Norwalk Power LLC
One Manresa Island Avenue
South Norwalk, CT 06854

An NRG Energy company

August 20, 2019

Ms. Amanda Killeen
CT Department of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106

Subject: Sediment Remedial Action Plan
Norwalk Harbor Generating Station, Manresa Island Avenue, South Norwalk, CT

Dear Ms. Killeen:

Norwalk Power LLC ("Norwalk") respectfully submits this Remedial Action Plan (RAP) for the Norwalk Harbor Generating Station (the "Site"), located in South Norwalk, Connecticut to the Connecticut Department of Energy & Environmental Protection (CTDEEP) for your review and approval. This RAP presents proposed activities to remediate sediment in freshwater and saltwater wetlands at the subject Site. Public notice will be issued for this document after CTDEEP issues approval to do so.

Aptim Environmental & Infrastructure, LLC (APTIM; formerly CB&I) prepared and submitted the draft Wetland Sediment RAP to CTDEEP in October 2014 for review and approval prior to Public Notice. CTDEEP temporarily postponed concurrence to initiate Public Notice pending the completion of a pilot test. The pilot test details were agreed upon by the CTDEEP and the U.S. Environmental Protection Agency (USEPA). Norwalk successfully performed the pilot test and prepared and submitted the Wetland Sediment Remediation Pilot Test Data Evaluation Report to CTDEEP in February 2019. The report included the following summary and conclusion:

> "Per the pilot test plan, the pilot test sample results were evaluated to determine whether the draft Sediment RAP was verified by the pilot test (i.e., new backfill sediment concentrations less than TCCs). A nonparametric bootstrap method was used to calculate 95 percent UCLs of the mean for COCs in sediment at the wetland test cells (**Tables 4** and **5**). For each COC at each test cell, the 95 percent UCL of the mean is less than the corresponding TCC. In accordance with the pilot test plan, *the pilot test is considered successful and no further statistical evaluation is required.*
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> The pilot test plan stated that if any of the 95 percent UCL of the mean were greater than the corresponding TCC, that further statistical evaluation was required, specifically to compare the lined versus unlined test cells. However, as stated in the previous paragraph, both tests were successful so the liner is not needed. *Thus, per the pilot test plan, the draft Sediment RAP will continue with the 1 foot depth with no liner and no confirmation samples.* The October 2014 draft Sediment RAP will only be modestly revised with things such as updated dates and schedule, updated site plans (e.g., 2016 wetland re-delineation, new wells, etc.), pilot test construction lessons learned regarding wetland access, staging, and backfill specification, project permitting, new signatures, etc. and submitted to CTDEEP as draft for approval to issue public notice."

USEPA and CTDEEP concurred with the conclusions of the final pilot test report in an email from USEPA dated March 25, 2019. As such, this revised Sediment RAP is consistent with the October 2014 version with updated dates and schedule, updated site plans (e.g., 2016 wetland re-delineation, new wells, etc.), pilot test construction lessons learned regarding wetland access, staging, and backfill specification, project permitting, and new signatures.

If you have any questions regarding the site or the RAP, please do not hesitate to contact Paul Bukowsky, Environmental Compliance Engineer with Norwalk Power LLC at 203.783.6143 or at Paul.Bukowsky@nrg.com.

Sincerely,

Nicholas Volturno
Plant Manager, Norwalk Power LLC

Cc: Juan Perez, USEPA (electronic)
B. Spooner, NRG (electronic)
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REMEDIAL ACTION PLAN FOR WETLAND SEDIMENTS

NORWALK HARBOR GENERATING STATION
MANRESA ISLAND AVENUE
SOUTH NORWALK, CONNECTICUT

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1.0 INTRODUCTION

On behalf of Norwalk Power LLC ("Norwalk"), Aptim Environmental & Infrastructure, LLC (APTIM) prepared this Remedial Action Plan (RAP) for the wetland sediment remediation project associated with Norwalk Harbor Generating Station (the "Site"), located in South Norwalk, Connecticut. A completed Connecticut Department of Energy and Environmental Protection (CTDEEP) Remedial Action Plan Transmittal Form is provided in **Appendix A**. A copy of the required public notice is provided in **Appendix B**. This RAP presents proposed activities to remediate shallow sediment associated with potential ecological risk due to select metals in freshwater and saltwater wetlands at the subject Site.

APTIM (formerly CB&I) prepared and submitted the draft Wetland Sediment RAP to CTDEEP in October 2014 for review and approval prior to Public Notice. CTDEEP temporarily postponed concurrence to initiate Public Notice pending the completion of a pilot test. The pilot test details were agreed upon by the CTDEEP and the U.S. Environmental Protection Agency (USEPA). Norwalk successfully performed the pilot test and prepared and submitted the Wetland Sediment Remediation Pilot Test Data Evaluation Report to CTDEEP in February 2019. The report included the following summary and conclusion:

> "Per the pilot test plan, the pilot test sample results were evaluated to determine whether the draft Sediment RAP was verified by the pilot test (i.e., new backfill sediment concentrations less than TCCs). A nonparametric bootstrap method was used to calculate 95 percent UCLs of the mean for COCs in sediment at the wetland test cells (Tables 4 and 5). For each COC at each test cell, the 95 percent UCL of the mean is less than the corresponding TCC. In accordance with the pilot test plan, *the pilot test is considered successful and no further statistical evaluation is required.*
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USEPA and CTDEEP concurred with the conclusions of the final pilot test report in an email from USEPA dated March 25, 2019. As such, this revised Sediment RAP is consistent with the October 2014 version with updated dates and schedule, updated site plans (e.g., 2016 wetland re-delineation, new wells, etc.), pilot test construction lessons learned regarding wetland access, staging, and backfill specification, project permitting, and new signatures.

2.0 SITE DESCRIPTION

Norwalk Harbor Generating Station is located on an approximate 123-acre property in the South Norwalk section of Norwalk, Connecticut, at the entrance to Norwalk Harbor, in Long Island Sound. The property is owned by Norwalk Power LLC. Norwalk Harbor Generating Station is situated on Manresa Island, a peninsula extending into the Long Island Sound. The location of this facility is shown on the U.S. Geological Survey (USGS) Norwalk South topographic quadrangle map (**Figure 1**). Site elevations vary between 0 and 15 feet above mean sea level. The electric generating facility was constructed from 1958

to 1960, and was in continuous service between 1960 and 2013. The facility utilized coal for combustion from 1960 until 1972, when it was converted to an oil combustion facility.

The northern half of the Site consists of an undeveloped densely vegetated area that was formerly used for coal ash and oil ash disposal. The developed portion of the Site is located along the southern half of the peninsula. The developed area consists of the main plant building, transmission and distribution yard, bulk fuel storage area, a barge dock, and various facility structures. Long Island Sound surrounds Norwalk Power LLC's property to the south, west, and east, and residential properties are located to the north. The facility layout is shown on **Figure 2**.

The largest defined area of concern (AOC), AOC 1, includes an approximately 55-acre undeveloped densely vegetated area that encompasses the northern half of the Site. The southern half of AOC 1 is approximately 20 acres and contains coal ash and limited oil ash and fill at a depth ranging between 1 foot and 15 feet below grade. Coal ash disposal activities took place during the period when the facility utilized coal for combustion, between 1960 and 1972. In the early 1970s, oil ash also was disposed of in AOC 1 after the facility converted to using oil for combustion. Additionally, coal ash disposal activities included depositing the ash slurry in a series of connected depressions created by Connecticut Light & Power Company when the facility first started operating. These disposal activities were ceased by approximately 1975.

The following sections describe the environmental setting at the Site, focused on AOC 1, consisting of wetlands, surface water, groundwater, and biological resources along with the land use and environmental regulatory history.

2.1 Wetlands

Six areas within and adjacent to AOC 1 have been identified as wetlands and they are described in detail in the Wetland Delineation Report (Shaw, 2007) and updated Wetland Delineation Report (CB&I, 2017a). Summaries are provided in this section. As identified in the Sediment Information Submittal (SIS) dated August 26, 2011 (Shaw, 2011b), the five significant wetlands (Wetlands W-1, W-3, W-4, W-5, and W-6) were rated using the EPA "WET" protocol. They were rated with a Moderate value to society, a Moderate probability of performing functions, and Low habitat suitability for the species/groups assessed.

2.1.1 Wetland W-1

This freshwater forested wetland is located in the northwest corner of AOC 1 and is approximately 2.1 acres in size. A majority of it was inundated with approximately six inches of water at the time of delineation in late April 2007. Dominant vegetation included red maple, gray birch, northern bayberry, and willows (unidentifiable due to the lack of leaves, flowers, or fruit). Within the forested wetland was an opening in the canopy which was dominated by common reed and switch-grass (Shaw, 2007).

2.1.2 Wetland W-2

This feature has developed entirely within a manmade feature in the southeast portion of AOC 1, specifically a former ash settling area surrounded by berms, on fill material. This area was permitted and

used for barge slip dredge spoil management and is approximately 3.8 acres in size. It was vegetated with a monoculture of common reed, often extremely dense, that occupied most of the former settling area. Wetland W-2 was considered to be isolated as no connections from this confined area to other wetlands or watercourses were present (Shaw, 2007).

2.1.3 Wetland W-3

This wetland is located between Wetlands W-2 and W-5, in the southwest "quadrant" of AOC 1 and is approximately 0.2 acres in size. This wetland was re-delineated in August 2016 (CB&I, 2017a). This freshwater forested wetland supported the dominant tree, gray birch, and also supported red maple, goat willow, eastern cottonwood, and northern bayberry, with some common reed dominating the interior. Wetland W-3 contains a culvert beneath a packed gravel monitoring well access road that drains to the southern tidal portion of Wetland W-5. The culvert appeared obstructed by soil, leaves, and other debris, and it is likely that this hydrologic connection is limited (CB&I, 2017a).

2.1.4 Wetland W-4

This wetland, located in the southern tip of AOC 1, is essentially an herbaceous-dominated habitat, with a narrow belt of trees and shrubs along the perimeter. This freshwater wetland is approximately 0.9 acres in size. This wetland was re-delineated in August 2016 (CB&I, 2017a). The majority of the interior was dominated by an extremely dense and tall colony of common reed. The forested component of the wetland perimeter was dominated by gray birch and northern bayberry. Due to the presence of a community of breeding American toads observed in April 2007, it was assumed that this wetland does not connect hydrologically to the brackish waters of nearby Wetlands W-5 and W-6. The culvert beneath a packed gravel maintenance road draining from Wetland W-4 to Wetland W-3, a neighboring freshwater wetland, appeared obstructed by soil, leaves, and other debris, and it is likely that this hydrologic connection is limited (CB&I, 2017a).

2.1.5 Wetland W-5

This wetland is located between Manresa Island Avenue and Wetland W-3, in the southwest quadrant of AOC 1 and is approximately 3.0 acres in size. This resource includes salt meadow habitat in its southern portion, and forested freshwater wetland in the northern part at higher elevations. This wetland was re-delineated in August 2016 (CB&I, 2017a). The salt meadow was dominated by marsh-elder, salt grass, salt meadow cordgrass, and common reed. Other less common species included saltmarsh fleabane, slender glasswort, saltmarsh cordgrass, and sea-lavender. The vegetated community of the forested freshwater portion was similar to that of Wetland W-1. This resource is hydrologically connected to Wetland W-3 by a small obstructed culvert, and to Wetland W-6 by a large culvert under Manresa Island Avenue, through which a prominent tidal channel flows (Shaw, 2007; CB&I, 2017a).

2.1.6 Wetland W-6

This resource is located west of Manresa Island Avenue. This resource is a triangular area comprised entirely of brackish water-dependent habitat and is approximately 5.0 acres in size. The vegetation was comprised predominantly of salt meadow cordgrass, spike grass, groundsel bush, and marsh elder. Salt marsh cordgrass was the dominant plant along the banks of a prominent tidal channel that meanders through this area and opens to a larger marsh along the Long Island Sound to the west. The most inland

reaches of this channel extend via culvert beneath Manresa Island Avenue and into Wetland W-5 (Shaw, 2007).

2.2 Sediment

Sediment is present in the wetlands on site and in the surrounding Long Island Sound. The extent of sediment is defined horizontally as wetland substrate that is below water for longer than a 2 month period in the spring. The delineation was based on multiple field observations and available photograph records. The extents of sediment in the wetlands on Site are shown on the Site Plan in **Figure 2**.

2.3 Surface Water

Surface water is present in the wetlands on Site and in the surrounding Long Island Sound. Fresh surface water from Wetland W-4 drains by a small culvert to Wetland W-3. Fresh surface water from Wetland W-3 drains by a small culvert to Wetland W-5. Fresh and saltwater mix in Wetland W-5 which is open to Wetland W-6 through a large culvert. Wetland W-6, a saltwater and tidally influenced resource, is directly connected to Long Island Sound. Fresh surface water in Wetland W-1 does not visibly connect to the other resources. Although surface water has been intermittently observed in each wetland at select times of the year, surface water sufficient for sample collection has historically not been present in Wetland W-3.

Long Island Sound surrounds the Site to the west, south, and east of the Site and is classified by CTDEEP as SC/SB to the east and SB/SA to the west and south. A Class SB surface water is defined as a water body that is known or presumed to meet water quality criteria that support designated uses. Designated uses are marine fish, shellfish and wildlife habitat, shellfish harvesting for transfer to a depuration plant or relay (transplant) to approved areas for purification prior to human consumption, recreation, industrial, and other legitimate uses including navigation. The SC/SB designation indicates that a water body does not meet all SB water quality criteria due to known pollution of the resource. A Class SA surface water is defined as an inland surface water classification and criteria known or presumed to meet criteria to support designated uses. SA designated uses are habitat for fish and other aquatic life and wildlife, potential drinking water supplies, recreation, navigation and water supply for industry and agriculture. The SB/SA designation indicates that a water body does not meet all SA water quality criteria.

2.4 Groundwater

The depth to groundwater across the Site is generally 6 to 17 feet below grade. The shallow and deep aquifers are separated by a semi-confining layer. Groundwater in the shallow and deep aquifers at the Site has been determined to flow radially toward the Long Island Sound and discharges to Long Island Sound. Localized shallow groundwater also discharges seasonally and during lower tides to the wetlands. The Site groundwater model is described later in this RAP.

Groundwater at the Site is classified as GB per the Connecticut WQS and Classifications documents. GB classification was established by CTDEEP to describe groundwater located in a heavily urbanized area of intense industrial activity, where a public water supply is available. Groundwater located within a GB area may not be suitable for human consumption due to historical releases and discharges without prior treatment. The Site and surrounding area is supplied drinking water by the City of Norwalk.

2.5 Biological Resources

A Natural Diversity Data Base (NDDB) review for the wetland sediment remediation project was obtained from CTDEEP Wildlife Division on July 4, 2015. The review indicated extant populations of the then proposed State Special Concern *Malaclemys t. terrapin* (northern diamondback terrapin) in the area of work. This turtle species has since been officially listed as State Special Concern. The review identified recommended protection strategies including time of year work restrictions, perimeter silt fencing, worker education, and daily turtle sweeps and relocation as necessary. An NDDB review renewal was also completed in 2016 specific for the wetland sediment remediation pilot test in Wetlands W-4 and W-5. Recommended protection strategies for the northern diamondback terrapin (*Malaclemys t. terrapin*) in the area of work were implemented including a work window of April 1 to November 1 (i.e., no work in habitat between November 1 and April 1) and installation of exclusionary fencing. An updated NDDB review request will be filed with CTDEEP in advance of the required permit application preparation.

APTIM conducted vegetation and wildlife surveys in AOC 1 and immediately adjacent habitats in July and September 2010 as reported in the *Biological Resources Report for AOC 1* (Shaw, 2011a). The purpose of the survey was to identify wildlife and wildlife habitat use within the various habitats of AOC 1 in preparation for remedy evaluations. In general, the Site was found to contain a wide variety of habitats ranging from forested upland to estuarine emergent wetland. This range of habitats hosts a variety of wildlife, particularly in the wetlands. As indicated by the survey, the Site hosts a wide variety of avian species, both marine and non-marine feeding species. The results of the survey combined with historical observations indicate that the Site is being used by terrestrial wildlife as well. Least tern (*Sterna antillarum*) and common tern (*Sterna hirundo*) were not detected within AOC 1 or any other location on Site during the survey. However, both of these species were observed off site to the east-southeast of the polishing basin during the survey. The diamondback terrapin (*Malaclemys terrapin*) was not detected within AOC 1 or any other location on site during the survey. Osprey (*Pandion haliaetus*) were detected multiple times during the survey both on and off site.

The U.S. Fish and Wildlife Service (USFWS) has classified the northern long-eared bat (*Myotis septentrionalis*) as a federal threatened species. The northern long-eared bat is known to occur in coastal regions of Connecticut, although maternity roost trees have not yet been identified anywhere in the state. The nearest known winter hibernacula to the Site is to the southwest in Greenwich, Connecticut (CTDEEP, 2016a). The review for federal species of interest will be part of the federal permitting for the planned wetland sediment remediation.

2.6 Current and Potential Future Site Uses

The Site is currently inactive although one small office space in the former wastewater treatment building remains functional for periodic visits from area Norwalk Power LLC personnel. The wetlands are expected to remain as wetlands into the foreseeable future.

2.7 Site Regulatory History

As a result of historic operations, the Norwalk Harbor Generating Station is being assessed and remediated as part of a State Corrective Action program under Licensed Environmental Professional (LEP) oversight in communication and coordination with the CTDEEP Remediation Division. Numerous site-wide investigations, risk assessments, remediation, and other activities have been conducted under the CT Transfer Act and Resource Conservation and Recovery Act (RCRA) Corrective Action programs. As summarized in the Phase III Investigation Final Report (Shaw, 2010), the assessment included the identification of 12 AOCs inclusive of groundwater at the Site. Previous investigation activities, summarized in the following section, have indicated the presence of sediment impacted by polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (total and extractable petroleum hydrocarbons), and metals in the wetlands of AOC 1. These sediment contaminants are potentially sourced from petroleum oil, coal, and coal ash at the Site. As described later in this RAP, only select metals are identified for remediation in wetland sediments. Similarly, groundwater and surface water on site are impacted by historic operations and their relationship to wetland impacts are also discussed in this RAP.

3.0 CONTAMINANT FATE AND TRANSPORT

This section identifies the Conceptual Site Model (CSM) specific for the wetland resources in AOC 1 including sediment, surface water, and groundwater components. The CSM is depicted in **Figure 3**. The CSM follows precipitation in surface water runoff and through the ground surface into groundwater that discharges to wetlands and Long Island Sound. The analysis of fate and transport of contaminants within the wetland resources in AOC 1 is supported by a groundwater model developed consistent with the CSM. Contaminant fate and transport and the supporting groundwater model are discussed in this section.

3.1 Fate and Transport

The metals in the wetland sediments are likely to originate from one primary and two secondary sources. These potential sources include:

a) Primary - the historical ash sluicing operations which moved coal ash through a series of pipes towards the wetlands;

b) Secondary - metals dissolved in groundwater that discharges to the wetlands; and

c) Secondary - metals dissolved in surface runoff/overland flow following precipitation events.

The ash sluicing operations, which were the primary source of metals, were a historical source that ceased several decades ago while the other two are current secondary sources. Metal concentrations originating from the ash sluicing operations are, therefore, not expected to increase over time.
Both of the current sources (groundwater and overland flow) are seasonal. The groundwater discharges to the wetlands only during the months when the water table is high. During the rest of the year, the wetlands are typically dry, with the water table lowered to elevations such that surface water moves vertically from in the wetlands to the surrounding water table. As a result, groundwater discharges contribute metals to the wetland sediments during the wet season, while during the dry season the metals may be desorbed from the sediments and migrate to the groundwater. Wetland W-6 and portions of Wetland W-5 are also tidally influenced which can affect the groundwater discharge.

Similarly, overland flow with dissolved metals and suspended surficial soil is active only after heavy precipitation events and does not contribute metals to the wetlands consistently throughout the year. These seasonal sources are not expected to result in sustained long term increases in the sediment metal concentrations. The issue was previously addressed in the SIS dated August 26, 2011 (Shaw, 2011b), where it was shown that if the sediments were to be replaced by clean backfill, the backfill material will become impacted with low to moderate levels of metals, but unlikely to approach or exceed the risk based target cleanup concentrations (TCCs) of metals. This indicates that the seasonal fluxes of metals from groundwater and overland flow to the sediments will not result in an unacceptable increase in metal concentrations, and some of the increases may be balanced by reductions during the dry season when the falling water table may de-sorb metals from the sediments. The updated backfill analysis is summarized in **Table 1**. This analysis was supported by the positive results of the wetland sediment remediation pilot test conducted at the Site in 2017-2018 (APTIM, 2019). Due to recent new information regarding elevated concentrations of aluminum in soil and groundwater at the Site, aluminum was added as a constituent of concern (COC) in sediment for the pilot study as a conservative measure. There are limited data for screening criteria for aluminum in sediment. The New Jersey Department of Environmental Protection (NJDEP) lists Ecological Screening Criteria (ESC; 2009) for aluminum in sediment that are referenced from the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs) (2008). As a conservative measure for reference, these NJDEP ESC values for aluminum are included as the TCCs in **Table 1**.

3.2 Groundwater Model

Groundwater at the Site has been assessed using a computer model consistent with the CSM. Using site-specific inputs where available and standard reference values, the model ultimately will be used to support the determination as to whether or not groundwater remediation is necessary for the Site. The previous modeling effort was presented to CTDEEP in the *Preliminary Technical Impracticability Assessment for Groundwater* (Shaw, 2012) and subsequent communications. The model was updated to include Wetlands W-3, W-4, W-5, and W-6 as surface water bodies in the flow model and updated with contaminant concentrations from more recent groundwater monitoring events (through 2015) and other conservative input parameters. The updated modeling effort will be presented to CTDEEP under separate cover. However, the findings specific for the AOC 1 wetlands that are the subject of this RAP are described herein. A summary of the updated modeling process with figures are provided in

Appendix C. The results of the updated groundwater flow and solute transport modeling are similar to the previous modeling results.

4.0 RISK ASSESSMENT

This section evaluates the potential risks associated with the wetland resources at the Site. The more recent assessments of the wetland media were previously reported separately to address specific data updates and technical approaches. The purpose of this section is to bring those previous assessments back together and present a more comprehensive understanding of the potential risks associated with the wetland resources at the Site and identify the remediation objective(s).

For the purposes of the sediment and surface water risk assessments, Wetlands W-1, W-3, and W-4 are grouped together as the freshwater wetlands and Wetlands W-5 and W-6 are grouped together as the saltwater (tidal) wetlands. Wetland W-2 was not evaluated for remediation as it is a component of facility operations.

4.1 Sediment Ecological Risk Assessment

In the August 2011 SIS, APTIM presented an evaluation of sediment in AOC 1 freshwater and saltwater wetlands, including Wetland W-6 and AOC 11 Long Island Sound (Shaw, 2011b). The evaluation was presented to CTDEEP and EPA during a meeting in December 2011. This evaluation included review of sediment analytical data and toxicity testing.

As reported in the SIS (Shaw, 2011b) for the 2009 and 2010 sediment sampling events, the most recent sediment sampling events, ETPH and metals were detected in sediment samples collected from Wetlands W-1, W-3, W-4, W-5, and W-6. Sediment samples included the biologically active zone (top 6 inches). The total vertical extent of contamination is generally limited to relatively shallow depths. In order to determine constituents of potential concern (COPCs), concentrations of these constituents were compared to screening values. Only select metals were considered COPCs in sediment of each wetland and ETPH was considered a COPC in Wetlands W-3 and W-4. COPCs were evaluated further in the risk assessment.

Based on the analytical data and toxicity test results, risk evaluations were completed for benthic invertebrates and vertebrate wildlife. The conclusions of the risk evaluation were the following:

- for saltwater wetlands – the evaluation of sediment in Wetlands W-5 and W-6 has shown that there is potential risk to benthic invertebrates and to wetland vertebrate wildlife from exposure to concentrations of contaminants (arsenic and nickel) in the sediment;
- for freshwater wetlands - the evaluation of sediment in Wetland W-1 has shown no significant risk to benthic invertebrates or to wetland vertebrate wildlife from exposure to concentrations of contaminants in the sediment. The sediment in Wetlands W-3 and W-4 also shows no risk to benthic invertebrates. However, there is potential risk to vertebrate wildlife from exposure to three metals in sediment in Wetlands W-3 and W-4;

- for AOC 11 Long Island Sound sediment – the evaluation of sediment from Long Island Sound has shown that effects on benthic invertebrates related to the Site are unlikely.

CTDEEP provided comments on the SIS to Norwalk Power LLC in a letter dated January 15, 2014. CTDEEP agreed with the conclusion of the SIS that no removal or remediation was necessary for AOC 11 Long Island Sound sediment. No remediation was recommended for Wetland W-1 in the SIS. CTDEEP requested a revised calculation of estimated ecological risk-based TCCs for Wetlands W-3, W-4, W-5, and W-6 and identified that remediation was necessary for each of these four wetlands. APTIM responded to CTDEEP comments relating to the interpretation of sediment toxicity test and risk assessment results and the estimation of TCCs in the "Norwalk Wetland Sediment Remediation Approach" submittal in June 2014 (CB&I, 2014). This October 2014 RAP does not deviate from the June 2014 submittal. CTDEEP concurred with the June 24 submittal in an email dated August 5, 2014. The revised calculations are presented in **Appendix D**. The results of the revised calculation do not substantially change the previous risk conclusions or remediation approach and extent associated with Wetlands W-3, W-4, W-5, and W-6. **Figure 4** shows the sediment extent line and proposed sediment remediation areas.

In addition, as discussed in Section 3.1, Fate and Transport, APTIM performed a series of analytical calculations to determine the likelihood of clean backfill in the wetlands to become impacted post-remediation. Although the analysis indicated that the backfill material would become impacted with low to moderate levels of metals, the concentrations would not approach or exceed the revised TCCs (concentrations of COCs that would reduce risk to acceptable levels). The results are summarized in **Table 1**. This analysis was supported by the positive results of the wetland sediment remediation pilot test conducted at the Site in 2017-2018 (APTIM, 2019).

4.2 Surface Water Ecological Risk Assessment

COPCs were identified in the 2009 ERA (Shaw, 2009) as those analytes detected in surface water that could present a potential risk for ecological receptors. COPCs were selected based on their relationship to background concentrations and Connecticut Water Quality Criteria (WQC). Copper, lead, and zinc were identified as COPCs in surface water of freshwater wetlands based on samples collected from Wetland W-4. Nickel is the sole COPC identified in Wetland W-5 surface water. No COPCs were identified in Wetland W-6 surface water.

Surface water quality in Wetlands W-4, W-5, and W-6 and Long Island Sound was evaluated in the Surface Water Sampling and Analysis transmittal to CTDEEP Remediation Division dated October 8, 2013 (Shaw, 2013b). Surface water in Wetlands W-4, W-5, and W-6 were monitored from 2009 to 2011. In order to gather more data to make a determination of potential risk to aquatic receptors in wetland surface water at AOC 1 and Wetland W-6, three rounds of surface water sampling and analysis, and two rounds of toxicity testing were conducted between 2011 and 2013. The conclusions reached in the Surface Water Sampling and Analysis transmittal (Shaw, 2013b) are provided in the following paragraphs.

In Wetland W-4, maximum concentrations of aluminum, cadmium, copper, lead, nickel, selenium, and zinc exceed the chronic freshwater WQC. However, the mean concentrations of these metals are below the WQC, except for aluminum. It is concluded that concentrations of arsenic, beryllium, cadmium, copper, lead, nickel, selenium, thallium, and zinc in these surface water samples at Wetland W-4 do not present a significant risk to aquatic receptors. Since the aluminum concentration in the one sample collected from Wetland W-4 is above the WQC, the surface water in Wetland W-4 will continue to be monitored (Shaw, 2013b).

In Wetland W-5, maximum concentrations of copper, nickel, and zinc exceed the chronic saltwater WQC. The mean concentrations of copper and nickel also exceed the WQC. Based on toxicity test results, metals concentrations in surface water at Wetland W-5 do not present a significant risk to aquatic receptors (Shaw, 2013b). Aluminum was analyzed in Wetland W-5 surface water but no saltwater criteria was available for comparison.

In Wetland W-6, only one concentration of copper slightly exceeded the chronic saltwater WQC. The average concentration of copper over the four samples is less than the WQC. Therefore, it is concluded that metals concentrations in surface water at Wetland W-6 do not present a significant risk to aquatic receptors (Shaw, 2013b). Aluminum was not analyzed in Wetland W-6 surface water.

Six surface water samples were collected from Long Island Sound adjacent to the Site in 2008. As concluded in the ERA, there is no impact to Long Island Sound surface water from the Site (APTIM f/k/a Shaw, 2013b).

CTDEEP provided comments on the Surface Water Sampling and Analysis transmittal (Shaw, 2013b) in a memo dated June 30, 2016 (CTDEEP, 2016b). APTIM commented on CTDEEP's memo in a letter dated February 27, 2017 (CB&I, 2017b). The comments and response do not change the statements made in this document except for the surface water sampling plan presented in Section 7.0. APTIM has conducted multiple rounds of surface water sampling in wetlands at the Site since the Surface Water Sampling and Analysis transmittal (Shaw, 2013b) and the results from 2014 to 2019 are generally consistent with previous data.

4.3 Groundwater Ecological Risk Assessment

Groundwater at the Site has been monitored and reported on an annual basis since 1989. Heavy range petroleum (extractable total petroleum hydrocarbons [ETPH]), volatile organic compounds (VOCs), PAHs, and metals have been detected in groundwater at the Site. The primary COCs in AOC 1 groundwater are metals which are widespread throughout AOC 1 with concentrations greater than the default Surface Water Protection Criteria (SWPC), approved Alternative SWPC, and the CT WQC for aquatic life. Since groundwater from AOC 1 discharges directly to wetlands and Long Island Sound, data is compared to the SWPC and WQC for compliance purposes. In general, groundwater from the eastern and southern portion of the Site discharges to Long Island Sound and data is compared to SWPC and groundwater from the northwestern portion of the Site discharges to wetlands and data is compared to WQC.

A review of more than 10 years (through 2015) of groundwater concentration data indicates that the groundwater concentrations of metals are clearly stable and a steady state condition exists at the Site. The results of additional groundwater monitoring conducted through April 2019 are generally consistent with previous data. Any temporary increases in groundwater concentrations and the mass of metals leaching from soil/ash are balanced by the loss of metals mass and concentration reduction caused by the diffuse discharge of groundwater to surface water. This is in conjunction with natural attenuation processes, primarily dispersion of metals along the groundwater flow paths, natural recovery, and adsorption of metals to the saturated porous media.

As identified in the *Preliminary Technical Impracticability Assessment for Groundwater* (Shaw, 2012), the potential for risk to ecological receptors at the Site from groundwater has been quantified using a variety of techniques. Site conditions as pertain to an ecological risk assessment have not changed in the seven years since the TI. There is no risk to ecological receptors at the Site from direct exposure to groundwater, since the depth to groundwater at the Site (6 to 17 feet below grade) is such that direct exposure of ecological receptors via groundwater is unlikely. Groundwater that discharges from the Site to surface water bodies on or adjacent to the Site has been evaluated as part of the surface water assessment.

4.4 Human Health Risk Assessment

The need for sediment remediation has been based solely on the ecological risk assessments. This approach is supported by the lack of human exposure pathways to the wetland sediment and lack of human health comparison criteria for sediment. Potential human exposure pathways to COCs in wetland sediment are limited to direct contact and fish consumption. Based on field observations, the wetlands do not support populations for typical recreational fishing activities. As the Site has perimeter fencing, any potential fishing in the wetlands on the private property is not likely to occur. Direct contact with wetland sediment could occur only during construction work including remediation; however, potential exposure during construction would be controlled through worker training and the use of appropriate personal protective equipment (PPE).

The potential risk to human health from groundwater and surface water has been evaluated following industry standard procedures. There is no significant current or future risk to human health from groundwater or surface water, because no current or future use of groundwater or surface water for drinking or irrigation purposes in the Site area is known or expected. As the power plant was deactivated, there are no current or planned Site activities which would expose a worker to groundwater or surface water. Potential trespassers are controlled by perimeter fencing, posted signage, and a guard and gate system. In addition, groundwater flows primarily towards Long Island Sound. The concentrations and extent of the groundwater plume are not anticipated to change significantly over 20 years.

5.0 WETLAND REMEDIATION OBJECTIVES

This section identifies the remediation objectives for groundwater, surface water, and sediment within and immediately surrounding the southwest wetlands (SWWs) consisting of Wetlands W-3, W-4, W-5, and W-

6 based on the conclusions of the contaminant fate and transport analysis and risk assessment. Representative photographs of the SWWs are provided in **Appendix E**.

5.1 Groundwater

Groundwater remediation for the SWWs is not warranted based on the results of the risk assessment indicating that backfill used in potential wetland restoration actions would not become impacted by groundwater to levels approaching or exceeding the TCCs for sediment and based on the positive results of the wetland sediment remediation pilot test. In addition, there is no direct exposure pathway to groundwater in the SWWs and impacts to SWW surface water are evaluated as part of the surface water assessment. Groundwater will be addressed in a Groundwater RAP. The groundwater monitoring plan is presented in Section 7.0 of this RAP

5.2 Surface Water

Surface water in Wetland W-4 will continue to be monitored based on the results of the ecological risk assessment for aluminum; however, surface water remediation in Wetland W-4 is not warranted at this time. As metals concentrations in surface water at Wetlands W-5 and W-6 do not present a significant risk to aquatic receptors, surface water remediation in these saltwater wetlands is not warranted. It is anticipated that sediment remediation in the SWWs may decrease the remaining low level surface water impacts as the post-remediation contact layer between substrate sediment and surface water will be replaced. The surface water monitoring plan is presented in Section 7.0 of this RAP.

5.3 Sediment

The objective of SWW sediment remediation is to address the sediment associated with potential ecological risk by significantly reducing the concentration of metals in the top one foot of sediment, which includes the biologically active zone (top 6 inches), to levels that are protective of the environment. Impacted material greater than one foot will not be remediated because the top one foot of sediment already conservatively addresses the surficial biologically active zone and, as stated in Section 4.1, the total vertical extent of contamination is generally limited to relatively shallow depths.

Alternatives to achieve this objective are evaluated followed by a recommended course of action. There will be short term and long term effects on the wetlands environment as a result of any active remedial alternative. Consideration is given to minimizing the negative short term disturbance to potential ecological receptors and maximizing the long term benefits of reducing contaminant concentrations in the environment in which they live.

Based on the risk assessment, the summary of the freshwater and saltwater SWW sediment TCCs are presented in the tables below. The NJDEP Ecological Screening Criteria (2009) for aluminum are listed with the TCCs in the tables below.

Summary of Estimated Sediment TCCs for Freshwater Wetlands W-3 and W-4

Metals of Concern	Current Exposure Point Concentration (mg/kg)	Target Cleanup Concentrations (mg/kg)
Aluminum	--	25,500
Arsenic	123.9	107
Copper	393.1	31
Nickel	716.2	85

Summary of Estimated Sediment TCCs for Saltwater Wetlands W-5 and W-6

Metals of Concern	Current Exposure Point Concentration (mg/kg)	Target Cleanup Concentrations (mg/kg)
Aluminum	--	18,000
Arsenic	133.3	73
Nickel	243.9	59

6.0 SEDIMENT REMEDIATION

This section describes the evaluation of sediment remedial action alternatives and the details of the selected and proposed remedial alternative.

6.1 Sediment Remedial Action Alternative Evaluation

This section supports the selection of a remedial action alternative for the SWWs sediment by providing information on the process by which the recommended remedial action alternative was developed and evaluated. This section includes an initial identification and screening of technologies, a detailed evaluation of alternatives, and a statement to justify the selected alternative. A comprehensive review of federal and state guidance documents, case studies, and project summaries both in-house and on-line was performed to identify, develop, and evaluate applicable alternatives for implementation on this project.

The SIS included an evaluation of remedial alternatives for SWW sediments which involved scoring remedial alternatives using a detailed evaluation process and rating and selecting alternatives using an evaluation scoring matrix (Shaw, 2011b). Based on the results of the detailed evaluation for wetlands, the recommended remedial option for Wetlands W-5 and W-6 was Monitored Natural Recovery (MNR) and the recommended remedial option for freshwater wetlands, Wetlands W-3 and W-4, was Excavate One Foot and Backfill. In the January 15, 2014 comment letter on the SIS, CTDEEP did not agree with MNR for Wetlands W-5 and W-6. APTIM responded to CTDEEP comments relating to remedial options in the “Norwalk Wetland Sediment Remediation Approach” submittal in June 2014 (CB&I, 2014). This October 2014 RAP does not deviate from the June 2014 submittal. CTDEEP concurred with the June 24

submittal in an email dated August 5, 2014 and again stated that it is CTDEEP's opinion that MNR is not appropriate for metals in sediments. The sediment remediation alternatives evaluated in the SIS and the June 2014 submittal are presented herein to address CTDEEP's comments.

6.1.1 Initial Sediment Remedial Action Technology Screening

To address potential unacceptable ecological risks associated with sediment in the SWWs, an initial evaluation of applicable remedial technologies was conducted. The remediation areas of the SWWs are shown on a site plan (**Figure 4**) and an aerial photograph (**Figure 5**) to support the understanding of the varied conditions (grass, shrub, and tree vegetation; open water; tidal influence; etc.) and equipment access considerations necessary to evaluate remedial actions.

General response actions for sediments with an associated ecological risk are limited to monitoring, containment, removal, and treatment. The containment action is not considered further as the remediation objectives include maintaining functioning vegetated wetlands. Due to the type of contamination (i.e., metals) and the separate remediation areas with varied physical characteristics, in-situ treatment options were not included. On-site ex-situ treatment options were also not included due to the type of contamination, the high silt and fines content of the sediment, and the relative high cost associated with treatment preparation of the varied freshwater and saltwater wetland sediments. The general response actions for SWW sediments are briefly discussed below.

A monitoring action for the SWW sediments would take the form of MNR. MNR involves ongoing, naturally occurring processes to reduce the risk posed by the contaminants in sediment and includes a long term monitoring component to document progress towards TCCs. Transformation of contaminants is usually a major attenuating process; however, this process is assumed to be too gradual for the persistent COCs in sediment to provide for remediation in a reasonable time frame. Therefore, isolation and mixing of contaminants through natural sedimentation is the process most frequently relied upon for contaminated sediment.

A removal action would require some form of excavation and dewatering followed by disposal. The forms of excavation vary depending on the hydrology of the wetland and potential equipment access. It is feasible to excavate the SWW sediments in the wet, under current conditions, or in the dry, under dewatered conditions. In contrast, dredging in Wetland W-6 may be more appropriate than excavation given the presence of very loose, fine, wet sediment within the limited area of consistently submerged area of open water.

Performing the removal action under current conditions (i.e., in the wet) versus under dewatered conditions (i.e., in the dry) will be considered as two separate remedial alternatives. Disposal of removed sediment on site may not be appropriate depending on the levels of COCs in the sediment. Thus, off-site disposal is likely required. Although on-site ex-situ treatment was not considered, select disposal facilities can perform treatment or recycling of the material for reuse. The availability and relative cost of disposal at such off-site treatment facilities will be considered during the construction bid process. For the purposes of this document, off-site disposal will mean any permitted, licensed, and approved treatment, storage, or disposal facility.

6.1.2 Detailed Sediment Remedial Action Alternative Identification

Based on the limited applicable general response actions, the alternatives evaluated in detail for the remediation of sediment in SWWs include MNR; removal in the dry with backfill, off-site disposal, and wetlands restoration; and removal in the wet with backfill, off-site disposal, and wetlands restoration. The MNR alternative would consist of limited sediment, surface water, and groundwater monitoring. No active remediation would be performed. MNR is a remedial option that includes the following benefits:

- MNR is protective of the current wetland ecosystems, which host a variety of terrestrial and aquatic species.
- No wetland impacts would occur that would require mitigation.
- MNR would be relatively easy to implement.
- Only limited permitting would be required.
- MNR would incur significantly lower costs than other remediation alternatives.
- No energy use is required, resulting in a minimal carbon footprint.
- No waste is generated.

The dry excavation alternative would consist of dewatering Wetland W-6, excavation of sediment in each SWW, placement of backfill, off-site disposal, and wetland restoration. The tidal inlet culvert from Long Island Sound to Wetland W-6 and the culvert connecting Wetlands W-5 and W-6 would be blocked to minimize inflow and standing water would be removed from Wetland W-6 with pumps prior to and during excavation. Based on a review by the project hydrogeologist and engineer, dewatering of Wetland W-6 (open water of approximately 300 feet by 120 feet area) would require approximately 10 wells operating at 50 gallons per minute each for the anticipated 3 weeks of preparation, excavation, and restoration. It was assumed that no shoring would be needed to dewater Wetland W-6. The excavation dewatering water would require filtration to remove fines prior to discharge to Long Island Sound. Silt curtains would be installed at the other culverts or other wetland outlets as needed to contain suspended sediment in the designated work area. The excavation would be 1 foot in depth of existing grade over the delineated sediment area. No sediment samples would be collected from the excavation area after removal. Excavation could be performed with standard excavation equipment including a long stick excavator and dump trucks. Equipment access into the wetlands would be provided by low ground pressure mats. On softer substrate areas, excavation could be performed with a specialized “swamp buggy” type excavator designed to operate on soft ground. Existing root clusters of vegetation may provide limited additional support for heavy equipment access. Once excavated, the sediment must be dewatered. Dewatering of the excavated sediment could occur in two phases depending on the wetland conditions and layout. The sediment excavated from Wetlands W-3 and W-4, the smaller and more densely woody vegetated (scrub/shrub and forested) wetlands, would be promptly transported to a dewatering pad constructed in the vicinity of the wetlands. The sediment excavated from Wetlands W-5 and W-6, the larger and herbaceous/emergent vegetated wetlands, could be temporarily stockpiled (i.e., “high-piled”) within the remaining wetland remediation area for cursory dewatering before being transported to the dewatering

pad / containment cell. This approach would require double handling of the excavated sediment in the wetland. The dewatering pad / containment cell would be constructed to contain and collect water drained from the sediment and pump to water filtration and a designated discharge location. The dewatered sediment could also be mechanically mixed with a drying agent in the containment cell as needed to absorb the excess moisture in the sediment to allow for material transportation off-site. Sizeable root clusters of vegetation contained in the excavated sediment may need to be removed and disposed of separately prior to processing dewatered sediment with a drying agent. The dewatered sediment would be characterized for transportation and disposal, transferred from the containment cell to trucks, and transported off-site for disposal. Following removal of the SWW sediment, the excavated areas would be backfilled with 1 foot of clean backfill, planted with native wetland vegetation, and monitored to ensure that the native wetland vegetation, rather than invasive wetland vegetation, becomes established. The excavation water controls in the wetlands including culvert blocks and pumping equipment would be removed during the restoration phase.

The wet removal alternative differs from the dry excavation alternative in that dewatering is not performed in Wetland W-6 and dredging is necessary in wetter areas. The tidal inlet culvert from Long Island Sound to Wetland W-6 and the culvert connecting Wetlands W-5 and W-6 would be blocked to minimize inflow and silt curtains would be installed at the other culverts or other wetland outlets as needed to contain suspended sediment in the designated work area. Both hydraulic and mechanical dredging are feasible in the open water portion of Wetland W-6. Hydraulic dredging would not be feasible in the intertidal vegetated portion of Wetland W-6 or other wetlands. Hydraulic dredging could be performed with slurry transport to geotubes or equivalent for dewatering in the designated dewatering area. Mechanical dredging could be performed with an environmental bucket clam shell rig mounted on a flexi-float or other similar small barge. Dewatering of the excavated sediment not contained in geotubes or equivalent and subsequent steps through transportation and disposal would be performed as described for the dry excavation alternative. No sediment samples would be collected from the excavation or dredging areas after removal.

6.1.3 Selection of the Proposed Remedial Action

The evaluation methodology consisted of scoring each alternative in 7 categories – effectiveness, reliability, difficulty of implementation, costs, risks associated with implementation, timeliness of outcome achieved, and green benefits – then rating and selecting an alternative using an evaluation scoring matrix. Based on the results of the detailed evaluation provided in **Appendix F**, the wet removal alternative was the selected alternative. This alternative will address the sediment toxicity in the most effective and timely manner.

The selected alternative will physically remove contaminated sediment from the biologically active zone such that no residual hazardous material will remain in the top 1 foot of sediment and will restore the wetland with backfill and vegetation. No sediment samples will be collected from the excavation or dredging areas after removal. The proposed remedial action reduces potential ecological risk by removing the sediment associated with the potential risk. The removal will be performed with equipment specialized for varying wetland conditions (i.e., dredging and excavation). The long-term risk reduction of sediment removal outweighs sediment disturbance and temporary habitat disruption. It is anticipated that

the quality and quantity of wetland plant and animal life in the remediation areas will rebound after completion of removal and restoration. Removal is a permanent solution for addressing contaminated sediment from the wetlands. The cleanup of the wetlands will not adversely impact the current and reasonably anticipated future land use of the Site as a wetland.

6.2 Proposed Sediment Remedial Action

The major components of the proposed remedial action for sediment in Wetlands W-3, W-4, W-5, and W-6 include the following:

- Sediment Removal
  - Site preparation;
  - Excavation of SWW sediment in Wetlands W-3, W-4, W-5, and a portion of Wetland W-6;
  - Dredging of submerged SWW sediment in the open water area of Wetland W-6;
  - Sediment dewatering;
  - Characterization, transport, and off-site disposal of sediment;
- Wetland Restoration
  - Restoration of excavated areas to pre-existing elevations with clean backfill;
  - Planting the restored areas to establish native wetland vegetation; and
- Wetland Monitoring
  - Monitoring of the restored area to ensure that the native wetland vegetation becomes established.

The proposed remedial action will be performed in a manner that is protective of the environment through the use of a qualified contractor and implementation of best management practices. The quantity of sediment, remedial action design, avoidance measures, and construction monitoring are detailed in this section. The level of detail presented herein is commensurate with an enhanced performance-driven plan because the contractor will have to consider site-specific layout and his own equipment when executing the removal action. Design drawings and technical specifications for the remedial action are provided in **Appendices G** and **H**, respectively. The project will be performed in accordance with this RAP, design drawings, technical specifications, project permits (Section 8.0), deed restrictions (e.g., cap or engineered control disturbance), and any other Norwalk Power LLC requirements.

The execution schedule and time of year must be considered before initiating the remediation activities detailed in this section. The SWWs are typically drier in the summer months, particularly Wetlands W-3 and W-4, making that season an ideal time to perform excavation activities. However, the vegetation installation component of wetland restoration is restricted to wetter months to minimize mortality. If removal was performed in the summer followed by a fall planting of select vegetation, portions of Wetlands W-5 and W-6 would require temporary stabilization of backfill over the winter prior to spring planting of remaining vegetation. If removal was performed in the winter, all vegetation could be installed in the spring. The proposed schedule identified in Section 9.0 assumes timely implementation of this RAP and is subject to change based on best practices to address seasonal work restrictions. The

contractor will be expected to execute the remedial action with minimum if any lag between phases of work.

6.2.1 Location and Quantity of Sediment

The following table identifies the estimated areas of sediment in each SWW based on a CADD drawing calculation. The volumes are presented assuming the top one foot of sediment, a conservative depth below the biologically active zone, will be addressed by remediation. Actual sediment volumes may vary from the estimates based on the pre-construction survey to be conducted by the contractor.

Wetland	Wetland Area (ac.)	Sediment Area (sq. ft.)	Sediment Area (ac.)	Sediment Volume for 1 Foot Depth (cy) [1]
W-3	0.2	2,681	0.1	100
W-4	0.9	22,969	0.5	851
W-5	3.0	38,695	0.9	1,433
W-6	5.0	99,687	2.3	3,693
W-6 (vegetated)	--	*63,303*	*1.5*	*2,345*
W-6 (open water)	--	*36,384*	*0.8*	*1,348*
TOTAL	**--**	**164,032**	**3.8**	**6,077**

1. Volume estimate does not include side slopes or channel cuts.

A known high voltage electrical line is identified in Wetland W-6 as shown on site plans and design drawings. Due to the required protocols for maintaining a safe distance as defined by the electric line owner, electric line operator, and Norwalk Power LLC, sediment will not be removed in the immediate vicinity of the line. Prior to working in Wetland W-6, test pits will be excavated above the cable sufficient to locate thermal sand backfill. The limit of sediment removal will be a set distance (approximately 2 feet) from the field located thermal sand backfill. Equipment crossing or working above electric cables will have less than 7 pounds per square inch (psi) ground pressure or work on equivalent low pressure mats. Additional construction restrictions may also be identified for traversing the line with access roads and equipment.

6.2.2 Remedial Action Design – Sediment Removal

The first phase of the remedial action, sediment removal, consists of site preparation, excavation, dredging, sediment dewatering, dewatering water filtration, and solids disposal. Each step is detailed in this section.

6.2.2.1 Site Preparation

The work areas will be surveyed during site preparation to provide a baseline for their restoration and to provide the data necessary for sediment removal calculations. The survey will include spot surface elevations and identification of notable surface features (e.g., drainage channels in Wetland W-5). Work limits will be established based on the pre-construction survey.

The staging area for the project will be located on the former equalization basin (EB#2) located southeast of Wetland W-4 which is approximately 3 acres in size and may also include existing wastewater treatment facilities if appropriate. This capped former equalization basin is relatively flat and accessible from the land side by multiple access roads. The area is currently covered with grass and is part of a previously installed and currently maintained RCRA cap. The staging area will be constructed on top of the lawn so as not to disturb the RCRA EB#2 cap per APTIM's recent desktop engineering review of the cap versus proposed use for this sediment RAP. The staging area will be used for excavated and dredged sediment management, dewatering water and filtrate processing, the loading area for trucks taking the material off-site, backfill materials staging, equipment decontamination, the staging area for equipment, and the contractor field office, if necessary. Existing wastewater treatment facilities (e.g., equalization basin, clarifier, etc.) may also be used if appropriate. Erosion and sediment controls will be installed as per design drawings and technical specifications prepared based on the guidelines outlined in the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control and project permits as appropriate for the stockpiles and to prevent release of sediment laden water from the staging area. Other existing paved areas to the south of the staging area will be used for contractor parking and temporary facilities. Minimal disturbance through digging or displacement of the existing cap is likely to occur during site preparation and will be performed in accordance with special variance, as needed, from the deed restrictions protecting the RCRA EB#2 cap. Restoration of the staging area upon completion of work will include the removal of all materials imported for the work and restoring low-permeability cap and seeding as necessary.

Due to the significant presence of the invasive species common reed in and immediately adjacent to the SWW sediment remediation areas, an herbicide treatment will be performed prior to excavation action. Herbicide treatment will be targeted for invasive species in accordance with the procedures identified in the technical specifications (Appendix H, Section 02110). The herbicide HABITAT (Imazypyr) manufactured by BASF will be used for this project. Herbicide applications will be performed by a Connecticut licensed herbicide applicator and will be sprayed on common reed within the remediation areas and extending a distance of approximately 25 feet from the planned excavation limit and on equipment access routes. Treatment of the invasive vegetation in this manner prior to excavation will greatly reduce the potential for spreading common reed to other areas of the Site during excavation and sediment management. Herbicide application will be performed in the appropriate season so as to maximize its effectiveness.

In preparation for excavation, the culverts will be blocked to prevent water flow. An Aqua Dam® or equivalent flexible inflatable device may be used. There are culverts between Wetlands W-4 and W-3, W-3 and W-5, W-5 and W-6, and W-6 and the Long Island Sound. Although unlikely and at the contractor's discretion, standing water in the remediation area may be pumped out and contained for treatment and discharge if needed; however, water infiltration into the remediation area will not necessarily be controlled during sediment removal. Water flow into and between the wetlands will only be impeded as needed to perform the sediment removal and restoration. The duration of the water flow restrictions will be minimized so as to avoid or minimize potential adverse effects of changed hydrology on wetlands areas outside the remediation areas. No significant adverse effects are anticipated.

6.2.2.2 Excavation

Depending on the size of the remediation area, the reach of equipment, and moisture content of sediment, excavation will likely be executed by one of the following two methods: 1) excavator in remediation area excavates and deposits sediment in off-road dump truck positioned on nearby temporary access road for transport to dewatering area; or, 2) excavator in remediation area excavates and deposits sediment near edge (i.e., high-pile positioned to drain into non-remediated work area), excavator outside remediation area scoops from temporary stockpile and turns to load sediment in off-road dump truck for transport to the dewatering area within the staging area. Dump trucks with end gate seals will be used for transporting sediment or will be otherwise watertight as needed.

The majority of the ground surface in the remediation areas (except the open water portion of Wetland W-6) is expected to support standard heavy equipment because of the presence of vegetation. However, the specialized 'swamp buggy' low ground pressure type excavators can also be used as they are constructed of lightweight materials (i.e., aluminum) and customized tracks to 'float' on soft ground and reduce rutting. Excavation in the smaller Wetlands W-3 and W-4 is anticipated to be performed by Method 1. Excavation in Wetland W-5 is anticipated to be performed by Method 2 wherein excavated sediment may be temporarily stockpiled within the sediment remediation area (high-pile positioned to drain into non-remediated work area) prior to be transferred to the staging area. This secondary handling step may be necessary as the remediation area is larger, and sediment may be wetter, but it also allows for limited initial dewatering within the wetland. No sediment samples will be collected from the excavation area after removal.

Temporary access routes will be constructed into each wetland area as needed. Access routes to the remediation areas will be selected to minimize the footprint of wetland traversed. Low pressure ground mats will be used for access routes in wetlands. Multiple access routes may be required for the larger remediation areas, specifically Wetlands W-5 and W-6. Note that access routes shown on Design Drawings in **Appendix G** are examples only and are not final locations or quantity.

Depending on the overall project schedule and recommended vegetative restoration window, excavation will likely proceed from the smaller more isolated areas first, Wetlands W-3 and W-4, which are also the upgradient locations, to Wetland W-5, and ending at Wetland W-6.

6.2.2.3 Dredging

Dredging in the open water portion of Wetland W-6 will be performed via mechanical or hydraulic means, depending on the selected contractor's equipment. With either method, the culverts to W-5 and the Long Island Sound will be blocked. A silt curtain may be installed as needed within discrete portions of Wetland W-6 at higher tides to aid in containing suspended sediment during removal. No sediment samples will be collected from the dredging area after removal.

Hydraulic Dredging

With hydraulic dredging, the dredged material will be transferred as a slurry through a pipe to a geotube, filter press, or equivalent sediment dewatering device located in the staging area.

A dredging barge will be launched and mobilized to the Site. The barge used to support hydraulic dredging equipment and guide the intake line will be positioned as required to target the delineated dredge area. The barge will be equipped with a navigation system to pinpoint the target dredging locations. The barge will have a current operating license and will adhere to applicable rules and regulations governing boat operations.

Although the wetland outlet will be blocked to prevent a potential release of suspended sediment to the Long Island Sound, additional controls will limit sediment resuspension during hydraulic dredging. The dredge head speed can be adjusted to minimize resuspension. In addition, the target dredging depth of 1-foot is relatively shallow thereby minimizing the movement of adjacent sediment (i.e., sloughing) and potential for resuspension.

The dredging barge will transfer the dredging slurry in a pipeline to the sediment management area. The dredge pump is anticipated to be capable of transporting the slurry to the designated sediment management area such that booster pumps should not be required. The maximum estimated distance from the dredging barge to the sediment management area is 900 feet. Provisions to prevent the dredge slurry from flowing back into the wetland in the event of a dredging shut-down or other maintenance event will be employed. The first section of slurry pipeline from the barge to land will be a floating pipeline. Once the floating pipeline reaches the shore, it will be secured in place until it reaches the sediment management area.

A coagulant polymer may be injected in the pipeline during transfer of the dredge slurry to the sediment management area to enhance liquid/solid separation and to increase the capture rate of the solids in the geotextile tubes, filter press, or equivalent. The contractor will collect sediment samples and perform testing of the sediment as needed to determine the appropriate coagulant prior to mobilization for dredging.

Mechanical Dredging

With mechanical dredging, the dredged material will be transferred to the staging area in the same way it is done for the excavation. The mechanical dredging equipment may be staged on land or floated in the water, depending on the selected contractor's equipment. An environmental bucket clamshell will be used to minimize suspension of impacted sediment into the water.

6.2.2.4 Sediment Dewatering

Dewatering will be performed in the staging area for both the excavated sediment and dredged sediment. Dredge materials dewatering will be performed in a separate part of the staging area from the excavated materials due to the different equipment required. Existing wastewater treatment facilities may also be used to support dewatering if appropriate.

Hydraulic Dredged Sediment Dewatering

The dredge slurry will first be screened to remove stones and debris and then dewatered. The dredge slurry will be pumped into geotextile tubes (e.g., Geotube®), filter press, or equivalent. A manifold or distribution header piping system will be used as needed to fill multiple tubes. The filtrate from the tubes,

along with precipitation contacting the active dewatering area, will be conveyed within the sediment management area to the dewatering effluent holding tank. Significant amounts of filtrate are assumed to continue to drain from the tubes for 3 to 4 weeks after dredging. Therefore, even when the dredging is complete, the dewatering area will be active.

The dewatering operational area will be optimized (i.e., sized appropriately) and controlled to minimize the amount of contact water generated through precipitation. Precipitation is not considered to be a significant source of moisture for the dewatering. The contractor will take the necessary steps to address odors from the sediment should they become a nuisance.

When the flow rate of filtrate from the geotextile tubes has significantly slowed, the tubes will continue to air dry for an estimated additional 4 months, or as needed to meet transportation requirements and the acceptance requirements of the permitted off-site disposal facility. The moisture content of the sediment will be tested periodically until the desired levels are reached. Characterization will be performed by core sampling through the tubes to collect composite material rather than by potentially prematurely opening the tube. Any tubes opened for load out but not fully emptied will be required to be covered with plastic at day's end and during down times when the threat of rain is imminent. No stockpiling per se is anticipated to be necessary as the tubes will contain the sediment.

Excavated and Mechanically Dredged Sediment Dewatering

Excavated materials (and mechanically dredged sediment, if selected) that are saturated with water will be transferred to the staging and dewatering area. The excavated and mechanically dredged material will be dewatered within the staging area and conditioned, if needed, to eliminate any free liquid within the material. The dewatering area will be constructed large enough for trucks to drive in with their loads. The drive-in area will be constructed with a ramp for vehicle access to a designated HDPE-lined area and may be divided into multiple "cells." Multiple containment cells may be required depending on the excavation, mechanically dredging, and dewatering rates and the type of material. The water from the dewatering area will be contained and pumped to the water management area.

The excavated materials will be dried by some combination of draining and air drying. Stockpiles will be allowed to slack dry (drain), suitable primarily for sand or similar granular materials. Stockpiles will also be turned on a regular basis (air dry), suitable for mostly soils with very little excess moisture, which can be naturally evaporated within a reasonable time, weather permitting. If approved by the engineer, a reagent (e.g., lime, cement, or kiln dust) may also be added to the excavated materials to absorb water. This conditioning is suitable for soils with intermediate to high levels of moisture or which are clayey or silty, either of which make draining and air drying difficult to complete in a timely manner. At the engineer's discretion, quicklime may be the preferred reagent because it does not work by merely absorbing moisture (thereby adding more weight for disposal), but by adding heat of hydration to help evaporate water. Large root clusters will need to be separated from the soil prior to mixing with a reagent to ensure adequate mixing. Mixing can be performed mechanically within the containment cell. The materials will be sufficiently conditioned to pass the paint filter test.

Once dewatered and conditioned, if necessary, the materials can be transferred to a separate stockpile area within the staging area.

6.2.2.5 Water Management

The water management area will be a designated part of the staging area where dewatering waters from dredged and excavated materials are contained and treated (i.e., filtered) for discharge. Existing wastewater treatment facilities may also be used for water management if appropriate. The water will be treated as required to meet the discharge permit requirements and WQC prior to discharge to the Long Island Sound. The pretreatment holding tank and a temporary filtration system will be set up in the water management area. Selection of additional filtrate treatment methodologies, if any, and operation of the water treatment system will be the contractor's responsibility.

6.2.2.6 Solids Disposal

Chemical and physical characterization required for transportation and disposal facility acceptance will be performed while the sediment is in the containment cell or in the tube in the case of hydraulically dredged sediment. Sediment stockpiles may need to be segregated in the staging area depending on anticipated metals concentrations at the source. In addition to conditioning to pass the paint filter test for transportation, select sediments may require additional treatment prior to disposal depending on the results of Toxicity Characteristic Leaching Procedure (TCLP) testing. If the detection of herbicides used during execution of activities specified by this RAP causes transportation and disposal complications, then Norwalk Power LLC will evaluate the applicability of a variance assuming that the herbicide was applied in a manner consistent with the manufacturer's directions.

The dewatered and characterized sediment and other removed, impacted, or work materials (e.g., vegetation, spent work materials, etc.) will be loaded from the sediment management area onto trucks for transport off-site to an approved, licensed, and permitted facility. Disposal facilities must be pre-approved by Norwalk Power LLC. The trucks will enter the Site through the main gate, follow the paved access road to the sediment management area, and loop or turn around near the sediment management area. Assuming 18 cy per load (actual capacity typically weight-based), up to 370 dump trucks will be required to transport the sediment off site. The sediment is anticipated to meet non-hazardous classification for transportation and disposal and will likely go to a landfill, an incinerator, or a combination of both.

6.2.3 Remedial Action Design - Wetland Restoration

The second phase of the remedial action, wetland restoration, consists of restoring soils, hydrology, and vegetation. The existing wetlands are successful and functional as they are and without enhancements. As such, the entirety of the disturbed wetlands including sediment removal and access routes will be restored to pre-excavation function. Each restoration step is detailed in this section.

6.2.3.1 Soils

The grading plan associated with the wetland restoration mirrors the pre-excavation conditions including recreation of surface features such as drainage channels within the wetlands (i.e., Wetlands W-5 and W-6). The excavated and dredged areas will be filled with clean backfill and a licensed surveyor will verify the final grade and limits of work.

The backfill requirements are identified in the technical specifications in **Appendix H**. A specific mixture of sand and organic rich topsoil will be used to backfill excavations in Wetlands W-3 and W-4. Sand only will be used to backfill excavations in Wetlands W-5 and W-6. Fines and/or topsoil are not proposed as backfill in the tidal wetlands as they are more likely to be washed away in the tidal movement. Coconut fiber rolls, coir logs, biologs, or equivalent will be used to define the restored channel in Wetland W-6. The biologs will be installed in a stepped pattern, the final design for which will be dependent on the pre-removal survey.

The exact means and methods for placement of backfill will be determined by the contractor. It is anticipated that all or the majority of backfill will be placed by traditional methods consisting of dump trucks, front-end loaders, etc. Hydraulic placement (i.e., via tremie pipe) of the backfill in a portion of Wetland W-6 may also be considered. A post-backfill survey will be conducted to confirm that the grade has been adequately restored. The performance requirements for the backfill operation are identified in the technical specification included in **Appendix H**.

6.2.3.2 Hydrology

As will be done during the remediation, temporary engineering and drainage controls (e.g., block culverts) will be used, if necessary, to minimize surface water in individual sections of the wetlands during final restoration activities. Once the restoration activities have been completed, the temporary controls will be removed to allow the wetland hydrology to return to a pre-construction state. The hydrology of the freshwater wetlands is primarily groundwater-driven and the saltwater wetlands is tidal. It is anticipated that the local hydrology will return quickly and allow for the successful establishment of the restored wetland communities.

6.2.3.3 Vegetation

The planting schedule will restore each wetland in kind with native species and will consist of a combination of seed mix, grass plugs, and planted woody stems. The vegetation for the restoration was selected primarily based on its current presence within the surrounding forest and wetland systems. The vegetation that was selected for the restoration are non-invasive native species common in southern Connecticut, and provide excellent habitat and food sources for wildlife. With the existing hydrology, it is anticipated that the selected vegetation for the restoration will respond and proliferate. The combination of planting a variety of species should ensure the success of the restoration. The proposed grading and planting plan included in the Design Drawings in **Appendix G** details the proposed planting areas and densities for the restoration areas.

In the event there is a significant time lag between establishment of final surface grade and installation of wetland vegetation such that opportunistic plant species volunteer into the restoration areas, personnel qualified in vegetation identification will survey the areas. The survey will identify the presence or absence of any invasive plant species. Prior to planting the wetland, invasive plant species will be eradicated from the restoration areas. The project is planned to be executed to avoid such a gap for anything other than seasonal planting restrictions; however, this additional step is a protection to control undesired vegetation.

Planting Schedule for Freshwater Wetlands W-3 and W-4

The restoration goal for Wetland W-3 is a freshwater forested wetland with open/standing water. The restoration goal for Wetland W-4 is a freshwater scrub/shrub wetland. The graded backfill surface will be seeded then planted with potted trees and shrubs as identified on the design drawings. Installation will be performed during the dormant season as indicated on the design drawings to avoid installing potted plants when it is too hot and dry.

Planting Schedule for Tidal Wetlands W-5 and W-6

The restoration goal for Wetland W-5 is a brackish emergent wetland. The restoration goal for Wetland W-6 is a tidal emergent wetland. No vegetation will be installed in the drainage channels in Wetland W-5 or in the designated open water portion of Wetland W-6 except as appropriate on the stepped coir logs. The restoration area will be planted with a mixture of grass plugs and scattered shrubs as identified on the design drawings. Installation of the grass plugs will be performed during the spring as indicated on the design drawings as the grass plugs need to be actively growing when installed in order to sufficiently establish roots for a full growing season and minimize displacement during the subsequent dormant winter months. Installation of the woody vegetation will be performed during the dormant season as indicated on the design drawings to avoid installing potted plants when it is too hot and dry.

6.2.4 Remedial Action Design – Wetland Monitoring

Monitoring of the restored wetlands will be performed as required by the project permits. Periodic monitoring will be necessary to document success of planted vegetation and management of invasive vegetation.

6.2.4.1 Vegetation Monitoring

The monitoring program will be designed to document that the wetland restoration is a success. The monitoring program will consist of a post construction report and subsequent monitoring. Annual monitoring for a period of three to five years is commonly required. A qualified wetland scientist will prepare the post construction report including the establishment of a site-specific monitoring protocol; this will be included with the project completion documentation for the restoration effort. Monitoring in the wetland plots should include monitoring the wetland parameters of vegetation and hydrology, plus percent survival of woody species, dominant herbaceous vegetation, and total percent cover. Monitoring will ensure that the Site is not colonized by invasive species (e.g., purple loosestrife and common reed) whose growth may not be obvious at first. Quantitative monitoring should be performed to determine the overall success of the wetland species diversity and abundance.

A qualified wetland scientist will inspect the wetland restoration areas twice during each of the first two full growing seasons, during late spring and during the mid to late summer. The inspections will be documented together in one written report at the end of each growing season.
Vegetation monitoring will occur within three (3) randomly distributed quadrants sampled within the tree, shrub, and herbaceous strata of each restored wetland. Photos of each quadrant will be taken during the inspections and submitted with the report.

Monitoring reports are a way to document the progress of the restoration area and to track the coverage and survival each monitoring period. Photographic logs from marked, fixed locations will further document the success of the area.

6.2.4.2 Invasive Plant Species Control

Invasive plant populations require close monitoring in order to determine whether they are colonizing an area. Prior to planting the wetlands, invasive plant species will be eradicated from the restoration areas by a combination of the mechanical and chemical methods described below. An assessment of the presence or absence of invasive species in the wetland will be conducted following each monitoring period. If required, preventative control measures will be taken following each assessment.
The control of invasive native and introduced species, including, but not limited to, common reed, purple loosestrife, Japanese Stilt-grass, Japanese honeysuckle, and reed canary grass will be addressed through three main courses of action - Biological Control Methods, Mechanical Control Methods, and Chemical Control Methods.

Biological Control Methods

The area will be seeded and planted aggressively immediately after grading is complete to encourage the successful growth of valuable native trees, shrubs, and herbaceous species except when limited by seasonal planting restrictions. Aggressive planting will deter encroachment into the wetland areas by invasive species by utilizing vital resources including sunlight, water, and soil nutrients. Establishing a substantial herbaceous cover during the first growing season will decrease the opportunities for encroachment by invasive species. Shrub and tree growth during subsequent growing seasons will additionally limit the resources available to the invasive and undesirable species.

Mechanical/Chemical Control Methods

If invasive species are found to have colonized the wetland restoration areas, they will be removed using a combination of mechanical and chemical control methods. Manual cutting and removal of live stems of undesired plants will be used along with the application of an environmentally benign herbicide in accordance with the procedures identified in the technical specifications (Appendix H, Section 02110). The herbicide HABITAT (Imazypyr) manufactured by BASF will be used for this project. Herbicide applications will be performed by a Connecticut licensed herbicide applicator. Herbicide application will be performed in the appropriate season so as to maximize its effectiveness.

Predation/Herbivory Control

If herbivory of newly planted species is observed during monitoring events, measures may need to be implemented to replace or prevent further damage to vegetation. Browsing by avian species and deer may be an issue at the Site as they both can navigate around and over the existing perimeter fence.

6.2.5 Avoidance, Minimization, and Mitigation

The measures considered and planned to be implemented to avoid, minimize, and mitigate the potential adverse effects of the sediment remediation work on various environmental receptors and their environment have been discussed throughout this text. This section provides a summary of those previously identified measures.

The sediment remediation areas within each wetland were delineated based on the results of an ecological risk assessment and target only those areas of each wetland associated with ecological risk for remediation thereby minimizing total potential wetland impacts at the Site. Similarly, work access routes through or across wetland areas surrounding sediment remediation areas and means of access to remediation areas will be selected and implemented so as to minimize adverse impacts to wetland areas surrounding remediation areas to the extent possible. This includes the use of low ground pressure mats and giving preference to fewer and shorter access routes.

Sediment remediation without dewatering of Wetland W-6 (i.e., removal in the wet), the selected remedial option, will avoid the potential adverse effects of temporary changed hydrology on the entirety of Wetland W-6, including those portions of the wetland outside the sediment remediation area. Dewatering Wetland W-6 for the duration of excavation and restoration activities could also adversely affect the hydrology of the connected Wetland W-5. Although less significant an impact on wetland hydrology than dewatering, the duration of blocking tidal flow during sediment removal will also be minimized by efficient project scheduling to minimize the potential adverse effects of temporary changed hydrology and tidal flushing. Standard best management practices will be utilized in work areas including excavation, access, staging, dewatering, and other sediment handling areas. These will consist of silt fence, hay bale barriers, stone construction entrances, dust control, scour protection, and others as appropriate.
The sediment remediation work will be performed in accordance with any time of year restrictions identified in project permits. As stated in Section 2.4, an updated NDDB review request specific for the proposed wetland remediation activities will be filed with CTDEEP in advance of the required permit application preparation. The identified sandy beach habitat protected for terns during the nesting season does not apply to the planned work areas.

The contractor will be required to provide and abide by a plan to prevent and control petroleum spills for their activities as well as being required to perform work in accordance with the Norwalk Harbor Generating Station plan. Sediment remediation activities will include the use of heavy equipment both in the wetland and on the upland Site. The potential for petroleum spills from fuel delivery, equipment malfunction, or equipment damage will exist during Site activities. Inspections of spill controls and reporting of spills will be performed in coordination with Norwalk Power LLC.

6.2.6 Construction Quality Assurance / Quality Control and Inspections

Construction quality assurance / quality control (QA/QC) and inspections will be conducted during implementation of the wetland sediment remediation to document compliance with best management practices and federal, state, and local project permits. Norwalk Power LLC will have direct oversight of their selected contractor. The Site LEP, Mr. Andrew D. Walker of APTIM, will be significantly involved with the execution of the RAP so that he can certify that the RAP goals were met and document any deviations.

The contractor will be required to document that the designated remediation areas of sediment have been removed to the specified depth and that sufficient backfill has been placed to restore pre-removal grade. Acceptable documentation consists of civil survey. The contractor must certify that the designated

sediment was removed and remediation areas were backfilled through pre- and post-removal surveys and a post-backfill survey.

Inspections will be performed routinely to ensure that sediment is not being released to surrounding resource areas.

7.0 SURFACE WATER AND GROUNDWATER QUALITY MONITORING

Upon completion of implementation of the wetland sediment remedy, long-term monitoring programs for surface water and groundwater will be continued for the Site under LEP oversight and in coordination with the CTDEEP Remediation Division.

The specific objective for the groundwater and surface water sampling near and in the wetlands will be to demonstrate that contaminant concentrations continue to be stable or declining. Long-term groundwater monitoring at the Site will be performed to assess compliance and confirm stability of the metals groundwater plume.

As identified by the surface water ecological risk assessment discussed in Section 4.2 and based on subsequent discussions regarding surface water sampling and analysis with CTDEEP, surface water monitoring will be performed consistent with the response letter to CTDEEP dated February 27, 2017 (APTIM f/k/a CB&I, 2017b). The surface water sampling plan consists of the following:

- Sampling in Wetlands W-4 (freshwater) and W-5 (saltwater);
- Analysis of total and dissolved aluminum, arsenic, beryllium, cadmium, copper, lead, nickel, selenium, thallium, and zinc by Method 6020B;
- Sampling in spring (e.g., April/May) for high water table condition at low tide; and
- Sampling in late summer (e.g., August/September) for low water table condition at low tide.
- After three years of sampling, re-evaluate the sampling plan including sampling location, parameter list, and sampling timing/frequency.

Groundwater monitoring will be conducted immediately upgradient of the SWWs and consist of sampling five existing monitoring wells annually. Groundwater samples will be collected using the low-flow/stress purging technique, including recording field water quality parameters, from wells AOC1-MW6, AOC1-MW11, NH-8S, NH-10S, and NH-14S. Groundwater samples will be analyzed for total and dissolved aluminum, arsenic, copper, and nickel.

8.0 PROJECT PERMITTING

Performance of the wetland sediment remediation project will require federal, state, and local authorizations and permits as detailed in this section. Pre-application consultation with the various regulatory agencies will clarify the permit application processes required for this project and the need for supporting documentation such as updated wetlands delineation. Although the Design Drawings presented in **Appendix G** were developed in accordance with previous permitting efforts at the Site, it is

anticipated that they may be revised as needed to address any additional requirements of regulatory agencies specific for this project.

8.1 Federal

The New England District of the ACOE issued a General Permit (GP) for activities in waters of the U.S. within the State of Connecticut effective August 19, 2016 (expires August 19, 2021). This remediation project involves excavating from a regulated wetland and is, therefore, subject to the CT GP. Projects authorized under this permit must meet the General Conditions. Authorization under the CT GP is valid only after obtaining required state or local approvals. Compensatory mitigation may be required and will be determined during the permitting process.

ACOE requires that wetland delineations be completed within three years of permit application processing. Wetlands W-3, W-4, and W-5 were last delineated in August 2016. Wetland W-6 was last delineated in April 2007. Therefore, at a minimum, Wetland W-6 will be re-delineated prior to preparation of the ACOE permit application. ACOE also requires that trees with a diameter-at-breast-height (dbh) of 3 inches or greater be identified and located in the work area to assess potential impacts of the project on the federal threatened species, northern long-eared bat. This task will be performed at the time of the re-delineation. Design Drawings in **Appendix G** may be adjusted as a result of these field studies and the application processing.

8.2 State

The Land and Water Resources Division (LWRD) of the CTDEEP regulates permitting programs for work conducted in tidal wetlands. Thus, the remediation of Wetlands W-5 and W-6 will be subject to LWRD review. Remediation of these two wetlands will require a Structures, Dredging and Fill and Tidal Wetlands permit. CTDEEP does not issue permits for work in inland wetlands conducted by private non-government entities.

The filtrate discharge will be permitted with a CTDEEP General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water. The discharge must comply with the conditions of the general permit including numerical effluent limits.

The sediment stockpiles generated in the wetland remediation areas and in the dewatering area will be regulated by the CTDEEP General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer). The general permit is applicable when a combined total stockpile volume of 1,000 cy or greater is stored at the site of excavation for a period exceeding 45 days. It is anticipated that the sediment managed in the geotubes will not meet the criteria for coverage under this permit.

8.3 Local

Local agencies with jurisdiction to review this dredging project include the Norwalk Inland Wetland Agency (NIWA), the Norwalk Planning & Zoning Commission, and the Norwalk Department of Public Works.

The NIWA reviews projects occurring in inland resources areas and adjacent upland areas within 100 feet of the inland or tidal resource. However, they do not have jurisdiction in tidal resource areas as those are regulated by LWRD. The NIWA will review remediation activities in Wetlands W-3 and W-4 and adjacent upland areas within 100 feet of Wetlands W-3, W-4, W-5, and W-6. The remediation project is likely to be considered a 'significant' regulated activity due to the scope of activities within the wetlands.

A coastal site plan review is required for activities or projects which are located fully or partly within the Coastal Boundary as defined in Connecticut General Statutes (CGS) Section 22a-94(b) and delineated on maps approved by the CTDEEP. The Site is entirely within the Coastal Boundary. Applicable policies and standards which must be met by the project are contained in the Connecticut Coastal Management Act (CCMA), codified in the at CGS Sections 22a-90 through 22a-112. As the state-designated agency for the coastal consistency review, the Norwalk Planning & Zoning Commission performs the coastal site plan review as per Article 111, Coastal Zone, of the City of Norwalk Building Zone Regulations.

As per Article 113, Excavation and Fill Regulations, of the City of Norwalk Building Zone Regulations, excavation, filling, and grading of land activities require a zoning permit. The permit application shall comply with the requirements of City Code Chapter 97 Excavating and Filling of Land and will be reviewed and approved by the Norwalk Department of Public Works.

9.0 PROPOSED REMEDIAL ACTION PLAN IMPLEMENTATION SCHEDULE

Although dependent upon obtaining required authorizations/permits and selection of a contractor through a competitive bidding process, the proposed remediation draft schedule is as follows:

- August 2019 - RAP Submittal to CTDEEP Remediation Division
- November 2019 – CTDEEP Issues RAP Authorization to Proceed with Public Notice and Public Comment Period Begins
- November 2019 – Initiation of Permit Application Preparation and Submittals
- January 2020 – Public Comment Period Ends
- TBD – CTDEEP Issues Approval of Final RAP
- Approval of Final RAP + 4 months – Contractor Procurement and Construction Bid Walk
- Approval of Final RAP + 6 months – Permits in Hand
- Approval of Final RAP + 8 months – Begin Remedy Implementation including the following potentially overlapping or lagging activities (note potential time of year limitation to work in tidal wetlands from April 1 through November 1 for state turtle protection [i.e., no work November 1 through April 1]):
    - 2 weeks site preparation
    - 3 to 5 weeks of excavation (200 to 400 cy per day)
    - 1 to 2 weeks of dredging (200 cy per day)
    - Up to 16 weeks of dewatering and sediment management
    - 12 weeks of sediment characterization and T&D
    - Up to 6 weeks of backfill

    - Up to 12 weeks of vegetation restoration (seasonal)
- Approval of Final RAP + 17 months – Complete Remedy Implementation
- Approval of Final RAP + 19 months – Remedy Completion Report Submittal to CTDEEP Remediation Division

The proposed schedule identified above assumes implementation of this RAP as soon as possible and, as identified in Section 6.2, is subject to change based on best practices to address seasonal work restrictions. The contractor's proposed schedule of performance will be identified and approved by Norwalk Power LLC prior to initiation of site activities. The schedule will consider, to the extent feasible, preferred dry seasons for removal actions (i.e., summer) and preferred planting windows for wetland restoration (i.e., fall through spring). The contractor will be expected to execute the remedial action with minimum if any lag between phases of work and employ appropriate protections from sedimentation and erosion between phases.

10.0 REFERENCES

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11.0 LIMITATIONS ON WORK PRODUCT

The information contained in this report, including its conclusions, is based upon the information that was made available to APTIM during the investigation and obtained from the services described, which were performed within time and budgetary restraints.

This report contains information and opinions that are limited to the date the report was issued. APTIM has not conducted any site visit, data review or other investigation of a property since the date of the report relating to that property, and APTIM makes no representation with respect to, nor expresses any opinion about, any property after the date of the report. By providing this report, APTIM does not assume any obligation to update the report for any purpose whatsoever.

APTIM makes no representation concerning the legal significance of its findings or of the value of the property investigated. APTIM has no contractual liability to any third parties for the information or opinions contained in this report.

Unless and until the parties agree otherwise in writing, the use of this report or any information contained therein by any third party shall be at such third party's sole risk. Such use shall constitute an agreement to release, defend and indemnify Norwalk Power LLC and APTIM from and against any and all liability in connection therewith.

TABLES

TABLE 1
Sediment Backfill Concentration Estimations Relative to Target Cleanup Concentrations (TCC) - Post RAP
NRG-Norwalk, South Norwalk, CT

For Freshwater Wetlands

COC in Sediment Currently Exceeding TCC	Wetland	Maximum Concentration in Groundwater Discharging to Wetland [1] (mg/L)	Maximum Concentration in Surface Water in Wetland [2] (mg/L)	Is Concentration Greater Value in GW or SW?	Soil-Water Distribution Coefficient - Kd [3] (L/kg)	Estimated Maximum Backfill Concentration Post Remediation & Equilibrium Using Greater Value [4] (mg/kg)	RAP TCC Freshwater Sediment [5] (mg/kg)	Does Estimated Backfill Concentration Approach or Exceed TCC?
Aluminum	W-3	224.000	NA	GW	28	6,380	25,500	No
	W-4	224.000	0.280	GW	28	6,380		No
Arsenic	W-3	0.024	NA	GW	29	1	107	No
	W-4	0.012	0.007	GW		<1		No
Copper	W-3	0.714	NA	GW	35	25	31	No
	W-4	0.546	0.014	GW		19		No
Nickel	W-3	0.931	NA	GW	65	61	85	No
	W-4	0.931	0.019	GW		61		No

For Saltwater Wetlands

COC in Sediment Currently Exceeding TCC	Wetland	Maximum Concentration in Groundwater Discharging to Wetland [1] (mg/L)	Maximum Concentration in Surface Water in Wetland [2] (mg/L)	Is Concentration Greater Value in GW or SW?	Soil-Water Distribution Coefficient - Kd [3] (L/kg)	Estimated Maximum Backfill Concentration Post Remediation & Equilibrium Using Greater Value [4] (mg/kg)	RAP TCC Saltwater Sediment [5] (mg/kg)	Does Estimated Backfill Concentration Approach or Exceed TCC?
Aluminum	W-5	8.040	0.808	GW	604	4,860	18,000	No
	W-6	11.100	NA	GW	438	4,860		No
Arsenic	W-5	0.264	0.039	GW	29	8	73	No
	W-6	0.040	NA	GW		1		No
Nickel	W-5	0.173	0.002	GW	65	11	59	No
	W-6	0.168	NA	GW		11		No

Notes:

1. A detailed model based assessment of groundwater flow paths to the wetlands was performed and was used to identify the nearest groundwater monitoring wells up/side-gradient of each wetland. W3: NH-8S/14S; W4: NH-3S/10S/14S; W5 AOC1-MW6/11/12+NH-8S; W6: AOC1-MW11/12/13/14. The site groundwater is in steady state, generally stable, with no increasing trends. Groundwater data used in this table includes most recent five years (2014 to 2019). For aluminum, arsenic, and nickel, maximum groundwater concentration was used. For copper, 95% UCL was used.

2. Surface water data used in this tables includes most recent five years (9/2014-4/2019). W3 has been dry on multiple sampling events. W3 surface water concentrations are likely to be similar to W4. W6 surface water concentrations are likely to be less than or similar to W5.

3. Kd values were obtained from the following reference sources:
   i) Arsenic and Nickel - U.S. EPA, Soil Screening Guidance: User's Guide, Second Edition, July 1996, EPA/540/R-96/018, Table 46, Page 158, Kd values corresponding to a pH of 6.8. The EPA 1996 guidance document provides Kd values that are typically used as a conservative estimate of Kd values.
   ii) Copper - Baes III, C.F, R.D. Sharp, A.L. Sjoreen, and R.W. Shor, 1984, A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture, ORNL-5786. Geometric mean for copper from Table 2-13 page 61. Since Copper Kd values were not available in the EPA 1996 guidance document, the Baes et. al. 1984 reference was used.
   iii) Aluminum - Literature value available from Baes III, C.F, et al., 1984, is based on computer simulation and produces higher estimated backfill concentration than observed in sediment samples during 2017-2018 pilot test. Alternate approach used here to determine Kd using formula of 'estimated maximum backfill concentration' (i.e., maximum concentration of aluminum observed during pilot test) divided by 'maximum concentration in groundwater.'

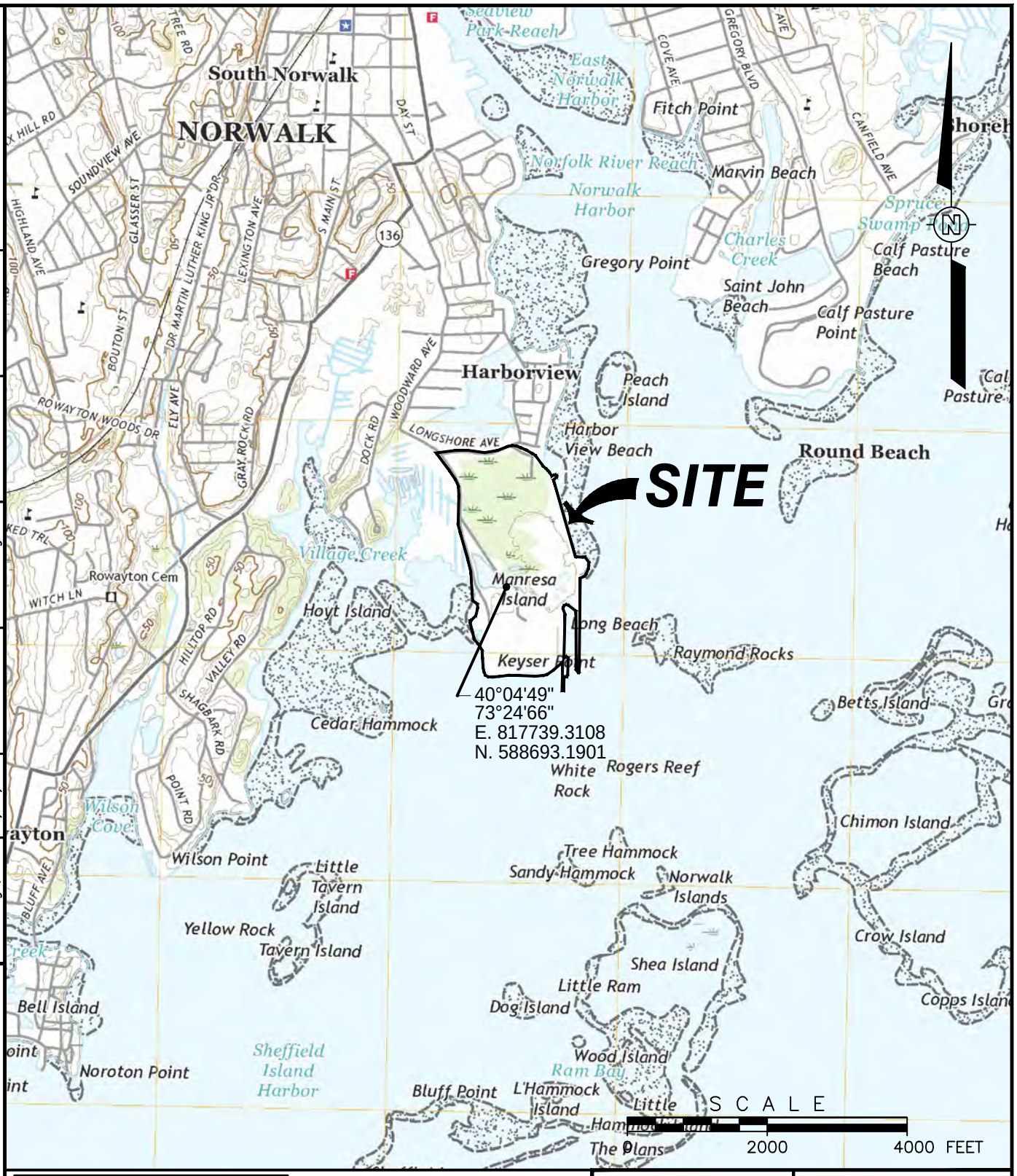
4. Backfill concentration values estimated using the formula of 'maximum concentration in groundwater' (or surface water, if applicable) divided by 'Kd', except as noted for aluminum above.

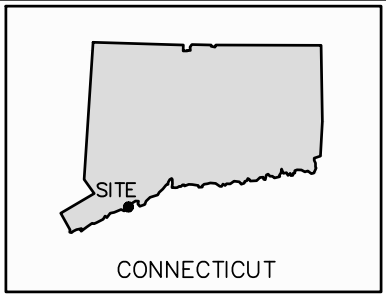
5. Aluminum values are the NJDEP Ecological Screening Criteria (2009) for freshwater and saltwater referenced from the NOAA Screening Quick Reference Tables (SQuiRTs) (2008).

6. Assumes backfill used in remedial action meets specifications presented in RAP Appendix H.

   NA=not available

FIGURES





REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES, NORWALK SOUTH, CONNECTICUT, DATED 2018, SCALE 1"=2000'.

APTIM
150 Royall Street
Canton, Massachusetts

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

FIGURE 1

SITE LOCATION PLAN

NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	4/10/19	A. Steele	E. Schlegel	A. Steele	--	631003718-A1

File: O:\Shaw Offices - CAD Files\Stoughton, MA\NRG\Norwalk\631003718_Wetland Sed_RAP\631003718-A1.dwg
Plot Date/Time: Apr 26, 2019 - 11:53am
Plotted By: Evan.Schlegel
Xref: Image

DRAWING NUMBER 631003718-D1

OFFICE Pittsburgh, PA

AOC-1
FORMER ASH DISPOSAL AREA

AOC-2
FORMER GASOLINE UST

AOC-3
FUEL OIL TANK FARM

AOC-4
FORMER COAL STORAGE AREA

AOC-5
FORMER FUEL OIL USTS

AOC-6 I.C.U.

AOC-7
EXISTING SEPTIC LEACH FIELD

AOC-8
FORMER SEPTIC LEACH FIELD

AOC-9
ELECTRICAL EQUIPMENT

AOC-10 FORMER RCRA IMPOUNDMENT

AOC-11
LONG ISLAND SOUND SEDIMENT (BOUNDARIES NOT ILLUSTRATED)

AOC-12 CONTAINER STORAGE AREA

LONG ISLAND SOUND

RIP-RAP

DOCK STORAGE BUILDING (ON PILE – NO FOUNDATION)

FOLDING BASIN

EQUALIZATION BASINS

#2 FUEL OIL AST'S

FORMER UST'S

DENSELY VEGETATED AREA

W-1

W-2

W-3

W-4

W-5

W-6

SALTWATER WETLAND AREA

LONGSHORE AVENUE

MANRESA AVENUE

SEE DETAIL 'A'

SW-INLET

TIDAL INLET

COOLING WATER CANAL DISCHARGE

LIS-7 AND LIS-8 1/2 MILE

2-BACKGROUND SEDIMENT SAMPLES ~1/2 MILE (SD-13 & SD-14)

LIS-9 AND LIS-10 1/2 MILE

2-BACKGROUND SEDIMENT SAMPLES ~1/2 MILE (SD-15 & SD-16)

SD-12 ALT-1 (BASED ON UTILITIES)

0 VERIFY SCALE 1"

SCALE
0 120 240 360 FEET

REFERENCE:

MONITORING WELLS AOC1–MW11 THRU AOC1–MW16 LOCATIONS AND SURFACE WATER GAUGES SW–W1, W3, W4, W5, W6, AND INLET LOCATIONS PREPARED BY A–PLUS CONSTRUCTION, DATED JANUARY 2015.

"TEST PIT, SOIL BORING & MONITORING WELL SAMPLE LOCATIONS" PREPARED BY METCALF & EDDY. DATED AUG. 2004. DWG# CZNOR002.DWG

SHAW FIELD WORK FOR WETLAND DELINEATION, HIGH TIDE, ASH DEPTH AND TREE LINE COMPLETED IN APRIL, 2007. CB&I REVISED DELINEATION FOR WETLANDS W–3, W–4, AND W–5 IN AUGUST 2016 USING GPS.

"SOIL BORING, MONITORING WELLS, WETLANDS AND HIGH TIDE LOCATIONS" PREPARED BY MARTINEZ AND COUCH ASSOCIATES, DATED AUG. 2007 DWG# MCA–NORWALK–NGR.DWG

"BIO–ACCUMULATION SAMPLE LOCATIONS, HA–2 PRE–DELINEATION AREA AND AOC–1 TOPOGRAPHICAL CONTOURS" PREPARED BY A–PLUS CONSTRUCTION, DATED SEPTEMBER 2008.

"SOIL BORINGS AOC1–SB04 AND AOC1–SB05 LOCATIONS, AND MONITORING WELLS AOC1–MW07 THRU AOC1–MW10 LOCATIONS" PREPARED BY A–PLUS CONSTRUCTION, DATED DECEMBER 2011.

LEGEND:

- BORING LOCATIONS FROM PHASE II, PHASE III, AND/OR SUPPLEMENTAL INVESTIGATIONS
- PHASE II SEDIMENT SAMPLE LOCATION
- PHASE III SOIL BORING/ MONITORING WELL LOCATIONS
- TEST PIT LOCATION (M&E, SUPPLEMENTAL PHASE III, MAY 2003)
- HAND AUGER SAMPLE LOCATION (M&E, SUPPLEMENTAL PHASE III, SEPT 2003)
- FIRE HYDRANT
- ESTIMATED TREE LINE
- EXISTING FENCE LINE
- ESTIMATED LATERAL LIMIT OF AREA OF CONCERN
- DELINEATED WETLANDS AREA
- DELINEATED TREE LINE
- SEDIMENT EXTENT LINE
- APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- WETLAND AREA IDENTIFICATION
- SHAW INSTALLED SOIL BORING (APRIL/MAY 2007 AND DECEMBER 2011)
- SHAW INSTALLED MONITORING WELL (APRIL/MAY 2007 AND DECEMBER 2011)
- MONITORING WELL (1987)
- APTIM INSTALLED MONITORING WELL (OCTOBER 2017)
- SURFACE WATER SAMPLE LOCATION
- CB&I INSTALLED MONITORING WELL (DECEMBER 2014)
- CB&I INSTALLED SURFACE WATER GAUGE (DECEMBER 2014)
- CB&I SOIL BORINGS (JUNE 2017)
- APTIM SOIL BORINGS (OCTOBER 2017) LOCATION ID FORMAT: AOC1–SB7##
- WETLAND SEDIMENT REMEDIATION PILOT TEST CELLS (SEPTEMBER 2017)
- BIO–ACCUMULATION SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (2009)
- SEDIMENT SAMPLE LOCATION (2009) FOR VISUAL OBSERVATION ONLY
- SEDIMENT SAMPLE LOCATION (2010)

DETAIL 'A'
HA–2 DELINEATION AREA
1"=10'

PEX-1 PEX-2 PEX-3 PEX-4 PEX-5 PEX-6 PEX-7 PEX-8 PEX-9 PEX-10 PEX-11 PEX-12 PEX-13 PEX-14 PEX-15 PEX-16 PEX-17 PEX-18 HA-2 PEX-19 PEX-20 PEX-21 PEX-22 PEX-23 PEX-24 PEX-25 PEX-26 PEX-27 PEX-28 PEX-29 PEX-30

APTIM

150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: E. Schlegel
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg

Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

SITE PLAN

NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

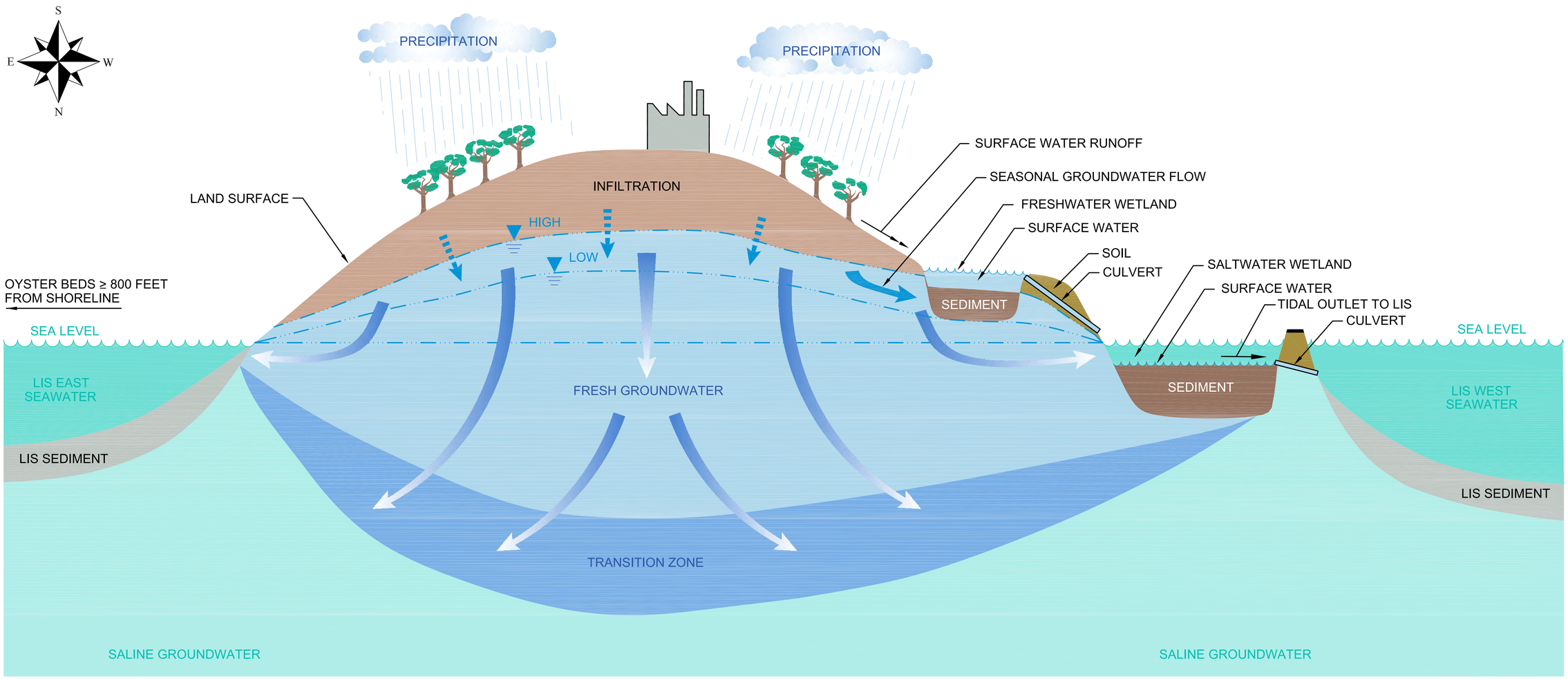
DATE: 4/12/19 | SCALE: AS SHOWN | DRAWING NO. 631003718–D1 | FIGURE NO. 2

Xref: NORWALK BASE MAP – REV. 2–2018
Image
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Plotted By: Evan.Schlegel

OFFICE
Pittsburgh, PA

DRAWING NUMBER
631003718-D2

VERIFY SCALE
0 1"



THIS CONCEPTUAL SITE MODEL (CSM) IS A SYNTHESIS OF INFORMATION PREVIOUSLY PRESENTED. SOURCES OF INFORMATION USED:

- PHASE III REPORT
- SEDIMENT INFORMATION SUBMITTAL
- PRELIMINARY TECHNICAL IMPRACTICABILITY ASSESSMENT FOR GROUNDWATER
- PROFESSIONAL JUDGMENT
- U.S. GEOLOGICAL SURVEY FACT SHEET 057-00, JANUARY 2013

THIS DRAWING PRESENTS A CSM OF THE HYDROLOGIC SETTING, CONTAMINANT SOURCES, RELEASE MECHANISMS AND TRANSPORT PATHWAYS, AND PLACES THEM IN A SPATIAL CONTEXT. IT IS NOT INTENDED TO QUANTIFY THE ELEMENTS DEPICTED. IT PRESENTS A VISUAL SUMMARY OF ESTIMATED PROCESSES THAT OCCUR AT THE SITE. THE CSM REFLECTS THE BEST INTERPRETATION OF AVAILABLE INFORMATION FROM THE SITE INVESTIGATIONS PERFORMED TO DATE.

LEGEND:

- SOIL IMPACTED WITH COAL AND COAL ASH
- DIRECTION OF GROUNDWATER FLOW
- INFILTRATION FROM PRECIPITATION AND LEACHING OF METALS
- GROUNDWATER TABLE
- SURFACE WATER RUNOFF
- LIS — LONG ISLAND SOUND

NOTE:

MORE THAN 10X VERTICALLY EXAGGERATED CROSS SECTION OF THE SITE, LOOKING SOUTH.

"NOT TO SCALE"

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: *A. Steele*	Norwalk Power LLC Manresa Island Avenue South Norwalk, Connecticut
DRAWN BY: *G. Jones*	CONCEPTUAL SITE MODEL NORWALK HARBOR GENERATING STATION SOUTH NORWALK, CONNECTICUT
CHECKED BY: *A. Steele*	
APPROVED BY: *A. Walker*	DATE: 4/12/19 · SCALE: AS SHOWN · DRAWING NO. 631003718-D2 · FIGURE NO. 3

File: O:\Shaw Offices - CAD Files\Stoughton, MA\NRG\Norwalk\631003718_Wetland Sed_RAP\631003718-D2.dwg
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Plotted By: Evan.Schiegel
Image : CB&I.jpg
NRG(R)_PITTSBURGH_C.jpg

OFFICE Pittsburgh, PA

DRAWING NUMBER 631003718-D3

VERIFY SCALE 0 1"

Xref: Image

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Plot Date/Time: Apr 26, 2019 - 1:16pm
Plotted By: Evan.Schlegel

DENSELY VEGETATED AREA

DENSELY VEGETATED AREA

AOC1-MW9

WSD-41	
Arsenic	91.2
Copper	283
Nickel	203

WSD-40	
Arsenic	81.1
Copper	103
Nickel	47.2

WSD-39	
Arsenic	61.4
Copper	218
Nickel	81.3

WSD-35	
Arsenic	64.9
Copper	232
Nickel	119

WSD-30	
Arsenic	21.6
Nickel	20.7

WSD-31	
Arsenic	90.3
Nickel	15.8

WSD-32	
Arsenic	74.5
Nickel	37.7

WSD-33	
Arsenic	165
Nickel	40.6

WSD-28	
Arsenic	152
Nickel	49.5

WSD-04	
Arsenic	222
Nickel	58.9

WSD-27	
Arsenic	128
Nickel	26.2

WSD-03	
Arsenic	227
Nickel	76.8

WSD-11	
Arsenic	5.2
Nickel	15.3

WSD-01	
Arsenic	87.8
Nickel	151

WSD-16	
Arsenic	4.9
Nickel	10

WSD-34	
Arsenic	56.8
Copper	145
Nickel	147

WSD-06	
Arsenic	188
Copper	526
Nickel	1630

WSD-37	
Arsenic	32.6
Copper	152
Nickel	43.7

WSD-36	
Arsenic	150.5
Copper	344
Nickel	352

WSD-38	
Arsenic	80.1
Copper	228
Nickel	85.7

WSD-05	
Arsenic	145
Copper	665
Nickel	591

WSD-29	
Arsenic	329
Nickel	68.1

WSD-14	
Arsenic	147
Nickel	231

WSD-15	
Arsenic	108
Nickel	35.3

WSD-19	
Arsenic	170
Nickel	143

WSD-13	
Arsenic	61
Nickel	159

WSD-02	
Arsenic	29.4
Nickel	48.5

WSD-22	
Arsenic	59.1
Nickel	119

WSD-26	
Arsenic	94.1
Nickel	855

WSD-18	
Arsenic	66.7
Nickel	51.1

WSD-25	
Arsenic	10.9
Nickel	44.2

WSD-17	
Arsenic	61.3
Nickel	32.6

WSD-20	
Arsenic	40.2
Nickel	106

WSD-23	
Arsenic	101
Nickel	166

WSD-21	
Arsenic	32.2
Nickel	76.2

WSD-24	
Arsenic	195
Nickel	780

WSD-12	
Arsenic	203
Nickel	448

NH-1S
NH-9D
NH-9S
NH-10S
NH-10D
NH-14S
NH-14D
NH-8D
NH-8S
AOC1-MW6
AOC1-MW11
AOC1-MW12
AOC1-MW13
AOC1-MW14
EQUALIZATION BASIN
W-3
W-4
W-5
W-6
W4-TC1
W4-TC2L
W5-TC1
W5-TC2L
SW-W3
SW-W4
SW-W5
SW-W6
SW-INLET
WSD-1
WSD-2
WSD-3
WSD-4
WSD-5
WSD-6
WSD-9
WSD-10
WSD10
WSD11
WSD12
WSD13
WSD14
WSD15
WSD16
WSD17
WSD18
WSD20
WSD21
WSD22
WSD23
WSD24
WSD25
WSD26
WSD27
WSD28
WSD29
WSD30
WSD31
WSD32
WSD33
WSD34
WSD35
WSD36
WSD37
WSD38
WSD39
WSD40
WSD41
TIDAL INLET

SCALE
0 60 120 180 FEET

LEGEND:

- EXISTING FENCE LINE
- APPROXIMATE SHORELINE LOCATION
- DELINEATED WETLANDS AREA
- W-1 WETLAND AREA IDENTIFICATION
- SEDIMENT EXTENT LINE
- E APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- SEDIMENT SAMPLE LOCATION (2009)
- SEDIMENT SAMPLE LOCATION (2009) FOR VISUAL OBSERVATION ONLY
- SEDIMENT SAMPLE LOCATION (2010)
- NH-2D MONITORING WELL (1987)
- SEDIMENT SAMPLE WITH SIGNIFICANTLY ELEVATED TOXICITY
- SEDIMENT SAMPLE WITH NO SIGNIFICANTLY ELEVATED TOXICITY
- FRESHWATER SEDIMENT PROBABILITY OF OBSERVING SEDIMENT TOXICITY > 75% BASED ON MEAN PEC QUOTIENT METHOD
- SALTWATER SEDIMENT MEAN ER-M QUOTIENT > 1
- PROPOSED SEDIMENT REMEDIATION AREA. TOP ONE FOOT WILL BE REMOVED AND REPLACED WITH APPROPRIATE CLEAN MATERIAL. AS A PRACTICAL MATTER, THE ENTIRE HORIZONTAL EXTENT OF THE SEDIMENT IN WETLANDS W5 AND W6 WILL BE REMOVED. NO POST REMEDIATION CONFIRMATION SAMPLES WILL BE COLLECTED.
- SW-INLET CB&I INSTALLED SURFACE WATER GAUGE (DECEMBER 2014)
- W4-TC1 WETLAND SEDIMENT REMEDIATION PILOT TEST CELLS (SEPTEMBER 2017)

NOTES:

1. W3 AND W4 ARE FRESHWATER WETLANDS
2. W5 AND W6 ARE SALTWATER WETLANDS
3. ALL CONCENTRATIONS IN MILLIGRAM PER KILOGRAM.

FRESHWATER WETLAND SEDIMENT TARGET CLEANUP CONCENTRATIONS	
Arsenic	107
Copper	31
Nickel	85

SALTWATER WETLAND SEDIMENT TARGET CLEANUP CONCENTRATIONS	
Arsenic	73
Nickel	59

REFERENCE:

MONITORING WELLS AOC1-MW11 THRU AOC1-MW16 LOCATIONS AND SURFACE WATER GAUGES SW-W1, W3, W4, W5, W6, AND INLET LOCATIONS PREPARED BY A-PLUS CONSTRUCTION, DATED JANUARY 2015.

"TEST PIT, SOIL BORING & MONITORING WELL SAMPLE LOCATIONS" PREPARED BY METCALF & EDDY. DATED AUG. 2004. DWG# CZNOR002.DWG

SHAW FIELD WORK FOR WETLAND DELINEATION, HIGH TIDE, ASH DEPTH AND TREE LINE COMPLETED IN APRIL, 2007. CB&I REVISED DELINEATION FOR WETLANDS W-3, W-4, AND W-5 IN AUGUST 2016 USING GPS.

"SOIL BORING, MONITORING WELLS, WETLANDS AND HIGH TIDE LOCATIONS" PREPARED BY MARTINEZ AND COUCH ASSOCIATES. DATED AUG. 2007 DWG# MCA-NORWALK-NGR.DWG

"BIO-ACCUMULATION SAMPLE LOCATIONS, HA-2 PRE-DELINEATION AREA AND AOC-1 TOPOGRAPHICAL CONTOURS" PREPARED BY A-PLUS CONSTRUCTION, DATED SEPTEMBER 2008.

"SOIL BORINGS AOC1-SB04 AND AOC1-SB05 LOCATIONS, AND MONITORING WELLS AOC1-MW07 THRU AOC1-MW10 LOCATIONS" PREPARED BY A-PLUS CONSTRUCTION, DATED DECEMBER 2011.

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
A. Steele	E. Schlegel	A. Steele	A. Walker

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

SITE PLAN OF SEDIMENT REMEDIATION AREAS
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE:	SCALE:	DRAWING NO.	FIGURE NO.
4/15/19	AS SHOWN	631003718-D3	4



LEGEND:

W-1 — DELINEATED WETLANDS AREA

WETLAND AREA IDENTIFICATION

SEDIMENT EXTENT LINE

PROPOSED SEDIMENT REMEDIATION AREA. TOP ONE FOOT WILL BE REMOVED AND REPLACED WITH APPROPRIATE CLEAN MATERIAL. AS A PRACTICAL MATTER, THE ENTIRE HORIZONTAL EXTENT OF THE SEDIMENT IN WETLANDS W5 AND W6 WILL BE REMOVED. NO POST REMEDIATION CONFIRMATION SAMPLES WILL BE COLLECTED.

NOTES:

1. W3 AND W4 ARE FRESHWATER WETLANDS
2. W5 AND W6 ARE SALTWATER WETLANDS

REFERENCES:

1. AERIAL PHOTOGRAPH FROM GOOGLE EARTH, DATED SEPTEMBER 2017.

2. SHAW FIELD WORK FOR WETLAND DELINEATION, HIGH TIDE, ASH DEPTH AND TREE LINE COMPLETED IN APRIL, 2007. CB&I REVISED DELINEATION FOR WETLANDS W-3, W-4, AND W-5 IN AUGUST 2016 USING GPS.

SCALE
0 80 160 240 FEET

OFFICE Pittsburgh, PA
DRAWING NUMBER 631003718-D4

VERIFY SCALE 0 1"

Xref Image

File: O:\Shaw Offices - CAD Files\Stoughton, MA\NRG\Norwalk\631003718_Wetland Sed_RAP\631003718-D4.dwg
Plot Date/Time: Apr 26, 2019 - 12:56pm
Plotted By: Evan.Schlegel

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele	Norwalk Power LLC Manresa Island Avenue South Norwalk, Connecticut
DRAWN BY: E. Schlegel	AERIAL PHOTOGRAPH OF SEDIMENT REMEDIATION AREAS NORWALK HARBOR GENERATING STATION SOUTH NORWALK, CONNECTICUT
CHECKED BY: A. Steele	

APPROVED BY:	DATE:	SCALE:	DRAWING NO.	FIGURE NO.
A. Walker	4/15/19	AS SHOWN	631003718-D4	5

APPENDIX A

REMEDIAL ACTION PLAN TRANSMITTAL FORM

Remedial Action Plan Transmittal Form

DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION
BUREAU OF WATER PROTECTION AND LAND REUSE
REMEDIATION DIVISION www.ct.gov/deep/remediation

Date Stamp
(DEEP Use Only)

This form is a cover document to transmit a Remedial Action Plan. When the use of this transmittal form is required or requested by the Commissioner, a Remedial Action Plan approved in writing by the LEP, a copy of public notification of remediation, as well as all other documentation that demonstrates all applicable laws and regulations have been complied with, is to be attached to this transmittal form to document that remediation of the establishment has been initiated.

Part I of this form must be completed and signed by the Party responsible to submit a Remedial Action Plan for the remediation of the parcel in accordance with the remediation standards. Part II of this form is to be completed and signed and sealed by a licensed environmental professional (LEP).

All sections of this form must be filled out, as applicable.

PART I: GENERAL INFORMATION

Remediation ID No. (Rem#): CTD000854214

Site Identification

Establishment Name (as on Form III): Norwalk Power LLC

Establishment Address: One Manresa Island Avenue

City/Town: South Norwalk State: CT Zip Code: 06854

Description in Property Deed:

Recorded on page 235 of volume 3834 of the Town of South Norwalk

land records, as lot 2 block 86 on map 5 in the Tax Assessor's Office.

Check the box indicating under which program this documentation is being submitted:

☒ Connecticut General Statutes (CGS) section 22a-134a(a)-(e), Property Transfer filing

☐ CGS section 22a-133x, Voluntary Remediation

☒ Other (specify) State RCRA

Submit this completed form to:

REMEDIATION DIVISION
BUREAU OF WATER PROTECTION AND LAND REUSE
DEPARTMENT OF ENERGY AND ENVIRONMENTAL PROTECTION
79 ELM STREET, 2ND FLOOR
HARTFORD, CT 06106 - 5127

PART I: GENERAL INFORMATION (continued)

The following documentation must be attached to this form. Check boxes, as applicable, to verify that the documentation has been submitted with this form.

☒ **REMEDIAL ACTION PLAN -** in accordance with CGS Section 22a-134a(g)(1)

Dated: Aug. 2019 Prepared by: Aptim Environmental & Infrastructure, LLC

☒ **PUBLIC NOTICE OF REMEDIATION -** in accordance with CGS Section 22a-134a(i)

☒ copy of published notice in newspaper

☒ copy of notice to local Director of Health

Check the applicable box if additional public notice requirements were implemented and provide documentation.

☒ sign erected on establishment

☐ copies of the notice of remediation mailed to abutting property owners

Note: Certifying Party must provide copies of any written public comments and responses.

List all applicable documentation and attach to this form.

DOCUMENT	DATED	PREPARED BY

Certifying Party Certification

"I submit this form and attached remedial action plan approved by a licensed environmental professional. I shall apply for all permits and approvals that are necessary to carry out the remedial actions, and I shall ensure that any necessary permit applications are complete and that the issuance of any such permit and/or approval will be diligently pursued."

Printed Name of Authorized Signatory

Title

Signature of Authorized Signatory

Date

Representing (Name of Company): Norwalk Power LLC

Address: One Manresa Island Avenue

City/Town: South Norwalk State: CT Zip Code: 06854

Phone:

Email:

PART II: REMEDIAL ACTION PLAN SUMMARY

To be completed by the LEP

Groundwater Class:

Soil: Concentrations of Pollutants in Excess of RSR Criteria:

Criterion Exceeded	Remedial Measure	COC
☐ PMC	☐ In-situ	☐ Non-chlorinated VOCs
☐ GA	☐ Excavation / on-site re-use	☐ Chlorinated VOCs
☐ GB	☐ Excavation & removal	☐ Metals
	☐ Engineered Control	☐ PAHs
☐ DEC	Date of Commissioner Approval:	☐ SVOCs
☐ Res	☐ ELUR	☐ PCBs
☐ I / C	☐ RSR exemption	☐ ETPH
	☐ RSR Alternative Criteria	☐ Pesticides
	Date of Commissioner Approval:	☐ Other (specify):
	☐ Other (specify):	

Groundwater: Concentrations of Pollutants in Excess of RSR Criteria:

Criterion Exceeded	Remedial Measure	COC
	☐ Pump & Treat	☐ Non-chlorinated VOCs
☐ GWPC	☐ Air Sparging / Vapor extraction	☐ Chlorinated VOCs
☐ Volatilization	☐ Dual-Phase	☐ Metals
☐ SWPC	☐ Monitored natural attenuation	☐ PAHs
	☐ ELUR	☐ SVOCs
	☐ RSR exemption	☐ PCBs
	☐ RSR Alternative Criteria	☐ ETPH
	Date of Commissioner Approval:	☐ Pesticides
	☐ Other (specify):	☐ Other (specify):

PART II: REMEDIAL ACTION PLAN SUMMARY (continued)

Vapor Intrusion:

Remedial Measure

- ☐ sub-slab depressurization
- ☐ vapor barrier
- ☐ indoor-air monitoring

Date of DPH Commissioner Approval of such plan:

NAPL present: ☐ Overburden ☐ Bedrock ☐ None

Other (specify): Sediment removal for metals remediation in wetlands with off-site disposal

LEP Approval

"I have personally examined and am familiar with the information in the remedial action plan summary of this transmittal form, and I approve the attached remedial action plan. My professional services have been rendered in accordance with the 'Rules of Professional Conduct' (Section 22a-133v-6 of the Regulations of Connecticut State Agencies)."

Andrew D. Walker	481
Printed Name of LEP	License Number
Signature of LEP	Date

Company: Aptim Environmental & Infrastructure, LLC

Address: 150 Royall Street

City/Town: Canton State: MA Zip Code: 02021

Phone: 617-589-6143

Email: andrew.walker@aptim.com

Affix Seal Here

APPENDIX B

REMEDIAL ACTION PLAN PUBLIC NOTICE

NOTICE OF REMEDIATION

Norwalk Power LLC
Manresa Island Avenue
Norwalk, CT

Pursuant to Connecticut General Statutes (CGS) Section 22a-134a, a Remedial Action Plan (RAP) that details implementation of remedial action at the Norwalk Power LLC property located at One Manresa Island Avenue, Norwalk, Connecticut has been prepared and submitted to the Connecticut Department of Energy & Environmental Protection (CTDEEP). The proposed remedial action includes removal and off-site disposal of approximately 7,000 cubic yards of shallow sediment in wetlands followed by restoration activities at the subject property.

Response actions at this site will be conducted by Norwalk Power LLC which has engaged a Licensed Environmental Professional, Andrew D. Walker of Aptim Environmental & Infrastructure, LLC to manage response actions. The RAP is available for review at the following web site: https://www.nrg.com/legal/norwalk-harbor-generating-station.html.

To obtain more information on the RAP and the opportunities for public involvement in its remediation, please contact Mr. Robert Spooner of Norwalk Power LLC at P.O. Box 1001,1866 River Road, Middletown, CT 06457 or at (860) 343-6963.

Any public comments must be submitted in writing to the State by August 6, 2020. Please send the comments to the CTDEEP Commissioner at 79 Elm Street, Hartford, CT 06106.

APTIM
150 Royall Street
Canton, MA 02021
APTIM.com

June 22, 2020

Project #: 631012814.010

Ms. Deanna D'Amore
Director of Health
Norwalk Health Department
137 East Avenue
Norwalk, Connecticut 06851

Subject: Public Notice, Remedial Action Plan
Norwalk Harbor Generating Station
Norwalk, Connecticut

Dear Ms. D'Amore:

Pursuant to Connecticut regulations, a Remedial Action Plan (RAP) that details implementation of remedial action at the Norwalk Power LLC property has been submitted to the Connecticut Department of Energy & Environmental Protection (CTDEEP). The proposed remedial action includes removal of shallow sediment from wetlands at the subject property followed by restoration activities. On behalf of Norwalk Power LLC, attached please find a copy of the public notice for this remediation that will run in The Hour on June 23, 2020. In further compliance with CTDEEP requirements, a notice sign for this remediation will also be posted and maintained at the facility.

If you have any questions regarding this letter, please do not hesitate to call me at 617.589.6143.

Sincerely,

Andrew D. Walker, LEP
Project Manager
Aptim Environmental & Infrastructure, LLC

E-Mail Address: Andrew.Walker@APTIM.com

Attachment: Public Notice

cc: Ms. Amanda Killeen, CTDEEP (hard copy)
Mr. Paul Bukowsky, Norwalk Power LLC (electronic and hard copy)
Mr. Bob Spooner, NRG (electronic)
Mr. Juan Perez, USEPA (electronic)

APPENDIX C

SUMMARY OF UPDATED GROUNDWATER MODELING

APPENDIX C

SUMMARY OF UPDATED GROUNDWATER MODELING

October 2018

1.0 Introduction

Groundwater flow and solute transport modeling was conducted to evaluate the arsenic and nickel concentrations in groundwater discharging to fresh water wetlands, Wetlands W-3 and W-4, and salt water wetlands, Wetlands W-5 and W-6, at the Norwalk Harbor Generating Station located in Norwalk, Connecticut. The model is an updated version of the model that was previously constructed to evaluate groundwater flow and compare various groundwater remedial alternatives as part of the Preliminary Technical Impracticability Assessment for Groundwater dated November 2012 (Preliminary TI; Shaw Environmental, Inc. [Shaw], 2012). The major changes implemented through the update are the incorporation of Wetlands W-3, W-4, W-5, and W-6 in the model and the extension of the modeled area to the north to include the off-site residential neighborhood. The previous model evaluation utilized a site-wide scale approach with no wetland areas, while the updated model focuses on the wetland area and the transport of arsenic and nickel from groundwater to Wetlands W-3, W-4, W-5, and W-6.

2.0 Groundwater Modeling

As presented in the Preliminary TI (Shaw, 2012), Aptim Environmental & Infrastructure, Inc. (APTIM) developed a three-dimensional groundwater flow and transport model with commercial computer software. The computer software GMS/MODFLOW was used for modeling the groundwater flow at the site. The software package GMS/MT3D was used for solute transport modeling for arsenic and nickel, which are the contaminants of concern (COCs) with the most significant overall environmental risk. The purpose of the solute transport modeling was to map the future extent of remedial criteria exceedences (i.e., the metal plume dimensions) after the implementation of various remedial alternatives, and to map the concentration distributions of selected metals within the plume over 10 increments up to 50 years. The recent updates to groundwater flow and solute transport modeling are described in this section.

2.1 Flow Modeling

Wetlands W-3, W-4, W-5, and W-6 are incorporated in the updated model as General Head Boundaries (GHB). The General-Head Boundary package is used to simulate head-dependent flux boundaries. The use of GHB ensures that flow into or out of wetlands flux is always proportional to the difference in head between the surface water in the wetlands and the groundwater immediately up gradient of the wetlands. The wetlands were assigned surface water elevations based on measurements made during the mid-tide (between high-tide and low-tide) in Long Island Sound.

Once the flow model was constructed, groundwater flow directions in the area up gradient of the wetlands were examined to identify flow directions. Groundwater elevation contours and groundwater flow vectors for the site based on the updated model are provided in **Figures 1** and **2a**, respectively. Based on more than 10 years of groundwater elevation data and the updated groundwater flow model, an apparent groundwater divide was identified to run generally north-south through AOC 1 and dictates easterly and westerly groundwater flows. The divide potentially moves seasonally and over time and, thus, its location is an approximation and cannot be established as a fixed or permanent feature in the field. The groundwater divide is located approximately 50 to 200 feet up gradient (east) of the wetlands; groundwater flow to the east of the divide is directed away from the wetlands while groundwater flow to the west of the divide is directed towards the wetlands. The divide distinguishes where the applicable CT or alternative Surface Water Protection Criteria (ASWPC) or CT Water Quality Criteria (WQC) are likely to be applicable for site groundwater based on the receiving water from the updated groundwater flow model. Groundwater that ultimately discharges to Long Island Sound needs to achieve compliance with the ASWPC, while the remaining groundwater needs to achieve compliance with the saltwater WQC. There are very limited select areas where compliance with the freshwater WQC is required. The groundwater flow vectors in the wetlands area and the zone of groundwater discharge to wetlands where the WQC applies are shown in **Figure 2b**. The identification of the groundwater divide is critical not only to determine the groundwater flow that discharges to the wetlands, but also to determine concentrations of COCs dissolved in the groundwater that are expected to discharge to the wetlands.

2.2 Solute Transport Modeling

Arsenic and nickel solute transport models were constructed using the measured groundwater concentrations between 2007 and 2015 to establish current conditions and concentrations in the groundwater discharging to the wetlands. The arsenic and nickel concentrations in groundwater used in the model (Year 0) are shown in **Figures 3a** and **4a**, respectively. The transport models were then run for a 20 year period to determine future impacts to the wetlands. Model predictions were used to determine the maximum concentrations of arsenic and nickel in groundwater that may discharge to the wetlands at time intervals of 5 years, 10 years, and 20 years into the future. The arsenic and nickel concentrations in groundwater up to 20 years in the future are shown in **Figures 3b, c, d** and **4b, c, d**, respectively. The results of the updated groundwater solute transport modeling are generally similar to the previous modeling results except at the northern boundary where area of metals impact is slightly extended.

3.0 References:

Shaw Environmental, Inc., 2012. *Preliminary Technical Impracticability Assessment for Groundwater*, Norwalk Power LLC, Norwalk Harbor Generating Station, Norwalk, Connecticut. November 20, 2012.



LEGEND:

Water level under static conditions
(feet above mean sea level)

- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2
- 1
- 0

Wetland boundary

NOTES:

1. Information presented on this figure is based on GMS MODFLOW File ID 2015Model.gpr.

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APTIM

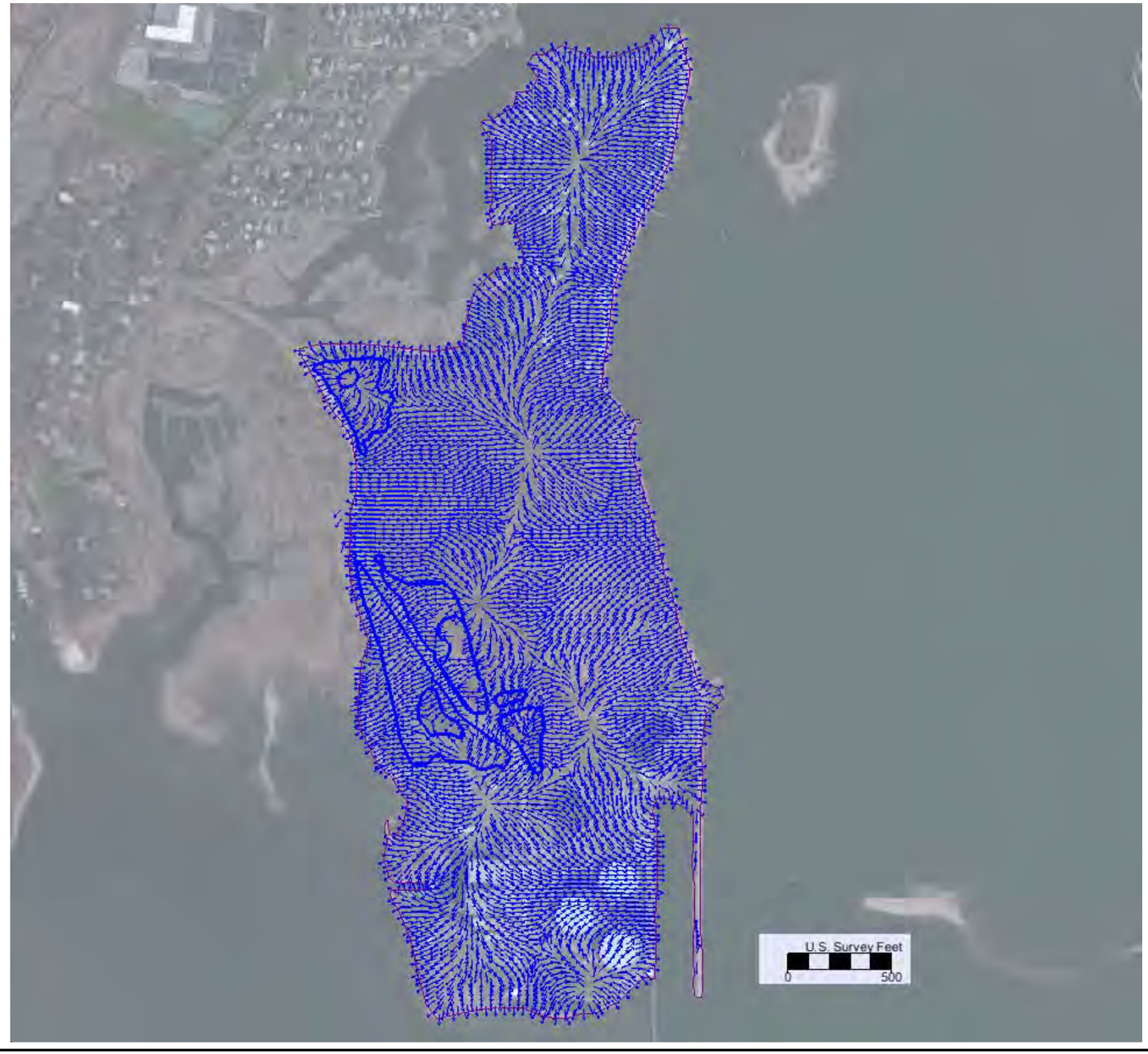
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CANTON, MA 02021

FIGURE 1

CALIBRATED GROUNDWATER MODEL GROUNDWATER ELEVATION CONTOURS – SITEWIDE EXTENDING TO RESIDENTIAL AREA

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Groundwater Flow Vector

Wetland boundary

NOTES:

1. Information presented on this figure is based on GMS MODFLOW File ID 2015Model.gpr.

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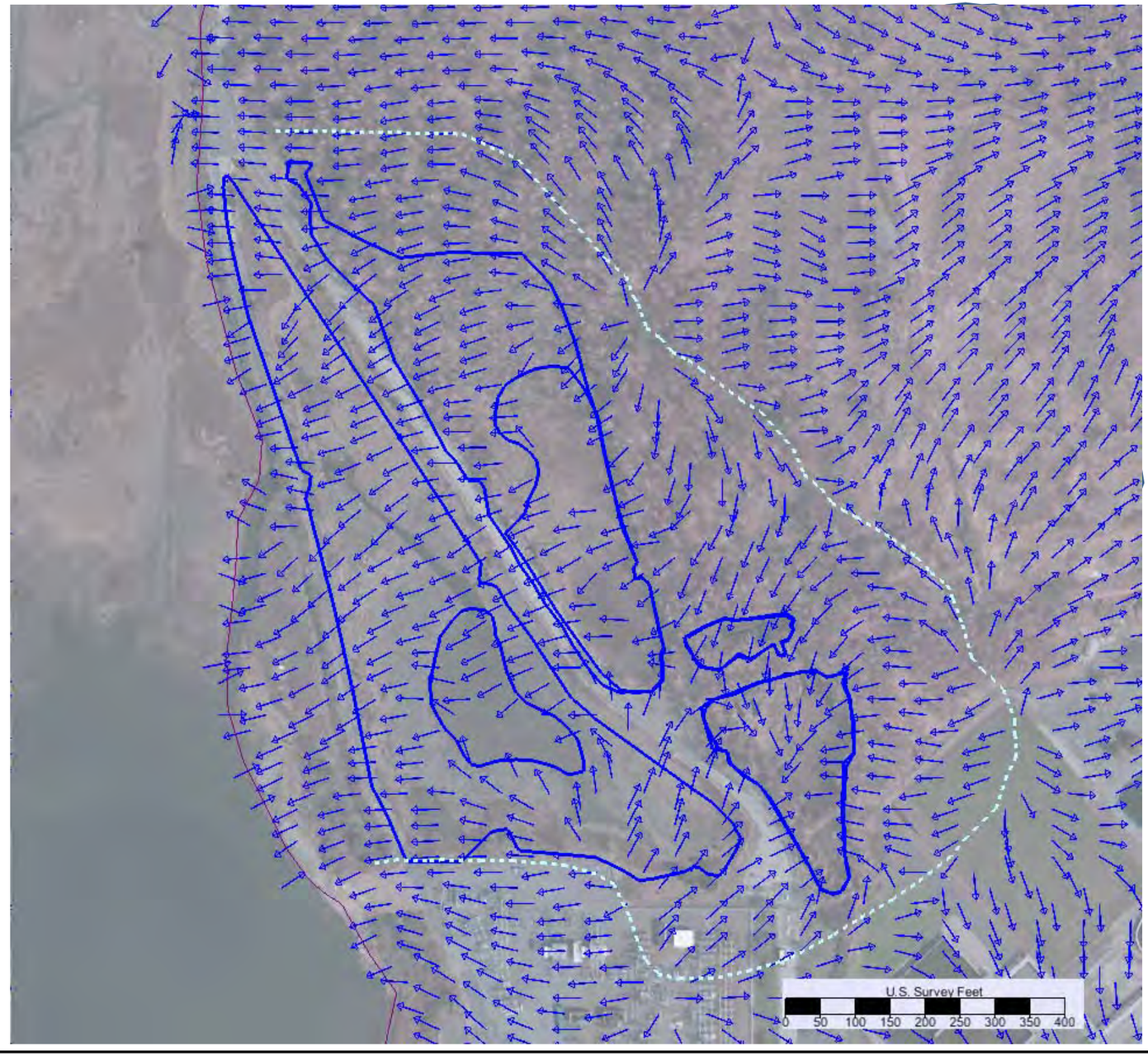
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FIGURE 2a

GROUNDWATER FLOW VECTORS – SITEWIDE AND RESIDENTIAL AREA

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Groundwater Flow Vector

Zone of Groundwater Discharge to Wetlands

NOTES:

1. Information presented on this figure is based on GMS MODFLOW File ID 2015Model.gpr.

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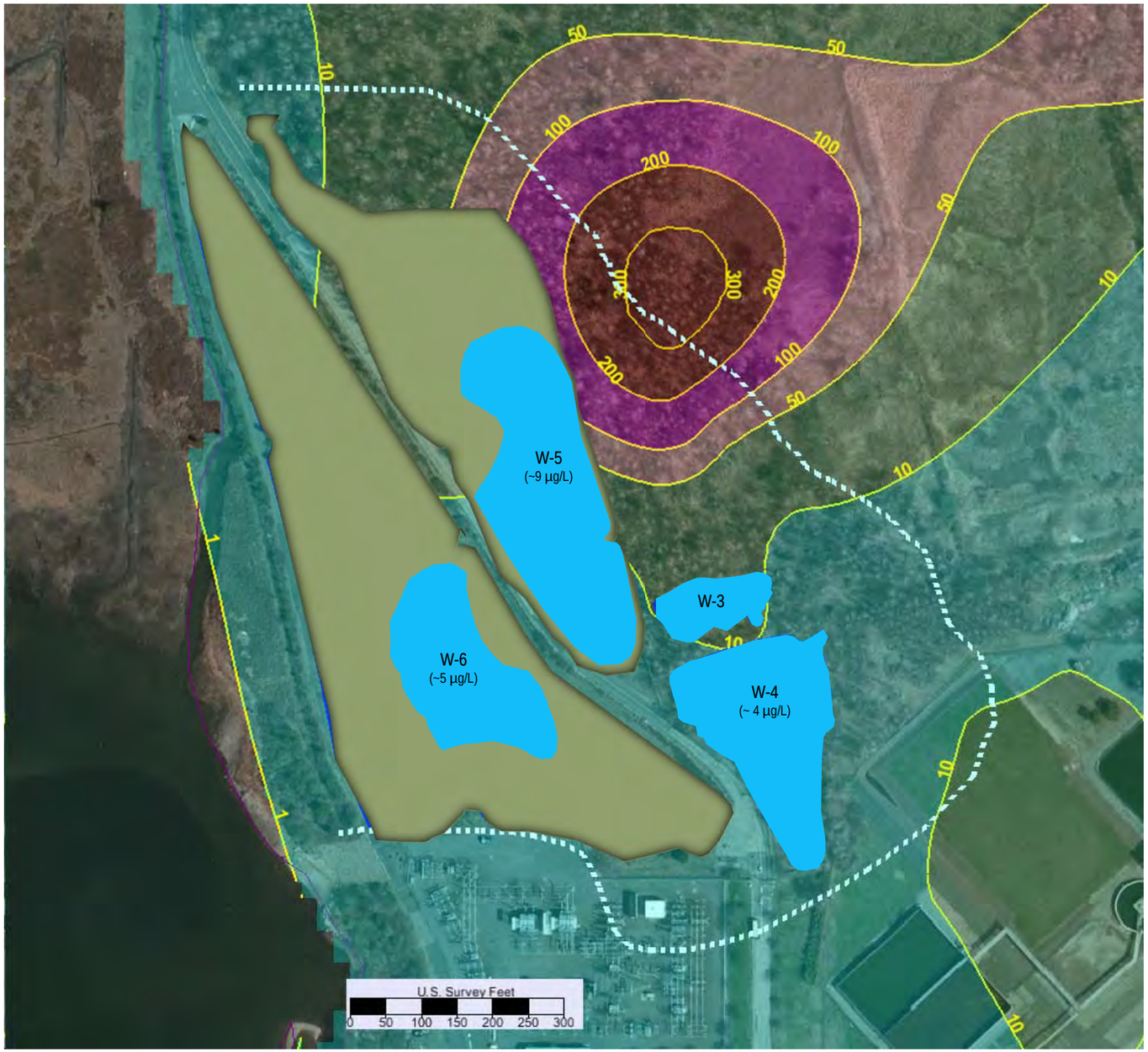
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FIGURE 2b

GROUNDWATER FLOW VECTORS – WETLANDS AREA

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

W-5 (~9 µg/L) Wetland area with standing water and approximate surface water concentration

NOTES:

1. Year 0 estimated concentrations are values interpolated from average concentrations for samples collected from monitoring wells across the site between 2007 and 2015.

2. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.

3. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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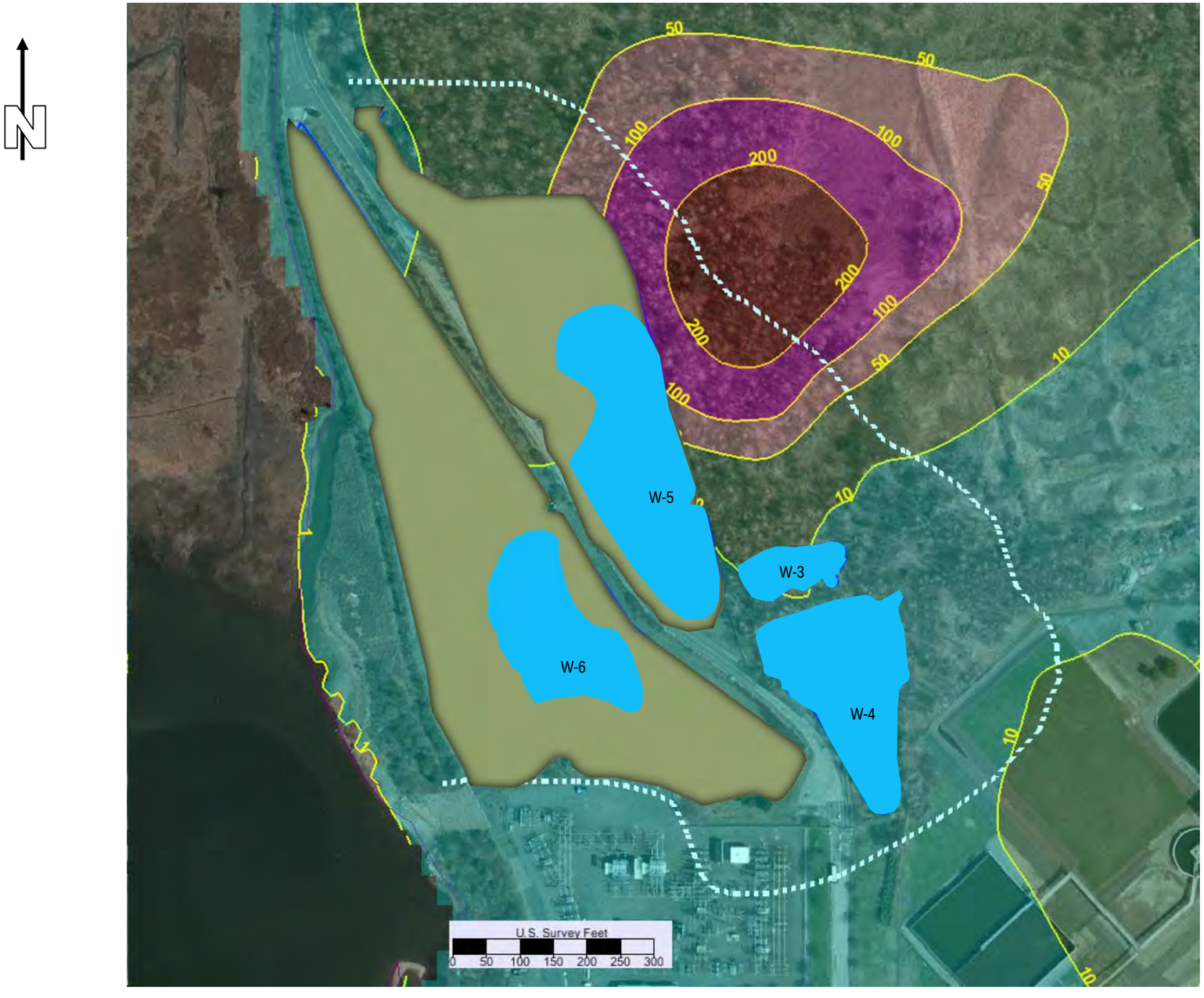
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FIGURE 3a

ARSENIC CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 0

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

Wetland area with standing water

NOTES:

1. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.

2. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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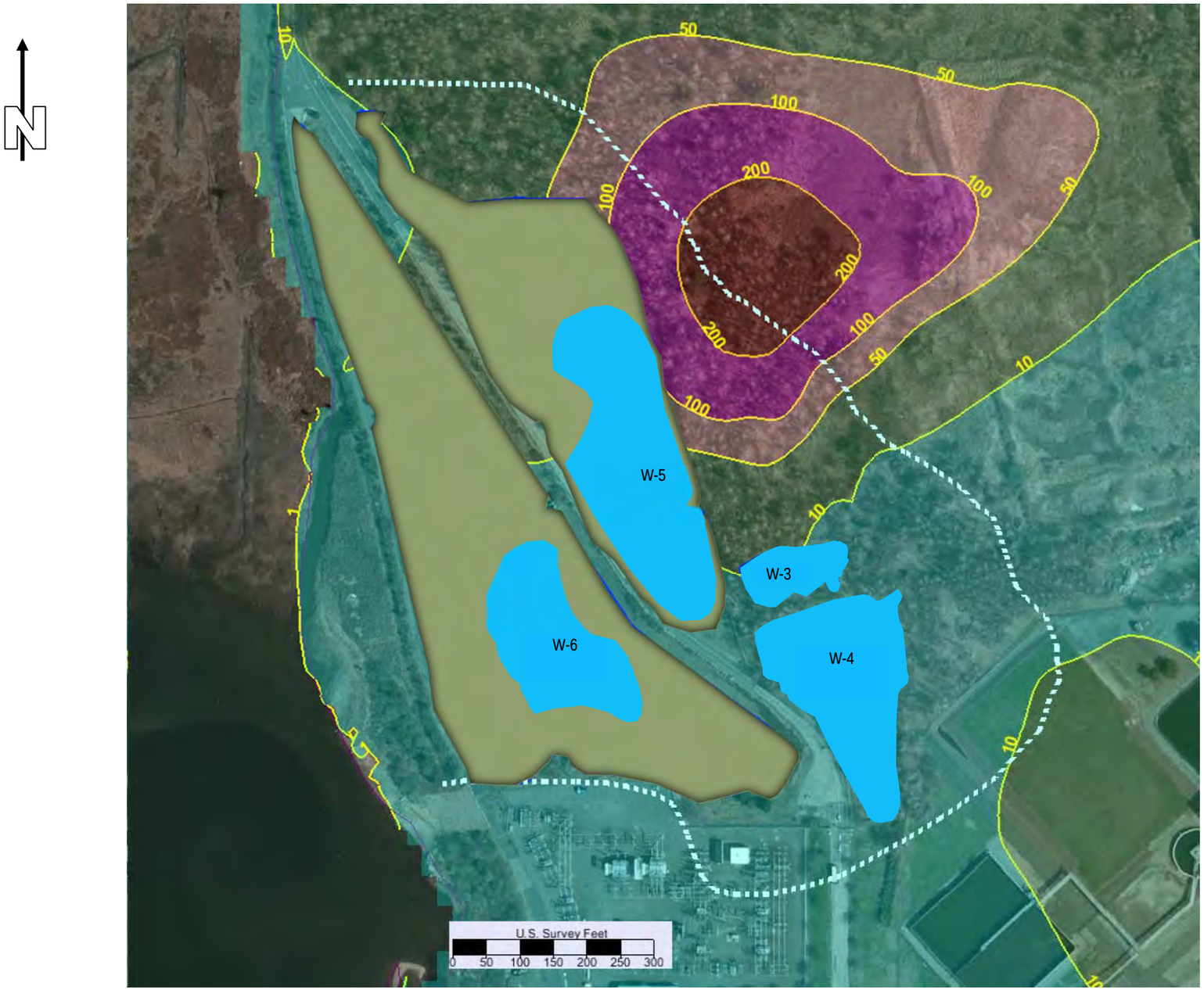
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FIGURE 3b

ARSENIC CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 5

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

Wetland area with standing water

NOTES:

1. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.

2. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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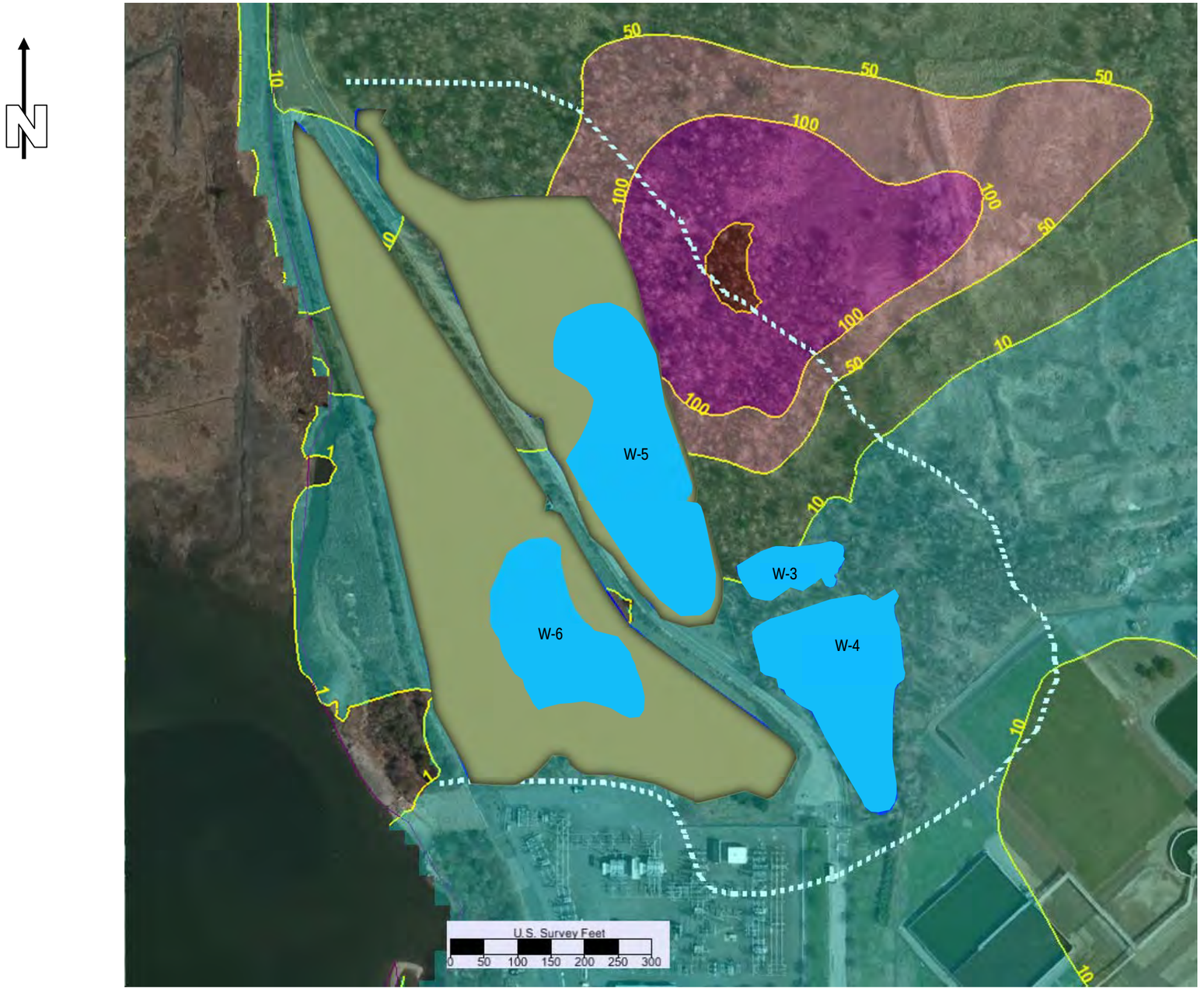
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FIGURE 3c

ARSENIC CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 10

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

Wetland area with standing water

NOTES:

1. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.
2. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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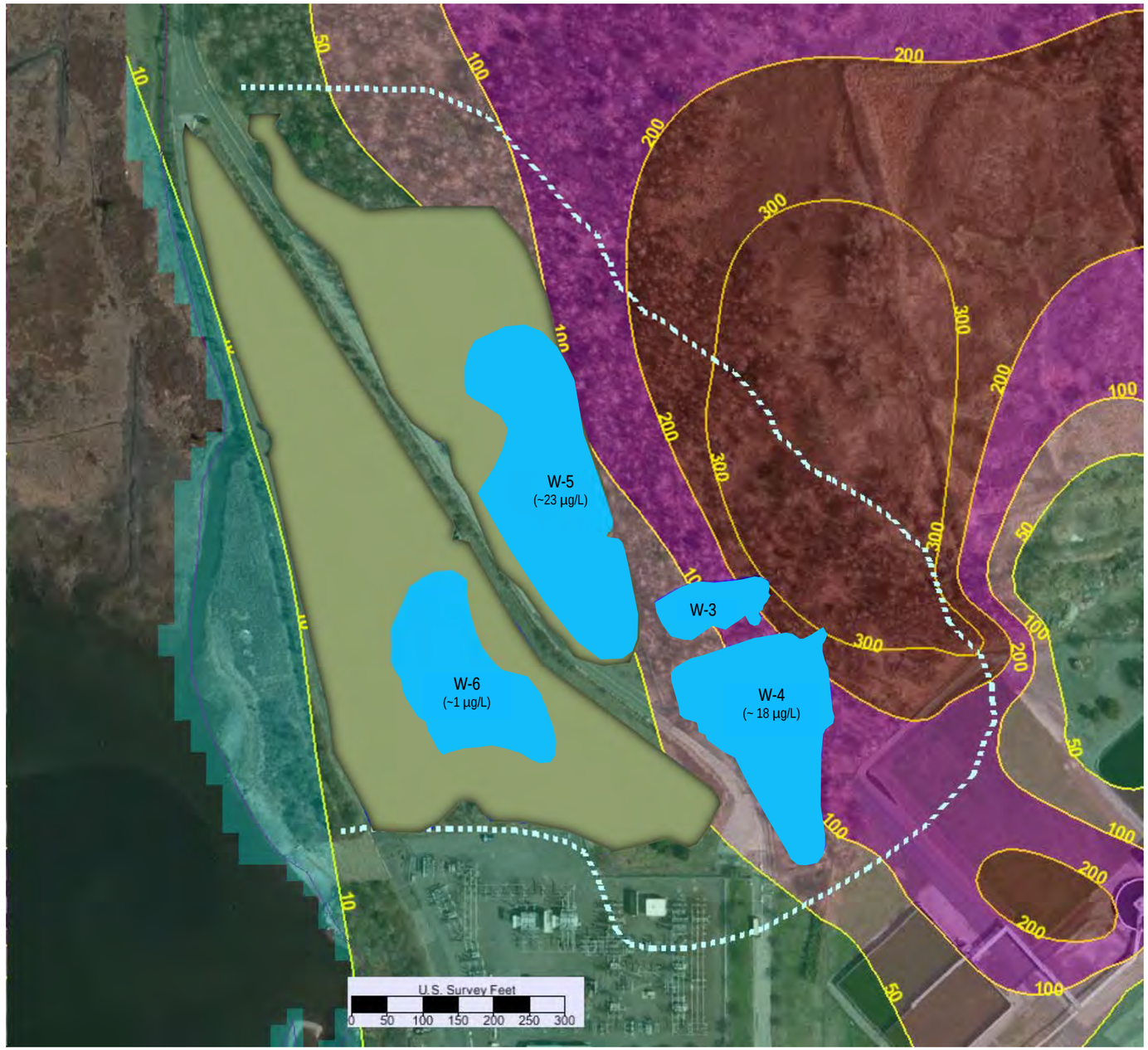
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FIGURE 3d

ARSENIC CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 20

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

W-4 (~ 18 µg/L) Wetland area with standing water and approximate surface water concentration

NOTES:

1. Year 0 estimated concentrations are values interpolated from average concentrations for samples collected from monitoring wells across the site between 2007 and 2015.
2. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.
3. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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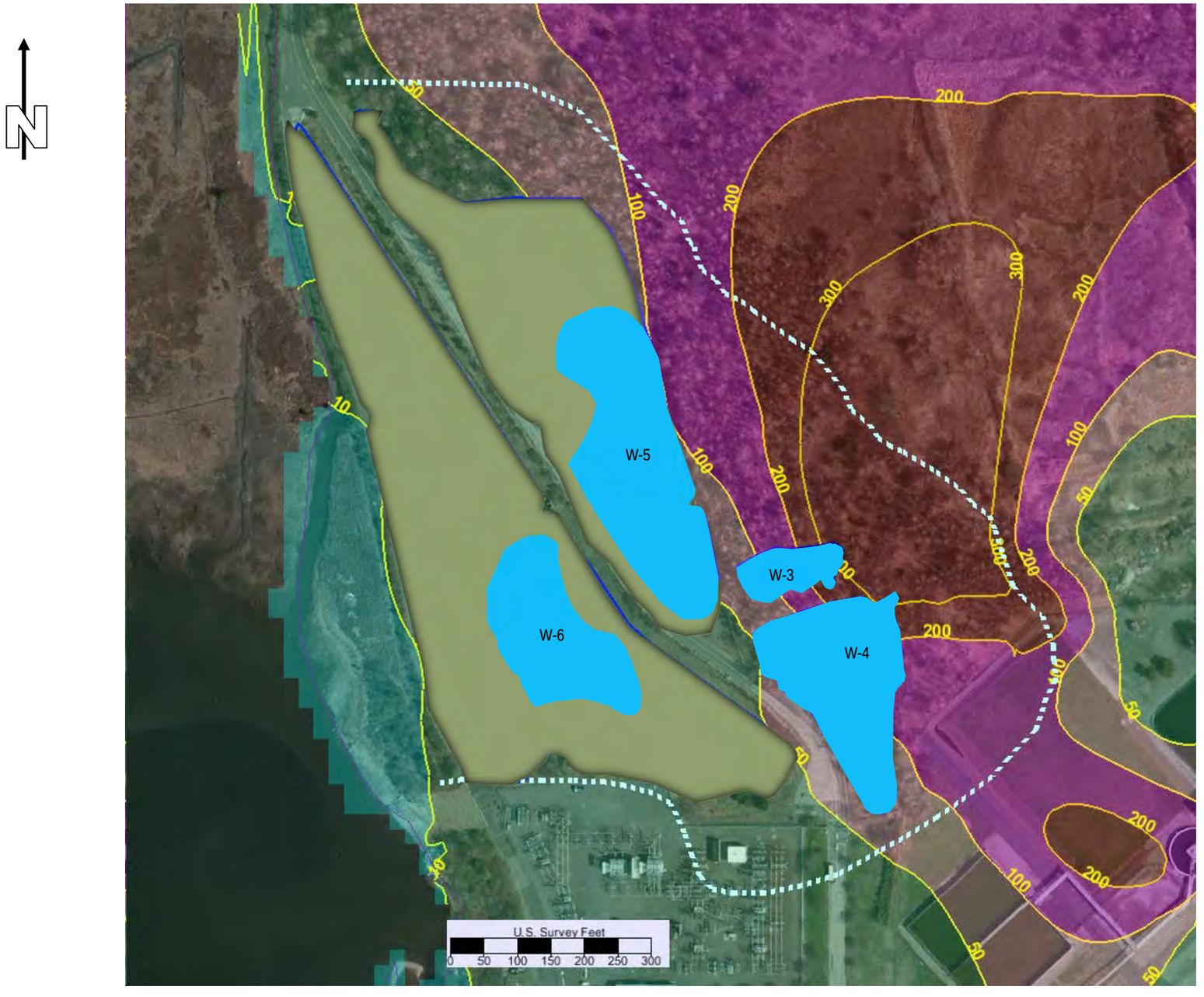
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FIGURE 4a

NICKEL CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 0

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

Wetland area with standing water

NOTES:

1. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.

2. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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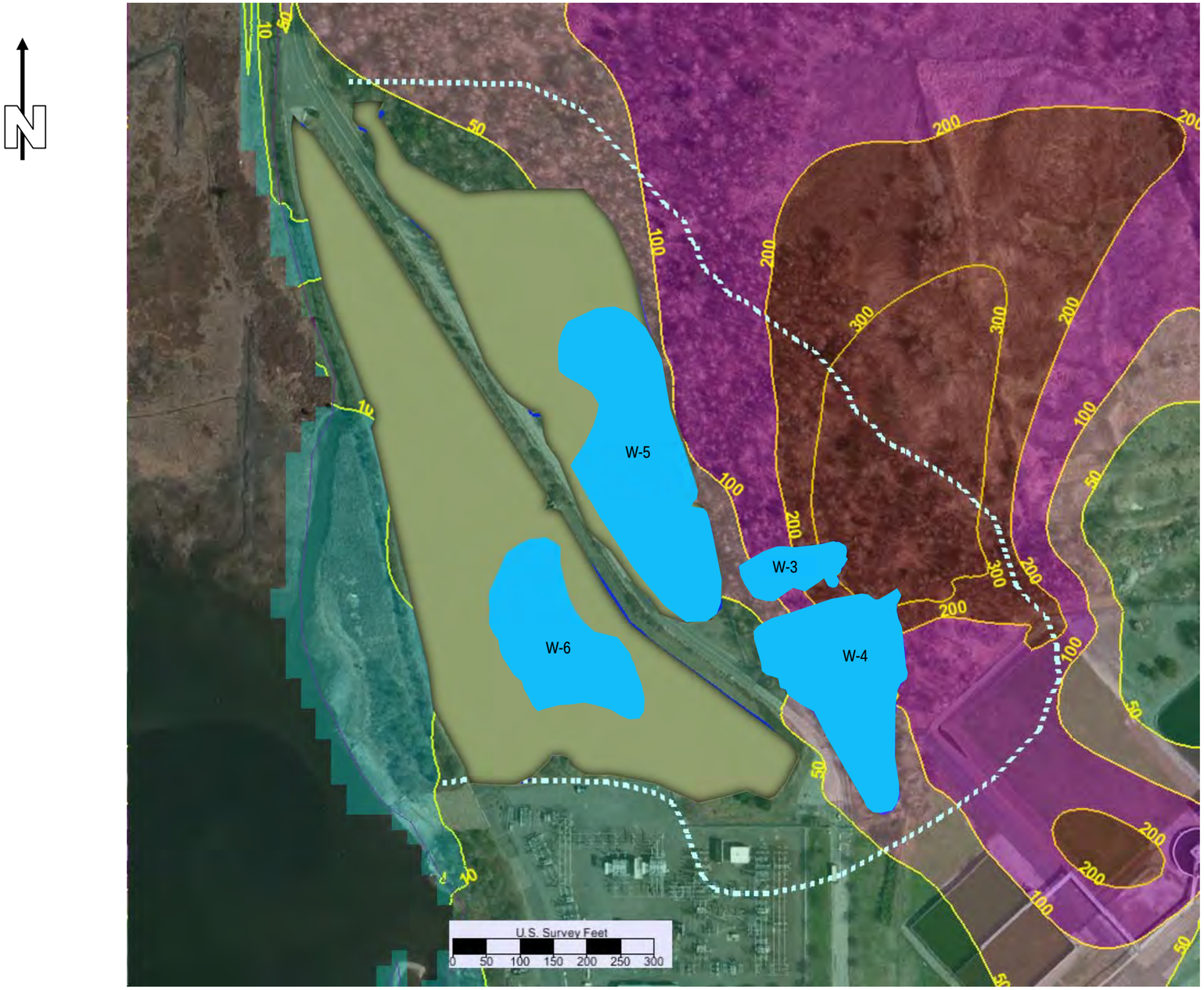
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FIGURE 4b

NICKEL CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 5

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

Wetland area with standing water

NOTES:

1. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.

2. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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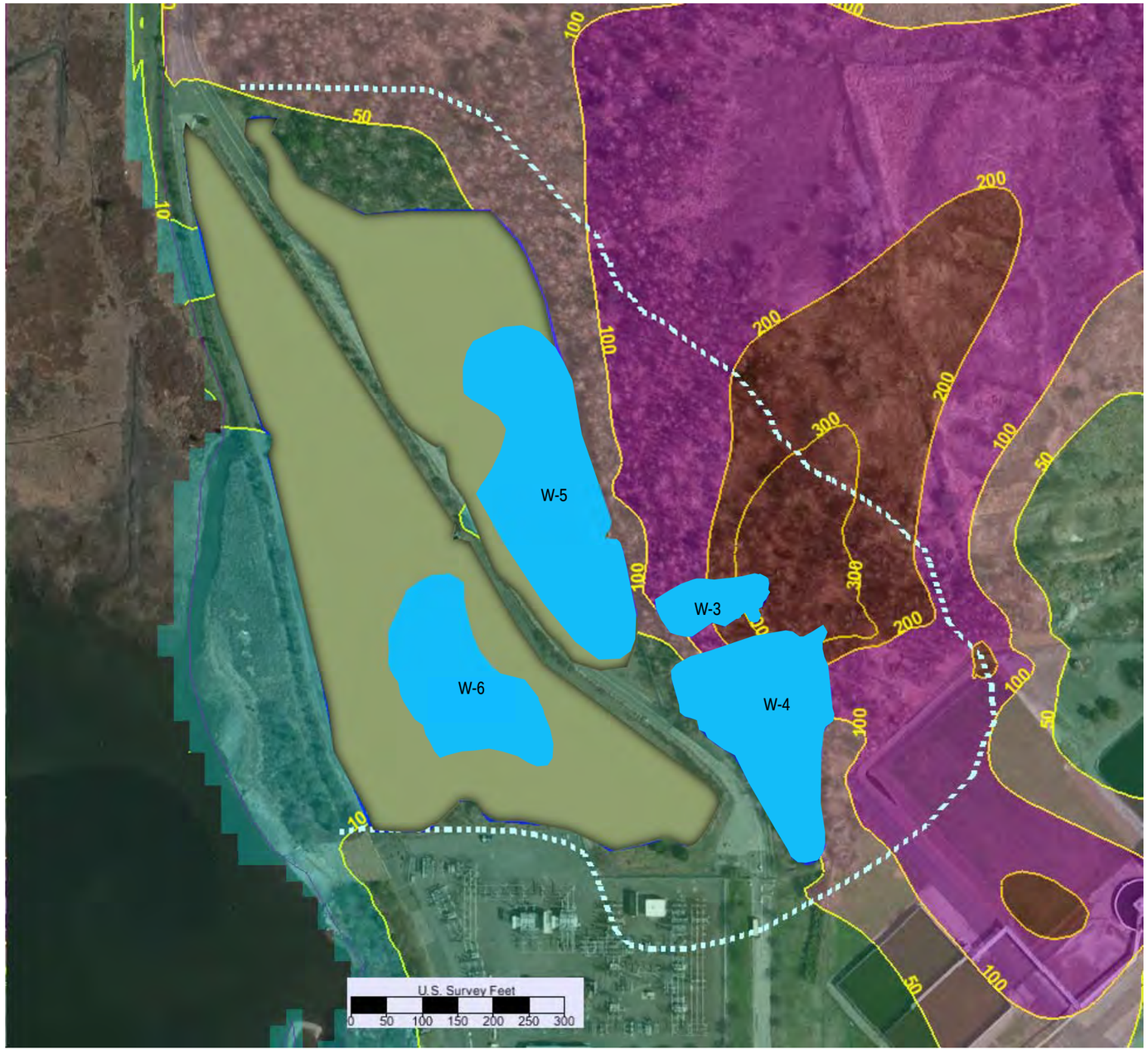
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CANTON, MA 02021

FIGURE 4c

NICKEL CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 10

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT



LEGEND:

Concentration contour, µg/L

Zone of Groundwater Discharge to Wetlands

Wetland

Wetland area with standing water

NOTES:

1. No leaching was considered in the model because the site is assumed to be in steady state between leaching and groundwater discharge.

2. Information presented on this figure is based on GMS MT3D File ID wetlandfocus_no68.gpr.

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FIGURE 4d

NICKEL CONCENTRATIONS IN GROUNDWATER NEAR WETLANDS – YEAR 20

GROUNDWATER FLOW AND SOLUTE TRANSPORT MODELING RESULTS

NORWALK POWER LLC
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

APPENDIX D

RECALCULATION OF ESTIMATED ECOLOGICAL RISK-BASED TARGET CLEANUP CONCENTRATIONS

APPENDIX D

RECALCULATION OF ESTIMATED ECOLOGICAL RISK-BASED TARGET CLEANUP CONCENTRATIONS

June 2019

1.0 Introduction

The Sediment Information Submittal (SIS) (Shaw Environmental, Inc. [Shaw], 2011), submitted to Connecticut Department of Energy and Environmental Protection (CTDEEP) in August 2011, evaluated risk to ecological receptors from exposure to chemicals in the freshwater and saltwater wetland sediment at Area of Concern (AOC) 1, Norwalk Harbor Generating Station. Based on the outcome of the risk assessment, target cleanup concentrations (TCCs) of constituents of concern (COCs) were estimated, and remedial alternatives were assessed. The SIS was reviewed by CTDEEP and comments were submitted to Norwalk Power, LLC by letter dated January 15, 2014. The responses to these comments are discussed in this appendix, with a reference to the specific comment (e.g., FW bullet 1 refers to the comment under the first bullet under the Freshwater Wetlands heading in CTDEEP's comment letter; SW = Saltwater Wetlands). In general, the comments related to the interpretation of toxicity test and risk assessment results, and the estimation of TCCs. The revisions made to the information provided in the SIS, and the resulting recalculation of estimated TCCs, are presented in the following sections.

2.0 AOC 1 Freshwater Wetlands

2.1 Evaluation of Risk to Benthic Invertebrates from AOC 1 Freshwater Sediment

CTDEEP had no comments on the freshwater sediment toxicity test results. The conclusion of the SIS is unchanged; benthic invertebrate populations are unlikely to be affected by exposure to freshwater wetland sediment. Therefore, the TCCs for freshwater wetland sediment remediation will continue to be based only on the potential risk to wildlife receptors (see Sections 2.2 and 2.3).

2.2 Evaluation of Risk to Wetland Vertebrate Wildlife from AOC 1 Freshwater Sediment – Wetlands W3 and W4

As stated in the SIS, extractable total petroleum hydrocarbons (ETPH), arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc, as well as the metals with no screening values (barium, beryllium, thallium, and vanadium), are considered constituents of potential concern (COPCs). COPC selection did not include comparison to background

concentrations, since, despite an extensive investigation, no appropriate background freshwater wetland was available. Details of the investigation are on file.

In response to CTDEEP comments (FW bullet 1), hazard quotients (HQs) based on no-observed-adverse-effect-level (NOAEL) and lowest-observed-adverse-effect-level (LOAEL) toxicity reference values were recalculated for the two representative freshwater wildlife receptors. This recalculation uses moderately aggressive LOAELs to calculate TCCs. Results are summarized in **Table D1**. ETPH could not be assessed for the mole or the wren due to the lack of toxicity reference values (TRVs) (NOAELs and LOAELs). Barium, beryllium, thallium, and vanadium were not assessed since these compounds are not bioaccumulative (U.S. Environmental Protection Agency [EPA], 2000). As shown in **Table D1**, for the star-nosed mole, HQ_{NOAELs} are greater than 1 for arsenic, copper, nickel, and selenium. For the Carolina wren, HQ_{NOAELs} are greater than 1 for arsenic, chromium, copper, lead, methyl mercury, nickel, selenium, and zinc. As stated in the SIS, use of NOAELs may overestimate effects since this measurement endpoint does not reflect any observed impacts; therefore, LOAEL-based HQs were calculated for those metals with HQ_{NOAELs} greater than 1. For the mole, HQ_{LOAELs} are greater than 1 for copper (3.7), nickel (10), and selenium (2.3). For the wren, HQ_{LOAELs} are greater than 1 for arsenic (1.1), copper (13), nickel (4.8), and selenium (2.3).

CTDEEP commented that an estimated TCC should be developed for arsenic, mercury, and selenium (FW bullet 3). NRG/APTIM do not totally agree, for the following reasons. For arsenic, HQ_{LOAELs} are very low (less than or equal to 1.1). This indicates a very low potential for risk. However, to be conservative, a TCC will be estimated for arsenic. For mercury, HQs were calculated for both inorganic mercury and methyl mercury. HQ_{LOAELs} are less than 1 for both forms of mercury (see **Table D1**); therefore, adverse impacts to vertebrate wildlife from exposure to mercury are not expected and TCCs are not necessary. For selenium, as discussed in the SIS, there is too much uncertainty with the selenium biota-sediment accumulation factor (BSAF) used in the food chain model to recommend further action specifically for selenium. Therefore, TCCs are not calculated for mercury and selenium.

Based on the above discussion, there is a potential for risk to avian wildlife receptors from exposure to arsenic (low potential risk), and to mammalian and avian wildlife receptors from exposure to copper and nickel in sediments at Wetlands W3 and W4. TCCs for arsenic, copper, and nickel in freshwater wetland sediment are estimated in the following section.

2.3 AOC 1 Freshwater Wetlands Estimated Target Cleanup Concentrations

The wetland W3/W4 food chain models were back-calculated to estimate concentrations of arsenic, copper, and nickel that would reduce risk to acceptable levels (i.e., estimated TCCs). CTDEEP commented (FW bullet 1) that the estimated TCCs presented in the SIS (Shaw, 2011) should be adjusted so that the resultant HQ_{LOAELs} are less than 1 and the HQ_{NOAELs} approach 1. CTDEEP also commented (FW bullet 2) that the sediment benchmark should not be included in estimating the TCC for copper. Based on these comments, the TCC calculations were revised, as detailed in **Table D2**, along with the selected estimated TCCs.

For arsenic, the exposure point concentration (EPC) would have to be reduced from 123.9 mg/kg to 107 mg/kg to result in wren HQ_{LOAELs} less than 1. For copper, the EPC would have to be reduced from 393.1 mg/kg to 31 mg/kg to result in both mole and wren HQ_{LOAELs} less than 1. For nickel, the EPC would have to be reduced from 716.2 mg/kg to 71 mg/kg to result in both mole and wren HQ_{LOAELs} less than 1. However, the selected estimated TCC for nickel is 85 mg/kg, based on CTDEEP comments (FW bullet 4). CTDEEP commented: "[The SIS] target EPC for nickel of 85 mg/kg may be acceptable based on an evaluation of the resultant concentrations remaining after remediation. Toxicity data indicates that levels higher than this did not result in toxicity to invertebrates. Also nickel is co-located with copper in sediments and would be removed due to high copper concentrations." It is NRG/APTIM's interpretation that the statement "based on an evaluation of the resultant concentrations remaining after remediation" refers to remediation of only certain areas within the wetlands, or hot spot removal. Since the proposed remediation involves removing all sediment, and backfilling with appropriate clean fill, an evaluation of concentrations remaining after remediation will not be necessary.

3.0 AOC 1 Saltwater Wetlands

3.1 Evaluation of Risk to Benthic Invertebrates from AOC 1 Saltwater Sediment

With regard to the saltwater sediment toxicity test results, CTDEEP disagreed with the assertion that a biologically significant impact occurs only when more than 20 percent of the population is affected (SW bullet 4). To clarify, the SIS does not refer to 20 percent of the population being affected, but rather states that toxicity test results are biologically significant only if an effect (i.e., difference) of 20 percent or greater is seen when comparing the site results with the reference site or with the laboratory control. Regardless, in this case, concern with biological significance is not relevant since the SIS did conclude that the sediment toxicity test results showed evidence of toxicity; therefore, wetland sediment concentrations may pose risk to benthic invertebrates. Results of the toxicity test were used in the estimation of TCCs in saltwater sediments (see Section

3.3). This recalculation moderately increases the benthic invertebrate TCC by using a 25 percent difference between the site results and the reference site or laboratory control as a biologically significant impact. Note that the toxicity test results may over estimate risk and do not prove actual site risks.

3.2 Evaluation of Risk to Wetland Vertebrate Wildlife from AOC 1 Saltwater Sediment

As stated in the SIS, ETPH, arsenic, cadmium, nickel, and selenium, as well as the metals with no screening values (barium, beryllium, thallium, and vanadium), are considered COPCs in saltwater wetland sediment. Chromium, copper, lead, mercury, silver, and zinc were eliminated as COPCs because their concentrations were less than background concentrations. CTDEEP commented (SW bullets 1 and 3) that copper and mercury should not be eliminated because they are below "questionable background concentrations", and they exceed ER-L and ER-M values in certain locations. NRG/APTIM is confident that the background location is appropriate as it is outside the influence of site related (and any specific known non-site related) contaminants, and there are no plans to sample an alternative background location. A revised groundwater model has been completed to determine plume flow direction, concentrations, and potential resulting impacts to wetlands. The results are not substantially different than the groundwater model presented in the preliminary Technical Impracticability (TI) Assessment for Groundwater dated November 20, 2012 (Shaw, 2012). The existing saltwater wetland background concentrations are valid for determining COPCs.

In response to CTDEEP comments (SW bullet 5), HQs based on NOAEL and LOAEL toxicity reference values were recalculated for the two representative invertivorous wildlife species (star-nosed mole and spotted sandpiper). Also in response to CTDEEP comments (SW bullet 6), two additional representative saltwater wildlife receptors, both piscivores (mink and belted kingfisher), were evaluated for potential food-chain model effects. This recalculation uses moderately aggressive LOAELs to calculate TCCs. The results are summarized in **Table D3**. ETPH could not be assessed for any receptor due to the lack of TRVs. Barium, beryllium, thallium, and vanadium were not assessed since these compounds are not bioaccumulative (EPA, 2000). As shown in **Table D3**, for the mole and the sandpiper, HQ_{NOAELs} are greater than 1 for arsenic, nickel, and selenium. For the mink, HQ_{NOAELs} are greater than 1 for arsenic and nickel. For the kingfisher, HQ_{NOAELs} are greater than 1 for arsenic and selenium. As stated in the SIS, use of NOAELs may overestimate effects since this measurement endpoint does not reflect any observed impacts; therefore, LOAEL-based HQs were calculated for those metals with HQ_{NOAELs} greater than 1. For the mole, HQ_{LOAELs} are greater than 1 for nickel (4.1) and selenium (5.5). For the sandpiper,

HQ_{LOAELs} are greater than 1 for selenium (2.4). For the mink and the kingfisher, HQ_{LOAELs} are all less than 1.

As discussed in the SIS, there is too much uncertainty with the selenium BSAF used in the food chain model to recommend further action specifically for selenium. Therefore, TCCs are not calculated for selenium.

Based on the above, there is a potential for risk to invertivorous mammals from exposure to nickel in sediments at Wetlands W5 and W6.

3.3 AOC 1 Saltwater Wetlands Estimated Target Cleanup Concentrations

Since there is a potential for risk to benthic invertebrates and to vertebrate wildlife receptors from exposure to arsenic and nickel, respectively, in sediments at Wetlands W5 and W6, estimated TCCs were calculated for arsenic and nickel.

Benthic Invertebrate Risk – As stated in the SIS, an analysis of sediment toxicity test results from all saltwater sediment samples tested, showed that concentrations of arsenic were well correlated with the toxicity test results; therefore, arsenic is considered the contaminant of concern for risk to benthic invertebrates. Using regression analysis, a site-specific risk-based estimated TCC for arsenic in saltwater sediments was calculated as 73 mg/kg.

Vertebrate Wildlife Risk - The wetland W5/W6 food chain models were back-calculated to estimate concentrations of nickel that would reduce risk to acceptable levels. CTDEEP commented (page 3, second bullet) that the distribution of contaminants in the wetlands and the concentrations left behind following remediation activities should be evaluated for arsenic, copper, nickel, vanadium, mercury, and selenium and the resultant effect on the HQ NOAEL. It is NRG/APTIM's interpretation that the statement "the distribution of contaminants in the wetlands and the concentrations left behind following remediation activities should be evaluated" refers to remediation of only certain areas within the wetlands, or hot spot removal. Since the proposed remediation involves removing all sediment, and backfilling with appropriate clean fill, an evaluation of concentrations remaining after remediation will not be necessary.

CTDEEP also commented (SW bullet 5) that the estimated TCCs presented in the SIS (Shaw, 2011) should be adjusted so that the resultant HQ_{LOAELs} are less than 1 and the HQ_{NOAELs} approach 1. The adjusted TCC calculations are detailed in **Table D4**, along with the selected estimated TCCs.

For nickel, the EPC would have to be reduced from 243.9 mg/kg to 59 mg/kg to result in a mole HQ_{LOAEL} less than 1. Thus, 59 mg/kg is the estimated TCC for nickel.

4.0 References

Shaw Environmental, Inc. (Shaw), 2011. *Sediment Information Submittal*, Norwalk Generating Station. August 26, 2011.

Shaw, 2012. *Preliminary Technical Impracticability Assessment for Groundwater*, Norwalk Power LLC, Norwalk Harbor Generating Station, Norwalk, Connecticut. November 20, 2012.

U.S. Environmental Protection Agency (EPA), 2000. *Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment: Status and Needs*, Bioaccumulation Analysis Workgroup, Washington, DC.

Table D1
Risk Characterization Summary
Hazard Quotients - Freshwater Wetland Vertebrate Wildlife
AOC 1 Wetlands W3 and W4
NRG Norwalk

COPC	Wetland W3 & W4 - 2009 & 2010 Combined - 95% UCL EPC				Wetland W3 & W4 Risk Conclusion**
	Star-Nose Mole		Carolina Wren		
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	
Inorganics					
Arsenic	2.1	0.4	2.3	1.1	low PR (wren)
Cadmium	0.1	*	0.1	*	NSR
Chromium	0.5	*	1.1	1.0	NSR
Copper	10	3.7	38	13	**PR**
Lead	0.3	*	1.6	0.8	NSR
Mercury	0.006	*	0.5	*	NSR
Methyl Mercury	0.3	*	4.6	0.5	NSR
Nickel	20	10	13	4.8	**PR**
Selenium	2.3	2.3	3.0	2.3	NSR
Zinc	0.5	*	1.5	0.6	NSR

Notes:
Individual Hazard Quotients greater than 1 are shaded.
* Not calculated because there was no risk shown from NOAEL-based HQs.
** Refer to text for a discussion of risk conclusions.
NSR = No Significant Risk
PR = Potential Risk
"--" = No Toxicity Reference Values available to calculate Hazard Quotient.

Table D2
Calculation of Ecological Risk-Based Target Cleanup Concentrations
AOC 1 Freshwater Wetlands W3 and W4 Sediment
Norwalk Harbor Generating Station
Norwalk, Connecticut

Estimated Food Compound Concentration:

$CONC_{prey}$ = EPC_{sed} applied to Sediment-to-Invertebrate Bioaccumulation Factor

$CONC_{plant}$ = EPC_{soil} applied to Plant Uptake Equations (see ERA Table L-1)

Exposure Estimates:

$$\text{Soil Compound Exposure (mgCOPC/kgBW/day)} = \frac{EPC_{soil} * FD_{soil} * FIR * AUF * ED}{BW}$$

$$\text{Invertebrate Prey Exposure (mgCOPC/kgBW/day)} = \frac{CONC_{prey} * FD_{prey} * FIR * AUF * ED}{BW}$$

$$\text{Plant Exposure (mgCOPC/kgBW/day)} = \frac{CONC_{plant} * FD_{plant} * FIR * AUF * ED}{BW}$$

$$\text{Surface Water Exposure (mgCOPC/kgBW/day)} = \frac{EPC_{water} * WIR * AUF * ED}{BW}$$

Total Potential Dietary Exposure

$$TPDE = \underset{\text{(mgCOPC/kgBW/day)}}{\text{Invertebrate Prey Exposure}} + \underset{\text{(mgCOPC/kgBW/day)}}{\text{Plant Exposure}} + \underset{\text{(mgCOPC/kgBW/day)}}{\text{Soil Exposure}} + \underset{\text{(mgCOPC/kgBW/day)}}{\text{Surface Water Exposure}}$$

Risk Equations:

HQ_{NOAEL} = TPDE / NOAEL

HQ_{LOAEL} = TPDE / LOAEL

Parameter		Description	Units	Value		Notes
$CONC_{prey}$	=	Invertebrate Prey Compound Concentration	mgCOPC/kg dry tissue	calculated		
$CONC_{plant}$	=	Plant Compound Concentration	mgCOPC/kg dry tissue	calculated		
EPC_{soil}	=	Soil exposure point concentration	mgCOPC/kg dry soil	see below		
EPC_{water}	=	Surface water exposure point concentration	mg/L	see below		
TPDE	=	Total Potential Dietary Exposure	mgCOPC/kgBW/day	calculated		
HQ	=	Hazard Quotient	unitless	calculated		
NOAEL	=	No Observed Adverse Effects Level	mgCOPC/kgBW/day	see below		
LOAEL	=	Lowest Observed Adverse Effects Level	mgCOPC/kgBW/day	see below		
Exposure Parameters				***Mole***	***Wren***	
$FD_{inverts}$	=	Fraction of diet as invertebrates	unitless	0.9	0.925	
FD_{plants}	=	Fraction of diet as plants	unitless	0.05	0.05	
FD_{sed}	=	Fraction of diet as sediment	unitless	0.05	0.025	
FIR	=	Food ingestion rate	kg/day-dry wt	0.0059	0.0046	
WIR	=	Water ingestion rate	L/day	0.0067	0.0039	
HR	=	Home range	acre	1	0.4	
EA	=	Exposure area	acre	0.83	0.83	
AUF	=	Area Use Factor (Exposure area/Home range)	unitless	0.83	1	Calculated (cannot be greater than 1)
ED	=	Exposure Duration	unitless	1	1	
BW	=	Body weight	kg	0.05	0.0176	

Table D2
Calculation of Ecological Risk-Based Target Cleanup Concentrations
AOC 1 Freshwater Wetlands W3 and W4 Sediment
Norwalk Harbor Generating Station
Norwalk, Connecticut

STAR-NOSED MOLE

Chemical	EPC_{soil}	Invertebrate Prey Compound Concentration (mgCOPC/kg dry tissue)	Plant Compound Concentration (mgCOPC/kg dry tissue)	Sed Compound Exposure (mgCOPC/kgBW/day)	Surface Water Exposure (mgCOPC/kgBW/day)	Invertebrate Prey Exposure (mgCOPC/kgBW/day)	Plant Exposure (mgCOPC/kgBW/day)	TPDE (mgCOPC/kgBW/day)	Mammalian TRV (NOAEL)	HQ_{NOAEL}	Mammalian TRV (LOAEL)	HQ_{LOAEL}
Metals												
Copper	105	163	36.5	0.51	0.0007	14.2	0.18	14.9	5.6	2.66	15.14	0.99
Nickel	71	34.5	2.6	0.34	0.001	3.0	0.01	3.4	1.7	1.98	3.4	0.99

CAROLINA WREN

Chemical	EPC_{soil}	Invertebrate Prey Compound Concentration (mgCOPC/kg dry tissue)	Plant Compound Concentration (mgCOPC/kg dry tissue)	Sed Compound Exposure (mgCOPC/kgBW/day)	Surface Water Exposure (mgCOPC/kgBW/day)	Invertebrate Prey Exposure (mgCOPC/kgBW/day)	Plant Exposure (mgCOPC/kgBW/day)	TPDE (mgCOPC/kgBW/day)	Avian TRV (NOAEL)	HQ_{NOAEL}	Avian TRV (LOAEL)	HQ_{LOAEL}
Metals												
Arsenic	107	15.3	3.87	0.70	0.0007	3.70	0.05	4.45	2.24	1.99	4.51	0.99
Copper	31	48.2	10.77	0.20	0.001	11.7	0.14	12.0	4.05	2.96	12.1	0.99
Nickel	148	71.9	4.5	0.97	0.003	17.4	0.06	18.4	6.71	2.74	18.6	0.99

Notes:
HQs > 1 are shaded.

Summary of Selected Estimated Target Concentrations for Wetlands W3 & W4

COC	Current EPC	Benthic Invertebrate Est. Target Conc.	EPC needed to reduce HQ_{LOAEL} to < 1.0		Selected Estimated Target Conc.
			Mole	Wren	
Arsenic	123.9	NA	NA	107	**107**
Copper	393.1	NA	105	31	**31**
Nickel	716.2	NA	71	148	**85***

Note: All concentrations are in mg/kg.

* Based on CTDEEP Freshwater Wetland comment, bullet 4, of January 15, 2014 letter. See text Section 2.3 for details.

Table D3
Risk Characterization Summary
Hazard Quotients - Saltwater Wetland Vertebrate Wildlife
AOC 1 Wetlands W5 and W6
NRG Norwalk

Analyte	2009 & 2010 Combined 95% UCL EPC								Risk Conclusion**
	Star-Nose Mole		Spotted Sandpiper		Mink		Belted Kingfisher		
	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	NOAEL HQ	LOAEL HQ	
Inorganics									
Arsenic	2.7	0.5	2.0	1.0	1.5	0.3	1.8	0.9	NSR
Cadmium	0.2	*	0.1	*	0.1	*	0.2	*	NSR
Nickel	8.2	4.1	2.4	0.9	1.5	0.7	0.9	*	PR (mole)
Selenium	5.6	5.5	3.0	2.4	0.97	*	1.2	0.96	PRSU

Notes:
Individual Hazard Quotients greater than 1 are shaded.
* Not calculated because there was no risk shown from NOAEL-based HQs.
** Refer to text for a discussion of risk conclusions.
NSR = No Significant Risk
PR = Potential Risk
PRSU = Potential Risk with Significant Uncertainty
"--" = No Toxicity Reference Values available to calculate Hazard Quotient.

Table D4
Calculation of Ecological Risk-Based Target Cleanup Concentrations
AOC 1 Saltwater Wetlands W5 and W6 Sediment
Norwalk Harbor Generating Station
Norwalk, Connecticut

Estimated Food Compound Concentration:

$CONC_{prey}$ = EPC_{sed} applied to Sediment-to-Invertebrate Bioaccumulation Factor

$CONC_{plant}$ = EPC_{soil} applied to Plant Uptake Equations (see ERA Table L-1)

Exposure Estimates:

Soil Compound Exposure (mgCOPC/kgBW/day) = $\frac{EPC_{soil} * FD_{soil} * FIR * AUF * ED}{BW}$

Invertebrate Prey Exposure (mgCOPC/kgBW/day) = $\frac{CONC_{prey} * FD_{prey} * FIR * AUF * ED}{BW}$

Plant Exposure (mgCOPC/kgBW/day) = $\frac{CONC_{plant} * FD_{plant} * FIR * AUF * ED}{BW}$

Surface Water Exposure (mgCOPC/kgBW/day) = $\frac{EPC_{water} * WIR * AUF * ED}{BW}$

Total Potential Dietary Exposure

TPDE = Invertebrate Prey Exposure (mgCOPC/kgBW/day) + Plant Exposure (mgCOPC/kgBW/day) + Soil Exposure (mgCOPC/kgBW/day) + Surface Water Exposure (mgCOPC/kgBW/day)

Risk Equations:

HQ_{NOAEL} = TPDE / NOAEL

HQ_{LOAEL} = TPDE / LOAEL

Parameter		Description	Units	Value				Notes
$CONC_{prey}$	=	Invertebrate Prey Compound Concentration	mgCOPC/kg dry tissue		calculated			
$CONC_{plant}$	=	Plant Compound Concentration	mgCOPC/kg dry tissue		calculated			
EPC_{soil}	=	Soil exposure point concentration	mgCOPC/kg dry soil		see below			
EPC_{water}	=	Surface water exposure point concentration	mg/L		see below			
TPDE	=	Total Potential Dietary Exposure	mgCOPC/kgBW/day		calculated			
HQ	=	Hazard Quotient	unitless		calculated			
NOAEL	=	No Observed Adverse Effects Level	mgCOPC/kgBW/day		see below			
LOAEL	=	Lowest Observed Adverse Effects Level	mgCOPC/kgBW/day		see below			
Exposure Parameters				***Mole***	***Sandpiper***	***Mink***	***Kingfisher***	
FD_{fish}	=	Fraction of diet as fish	unitless	0	0	0.957	0.95	
$FD_{inverts}$	=	Fraction of diet as invertebrates	unitless	0.9	0.82	0	0	
FD_{plants}	=	Fraction of diet as plants	unitless	0.05	0	0	0	
FD_{sed}	=	Fraction of diet as sediment	unitless	0.05	0.18	0.043	0.05	
FIR	=	Food ingestion rate	kg/day-dry wt	0.0059	0.0069	0.07	0.0163	
WIR	=	Water ingestion rate	L/day	0.0067	0.0071	0.08	0.017	
HR	=	Home range	acre	1	0.6	19.3	8.8	
EA	=	Exposure area	acre	>1	>1	4	4	
AUF	=	Area Use Factor (Exposure area/Home range)	unitless	1	1	0.21	0.45	Calculated (cannot be greater than 1)
ED	=	Exposure Duration	unitless	1	0.7	1	1	
BW	=	Body weight	kg	0.05	0.0425	0.782	0.158	

Table D4
Calculation of Ecological Risk-Based Target Cleanup Concentrations
AOC 1 Saltwater Wetlands W5 and W6 Sediment
Norwalk Harbor Generating Station
Norwalk, Connecticut

STAR-NOSED MOLE

Chemical	EPC_{sed}	Invertebrate Prey Compound Concentration (mgCOPC/kg dry tissue)	Plant Compound Concentration (mgCOPC/kg dry tissue)	Sed Compound Exposure (mgCOPC/kgBW/day)	Surface Water Exposure (mgCOPC/kgBW/day)	Invertebrate Prey Exposure (mgCOPC/kgBW/day)	Plant Exposure (mgCOPC/kgBW/day)	TPDE (mgCOPC/kgBW/day)	Mammalian TRV (NOAEL)	HQ_{NOAEL}	Mammalian TRV (LOAEL)	HQ_{LOAEL}
Metals												
Nickel	59	28.7	2.3	0.35	0.001	3.02	0.01	3.38	1.7	1.99	3.40	0.99

Notes:

HQs > 1 are shaded.

Summary of Selected Estimated Target Concentrations for Wetlands W5 & W6

COC	Current EPC	Benthic Invertebrate Est. Target Conc.	EPC needed to reduce HQ_{LOAEL} to < 1.0				Saltwater Sediment Background	Selected Estimated Target Conc.
			Mole	Sandpiper	Mink	Kingfisher		
Arsenic	133.3	73	NA	NA	NA	NA	10.1	**73**
Nickel	243.9	NA	59	NA	NA	NA	30.4	**59**

Note: All concentrations are in mg/kg.

APPENDIX E

PHOTOGRAPHS OF WETLANDS

APPENDIX E
Photographs of Wetlands

Client: NRG – Norwalk Power LLC **Project Number:** 631003718

Site Name: Norwalk Harbor Generating Station **Site Location:** South Norwalk, CT

Photographer: CB&I

Date: April 2007

Photograph: Photo 1

Direction: Northwest

Comments: Wetland W-3.



Photographer: APTIM

Date: August 2016

Photograph: Photo 2

Direction: East

Comments: Sampling point SP-4 within the western part of Wetland W-3.



APPENDIX E
Photographs of Wetlands

Client: NRG – Norwalk Power LLC **Project Number:** 631003718

Site Name: Norwalk Harbor Generating Station **Site Location:** South Norwalk, CT

Photographer: CB&I

Date: April 2007

Photograph: Photo 3

Direction: Northwest

Comments: Wetland W-4.



Photographer: APTIM

Date: August 2016

Photograph: Photo 4

Direction: South

Comments: Sampling point SP-6 within the northern part of Wetland W-4.



APPENDIX E
Photographs of Wetlands

Client: NRG – Norwalk Power LLC **Project Number:** 631003718

Site Name: Norwalk Harbor Generating Station **Site Location:** South Norwalk, CT

Photographer: CB&I **Date:** April 2007 **Photograph:** Photo 5 **Direction:** Southeast **Comments:** Wetland W-5.	
Photographer: APTIM **Date:** August 2016 **Photograph:** Photo 6 **Direction:** Southeast **Comments:** Wetland W-5.	

APPENDIX E
Photographs of Wetlands

Client: NRG – Norwalk Power LLC **Project Number:** 631003718

Site Name: Norwalk Harbor Generating Station **Site Location:** South Norwalk, CT

Photographer: CB&I

Date: April 2007

Photograph: Photo 7

Direction: North

Comments: Wetland W-6.



Photographer: CB&I

Date: November 2009

Photograph: Photo 8

Direction: West

Comments: Wetland W-6.



APPENDIX E
Photographs of Wetlands

Client: NRG – Norwalk Power LLC **Project Number:** 631003718

Site Name: Norwalk Harbor Generating Station **Site Location:** South Norwalk, CT

Photographer: CB&I **Date:** November 2009 **Photograph:** Photo 9 **Direction:** Northwest **Comments:** Wetland W-6.	
Photographer: CB&I **Date:** November 2009 **Photograph:** Photo 10 **Direction:** North **Comments:** Wetland W-6.	

APPENDIX F

EVALUATION OF SEDIMENT REMEDIAL ALTERNATIVES

Appendix F

Evaluation of SWW Sediment Remedial Action Alternatives
Norwalk Generating Station, Norwalk, CT

Evaluation Criteria	Alternative 1 Monitored Natural Recovery	Alternative 2 Dry Excavation of One Foot, Backfill, Off-Site Disposal, and Wetlands Restoration	Alternative 3 Wet Excavation and Dredging of One Foot, Backfill, Off-Site Disposal, and Wetlands Restoration
A. Effectiveness (Score 1-5)			
1) Ability to reduce ecological risk to acceptable levels	• This alternative has a low chance of success in eliminating ecological risk and a moderate chance of success in reducing ecological risk in impacted sediment over a long time frame.	• This alternative has a high probability of success in eliminating ecological risk by executing excavations in the dry. Open water portion of Wetland W-6 will be the only areas that will require dewatering for access. No shoring will be used.	• This alternative has a high probability of success in eliminating ecological risk by executing excavations without any dewatering (for access). Open water portion of Wetland W-6 will be dredged.
2) Ability to remove, destroy, treat, or detoxify hazardous material	• Does not remove impacted sediment.	• Removes impacted sediment in the biologically active zone.	• Removes impacted sediment in the biologically active zone.
3) Type and quantity of treatment residual	• No treatment. Hazardous material quantities in sediment are expected to be slowly reduced over a long time frame.	• No treatment. No residual hazardous material will remain in sediment.	• No treatment. No residual hazardous material will remain in sediment.
4) Relative risk associated with residual hazardous materials	• Moderate risk associated with residual COCs in sediment.	• None	• None
Effectiveness Rating	**1**	**5**	**5**
B. Reliability (Permanence) (Score 1-3)			
1) Likelihood that technology will meet process efficiencies or performance specifications	• Moderate likelihood	• High likelihood	• High likelihood
2) Magnitude of residual risk	• Moderate magnitude of residual risk	• Low magnitude of residual risk. Reasonable probability that backfill sediment will become impacted from concentrations of metals in groundwater, but levels will be significantly below TCCs.	• Low magnitude of residual risk. Reasonable probability that backfill sediment will become impacted from concentrations of metals in groundwater, but levels will be significantly below TCCs.
3) Type and degree of long-term management or monitoring	• Groundwater and surface water monitoring will be required to confirm stability of concentrations. Limited sediment sampling will be conducted at 5-year intervals.	• Limited groundwater and surface water monitoring will be required to confirm stability of concentrations.	• Limited groundwater and surface water monitoring will be required to confirm stability of concentrations.
Reliability Rating	**1**	**3**	**3**

Appendix F

Evaluation of Sediment Remedial Action Alternatives
Norwalk Generating Station, Norwalk, CT

Evaluation Criteria	Alternative 1 Monitored Natural Recovery	Alternative 2 Dry Excavation of One Foot, Off-Site Disposal, and Wetlands Restoration	Alternative 3 Wet Excavation and Dredging of One Foot, Off-Site Disposal, and Wetlands Restoration
C. Difficulty (Implementability) (Score 1-3)			
1) Technical complexity	• Implementation involves little complexity.	• Implementation involves high complexity to dewater and excavate Wetland W-6 using temporary network of 10 pumping wells. • Approximately 15 million gallons of water will be generated from dewatering Wetland W-6 requiring management. • Water filtration will be required prior to discharge for wetland and sediment dewatering. • Low complexity for performing excavation in Wetlands W-3, W-4, and W-5.	• Implementation involves moderate complexity to complete excavation and dredging in the wet. • Approximately 1.5 million gallons of water will be generated from hydraulic dredging requiring management using Geotubes. • Implementation involves coordination of two crews for specialized sediment removal (dredging and excavation). • Water filtration will be required prior to discharge for hydraulic dredging and sediment dewatering.
2) Integration with facility operations	• No existing facility operations.	• No existing facility operations.	• No existing facility operations.
3) Site access requirements/ limitations	• Site access for monitoring required, but no limitations anticipated.	• Site access for implementation and monitoring required, but no limitations anticipated.	• Site access for implementation and monitoring required, but no limitations anticipated.
4) Availability of services, materials, equipment or specialists.	• The services for implementation are readily available.	• The services and equipment for implementation are readily available.	• The services and equipment for implementation are readily available.
5) Availability, capacity and location of off-site treatment, storage, and disposal facilities	• No off-site treatment needed.	• Facilities are readily available for handling waste material.	• Facilities are readily available for handling waste material.
6) Permits	• Limited permitting required.	• Significant natural resource permitting required.	• Significant natural resource permitting required.
Difficulty Rating	**3**	**1**	**2**
D. Cost (Score 1-3)			
1) Estimated Cost of Implementation	• Initial Investment: $1,000 • Present Worth Monitoring (20 years): $73,600 • Total Present Worth: $74,600	• Initial Investment: $3,850,000 • Present Worth Monitoring (20 years): $149,000 • Total Present Worth: $3,811,000	• Initial Investment: $3,660,000 • Present Worth Monitoring (20 years): $149,000 • Total Present Worth: $3,993,000
2) OM&M	• Annual GW and SW monitoring • Sediment monitoring once every 5 years	• Wetland restoration monitoring and invasives management in first 5 years • Annual GW and SW monitoring	• Wetland restoration monitoring and invasives management in first 5 years • Annual GW and SW monitoring
3) Cost of Continuing Energy Consumption	• $< 200/year (fuel)	• $< 100/year (fuel)	• $< 100/year (fuel)
Cost Rating	**3**	**1**	**2**

Appendix F

Evaluation of Sediment Remedial Action Alternatives
Norwalk Generating Station, Norwalk, CT

Evaluation Criteria	Alternative 1 Monitored Natural Recovery	Alternative 2 Dry Excavation of One Foot, Off-Site Disposal, and Wetlands Restoration	Alternative 3 Wet Excavation and Dredging of One Foot, Off-Site Disposal, and Wetlands Restoration
E. Risk of Implementation (Score 1-3)			
1) Relative risk to the community	• None	• Moderate risk from transportation and disposal of impacted sediment.	• Moderate risk from transportation and disposal of impacted sediment.
2) Relative risk to workers	• Minor risk during implementation minimized through worker training.	• Moderate risk during implementation minimized through worker training.	• Moderate risk during implementation minimized through worker training.
3) Measures needed to mitigate environmental impacts	• None required.	• Extensive silt and run off controls needed during implementation, continuing controls not required. • Significant water management measures required for Wetland W6.	• Extensive silt and run off controls needed during implementation, continuing controls not required. • Limited water management at removal area where hydraulic dredging performed.
Risk Rating	**3**	**1**	**2**
F. Timeliness (Score 1-3)			
1) Time to achieve remedial objective	• Extended treatment time (> 20 years).	• Rapid time frame (1 year).	• Rapid time frame (1 year); potential for two crews to operate at same time.
Timeliness Rating	**1**	**3**	**3**
G. Green Benefits (Score 1-3)			
1) Minimizes energy use or uses renewable energy	• No energy use.	• Most energy use (fuel consumption during implementation) particularly for operating pumps and water filtration system.	• Moderate energy use (fuel consumption during implementation).
2) Minimizes air pollution or greenhouse gas emissions	• No air pollution.	• Most air pollution (heavy equipment during implementation and generators).	• Moderate air pollution (heavy equipment during implementation).
3) Reduce, reuse and recycle waste	• Option does not generate waste.	• Option will generate a significant volume of waste for off-site disposal including sediment and staging area materials.	• Option will generate a significant volume of waste for off-site disposal including sediment and staging area materials.
4) Protects land and ecosystem.	• Noninvasive. Most protective of current wetland community and habitat (remains intact); provides least protection in the long-term.	• Includes a temporary destruction of wetland community and habitat; provides reasonable protection when community becomes re-established.	• Includes a temporary destruction of wetland community and habitat; provides reasonable protection when community becomes re-established.
5) Protects wetland functions and values.	• Most protective of current well-functioning and valuable wetlands.	• Least protective of current well-functioning and valuable wetlands. Designed to restore existing wetland functions and values over time.	• Least protective of current well-functioning and valuable wetlands. Designed to restore existing wetland functions and values over time.
Green Benefits Rating	**3**	**1**	**2**

Alternative #	Alternative Description	A	B	C	D	E	F	G	Score	Overall Ranking
1	Monitored Natural Recovery	1	1	3	3	3	1	3	15	2
2	Dry Excavation of One Foot, Off-Site Disposal, and Wetlands Restoration	5	3	1	1	1	3	1	15	2
3	Wet Excavation and Dredging of One Foot, Off-Site Disposal, and Wetlands Restoration	5	3	2	2	2	3	2	19	1

Notes:

A. Effectiveness (E)
- 1 = Not widely used and probably not effective
- 2 = Widely used but probably not effective, or not widely used and may not be effective
- 3 = Widely used but may not be effective, or not widely used but probably effective
- 4 = Widely used and probably effective, or not widely used but proven and effective
- 5 = Widely used, proven, and effective

B Reliability (R1) (permanence)
- 1 = Low reliability/permanence and/or high maintenance
- 2 = Average reliability/permanence and/or average maintenance
- 3 = High reliability/permanence and/or low maintenance

C Difficulty (D) (comparative technical complexity, permitting, and disruptions to current operations)
- 1 = Most difficult to implement
- 2 = Moderate difficulty to implement
- 3 = Easiest to implement

D Cost (C)
- 1 = Highest relative cost compared to other alternatives
- 2 = Greater than lowest cost, but less than the highest cost
- 3 = Lowest relative cost compared to other alternatives

E Risk (R2) (relative risk associated with implementation)
- 1 = Highest risks associated with implementation
- 2 = Moderate risk associated with implementation
- 3 = Lowest risk associated with implementation

F Time (T) (comparative timeliness to eliminate uncontrolled sources and achieve a level of No Significant Risk)
- 1 = Extended treatment time
- 2 = Acceptable treatment time
- 3 = Rapid treatment

G Green Benefits (B)
- 1 = Least beneficial compared to other alternatives
- 2 = Moderate benefit compared to other alternatives
- 3 = Most beneficial compared to other alternatives

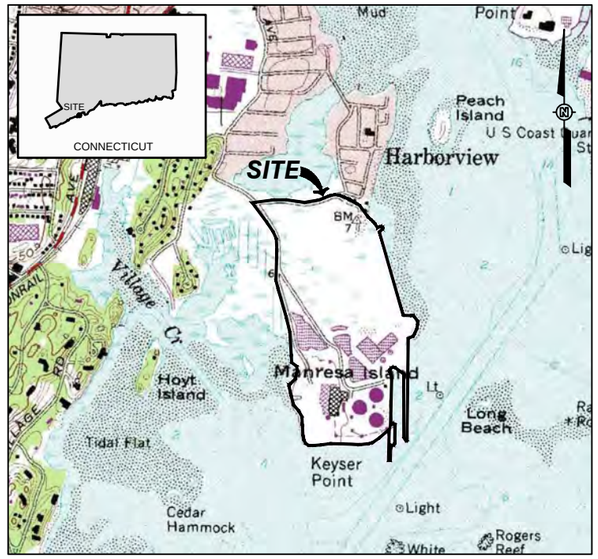
Score = E + R1 + D + C + R2 + T + B; Possible scores are 7 to 23.

APPENDIX G

DESIGN DRAWINGS

OFFICE Pittsburgh, PA

DRAWING NUMBER 1009654016-T1



SITE LOCATION MAP

SCALE

0 2000 4000 FEET

INDEX OF DRAWINGS

APTIM DRAWING NUMBER	SHEET REFERENCE NUMBER	DESCRIPTION
1009654016-T1	T-1	TITLE SHEET
1009654016-B6	C-2	INDEX PLAN
1009654016-B7	C-3	W-3/W-4 CONSTRUCTION PLAN
1009654016-B8	C-4	W-5/W-6 CONSTRUCTION PLAN
1009654016-B9	C-5	POTENTIAL STAGING AREA LAYOUT
1009654016-B10	C-6	SECTIONS A AND B
1009654016-B11	C-7	SECTIONS C AND D
1009654016-B12	C-8	DETAILS
1009654016-B13	W-1	W-3/W-4 RESTORATION PLAN
1009654016-B14	W-2	W-5/W-6 RESTORATION PLAN
1009654016-B15	C-9	PLANTING AND SITE RESTORATION



SITE VICINITY MAP

SCALE

0 15 30 MILES

VERIFY SCALE 0 1"

REMEDIAL ACTION PLAN FOR WETLAND SEDIMENTS

NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

PREPARED FOR

NORWALK POWER LLC
MANRESA ISLAND AVENUE
SOUTH NORWALK, CONNECTICUT

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM

150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg

Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

TITLE SHEET

NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14
SCALE: AS SHOWN
DRAWING NO. 1009654016-T1
SHEET NO. T-1

OFFICE
Pittsburgh, PA

DRAWING NUMBER 1009654016-B6

LONG ISLAND SOUND

LEGEND:

- W–1 — WETLAND AREA IDENTIFICATION
- ——X—— EXISTING FENCE LINE
- — — — DELINEATED WETLANDS AREA
- SEDIMENT EXTENT LINE AND SEDIMENT REMEDIATION AREA
- ——E—— APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- APPROXIMATE SHORELINE LOCATION
- 100 YEAR FLOOD BOUNDARY, FIRM MAP, FAIRFIELD, COUNTY, CONNECTICUT, PANEL 533 OF 626, MAP NUMBER 09001C05336,MAP REVISED JULY 8, 2013. (MAJORITY OF THE SITE IS WITHIN THE FLOOD ZONE AND THE AREAS OUTLINED ARE OUTSIDE THE FLOOD ZONE)
- ⊗ OSPREY NESTING PLATFORM

NOTE:

ORIGINAL WETLAND DELINEATION PERFORMED IN 2007 AND REVISED FOR WETLANDS W–3, W–4, AND W–5 IN AUGUST 2016.

STAGING AREA (SEE SHEET C–5)

WETLAND W–3/W–4 (SEE SHEET C–3)

FRESHWATER WETLANDS (W–3, W–4, AND NORTHERN W–5) NOT IN STATE JURISDICTION

TIDAL WETLANDS (SOUTHERN W–5 AND W–6) IN STATE JURISDICTION

WETLAND W–5/W–6 (SEE SHEET C–4)

TIDAL INLET

TIDAL WETLAND AREA

W–3 W–4 W–5 W–6

POLISHING BASIN

FORMER EQUALIZATION BASIN #2 (CAPPED)

EQUALIZATION BASINS

#2 FUEL OIL AST's

FORMER UST's

RIP–RAP

MANRESA AVENUE

WOODWARD AVENUE

SCALE 0 300 600 FEET

VERIFY SCALE 0 1"

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: *A. Steele*
DRAWN BY: *G. Jones*
CHECKED BY: *A. Steele*
APPROVED BY: *A. Walker*

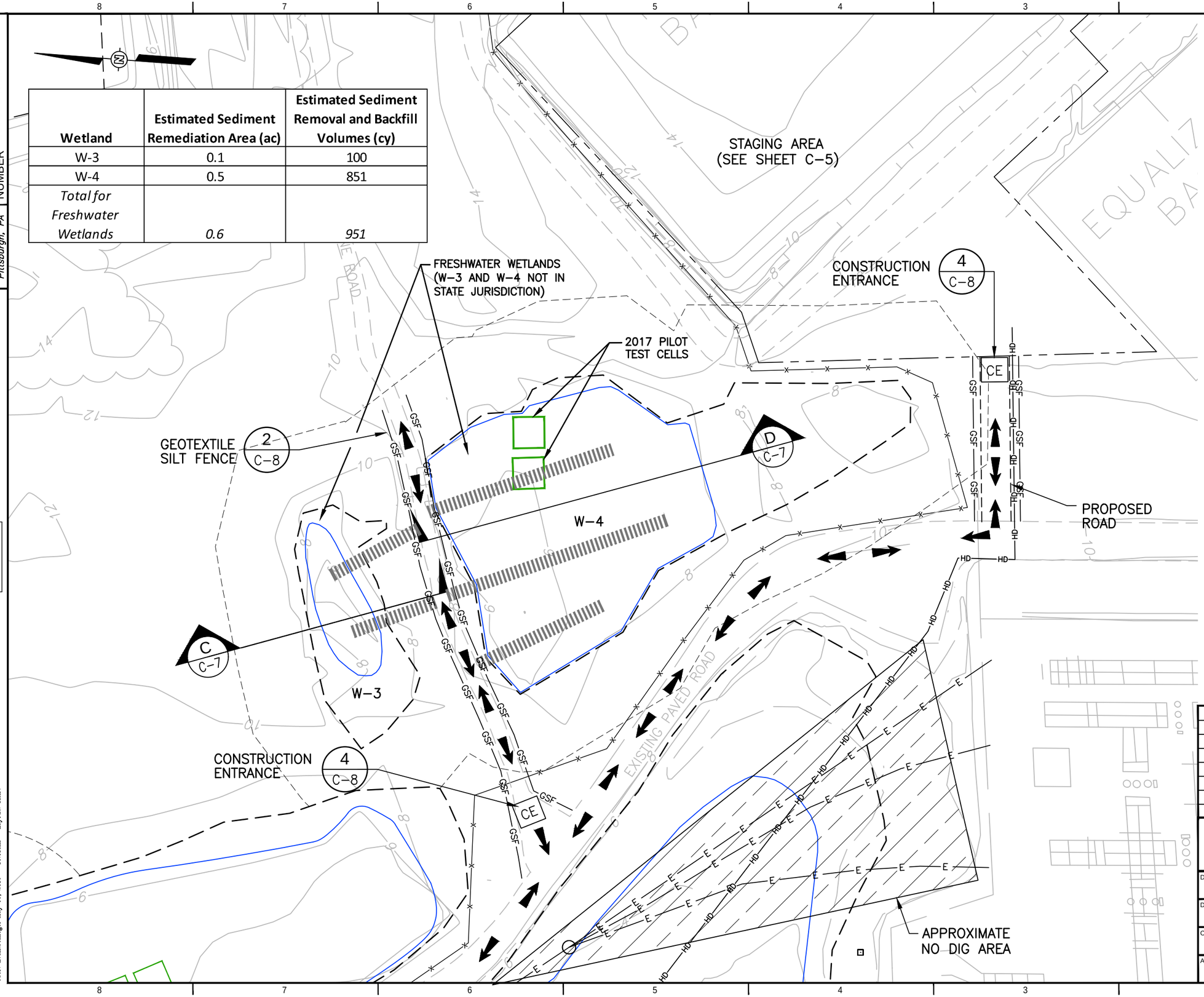
nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

INDEX PLAN
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14 | SCALE: AS SHOWN | DRAWING NO. 1009654016–B6 | SHEET NO. C-2

File: C:\Shaw Offices – CAD Files\Stoughton, MA\NRG\Norwalk\631003718_Wetland Sed_RAP\1009654016–B6_R3.dwg
User: Evan.Schlegel Apr 29, 2019 – 9:34am Layout: 11 x 8.5

Wetland	Estimated Sediment Remediation Area (ac)	Estimated Sediment Removal and Backfill Volumes (cy)
W-3	0.1	100
W-4	0.5	851
Total for Freshwater Wetlands	*0.6*	*951*



LEGEND:

- W-1 — WETLAND AREA IDENTIFICATION
- EXISTING FENCE LINE
- DELINEATED WETLANDS AREA
- NIWA UPLAND REVIEW BOUNDARY
- SEDIMENT EXTENT LINE AND SEDIMENT REMEDIATION AREA
- E — APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- 10 — EXISTING GROUND SURFACE, 2' CONTOUR INTERVAL (NGVD 1929)
- CONSTRUCTION VEHICLE ROUTE
- POTENTIAL TEMPORARY ACCESS ROAD LOCATION (LOW GROUND PRESSURE MAT) (SEE NOTE 1)
- HD — HYDRAULIC DREDGING SLURRY PIPE ROUTE OPTION

CONTRACTOR SEQUENCE:

1. MARK LIMITS OF SEDIMENT REMOVAL AND VERIFY WITH NRG REPRESENTATIVE. DETERMINE IF PILOT TEST CELLS WILL BE INCLUDED IN REMOVAL OR EXCLUDED/WORKED AROUND.
2. REMOVE TOP ONE FOOT OF SEDIMENT (MATERIAL) FOLLOWING EXISTING SURFACE CONTOURS IN SEDIMENT REMEDIATION AREAS.
3. STOCKPILE MATERIAL AS NEEDED FOR DEWATERING WITHIN REMEDIATION AREA.
4. TRANSFER MATERIAL TO STAGING AREA FOR FINAL DEWATERING, CHARACTERIZATION, AND T&D.
5. COMPLETE OTHER MISCELLANEOUS ITEMS AS PER SPECIFICATIONS.

NOTE:

1. POTENTIAL TEMPORARY ACCESS ROAD LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE AND SUBJECT TO CHANGE IN NUMBER, LOCATION, AND LAYOUT.

SCALE
0 60 120 FEET

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	EVERSOURCE ELECTRIC LINE UPDATED	4/15/15	PF
4	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele	Norwalk Power LLC Manresa Island Avenue South Norwalk, Connecticut
DRAWN BY: G. Jones	W-3/W-4 CONSTRUCTION PLAN
CHECKED BY: A. Steele	NORWALK HARBOR GENERATING STATION SOUTH NORWALK, CONNECTICUT

APPROVED BY:	DATE:	SCALE:	DRAWING NO.	SHEET NO.
A. Walker	7/30/14	AS SHOWN	1009654016-B7	C-3

OFFICE Pittsburgh, PA
DRAWING NUMBER 1009654016-B7

0 VERIFY SCALE 1"

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User: Evan.Schlegel May 09, 2019 - 10:01am Layout: 11X17

Wetland	Estimated Sediment Remediation Area (ac)	Estimated Sediment Removal and Backfill Volumes (cy)
W-5	0.9	1,433
W-6 (vegetated)	1.5	2,345
W-6 (open water)	0.8	1,348
Total for Tidal Wetlands	*3.2*	*5,126*

W-5 – SOUTH TIDAL WETLANDS (IN STATE JURISDICTION)

W-5 – NORTH FRESHWATER WETLANDS (NOT IN STATE JURISDICTION)

W-6 TIDAL WETLANDS (IN STATE JURISDICTION)

SEDIMENT EXTENT LINE IS COINCIDENT WITH HTL FOR WETLAND W-5 AND THE NORTHERN PORTION OF THE SEDIMENT EXTENT LINE IS APPROXIMATELY COINCIDENT WITH THE TWL (SEE NOTE 3)

HTL

2017 PILOT TEST CELLS

APPROXIMATE NO DIG AREA

CULVERT

APPROXIMATE THERMO COUPLE LOCATION

7 / C-8 CHANNEL CUT

HISTORIC LIMIT OF OPEN WATER

B / C-6

A / C-6

EXISTING PAVED ROAD

MANRESA AVENUE

CULVERT

TIDAL INLET

SALTWATER WETLAND AREA

SCALE 0 100 200 FEET

LEGEND:

- W-4 — WETLAND AREA IDENTIFICATION
- EXISTING FENCE LINE
- DELINEATED WETLANDS AREA
- NIWA UPLAND REVIEW BOUNDARY
- SEDIMENT EXTENT LINE AND SEDIMENT REMEDIATION AREA
- E — APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- 10 — EXISTING GROUND SURFACE, 2' CONTOUR INTERVAL (NGVD 1929)
- CONSTRUCTION VEHICLE ROUTE
- POTENTIAL TEMPORARY ACCESS ROAD LOCATION (LOW GROUND PRESSURE MAT) SEE NOTE 5
- APPROXIMATE SHORELINE LOCATION
- HIGH TIDE LINE ELEVATION (6.3' NGVD 1929) SEE NOTE 2
- HD — HYDRAULIC DREDGING SLURRY PIPE ROUTE OPTION

NOTES:

1. SURVEY DATA WAS LIMITED SUCH THAT THE ENTIRETY OF HTL (6.3) IN WETLAND W-6, MHW (4.4') AND MLW (2.9') CAN NOT BE ACCURATELY DEPICTED.
2. COASTAL JURISDICTION LIMIT (CJL) IS CTDEEP OLISP CALCULATED ELEVATION FOR THE LONG ISLAND SOUND IN NORWALK REFERENCED TO NAVD88 (ELEV. 5.4') AND IS ROUGHLY COINCIDENT WITH THE DEPICTED HIGH TIDE LINE (HTL). AS PER THE ORTHOMETRIC HEIGHT CONVERSION CALCULATOR PROVIDED BY NOAA (VERTCON), NAVD88 IS APPROXIMATELY 1.099 FEET LOWER THAN NGVD29 IN THE PROJECT AREA.
3. THE TRANSITION FROM THE NORTHERN FRESHWATER HABITAT TO THE SOUTHERN TIDAL HABITAT OF WETLAND W-5 IS ASSUMED TO BE COINCIDENT WITH THE HTL AND THE OBSERVED TREE LINE. THIS IS ALSO CONSISTENT WITH A TIDAL WETLANDS LIMIT (TWL) ELEVATION OF APPROXIMATELY 5.6 FT NAVD88 DETERMINED USING THE 1 YEAR FREQUENCY TIDAL FLOOD ELEVATION OF APPROXIMATELY 5.7 FT NGVD (USACE, SEPTEMBER 1988) PLUS 1 FT AND LESS 1.099 FT CONVERSION FROM NGVD TO NAVD88.
4. THE UNDERGROUND ELECTRIC LINES ARE SHOWN BASED ON A MEETING BETWEEN NRG, EVERSOURCE, AND CB&I ON APRIL 3, 2015, PREVIOUS FIELD MARK OUT BY EVERSOURCE, AND SUBSEQUENT DISCUSSION.
5. POTENTIAL TEMPORARY ACCESS ROAD LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE AND SUBJECT TO CHANGE IN NUMBER, LOCATION, AND LAYOUT.

CONTRACTOR SEQUENCE:

1. VERIFY ELECTRIC CABLE LOCATION WITH EVERSOURCE AND UTILITY MARK OUT.
2. EXCAVATE TEST PITS ABOVE ELECTRIC CABLE SUFFICIENT TO LOCATE THERMAL SAND BACKFILL.
3. MARK OUT "NO DIG AREA" AND CONFIRM WITH NRG AND EVERSOURCE REPRESENTATIVES.
4. EAST EDGE OF SEDIMENT REMOVAL SHALL BE NO CLOSER THAN WEST EDGE OF THERMAL SAND BACKFILL OR A MINIMUM OF 2 FEET OFF WEST CABLE.
5. MARK LIMITS OF SEDIMENT REMOVAL AND VERIFY WITH NRG REPRESENTATIVE. DETERMINE IF PILOT TEST CELLS WILL BE INCLUDED IN REMOVAL OR EXCLUDED/WORKED AROUND.
6. EQUIPMENT CROSSING OR WORKING ABOVE ELECTRIC CABLES SHALL HAVE LESS THAN 7 PSI GROUND PRESSURE OR WORK ON EQUIVALENT LOW PRESSURE MATS.
7. REMOVE TOP ONE FOOT OF SEDIMENT (MATERIAL) FOLLOWING EXISTING SURFACE CONTOURS IN SEDIMENT REMEDIATION AREAS.
8. STOCKPILE MATERIAL AS NEEDED FOR DEWATERING WITHIN REMEDIATION AREA, (NOT APPLICABLE FOR DREDGE AREA).
9. TRANSFER MATERIAL TO STAGING AREA FOR FINAL DEWATERING, CHARACTERIZATION, AND T&D.
10. COMPLETE OTHER MISCELLANEOUS ITEMS AS PER SPECIFICATIONS.

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	EVERSOURCE ELECTRIC LINE UPDATED	4/15/15	PF
4	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele	Norwalk Power LLC Manresa Island Avenue South Norwalk, Connecticut
DRAWN BY: G. Jones	W-5/W-6 CONSTRUCTION PLAN
CHECKED BY: A. Steele	NORWALK HARBOR GENERATING STATION SOUTH NORWALK, CONNECTICUT

APPROVED BY:	DATE:	SCALE:	DRAWING NO.	SHEET NO.
A. Walker	7/30/14	AS SHOWN	1009654016-B8	C-4

OFFICE Pittsburgh, PA
DRAWING NUMBER 1009654016-B8

VERIFY SCALE 0 1"

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User: Evan.Schlegel May 14, 2019 - 11:18am Layout: 11 x 8.5

OFFICE Pittsburgh, PA

DRAWING NUMBER 1009654016-B9

BARGE SLIP TO LONG ISLAND SOUND

BULKHEAD

RIP RAP

TREATED WATER DISCHARGE

POLISHING BASIN

FORMER EQUALIZATION BASIN #2 (CAPPED)

EQUALIZATION BASINS

DEWATERING WATER TREATMENT

FRAC TANK

SUMP (PIPED TO WATER TREATMENT)

GEOTUBE

SECONDARY CONTAINMENT

TYPICAL SEDIMENT DEWATERING AREA 5/C-8

SLOPE

DEBRIS SCREEN

SUMP (PIPED TO WATER TREATMENT)

STAGING AREA

SUMP (PIPED TO WATER TREATMENT)

4/C-8 CONSTRUCTION ENTRANCE

INSTALL CULVERT TO MANTAIN FLOW FROM DITCH

EXISTING DIRT/STONE ROAD

W-4

PROPOSED ROAD

EXISTING PAVED ROAD

CE

HD

GSF

OR

LEGEND:

W-1	WETLAND AREA IDENTIFICATION
—x—	EXISTING FENCE LINE
— — —	DELINEATED WETLANDS AREA
	SEDIMENT EXTENT LINE AND SEDIMENT REMEDIATION AREA
10	EXISTING GROUND SURFACE, 2' CONTOUR INTERVAL (NGVD 1929)
	CONSTRUCTION VEHICLE ROUTE
- - - - - -	HIGH TIDE LINE ELEVATION (6.3')
— - - —	PROPOSED STAGING AREA
—HD—	HYDRAULIC DREDGING SLURRY PIPE ROUTE OPTION

CONTRACTOR SEQUENCE:

1. TRANSFER REMOVED WETLAND MATERIAL TO DEWATERING AREAS FOR FINAL DEWATERING.
2. CONTAIN, MANAGE, AND TREAT WATER GENERATED WITHIN DEWATERING AREAS.
3. AFTER CHARACTERIZATION BY OTHERS, T&D MATERIAL TO NRG-APPROVED LAND-BASED DISPOSAL FACILITY.
4. COMPLETE OTHER MISCELLANEOUS ITEMS AS PER SPECIFICATIONS.

SCALE
0 80 160 FEET

VERIFY SCALE 0 1"

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
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3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

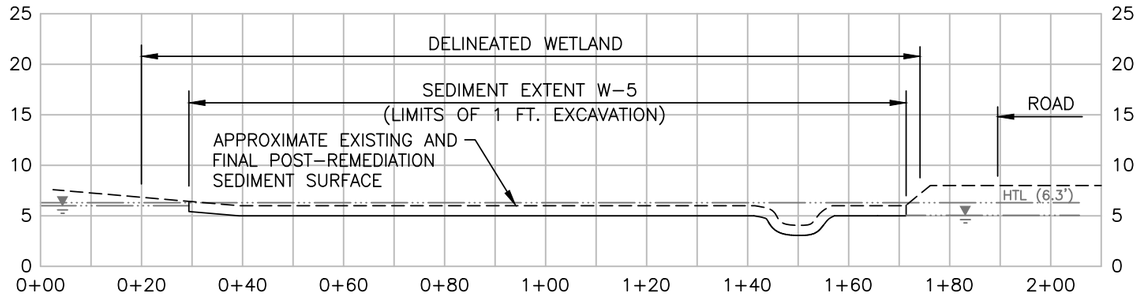
DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

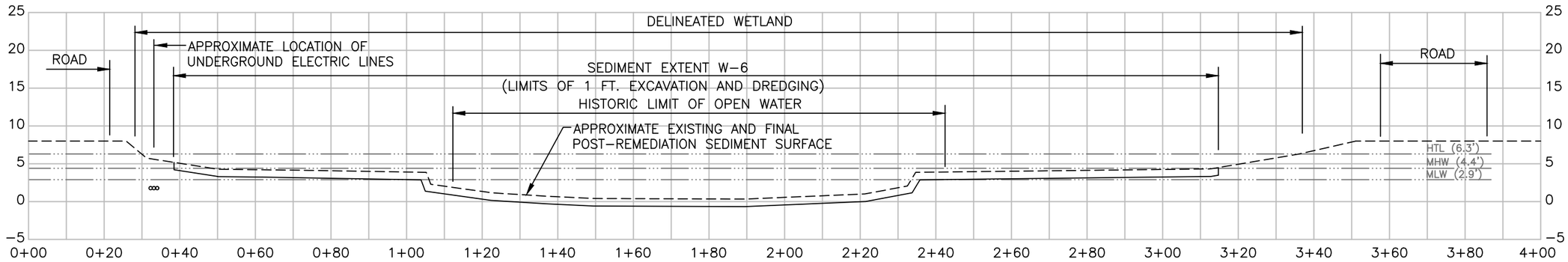
POTENTIAL STAGING AREA LAYOUT
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14 | SCALE: AS SHOWN | DRAWING NO. 1009654016-B9 | SHEET NO. C-5

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User: Evan.Schlegel Apr 16, 2019 - 12:55pm Layout: 11 x 8.5



SECTION A C-4



SECTION B C-4

NOTE:

SURVEY DATA IS LIMITED FOR WETLAND W–6 AND FOR AREAS WITH ELEVATIONS BELOW 6' SUCH THAT THE EXISTING SEDIMENT SURFACES SHOWN WITHIN THE SEDIMENT EXTENT LIMITS ARE APPROXIMATED BASED ON SITE KNOWLEDGE.

VERTICAL SCALE

0 15 30 FEET

HORIZONTAL SCALE

0 30 60 FEET

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	EVERSOURCE ELECTRIC LINE UPDATED	4/15/15	PF
4	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM

150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg

Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

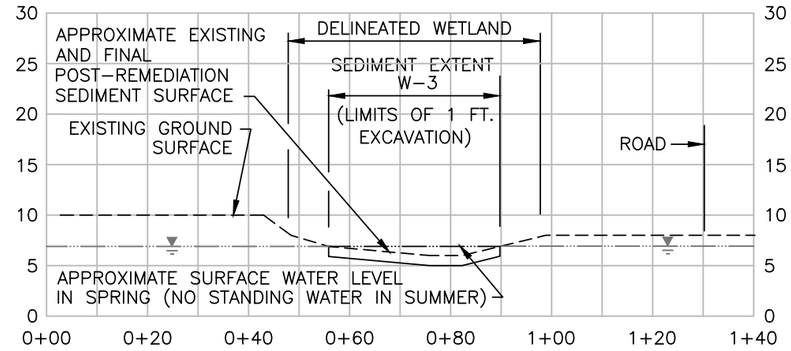
SECTIONS A AND B
WETLAND W-5 AND W-6
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14
SCALE: AS SHOWN
DRAWING NO. 1009654016–B10
SHEET NO. C-6

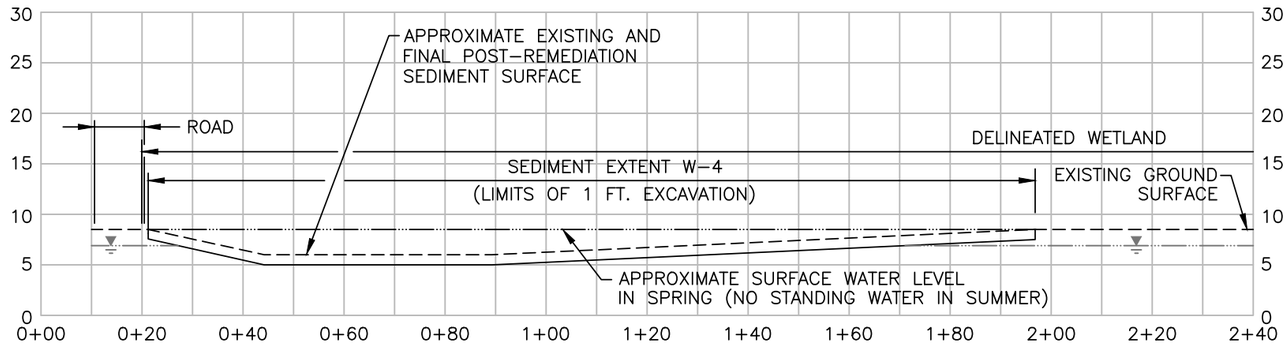
OFFICE Pittsburgh, PA
DRAWING NUMBER 1009654016-B10

VERIFY SCALE 0 1"

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User: Evan.Schlegel Apr 16, 2019 - 1:05pm Layout: 11 x 8.5



SECTION C / C-3



SECTION D / C-3

VERTICAL SCALE
0 15 30 FEET

HORIZONTAL SCALE
0 30 60 FEET

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

SECTIONS C AND D
WETLAND W-3 AND W-4
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

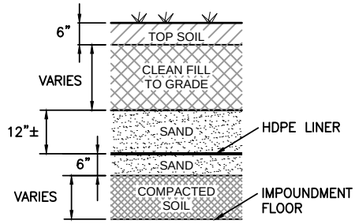
DATE: 7/30/14
SCALE: AS SHOWN
DRAWING NO. 1009654016-B11
SHEET NO. C-7

OFFICE Pittsburgh, PA
DRAWING NUMBER 1009654016-B11

VERIFY SCALE 0 1"

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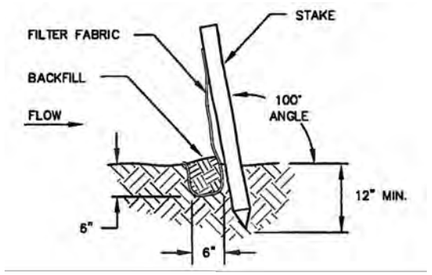
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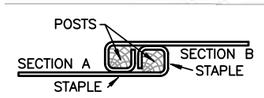


PROVIDED FOR REFERENCE ONLY

DETAIL 1 (C-8)
EXISTING AOC-10 LOW PERMEABILITY RCRA CAP

SCALE: N.T.S.





STANDARD SYMBOL: GSF

TOP VIEW
JOINING TWO ADJACENT SILT FENCE SECTIONS

NOTES:

A) MINIMUM LENGTH OF SILT FENCE IS 15 LF.

B) MAXIMUM POST SPACING IS 10 LF.

C) JOINTS ONLY AT SUPPORT POST WITH MINIMUM 8" OVERLAP, SECURELY SEALED.

D) SEDIMENTATION DEPOSITS SHALL BE REMOVED WHEN IT REACHES 1/2 THE HEIGHT OF THE SILT FENCE.

E) SILT FENCE SHALL NOT BE USED IN A WATER COURSE.

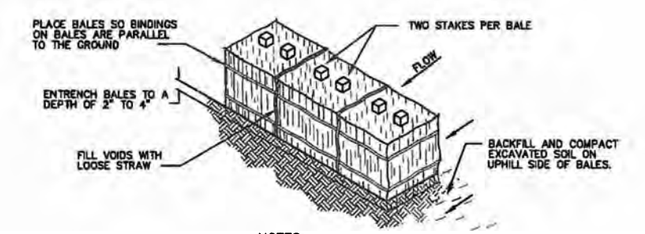
F) UPON ESTABLISHMENT OF GROUND COVER ON DISTURBED AREAS AND WHEN DIRECTED BY THE ENGINEER, FENCE WILL BE REMOVED AND ANY SEDIMENTATION WILL BE THINLY SPREAD UPON EXISTING GROUND COVER.

CONSTRUCTION SPECIFICATION

1. FENCE POSTS SHALL BE A MINIMUM OF 42" LONG DRIVEN 16" MINIMUM INTO THE GROUND. WOOD POSTS SHALL BE 1–1/2" X 1–1/2" SQUARE (MINIMUM) CUT, OR 1–3/4" DIAMETER (MINIMUM) ROUND AND SHALL BE OF SOUND QUALITY HARDWOOD. STEEL POSTS WILL BE STANDARD T OR U SECTION WEIGHTING NOT LESS THAN 0.5 POND PER LINEAR FOOT. FENCE POST SECTIONS SHALL BE INSTALLED WITH A MINIMUM OF 20" ABOVE GROUND.
2. GEOTEXTILE SHALL BE INSTALLED WITH A MINIMUM OF 16" ABOVE GROUND.
3. SILT FENCE SHALL BE INSPECTED AFTER EACH RAINFALL EVENT.

DETAIL 2 (C-3, W-1)
SILT FENCE

SCALE: N.T.S.



STANDARD SYMBOL: HB

NOTES:

A) IDEALLY, BALES SHOULD BE ENTRENCHED 2 TO 4 INCHES AND TIGHTLY BUTTED TOGETHER. BALES CAN BE SUCCESSFULLY PLACED WITHOUT A TRENCH IF GOOD GROUND CONTACT IS MADE. REMOVE HEAVY BRUSH AND FILL ALL VOIDS WITH LOOSE STRAW.

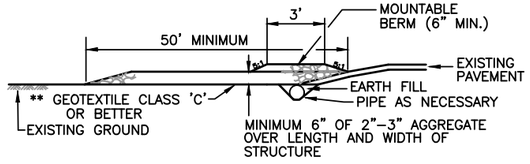
B) BALES SHALL BE ONLY USED AS A TEMPORARY BARRIER AND FOR NO LONGER THAN 80 DAYS. THEY SHALL NOT BE USED ON A JOB ADJACENT TO A RESIDENTIAL NEIGHBORHOOD, RESIDENCES OR ADJACENT TO OR IN A WATERCOURSE.

C) WHEN SEDIMENTATION DEPOSITS REACH WITHIN 3" OF THE TOP OF BALES, REMOVE SEDIMENTATION OR ADD ADDITIONAL BALES ON SEDIMENTATION DIRECTLY BEHIND FIRST ROW OF BALES AS DIRECTED BY ENGINEER.

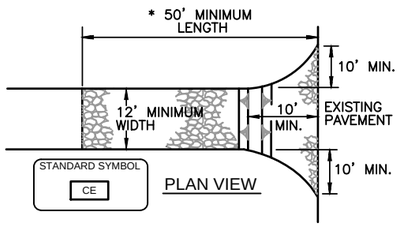
D) UPON ESTABLISHMENT OF GROUND COVER ON DISTURBED AREAS AND WHEN DIRECTED BY ENGINEER, HAY BALES WILL BE REMOVED AND USED AS MULCH. ANY SEDIMENTATION WILL BE THINLY SPREAD UPON ESTABLISHED GROUND COVER.

DETAIL 3 (?)
HAY BALE BARRIER

SCALE: N.T.S.



PROFILE



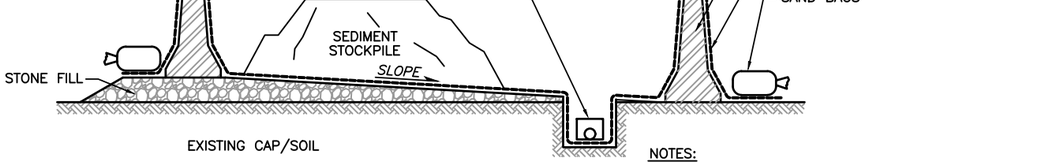
PLAN VIEW

CONSTRUCTION SPECIFICATION

1. LENGTH – MINIMUM OF 50'
2. WIDTH – 12' MINIMUM, FLARED AT THE EXISTING ROAD TO PROVIDE A TURNING RADIUS.
3. GEOTEXTILE FABRIC (FILTER CLOTH) SHALL BE PLACED OVER THE EXISTING GROUND PRIOR TO PLACING STONE.
4. STONE – CRUSHED AGGREGATE (CONNDOT # 3) SHALL BE PLACED AT LEAST 6" DEEP ENTRANCE. OVER THE LENGTH AND WIDTH OF THE ENTRANCE.
5. SURFACE WATER – ALL SURFACE WATER FLOWING TO OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED THROUGH THE ENTRANCE, MAINTAINING POSITIVE DRAINAGE. PIPE INSTALLED THROUGH THE STABILIZED CONSTRUCTION ENTRANCE SHALL BE PROTECTED WITH A MOUNTABLE BERM WITH 5:1 SLOPES AND A MINIMUM OF 6" OF STONE OVER THE PIPE. PIPE HAS TO BE SIZED ACCORDING TO THE DRAINAGE. WHEN THE SCE IS LOCATED AT A HIGH SPOT AND HAS NO DRAINAGE TO CONVEY A PIPE WILL NOT BE NECESSARY. PIPE SHOULD BE SIZED ACCORDING TO THE AMOUNT OF RUNOFF TO BE CONVEYED. A 6" MINIMUM WILL BE REQUIRED.
6. LOCATION – A STABILIZED CONSTRUCTION ENTRANCE SHALL BE LOCATED AT EVERY WHERE CONSTRUCTION TRAFFIC ENTERS OR LEAVES A CONSTRUCTION SITE. POINT THE SITE MUST TRAVEL OVER THE ENTIRE LENGTH OF THE VEHICLES LEAVING STABILIZED CONSTRUCTION ENTRANCE.

DETAIL 4 (C-3, 5, W-1)
CONSTRUCTION ENTRANCE

SCALE: N.T.S.

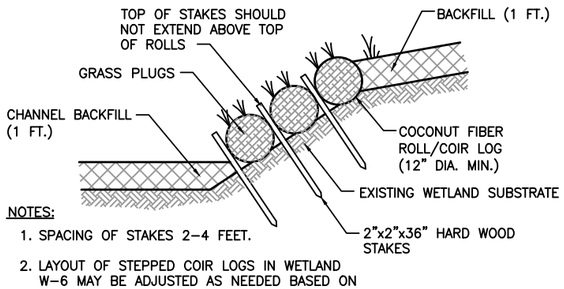


NOTES:

1. MATERIAL REMOVED FROM SUMP EXCAVATION MAY BE IMPACTED HAZARDOUS MATERIAL AND RCRA CAP (SEE DETAIL 1) SEE SPECIFICATIONS FOR HANDLING REQUIREMENTS.

DETAIL 5 (C-5)
TYPICAL SEDIMENT DEWATERING AREA DETAIL

SCALE: N.T.S.

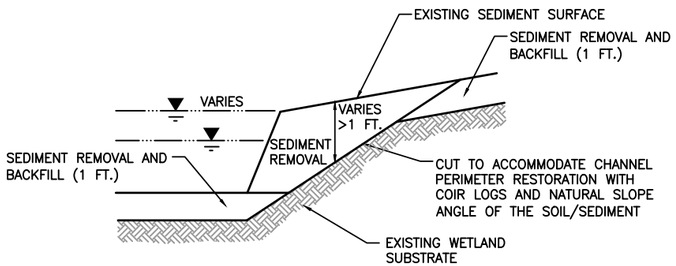


NOTES:

1. SPACING OF STAKES 2–4 FEET.
2. LAYOUT OF STEPPED COIR LOGS IN WETLAND W–6 MAY BE ADJUSTED AS NEEDED BASED ON THE DETAILED PRE–CONSTRUCTION SURVEY.

DETAIL 6 (W-2)
TYPICAL STEPPED COIR LOGS

SCALE: N.T.S.



DETAIL 7 (C-4)
CHANNEL CUT

SCALE: N.T.S.

REFERENCE:

SILT FENCE AND HAY BALE BARRIER DETAILS OBTAINED FROM CITY OF NORWALK, DEPARTMENT OF PUBLIC WORKS, STANDARD CONSTRUCTION DETAILS, SHEET 11, EROSION AND SEDIMENTATION CONTROL DETAILS, REV. 1, DATED 2/3/2009.

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

DETAILS
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14
SCALE: AS SHOWN
DRAWING NO. 1009654016–B12
SHEET NO. C-8

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STAGING AREA
(SEE SHEET C-5)

CONSTRUCTION ENTRANCE 4 / C-8

22,968.4 Sq. Feet
0.5 Acres

GEOTEXTILE SILT FENCE 2 / C-8

W-4

W-3

2,680.8 Sq. Feet
0.1 Acres

CONSTRUCTION ENTRANCE 4 / C-8

EXISTING DIRT/STONE ROAD

EXISTING PAVED ROAD

PROPOSED ROAD

CE

GSF

E

LEGEND:

- W-1 — WETLAND AREA IDENTIFICATION
- EXISTING FENCE LINE
- DELINEATED WETLANDS AREA
- SEDIMENT EXTENT LINE AND SEDIMENT REMOVAL AREA
- —E— APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- 10 — EXISTING GROUND SURFACE, 2' CONTOUR INTERVAL (NGVD 1929)
- CONSTRUCTION VEHICLE ROUTE
- INSTALL BACKFILL, SEED MIX, WOODY VEGETATION
- TEMPORARY ACCESS IF USED

NOTES:

1. SEE SHEET C-9 FOR PLANTING AND SITE RESTORATION.
2. RESTORED ACCESS ROAD AREAS WITHIN WETLAND BOUNDARIES WILL BE STABILIZED WITH PLANTED VEGETATION AS SPECIFIED FOR EACH WETLAND. UPLAND PORTIONS WILL BE STABILIZED WITH STANDARD EROSION CONTROL SEED MIX.
3. ALL AREAS DISTURBED DURING REMEDIATION SHALL BE RESTORED.
4. RESTORATION MUST MIMIC EXISTING HYDROLOGY FOR ALL DISTURBED AREAS.

SCALE
0 60 120 FEET

VERIFY SCALE 0 1"

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

W-3/W-4 RESTORATION PLAN
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14 | SCALE: AS SHOWN | DRAWING NO. 1009654016-B13 | SHEET NO. W-1

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DRAWING NUMBER 1009654016-B14

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38,694.1 Sq. Feet
0.9 Acres

W-5

W-6

CULVERT

9,898.5 Sq. Feet
0.2 Acres

HISTORIC LIMIT OF
OPEN WATER

12,416.2 Sq. Feet
0.3 Acres

APPROXIMATE
NO DIG AREA

HTL

EXISTING PAVED ROAD

6,183.4 Sq. Feet
0.1 Acres

2,867.7 Sq. Feet
0.1 Acres

31,935.6 Sq. Feet
0.7 Acres

HTL

MANRESA AVENUE

CULVERT

TIDAL INLET

SALTWATER WETLAND AREA

LEGEND:

- W-1 — WETLAND AREA IDENTIFICATION
- EXISTING FENCE LINE
- DELINEATED WETLANDS AREA
- SEDIMENT EXTENT LINE AND SEDIMENT REMOVAL AREA
- E — APPROXIMATE LOCATION OF UNDERGROUND ELECTRICAL LINE
- 10 — EXISTING GROUND SURFACE, 2' CONTOUR INTERVAL (NGVD 1929)
- CONSTRUCTION VEHICLE ROUTE
- INSTALL BACKFILL, GRASS PLUGS, AND WOODY VEGETATION
- INSTALL BACKFILL WITH STEPPED COIR LOGS (SEE DETAIL 6 SHEET C-8) AND GRASS PLUGS
- TEMPORARY ACCESS IF USED

NOTES:

1. SEE SHEET C-9 FOR PLANTING AND SITE RESTORATION.
2. RESTORED ACCESS ROAD AREAS WITHIN WETLAND BOUNDARIES WILL BE STABILIZED WITH PLANTED VEGETATION AS SPECIFIED FOR EACH WETLAND. UPLAND PORTIONS WILL BE STABILIZED WITH STANDARD EROSION CONTROL SEED MIX.
3. ALL AREAS DISTURBED DURING REMEDIATION SHALL BE RESTORED.
4. RESTORATION MUST MIMIC EXISTING HYDROLOGY INCLUDING TIDAL FLUX FOR ALL DISTURBED AREAS.

SCALE
0 100 200 FEET

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	EVERSOURCE ELECTRIC LINE UPDATED	4/15/15	PF
4	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

W-5/W-6 RESTORATION PLAN
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14
SCALE: AS SHOWN
DRAWING NO. 1009654016-B14
SHEET NO. W-2

Restoration Vegetation Notes:

1. All areas disturbed during remediation shall be restored.
2. If seed is applied by hydroseeding, then hydromulch will also be applied.
3. Actual mixture of identified plant species installed in each wetland will be determined upon plant availability.
4. Wetland Indicator Status of restoration vegetation:
   a. OBL Obligate Wetland, occur almost always (estimated probability >99%) under natural conditions in wetlands.
   b. FACW Facultative Wetland, usually occur in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
   c. FAC Facultative, equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
5. Designated vegetation is available from local vendors (e.g., Pinelands Nursery, New Jersey or Person's Nursery, Maine).

Wetland W-3

BACKFILL/SOIL: mixture of sand and organic rich topsoil as per specifications.
SEED: "FACW Meadow Mix" at a rate of 20 pounds per acre.
COMPANION CROP SEED: Annual Rye (*Lolium multiflorum*) at a rate of 20 pounds per acre.
GRASS PLUGS: No grass plugs.
WOODY VEGETATION: 50% trees and 50% shrubs, mixture of species listed in table below.
WOODY PLANT SPACING: 8 feet on center (approximately 680 stems per acre).
PLANTING TIMING: between mid-September and the end of May provided the ground is not frozen.

Vegetation for Wetland W-3 Restoration

Common Name	Scientific Name	Indicator Status	Size
Trees			
Red maple	*Acer rubrum*	FAC	2 gallon
Grey birch	*Betula populifolia*	FAC	2 gallon
Black willow	*Salix nigra*	FACW	2 gallon
Shrubs			
Smooth alder	*Alnus serrulata*	OBL	1 gallon
Buttonbush	*Cephalanthus occidentalis*	OBL	1 gallon
Inkberry holly	*Ilex glabra*	FACW	1 gallon
Winter berry	*Ilex verticillata*	FACW	1 gallon
Pussy willow	*Salix discolor*	FACW	1 gallon

Wetland W-4

BACKFILL/SOIL: mixture of sand and organic rich topsoil as per specifications.
SEED: "FACW Meadow Mix" at a rate of 20 pounds per acre.
COMPANION CROP SEED: Annual Rye (*Lolium multiflorum*) at a rate of 20 pounds per acre.
GRASS PLUGS: No grass plugs.
WOODY VEGETATION: 25% trees and 75% shrubs, mixture of species listed in table below.
WOODY PLANT SPACING: 8 feet on center (approximately 680 stems per acre).
PLANTING TIMING: between mid-September and the end of May provided the ground is not frozen.

Vegetation for Wetland W-4 Restoration

Common Name	Scientific Name	Indicator Status	Size
Trees			
Red maple	*Acer rubrum*	FAC	2 gallon
Grey birch	*Betula populifolia*	FAC	2 gallon
Black willow	*Salix nigra*	FACW	2 gallon
Shrubs			
Smooth alder	*Alnus serrulata*	OBL	1 gallon
Buttonbush	*Cephalanthus occidentalis*	OBL	1 gallon
Inkberry holly	*Ilex glabra*	FACW	1 gallon
Winter berry	*Ilex verticillata*	FACW	1 gallon
Pussy willow	*Salix discolor*	FACW	1 gallon

Wetland W-5

BACKFILL/SOIL: sand as per specifications.
SEED: No seed.
GRASS PLUGS: 50-75% salt meadow cordgrass (*Spartina patens*) and 25-50% mixture of other grass species listed in table below.
GRASS PLUG SPACING: 2 feet on center (approximately 21,000 stems per acre).
WOODY VEGETATION: shrubs as listed in table below.
WOODY PLANT SPACING: among the grasses at approximately 100 stems per acre.
PLANTING TIMING: May, June, or July.

Vegetation for Wetland W-5 Restoration

Common Name	Scientific Name	Indicator Status	Size
Grasses			
Spike grass	*Distichlis spicata*	FACW	2" plug
Black grass	*Juncus gerardii*	FACW	2" plug
3 square	*Schoenoplectus pungens*	FACW	2" plug
Salt meadow cordgrass	*Spartina patens*	FACW	2" plug
Shrubs			
Groundsel tree	*Baccharis halimifolia*	FACW	1 gallon

Wetland W-6

No vegetation will be installed in the designated open water area.
BACKFILL/SOIL: Install stepped coir logs (See detail 6 sheet C-8)as needed on the perimeter of the designated open water area. Sand as per specifications.
SEED: No seed.
GRASS PLUGS: only salt marsh cordgrass (*Spartina alterniflora*) along the tidal channel at a distance ranging from 5 to 20 feet from the channel surrounded by a mixture of 50-75% salt meadow cordgrass (*Spartina patens*) and 25-50% mixture of other grass species listed in table below.
GRASS PLUG SPACING: 2 feet on center (approximately 21,000 stems per acre).
WOODY VEGETATION: shrubs as listed in table below.
WOODY PLANT SPACING: among the mixed grasses at approximately 100 stems per acre.
PLANTING TIMING: May, June, or July.

Vegetation for Wetland W-6 Restoration

Common Name	Scientific Name	Indicator Status	Size
Grasses			
Spike grass	*Distichlis spicata*	FACW	2" plug
Black grass	*Juncus gerardii*	FACW	2" plug
3 square	*Schoenoplectus pungens*	FACW	2" plug
Salt marsh cordgrass	*Spartina alterniflora*	OBL	2" plug
Salt meadow cordgrass	*Spartina patens*	FACW	2" plug
Shrubs			
Groundsel tree	*Baccharis halimifolia*	FACW	1 gallon
High tide bush	*Iva frutescens*	FACW	1 gallon

REV	DESCRIPTION / ISSUE	DATE	APPROVED
1	ISSUED TO NRG FOR REVIEW	7/31/14	ADW
2	ISSUED TO CTDEEP FOR PUBLIC NOTICE APPROVAL	10/7/14	ADW
3	UPDATED TO INCLUDE NEW WETLAND DELINEATION BOUNDARIES	4/18/19	ADW

APTIM
150 Royall Street
Canton, Massachusetts

DESIGNED BY: A. Steele
DRAWN BY: G. Jones
CHECKED BY: A. Steele
APPROVED BY: A. Walker

nrg
Norwalk Power LLC
Manresa Island Avenue
South Norwalk, Connecticut

PLANTING AND SITE RESTORATION
NORWALK HARBOR GENERATING STATION
SOUTH NORWALK, CONNECTICUT

DATE: 7/30/14 | SCALE: AS SHOWN | DRAWING NO. 1009654016-B15 | SHEET NO. C-9

OFFICE Pittsburgh, PA | DRAWING NUMBER 1009654016-B15

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User: Evan.Schlegel Apr 16, 2019 - 2:59pm Layout: 11 x 8.5

APPENDIX H

TECHNICAL SPECIFICATIONS

Sediment Remediation in Wetlands
Norwalk Harbor Generating Station
South Norwalk, Connecticut

Table of Contents
Design Specifications

Section No.	Title
01010	Summary of Work
01041	Project Coordination
01110	Statement of Work
01300	Submittals
01400	Quality Control
01500	Temporary Construction Facilities and Controls
01501	Health and Safety Provisions
01502	Environmental Protection
01572	Temporary Storm Water Pollution Control
01780	Closeout Submittals
02000	Project Survey and Stakeout
02110	Site Clearing
02140	Dewatering Water Treatment
02222	Excavation
02230	Crushed Stone
02233	Gravel Access Road
02595	Geotextile
02660	Backfill
02936	Vegetative Cover
31000	Earthwork
35023	Hydraulic Dredging

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 Sub-Section Not Used

1.2 Work To Be Done

A. Overview

i. These specifications have been prepared for Sediment Remediation in Wetlands on behalf of Norwalk Power LLC for the Norwalk Harbor Generating Station, located in South Norwalk, Connecticut.

ii. The sediment removal work is being performed for remediation as part of a State Corrective Action program under Licensed Environmental Professional (LEP) oversight. The objective of sediment remediation at the Norwalk Harbor Generating Station is to address the sediment associated with potential ecological risk by significantly reducing the concentration of metals in the top one foot of sediment, which includes the biologically active zone (top 6 inches), to levels that are protective of the environment.

iii. Sediment limits shown on the Drawings do not include side slopes or channel cuts. Limits of required impacted sediment removals are shown. Side slope volumes will not be included in pay items. Final extent of removal will be determined from measurement of full depth removal in the field and paid as so determined. Channel cut volumes will be included in pay items.

iv. Wetlands shall be restored to pre-construction topography and in accordance with the technical specifications and drawings for backfill and vegetative stabilization.

B. Design Criteria

i. Run Off Mitigation Measures - No runoff from the sediment dewatering area will be allowed. Contractor shall install sedimentation controls (e.g., hay bales and silt fences) at any disturbed areas and at areas where sediment is piped, handled, or transported outside of the sediment containment area.

C. Special Construction Concerns

i. Permit Conditions - The U.S. Army Corps of Engineers (ACOE), Connecticut Department of Energy and Environmental Protection (CTDEEP), and City of Norwalk will be contacted regarding the scope and permitting approvals will be obtained. Requirements of these approvals will be incorporated into the sediment remediation activities. Other permits relative to this project may be required and could result in additional mitigation measures.

Impacted Sediment - Impacted sediment will be generated by the removal action. It must be handled, stored, and managed per the pertinent section of these specifications.

RCRA EB#2 Cap - The area proposed for the location of the water treatment facility and sediment dewatering is covered with a vegetated Resource Conservation and Recovery Act (RCRA) cap. The soil beneath the RCRA EB#2 cap is impacted with metals that exceed the

Industrial/Commercial Direct Exposure Criteria (I/C DEC) and, thus, all appropriate procedures must be followed when disturbing the RCRA EB#2 cap and handling impacted soil.

Buried Electric Line Avoidance – A buried high voltage electrical line in Wetland W-6 must be avoided as per procedures provided by Eversource including utility location, excavation of test pits, and establishment and maintenance of no dig area. Equipment crossing or working above electric cables must have less than 7 pounds per square inch (psi) ground pressure or work on equivalent low pressure mats.

1.3 Definitions

A. Contractor: The person, firm, or corporation with whom the Owner has entered into the Agreement.

B. Owner: Norwalk Power LLC, One Manresa Avenue, South Norwalk, CT and their parent company NRG Energy, Inc., the Corporation that is funding and administering the Contract.

C. Owner's Representative: The Owner's representative during the construction period. The Owner's Representative will interpret the intent of the Contract Documents, and will resolve questions that may arise as to quality and acceptability of materials furnished and work performed. The Owner's Representative will observe, monitor, and report to ensure that the Contractor follows the Quality Control Requirement, the Temporary Construction Site Plan, and these Specifications. Owner's Representative will notify the Contractor and Owner of non-adherence. The Owner's Representative will not be responsible for the Contractor's construction means, methods, controls, techniques, sequences, procedures or construction safety.

1.4 Work By Owner

A. Information or services under the Owner's control will be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the work.

B. The Owner will issue all instructions to the Contractor through the Owner's Representative.

C. The Owner will provide safety orientation for the Contractor and Contractor personnel for one hour prior to the start of any site work

D. Items noted "NIC" (Not in Contract") will be furnished and installed by the Owner or other contractors.

1.5 Contractor Use Of Site And Premises

A. Limit use of site and premises to allow:

i. Owner occupancy, and

ii. Work by Others and work by Owner.

B. The Contractor shall confine his materials and their storage, and the operation of his workmen to limits indicated by the directions of the Owner or the Owner's Representative and as shown in the Contract Documents, and shall not unreasonably encumber the premises with such materials, but shall store them in orderly fashion so that they will not interfere with the work under this Contract or other contracts, or with the operation of the Owner's facilities. The Contractor shall not load nor permit any part of the work to be loaded with a weight that will endanger its safety or unduly affect

structures, piers, or bulkheads and any area of the site such as, but not limited to, existing final cover areas, or any part thereof. The Contractor shall enforce the instructions of the Owner's Representative regarding signs, fires, smoking, and confined space work. The Contractor shall repair, at his own cost, any structure damaged by his work.

C. Contractor staging areas and stockpiles of material shall be in areas approved or designated by the Owner or Owner's Representative.

D. Neither the Contractor nor any of his employees shall park any vehicle anywhere on the site, except at such locations as shown or as specifically approved by the Owner's Representative for the purpose.

1.6 Work Sequence

A. Construct work in stages to accommodate Owner's occupancy requirements during the construction period, coordinate construction schedule and operations with Owner and Owner's Representative.

B. Work stages, crew size on site, equipment and material deliveries shall be scheduled such that work sequences are continuous and work does not start and stop on less than weekly periods. This is essential for scheduling of Owner and Owner's Representative site staff who must be on site when work is underway.

1.7 Owner Occupancy

A. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

B. Schedule the work to accommodate this requirement.

1.8 Working Hours

A. Subject to local authorities, the Contractor will be allowed to work from 7 a.m. to 5 p.m., Monday through Friday. Work includes automated equipment operation and water treatment discharge. The Contractor will be allowed to work on Saturday from 7 a.m. to 5 p.m. or further extended hours on Monday through Saturday provided that the following conditions are met:

i. The Owner and Owner's Representative are notified five working days in advance of the Contractor's intended work and approval is granted by the Owner, and

ii. Noise levels at the property line do not exceed OSHA Limits.

1.9 Traffic Routing To Site

A. All vehicle traffic to and from the site will use numbered CT or US Highway routes except immediately between such routes and the material supplier or the site.

B. The Contractor is responsible for cleaning all soil and debris associated with this work from the traffic routes on a daily basis, or more frequently if needed as determined by the Owner's Representative, Owner, or local official.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 GENERAL

1.1 Sub-Section

Not Used

1.2 Related Sections

Not Used

1.3 Project Coordination Administrator

A. Project Coordination Administrator – Owner's Representative.

B. The Contractor shall cooperate with the Owner and Owner's Representative in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

C. During remediation, coordinate use of site and facilities through the Owner's Representative.

D. Comply with Owner's Representative's procedures for project communications; submittals, reports and records, schedules, coordination drawings, and resolution of ambiguities and conflicts.

E. Comply with instructions of the Owner's Representative for use of temporary utilities, construction facilities, and lay down areas.

F. Coordinate field engineering and layout with the Owner's Representative.

1.4 Schedules

A. Submit preliminary construction work plan and schedule in accordance with SECTION 01300 – SUBMITTALS and at least 14 days prior to kick off of the work.

B. At a minimum, submit revised remediation work schedule analysis with each request for payment and prior to progress meeting.

C. Provide at least 5-day notice of schedule changes.

D. Perform the work with sufficient crew / staff, proper equipment and timely material deliveries such that approved sequences and removal progress are maintained.

E. Maintaining schedule is essential for reasonable scheduling of Owner and Owner's Representative oversight staff. Contractor shall be held responsible for cost of oversight staff on site when scheduled work is not being performed.

1.5 Submittals

A. Submit shop drawings, product data and samples in accordance with SECTION 01300 – SUBMITTALS for review and compliance with Contract Documents, for field dimensions and clearances, for relation to available space, and for relation to work of separate contracts. Revise and resubmit as required.

B. Submit requests for interpretation of Contract Documents, and obtain interpretation through Owner's Representative.

C. Process requests for substitutions, and change orders, through the Owner's Representative.

D. Deliver closeout submittals for review and preliminary inspection reports for transmittal to the Owner's Representative.

1.6 Closeout Procedures

A. Notify Owner's Representative in writing when work is considered ready for acceptance of Substantial Completion. Accompany Owner's Representative on preliminary inspection to determine items to be listed for completion or correction in Contractor's notice of Substantial Completion.

B. Comply with Owner's Representative's instructions to correct items of work listed in executed Certificates of Substantial Completion and for access to Owner occupied areas.

C. Notify Owner's Representative in writing when work is considered finally complete. Accompany Owner's Representative on preliminary final inspection.

D. Comply with Owner's Representative's instructions for completion of items of work determined by the Owner's Representative's inspections to be incomplete.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01110

STATEMENT OF WORK

PART 1 GENERAL

1.1 Work Covered by Contract Documents

A. The activities to be performed consist of:

i. Preparation of staging area;

ii. Preparation of sediment dewatering area;

iii. Preparation of water treatment and piping;

iv. Preparation and installation of runoff and erosion control barriers;

v. Review facilities with Owner's Representative in preparation for start up of operations;

vi. Location of buried electrical line in Wetland W-6 through utility location service and test pits;

vii. Establish and maintain no dig area around buried electrical line in Wetland W-6;

viii. Perform sediment removal from wetland areas to the extents shown on the contract drawings;

ix. Furnish, transport, and manage backfill;

x. Furnish, transport, manage, and install coir logs for channel perimeter restoration;

xi. Perform backfill to the extents of removal and grade;

xii. Furnish, transport, and install vegetation shown on the contract drawings;

xiii. Dewater removed materials;

xiv. Collect and store filtrate and water from sediment dewatering;

xv. Design, furnish, install, and operate sediment dewatering water treatment system with discharge;

xvi. Manage, transport, and dispose of sediment off site;

xvii. Perform all measurement of sediment removal areas and volumes and restoration areas to verify completion and close out operations;

xviii. Review work for Substantial Completion;

xix. Remove all temporary facilities and restore site to original conditions;

xx. General site cleanup; and,

xxi. Inspect and certify site cleanup with Owner's Representative.

B. Site Description

i. The Norwalk Harbor Generating Station is located on an approximate 123-acre site in South Norwalk, Connecticut, surrounded on three sides by the Long Island Sound. The property is owned by Norwalk Power LLC. The northern portion of the site and in the work areas is vegetated. The southern portion of the site is developed with facility structures. As a result of historic operations, delineated sediments in the site wetlands are impacted with metals.

ii. Contractor shall distribute copies of the Environmental Goals to each subcontractor. The overall goal for remediation is to protect the environment. Specifically:

a. Preserve and restore the site ecosystem and biodiversity; avoid site degradation and erosion. Minimize offsite environmental impact.

b. Use the minimum amount of energy, water, and materials feasible to meet the design intent.

c. Manage removal site and storage of materials to ensure no negative impact on the environment.

d. Reduce waste through reuse, recycling, and supplier take-back.

1.2 On-site Permits

A. The Owner has identified the following project permits which will be supplied to the Contractor:

i. City of Norwalk Planning and Zoning Board Approval;

ii. City of Norwalk Inland Wetlands and Watercourses Agency Permit;

iii. City of Norwalk Department of Public Works Excavation and Fill Permit;

iv. U.S. Army Corps of Engineers Permit;

v. Connecticut Department of Environmental Protection (CTDEEP) Land and Water Resources Division (LWRD) Permit; and

vi. CTDEEP Discharge Permit; and

vii. CTDEEP General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer).

1.2.1 Utility Outage Requests

Not Applicable

1.2.2 Welding and Burning Permits

ACTIVITY	SUBMISSION DATE
Burning/Welding Permits	7 calendar days prior to work

Permits shall be posted at a conspicuous location in the construction area.
Burning of trash or rubbish is not permitted.

1.3 Notification Prior to Excavation

A. Notify the Owner's Representative at least 5 days prior to starting excavation or grading work to prepare the site. Contact Connecticut Call Before You Dig (CBYD) at least 5 days prior to excavating. Contractor is responsible for marking all utilities not marked by CBYD. Owner and Owner's Representative will assist Contractor, to the extent possible, in locating site utilities.

B. A known high voltage electrical line is identified in Wetland W-6 on Design Drawings. Contractor shall adhere to safety protocols when working in this area and shall maintain safe distance as defined by electric line owner, electric line operator, and Owner. Contractor shall locate and flag the electrical line and complete the Connecticut CBYD utility location process. Contractor shall complete test pit location to confirm electrical line location and establish and maintain no dig area.

1.4 Transportation and Disposal

A. Contractor shall load, transport, and dispose of dewatered sediment at an approved, licensed, permitted, upland receiving facility that Owner has approved.

B. The Owner will provide the Contractor with a list of Owner-approved disposal facilities. The Contractor may use a different facility with prior written approval from the Owner. The Contractor shall provide the required documentation from the proposed disposal facility to the Owner for review at least 30 days prior to loading for transport.

C. The Contractor shall provide copies of the necessary paperwork for analysis to the Owner and Owner's Representative.

1.5 Owner Furnished Material

A. Use of water from the plant site (via two city water hydrants) and connection to hydrants for small quantities of water may be negotiated, but would be limited to a small number of truck loads of water per day and would not include any piping or transportation of water from existing locations by the Owner.

1.6 General Construction Conditions

A. The area proposed for the location of the water treatment facility and sediment dewatering is covered with a vegetated RCRA EB#2 cap. The soil beneath the RCRA EB#2 cap is impacted with metals that exceed the Industrial/Commercial Direct Exposure Criteria (I/C DEC) and, thus, all appropriate procedures must be followed when disturbing the RCRA EB#2 cap and handling impacted soil.

B. Contractor shall not remove any of the RCRA EB#2 cap except to construct a sump for collection of water from the removed materials. All areas shall be graded to provide positive drainage. Except as required within the wetland removal areas, no work shall be performed in standing water or where the ground is soft or unstable.

C. The generation of silt and dust during construction is anticipated even in previously developed areas. The following sections summarize measures that will be taken to minimize impacts from silt and dust.

1.6.1 Silt Control

A. No unusual runoff and sedimentation measures outside those required for controlling excavated sediment are anticipated to control and treat runoff during construction. Prior to the start of construction, a combination of silt fences and hay bales shall be installed around any disturbed areas and downgradient of the sediment dewatering area to contain any generated silt. Hay bales and silt fence shall be installed around all catch basins in the area of the work.

1.6.2 Dust Control

A. Fugitive dust may be generated during dry weather conditions. Water shall be sprayed on any work areas or unpaved roadways exhibiting excessive dust generation. A water source will be identified by the Owner's representative during the initial work. Paved roadway will be swept clean if required by the Owner's representative. Trucks used for transporting soil or gravel during construction shall be covered to avoid loss of transported material. A maximum truck speed of 8 mph while on unpaved surfaces will be posted to minimize dust.

1.6.3 Material Stockpiling

A. Stockpiles shall be surrounded by silt fencing, particularly on the downhill side of each pile. The location of stockpiles shall be negotiated with the Owner's representative. Excavated or dredged materials shall not be stockpiled on site except within the designated staging area for dewatering, in watertight containers, or as approved by project permits for cursory dewatering within the removal area from which the material originated.

1.6.4 Fuel and Lubricant Storage

A. Fuels and lubricants shall be stored in spill proof containers and quantities over 5-gallons in size shall be placed within either a fuel storage locker or within secondary containment to contain any spillage or leakage. Any on-site fuel storage tank shall either be double contained or placed within secondary containment. Secondary containment shall be maintained free of accumulated rain water. No fueling other than for dredges will be allowed in or in the immediate vicinity of the wetlands.

1.6.5 Temporary Facilities

A. Temporary facilities consist of any necessary office or storage trailer(s) and temporary sanitary facilities. All shall be furnished and maintained by the Contractor.

PART 2 QUALITY CONTROL

2.1 Preconstruction Submittals

A. The Contractor shall submit information to the Owner/Owner's Representative in accordance with the technical specifications. The submittal procedures are established in SECTION 01300 – SUBMITTALS of the Technical Specifications, and the requirements for each submittal are detailed in the various technical specifications. Owner's Representative will review and accept the submittal with or without comments, or reject the submittal and require a new submittal that details conformance to the specifications. Owner's Representative acceptance does not relieve the Contractor from compliance with specifications.

2.2 Construction Observation and Field Documentation

A. The Contractor shall provide to the Owner/Owner's Representative field documentation as required by the specifications. Owner's Representative will provide a qualified professional to observe and monitor construction activities and inform the Contractor when construction does not meet the specification requirements. Owner's Representative's failure to inform the contractor of not meeting specification does not relieve the Contractor of his contractual obligations. The observing professional will verify Contractor construction documentation as detailed below.

2.3 Construction Documentation and Record Keeping

A. Records of construction progress, QA/QC activities, and a daily field logbook shall be maintained by the Contractor during the project. The logbooks shall include the following information on a daily basis:

i. Current date;

ii. Weather conditions, including daily high and low temperature, wind conditions, and precipitation, if any;

iii. List of personnel and equipment operating on site, including the names of key QA/QC and construction personnel. This listing may also include the number of hours worked, number of hours on standby, and work activities completed by the on-site personnel;

iv. General description of the on-site work activities;

v. Description of work completed during the day, referencing the location at the facility where the work was performed;

vi. Identification of specific areas worked;

vii. Drawings, sketches, and maps showing work completed;

viii. Drawings, sketches, and maps showing QA/QC testing areas;

ix. Reworked and repaired areas will be recorded with QA/QC testing results;

x. Identification of samples collected for testing at the QA/QC laboratories, including sample number, location, and testing to be performed;

xi. Identification of any field modifications to the Engineering Plans or Technical Specifications;

xii. Collection of information required by the Construction Documentation Report as identified below;

xiii. Documentation of discussions, decisions or recommendations involving the earthwork contractor, subcontractors, the Owner, CTDEEP, Owner's Representative, or any other notable party; and

XIV. At the end of the project, logbooks will be retained for review and inclusion in the project file.

PART 3 EXECUTION

Not used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 Section Includes

A. Submittal Procedures

B. Construction Work Plan and Schedules

C. Proposed Products List

D. Product Data

E. Material Data

F. Samples

G. Water Treatment Process Design and Operating Procedures

H. Manufacturer's Instructions

I. Manufacturer's Certificates

J. Construction Photographs

K. Construction Logs

L. As-Built Drawings

M. Analytical Results

N. E&SCP

1.2 Submittal Procedures

A. Prepare a complete listing of all submittals required for the project noting the number of each submittal and the date each submittal is to be submitted. The Contractor shall identify submittals that are time critical to completion of the project. The list should include at a minimum the items in Parts 1.4 through 1.16 below. The listing shall be submitted within 7 days of Award of the Contract and shall be a prerequisite to the first partial payment.

B. Transmit each submittal with Owner's Representative accepted form. Submit the number of copies which the Contractor requires plus two (2) copies for the Owner's Representative and one (1) copy for the Owner.

C. Sequentially number the submittals using the section and sequential number (e.g., 03300-1, 03300-2). Resubmittals shall have the same submittal number with a sequential letter designation for each succeeding resubmittal (e.g., 03300-1-A, 03300-1-B).

D. Identify Project, Contractor, subcontractor or supplier; pertinent Plan sheet and detail number(s), and specification Section number, as appropriate.

E. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and Contract Documents.

F. Schedule submittals to expedite the project, and deliver to Owner's Representative. Coordinate submission of related items such that a complete review of the submittal can be performed. Incomplete submittals or submittals not fully coordinated will not be reviewed. The Contractor will be advised in writing of the reasons for the Owner's Representative's action.

G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed work.

H. Provide space for Contractor and Engineer review stamps, as needed.

I. Revise and resubmit submittals as required, identify all changes made since previous submittal.

J. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

K. The Contractor shall allow a minimum of 10 working days for the Owner's Representative to review each submittal. The Owner's Representative will endeavor to complete the review of all submittals as soon as possible in accordance with the Contractor's assigned priority to each submittal. Failure by the Contractor to make submittals on time or failure to allow sufficient time for review of any and all submittals shall not relieve him of the responsibility to complete the project in the specified time.

1.3 Construction Work Plan and Schedules

A. Submit initial construction narrative work plan and a bar schedule in duplicate within 5 days after date of Owner-Contractor Agreement for Owner's Representative review or 14 days before start of field work whichever is earlier.

B. Show complete sequence of construction by activity, identifying work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, total and free float dates, and activity durations.

C. Indicate estimated percentage of completion for each item of work at each submission.

D. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

1.4 Proposed Products List

A. Within 30 days after date of Owner-Contractor Agreement, submit complete list of materials and major products proposed for use, with name of manufacturer, trade name, and model number of each product. This can be coordinated with Paragraph 1.3 of this Section.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

C. Safety Data Sheets (SDS) require written approval and signature documentation from Owner's representative prior to any product being shipped to the site.

1.5 Product Data

A. Submit the number of copies which the Contractor requires, plus two (2) copies which will be retained by the Owner's Representative and one (1) copy to be forwarded to the Owner.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. After review, distribute in accordance with submittal procedures above and provide copies for Record Documents.

1.6 Material Data

A. As identified in each specification Section for backfill, seed, plants, and any material to be installed on the site.

1.7 Samples

A. If needed, submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals to ensure approval will not interfere with construction sequence.

B. Submit the number or samples specified in individual specification Sections; one of which will be retained by Owner's Representative.

C. Reviewed samples which may be used in the work are indicated in individual specification Sections.

1.8 Water Treatment Process Design and Operating Procedures

A. As identified in SECTION 02140 – DEWATERING WATER TREATMENT.

1.9 Manufacturer's Instructions

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.10 Manufacturer's Certificates

A. When specified in individual specification Sections, submit manufacturers' certificate to Owner's Representative for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner's Representative.

1.11 Construction Photographs

A. Photography

i. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Owner's Representative.

B. Prints

i. Color; two (2) sets of prints in a photo log format and on disc or memory stick with all digital photos. Two photographs per page.

ii. Identify each photo in a photo log format with data to left of the photo using a MS Word or Power Point document for digital photos. Identify name of Project, Contract No., orientation of view, date and time of view, name of photographer, and photograph file name or numbered in the data column. Provide description of what is shown in the photograph.

iii. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

iv. Provide factual presentation.

v. Include adjacent or distant features to allow location of the feature on site and in the future.

C. Views

i. Provide photographs from two (2) views of each construction item on each workday until Date of Substantial Completion.

ii. Consult with Owner's Representative for instructions on views required.

D. Submittals

i. Deliver photo logs within 3 working days of each Application for Payment. Application for Payment will not be processed unless complete and includes construction photographs.

1.12 Construction Logs

A. As identified in SECTION 01110 – STATEMENT OF WORK, Part 2.3.

1.13 As-Built Drawings

A. The contractor shall produce drawings showing final as-built conditions of the project including limits of work, limits of removal, and limits of restoration. The final CADD record drawings must consist of one set of electronic CADD drawing files in the specified format, two sets of prints, and one set of the approved working Record drawings.

B. Working Record and Final Record Drawings

i. Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly

basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan. The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Owner's Representative and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working drawings as specified herein, the Owner's Representative will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the record drawings. This monthly deduction will continue until an agreement can be reached between the Owner's Representative and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final record drawings, but not limited to, the following information:

a) The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b) Correct grade, elevations, cross section, or alignment of excavation, removal limits, roads, earthwork, structures or utilities if any changes were made from contract plans.

c) Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, and pipe sizes.

d) Spot elevations at horizontal grid points within and adjacent to sediment removal areas for existing grade, bottom of sediment removal, and finish grade. The topographic survey shall be performed by a surveyor licensed in the State of Connecticut. The topographic survey drawing should be provided with 0.5-foot contours and supplied at a scale of 1" = 40'. Spot elevations shall be accurate to 0.01 foot.

e) Changes or modifications which result from the final inspection.

f) Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.

B. Drawing Preparation

i. Modify the record drawings as may be necessary to correctly show the features of the project as it has been constructed. The working as-built marked prints must be neat, legible and accurate. These drawings are part of the permanent records of this project

and must be returned to the Owner. Any drawings damaged or lost by the Contractor must be satisfactorily replaced by the Contractor at no expense to the Owner.

C. Computer Aided Design and Drafting (CADD) Drawings

i. Only employ personnel proficient in the preparation of CADD drawings to modify the contract drawings or prepare additional new drawings. Additions and corrections to the contract drawings must be equal in quality and detail to that of the originals. Line colors, line weights, lettering, layering conventions, and symbols must be the same as the original line colors, line weights, lettering, layering conventions, and symbols. If additional drawings are required, prepare them using the specified electronic file format applying the same graphic standards specified for original drawings. The title block and drawing border to be used for any new final record drawings must be identical to that used on the contract drawings. Accomplish additions and corrections to the contract drawings using CADD files.

ii. Provide CADD "base" colors of red, green, and blue. Color code for changes as follows:

a) Deletions (Red) - Over-strike deleted graphic items (lines), lettering in notes and leaders.

b) Additions (Green) - Added items, lettering in notes and leaders.

c) Special (Blue) - Items requiring special information, coordination, or special detailing or detailing notes.

iii. When final revisions have been completed, show the wording "RECORD DRAWINGS / AS-BUILT CONDITIONS" followed by the name of the Contractor in letters at least 3/16 inch high on the cover sheet drawing. Mark all other contract drawings either "Record" drawing denoting no revisions on the sheet or "Revised Record" denoting one or more revisions. Date original contract drawings in the revision block.

iv. Within 10 days after Owner approval of all of the working record drawings for a phase of work, prepare the final CADD record drawings for that phase of work and submit two sets of blue-lined prints of these drawings for Owner review and approval. The Owner will promptly return one set of prints annotated with any necessary corrections. Within 7 days revise the CADD files accordingly at no additional cost and submit one set of final prints for the completed phase of work to the Owner. Within 10 days of substantial completion of all phases of work, submit the final record drawing package for the entire project. Submit one set of electronic files on compact disc, read-only memory (CD-ROM), two sets of copies and one set of the approved working record drawings. Failure to submit final record drawing files and marked prints as specified will be cause for withholding any payment due the Contractor under this contract. Approval and acceptance of final record drawings must be accomplished before final payment is made to the Contractor.

1.14 Analytical Results

A. When specified in individual specification Sections, submit analytical results or certificates of analysis to Owner's Representative for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements / analytical maximum concentrations allowed per CTDEEP regulations. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Owner's Representative.

1.15 E&SCP

A. Submit the Erosion and Sediment Control Plan (E&SCP) in accordance with SECTION 01502 – ENVIRONMENTAL PROTECTION to the Owner's Representative for approval.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 Section Includes

A. Quality assurance and control of installation

B. References

C. Field samples

D. Inspection and testing laboratory services

E. Manufacturers' field services and reports

1.2 Related Sections

A. SECTION 01300 – SUBMITTALS

1.3 Quality Assurance/Control of Installation

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Owner’s Representative before proceeding.

D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or manufacturer's specified requirements indicate higher standards or more precise workmanship.

E. Work is to be performed by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 References

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Should specified reference standards conflict with Contract Documents, request clarification from Owner’s Representative before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 Field Samples

A. Obtain field samples at the site as required by individual specifications Sections for review.

B. Acceptable samples represent a quality level for the work.

C. Where field sample is specified in individual Sections to be removed when directed by the Owner's Representative, remove the sample and restore the area as specified.

1.6 Inspection and Testing Laboratory Services

A. The Contractor shall appoint, employ, and pay for services of an independent firm to perform inspection and testing as required by each technical specification.

B. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Owner's Representative.

C. Reports shall be submitted by the independent firm to the Owner's Representative, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

D. Contractor shall cooperate with independent firm; furnish samples of materials, equipment, tools, storage and assistance as requested:

i. Notify Owner's Representative and independent firm 48 hours (not including Saturday, Sunday and Federal Holidays), prior to expected time for operations requiring services.

ii. Make arrangements with independent firm and pay for samples and tests required for Contractor's use.

E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Owner's Representative. Payment for retesting will be the responsibility of the Contractor.

1.7 Manufacturers' Field Services and Reports

A. When specified in individual specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.

B. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report in duplicate within 30 days of observation to Owner's Representative for review.

1.8 Independent Quality Assurance

A. Owner may provide a Quality Assurance (QA) observer(s) for any part or all of the contract period.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 Summary

A. Requirements of this Section apply to, and are a component of, each section of the specifications.

1.2 Submittals

A. Owner approval is required for submittals. Submit the following in accordance with SECTION 01300 - SUBMITTALS:

i. Preconstruction Submittals

ii. Construction Site Plan

1.3 Construction Site Plan

A. Prior to the start of work, submit a site plan showing the locations and dimensions of temporary facilities including layouts and details, sediment and erosion control features, equipment and material storage area (onsite and offsite), access and haul routes, avenues of ingress/egress, and details of the fence installation. Identify any areas which may have to be graveled to prevent the tracking of mud or increased in elevation to promote drainage of water from the dewatering area. Indicate if the use of a supplemental or other staging area is desired. Show locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, city water sources, and worker parking areas.

PART 2 PRODUCTS

2.1 Temporary Signage

A. Immediately upon beginning of work, provide a weatherproof glass-covered bulletin board not less than 36 by 48 inches in size for displaying the Equal Employment Opportunity poster, Wage Rate Information poster, and other information approved by the Owner's representative. Locate the bulletin board at the project site in a conspicuous place easily accessible to all employees, as approved by the Owner's representative.

2.2 Temporary Traffic Control

2.2.1 Haul Roads

A. At Contractor's expense, construct access and haul roads necessary for proper prosecution of the work under this contract. Construct with suitable grades and widths, provide necessary, signs, barricades, and distinctive markings for the safe movement of traffic. The method of dust control, although optional, must be adequate to ensure safe operation at all times. Methods for cleaning truck tires before leaving the site shall be provided. Location, grade, width, and alignment of construction and hauling roads are subject to approval by the Owner's representative.

2.2.2 Fencing

A. Provide fencing along the construction site at all open excavations to control access by unauthorized people. Fencing must be installed to be able to restrain a force of at least 250 pounds against it.

2.3 Temporary Wiring

A. Provide temporary wiring in accordance with NFPA 241 and NFPA 70, Article 305-6(b), Assured Equipment Grounding Conductor Program. Include frequent inspection of all equipment and apparatus.

PART 3 EXECUTION

3.1 Employee Parking

A. Contractor employees shall park privately owned vehicles in an area designated by the Owner's representative. This area will be within reasonable walking distance of the construction site. Contractor employee parking must not interfere with existing and established parking requirements of the Norwalk Harbor Generating Station.

3.2 Availability And Use Of Utility Services

3.2.1 Temporary Utilities

A. Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions, and not violate applicable codes and standards.

3.2.2 Utility Services

A. The Owner will make all reasonably required utilities available to the Contractor from existing outlets and supplies. Unless otherwise provided in the contract, the amount of each utility service consumed will be charged to or paid for by the Contractor at prevailing rates charged to the Owner or, where the utility is produced by the Owner, at reasonable rates determined by the Owner's representative. Carefully conserve any utilities furnished without charge.

3.2.3 Meters and Temporary Connections

A. At the Contractor's expense and in a manner satisfactory to the Owner's representative, provide and maintain necessary temporary connections and distribution lines. Notify the Owner's representative, in writing, 5 working days before final electrical connection is desired. Owner will make the final hot connection after inspection and approval of the Contractor's temporary wiring installation. The Contractor shall not make the final electrical connection.

3.2.4 Sanitation

A. Provide and maintain within the construction area minimum field-type sanitary facilities approved by the Owner's representative and periodically remove waste to a commercial facility. Maintain these conveniences at all times without nuisance. Include provisions for pest control and elimination of odors. Owner toilet facilities will not be available to Contractor's personnel.

3.2.5 Telephone

A. Make arrangements and pay all costs for telephone facilities desired.

3.2.6 Fire Protection

A. Provide temporary fire protection equipment for the protection of personnel and property during construction. Remove debris and flammable materials weekly to minimize potential hazards.

3.2.7 Dust Control

A. Dust control methods and procedures must be approved by the Owner's representative. Treat dust abatement on access roads with applications of calcium chloride, water sprinklers, or similar methods or treatment.

3.3 Contractor's Temporary Facilities

3.3.1 Administrative Field Offices

A. Provide and maintain administrative field office facilities within the construction area at the designated site. Owner office and warehouse facilities will not be available to the Contractor's personnel.

3.3.2 Appearance of Trailers

A. Trailers utilized by the Contractor for administrative or material storage purposes must present a clean and neat exterior appearance and be in a state of good repair. Trailers which, in the opinion of the Owner's representative, require exterior painting or maintenance will not be allowed on Owner property.

3.3.3 Security Provisions

A. The Contractor shall be responsible for the security of its own equipment; in addition, the Contractor shall provide security services to perform periodic security checks of the temporary project field office.

3.3.4 Trailer-Type Mobile Office

A. The Contractor shall, at its option, furnish and maintain a trailer-type mobile office acceptable to the Owner's representative and providing as a minimum the facilities specified above. Securely anchor the trailer to the ground to guard against movement during high winds.

3.4 Temporary Project Safety Fencing

A. As soon as practicable, but not later than 15 days after the date established for commencement of work, furnish and erect temporary project safety fencing at the work site in areas designated by the Owner's representative. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 42 inches high, supported and tightly secured to steel posts located on maximum 10 foot centers, constructed at the approved location. Maintain the safety fencing during the life of the contract and, upon completion and acceptance of the work, will become the property of the Contractor and be removed from the work site.

3.5 Cleanup

A. Remove construction debris, waste materials, packaging material and the like from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways must be cleaned away. Store within the fenced area described above or at the supplemental storage area areas designated by the Owner's representative any materials resulting from demolition activities which are salvageable. Contractor shall neatly stack stored materials not in trailers, whether new or salvaged.

B. All areas of the original RCRA EB#2 cap (or other soil engineered controls if installed) shall be restored to equal or better condition than pre construction.

3.6 Restoration of Storage Area

A. Upon completion of the project remove the bulletin board, signs, barricades, haul roads, and any other temporary products from the site. After removal of trailers, materials, and equipment, remove the Contractor-installed construction fence. Restore to the original or better condition, areas used by the Contractor for the storage of equipment or material, or other use. Gravel used to traverse grassed areas must be removed and the area restored to its original condition, including top soil and seeding as necessary.

B. All areas of the original RCRA EB#2 cap (or other soil engineered controls if installed) shall be restored to equal or better condition than pre construction.

END OF SECTION

SECTION 01501

HEALTH AND SAFETY PROVISIONS

PART 1 GENERAL

1.1 Section Includes

A. Site Health and Safety Requirements for the Work to be performed at the site.

1.2 Related Sections

A. SECTION 01300 - SUBMITTALS

B. The Site Safety Plan relates to all work outlined in these Specifications.

1.3 General Requirements

A. The Contractor agrees to comply with all the requirements and procedures contained in this document. The requirements and procedures are as follows:

i. The Contractor shall be responsible to maintain a safe workplace and take all prudent environmental, health and safety precautions to protect the Owner's Representative, all other workers, and the public.

ii. Comply with all applicable Norwalk Power LLC, Federal, State, municipal, local, and any other applicable occupational safety and health regulations and requirements issued to impose by any governmental authority (including, but not limited to, Title 29, Code of Federal Regulations Parts 1910 and 1926).

iii. The Contractor agrees to monitor working conditions at all times during construction and, as necessary, to provide appropriate protective clothing, equipment and facilities for his personnel, and/or to establish workplace procedures to ensure their safety.

iv. If, at any time, the Owner or the Owner's Representative is apprised of a safety hazard which demands immediate attention because of its high potential for harm to public travel, persons on or about the work, or public or private property, the Owner or the Owner's Representative will have the right to order such safeguards to be erected and such precautions to be taken as necessary, and the Contractor shall comply with such orders. If, under such circumstances the Contractor does not or cannot immediately put the work into proper and approved condition, or if the Contractor or his representative is not upon the site so that he can be notified immediately of the insufficiency of safety precautions, then the Owner may put the work into such a condition that it shall be, in his opinion, in all respects safe, and the Contractor shall pay all expenses of such labor and materials as may have been used for this purpose by him or by the Owner. The fact that the Owner or the Owner's Representative does not observe a safety hazard or does not order the Contractor to take remedial measures, shall in no way relieve the Contractor of the entire responsibility for any costs or claims for loss, damage or injury, by or against any party sustained on account of the insufficiency of the safety precautions taken by him or by the Owner acting under authority of this Section.

v. It is the responsibility of the Contractor to take appropriate safety precautions to meet weather conditions or hazard which may be present during the performance of the work, whether reasonably foreseeable or not. The Contractor is alerted to the fact that it shall be his sole responsibility to anticipate and provide such additional safety precautions, facilities, personnel, and equipment as shall be necessary to protect life and property from whatsoever conditions of hazard are present or may be present.

vi. Site-Specific Health and Safety Plan: The Contractor shall prepare and implement a written site-specific/task-specific health and safety plan (HASP). This plan must meet the requirements of 29 CFR 1910.120(b)(4) – Site-Specific Health and Safety Plans. This plan shall also include safety procedures and guidelines under OSHA 29 CFR 1926 for the work involving subsurface excavation, scraping, and removal of contaminated soils, specifically procedures and guidelines in accordance with 29 CFR 1926.650-654.

vii. As a minimum, the HASP must:

a. Identify key personnel such as the site Health and Safety Officer, Project Manager, Site Supervisors, and individuals on-site with authority to change protection levels.

b. Define the roles of key personnel and their responsibilities related to the HASP.

c. Describe site location in terms of size, surroundings, operations, facilities, etc. (include map of site location).

d. Discuss site history (compliance, past industries located on-site, etc.)

e. Identify various site operations.

f. Describe potential health and safety hazards along with appropriate precautions or Standard Operating Procedures.

g. Verify that operational employees have participated in health and safety training in compliance with OSHA 29 CFR 1910.120(e).

h. Include a site map designating work area boundaries.

i. Establish guidelines and standard operating procedures for conducting: 1) routine site activities including safe work practices and communication among work parties; and 2) special activities such as confined space entry and excavation.

j. Discuss possible emergencies due to physical factors such as heat stress, cold stress, fire/explosion, spills or releases of leachate or other deleterious substances. Establish a contingency plan that identifies the names and phone numbers of emergency service facilities (i.e., medical, fire, ambulance, etc.) and the Owner's representative, and identifies first-aid measures in a medical emergency. Include a map and written directions to the nearest hospital.

k. Implement control procedures to prevent access to the site by unauthorized personnel.

l. Establish a recordkeeping system for logging personnel and visitors on a daily basis.

viii. The HASP shall address the needs for its continual review and adjustment to reflect changes in field conditions. The HASP is intended to be a living document in that it will continually evolve as site conditions and knowledge of the site work activities develop further. The HASP shall include procedures for preparing continual updates based upon monitoring and procedures for implementation of any plan adjustments.

ix. All confined space entries must be performed in accordance with OSHA 29 CFR 1910.146 (if applicable).

x. The Contractor is solely responsible for enforcement of the HASP. The Owner's Representative has a HASP for his own personnel. This Health and Safety Plan will be made available to the Contractor for reference.

xi. The Contractor shall be responsible for monitoring oxygen levels and lower explosive level (LEL) in and around trenches (if applicable). No personnel shall be permitted to enter into a trench without proper monitoring or use of the correct safety equipment and procedures.

xii. The Contractor is responsible for the health and safety of all subcontractors.

B. The area proposed for the location of the water treatment facility and sediment dewatering is covered with a vegetated cap RCRA EB#2 cap. The soil beneath the RCRA EB#2 cap is impacted with metals that exceed the Industrial/Commercial Direct Exposure Criteria (I/C DEC) and, thus, all appropriate procedures must be followed when disturbing the RCRA EB#2 cap and handling impacted soil. Contractor shall not remove any of the RCRA EB#2 cap except to construct a sump for collection of water from the removed sediment.

1.4 Use of Hazardous Materials — Hazard Communication

A. The Contractor personnel shall not bring any hazardous substances (as defined by OSHA) onto the site premises unless accompanied by a Safety Data Sheets (SDS). SDS require written approval and signature documentation from Owner's representative prior to any product being shipped to the site. SDS' must be maintained at the job site and submitted to the Owner's Environmental Department.

B. Contractor shall ensure all containers of hazardous materials are labeled in compliance with State and Federal OSHA regulations with the product name, appropriate hazard warnings, and the name and address of the manufacturer. See Owner's Environmental Department or Owner's Representative for proper labeling, and storage location requirements.

C. Contractor shall ensure its employees are trained in the safe handling and use of hazardous materials in accordance with Title 29 CFR 1910.1200 – Hazard Communication.

D. Contractor shall ensure that all applicable employees are medically qualified (as defined by OSHA) to perform the work assigned.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01502

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 Work Included

A. Furnish all labor, equipment, and materials required for environmental protection during and as the result of construction operations under this Contract except for those measures set forth in other provisions of these Specifications. Environmental protection requires consideration of air, water, and land, and involves noise and solid waste management as well as other pollutants.

1.2 Related Sections

Section 01572 – Temporary Storm Water Pollution Control

1.3 Applicable Regulations

A. Comply with all applicable Norwalk Power LLC, Federal, State, and local laws and regulations concerning environmental protection, as well as the specific requirements stated in this Section and elsewhere in the Specifications.

1.4 Submittals

A. Erosion and Sedimentation Control Plan

1. Submit to the Owner's Representative for approval, a detailed site specific erosion and sedimentation control plan sufficiently in advance of construction so as not to delay initiation of work. No site work may commence without an approved plan. Plan should conform to the accepted Standards and practices for soil erosion and sediment control set forth by the State of Connecticut. The plan shall supplement the requirements of this specification and the engineering plans.
2. The plan should include an erosion and sedimentation sequencing plan that follows the construction sequence.

B. The Contractor shall submit notice to the Owner's Representative of specific herbicides or pesticides planned to be used on the site. SDS for herbicides and pesticides require written approval and signature documentation from the Owner's Representative prior to transporting the products to the site.

PART 2 PRODUCTS

2.1 General

A. All materials shall be in accordance with the Contractor's plan for environmental protection.

2.2 Materials

A. Silt Fence

1. Silt fence shall meet the requirements of Section 01572, Temporary Storm Water Pollution Control, be approved by Owner's Representative, and meeting requirements of Permits.

B. Hay Bales

1. Hay bales shall meet the requirements of Section 01572, Temporary Storm Water Pollution Control, be approved by Owner's Representative, and meeting requirements of Permits.

PART 3 EXECUTION

3.1 Protection of Land Resources

A. General – Preserve land resources within the project boundaries and outside the limits of permanent work performed under this Contract, or restore to a condition after completion of construction, which will appear to be natural and not detract from the appearance of the project. Confine construction activities to areas defined on the Drawings or in the Specifications except with written approval of the Owner and the Owner's Representative.

B. Prevention of Landscape Defacement – Working areas shall be limited to work areas indicated on the drawings to the extent possible. Working across grassed, treed, or brush areas to access sediment removal areas shall be kept to a minimum. The Contractor shall not enter beyond the working limits of the working area except with written approval of the Owner's Representative and Owner.

C. Wetlands Protection – Disturbance in wetlands shall be limited to that allowed by Permit for this work. All other wetland areas shall be protected during construction. No equipment, materials or stockpiles shall be placed in the wetland areas. All disturbed wetlands shall be restored to their natural conditions.

D. Runoff – No runoff from the construction area, sediment dewatering area, treatment area, stockpiles, or material storage to the adjacent waterway or on-site drainage systems will be allowed.

E. Location of Storage – The location of areas for storage of the Contractor's materials required temporarily in the performance of the work, shall be within the limits of the working area at the direction of the Owner or the Owner's Representative, prior to use. The preservation of the landscape shall be an imperative consideration in the selection of all such sites. Where temporary structures are constructed on sidehills, the Owner's Representative may require cribbing to be used to obtain level foundation. Benching or leveling of earth may not be allowed, depending on the location of the proposed facility.

F. Post-Construction Cleanup or Obliteration – The Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, water treatment facilities, sediment dewatering areas, regraded parking lots, stockpiles of excess or waste materials, or any other vestiges of construction.

3.2 Protection of Water Resources

A. General – The Contractor shall not pollute streams, rivers, lakes, or reservoirs with fuels, oils, bitumens, calcium chloride, acids, or harmful materials. It is the responsibility of the Contractor to investigate and comply with all applicable Federal, State, County, and Municipal laws concerning pollution of rivers, streams, impounded water, and wetlands. All work under this Contract shall be performed in such a manner that objectionable conditions will not be created in streams through, or bodies of water adjacent to, the project area.

B. Erosion – Surface drainage from cuts and fills within the construction limits, whether or not completed, and from borrow and waste disposal areas, shall, if turbidity producing materials are present, be held in suitable sedimentation basins or shall be graded to control erosion within acceptable limits. Temporary erosion and sediment control measures such as berms, dikes, drains, or sedimentation basins, if required to meet the above standards, shall be provided and maintained until permanent drainage and erosion control facilities are completed and operative. The area of bare soil exposed at any one time by construction operations should be held to a minimum.

C. Apply temporary mulch on denuded ground immediately after rough grading is completed. This shall apply to all areas not subject to appreciable traffic during construction, even those that are to receive some form of construction later if ground is to be exposed 30 days or more.

D. If, in the Owner's opinion the Contractor does not provide sufficient protection against erosion, additional erosion control measures will be implemented by the owner at the Contractor's expense.

E. Spillages – At all times of the year, special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, waste washings, herbicides and insecticides, and cement and surface drainage from entering public waters. Should a spillage into the public waters occur, the Contractor shall immediately notify the proper authorities and the Owner's representative. The Contractor shall be responsible for any and all costs associated with the cleanup of spillages.

F. Washing and Curing Water – Water used in material processing, aggregate processing, concrete curing, foundation and concrete cleanup, and other wastewaters shall not be allowed to enter or reenter the waterway if an increase in the turbidity of the waterway will result there from. At the point where this water enters the waterway, precautions must be taken to assure that no permanent damage or serious temporary damage is caused by change of the pH factor of the stream or by introduction of nutrients or oxygen-consuming materials. Chemicals shall be added to adjust pH factor, if required.

G. Disposal – Disposal of any materials, wastes, effluents, trash, garbage, oil, grease, chemicals, etc., in areas adjacent to streams or other waterways shall be strictly prohibited. If any waste material is dumped in unauthorized area, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as specified hereinbefore, and replaced with suitable fill material, compacted and finished with topsoil, all at the expense of the Contractor. Transportation and disposal of any material from the site shall be in accordance with the all local, state and federal regulations including but not limited to the Toxic Substances Control Act.

H. Muck Excavation Operations – There shall be no discharge of silty, muddy, or polluted water from demucking operations to a natural water course. The Contractor shall ensure waters reaching existing water courses meet or exceed the quality of the water course. Stormwater

collected during construction shall be treated at the on-site stormwater treatment plant. Coordinate dewatering operations with Owner. The Contractor shall be responsible for any permits required for discharge of pollutant waters into water courses, or any fines imposed for failing to obtain such permits.

I. In areas where work is carried out adjacent to wetlands, the Contractor shall take care to protect the wetland and refrain from excavating or placing excavated material in the wetland except as specifically noted in the design drawings and permits.

3.3 Protection of Fish and Wildlife

A. Perform all work and take steps required to prevent any interference or disturbance to fish and wildlife. The Contractor shall not be permitted to alter water flows or otherwise disturb native habitat adjacent to the project area which, in the opinion of the Owner's Representative, are critical to fish or wildlife. Fouling or polluting of water will not be permitted. Wash waters and wastes shall be processed, filtered, ponded, or otherwise treated prior to their release into streams or other waterways. Should polluting or fouling the water occur, the Contractor shall immediately notify the proper authorities. The Contractor shall be responsible for any and all costs associated with the cleanup of polluted or fouled waters.

3.4 Maintenance

A. Dispose of all discarded debris, aggregate samples and concrete test samples from any source whatsoever, in a manner approved by the Owner's Representative. Toilet facilities shall be kept clean and sanitary at all times. Services shall be performed at such a time and in such a manner to least interfere with the operations. Services shall be accomplished to the satisfaction of the Owner's Representative.

B. The Contractor shall frequently remove materials no longer required on the site, such as excess excavated material, forms, temporary structures and similar materials and equipment so that, at all times, the site, access routes to the site and any other areas disturbed by his operations shall present a neat, orderly, workmanlike appearance.

C. Before substantial completion inspection, the Contractor shall remove all surplus material, falsework, temporary structures, including foundations and debris of every nature resulting from his operations, and put the site in a neat, orderly condition; and restore all areas which have been used for storage of materials and equipment, and all areas which have been disturbed by his operations, to their original condition or to a condition satisfactory to and approved by the Owner's Representative.

3.5 Dust Control

A. The Contractor shall maintain all excavations, embankments, stockpiles, haul roads, permanent access roads, waste areas, borrow areas and all other work areas within or outside the project boundaries free from windblown dust which would cause a hazard or nuisance to others or contaminate surface water.

B. The Contractor shall, at his own expense, keep dust under control at all times on all roadways and other areas adjacent to the work or on the site of the work by the use of spraying water or approved chemicals at least once a day and at other times when directed, including after working hours, Saturdays, Sundays and Federal holidays.

C. Approved temporary methods of stabilization consisting of motor sweepers, vacuums, spraying water, and a combination of these methods, will be permitted to control dust. Spraying water shall be repeated at such intervals a to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient suitable equipment on the job to accomplish this, if sprinkling is used. Dust control shall be performed daily as the work proceeds and whenever a dust nuisance or hazard occurs.

D. All areas undergoing excavation, grading, filling, cutting or subject to other dust-producing activities by vehicles should be subjected to dust-inhibiting practices. The use of liquid palliatives and penetrating asphaltic materials will not be permitted. Anchored mulch (asphaltic binders will not be permitted) shall be applied to non-traffic areas subject to blowing as a temporary treatment. Permanent vegetation shall be established as soon as possible.

3.6 Noise Control

A. The Contractor shall use every effort and means possible to minimize or eliminate noise caused by his operation which the Owner's Representative may consider objectionable. The Contractor shall provide working machinery, designed to operate within applicable noise regulations. The Contractor is responsible for maintaining compliance with all applicable noise regulations and all State and local noise ordinances.

3.7 Odor Control

A. The Contractor shall use every effort and means possible to minimize or eliminate odor caused by his operation which the Owner's Representative may consider objectionable.

3.8 Pesticides and Herbicides

A. Where pesticides or herbicides are to be used in construction operations, data relative to restrictions on the type or types of material available and approved for application to control or eradicate vegetation, insects or organisms shall be obtained from the State or County agriculture departments. The amount of pesticide applied shall be limited to the recommended dosage. Application equipment shall provide an even distribution of the materials in accordance with the approved rate in terms of pounds per acre. Materials approved by the Owner's Representation and delivered to the site shall be covered and protected from the elements. Contents of the containers shall not be exposed. Application equipment or empty containers shall not be rinsed and discharged to the natural drainage channel. The rinse water shall be disposed of in a manner that would not cause pollution of surface or groundwater. Should pollution of the surface or groundwater occur the Contractor shall immediately notify the proper authorities. The Contractor shall be responsible for any and all expenses associated with the cleanup of the pollution of the surface or groundwater.

3.9 Prohibited Construction Procedures

A. The Contractor is advised that the disposal of excess excavated material in wetlands, stream corridors, and floodplains is strictly prohibited. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. Therefore, the Contractor shall be required to remove the fill at his own expense and restore the area impacted.

B. The Contractor shall, at a minimum, be strictly prohibited from performing the following construction procedures:

1. Dumping of spoil material into any stream corridor, any wetlands, any surface waters, or at unspecified locations,
2. Indiscriminate, arbitrary or capricious operation of equipment in any stream corridors, any wetlands or surface waters,
3. Pumping or discharging of silt-laden water from trenches or other excavations into any surface waters, any stream corridors or any wetlands,
4. Damaging vegetation adjacent to, or outside of, the access road or the right-of-way,
5. Disposal of trees, brush and other debris in any stream corridors, any wetlands, any surface waters, or at unspecified locations,
6. Permanent or unspecified alteration of the flow line of any stream,
7. Open burning of project debris,
8. Location of storage stockpile areas in environmentally sensitive area,
9. Disposal of excess or unsuitable excavation material in wetlands or floodplains even with permission of the property owner, and,
10. Remove all dust, dirt, debris attributable to this work from paved driveways at the facility on a routine basis by means of a street sweeper and litter removal labor crew.

END OF SECTION

SECTION 01572

TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 GENERAL

1.1 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM D 4439	(2004) Geosynthetics
ASTM D 4491	(1999a; R 2004e1) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(2004; R 2009) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(2008) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(2004) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(2002; R 2009) Identification, Storage, and Handling of Geosynthetic Rolls and Samples

1.2 System Description

The work consists of implementing the storm water pollution prevention measures to prevent sediment from entering streams or water bodies as specified in this Section and the requirements of the National Pollution Discharge Elimination System (NPDES) permit and project Permits.

1.3 Erosion And Sediment Controls

The controls and measures required of the Contractor are described below.

1.3.1 Stabilization Practices

The stabilization practices to be implemented include temporary and permanent seeding, erosion control mats, etc. On the daily CQC Report, record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, dredging, backfill, cover soil placement, grading, and planting); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraph UNSUITABLE CONDITIONS, initiate stabilization practices as soon as practicable, in any portion of the site where construction activities have temporarily or permanently ceased. Where construction activities have permanently ceased or have temporarily

been suspended for more than seven (7) days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within three (3) days. Areas that will remain disturbed but inactive for at least thirty (30) days shall receive temporary seeding. Areas that will remain disturbed beyond the planting season shall receive long-term, non-vegetative stabilization sufficient to protect the site between planting seasons.

1.3.1.1 Unsuitable Conditions

Where the initiation of stabilization measures is precluded by unsuitable conditions caused by the weather, initiate stabilization practices as soon as practicable after conditions become suitable.

1.3.1.2 Burnoff

Burnoff of the ground cover is not permitted.

1.3.1.3 Protection of Erodible Soils

Immediately finish the earthwork brought to a final grade, as indicated or specified, and protect the side slopes and back slopes upon completion of rough grading. Plan and conduct earthwork to minimize the duration of exposure of unprotected soils.

1.3.2 Erosion, Sediment, and Stormwater Control Plan (E&SCP)

The Contractor must submit an E&SCP for Owner's Representative approval in accordance with SECTION 01502 – ENVIRONMENTAL PROTECTION. The Owner or Owner's Representative will obtain the federal, state, and local approvals for erosion, sediment, and stormwater control. The contractor shall endorse the documents and commit to following the stated procedures and requirements. Maintain an approved copy of the plans and approvals and/or permits at the construction on-site office

1.3.3 Structural Practices

Implement structural practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement structural practices in a timely manner, during the construction process, to minimize erosion and sediment runoff. Location and details of installation and construction are shown on the drawings. Some required erosion control features are in place from previous/active work at the site and it shall be the contractor's responsibility to install, repair or replace features required for the subject work.

1.3.3.1 Geotextile Silt Fences

Provide geotextile silt fences as a temporary structural practice to minimize sediment runoff. Properly install silt fences to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Install silt fences in the locations indicated on the drawings at a minimum. Obtain approval from the Owner's Representative prior to final removal of silt fence barriers.

1.3.3.2 Hay Bale Barriers

Provide bales of hay or straw as a temporary structural practice to minimize sediment runoff. If bales are used, properly place the bales to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, and grading) in each independent runoff area (e.g., after clearing and grubbing in a area between a ridge and drain, place the bales as work progresses, remove/replace/relocate the bales as needed for work to progress in the drainage area). Install hay bale barriers in the locations indicated on the drawings at a minimum. The Owner's Representative will approve the final removal of hay bale barriers. Provide rows of bales of hay or straw as necessary as follows:

a. Along the downhill perimeter edge of areas disturbed.

b. Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.

c. Along the toe of cut slopes and fill slopes of the construction areas.

d. Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas.

e. Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales.

f. At the entrance to culverts that receive runoff from disturbed areas.

1.3.3.3 Construction Entrances

Trap sediment from vehicles departing the site in a stone construction entrance that meets the requirements of Connecticut Guidelines for Soil Erosion and Sediment Control 5-12-1. Aggregates for Construction Entrances shall conform to CONNDOT #3.

1.4 Submittals

Owner approval is required for submittals. Submit the following in accordance with SECTION 01300 - SUBMITTALS:

SD-06 Test Reports

Storm Water Inspection Reports for General Permit

Erosion and Sediment Controls

SD-07 Certificates

Mill Certificate or Affidavit

Certificate attesting that the Contractor has met all specified requirements.

1.5 Delivery, Storage, And Handling

Store materials in designated areas and as recommended by the manufacturer protected from the elements, direct exposure, and damage. Do not drop containers from trucks. Material shall be free of defects that would void required performance or warranty. Deliver products in the manufacturer's original sealed containers and stored in a secure area.

a. Furnish erosion control blankets and geotextile fabric in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Label erosion control blanket and geotextile fabric rolls to provide identification sufficient for inventory and quality control purposes.

PART 2 PRODUCTS

2.1 Components For Geotextile Silt Fences

2.1.1 Filter Fabric

Provide geotextile that complies with the requirements of ASTM D 4439, and consists of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and contains stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure. Provide synthetic filter fabric that contains ultraviolet ray inhibitors and stabilizers to assure a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile Strength	ASTM D 4632	100 lbs. min.
Elongation (percent)	ASTM D 4632	30 percent max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes And Posts

Use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 1.5 by 1.5 inches, and have a minimum length of 42 inches. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 0.5 pounds/linear foot and a minimum length of 42 inches.

2.1.3 Mill Certificate or Affidavit

Provide a mill certificate or affidavit attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. Specify in the mill certificate or affidavit the actual Minimum Average Roll Values and identify the fabric supplied by roll identification numbers. Submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.2 Components For Hay Bale Barriers

The hay or straw in the bales shall be stalks from oats, wheat, rye, barley, rice, or from grasses such as byhalia, bermuda, etc., furnished in air dry condition. Provide rectangular bales with a standard cross section of 14 by 18 inches. Wire-bound or string-tie all bales. Use either wooden stakes or steel posts to secure the hay bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimensions of 1.5 by 1.5 inches in cross section and have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing hay bales, shall have a minimum weight of 0.5 pounds/linear foot and a minimum length of 3 feet.

PART 3 EXECUTION

3.1 Installation Of Silt Fences

Extend silt fences a minimum of 16 inches above the ground surface without exceeding 30 inches above the ground surface. Provide filter fabric from a continuous roll cut to the length of the barrier to avoid the use of joints. Support posts should be spaced no greater than 10 feet apart. When joints are unavoidable, splice together filter fabric at a support post, with a minimum 6 inch overlap, and securely sealed. Excavate trench approximately 6 inches wide and 6 inches deep on the upslope side of the location of the silt fence. The 6 by 6 inch trench shall be backfilled and the soil compacted over the filter fabric. Remove silt fences upon approval by the Owner’s Representative.

3.2 Installation Of Hay Bale Barriers

Place the hay bales in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. At the each end of each row turn bales uphill when used to retain sediment. Install hay bales so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. Entrench and backfill the barrier. Excavate a trench the

width of a bale and the length of the proposed barrier to a depth of 2 to 4 inches. Securely anchor each bale by at least two stakes driven through the bale. Drive the first stake or steel post in each bale toward the previously laid bale to force the bales together. Drive stakes or steel pickets a minimum 18 inches deep into the ground to securely anchor the bales. After the bales are staked and chinked (gaps filled by wedging with hay or straw), backfill the excavated soil against the barrier. Conform the backfill soil with the ground level on the downhill side and build up to 4 inches against the uphill side of the barrier. Scatter loose hay or straw over the area immediately uphill from a hay bale barrier to increase barrier efficiency.

3.3 Field Quality Control

3.3.1 Silt Fence Maintenance

Inspect the silt fences in accordance with paragraph, titled "Inspections," of this section. Any required repairs shall be made promptly. Pay close attention to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, replace the fabric promptly. Remove sediment deposits when deposits reach one-half of the height of the barrier. Remove a silt fence when it is no longer required. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. Disposal of silt fence when no longer needed on site for subsequent activities is the responsibility of the contractor.

3.3.2 Hay Bale Barrier Maintenance

Inspect hay bale barriers in accordance with paragraph, titled "Inspections". Pay close attention to the repair of damaged bales, end runs and undercutting beneath bales. Accomplish necessary repairs to barriers or replacement of bales in a prompt manner. Remove sediment deposits when deposits reach within 3 inches of the top of the barrier. Remove a hay bale barrier when it is no longer required. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. Disposal of hay bales when no longer needed on site for subsequent activities is the responsibility of the contractor.

3.3.3 Construction Entrance Maintenance

Remove accumulated sediment/debris from Entrances in accordance with paragraph titled “Inspections”, of this section. Remove sediment deposits when deposits reach 1/3 the height of the check dam. Maintain the stone construction entrances in a condition which will prevent tracking and washing of sediment onto paved surfaces. If stone construction entrances become unusable, add a fresh layer of CONNDOT #3 Stone. All removed accumulated material shall be placed under the proposed soil cover or disposed of offsite at an Owner approved facility.

3.4 INSPECTIONS

3.4.1 General

Inspect disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials exposed to precipitation, structural control measures, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Conduct inspections where areas have been finally stabilized at least once every month while on site for contract work.

3.4.2 Inspections Details

Inspect disturbed areas [and areas used for material storage that are exposed to precipitation] for evidence of, or the potential for, pollutants entering the drainage system. Observe erosion and sediment control measures to ensure that they are operating correctly. Inspect discharge locations or points to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Inspect locations where vehicles exit the site for evidence of offsite sediment tracking.

3.4.3 Inspection Reports

For each inspection conducted, prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations, maintenance performed, and actions taken. Furnish the report to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

3.4.4 Timely Repair of Deficiencies

Repair any deficiencies found during the above inspections immediately after storm events, within 24 hours in good weather.

END OF SECTION

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 Submittals

A. SD-03 Product Data

i. As-Built Record of Equipment and Materials

a. Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

B. SD-11 Closeout Submittals

i. Record Drawings

a. The Contractor shall prepare and provide drawings showing final as-built conditions of the project over the entire project area including grades, slopes, materials and all design features included in the construction. The final CADD record drawings must consist of one set of electronic CADD drawing files in the specified format, 2 sets of prints, and one set of the approved working Record drawings.

1.2 Project Record Documents

1.2.1 Record Drawings

A. This paragraph covers record drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working record drawings" and "final record drawings" refer to contract drawings which are revised to be used for final record drawings showing as-built conditions.

i. **Working Record and Final Record Drawings**

Revise 2 sets of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. Keep these working as-built marked drawings current on a weekly basis and at least one set available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction must be accurately and neatly recorded as they occur by means of details and notes. Prepare final record (as-built) drawings after the completion of each definable feature of work as listed in the Contractor Quality Control Plan. The working as-built marked prints and final record (as-built) drawings will be jointly reviewed for accuracy and completeness by the Owner's Representative and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working drawings as specified herein, the Owner's Representative will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the record drawings. This monthly deduction will continue until an agreement can be reached between the Owner's Representative and the Contractor regarding the accuracy and completeness of updated drawings. Show on the working and final record drawings, but not limited to, the following information:

a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, show by offset dimensions to two permanently fixed surface features the end of each run including each change in direction on the record drawings. Locate valves, splice boxes and similar appurtenances by dimensioning along the utility run from a reference point. Also record the average depth below the surface of each run.

b. Correct grade, elevations, cross section, or alignment of roads, earthwork, structures or utilities if any changes were made from contract plans.

c. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

d. Changes or modifications which result from the final inspection.

e. Where contract drawings or specifications present options, show only the option selected for construction on the final as-built prints.

f. Plans and cross sections developed from accepted survey data obtained in and adjacent to sediment removal areas including prior to dredging and sediment removal; after removal / prior to backfill, as accepted for backfill; and final, after backfill / before planting.

1.2.1.2 Payment

A. No separate payment will be made for record drawings required under this contract, and all costs accrued in connection with such drawings are considered a subsidiary obligation of the Contractor.

1.2.2 Final Approved Shop Drawings

A. Furnish final approved project shop drawings 30 days after transfer of the completed facility. Final shop drawing submittals shall be bound in a three-ring binder indexed and assembled in the order of the design specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02000

PROJECT SURVEY AND STAKEOUT

PART 1 GENERAL

1.1 SCOPE

A. The work to be performed under this section consists of doing all necessary field survey work required to construct all elements of the project as shown on the Construction Plans and as specified herein.

B. The work shall include the generation of pre-construction, post-removal, and as-built surveys and survey drawings.

1.2 GENERAL

A. The work shall include, but shall not be limited to, stakeout, as-built surveys of work items as required.

PART 2 PRODUCTS

Not Used.

PART 3 CONSTRUCTION

3.1 GENERAL

A. Surveying work shall be performed by a Surveyor licensed in the State of Connecticut.

B. Contractor shall coordinate his work and Surveyor's work to avoid delays.

C. Establish pre-construction topography of work area including wetland sediment and open water sediment areas.

D. Prior to construction, all work shall be staked out to establish elevations and locations, and this information shall be plotted and available to the Owner's Representative. The exact position of all work shall be established from control points, and section grid lines established at the site.

E. The Contractor shall locate and place all cut, fill, slope, final grade or other stakes and points, as the Owner's Representative may direct for the proper progress of the work. All control points shall be properly guarded and flagged for easy identification.

F. The Contractor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc., throughout the life of the project. Damaged or destroyed points, bench marks or stakes, or any reference points made inaccessible by the progress of the construction, shall be replaced or transferred by the Contractor. Any of the above points shall be referenced by ties to acceptable objects and recorded. Any alterations or revisions in the ties shall be so noted and the information furnished to the Owner's Representative immediately. All computations necessary to

establish the exact position of the work from control points shall be made and preserved by the Contractor. All computations, survey notes, and other records necessary to accomplish the work shall be neatly made.

G. The Contractor shall provide the Owner's Representative with the grades of work items as required in Specifications.

3.2 PRE-CONSTRUCTION, POST-REMOVAL, AND AS-BUILT SURVEY

A. Surveys shall be on a grid with a maximum spacing of 50 feet or an equivalent method and spacing approved by the Owner's Representative, with additional elevations at slope change locations. Surveys shall identify notable surface features within work areas such as drainage channels in Wetland W-5. The as-built survey shall include locations of grid points and physical features, bottom elevations, and topographic contour elevations shall be at 0.5 foot intervals.

B. The topography, revised surface elevations, and grades of any areas of sediment removal or affected as part of the project construction including pre- and post-removal surveys, backfill survey, and the restored staging area. The topographic survey shall be performed by a surveyor licensed in the State of Connecticut. The topographic survey drawing should be provided with 0.5-foot or less contours, spot elevation 0.01 foot, and supplied at a scale of 1" = 40' or larger. Contractor shall show each survey separately and as a combined drawing such that the elevation differences between original grade and post-removal grade can be determined at any point in the sediment removal area. Individual and combined drawings shall also clearly show the differences in elevation between removed wetland bottom and top of backfill and between top of backfill and original wetland bottom.

C. Contractor shall provide survey of areas disturbed for the installation of temporary facilities where excavation of the environmental control cover was required. Such surveys may be limited to the area of the disturbance plus 20-feet around the perimeter. Contractor shall show each survey separately and as a combined drawing such that the elevation differences between original grade and excavation bottom can be determined at any point in the sediment removal and replacement area. Individual and combined drawings shall also clearly show the differences in elevation between excavation and bottom top of backfill and between top of backfill and original grade.

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of clearing, grubbing, and stripping of the work area as shown, specified, or required.

1.2 RELATED SECTIONS

A. Section 01502 – Environmental Protection

B. Section 02222 – Excavation

1.3 REGULATORY REQUIREMENTS

A. Conform to applicable code for disposal of debris. No burning debris on-site.

B. Coordinate clearing work with utility companies.

PART 2 PRODUCTS

2.1 MATERIALS

A. None under this Section.

PART 3 EXECUTION

3.1 TREATMENT OF PHRAGMITES

A. The Contractor shall provide herbicide spot application services in support of the remediation and restoration activities at the site. Prior to removal action, the Contractor shall apply the herbicide HABITAT (Imazypyr) at label specified rates to common reed (*Phragmites australis*) in the remediation areas and in the adjacent areas extending a distance of approximately 25 feet beyond the planned excavation limits. The herbicide application shall be conducted by licensed personnel in appropriate personal protective equipment using properly calibrated backpack sprayers or other approved methods. In advance of any herbicide application work, the contractor shall obtain the necessary CTDEEP permits and provide requisite public notifications. The Contractor applying the herbicide must be licensed to do so in wetlands in the State of Connecticut. The Contractor shall perform the herbicide application in the appropriate season so as to maximize its effectiveness.

B. The subcontractor shall provide the following documentation to the Owner's Representative prior to mobilization to the site for herbicide application:

i. CTDEEP Business License number/Certificate of Registration and indicating the firm's ability to perform pesticide applications to aquatic, wetland, and terrestrial sites;

ii. Documentation of any violation notices or fines/penalties received during the past three (3) years;

iii. Operator and/or Supervisory Licenses and resumes of key personnel (indicating CTDEEP license number, Bachelors of Science degree in a resource management discipline, and years of experience as a pesticide applicator/operator);

iv. Name/CTDEEP certified supervisory applicator number of field crew chief; and

v. Proof on Insurance pursuant to Connecticut Pesticide Control Regulations.

3.2 CLEARING AND GRUBBING

A. No clearing, grubbing, or stripping shall commence until the Contractor has staked out the proposed work, except for the work that may be required to complete the stakeout survey.

B. Except as otherwise directed, the Contractor shall cut, grub, remove and dispose of all objectionable material such as trees, stumps, stones, brush, shrubs, roots, rubbish and debris within the limits of the clearing defined in the Construction Plans. All such material shall be removed from areas to be occupied by structures, roads and pipelines and from areas designated for excavation.

C. Stripped topsoil and vegetation may be re-used in slope repair areas outside of the wetlands, where approved by the Owner's Representative.

D. When so designated by the Owner's Representative, the Contractor shall protect trees or groups of trees from damage by any construction operations by erecting suitable barriers, or by other approved means. The Contractor shall make every effort not to damage common native trees and shrubs, other than those he is permitted to cut, within or adjacent to the limits of work. Areas outside the limits of clearing shall be protected. No equipment or materials shall be stored in or allowed to damage these areas.

E. The Contractor shall chip trees, brush, and stumps, as required. Woodchips will become the property of the Owner, and be spread and placed away from wetland areas at the direction of the Owner's Representative.

3.3 FIELD QUALITY CONTROL

A. The limit of clearing, grubbing, and stripping shall be in accordance with the Contract Documents and the Owner's Representative's direction, and will be verified during the course of the work by the Owner's Representative.

END OF SECTION

SECTION 02140

DEWATERING WATER TREATMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, equipment, tools and appurtenances required to contain, collect, treat, and discharge dewatering liquid from removed wetland sediment as shown, specified, or required. The control of precipitation in sediment dewatering areas shall be considered as part of this work. The Contractor shall correct all damage or permit violations resulting from inadequacy of the dewatering system.

1.2 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01502 – Environmental Protection

C. Section 02222 – Excavation

D. Section 02223 – Backfill

E. Section 35023 - Hydraulic Dredging

1.3 SUBMITTALS

A. Prior to starting the work, submit a plan of the proposed dewatering systems prepared by a specialist having at least five (5) year's experience in the field of water treatment. Coordinate water treatment with sediment removal work and the Contractor's approved Soil Erosion & Sediment Control Plan. Any review or comments by the Owner's Representative shall not relieve the Contractor of his responsibility for dewatering.

PART 2 PRODUCTS

2.1 Material

A. Materials shall conform to those included in the Contractor's plan for dewatering.

PART 3 EXECUTION

3.1 Conduct Of Wastewater Treatment

A. The Contractor shall design, furnish, install and operate a sediment dewatering water treatment system as per the Contractor's submitted plan approved by the Owner and Owner's Representative and in accordance with the state permit for the entire duration of project including during dredging and post dredging. The Contractor shall install and maintain erosion and

sediment control measures during construction and operation of the system. During discharge operations, the Contractor shall install and maintain erosion and sediment control measures to ensure that discharge energies are sufficiently dissipated to prevent the erosion of soil and the discharge of eroded sediments to watercourses is prevented.

B. The Contractor shall outfit the discharge with a flow meter capable of recording total daily flow. The device shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted capability of that type of device. The maximum discharge rate cannot exceed the daily limit specified in the state permit registration.

C. The Owner will provide existing data for surface water quality to CTDEEP at the time of registration for the water treatment system water discharge permit. The Contractor will be responsible for any additional sampling and testing of the influent stream to the water treatment system as required to complete the initial screening analysis for permit compliance. The initial screening analysis requirements for the Contractor are anticipated to mirror the ongoing screening analysis requirements detailed in this specification.

D. Contractor will be responsible for sampling and testing water being discharged to Long Island Sound as required for permit compliance including both “ongoing screening analysis” and “monitoring.”

i. Ongoing Screening Analysis

a. Samples for ongoing screening shall be grab samples representative of the untreated sediment dewatering water and collected, preserved, handled, and analyzed using methods with quantification levels approved by the permit.

b. Ongoing screening will be performed annually for discharges less than 5,000 gallons per day or twice annually for discharges equal to or greater than 5,000 gallons per day.

c. Sampling and analysis for ongoing screening shall include total volatile organic compounds (VOCs) by EPA Method 624, total petroleum hydrocarbons (TPH), Methyl tertiary-butyl ether (MTBE) by EPA Method 624, total arsenic, total cadmium, total copper, total iron, total lead, total mercury, total zinc, pH, temperature, total settleable solids, and total suspended solids, or as defined in permit.

d. Sampling and analysis for ongoing screening shall include parameters associated with or affected by any additives used in dredging process, sediment dewatering process, or water treatment as defined in permit.

ii. Monitoring

a. The discharge to Long Island Sound shall be monitored for any pollutant that is identified during the screening at levels above the permit limits.

b. Sampling and analysis for monitoring shall include, at a minimum, total settleable solids, total suspended solids, total arsenic, and aquatic toxicity, or as defined in permit.

c. Samples for monitoring shall be grab samples representative of the undiluted discharge and collected, preserved, handled, and analyzed using methods with quantification levels approved by the permit.

d. Monitoring for initiation of a discharge shall be conducted on the first day of discharge, every other day for the first two weeks, weekly for the next month, then monthly thereafter depending on the discharge flow as defined in the permit.

e. Monitoring after system restarts after an exceedance of an effluent limitation shall be conducted on the first day of discharge, every other day for the first week, weekly for the next month, and then in accordance with the sampling schedule at the time the discharge was ceased.

f. Monitoring after system restarts for any reason other than an exceedance of a parameter limit shall be conducted on the first day of discharge and then in accordance with the sampling schedule at the time the discharge was ceased.

iii. All discharges, except intermittent discharges as defined in the permit, with a duration of greater than 90 days, shall be monitored for aquatic toxicity in accordance with the permit.

iv. All sample analyses shall be done by a laboratory certified by the Connecticut Department of Public Health and using methods approved in accordance with the permit.

v. Contractor will report results to Owner or Owner's Representative. Owner's Representative will coordinate transmittal of reports to CTDEEP as required for permit compliance.

vi. Contractor will make system adjustments as needed based on testing results to meet permit requirements for effluent water quality.

E. Permit Effluent Limitations

i. The pH of the discharges to Long Island Sound shall not be less than 6.0 nor greater than 8.5 standard units at any time.

ii. Effluent limitations are identified in Attachment A of the state permit. The following table summarizes the values for the minimum required ongoing screening and monitoring parameters:

Parameter	Maximum Concentration	Maximum Concentration 10:1 Dilution	Maximum Concentration 100:1 Dilution
Total VOCs	50 ug/L	--	--
1,1,2-TCA	42 ug/L	--	--
MTBE	70 ug/L	--	--
TPH	5.0 mg/L	--	--
Total Suspended Solids	30 mg/L	--	--
Total Settleable Solids	No limit	--	--
Arsenic, total	--	0.021 ug/L	0.021 ug/L
Cadmium, total	--	10.0 ug/L	95.9 ug/L
Copper, total	--	48 ug/L	480 ug/L
Iron, total	--	--	--
Lead, total	--	9.8 ug/L	93.6 ug/L
Mercury, total	--	1.0 ug/L	9.7 ug/L
Zinc, total	--	322 ug/L	1000 ug/L

ug/L – micrograms per liter.
mg/L – milligrams per liter.
10:1 dilution for discharges based on 7Q10 listed in permit registration.
100:1 dilution for discharges based on 7Q10 listed in permit registration.

F. If monitoring data or any other information indicates that a violation of an effluent limitation or any other condition of the state permit has occurred, the Contractor shall immediately notify the Owner's Representative and Owner for reporting as required by the permit and the Contractor shall take all reasonable action to determine the cause of such violation, correct such violation and mitigate results, prevent further violation, and report the results in writing to the Owner's Representative within one day of such violation and such corrective action for transmittal to the permitting authority.

G. The discharge shall cease immediately in accordance with the permit if:
i. Any limit is exceeded by more than 2 times;
ii. The pH is less than 5.0 or greater than 9.5 standard units;
iii. Any violation is not corrected within 7 days;
iv. The violation results in a toxic impact on aquatic life or threat to human health; or
v. The discharge is required to cease as per the permit for aquatic toxicity test results.

H. Contractor will be held legally and financially liable for any and all permit violations per Contract Terms and Conditions.

3.2 REQUIREMENTS

A. Comply with the following minimum requirements for dewatering:

i. The Contractor shall provide sufficient standby equipment for immediate operation. This

equipment shall be capable of maintaining dewatering on a continuous basis in the event that all of, or part of, the system should become inadequate or fail, including failure by a power outage.

ii. The Contractor shall comply with all applicable regulations and standards for discharge, treatment and/or disposal of dewatering liquids. The Contractor shall perform all necessary analytical testing.

iii. There shall be NO discharge of silty, muddy, or polluted water from construction or dewatering operations to a natural water course. The Contractor shall ensure that no waters are to reach existing water courses.

iv. All discharge of dewatering water shall be in accordance with applicable regulations, the project permits, and the Contractor's approved Soil Erosion and Sediment Control Plan.

v. The Contractor is responsible for complying with all permits and approvals associated with sediment dewatering and water treatment.

END OF SECTION

SECTION 02222
EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall be responsible for material removal and stockpiling, excavation and grading for drainage and other site features.

B. The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of test pits, excavation, regrading, and other related and incidental work within the designated area and as required for the construction of other work, as shown, specified or required.

C. The Contractor shall locate all existing utilities in work areas prior to commencing any excavation activities and perform test pits. All utilities shall be protected, and repaired or replaced if damaged.

D. The Contractor shall protect all benchmarks, existing structures and fences, from damage by excavation equipment, vehicular traffic, or other construction activities.

E. The Contractor shall be responsible for identifying and locating lines, levels, elevations, limits of work, and datum as required to complete the work.

F. Contractor shall load, transport, and dispose of dewatered sediment at an approved, licensed, permitted, upland receiving facility that Owner has approved.

1.2 RELATED SECTIONS

A. Section 01502 - Environmental Protection
B. Section 02140 – Dewatering Water Treatment
C. Section 02260 - Backfill

1.3 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the work are as indicated.

1.4 DEFINITIONS

A. Excavation shall mean the removal from place of all materials and shall include sediment, soil, structures above and below ground, rock, pavements, topsoil, demolition waste material, boggy waste, rubbish, tree stumps, boulders, logs, ashes, cinders, municipal solid waste, or

organic material such as peat, humus or organic silt.

B. Muck excavation shall mean the excavation and removal of soft, wet unsuitable subgrade material to the depth as directed by the Owner's Representative.

1.5 PROTECTION OF PEOPLE AND PROPERTY

A. The Contractor shall plan and conduct his operations so as to prevent damage to existing structures, utilities, safeguard people and property, minimize traffic inconvenience, protect the structures to be installed, and provide safe working conditions.

B. The Contractor shall not stockpile any material without the Owner's Representative's acceptance.

C. Stockpiles that are accepted by the Owner's Representative shall be carefully placed and the surrounding area shall be protected by placement of hay or straw bales, or an equivalent erosion control structure consistent with the State of Connecticut accepted standards and practices. All work shall be performed consistently with an erosion and sedimentation control plan accepted by the Owner's Representative.

D. All utilities (i.e., watermains, storm sewers, sanitary sewers, underground power lines) damaged during excavation activities shall be repaired or replaced to its original state. All damaged utilities shall be reported to Owner's Representative prior to repairing.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known underground, aboveground, and aerial utilities. Stake and flag locations.

C. Notify utility company to remove and relocate utilities.

D. Protect above and below grade utilities which are to remain.

E. Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.

F. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

G. Provide temporary access for equipment in wetlands with low pressure ground mats, timber mats, swamp mats, floats, or barge. The Contractor shall endeavor to minimize the footprint of temporary access routes outside sediment removal areas and in wetlands. Fill roads shall not be constructed or used.

3.2 WETLAND W-6 UTILITY TEST PIT

A. Verify electric cable location in Wetland W-6 with Eversource and utility mark out.

B. Excavate test pits above electric cable sufficient to locate thermal sand backfill.

C. Mark out “No Dig Area” and confirm with Owner and Eversource Representatives. East edge of sediment removal shall be no closer than west edge of thermal sand backfill or a minimum of 2 feet off west cable. Mark limits of sediment removal and verify with Owner’s Representative.

D. Equipment crossing or working above electric cables shall have less than 7 psi ground pressure or work on equivalent low pressure mats.

3.3 EXCAVATION

A. Determine if Pilot Test cells will be included in removal or excluded / worked around. Confirm with Owner’s Representative.

B. Excavate sediment targeted for remediation.

C. The excavated sediment shall be stockpiled in the area shown on the Plans or as directed by the Owner’s Representative.

D. All stockpiles shall be vegetated and/or temporary mulched to prevent erosion and sedimentation. The Contractor shall be responsible for cleaning any sediment runoff from the stockpiles at any time during construction as directed by the Owner’s Representative.

3.4 LIMITS OF EXCAVATION

A. Excavation shall be carried to the dimensions indicated in the Construction Plans or as directed by the Owner’s Representative.

B. Excavation carried below the depths shown, specified or required, without written directions from the Owner’s Representative, shall be refilled to the proper grade with backfill as per these specifications; all work of this nature shall be at the Contractor's expense.

3.5 UTILITY PROTECTION, REPAIR, AND REPLACEMENT

A. The Contractor shall contact all local utility companies prior to commencing work.

B. The Contractor shall locate all existing utilities (i.e., water mains, storm sewers, sanitary sewers, underground power lines, etc.) in work areas prior to commencing any excavation activities in conjunction with the utility and Owner's Representative.

C. The Contractor shall provide all the work, materials, and equipment required to protect the existing utilities in the working area.

D. The Contractor shall maintain essential site utilities (water, sewer, power, telephone, etc.) in operating condition throughout the work. The Contractor shall provide any necessary temporary utilities should services be disrupted due to the Contractor's work.

E. All utilities damaged during excavation activities shall be repaired or replaced to the lines and grades of its original working conditions in accordance with the requirements of the authorities having jurisdiction.

F. All damaged utilities and method of repair shall be reported to the Owner's Representative and utility owner for his approval by the Contractor prior to replacement.

3.6 STORAGE AND DISPOSAL

A. Excavated material shall be placed in stockpiles until it can be dewatered and transported offsite. Places for stockpiles shall be only where shown or approved, and shall avoid environmentally sensitive areas. The Contractor shall provide erosion control methods such as mulching, perimeter hay or straw bales, etc., in accordance with the Contractor's approved erosion and sediment control plan.

3.7 EXCAVATION INSTRUCTIONS

A. No excavation shall commence until the Contractor has staked out the proposed work, the Owner's Representative has reviewed and approved or adjusted the stakes as needed, and the Contractor has surveyed the proposed work.

B. All excavation shall be performed as indicated in the Construction Plans to the lines and elevations shown.

C. The Contractor shall provide temporary siltation/sediment control measures during construction in accordance with the provisions in Section 01502 − Environmental Protection.

D. Following excavation, the Contractor shall regrade and add fill as needed in order to achieve required surface as shown in the Construction Plans.

3.8 FIELD QUALITY CONTROL

A. The depth and limit of excavation will be in accordance with these Specifications, Construction

Plans, and the Owner's Representative's direction and will be verified during the course of excavation by the Owner's Representative.

END OF SECTION

SECTION 02230

CRUSHED STONE

PART 1 GENERAL

1.1 Description

A. The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing, placing, and compacting the crushed stone as shown, specified, or required.

1.2 Related Sections

A. Not Used.

1.3 Reference Section

A. ASTM D422

B. ASHTO-T-96

C. CTDOT M.01

PART 2 PRODUCTS

2.1 Material

A. Crushed stone shall be durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated, or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight.

B. Thin or elongated pieces are defined as follows: Thin stones shall be considered to be such stones whose average width exceeds four times their average thickness. Elongated stones shall be considered to be such stones whose average length exceeds four times their average width.

C. The crushed stone shall be durable crushed gravel stone obtained by artificial crushing of cobbles, boulders, or fieldstone.

D. The crushed stone shall be free from clay, loam, or deleterious material and not more than 5 percent of satisfactory material passing a No. 200 sieve will be allowed to adhere to the crushed stone.

E. The crushed stone shall have a maximum percentage of wear as determined by the Los Angeles Abrasion Test (AASHTO-T-96) of 50%.

F. The crushed stone shall be uniformly blended according to the grading requirements of CTDOT specifications, for the respective stones sizes shown in the following table:

CTDOT M.01.01 No. 3	Construction Entrances
CTDOT M.02.06 Gradation C	Crushed Stone Cover (Type 1 / Driving Surface)

CTDOT M.01.01 No. 3	
Sieve Size	Percent Passing by Weight
2 ½ in.(63 mm)	100
2 in. (50 mm)	90 - 100
1 ½ in. (37.5 mm)	35 - 70
1 in. (25 mm)	0 - 15
3/4 in. (19 mm)	--
1 / 2 in. (12.5mm)	0 - 5
CTDOT M.02.06 Gradation C	
Sieve Size	Percent Passing by Weight
1 ½ in. (37.5mm)	100
3/4 in. (19 mm)	45 - 80
1 / 4 in. (6.3 mm)	25 - 60
No. 10 (2.0 mm)	15 - 45
No. 40 (425 nm)	5 - 25
No. 100 (150 nm)	0 - 10
No. 200 (75 nm)	0 - 5

2.2 Submittal and Testing

A. The Contractor shall submit, to the Owner's Representative for approval, evidence that the material proposed for use as crushed stone is suitable for the proposed application prior to the material being transported to the site. The necessary evidence shall include, but not necessarily be limited to, the following testing:

Grain Size ASTM D422

Durability AASHTO T96

B. The Contractor shall submit to the Owner's Representative the evidence as specified in Paragraph 2.2 above, along with a minimum 50-pound sample of the proposed crushed stone for each different source of crushed stone.

C. No material shall be placed unless approved by the Owner's Representative.

D. If in the opinion of the Owner's Representative the crushed stone is unsuitable for the proposed application then the Contractor shall submit to the Owner's Representative the required suitable evidence as specified in Paragraph 2.2 above for crushed stone from a different source.

PART 3 EXECUTION

3.1 Placement

A. Aggregate Engineered Control and repairs or additions shall consist of CT DOT M.02.06 Gradation C Crushed Stone.

B. Uniform layers of stone shall be placed to the lines, depths, and grades as shown on the Plans. A sufficient quantity of stone shall be added to allow for settling to meet the final minimum 4-inch thickness.

C. Stone shall be hand tamped in-place around pipes.

D. Backfilling of stone shall be performed by the Contractor in a manner such that the material is kept clean and free of foreign materials on site, including fill, silts, debris, etc.

E. An indicator barrier consisting of a 50-foot by 50-foot grid of caution tape shall be placed on the surface of the existing material and below the new crushed stone layer. Depth indicator stakes consisting of a steel stake with elevation intervals marked by a professional surveyor employed by the contractor will be added at the perimeter of the crushed stone layer and at a few strategic locations throughout the crushed stone layer. Depth indicator stakes shall be installed at no less than one depth indicator stake per 10,000 square feet of surface area.

F. The Owner's Representative will at any time inspect the stone in stockpiles on-site for contamination and, if necessary, reject all or portions of the crushed stone.

END OF SECTION

SECTION 02233

GRAVEL ACCESS ROAD

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work specified herein consists of the construction of the gravel access road. The work shall be performed in accordance with this Specification and shall conform to the lines, grades, notes, and typical sections shown in the Drawings. Sources of all materials shall be selected well in advance of the time that materials will be required in the work.

B. Gravel access roads to be constructed where approved by Owner's Representative for convenience of the Contractor and removed when no longer needed solely at the Contractor's expense.

1.2 REFERENCES

A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only.

B. American Society for Testing and Materials (ASTM):

i. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristic of Soil Using Standard Effort.

ii. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

iii. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

A. Aggregate Base: Aggregate base as used herein is well-graded, crushed, durable aggregate uniformly moistened and mechanically stabilized by compaction.

B. Degree of Compaction: Degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D698, abbreviated hereinafter as percent laboratory maximum density.

1.4 SUBMITTALS

A. Copies of Waybills and Delivery Tickets: Submit during the progress of work. Certified waybills and delivery tickets for all materials actually used and including a notification stating the type of coarse aggregate delivered.

B. Manufacturer's Data: Submit geotextile manufacturer's data per SECTION 013000 - SUBMITTALS.

1.5 QUALITY ASSURANCE

Not used.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Materials, including approved material available from excavation and grading, shall be stockpiled in the manner and at locations designated. Before stockpiling of material, storage sites shall be cleared and sloped to drain. Materials obtained from different sources shall be stockpiled separately.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. Aggregate shall be crushed and shall have a gradation conforming to:

Sieve Size	Percent Passing
1.25”	100
1”	80-100
0.625”	50-80
No. 4	25-40
No. 40	3-18
No. 200	0-7.5

2.2 GEOTEXTILES

A. As specified in SECTION 02595 - GEOTEXTILE.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing in or adjacent to the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction on approved access road alignments.

3.2 OPERATION OF AGGREGATE SOURCES

A. Aggregates shall be obtained from off-site sources and shall be approved by the Owner’s Representative.

3.3 PREPARATION OF UNDERLYING COURSE

A. Before constructing aggregate base course, the underlying material shall be cleaned of foreign substances. Surface of underlying material shall meet the specified compaction. Ruts or soft yielding spots that may appear in the underlying material, areas having inadequate compaction, and deviations of the surface from requirements specified shall be corrected. Stabilization may be accomplished by mixing base course material into the underlying course and compacting by approved methods. Properly compacted material will be considered as part of the underlying course and shall meet all requirements for the underlying course. Finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until base course is placed.

3.4 PLACEMENT OF GEOTEXTILE

A. Fabric shall be placed on a normally prepared subgrade area extending the full width of the subbase layer being protected. Place fabric in a loose and unstretched condition to minimize shifting, puncture, and/or tearing. Overlap fabric roll-ends and edges a minimum of 12 inches with adjacent material. Place subbase material within 2 days after placement of fabric to minimize exposure. Place subbase material in a manner to minimize slippage of the fabric. If excessive slippage occurs, use steel securing pins at a maximum spacing of 6 feet. Securing pins shall be 18 inches long by 3/16 inch in diameter, pointed at one end and with a 1-1/2-inch washer head at the other end. Alternate securing devices may be used with the approval of the Owner's Consultant. Remove and replace fabric areas damaged during construction or sew replaced fabric. No traffic or construction equipment will be permitted on the fabric.

3.5 INSTALLATION

A. Compaction: Each layer of aggregate base course shall be compacted. Water content shall be maintained at optimum plus or minus 2 percent. Density of compacted mixture shall be at least 95 percent of laboratory maximum dry density. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. Areas inaccessible to the rollers shall be compacted with mechanical tampers and shall be shaped and finished by hand methods.

B. Layer Thickness: Compacted thickness of the aggregate course shall be as indicated on the Drawings.

C. Proof Rolling: Proof rolling of the areas indicated shall be in addition to the compaction specified and shall consist of the application of five coverages with a heavy vibratory steel drum roller. In areas designated, proof rolling shall be applied to the top lift or layer on which base course is laid and to each layer of base course. Water content of the top lift or layer on which base course is laid shall be maintained at optimum or at percentage directed from start of compaction to completion of proof rolling. Materials in base course or underlying materials that produce unsatisfactory results by rolling shall be removed and replaced with satisfactory materials and recompacted.

D. Finishing: The surface of the top layer shall be finished to grade and cross section shown or as approved by the Owner's Representative. The surface shall be of uniform texture. Should the surface for any reason become rough, corrugated, uneven in texture, or traffic-marked prior to completion, such unsatisfactory portion shall be scarified, reworked, recompacted, or replaced as directed.

3.6 FIELD QUALITY CONTROL

A. Thickness: Thickness of the base course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3-inch diameter test holes penetrating the base course.

3.7 TRAFFIC

A. Completed portions of the area may be opened to traffic after compaction testing and thickness measurements are completed and the roadway has been accepted by the Owner's Representative.

3.8 MAINTENANCE

A. The aggregate base course shall be maintained in a satisfactory condition for the duration of the contract. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact.

3.9 DISPOSAL OF UNSATISFACTORY MATERIALS

A. Removed in-place materials that are unsuitable for the base course material that is removed for the required correction of defective areas, and waste material and debris, shall be disposed of as directed by the Owner's Representative.

3.10 REMOVAL OF ACCESS ROADS

A. Gravel access roads constructed to provide the Contractor access to areas of the site shall be removed by the Contractor along with the removal of all other temporary facilities.

-- END OF SECTION --

SECTION 02595

GEOTEXTILE

PART 1 GENERAL

1.1 WORK INCLUDED

A. The Contractor shall furnish all labor, materials, equipment, tools and appurtenances required to complete the work of furnishing, and placing geotextile for the access road, complete with appurtenances, as shown, specified or required.

1.2 RELATED SECTIONS

A. Section 02233 − Gravel Access Road

1.3 SUBMITTALS

A. The Contractor shall furnish data from the geotextile manufacturer to verify the geotextile's polymer properties: chemical, resistance, density, polymer type and ultraviolet stability; mechanical properties; weight, tensile strength, permittivity apparent opening size, and puncture strength.

B. The Contractor shall furnish a mill certificate testing results from the geotextile manufacturer attesting that the fabric to be delivered to the site meets all requirements specified. Fabric will be rejected if it is found to have defects, rips, holes, flaws, deterioration or other damage.

1.4 PRODUCT HANDLING

A. The Contractor shall protect the work described in this Section before, during, and after installation, and shall protect the installed work covered by other Sections.

B. The Contractor shall, during all periods of shipment and storage, protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 120°F, mud, dirt, dust, debris and other deleterious sources. The fabric shall be maintained, wrapped in heavy-duty protective covering until it is installed.

C. If the Owner's Representative determines material is damaged or has excessive sunlight exposure, the Contractor shall immediately make all repairs and replacements, at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 GEOTEXTILE (NON-WOVEN)

A. The non-woven geotextile for the access road shall be Style 4506 as produced by Amoco, or approved equal, and shall meet the following requirements:

Property	Minimum Requirements	Method
Mass/Area	6 oz/sy	ASTM D5621
Tensile Strength	160 lbs	ASTM D4632
Elongation	50%	ASTM D4632
Permittivity	110 gpm/sf	ASTM D4491

Property	Minimum Requirements	Method
Burst Strength	350 psi	ASTM D3786
Equivalent Opening	70 Sieve	ASTM D4751

2.2 WIDTH OF FABRIC

A. To keep the number of overlays to a minimum, the geotextile shall be provided in sections not less than 12 feet wide. Seams, if used, shall be made at the factory and shall be tested in accordance with ASTM D5034 and D5035. The strength shall not be less than the required tensile strength of the geotextile in any principal direction.

PART 3 EXECUTION

3.1 SITE PREPARATION

A. Geotextile subgrade preparations shall conform to the requirements of this Section and related sections. The base surface shall be cleared of sharp objects, boulders, stumps, or any materials that may contribute to fabric punctures, shearing, rupturing or tearing. The subgrade shall be inspected for unstable areas or soft spots, before the fabric is placed, and additional fill shall be placed and compacted to eliminate those unstable areas.

3.2 INSTALLATION

A. The geotextile shall be placed in the manner and at the locations agreed upon and accepted. When placing the geotextile, sections shall be field-sewn, or heat-fused, as recommended by the manufacturer. Geotextile placed on slopes shall be shingled so that the upper strip of fabric overlaps the next lower strip. Geotextile shall be laid smooth and free of tension, stress, folds, wrinkles, or creases.

B. Geotextile shall only be placed on areas whose installation has been approved by the Owner's Representative.

C. During backdumping of any soils or stone over the geotextile, a minimum depth of 12 inches of soil shall be maintained over the geotextile at all times between the geotextile and wheel, truckloads, and bucket.

D. If geotextile should be damaged during any step of installation, a piece of geotextile material shall be cut and placed over the damaged area and overlap the undamaged material a minimum of 3 feet in each direction or as recommended by the Manufacturer.

3.3 PROTECTION

A. Any geotextile damaged during its installation or during placement of cover materials shall be replaced by the Contractor at his expense.

B. The work shall be scheduled so that the covering of the geotextile with a layer of the appropriate cover material is accomplished within 30 days after placement of the geotextile. Failure to comply with this requirement shall require additional QA/QC samples to be taken. If the results of the QA/QC testing do not meet the project specifications, the geotextile exposed for 30 days or more shall be replaced by the Contractor at his expense.

END OF SECTION

SECTION 02660

BACKFILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Furnish all labor, materials, equipment and incidentals necessary to perform all fill and grading required to complete the placement of coir logs and backfill as shown on the Plans and as directed by the Owner's Representative. The work shall include, but not necessarily be limited to, the labor to install coir logs, earthwork required for placing the backfill, and all related work.

1.2 RELATED SECTIONS

A. Section 02936 – Vegetative Cover

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. ASTM INTERNATIONAL (ASTM) D 2487 (2006e1) Soils for Engineering Purposes (Unified Soil Classification System [USCS]).

C. ASTM D 422 (1963; R 2007) Particle-Size Analysis of Soils.

D. ASTM D 5268, Specification for Topsoil Used for Landscaping Purposes.

1.4 SUBMITTALS

A. Submit name of proposed backfill supplier(s) and location of source(s) to Owner at least 30 days prior to shipment of materials to the site.

B. Submit name of proposed coir log manufacturer and manufacturer's specifications to Owner at least 30 days prior to shipment of product to the site.

C. Clean Material: Submit documentation in the form of laboratory analytical test results and certification of environmental due diligence that the backfill is free from hazardous or toxic constituents, regulated substances, and potential environmental contaminants and that it is suitable for use in an environmentally sensitive area. Submit documentation to Owner 15 days prior to shipment of materials to the site.

D. Owner approval is required for submittals. The following shall be submitted to Owner prior to ordering and shipment of materials to the site:

i. Materials Handling Plan: Materials handling plan describing placement procedures and equipment to be used.

ii. Backfill Samples: A minimum of 5 pounds of backfill of each backfill type from each proposed borrow source at least 15 days prior to backfill shipment to site for visual inspection.

iii. Borrow Source Assessment: Borrow Source Assessment Report at least 15 days prior to backfill shipment to site. No backfill shall be placed until the Borrow Source Assessment Report is approved by Owner. The report shall include the following: location of each borrow source; estimated quantity of borrow available; logs of subsurface explorations; and laboratory test results with complete laboratory reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Contractor to provide backfill from an off-site borrow source.

B. Deliver, handle, and transport backfill material at all times in a manner and with equipment that will prevent intermixing of material types, segregation, or contamination.

C. Stockpile backfill materials on site in locations approved by Owner.

D. Cover storage piles or install silt fences to prevent siltation of the site from backfill storage piles.

E. Minimize stockpiling requirements. Transport material from source(s) directly to final position when possible.

F. Any soil mixtures must be thoroughly mixed at vendor's place of business prior to delivery to the job site.

1.6 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies as identified in project permits.

PART 2 PRODUCTS

2.1 ORGANIC RICH TOPSOIL BACKFILL

A. Topsoil shall be as defined in ASTM D 5268. (Specification for Topsoil used for Landscaping Purposes).

B. Suitable topsoil includes selectively excavated material that is representative of soils in the local vicinity that produces growths of grass or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances or any material that might be harmful to plant growth or be a hindrance to grading, planting or maintenance operations. Topsoil shall be screened using a mechanical screen with square mesh openings no greater than 1 inch.

C. Soil material used as topsoil shall be loam or loamy sand, suitable to support vegetative growth.

D. Topsoil shall not contain more than five (5) percent by volume of stones, wood, or other natural objects larger than one inch in any diameter.

E. Topsoil shall be mixed with peat (approximately one-third or less of organics per volume) to achieve desired total organic content (TOC) in the final Organic Rich Topsoil Backfill product.

F. Organic Rich Topsoil Backfill shall comply with the following composition (by volume):

i. Organic material – minimum of 2%.

ii. Silt – minimum of 10%.

iii. Sand – 70 to 90%.

iv. Clay – 0 to 15%.

v. Foreign Materials – maximum of 1.0%.

vi. Soil pH shall be between 5.0 and 7.5, suitable for seed specified and be tested in accordance with ASTM D 4972.

vii. TOC between 8 percent and 12 percent.

G. Organic Rich Topsoil Backfill shall meet general backfill characteristics and backfill testing requirements identified in this specification.

2.2 SAND BACKFILL

A. Sand backfill shall be used if it meets the following requirements or is approved for such use by NRG.

B. Sand backfill for use in Wetland W-5, in the areas of Wetland W-6 being restored with grass plugs and woody vegetation, and as needed for mixing with topsoil in Wetlands W-3 and W-4 shall be medium coarse sand as determined by a Particle Size Analysis (ASTM D 422). The backfill material must entirely pass a 3/8 inch sieve, at least 95 percent passing a No. 4 sieve (4.75 mm), and less than 15 percent passing a No. 100 sieve (0.150 mm).

C. Sand backfill for use in the open water and coir log areas of Wetland W-6 shall be coarse sand as determined by a Particle Size Analysis (ASTM D 422). The backfill material must entirely pass a No. 4 sieve (4.75 mm) but be fully retained on a No. 10 sieve (2.00 mm).

D. Sand backfill shall meet general backfill characteristics and backfill testing requirements identified in this specification.

2.3 GENERAL BACKFILL CHARACTERISTICS

A. Clean backfill must be natural soil or must be earthen materials consisting only of soils which are raw materials extracted from a borrow pit, earthen bank, mine, or quarry.

B. Backfill must meet the definition of Suitable Fill identified in Section 97-2 of the City of Norwalk Code, or current definition per Norwalk Department of Public Works permit, as follows: Inorganic fill which must be approved in advance, and which includes but is not limited to earth, soil, loam, sand, gravel, rocks, boulders, clay, silt and earthy loose materials composed of particles, granules, small fragments of rock, other minerals or inorganic materials.

C. Backfill must not meet the definition of Unsuitable Fill identified in Section 97-2 of the City of Norwalk Code, or current definition per Norwalk Department of Public Works permit, as follows: Includes but is not limited to organic materials; unwanted or discarded materials, whether solid, semisolid; liquid or contained gaseous materials; recyclable materials, whether aluminum, glass, plastic, rubber, paper, corrugated paper or other natural or synthetic materials; garbage; trash; debris; rubbish; grass clippings or other lawn or waste; construction debris; concrete; asphalt; automobiles; automotive parts; human or animal waste or remains.

D. Unsuitable materials also means the following materials:

i. Asphalt, brick, ceramic, or concrete.

ii. Wire, steel, cast iron, cans, drums, or any other foreign material.

iii. Debris such as, but not limited to glass, plastic, paper, metals.

iv. Materials containing hazardous or toxic constituents, regulated substances, and potential environmental contaminants.

v. Trash, wood, ashes, cinders, or biodegradable waste.

2.4 BACKFILL TESTING

A. At least one composite backfill sample shall be collected of each backfill type for every 750 cubic yards of backfill and from each borrow site for both physical and chemical parameter testing. Tested backfill material cannot be delivered to the site until laboratory analytical results have been approved by Owner. Laboratory shall provide material tracking for samples and sample analytical results. Owner or Owner's Representative may require additional samples for analysis at the Contractor's expense in the event of observed changes in physical character of delivered backfill material.

B. Laboratory analysis shall be performed by a licensed and certified testing facility.

C. The Contractor shall submit, to the Owner's Representative for approval, evidence that the material proposed for use as organic rich topsoil backfill is suitable for the proposed application. The necessary evidence shall include, but not necessarily be limited to, the following testing:

i. Grain Size ASTM D 5268 or USDA Classification of Soils;

ii. pH ASTM D 4972;

iii. Organic Content ASTM D 5268 (specification for topsoil used for landscaping purposes); and

iv. Standard Nutrient Analysis (http://www.soiltest.uconn.edu/price.php) for plant available calcium, magnesium, phosphorous, potassium, iron, manganese, copper, zinc, aluminum, and boron; pH, and total lead. Testing facility shall provide recommendations for limestone and fertilizer based on the test results and the ground cover or wetland material being grown.

D. Backfill shall be free of contamination. Laboratory testing of offsite materials brought in for use as backfill will include, at a minimum, volatile organic compounds (VOCs; EPA Method 8260B; Reasonable Confidence Protocol [RCP] list), semivolatile organic compounds (SVOCs; EPA Method 8270C), extractable petroleum hydrocarbons (ETPH; Connecticut Department of Public Health Method), polychlorinated biphenyls (PCBs; EPA Method 8082), and 13 Priority Pollutant Metals plus aluminum, barium, and vanadium (EPA Methods 6010C and 7470A). Analysis will be completed by an independent Connecticut certified laboratory. Concentrations of the constituents in backfill shall meet the requirements identified in the table below. The constituent must be non-detect below the standard laboratory reporting limit to qualify as 'BDL.'

Constituent	Freshwater Sediment Screening Benchmarks – Threshold Effects	Saltwater Sediment Screening Benchmarks – Low Effects	Backfill Maximum Concentration
VOCs	NE	NE	BDL
SVOCs	NE	NE	BDL
ETPH (C9-C36)	205	174	BDL
PCBs	NE	NE	BDL
Metals (mg/kg)			
Aluminum	25,500*	18,000*	18,000*
Antimony	2	2	2
Arsenic	9.79	8.2	8.2
Barium	NE	48*	48*
Beryllium	NE	NE	BDL
Cadmium	0.99	1.2	0.99
Chromium	43.4	81	43.4
Copper	31.6	34	10
Lead	35.8	46.7	35.8
Mercury	0.18	0.15	0.15
Nickel	22.7	20.9	20.9
Selenium	2	2	2
Silver	1	1	1
Thallium	NE	NE	BDL
Vanadium	NE	57*	57*

Constituent	Freshwater Sediment Screening Benchmarks – Threshold Effects	Saltwater Sediment Screening Benchmarks – Low Effects	Backfill Maximum Concentration
Zinc	121	150	121

Notes:
BDL = below detection limit.
mg/kg = milligrams per kilogram.
NE = not evaluated.
* indicates risk-based recommended screening value.

E. If in the opinion of the Owner's Representative the backfill is unsuitable for the proposed application, the Contractor shall submit to the Owner's Representative the required suitable evidence as specified in above for backfill from a different source.

2.5 COIR LOGS

A. Coir fiber logs shall be a commercially made, 100 percent natural and biodegradable, erosion control product consisting of tightly bound cylinders of coconut fiber (coir) held together by coir fiber netting.

B. Coir logs shall be a minimum of 12 inches in diameter, minimum length of 10 feet, and minimum density of 9 pounds per cubic foot.

C. The Contractor shall keep the coir logs dry prior to installation.

PART 3 EXECUTION

3.1 BACKFILL PLACEMENT

A. No backfill material shall be placed unless approved by the Owner's Representative.

B. The contractor shall begin backfill operations only after Owner has approved the post-removal survey. The Contractor shall provide all the required materials, labor, and equipment to perform the work in accordance with these Specifications.

C. Sufficient depth of loose backfill shall be placed in two 6-inch lifts to create a full 1-foot final thickness using a low ground presser dozer, longstick excavator, clamshell bucket, or via hydraulic pumping. No compaction is required. Backfill shall be placed as identified in the required submittal, Materials Handling Plan, and approved by NRG prior to initiation.

D. The Contractor shall take care to ensure that underlying soils remain intact and do not become mixed with the backfill during installation.

E. Finished surfaces shall be free from depressions, mounds, or windrows. The top surface of the backfill shall be no greater than 0.1 foot above and no less than 0.1 foot below the lines and grades of the pre-removal survey.

3.2 DAMAGE

A. Damage that occurs to the placed backfill shall be repaired and grades re-established. Repairs to the backfill shall be documented including location and volume of backfill affected, corrective action taken, and results of retests.

3.3 COIR LOG INSTALLATION

A. Coir logs shall be placed along the toe of the perimeter channel surrounding the open water area in Wetland W-6 as identified on the design drawings for wetland channel restoration. Coir logs shall be oriented horizontally and parallel to the channel bottom.

B. Coir logs shall be placed in a 3 to 4 inch deep trench along the toe of the slope so that the bottom and back of the log are in contact with the wetland substrate. Additional backfill shall be placed under or behind the coir log as needed to ensure proper contact.

C. The Contractor shall secure the coir logs with hardwood stakes partially driven into the substrate along the side of the log at intervals specified by the manufacturer. Coir twine shall be woven between and around the stakes that are then driven flush with the top of the coir logs to firmly secure it to the wetland substrate.

D. Each successive length of log shall be placed end to end with the next, using coir fiber rope. The end of the coir log nearest the culvert connecting Wetland W-6 with the Long Island Sound shall be inserted, or “keyed,” 3 to 5 feet into the channel slope to prevent dislocation. In other locations where a coir log does not abut another coir log, the end shall be bent inward and buried in the bank to prevent water from intruding behind the roll and dislodging it.

E. Additional rows of coir logs shall be stacked in a stepped fashion as needed depending on the depth of the channel and length of the channel slope. Backfill shall be placed and graded to the top of the top log and stabilized with appropriate vegetation. Grass plugs shall be installed in the coir logs at the spacing identified in the restoration plan.

3.4 MEASUREMENT

A. The Contractor shall survey before and after backfill placement in exposed areas and provide to the Owner’s Representative.

B. The Contractor shall take soundings before and after backfill placement in submerged areas and provide to the Owner’s Representative.

C. Soundings will be taken by sonic methods as determined by the Contractor and accepted by the Owner’s Representative.

PART 4 QUALITY CONTROL

4.1 GENERAL

A. Grain size, pH, organic content, soil nutrient, and chemical contaminant testing will be performed on the backfill at a rate specified above.

B. Survey of subgrade and final grade and any intermediate grades or re-surveys as required.

END OF SECTION

SECTION 02936

VEGETATIVE COVER

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the seeding of all areas disturbed during the course of construction and to plant the specified woody and herbaceous vegetation.

B. The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to install erosion control blankets, as shown on the Plans and as requested by the Owner's Representative.

1.2 RELATED SECTIONS

A. SECTION 02660 – BACKFILL
B. SECTION 01572 – TEMPORARY STORMWATER POLLUTION CONTROL

1.3 REFERENCES

A. FS O-F-241 – Fertilizers, Mixed, Commercial.

1.4 DEFINITIONS

A. Weeds – Includes Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Broome Grass.

1.5 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed mixture in sealed containers showing weight, seed mix, year of production, date of packaging, and location of packaging. Seed in damaged packaging is not acceptable.

B. Deliver fertilizer, lime, and other soil amendments, as necessary, in waterproof bags or bulk trailers showing weight, chemical analysis, and name of manufacturer. Fertilizer in damaged packaging is not acceptable.

C. Inspect delivered plant stock to ensure adequate protection during transit was provided. Plants should have been protected from desiccation by sun and wind exposure under a cover and from sweating in adequately ventilated vehicles.

Physical injury should have been prevented by careful packing. Dead, dying, or significantly injured specimens shall not be installed on site.

D. The Contractor shall endeavor to schedule plant delivery and installation to occur on the same day. For temporary storage on site, plants shall be kept cool and moist until planting by providing shade and protection from drying winds. Grass plugs must be planted within 10 days of delivery to the site.

PART 2 PRODUCTS

2.1 SEED MIXTURE FOR UPLAND AREAS

A. Temporary and permanent seed mixtures shall be selected from the Connecticut Guidelines for Soil Erosion and Sediment Control and will be approved by the Owner's Representative.

B. Alternative seed mixtures must be pre-approved by the Owner's Representative.

2.2 SEED MIXTURES FOR WETLAND AREAS

A. Temporary and permanent seed mixtures for use in Wetlands W-3 and W-4 and required application rates are provided on the design drawings.

B. No seed mix shall be applied in Wetlands W-5 and W-6.

2.3 WOODY VEGETATION AND GRASS PLUGS

A. Woody vegetation and grass plugs for use in wetland restoration areas are provided on the design drawings including species, size, and spacing.

2.4 ACCESSORIES

A. Mulching Material:

1. Barley straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay chopped cornstalks, or paper mulch are not acceptable.

2. Turf and Jute Fabric – An erosion control blanket consisting of machine-produced 100% biodegradable mat with a 100% straw fiber matrix. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top side with a 100% biodegradable natural organic fiber netting woven into approximately 1/2" x 1" mesh and be sewn together with biodegradable thread on 1.5" centers or equivalent.

B. Fertilizer for Soil in Upland Areas: FS O-F-24, Type I, Grade A; recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil (as indicated in analysis) to the following proportions: nitrogen, 10 percent; phosphoric acid, 10 percent; soluble potash, 10 percent. Alternative fertilizer may be used as pre-approved by the Owner's Representative.

C. Fertilizer Tablets: 10 gram fertilizer tablet of 20-10-5 composition (20% total nitrogen, 10% available phosphate, and 5% soluble potash).

D. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that prepared soil base is ready to receive the work of this Section.

B. The Contractor shall repair any areas of backfill prior to application of vegetative cover.

3.2 TEMPORARY BACKFILL PROTECTION

A. The Contractor shall install geotextile silt fence around the culvert in Wetland W-6 discharging to Long Island Sound immediately after removing the culvert plug if vegetative cover is not complete. The Contractor shall maintain the geotextile silt fence until vegetative cover is complete.

B. Geotextile silt fence shall be installed in accordance with SECTION 01572 – TEMPORARY STORM WATER POLLUTION CONTROL.

3.3 FERTILIZING

A. Fertilizer and any other soil amendments recommended by the testing of the backfill performed in accordance with the specifications shall not be applied to backfill used in wetland restoration areas.

B. Fertilizer and any other soil amendments recommended by the testing of the backfill performed in accordance with the specifications shall be applied to backfill used in upland areas only.

C. Place one 10 gram fertilizer tablet of 20-10-5 composition (20% total nitrogen, 10% available phosphate, and 5% soluble potash) into the bottom of each plant hole prior to installing the woody vegetation in Wetlands W-3 and W-4. No tablets shall be used with the woody vegetation in Wetlands W-5 and W-6. No tablets shall be used for the grass plugs.

3.4 SEEDING

A. Temporary and permanent seeding shall be applied in disturbed upland area in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control.

B. Seed with a temporary seed mixture within 7 days after the suspension of grading work in disturbed areas where the suspension of work is expected to be more than 30 days but less than 1 year.

C. Seed with a permanent seed mixture on disturbed soils that have been brought to final grade or where the suspension of work is expected to exceed 1 year.

3.5 MECHANICAL SEEDING

A. Apply seeding for vegetative cover at rate recommended by local USDA Soil Conservation Service evenly in two intersecting directions. Rake in lightly. Do not

seed area in excess of that which can be mulched on same day.

B. Upland Planting Season: Time of Seeding – Depending on the seed mixture selected for upland areas, seeding in accordance with the Connecticut Guidelines for Soil Erosion and Sediment Control.

C. Wetland Planting Season: Wetland planting seasons are defined in the design drawings.

D. Do not sow immediately following rain, when ground is too dry, or during windy periods.

3.6 HYDROSEEDING

A. This method shall only be used following approval for use by the Owner's Representative. When applying seed, lime, fertilizer, or mulch materials with the hydroseeder, do not use more than 100 to 150 pounds of solids per 100 gallons of water. If inoculant is in a seed, fertilizer, and lime slurry, it should be used within 3 to 4 hours, or a fresh supply of inoculant should be added. When legume is to be included in a slurry mixture containing fertilizer, the amount of inoculant added to the tank should be four times the rate prescribed by the manufacturer. It is preferable to hydroseed when the soil is moist.

3.7 WOODY VEGETATION PLANTING

A. Woody vegetation provided in container pots shall be planted as follows:
   i. Hole shall be dug slightly larger (wider and deeper) than the pot.
   ii. Drop 1 fertilizer tablet into hole in Wetlands W-3 and W-4 (not in Wetlands W-5 or W-6) and cover with some soil.
   iii. Remove tree or shrub from container and loosen roots, prune dead or crushed roots, and straighten or cut circling roots.
   iv. Place in hole such that the base of the plant stem/top of soil in the container should be equal to or slightly above the final ground level.
   v. Backfill with the excavated material and lightly tamp down. Rake out excess soil.
   vi. Prune dead and injured branches.
   vii. Mulch will not be placed around individual woody plants.
   viii. Stakes will not be placed for individual trees.

B. Woody vegetation will be planted in the locations shown on the project drawings.

3.8 GRASS PLUG PLANTING

A. Grass plugs shall be planted in backfill as follows:
   i. Hole shall be dug deep and wide enough to accommodate all the roots and allow them to spread out without bunching or curling.
   ii. No fertilizer or fertilizer tablets will be used with grass plugs.
   iii. Place the plug upright at the same depth in the soil at which it was planted when rooted in the nursery.
   iv. Add soil as necessary to fill planting hole to existing grade making sure there are no turned up roots or air pockets in the soil.
   v. Mulch will not be placed around grass plugs.

B. Grass plugs shall be planted in coir logs in gaps created in the coir fiber netting by hand or with a sharp tool. The grass plugs shall be installed so that the top of the plug is 1 inch below the surface of the log and the surrounding coir fiber is tightly packed around the top of the plug.

C. Grass plugs shall be planted in the locations shown on the project drawings.

3.9 EROSION CONTROL

A. All vegetation surfaces shall be stabilized by mulching or erosion control matting.

3.10 MAINTENANCE AND PROVISIONAL ACCEPTANCE

A. The Contractor shall keep all seeded areas watered and in good condition, reseeding if and when necessary until a good, health, uniform growth is established over the entire area seeded, and shall maintain these areas in an approved condition until provisions acceptance.

B. On slopes, the Contractor shall provide against washouts by an approved method. Any washout which occurs shall be regraded and reseeded at the Contractor's expense until a good sod is established.

C. The Owner's Representative will inspect all work for provisional acceptance, upon the written request of the Contractor, received at least 10 days before the anticipated date of inspection. For Fall seeding, provisional acceptance may not be granted until the following Spring when growth has begun.

D. A satisfactory stand will be defined as a section of grass of 10,000 square feet or larger that has:

i. No bare spots larger than 3 square feet.
ii. No more than 10 percent of total area with bare spots larger than 1 square foot.
iii. No more than 15 percent of total area with bare spots larger than 6 inches square.

E. The inspection by the Owner's Representative will determine whether the Contractor needs to repair of reseed or replant in any area.

3.11 GUARANTEE PERIOD AND FINAL ACCEPTANCE

A. An inspection will be made by the Owner's Representative upon written request submitted by the Contractor at least 10 days before the anticipated date. Areas not demonstrating satisfactory stands as outlined above, as determined by the Owner's Representative, shall be renovated, reseeded and maintained, meeting all requirements as specified herein.

B. Any tree not living, after one years' time from planting, shall be replaced and guaranteed by the Contractor for an additional three months' time for survival, at no cost to the Owner.

C. After all necessary corrective work has been completed, the Owner's Representative will certify in writing the final acceptance of all or a portion of the stands.

END OF SECTION

SECTION 31000

EARTHWORK

PART 1 GENERAL

1.1 References

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

i. ASTM C 136 (2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

ii. ASTM C 33/C 33M (2008) Standard Specification for Concrete Aggregates

iii. ASTM D 1140 (2000; R 2006) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve

iv. ASTM D 2487 (2006e1) Soils for Engineering Purposes (Unified Soil Classification System)

v. ASTM D 422 (1963; R 2007) Particle-Size Analysis of Soils

vi. ASTM D 4318 (2005) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

x. SECTION 02230 – CRUSHED STONE

1.2 Submittals

A. When specified in individual specification Sections, submit analytical results or certificates of analysis to Owner's Representative for review, in quantities specified for Product Data.

PART 2 PRODUCTS

A. Testing of offsite soils brought in for use on site shall be as specified in individual specification Sections. Do not bring material onsite until analytical results have been approved by the Owner's Representative.

B. Provide bedding material and rock conforming to CONN DOT requirements for construction indicated and as specified for crushed stone.

C. Crushed stone cover for fill, repairs, and grading in areas of existing Environmental Control cover shall conform to Crushed Stone Cover (Type 1 / Driving Surface) previously installed, CONN DOT M.02.06C Gradation C as specified in SECTION 02230 – CRUSHED STONE.

PART 3 EXECUTION

3.1 General Excavation

A. Excavation not including dredging and grading of surface soils shall conform to these requirements. Lines and grades shall be those determined necessary by the Contractor for installation of temporary facilities and approved by the Owner's Representative.

B. Material installed to raise existing grades for temporary facilities shall be removed upon completion of the work and disposed at the Contractor's cost.

3.2 Perform Excavation

A. The area proposed for the location of the water treatment facility and the dredged sediment dewatering pad is covered with a vegetated RCRA EB#2 cap. The soil beneath the RCRA EB#2 cap is impacted with metals that exceed the Industrial/Commercial Direct Exposure Criteria (I/C DEC) and, thus, all appropriate procedures must be followed when disturbing the RCRA EB#2 cap and handling impacted soil. Contractor shall not remove any of the RCRA EB#2 cap except to construct a sump for collection of water from the dredged materials.

B. If a sump is excavated, Contractor shall store, protect and cover all impacted material excavated until the completion of the project. Contractor shall replace the impacted material in the excavation at the end of the work, compact it and Environmental Control Aggregate to the thickness of the original aggregate.

3.3 Ground Surface Preparation

3.3.1 General Requirements

A. Remove and replace unsatisfactory material with satisfactory materials, as directed by the Owner's Representative, in surfaces to receive fill or in excavated areas.

3.3.2 Frozen Material

A. Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to plus or minus 3 percent of optimum moisture.

B. Dispose unsatisfactory materials removing from excavations into designated waste disposal or spoil areas. Use satisfactory material removed from excavations, insofar as practicable, in the construction

of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Do not waste any satisfactory excavated material without specific written authorization. Dispose of satisfactory material, authorized to be wasted, in designated areas approved for surplus material storage or designated waste areas as directed. Do not dispose excavated material to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.4 Stone Placement

A. Place stone to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the stone throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

END OF SECTION

SECTION 35023

HYDRAULIC DREDGING

PART 1 GENERAL

1.1 DEFINITION

A. Hard material is defined as material requiring the use of special equipment for economical removal, and includes boulders or fragments too large to be removed in one piece by the dredge.

1.2 SUBMITTALS

A. Submittals shall be submitted in accordance with SECTION 01300 - SUBMITTALS.

B. Contractor shall load, transport, and dispose of dewatered sediment at an approved, licensed, permitted, upland receiving facility that Owner has approved.

C. The Contractor shall submit for approval a plan for usage of the Owner-designated staging area. This plan shall show the areas or portions thereof to be used and the components for managing sediment and filtrate. The plan shall show methods used to ensure the existing vegetative cover of the RCRA EB#2 cap is not disturbed.

D. The Contractor shall submit for approval a design and plan for treatment and discharge of treated water from the water treatment unit to the Long Island Sound. The plan shall include a written description of effluent monitoring for compliance with discharge limits and permit requirements. The plan shall include drawings of the erosion controls at the discharge point to prevent scour.

E. The Contractor shall submit a complete list of all vessels and equipment to be used during the contract, including all dredging plants, supporting vessels, and equipment. The vessel list shall contain the types and numbers of each, the draft of each, and all other pertinent information. The Contractor shall list the survey vessel, survey crew, type of survey equipment, and software that will be used to verify dredging locations, limits of dredging performed, and volumes for payment requests.

F. The Contractor shall submit for approval of use the Safety Data Sheets (SDS) for any additives to the dredge slurry, sediment, or water treatment. SDS require written approval and signature documentation from Owner’s representative prior to any product being shipped to the site. Any coagulant polymer used to enhance liquid/solid separation shall be certified environmentally-safe.

G. The Contractor shall submit disposal facility acceptance records and weight slips for sediment transportation and disposal.

1.3 MATERIAL TO BE REMOVED

A. The material to be removed is predominantly fines.

B. The removal of hard material is not included.

1.4 ARTIFICIAL OBSTRUCTIONS

A. A known electrical conduit through Wetland W-6 is shown on the design drawings.

B. The Owner has no knowledge of other cables, pipes, or other artificial obstructions or of any wrecks, wreckage, or other material that would necessitate the employment of additional equipment for economical removal. If actual conditions differ from those stated or shown, or both, the Contractor shall consult with the Owner and Owner's Representative to determine a suitable approach to work around the identified obstruction.

1.5 QUANTITY OF MATERIAL

A. The total estimated amount of material to be removed from within the specified limits is identified on Design Drawings. The quantities listed are estimates only. The Contractor shall complete the work specified whether the quantities involved are greater or less than those estimated.

1.6 OVERDEPTH DREDGING

A. To cover unavoidable inaccuracies of dredging processes, material may actually be removed to a depth of 3 inches below the depth specified and within the dredging limits. Sediment removed from overdepth dredging will not be included in the sediment volume for payment.

1.7 SIDE AND END SLOPES

A. A box cut shall be made at the limits of dredging except as specified for Wetland W-6 channel perimeter restoration with coir logs. No side slopes or end slopes are specified or included in the limits of dredging except as specified for Wetland W-6 channel perimeter restoration with coir logs.

B. Dredging to provide side slopes outside the required limits of sediment removal shall follow, as closely as practicable, the lines indicated or specified. Sediment removed to create side slopes will not be included in the sediment volume for payment except as specified for Wetland W-6 channel perimeter restoration with coir logs.

1.8 PERMITS

A. The Contractor shall comply with conditions and requirements of the federal, state, and local authorizations and permits obtained by the Owner. The Contractor shall make arrangements with a permitted disposal facility for disposal of dewatered dredged sediment.

1.9 CHARGES

A. The Contractor will pay charges imposed by the permitted disposal facility for disposal of dewatered dredged sediment.

1.10 ENVIRONMENTAL PROTECTION REQUIREMENTS

A. Provide and maintain during the life of the contract, environmental protective measures. Also, provide environmental protective measures required to correct conditions, such as oil spills or debris, that occur during the dredging operations. Comply with Norwalk Power LLC, Federal, State, and local regulations pertaining to water, air, and noise pollution.

B. The Contractor shall assure that all fuel oil transfer operations to or from his plant comply with all federal, state, and municipal laws, codes and regulations. The Contractor shall incorporate in his accident prevention program sufficient information to demonstrate compliance with 33 CFR 156 and any other applicable laws, codes, and regulations.

1.11 BASIS FOR BIDS

A. Base bids on the quantity of dredging indicated. Should the total quantity of dredging vary from that specified as the basis for bidding, the contract price will be adjusted in accordance with the bid unit price. The dredging conditions specified and indicated describe conditions which are known. However, the Contractor is responsible for other conditions encountered which are not unusual when compared to the conditions recognized in the dredging business as usual in dredging activities such as those required under this contract.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect the work, keep records of work performed, and ensure that gages, targets, ranges, and other markers are in place and usable for the intended purpose. Furnish, at the request of the Owner, boats, boatmen, laborers, and materials necessary for inspecting, supervising, and surveying the work. When required, provide transportation for the Owner and inspectors to and from the dredging barge.

3.2 DREDGING AREA PREPARATION

A. Contractor shall install a temporary access route, if needed, to launch dredge with prior approval of location and design by Owner's Representative. Contractor shall endeavor to minimize footprint outside sediment removal area and in wetland.

3.3 CONDUCT OF DREDGING WORK

A. Conduct sampling and testing as required for the determination of suitable coagulant polymer additive, if needed, prior to initiation of dredging. Add suitable coagulant polymer, if needed, to dredge slurry in transport or as appropriate.

B. Remove from wetland bottom and deposit dredged material into the sediment management area on land by the hydraulic process. Pipeline for hydraulic dredging shall be floated on the water to minimize sediment disturbance.

C. Provide for safe transportation and placement of dredged materials. Transport and placement of dredged material in the area designated for management of dredged material. The placement of dredged materials in unauthorized places is forbidden. Comply with rules and regulations of local port and harbor governing authorities.

D. Furnish, set, and maintain ranges, buoys, and markers needed to define the work and to facilitate inspection. Establish and maintain gages in locations observable from each part of the work so that the depth may be determined. Suspend dredging when the gages or ranges cannot be seen or followed. The Owner's Representative will furnish, upon request by the Contractor, survey lines, points, and elevations necessary for the setting of ranges, gages, and buoys.

E. Maintain the barges, pipelines, and associated equipment in good condition and to meet the requirements of the work. Promptly and properly repair leaks or breaks along pipelines. All materials and water that leak from any pipeline shall be cleared, removed, and placed within the limits of the staging area.

F. Provide a system of communication between the dredge crew, the crew at the dredged sediment management area and the crew at the water treatment facility. A portable two-way radio is acceptable.

G. Anchors, chains, firearms, and other articles of value, which are brought to the surface during dredging operations, shall remain or become the property of the Owner and shall be deposited on shore at a convenient location near the site of the work, as directed.

H. The prosecution of work shall ensure the stability of culverts and other structures as well as rip rap shore protection and existing RCRA EB#2 cap or engineered control surfaces lying on or adjacent to the site of the work, insofar as structures and features may be jeopardized by dredging operations. Repair damage resulting from dredging operations, insofar as such damage may be caused by variation in locations or depth of dredging, or both, from that indicated or permitted under the contract.

I. Upon completion of the work, promptly remove dredging barge, including ranges, buoys, piles, and other markers or obstructions.

J. The Contractor shall take all necessary measures to ensure that the condition of the staging area and sediment handling area, namely the existing RCRA EB#2 cap, does not deteriorate or become damaged due to the setup, use, or removal of the staging area. The soil beneath the RCRA EB#2 cap is impacted with metals that exceed the Industrial/Commercial Direct Exposure Criteria (I/C DEC) and, thus, all appropriate procedures must be followed when disturbing the RCRA EB#2 cap and handling impacted soil. Contractor shall not remove any of the RCRA EB#2 cap except to construct a sump for collection of water from the dredged materials.

3.4 CONDUCT OF SEDIMENT MANAGEMENT

A. Screen dredge slurry for debris prior to dewatering.

B. Sediment will be contained in Geotube® or equivalent geotextile tube dewatering system or other sediment filtration and dewatering device.

C. Contractor must make every effort to minimize precipitation contact with dredged sediment to maximize sediment dewatering.

3.5 CONDUCT OF TRANSPORTATION AND DISPOSAL

A. Contractor shall dewater sediment so as to meet transportation requirements, to meet disposal facility acceptance criteria, and as approved by Owner or Owner's Representative to minimize transportation costs.

B. Owner shall perform required characterization of sediment prior to transportation and disposal for off-site disposal.

C. Transport off site and disposal of all sediment shall be in accordance with applicable state and federal regulations.

D. Contractor shall provide certified weight slips from the receiving facility.

3.6 MEASUREMENT

A. The Contractor shall take soundings before and after dredging and provide to the Owner and the Owner's Representative as specified in SECTION 02000 – PROJECT SURVEY AND STAKEOUT.

B. The material removed will be measured by cubic yard in place, by means of soundings taken before and after dredging. The Design Drawings represent existing conditions based on current available information, but will be verified and corrected, if necessary, by soundings taken before dredging in each locality. Soundings shall be taken by sonic methods as determined by the Contractor and accepted by the Owner's Representative. The results of soundings as reviewed and approved by the Owner's Representative will be the basis for payment. Areas sounded more than 30 days prior to dredging or backfill shall be re-sounded when requested by the Owner. The Owner will maintain the option of being present when such soundings are made.

C. Contract depth will be determined by soundings or sweepings taken behind the dredge as work progresses. The Contractor shall take progress soundings or sweepings and provide to the Owner's Representative for review and acceptance.

D. Weekly estimates of work completed will be based on the result of soundings taken during the progress of the work. Deductions will be made for dredging and disposal not in accordance with the specifications.

E. Records of staging area effluent measurements and corrective action taken shall be submitted daily to the Owner or Owner's Representative.

3.7 FINAL EXAMINATION AND ACCEPTANCE

A. As soon as practicable after the completion of areas, which in the opinion of the Owner's Representative, will not be affected by further dredging operations, each area will be examined by the Contractor by sounding or sweeping, or both. The Contractor shall coordinate with the Owner's Representative to schedule when soundings or sweepings are to be made.

Representatives of each party will be permitted to accompany the sounding or sweeping party and to inspect the data and methods used in preparing the verification that dredging limits were met and the final estimate of sediment volume removed. When areas are found to be in a satisfactory condition, the work therein will be accepted as complete. Final estimates will be subject to deductions or correction of deductions previously made because of excessive overdepth, dredging outside of authorized areas, or disposal of material in an unauthorized manner.

-- END OF SECTION --