay (instead of other alternatives such as horizontal directional drilling), and that a jet plow trial run (without cable) should be conducted prior to installation of the submarine cable (as recommended by NH DES in a letter dated February 28, 2018 to the SEC if jet plowing is the selected alternative), the Applicant shall, unless otherwise authorized by NH DES, comply with the following:

- At least 90 days prior to the trial, the Applicant shall submit a Jet Plow Trial Plan (JPTP) to NHDES for approval and then implement the approved plan. The JPTP shall describe in detail how and when the trial and monitoring will be conducted and results reported.
- At least 14 days prior to the scheduled start of submarine cable installation in Little Bay the Applicant shall submit a jet plow trial run summary report to the SEC and NH DES that addresses the following:
  - how well the model predicts the sediment plume ;
  - how well the water quality monitoring plan works (including communication between the monitors and jet plow operators) and what if, any, modifications to the plan are necessary;
  - water quality monitoring results within the mixing zone and at the boundary;
  - how measures taken to reduce sediment suspension due to jet plowing (including, but not limited to jet plow speed and pressure reductions) impact water quality;
  - if results suggest that cable installation by jet plowing is likely to meet NH surface water quality standards; and
  - if any additional sediment suspension reduction measures are needed to help ensure surface water quality standards will be met.

Installation of submarine cable in Little Bay shall not proceed until authorized by NH DES and the SEC.

Appendix D

Jet Plow Trial Plan

Jet Sled Instream Water Quality Test Procedure

Abstract

Kokosing Industrial – Durocher Marine Division utilizes a jet sled to expedite the burial installation of high voltage submarine power cables. The jet sled accomplishes burial by guiding the power cable through a burial stinger into a trench created by fluidizing sediment using water jets. Depending on the characteristics of the sediment, a portion of the fluidized sediment can become suspended in the water column, causing increased turbidity and total suspended solid levels. This testing procedure outlines the installation practices associated with using a jet sled. These procedures will be used to perform a trial jet sled run to sample instream conditions representative of normal operating conditions.

Document No. LSCA-EE-KIDMD045

Document type: **Test Report**			Contractor Name: **Kokosing Industrial Inc. Durocher Marine Division**			
Project: **Little Bay Cable Installation**			Contractor's Document Number: **LSCA-EE-KIDMD045**		Issue: **D3**	
Document title: **Jet Sled Instream Water Quality Test Procedure**			Page: **Cover & 7 Pages**		Category: **EXTERNAL**	
D3	07/23/19	Issue for Construction	TJP	07/23/19	TJP	TJP
D2	04/24/19	Normandeau Review	TJP	04/25/19	TJP	TJP
D1	09/28/18	Issued for Review	JRC	10/01/18	TJP	TJP
Issue:	Date:	Document Status:	Prepared:	Checked:	Approved:	Released:

Contractor:	Contract Information:
LS Cable America 222 Bridge Plaza South, Suite 530 Fort Lee, NJ 07024	Job No. : 25090 Little Bay Cable Installation Newington, NH 03801

Kokosing Industrial Inc.
Durocher Marine Division
958 N. Huron Street
Cheboygan, Michigan 49721

CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

1 INTRODUCTION

A common method of submarine cable installation is through the use of a jet sled. A jet sled is deployed and pulled by an installation vessel along a cable route. As the sled is being pulled, submarine power cable is allowed to exit off the vessel stern chute, through the water column and into the jet sled bellmouth. The power cable then passes through a stinger that places the cable at a pre-determined burial depth. In order to reduce the pulling tensions on the sled, water jets are used to fluidize the sediment in front of the burial stinger. By fluidizing the sediment, there is potential to cause a change in water quality adjacent to the work site. The extent of the sediment plume caused by the jetting operations is entirely site specific, dependent on soil grain size and flow conditions. The procedures laid out herein are the normal operating parameters for a jet sled during an installation event. These procedures should be followed as closely as possible during a trial run to replicate conditions analogous to the cable installation event.

2 EQUIPMENT

2.1 JET SLED

Kokosing Industrial – Durocher Marine Division (KIDM) utilizes an ETA, Ltd. designed jet sled that allows burial up to two meters as shown in Figure . This sled is designed with a maximum pulling tension of 40,000 lbf. The speed at which burial occurs is dependent on keeping the pull force below the 40,000 lbf limit. Typical installation speeds range from 300-600 feet/hour based on soil condition, with a maximum allowable soil pressure of 20 kPa. Installations in jettable material occur at an average speed of 3-5 ft./min after taking anchor moves into consideration. The rate of jetting advance is optimized based on the water jet flow, pressure, and nozzle configuration. Using pre-construction site soil survey information, the jet sled nozzle size and pumps are chosen.

2.2 JET PUMPS

KIDMD uses a pair of high head, high flow jet pumps to meet the requirements for flow and nozzle pressure. These pump have been used successfully on multiple jobs and meets the flow and pressure requirements for projects requiring less than 500 feet of hose to reach the jet sled. Flow and pressure are directly proportional to hose length due to friction loss. A cut sheet of a typical pump curve can be found in **FIGURE** . This pump curve is compared with the system curve to determine the system operating point.

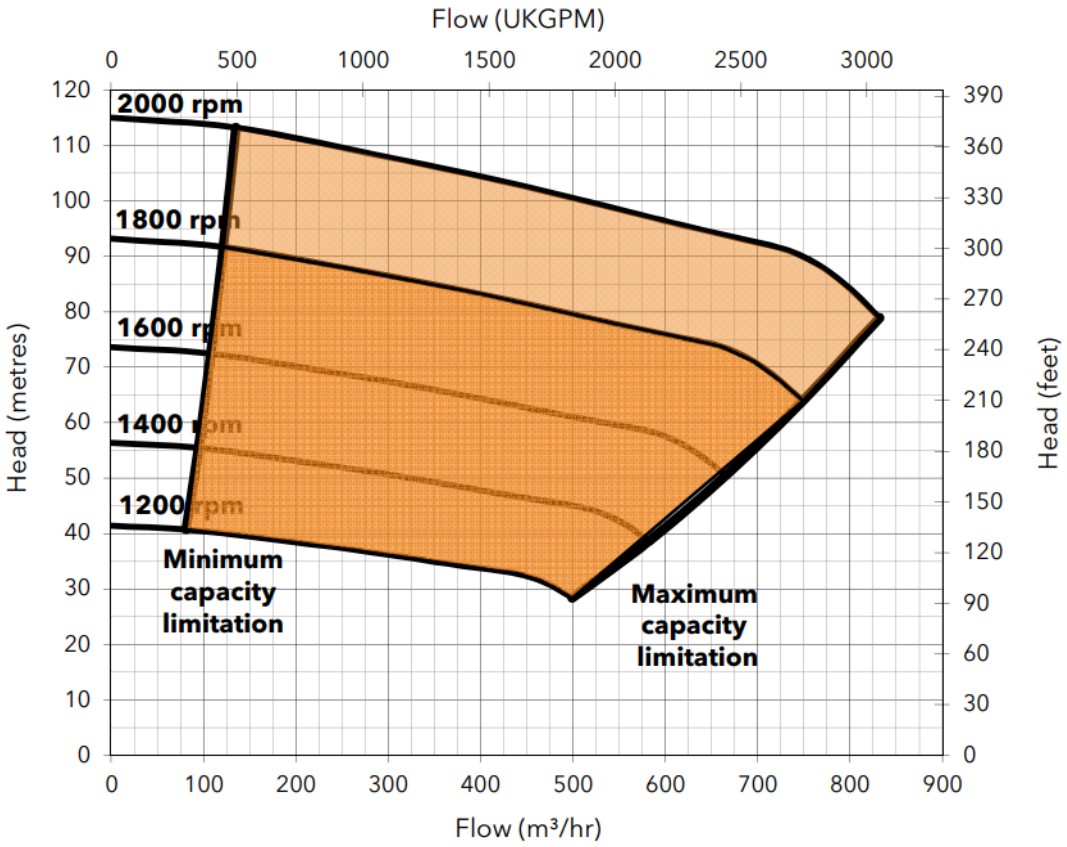


FIGURE 1: TYPICAL HIGH HEAD, HIGH FLOW JET PUMP CURVE

3 OPERATION

Upon deployment of the jet sled from the cable installation vessel, the power cable will be pulled through the bellmouth and out the back of the raised stinger to the manhole location on the shore. After the power cable is secured in the pullbox/manhole, burial operations are ready to begin. The pumps on the installation vessel are started and brought up to operating speed to supply the jet sled with water. The installation vessel begins moving ahead using anchors and the burial stinger is slowly rotated down until the desired burial depth is achieved. The installation will continue moving ahead on the route until the anchor or anchors used for advancing the vessel need to be repositioned. As the vessel anchors are repositioned the jet pumps used to supply the sled will be reduced to idle speed. The pumps are run at idle speed to prevent the intrusion of sediment into the system and block the jetting nozzles.

The speed at which burial occurs is limited by the maximum pulling tension on the sled. During installation the jet pump/s RPM's are adjusted to allow for the fastest rate of burial without compromising the structural integrity of the sled. Maximum advancement rates are limited due operator reaction time when subsea obstructions are encountered.

3.1 TELEMETRY

To determine if the jet sled is operating properly during installation events, telemetry is installed on the jet sled and flow system. This data is recorded and displayed in real-time from KIDM's proprietary cable lay software system. Information recorded by this system includes sled pitch and roll, depth of burial, sled position, water depth, jet hose pressure at sled, jet hose pressure at surface, system flow rate, and sled tow tension.

3.2 ANCHORING

The project intends to use four (4), 6,600 lb anchors to maneuver the barge along the cable route. As the barge advances, the anchors will need to be moved approximately three times to reach the opposite shore landing site. The approximate time to reposition anchors can take up to one hour. It should be noted that in shallow water areas the repositioning of anchors can cause sediment to be introduced into the water column from the anchor handling tug's propellers. This operation would generate sediment in the water column similar to lobster boats or perhaps oil spill support vessels.

4 TRIAL RUN PROCEDURE

The intent of the trial run will be to operate the jet sled under conditions as close as possible to the actual cable installation procedure. The trial run is to be performed over 1,000 feet in a simulated cable burial. The trial route will encompass both the shallow burial and the deeper burial portions of the route so that it characterizes the different water depths, sediments and burial depths expected along the route. The trial run will be performed using a cable installation vessel and equipment representative of an actual cable installation, including the use of all telemetry to compare jet sled data to water quality data collected by others. Total time to perform the trial run after all anchors are positioned and the vessel begins advancing the sled should take approximately 200 minutes at an average rate of 5.0 ft./min. The trial run is scheduled to start jetting operations at a slack high tide. Total time for setup and execution of the trial run after vessel mobilization should take two days.

Upon completion of the jet sled trial run, the cable installation vessel will perform anchor recovery and deployment trial run to simulate anchor handling required during cable lay/burial operations. As the vessel anchors are repositioned the jet pumps used to supply the sled will be reduced to idle speed. The pumps are run at idle speed to prevent the intrusion of sediment into the system and block the jetting nozzles.

5 JET SLED DRAWING

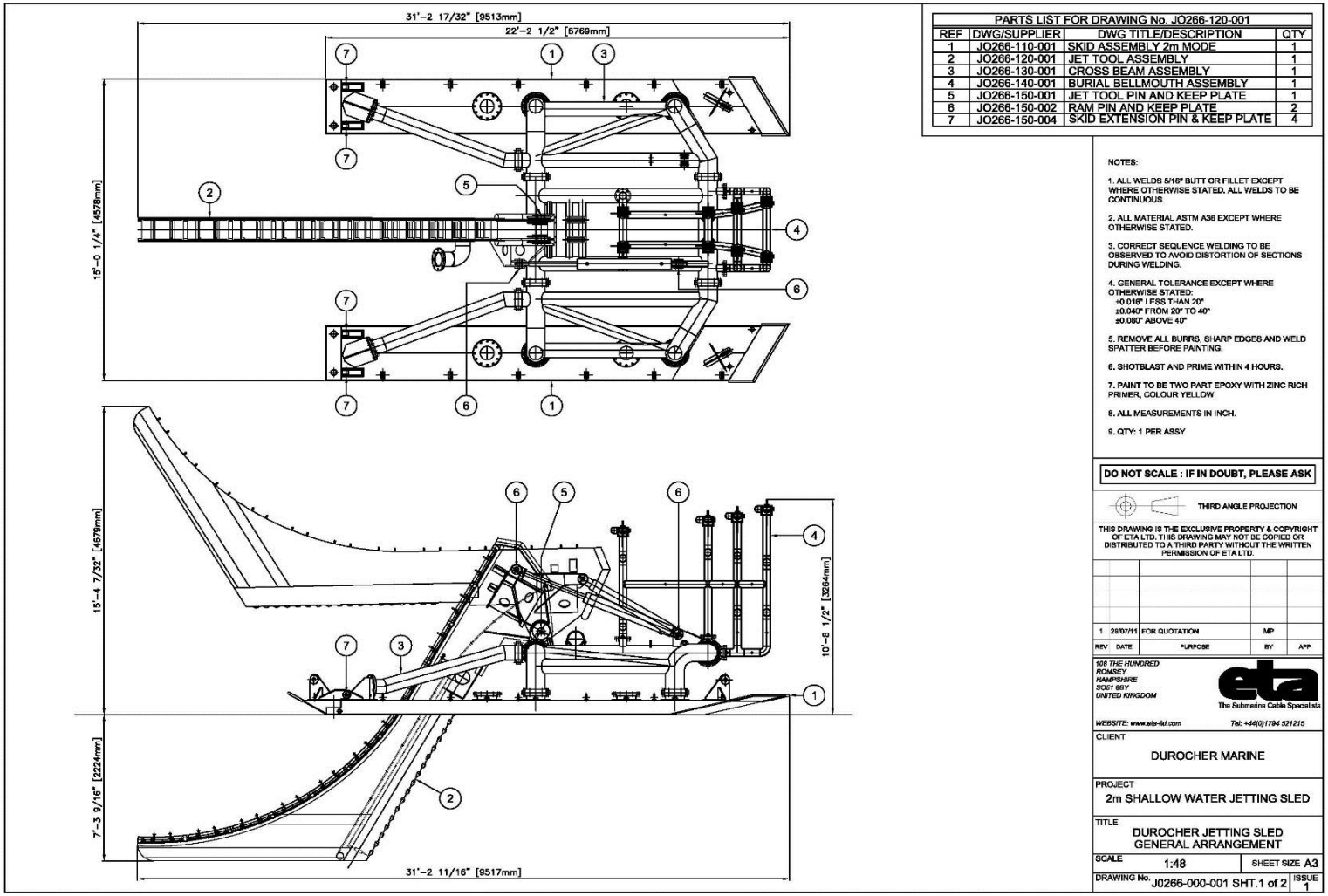


Figure 2: Jet Sled AutoCAD Drawing

6 CONCLUSION

This procedural report outlines the basic use of a jet sled during submarine power cable installation. The submarine cable installation operator will attempt to install the submarine power cable at a respectable pace that does not risk damage to the power cable. The use of a trial run will determine the actual turbidity and suspended solids generated from the jet sled based on the site specific conditions. By comparing the instream water quality information with the jet sled telemetry, an optimized jetting procedure may be developed to reduce the impact jet sled installation has on the environment.

Appendix E

Field Standard Operating Procedures

(Field Meter Instruction Manuals will be provided under separate cover to each Monitoring Team)

1. Responsibility and Program Organization

It is the responsibility of the Normandeau Program Manager to implement these and other applicable procedures. Any changes or deviations to procedures must be coordinated with the Program Manager, Quality Assurance Director, Eversource Energy, and NHDES. No changes shall be implemented without NHDES approval. Key field program personnel are provided below.

1.1. Field Operations Manager

The Field Operations Manager for the SRP is responsible for:

1. understanding all aspects of the Field SOP.
2. ensuring that all field tasks are completed by appropriately informed/trained personnel according to the SOP guidelines.
3. ensuring that the quality of the program is maintained according to the Field SOP guidelines.
4. ensuring for the safety and wellbeing of all personnel participating in the field program.
5. reporting all discrepancies/problems that can affect program results to the Program Manager and others (Report Authors, Laboratory Personnel, QA Director, etc.) as appropriate.

Along with the Field Operations Manager, key field program personnel include those responsible for sample and data collection.

The field quality program is managed by Normandeau's Quality Assurance Director, who has authority equal to and is independent from operations management. As director of all Normandeau quality programs, he has review responsibilities which are carried out during the audit function.

1.2. Independent Environmental Monitor

An independent environmental monitor (IEM) will be present for all water installation efforts. The monitor will review reports and provide recommendations to NHDES. During installation the IEM will be stationed on the construction barge and will be in constant contact with the onshore field coordinator (OFC), field crew, the construction crew and NHDES. The field crew will alert the OFC immediately if a Boundary Station Action Level (BSAL) as defined in section 5.2 of the main text, is reached during the installation or trial run process. The IEM has the authority to implement adaptive management responses. These responses may include changes to: sampling rate, jet plow advancement rate and water pressure.

1.3. Onshore Field Coordinator and Field Sample Coordinator

Two field coordinators will be on site to ensure that information from meter measurements and water collections meet project requirements.

An onshore field coordinator (OFC) will be present for all in-water cable installation requiring monitoring and will be within line-of-sight of the cable installation. The OFC will remain in constant contact with the field crews. Field crews sampling boundary and reference stations will update the OFC

with water quality measurement values from each station as they are collected. The OFC will report on field activities and alert the IEM if an action level is reached. Communications between the field crews and OFC will occur through texts. The OFC will assure that all contact information is up to date prior to the start of field collections.

The onshore field coordinator will enter data from boundary and reference stations into an excel file as they are collected which will be emailed or texted to the IEM hourly.

A field sample coordinator (FSC) will be located at Great Bay Marina throughout all monitoring activities. The FSC will assist with pre-coding data sheets with daily BSALs, receiving samples from the field crew intermittently, reviewing chains-of-custody (COC) for completeness, confirming the integrity and proper storage of sample bottles, and transferring samples and COCs to the Enthalpy courier.

1.4. Field Crew Leader

A field crew leader (FCL) will be designated for each monitoring event. The FCL will be responsible for ensuring that all field measurement and water collection equipment have been properly prepared/calibrated prior to each event. The FCL will also be responsible for ensuring that boats are running properly. At the end of each monitoring event, the FCL will confirm that field datasheets and chain-of-custody forms have been filled out correctly.

1.5. Courier

One boat and crew will be designated as the courier. The role of this crew is to move among the sampling crews to retrieve completed samples and associated paperwork to deliver to the FSC. In addition, this crew will deliver empty sample bottles to the sampling crews. The courier boat will also be responsible for delivering backup meters and equipment to sampling crews as needed.

2. Operating and Safety Procedures

2.1. Boats

Procedures outlined in the Normandeau Associates Health & Safety Plan 9.6 Boating Safety Program will be followed for Seacoast Reliability Project Field Operations. Copies are available on all boats.

2.2. Vehicles

Procedures outlined in the Normandeau Associates Health & Safety Plan 9.10 Vehicle Safety Program will be followed for Seacoast Reliability Project Field Operations. Copies are available in all vehicles.

2.3. Field Safety Awareness

Procedures outlined in the Normandeau Associates Health & Safety Plan 9.9 Field Safety Awareness Program will be followed for Seacoast Reliability Project Field Operations.

2.4. Invasive Organism Biosecurity

Procedures outlined in the Normandeau Associates Biosecurity Plan Program will be followed for Seacoast Reliability Project Field Operations. Normandeau personnel working with aquatic organisms in the United States will maintain a high standard of biosecurity. All Normandeau field crews will follow

Normandeau's disinfection procedures, in order to prevent the spread of aquatic invasive species and diseases.

2.5. Tailboards and Field Plans

Daily safety briefings will be given by Crew Leaders. Crew members attending this briefing will sign off on "Tailboard" reports and these reports will be filed with Normandeau's Health and Safety Officer. Field plans will be filed with the appropriate personnel.

3. Laboratory Water Sample Collection

Laboratory water sample collections will be taken concurrently with water quality monitoring at nearfield, boundary and reference stations for all phases of construction. Laboratory sample collection with be performed at 3 depths (surface, mid and bottom) when there is sufficient water depth to do so without disturbing the substrate for every station sampled except for fecal coliform which will only be collected at the surface level. When water depths are less than 7 ft, only near-surface and near-bottom measurements will be made. When water depths are less than 3 ft, only near-bottom measurements will be made. When water depths are less than 2 ft, no measurements will be made to avoid disturbing bottom sediments.

4. Data Handling – Field Data Sheet

All data sheets are reviewed for completeness and legibility by the originator. Data sheets are then transferred to the Field Operations Manager for quality control checks. Each crew leader will be responsible for gathering all datasheets at the conclusion of each day and will download digital data files into the appropriate location according to procedures developed by Normandeau IT. At the end of the sampling day, data sheets will then be transferred to the data quality control clerk in Bedford, NH for entry and quality control checks.

Prior to field sampling the Field Crew leader and Onshore Field Coordinator should make sure that the Turbidity Background NTU values for the day are distributed to field crews and if possible pre-filled on data sheets. Should measurements at reference stations indicate that ambient turbidity conditions are higher than the database indicates at the start of the day, the Onshore Field Coordinator will inform the IEM and the field crew.

The Seacoast Reliability Project field data sheet consists of 3 sections: Field Header Information; Water Quality Collection Data; Coding Information

Data from sample processing that occurs in the field for all field tasks are recorded on a data sheet of this type incorporated onto an 8-1/2" x 11" sheet of Ascot paper. Collection information is printed on one side of a data sheet, with one data sheet used per station (see figure below). Coding information is printed on the back of the data sheet (see figure below).

22860.003 Seacoast Reliability Project - WQ Monitoring

Date ______ Station ______ Meter no. ______ Vessel ____________________

Monitoring Type
1 = Hand Jetting
2 = Jet Plow Trial
3 = Jet Plow

TURBIDITY REFERENCE (NTU): **Sur** **Mid** **Bot**
(for Mobile and Sentry Stations only)

Employee numbers

Time | Total Depth (ft) | Use Code | Precip | Tide | Wind direc. | Wind speed | Wave height

ACTION LEVEL ≥ 10+ "LIKE" DEPTH REFERENCE
1 = yes
2 = no

Lat. Long.

	Depth (ft)	Temp (C)	Salinity (ppt)	DO (mg/L)	**TURBIDITY (NTU)**	WQ sample number	WQ time (record on SAM-10)
Sur							
Mid							
Bot							

Comment ____________________

Time | Total Depth (ft) | Use Code | Precip | Tide | Wind direc. | Wind speed | Wave height

ACTION LEVEL ≥ 10+ "LIKE" DEPTH REFERENCE
1 = yes
2 = no

Lat. Long.

	Depth (ft)	Temp (C)	Salinity (ppt)	DO (mg/L)	**TURBIDITY (NTU)**	WQ sample number	WQ time (record on SAM-10)
Sur							
Mid							
Bot							

Comment ____________________

Time | Total Depth (ft) | Use Code | Precip | Tide | Wind direc. | Wind speed | Wave height

ACTION LEVEL ≥ 10+ "LIKE" DEPTH REFERENCE
1 = yes
2 = no

Lat. Long.

	Depth (ft)	Temp (C)	Salinity (ppt)	DO (mg/L)	**TURBIDITY (NTU)**	WQ sample number	WQ time (record on SAM-10)
Sur							
Mid							
Bot							

Comment ____________________

\SRP\SRP_WQ_Monitoring.ai March 2019

Wind speed:

Code (MPH)	Water surface	Land
1 = 0-7	Smooth/small wavelets	Leaves rustle, wind on face
2 = 8-11	Lg. wavelets,scattered whitecaps	Leaves & twigs in constant motion, flag waving
3 = 12-16	Small waves, frequent whitecaps	Raises dust & loose paper, sm. branches moving
4 = 17-24	Medium crested waves, many whitecaps	Small trees begin to sway
5 = 25-35	Large waves,foam,blown spray	Whole trees in motion

Wind direction
0 = No wind
1 = North
2 = South
3 = East
4 = West

Precipitation
0 = None
1 = Light rain
2 = Heavy rain
3 = Snow

Wave height
1 = calm to 1/2 ft
2 = light chop (> 1/2 ft - 1 ft)
3 = heavy chop (>1 ft - 2 ft)
4 = large waves (>2 ft)

Tide
1 = Flood
2 = Flood slack + 15 minutes
3 = Ebb
4 = Ebb slack + 15 minutes

Sample depths
Sur = 1 foot below surface
Mid = mid-depth
Bot = 1 foot above bottom

Use code
1 = Valid
2 = Questionable
5 = Void

Station	Sample Type	Action Level
10-19	Nearfield	yes
21-30	Boundary	yes
41-43	Reference	no

Decimal Minutes		
Station	Latitude	Longitude
Near-Field Stations		
10	43 06.390	-70 52.152
11	43 06.280	-70 51.948
12	43 06.170	-70 51.744
13	43 06.060	-70 51.546
14	43 05.940	-70 51.348
15	43 06.192	-70 52.140
16	43 06.084	-70 51.954
17	43 05.976	-70 51.768
18	43 05.868	-70 51.582
19	43 05.778	-70 51.378

Station	Latitude	Longitude
Boundary Stations		
21	43 06.654	-70 52.140
22	43 06.912	-70 51.858
23	43 06.576	-70 51.900
24	43 06.456	-70 51.690
25	43 06.336	-70 51.480
26	43 06.216	-70 51.270
27	43 05.568	-70 51.570
28	43 05.130	-70 51.810
29	43 05.682	-70 51.804
30	43 05.670	-70 51.432
Fixed Instrument Stations		
31	43 06.870	-70 51.900
32	43 06.570	-70 51.816
33	43 06.318	-70 51.462
34	43 05.616	-70 51.678
Reference Stations		
41	43 06.984	-70 51.630
42	43 06.900	-70 51.306
43	43 05.022	-70 52.080

Sample Submittal Form/ SAM-10 Project : 23840.039 Task 25

Date | | | | | | |

SRP - Seacoast Reliability Project - WQ monitoring

Sample Number	Station	Sample Type	Collect Method	Collect Time	Depth Meters	Rep. No.	Sample Status	

Delivered by: _____ Date: _____ Received at: _____

Received by: _____ Date: _____

SRP\SRP_SAM 10.ai Mar 2019

Coding instructions are given below. All entries should be made neatly with only one symbol per data block. The originator of the data sheet is responsible for assuring the legibility of all entries.

If sampling information cannot be collected for all depths at a sampling site data fields related to that depth should be left blank and use code = 1.

If a sampling site is abandoned without conducting a data and/or water collection fill out the header and enter information in the fields for time, weather conditions and use code (=5). Data fields related to sample collection should be left blank and an explanation of why the sample could not be collected should be addressed in the comments (i.e. too shallow, equipment malfunction). If more space is needed additional comments may be included on the back of the data sheet.

Coding for Header Information

VARIABLE NAME	INSTRUCTIONS
DATE	Record date (Mo/Day/Yr) of sample collection
STATION:	Record appropriate station code for site of collection (back of data sheet)
LATITUDE:	Record the GPS coordinate of the sample location.
LONGITUDE:	Record the GPS coordinate of the sample location.
VESSEL:	Record name or description of vessel used for sample collection
TURBIDITY REFERENCE:	Turbidity reference numbers for Surface, Mid and Bottom depths will be provided to boat crews prior to the days sampling and will be used for the entire day of sampling
EMP NUMBERS:	Record employee numbers of individuals responsible for sample collection
METER NO:	Record number of water quality meter

Coding for Data Collection

VARIABLE NAME	INSTRUCTIONS
TIME:	Record time (HHMM) of the collection using 24-hour clock
TOTAL DEPTH:	Record total depth in feet
WIND SPD:	Record wind speed code (refer to back of data sheet): 1 = 0-7 mph 2 = 8-11 mph 3 = 12-16 mph 4 = 17-24 mph 5 = 25-35 mph
WIND DIR:	Enter wind direction code: 0 = no wind 1 = north 2 = south 3 = east

VARIABLE NAME	INSTRUCTIONS
	4 = west
PRECIP	Record presence of precipitation
WAVE_HT:	Enter code for estimated wave height: 1 = calm to 1/2 ft 2 = light chop (>1/2 ft to 1 ft) 3 = heavy chop (>1 ft to 2 ft) 4 = large waves (>2 ft)
TIDE	1 = Flood 2 = Flood slack ± 15 minutes 3 = Ebb 4 = Ebb slack ± 15 minutes
USE CODE:	Enter appropriate use code: 1 = no sampling problems 2 = questionable - issues may affect data interpretation, 5 = sampling problems (void)
COMMENTS:	Enter COMMENT if Use Code is 2 or 5 and provide a written explanation.
WQ COLLECTION	If a water quality collection is taken during this sample fill out the sample number and time
WQ SAMPLE NUMBER (Sur, Mid, Bot)	Record sample number from vial labels
WQ TIME (Sur, Mid, Bot)	Record time (HHMM) of water sample collection using 24- hour clock
DEPTH (Sur, Mid, Bot)	Record depth (in feet) at which the water quality sample was taken. Water quality readings should be taken 1 foot below the surface, mid depth, and 1 foot above bottom.
TEMP (Sur, Mid, Bot)	Record water temperature to the nearest 0.1°C at each sampling depth.
SALINITY (Sur, Mid, Bot)	Record salinity to the nearest 0.1 ppt at each sampling depth.
TURBIDITY (Sur, Mid, Bot)	Record turbidity to the nearest 0.1 NTU at each sampling depth.
DO (Sur, Mid, Bot)	Record dissolved oxygen to the nearest 0.01 mg/liter at each sampling depth
ACTION LEVEL	At the boundary stations, calculate the average of the depth readings and compare to the Boundary Station Action Level (BSAL) for the station. If over the BSAL, indicate 1 on the field sheet for yes. 1 = yes 2 = no If the BSAL is exceeded immediately contact the OFC.

5. Water Quality Measurement (Field Parameters)

5.1. Background and BSAL values

Prior to field sampling the Field Crew leader and Onshore Field Coordinator should make sure that the Background and BSAL values for the day are distributed to field crews and if possible pre-filled on data sheets.

5.2. Equipment

Hand-held meters and multiprobe sondes (dataloggers) will be used. Equipment Manuals with operating instructions will be available for each field crew. In case of equipment malfunction back up meters will be available on site.

5.3. Calibration

Meters will be calibrated in accordance with manufacturer's instructions and results tabulated on field worksheets. Hand-held meters will, at a minimum, be calibrated at the beginning of each monitoring day. Multiprobe sondes (dataloggers) will be calibrated prior to deployment and immediately after retrieval.

5.4. Water Quality Measurement Field Procedures – In Situ

5.4.1. Measurements of turbidity, dissolved oxygen, pH, salinity and temperature are made in situ at predetermined stations locations. Surface, mid-depth, and bottom measurements are made at each station.

5.4.2. The boat is brought on station, and upon instruction from the Boat Captain, *in situ* water analyzer probes are lowered over the side to 1 foot below the surface for surface measurements. After surface measurements are taken the probe is lowered to mid-depth, measurements are taken, and then the appropriate length of cable is paid out so that measurements can be taken 1 foot off the bottom. When water depths are less than 7 ft, only near-surface and near-bottom measurements will be made. When water depths are less than 3 ft, only near-bottom measurements will be made. When water depths are less than 2 ft, no measurements will be made to avoid disturbing bottom sediments.

5.4.3. Measurements of temperature, salinity, turbidity and DO are made at each depth interval for each sampling location to the nearest 0.1°C, 0.1 ppt, 0.1 NTU and 0.01 mg/l respectively.

5.4.4. When reading the dissolved oxygen concentration with a DO meter, it is important to avoid recording inaccurate data that might occur due to meter malfunction or some other reason. If a questionable DO reading is observed in the field, take a second reading with the same meter, and record this second reading in the comments section of the data sheet. Two consecutive readings at the same water quality station and depth with the same DO meter that are 110% or higher than the saturation value for theambient temperature will cause the DO meter to immediately be taken out of service until maintenance is performed, and a second calibrated meter will be used to record the DO reading.

5.4.5. Water quality data and laboratory water quality samples are collected concurrently.

5.4.6. Water quality readings will be downloaded from the array at the fixed stations on a weekly basis following this procedure.

6. Water Sample Collection (Lab Parameters)

6.1. Equipment

Water sample collection bottles

Cooler with ice

Plastic bags

Enthalpy Analytical Sample Submittal Forms Labels

6.2. Collection Methods

Laboratory water samples are collected at Near-field stations, at Boundary stations every hour and Reference stations at least once during active construction. Field personnel will collect samples using a pump and will be used to fill laboratory provided sample containers. All analytes will be collected for surface water. Samples taken by pump will not include fecal coliform. The labeled containers will be sealed and transferred to the Onshore Field Coordinator who will hold them until they are picked up by Enthalpy Analytical's (Hampton NH) courier.

A surface sample will be collected for fecal coliform according to NHDES protocols:

- Fecal coliform samples will be collected in 125 ml-clear, polyethylene, sterilized bottles supplied by the laboratory.
- Labels are applied to the bottle to record sample.
- On sample bottle labels, the sample date, sample time (military), and sample site identification are recorded using waterproof/indelible ink.
- Sampling poles with 3-prong clamps are used to hold sample bottle during sample collection.
- Position the mouth of the bottle opposite the direction of tidal flow and thrust the bottle 8-12 inches under the surface of the water using a continuous "U" shaped motion until almost full, leaving a one-inch air space.
- Samples are collected with the container completed submerged, so as to minimize the collection of water on the immediate surface. The bottle may need to be shaken or tipped to remove water, allowing for a one-inch air space.
- Samples are collected without disturbing the substrate. If the substrate is disturbed the sample is collected away from the disturbed area to minimize contamination possibilities.

Samples are stored on ice or ice packs in a light-tight cooler until delivery to the laboratory within 6 hours of sample collection.

Table 6-1: Collection Parameters for Samples to be Laboratory Analyzed

Analyte	Hold Time	Container	Preservative**	Temperature	Label
Dissolved Cu & As (filtered)*	180 days	125 mL Plastic	Nitric Acid	Ambient	A
Total Cu & As	180 days	250 mL Plastic	Nitric Acid	Ambient	B

Fecal Coliform ***	8 hours	100 mL Sterile	Sodium Thiosulfate	Cool < 6˚C	C
TSS	7 days	1000 mL Plastic	Unpreserved	Cool < 6˚C	D
Ammonia	28 Days	125 mL Plastic	Sulfuric Acid	Cool < 6˚C	E
TN, TKN, Nitrite/Nitrate	48 hours	500 mL Plastic	Unpreserved	Cool < 6˚C	F

** Sample will be field filtered using provided syringe filter*

*** All containers are pre-preserved*

**** Fecal Coliform will only be collected at the surface*

An additional container for QC analysis will be provided for each analyte (one per monitoring team per monitoring day)

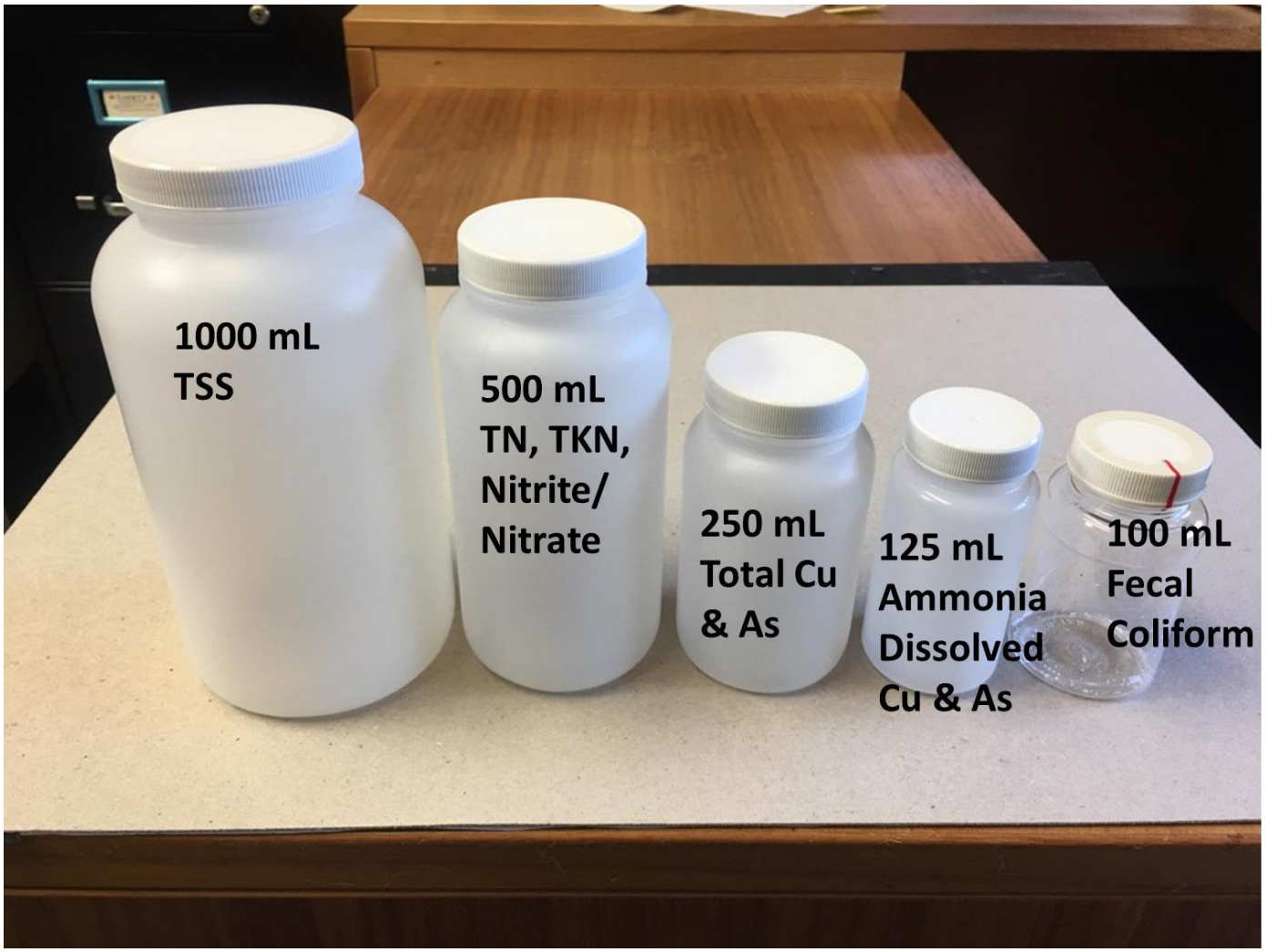


Figure 6-1: Collection vials for water samples

Figure 6-2: Syringe filter for dissolved metal sampling

6.3. Sample Handling and Storage

Samples should be properly labeled with indelible marker on the vial container and on the outside of the vial and transferred to Enthalpy Analytical within designated hold times in table 6-1. Samples will be kept cool (<6˚C) from collection until delivery to the laboratory. Samples may be transferred periodically from collection boats during the sampling period as dictated by hold times or space limitations.

Laboratory water samples will be transported to Enthalpy Analytical by courier twice daily during jet plow installation and daily during the jet plow trial run and hand jetting.

6.4. Data Handling

Sample collection data will be entered on an Enthalpy Analytical sample Submission Form (which must accompany all samples sent to Enthalpy Analytical).

Sample identification data will be used to make internal labels which are placed within plastic bags holding each sample (5 collection vials). The internal labels will include sample identification number, collection date, sample type, and station. The presence of each rep (A-F) must be verified on the label.

Prior to submittal, the Enthalpy Analytical sample submission forms must be checked for completeness, proper coding, and legibility, and then copied. Originals and one copy will accompany samples; the copy is to be signed by Enthalpy Analytical personnel and returned to Normandeau as a receipt; one copy will remain on file at Normandeau, and a second copy will be sent to the Eversource Energy either by email or by U.S. Mail. Also, sample submission forms will be faxed or scanned and emailed to: Sarah Allen (sallen@normandeau.com).

Vial label information may be filled in where possible prior to the sampling events. Sample labels will be provided by Normandeau or by Enthalpy Analytical. Labels must include Sample number, time of collection, station, type and date. The top portion of the label will be included in the plastic bag holding all 5 to 6 water collection vials for each sample. Additional labels with sample number and rep identification (i.e. 1000-A) are provided to attach to vials, sample submittal and COC forms.

Specific quality control procedures are documented in the quality control elements of Section 8 Quality Control for Field Studies. All submission forms and vial labels will be inspected for accuracy and legibility by the Crew Leader prior to relinquishing samples.

Enthalpy Analytical
1 Lafayette Road
Hampton, NH 03842

Voice: 603-926-3345
FAX: 603-926-3521

EA Job No:

CHAIN OF CUSTODY DOCUMENTATION

Client:	Contact:	Project Name:
Report to:	Address:	Project Number:
Invoice to:	Address:	Project Manager:
Voice:	Fax:	email:

Protocol:

Lab Number (assigned by lab)	Your Field ID: (must agree with container)	Date Sampled	Time Sampled	Sampled By	Grab or com-posite (G/C)	Container No	Container Size (mL)	Container Type (P/G/T)	Field Preser-vation	Matrix S=Solid W=Water	Filter N=Not needed F=Done in field L=Lab to do	Analyses Requested\ Special Instructions:

Relinquished By: Date: Time: Received By: Date: Time: Temp (C):

Relinquished By: Date: Time: Received at Lab By: Date: Time: Temp (C):

Comments:_____

COC Number:

REGISTERED

Sample Delivery Group No:	Page of

FIELD	PRECODED	BLANK	CODED	ACCEPTABLE CODES	COMMENTS
Date Sampled			x	mm/dd/yy	
Sampling Time			x	00:00	24 hour format
Sampled by:			x	Initials	Sample collector
Grab/Composite			x	G	Grab
All other fields	x				

Table 6-4: Data Coding Specifications for Sample Submission Form (example; to be updated with Enthalpy form)

7. Station Monitoring Instructions

Communications during Field Sampling

1.0 Key Personnel

- Independent Environmental Monitor (IEM)
  - Receives all turbidity measurements from field crew as collected
  - Makes determination whether turbidity exceedance at boundary stations warrants:
    - alteration of jet plow operations
    - additional sampling at affected station
  - Makes daily reports to NHDES about operations and any issues encountered
  - Reviews monitoring reports and supplies recommendations to NHDES
- Onshore Field Coordinator
  - Manages turbidity baseline database and updates as new data acquired
  - Provides turbidity background (See Table 2, Section 4.1) and Boundary Station Action Level (BSAL) values (see Section 5.2) to field crews
  - Interacts directly with IEM
- Onshore Sample Coordinator
  - Custodian of water samples as they are collected from field crews to provide to laboratory courier
    - Reviews chains-of-custody
    - Confirms samples are properly stored until pick-up
- Field Crews
  - Collect *in situ* measurements, field blanks and replicates (See Appendix A, Tables A-1 and A-2)

- Compare turbidity results to baseline/trigger values
- Report turbidity data to Onshore Field Coordinator
- As appropriate, collect water samples for laboratory analysis
  - Follow orders from IEM to continue or cease
  - Review chains-of-custody before surrendering to onshore field coordinator

2.0 Order of Communication

- Before jet plow operates
  - Onshore Field Coordinator provides turbidity background and BSALs by habitat (i.e., tidal flat or channel) to field crew and IEM
  - Field crew provides Onshore Field Coordinator with turbidity data as collected
    - Announce station number
    - Announce number of depths sampled
    - Provide turbidity data in this order
      - Near surface
      - Mid-depth
      - Near-bottom
- Once jet plow has started operating
  - Field crew provides Onshore Field Coordinator with turbidity data as collected
    - Announce station number
    - Announce number of depths sampled
    - Provide turbidity data in this order
      - Near surface
      - Mid-depth
      - Near-bottom
    - Identify whether turbidity exceedance has been observed
  - Onshore Field Coordinator
    - Provides IEM with turbidity results when BSAL has been exceeded
    - Relays instructions from IEM to affected field staff
  - IEM
    - Respond to Onshore Field Coordinator to confirm whether exceedance has occurred
    - Alert Onshore Field Coordinator as to field crew need to
      - Collect additional *in situ* measurements
    - **If the IEM is delayed in providing guidance to field crews, the field crew responsible for the station where exceedance occurred will continue sample as if the IEM has deemed the exceedance to be of concern**
- If turbidity exceedance triggers additional sampling (water, down current *in situ* measurements)
  - Field crew continues to report turbidity results to Onshore Field Coordinator who then reports to IEM, interpreting whether turbidity continues to exceed background trigger

- IEM confirms interpretation of exceedance and need to continue sampling or whether additional sampling can cease

Instructions for Monitoring Near-field Stations

Stations: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
(NOTE: Procedures may be modified based on results of jet plow trial)

1.0 Two hours before scheduled start of jet plow

- Arrive at first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
    - **NOTE**: if water depth is <7ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only near-bottom; if water depth is <2 ft, discontinue sampling
- Collect *in situ* measurements at each depth
    - Turbidity
    - Dissolve oxygen
    - Temperature
    - Salinity
- Report turbidity results to Onshore Field Coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory for the following:
    - TSS
    - Dissolved arsenic and copper, filtered through 0.45 micron filter
    - Total arsenic and copper (unfiltered)
    - Nitrogen (total N, TKN, nitrate/nitrite, and ammonia)
    - Fecal coliform
- Clean sampling gear as specified by sampling protocols
- Move to next station, moving from west to east, and repeat

2.0 One hour before scheduled start of jet plow

- Reoccupy assigned stations

3.0 One hour after jet plow has started

- Occupy first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
- Collect *in situ* measurements
    - Turbidity

    - Dissolve oxygen
    - Temperature
    - Salinity
    - **NOTE**: if water depth is <7ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only mid-depth; if water depth is <2 ft, discontinue sampling
- Report turbidity results by depth to IEM and onshore field coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory for the following:
    - TSS (remeasure turbidity in sample)
    - Dissolved arsenic and copper, filtered through 0.45 micron filter
    - Total arsenic and copper (unfiltered)
    - Nitrogen (total N, TKN, nitrate/nitrite, and ammonia)
    - Fecal coliform (surface only)
- Clean sampling gear as specified by sampling protocols
- Move to next station, moving from west to east, and repeat

4.0 Hours after jet plow has started

- Repeat the instructions for Step 3.0 for *in situ* measurements
- **Cessation of sampling:** When a specific station has exhibited reduction in turbidity to within background conditions for two consecutive sampling efforts, it no longer needs to be sampled
- **Anticipated duration of sampling by station (actual will depend on advance rate of jet plow):**

Nearfield station	Hours from start of jet plow
10	1-4
11	1-4
12	5-7
13	8-9
14	12-13
15	1-4
16	1-4
17	5-7
18	8-9
19	12-13

5.0 After jet plow has ceased operating

- Continue sampling eastern near-field stations (13, 14, 18, 19) hourly until turbidity is reduced to background levels.

Instructions for Monitoring Boundary Stations

Instructions for Monitoring Boundary Stations

Stations: 21, 22, 23, 24, 25, 26, 27, 28, 29

(NOTE: Procedures may be modified based on results of jet plow trial)

1.0 Two hours before scheduled start of jet plow

- Arrive at first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
    - **NOTE**: if water depth is <7ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only near-bottom; if water depth is <2 ft, discontinue sampling
- Collect *in situ* measurements
    - Turbidity
    - Dissolved oxygen
    - Temperature
    - Salinity
    -
- Report turbidity results to Onshore Field Coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory for the following:
    - TSS
    - Nitrogen (total N, TKN, nitrate/nitrite, and ammonia)
    - Fecal coliform (surface only)
- Clean sampling gear as specified by sampling protocols
- Move to next station, moving from west to east, and repeat

2.0 One hour before scheduled start of jet plow

- reoccupy assigned stations

3.0 One hour after jet plow has started

- Occupy first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
    - **NOTE**: if water depth is <7ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only mid-depth

- Collect *in situ* measurements
    - Turbidity
    - Dissolved oxygen
    - Temperature
    - Salinity
- Compare turbidity results to BSAL and report results to Onshore Field Coordinator
    - **If turbidity is below trigger value at each depth**
        - No water collection is required
        - Continue to next station
    - **If turbidity exceeds trigger value at any depth**
        - Collect water from affected depth(s) for the following:
            - TSS (remeasure turbidity in sample)
            - Nitrogen (total N, TKN, nitrate/nitrite, and ammonia)
            - Fecal coliform (surface only)
        - Move 100 ft down current and collect *in situ* measurements at all depths
        - If turbidity still exceeds trigger value, move 100 ft down current and repeat until there is no turbidity exceedance
        - If turbidity does not exceed trigger value, no additional down current measurements are required
        - At the original sampling location, initiate turbidity sampling at 15 minute intervals until turbidity no longer exceeds trigger value
        - Continue to inform Onshore Field Coordinator
        - Follow any additional instructions provided by the IEM
- Move to next station and repeat until all assigned stations have been sampled

4.0 Two and subsequent hours after jet plow has started

- Repeat the instructions for Step 3.0
- **Cessation of sampling:** When a specific station has exhibited turbidity below the BSAL for two consecutive hours, it no longer needs to be sampled
- **Anticipated duration of sampling by station (actual will depend on advance rate of jet plow):**

Nearfield station	Hours from start of jet plow
21	1-2
22	1-4
23	1-4
24	3-7
25	5-7
26	7-8
27	6-9
28	9-12
29	10-13

5.0 After jet plow has ceased operating

- Continue sampling eastern boundary stations hourly for two hours

Instructions for Monitoring Fixed Stations

Stations: 31, 32, 33

1.0 One week before jet plow trial run

- At each fixed station
- Determine and record position
- Deploy mooring containing continuous turbidity monitor so that probe is 3 ft above the substrate

2.0 Weekly until one week after hand jetting is complete

- Download data
- Provide data to database manager for incorporation, as appropriate, into baseline turbidity dataset
- Confirm condition of instrument and perform any maintenance or repairs necessary
- Using hand-held meters, take measurements adjacent to the dataloggers for all the field parameters during deployment and retrieval of the dataloggers to serve as a check of the datalogger results.

Instructions for Monitoring Reference Stations

Stations: 41, 42, 43
(NOTE: Procedures may be modified based on results of jet plow trial run)
1.0 Two hours before scheduled start of jet plow

- Arrive at first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
- Collect *in situ* measurements
    - Turbidity
    - Dissolved oxygen
    - Temperature
    - Salinity
    - **NOTE:** if water depth is <7 ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only near-bottom; if water depth is <2 ft, discontinue sampling
- Report turbidity results to Onshore Field Coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory
- Move to next station, moving from west to east, and repeat

2.0 One hour before scheduled start of jet plow

- reoccupy assigned stations

3.0 At least once during the cable installation while jet plow is operating

- Occupy first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
- Collect *in situ* measurements
    - Turbidity
    - Dissolve oxygen
    - Temperature
    - Salinity
- Report turbidity results to Onshore Field Coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory
- Move to next station and repeat

4.0 After jet plow has ceased operating

- Continue sampling reference stations hourly for two hours

Instructions for Monitoring Hand Jetting Stations

Stations: If hand jetting on west shore – Stations 10 & 14. If hand jetting on east shore - Stations 15 & 19

1.0 Two hours before scheduled start of hand jetting

- Arrive at first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
    - **NOTE**: if water depth is <7ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only near-bottom; if water depth is <2 ft, discontinue sampling
- Collect *in situ* measurements at each depth
    - Turbidity
    - Dissolved oxygen
    - Temperature
    - Salinity
- Report turbidity results to Independent Environmental Monitor (IEM) and onshore field coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory for the following:
    - TSS (remeasure turbidity in sample)
    - Dissolved arsenic and copper, filtered through 0.45 micron filter
    - Total arsenic and copper (unfiltered)
    - Nitrogen (total N, TKN, nitrate/nitrite, and ammonia)
    - Fecal coliform
- Clean sampling gear as specified by sampling protocols
- Move to next station, moving from west to east, and repeat

2.0 One hour before scheduled start of hand jetting

- Reoccupy assigned stations

3.0 One hour after hand jetting has started

- Occupy first station
- Determine and record position
- Determine total depth and depth of measurements
    - Near surface = 1 ft below surface
    - Mid-depth = middle of water column
    - Near bottom = 1 ft above substrate
- Collect *in situ* measurements

    - Turbidity
    - Dissolved oxygen
    - Temperature
    - Salinity
    - **NOTE**: if water depth is <7ft, sample only near-surface and near-bottom; if water depth is <3 ft, sample only near-bottom; if water depth is <2 ft, discontinue sampling
- Report turbidity results by depth to IEM and onshore field coordinator
- Collect water from each depth and put into prepared bottles supplied by laboratory for the following:
    - TSS (remeasure turbidity in sample)
    - Dissolved arsenic and copper, filtered through 0.45 micron filter
    - Total arsenic and copper (unfiltered)
    - Nitrogen (total N, TKN, nitrate/nitrite, and ammonia)
    - Fecal coliform
- Clean sampling gear as specified by sampling protocols
- Move to next station, moving from west to east, and repeat

4.0 One hour and every subsequent hour after hand jetting has started

- Repeat the instructions for Step 3.0 for *in situ* measurements

5.0 After hand jetting has ceased

- Continue sampling hourly until turbidity reaches background conditions

8. Quality Control for Field Studies

Audits of water quality data collection procedures will be conducted by the Field Operations Manager. These audits will be conducted early in the project to monitor the daily performance of each technician. The function of the quality control program is to continually monitor the reliability (accuracy, precision, and completeness) of data produced on a daily basis. The quality control program has been approved by the Quality Assurance Director and any changes to the procedures must be coordinated through the Quality Assurance Department. These procedures include acceptance/rejection criteria for each measurement parameter and corrective action procedures. The program managers are responsible for conducting the project quality control program. The Quality Control Supervisor will:

- monitor procedures to determine that the SOP's are followed
- conduct audits of documentation produced as a result of sample processing
- conduct precision and accuracy checks of technician and instrument performance
- monitor instrument calibration
- monitor training of technicians.

Other Quality Control provisions include the following;

- collection of at least one replicate for all parameters by each monitoring team each day that monitoring occurs;
- collection of at least one field blank for all lab parameters by each monitoring team each day that monitoring occurs;
- Lab duplicates;
- Calibration of hand-held meters at the beginning of each monitoring day;
- Calibration of multi probe dataloggers at deployment and retrieval;
- Hand-held meter checks of dataloggers at deployment and retrieval.
- Unless otherwise authorized by NHDES measurement performance for criteria for samples will comply with Table 4 on page 17 of the NHDES 2019-2023 River Monitoring Program Quality Assurance Plan, March 12, 2019.