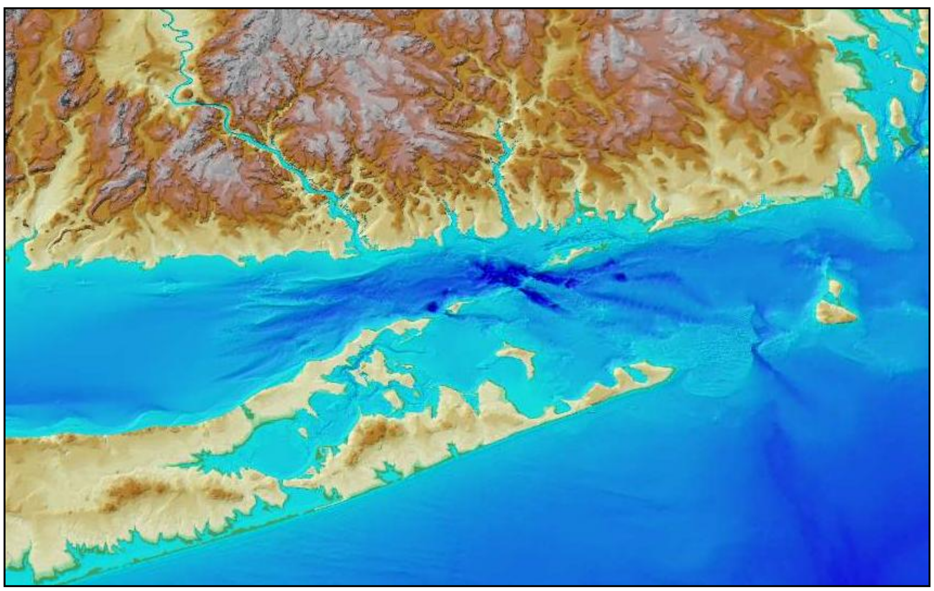
Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Site(s) in Eastern Long Island Sound, Connecticut and New York

APPENDIX B

Analysis of Alternative Open-Water Dredged Material Disposal Sites



Prepared for: **United States Environmental Protection Agency**

Sponsored by: **Connecticut Department of Transportation**

Prepared by: **Louis Berger**

with support from

University of Connecticut

April 2015

Supplemental Environmental Impact Statement for the Designation of Dredged Material Disposal Sites in Eastern Long Island Sound, Connecticut and New York

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APPENDIX B

ANALYSIS OF ALTERNATIVE OPEN-WATER DREDGED MATERIAL DISPOSAL SITES

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Acronyms and Abbreviations

CLDS	Central Long Island Sound Disposal Site (formerly abbreviated as CLIS in the literature)
CLIS	Central Long Island Sound
CSDS	Cornfield Shoals Disposal Site
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDOT	Connecticut Department of Transportation
CTDPH	Connecticut Department of Public Health
CPUE	Catch per Unit Effort
CWA	Clean Water Act
cy	cubic yard(s)
DAMOS	Disposal Area Monitoring System
DMMP	Dredged Material Management Plan
EIS	Environmental Impact Statement
ERM	Effects Range-Median
GIS	Geographic Information Systems
km	kilometer(s)
km^2	square kilometer(s)
LIS	Long Island Sound
LISS	Long Island Sound Study
LWRP	Local Waterfront Revitalization Program
m	meter(s)
m/s	meter(s) per second
m^3	cubic meter(s)
MLW	mean low water
MPRSA	Marine Protection, Research, and Sanctuaries Act
n/a	not applicable
NBDS	Niantic Bay Disposal Site
NEPA	National Environmental Policy Act
NLDS	New London dredged material disposal site
nmi	nautical mile(s)
nmi^2	square nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service

NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
ODMDS	Open water dredged material disposal site
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PO	Physical oceanography
RICRMC	Rhode Island Coastal Resources Management Council
RIDEM	Rhode Island Department of Environmental Management
RIDFW	Rhode Island Division of Fish and Wildlife
RISDS	Rhode Island Sound Disposal Site
SAMP	Special Area Management Plan
SEIS	Supplemental Environmental Impact Statement
TOC	Total organic carbon
UCONN	University of Connecticut
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WHG	Woods Hole Group
WLDS	Western Long Island Sound Disposal Site (formerly abbreviated as WLIS in the literature)
WLIS	Western Long Island Sound
ZSF	Zone of Siting Feasibility

EXECUTIVE SUMMARY

This report provides a summary of the selection process for alternative open-water dredged material disposal sites (ODMDSs) to be evaluated in a supplemental environmental impact statement (SEIS) for the designation of one or more ODMDSs in eastern Long Island Sound and/or Block Island Sound in Connecticut, New York, and Rhode Island. The SEIS will supplement the Environmental Impact Statement (EIS) for the designation of dredged material disposal sites in the Western and Central Long Island Sound, completed in 2004 (USEPA and USACE, 2004a). The SEIS is prepared by the U.S. Environmental Protection Agency (USEPA) and supported by the Connecticut Department of Transportation (CTDOT). It is conducted in consultation with other federal and state agencies of New York State and Connecticut, as well as with consultation of the public.

As stated in the Notice of Intent (NOI) published in October 2012, the SEIS would consider alternatives including: No-action (*i.e.*, no designation of any sites); designation of one or both of the currently active selected sites; designation of alternative ODMDSs identified within the study area; and identification of other disposal and/or management options.

The selection of alternative sites in eastern Long Island Sound and Block Island Sound was conducted using a two-tiered process following the Marine Protection, Research, and Sanctuaries Act (MPRSA). Tier 1 screening identified areas within the ZSF not acceptable for locating an ODMDS. Tier 2 screening identified specific alternative ODMDSs within the acceptable areas for further evaluation in the SEIS. Eleven sites were initially identified and evaluated in more detail. Six of these sites were located in eastern Long Island Sound; five sites were located in Block Island Sound. Three sites remained that are recommended for analysis as alternative sites in the SEIS. These sites are the two existing disposal sites (*i.e.*, the New London and Cornfield Shoals disposal sites) and the historically used Niantic Bay disposal site. In order to be able to accommodate the capacity needs for dredged material in the eastern Long Island Sound region over the 30-year planning time period, the boundary of the New London alternative site recommended to be analyzed in the SEIS was extended to the west by 1.5 nautical miles; the boundary of the Niantic Bay alternative site was extended to the east by 0.75 nautical miles.

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1. INTRODUCTION

This report summarizes the process and results for the selection of alternative open-water dredged material disposal sites (ODMDSs) to be evaluated in a supplemental environmental impact statement (SEIS) for the designation of one or more ODMDSs in eastern Long Island Sound and/or Block Island Sound in Connecticut, New York, and Rhode Island.

The U.S. Environmental Protection Agency (USEPA) has the authority to manage the disposal of dredged material in open water, including the designation of ODMDSs under Section 102(c) of the Marine Protection, Research, and Sanctuaries Act (MPRSA)[1] and 40 CFR 230.80 of USEPA's regulations under Section 404 of the Clean Water Act. USEPA Region 1 (New England) and Region 2 (Mid-Atlantic) jointly manage dredged material disposal in Long Island Sound. The preparation of the SEIS is financially supported by the State of Connecticut through the Connecticut Department of Transportation (CTDOT).

There are two currently active disposal sites in eastern Long Island Sound, the Cornfield Shoals and New London dredged material disposal sites (CSDS, NLDS). The use of these two sites was extended for 5 years by Public Law on December 23, 2011 (PL-112-74, Title I, Sec 116). These sites are scheduled to close in December 2016.

In October 2012, the USEPA published a Notice of Intent (NOI) in the Federal Register to prepare a federal SEIS to evaluate alternative ODMDSs within the eastern Long Island Sound region for the potential designation of one or more sites needed to serve the Eastern Long Island Sound region (FR 77:200 October 16, 2012). The dredging needs report prepared by the U.S. Army Corps of Engineers (USACE) identified a continued need for dredged material disposal for this region (USACE, 2009). As stated in the NOI, the SEIS would "identify and evaluate locations within the eastern Long Island Sound study area … to determine the sites that are best suited to receive dredged material for open-water disposal." At a minimum, the SEIS would consider alternatives including: No-action (*i.e.*, no designation of any sites); designation of one or both of the currently active disposal sites selected by the USACE; designation of alternative open-water sites identified within the study area that may offer environmental advantages to the existing sites; and identification of other disposal and/or management options, including beneficial uses. The alternative ODMDSs are to be developed and identified as part of the NEPA process.

The eastern Long Island Sound region or study area, hereafter referred to as the Zone of Siting Feasibility (ZSF)[2] developed for the SEIS in January 2013, includes eastern Long Island Sound and Block Island Sound (Figure 1).

The University of Connecticut (UCONN) and Louis Berger were tasked to assist the USEPA in the screening process for alternative ODMDSs to the NLDS and CSDS within this ZSF. The screening was based on readily available data and information from agencies, scientific literature, technical reports, and other relevant sources. This report presents the results of this process. The alternatives analysis process for the SEIS is similar to the process and format used

[1] The MPRSA is also referred to as the Ocean Dumping Act [ODA]) of 1972.

[2] Area within which ODMDSs could potentially be sited and which will be studied in the SEIS.

for the designation of the Central and Western Long Island Sound dredged material disposal sites (CLDS, WLDS) (USEPA and USACE, 2002; 2004a).

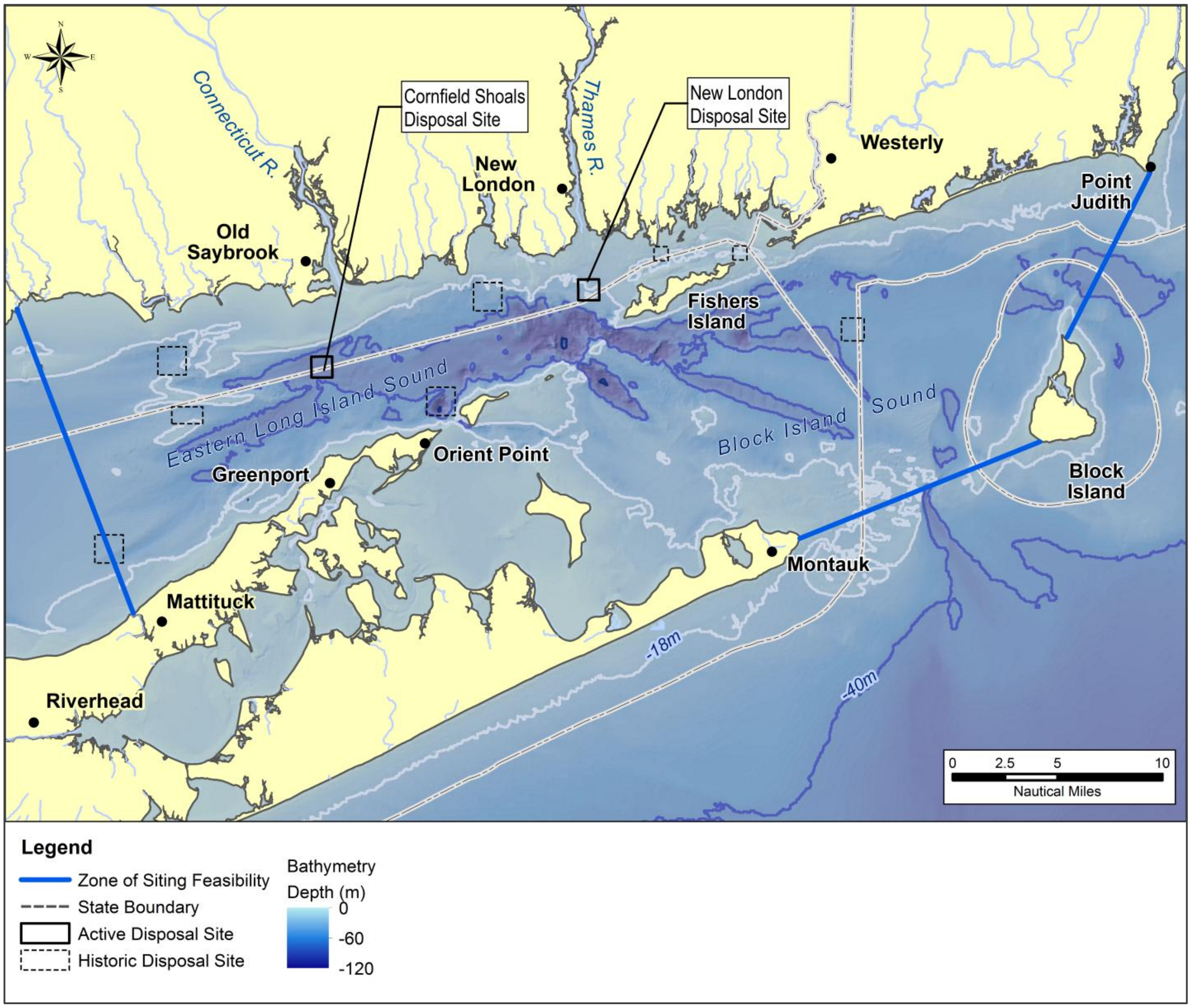

Figure 1. Zone of Siting Feasibility (ZSF) for the SEIS. The two active disposal sites (New London Disposal Site; Cornfield Shoals Disposal Site) are marked, as well as other historic[3] dredged material disposal sites.

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[3] To be consistent with the terminology used in the CLIS/WLIS EIS (USEPA and USACE, 2004a) , the term 'historic dredged material disposal site' (or 'historic disposal site' or 'historic site') refers to an area that was used historically for dredged material disposal.

2. SITE SCREENING PROCESS

The USEPA, in consultation with other federal and state agencies, selects alternative ODMDSs to the NLDS and CSDS for evaluation in the site designation SEIS following guidance in MPRSA. MPRSA lists five general and eleven specific required considerations in the evaluation and designation of ODMDSs (40 CFR 228.5 and 40 CFR 228.6, respectively; Table 1).

Screening was conducted in two tiers:

- *Tier 1 screening:* Identification of areas within the ZSF not acceptable for locating an ODMDS(s) designated under the MPRSA.
- *Tier 2 screening:* Identification of specific areas within the remaining acceptable areas for potentially siting an ODMDS(s), for further evaluation in the SEIS.

Table 2 describes the screening criteria. During the screening, GIS layers were created for specific resource issues using available data and information from multiple sources, including the U.S. Geological Survey (USGS), Connecticut Department of Energy and Environmental Protection (CTDEEP), New York State Department of Environmental Conservation (NYSDEC), Rhode Island Coastal Resources Management Council (RICRMC), and the USACE. Included in the USACE database were documents from their Disposal Area Monitoring System (DAMOS) program, as well as from their Long Island Sound Dredged Material Management Plan (LIS DMMP) program (USACE, 2014a).

For Tier 1 screening, these layers were then used to rule out areas unacceptable for open water disposal. Tier 2 considerations used additional resource information in the remaining areas to initially screen for potential ODMDSs; based on this information eleven potential sites were identified. These eleven sites were further assessed based on more in-depth literature review and field survey information, resulting in a reduced number of sites that are recommended for analysis in the SEIS.

Table 1. Required Considerations in the Evaluation and Designation of Ocean Dredged Material Disposal Sites (40 CFR 228.5 and 228.6)

Sec. 228.5 (a-e): General criteria for the selection of sites	
(a) The dumping of dredged material into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.	
(b) Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations of effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.	
(c) If at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in Section 228.5 through 228.6, the use of such sites will be terminated as soon as suitable alternate disposal sites can be designated.	
(d) The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation site study.	
(e) USEPA will, wherever feasible, designate ocean dumping sites beyond the edge of the Continental shelf and other such sites that have been historically used.	
Sec. 228.6(a)(1-11): Specific criteria for site selection	
(a) In the selection of disposal sites, in addition to other necessary or appropriate factors determined by the Administrator, the following factors will be considered:	
(1)	Geographical position, depth of water, bottom topography and distance from coast;
(2)	Location in relation to breeding, spawning, nursery, feeding or passage areas of living resources in adult or juvenile phases;
(3)	Location in relation to beaches and other amenity areas;
(4)	Types and quantities of wastes (dredged material) proposed to be disposed of, and proposed methods of release, including methods of packaging the waste (dredged material), if any;
(5)	Feasibility of surveillance and monitoring;
(6)	Dispersal, horizontal transport and vertical mixing characteristics of the area, including prevailing current direction and velocity, if any;
(7)	Existence and effects of current and previous discharges and dumping in the area (incl. cumulative effects);
(8)	Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean;
(9)	The existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys;
(10)	Potentiality for development or recruitment of nuisance species in the disposal site;
(11)	Existence at or in close proximity to the site of any significant natural or cultural features of historical importance.
(b) The results of a disposal site evaluation and/or designation study based on the criteria stated in paragraphs (1) – (11) will be presented in support of the site designation promulgation as an environmental assessment of the impact of the use of the site for disposal, and will be used in the preparation of an environmental impact statement for each site where such a statement is required by USEPA policy. By publication of a notice in accordance with this Part 228, an environmental impact statement, in draft form, will be made available for public comment not later than the time of publication of the site designation as proposed rulemaking, and a final EIS will be made available at the time of final rulemaking.	

Table 2. Open-water Disposal Reference Table for the Eastern Long Island Sound Disposal Site Designation SEIS

MPRSA	Key Words and Phrases from 40 CFR 228	Evaluation Factors*	Scree-ning Tier
Sec. 228.5 (a-e): General Considerations for the Selection of Sites			
228.5(b)	Perturbations to the environment during initial mixing	• Disposal site feasibility and stability	1
228.5(e)	Designating historically used sites	• Disposal sites	2
228.5(a)	Interference with other activities: *avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation*	• Navigation considerations • Designated marine habitats • Commercial and recreational fisheries	1 1 1
228.5(d)	Limiting site size for monitoring and surveillance	• Accessibility	2
228.5(c)	Closure of interim ODMDSs	n/a	n/a
Sec 228.6(a)(1-11): Specific Considerations for Site Selection			
228.6(a)(3)	Location relative to beaches and amenities	n/a	1
228.6(a)(6)	Site dispersion, transport, and mixing characteristics	• Disposal mound height limit • Disposal site feasibility and stability • Site characteristics	1 1 2
228.6(a)(8)	Interference with other uses	• Site use conflicts • Conservation areas • Economic Impacts • Renewable energy siting	1 1 2 2
228.6(a)(1)	Geography, depth, topography, distance from coast	• State waters/basins • Site characteristics	1 1
228.6(a)(2)	Location relative to living resources: *breeding, spawning, nursery, feeding, or passage areas of living resources in adult or juvenile phases*	• Existing seafloor habitat	2
228.6(a)(9)	Existing water quality and ecology of site	• Existing habitat(s) at site • Recreational uses • Essential fish habitats	2 2 2
228.6(a)(4)	Types and quantities of wastes and disposal methods	• Capacity and area of impact	2
228.6(a)(11)	Proximity to historical features	• Cultural/archaeological resource at site	2

3. TIER 1 SCREENING

The ZSF was discussed with the group of Federal and State Cooperating Agencies at a meeting on January 8, 2013. Tier 1 screening, as used for this SEIS, defined areas within the ZSF not acceptable for locating an open-water disposal site designated under the MPRSA. Factors used for Tier 1 screening considerations are described below.

3.1 NY/CT/RI State Waters [40 CFR 228.6(a)(1)]

The geography, depth, and distance of potential sites from the coast are relevant for considering effects on natural and human resources along the coast. These factors further affect the hauling distance for barges from dredging centers, as well as environmental and safety risks during transport in areas of strong currents.

The state boundary between New York and Connecticut runs roughly east-west through the center of eastern Long Island Sound (Figure 1). The western part of Block Island Sound is part of New York State waters. Most of Rhode Island's waters extend 3 nautical miles (nmi) (5.6 km) from shore (mainland and Block Island) into Block Island Sound. For site screening purposes, New York, Connecticut, and western Rhode Island state waters were considered equally. Lesser weight was given to the eastern portion of Block Island Sound for the following reasons:

- Long travel distance of greater than 25 nmi (46 km) from major dredging centers in eastern Long Island Sound. Longer distances increase transportation costs and have higher risks of accidents in high energy areas such as The Race.
- Close proximity of some of Rhode Island's communities (*e.g.*, Block Island [New Shoreham], Point Judith) to the Rhode Island Sound dredged material disposal site (RISDS[4]) to the east of Block Island.

3.2 Stability and Feasibility [40 CFR 228.5(b), 228.6(a)(1)]

The active NLDS is a "containment area"[5]; the CSDS is a 'dispersive areas'[6]. As stated in the NOI, both currently active disposal sites would be considered in the SEIS along with other alternative site(s). This approach was also discussed with the Cooperating Agency Group on January 8, 2013. For Tier 1 screening purposes, water depth was used as a surrogate for sediment stability, following the approach used for the 2004 EIS for the CLDS/WLDS (USEPA and USACE, 2002; 2004a). Specifically, waters shallower than 59 feet (18 m)[7] deep were

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[4] The RISDS was designated by the USEPA in 2004 after preparation of an EIS (USEPA and USACE, 2004b).

[5] Containment areas have physical and geological features that restrict movement of bottom sediments from the area to surrounding areas. Containment areas could be topographical depressions in the seafloor or other locations where peak bottom current velocities are too slow for resuspending sediment.

[6] Dispersive areas have physical and geological features that disseminate materials from the disposal area to surrounding areas over time. Disposal areas would have sufficiently high peak bottom current velocities that resuspend sediments and carry them beyond the disposal area.

[7] The 2004 EIS (USACE and USACE, 2004a) utilized information collected from the disposal of dredged material throughout Long Island Sound; this information noted that waves and currents can remove material from dredged

eliminated from consideration because wave and storm driven bottom currents in shallower depths in Long Island Sound were considered strong enough at times for resuspending bottom sediments.

Figure 2 shows the ZSF screened for water depths shallower than 59 feet (18 m). The same depth was applied for both eastern Long Island Sound and Block Island Sound. In Block Island Sound, this depth mostly eliminated shallow areas around Long Island from consideration.

Areas of erosion and areas of coarse-grained sediments, based on USGS interpretation (*e.g.*, Knebel et al., 1999; O'Donnell, 2014a, 2014b) were not screened out in Tier 1 but given consideration in Tier 2 regarding their potential as alternative ODMDSs.

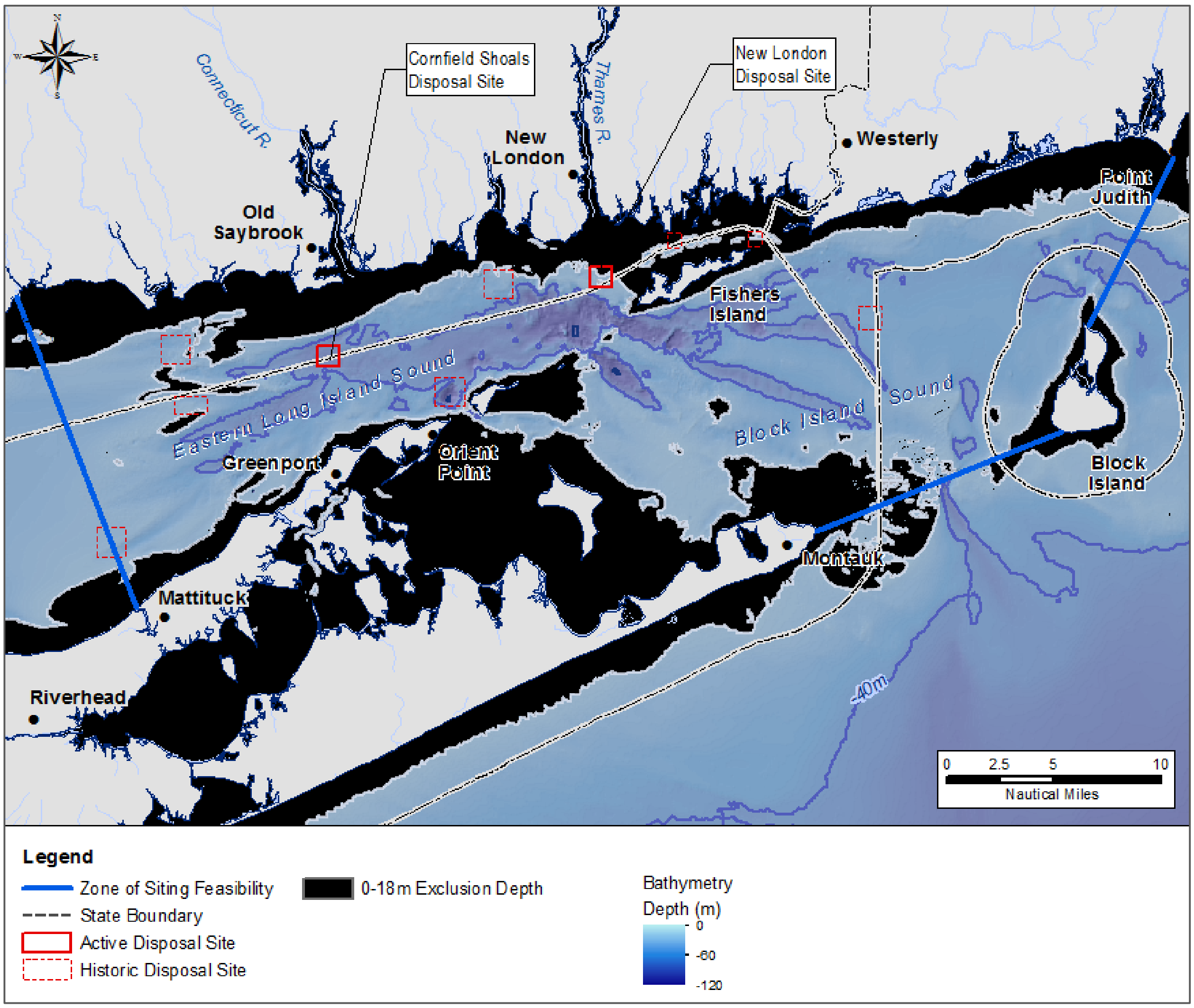

Figure 2. ZSF with waters shallower than 59 feet (18 m) screened in black. These shallow waters were considered susceptible to resuspension of sediment during storms and were thus removed from consideration.

material mounds that are at water depths shallower than 46 feet (14 m). Therefore, the 2004 EIS used a minimum depth of 59 feet (18 m) as a Tier 1 screening parameter.

3.3 Areas with Conflicting Uses [40 CFR 228.5(b), 228.6(a)(3), 228.6(a)(8)]

Conflicting use considerations included the following:

- *Beaches and amenities* (Figure 3): Data on beaches and parks were available from the LIS DMMP (WHG, 2010), as well as from State agencies and municipalities. Alternative ODMDSs would not be placed near beaches. Recreational boating is discussed in Section 3.4 below.

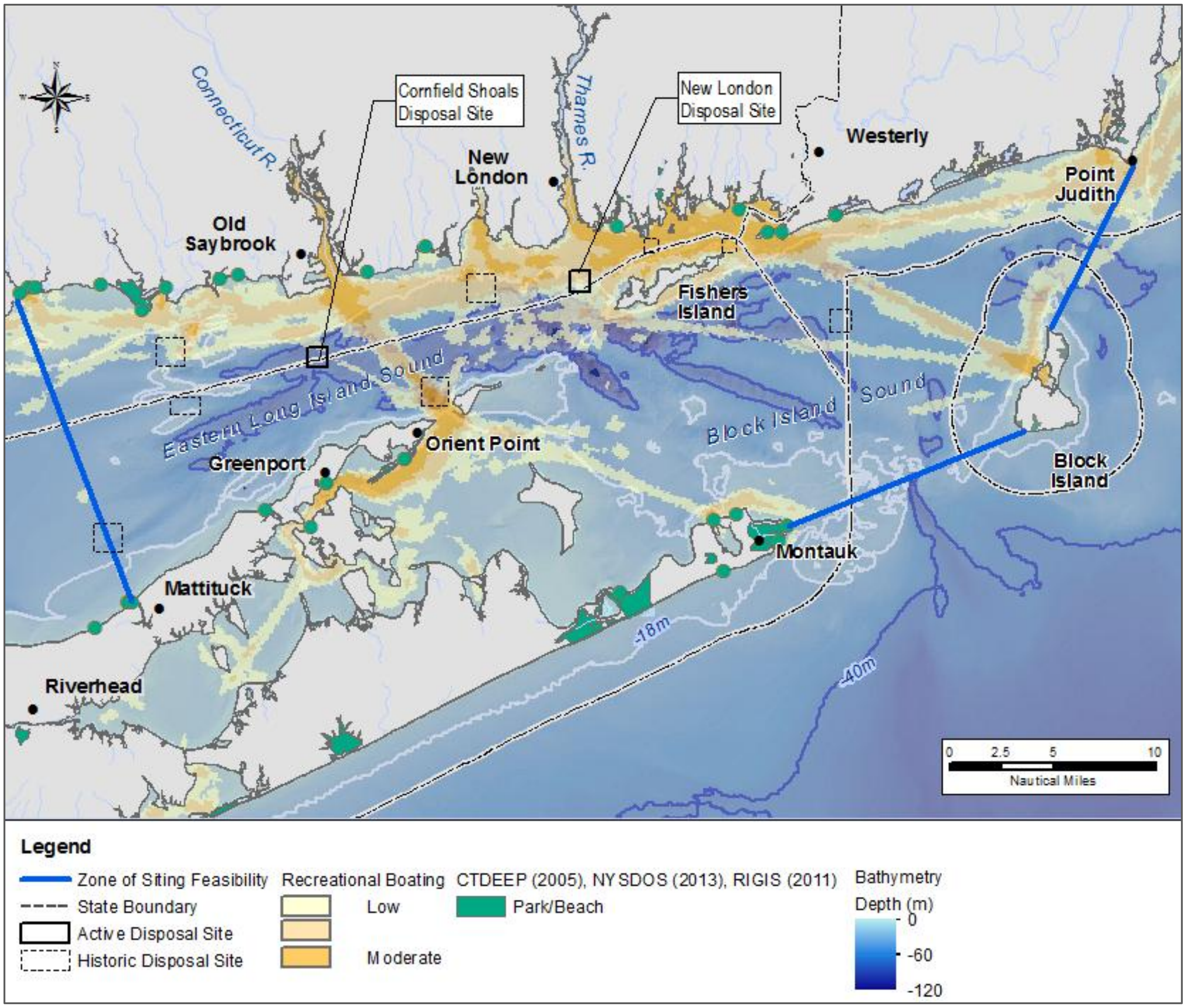

Figure 3. Public beaches, parks, and recreational boating in the ZSF. (Data sources: State GIS data bases [CTDEEP, NYSDOS, RIGIS] and NROC, 2012)

- *Conservation areas* (Figure 4): Conservation areas (nature preserves, sanctuaries, wildlife refuges, national seashores, parks, fish havens, artificial reefs, etc.) are located along the shore and in nearshore areas throughout the ZSF. Most conservation areas in the ZSF are in waters shallower than 59 feet (18 m). Alternative ODMDSs would not be placed near State or Federal reserve areas, artificial reefs, or other conservation areas. Hardbottom areas (rock outcrop, identified as reefs on NOAA charts; Figure 4) in the ZSF are considered fish havens and would be avoided.

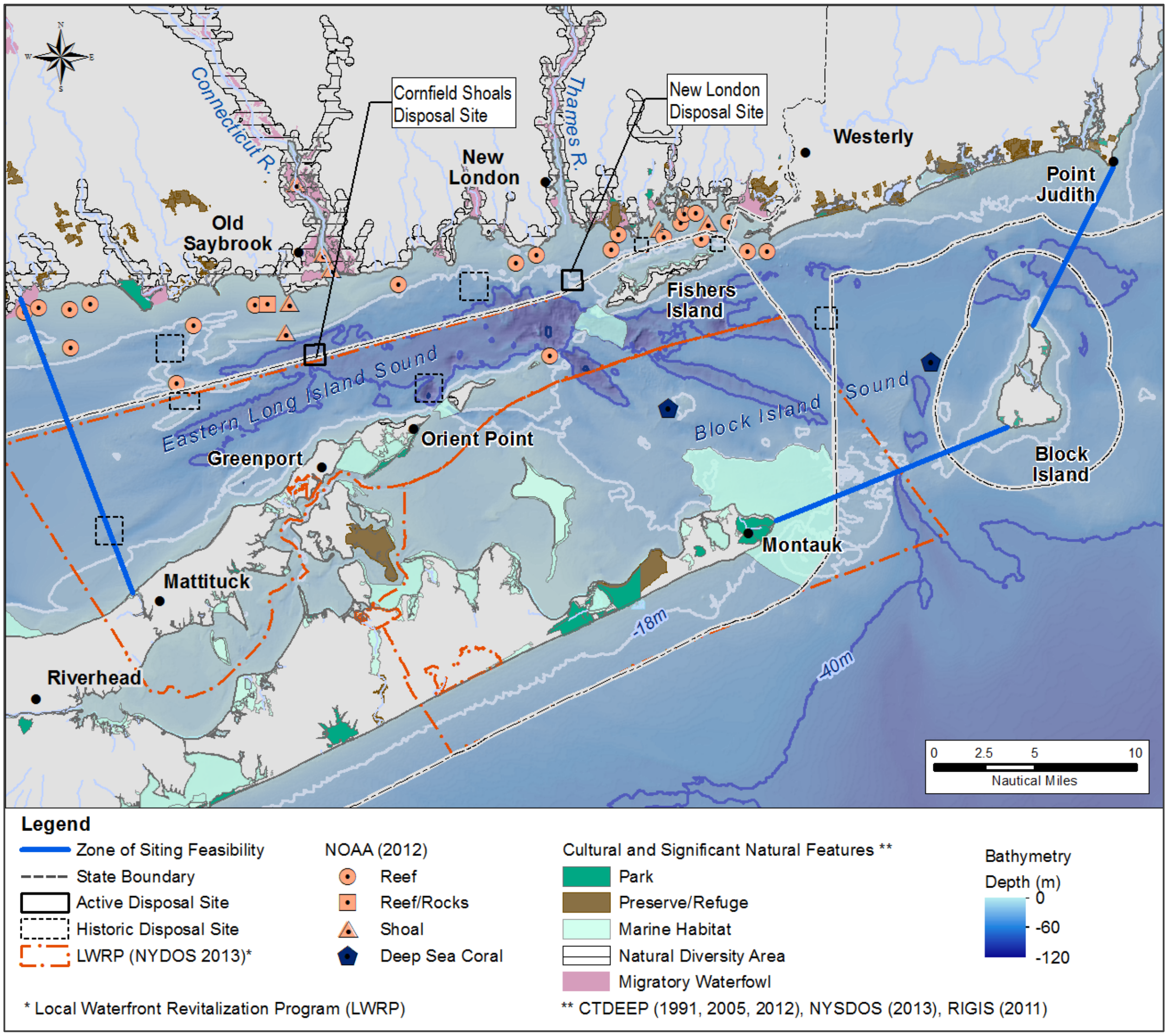

Figure 4. Conservation areas in the ZSF. (Data sources: State GIS data bases [CTDEEP, NYSDOS, RIGIS] and NOAA, 2012, 2013a)

- *Utilities (pipelines, cables, cable areas, etc.)* (Figure 5): Utilities in the ZSF consist of submarine pipelines, installed cables, and areas identified on NOAA charts for the installation of cables. Pipelines in the ZSF are limited to crossings in coastal estuaries of Connecticut only. Submarine cables in the ZSF consist of electric and telecommunications cables.

  Some of the cable areas near Fishers Island contained cables that were installed during the Second World War. Inquiries with various agencies and other organizations revealed that these cables are no longer in use and have at least partially been removed. These agencies and organizations included the U.S. Coast Guard, Naval Undersea Warfare Center, Fishers Island Electric Corporation, and the American Museum of Natural History [presently own Great Gull Island]). For the selection of disposal sites, active cable areas would be avoided. A minimum 200-ft (60-m) buffer zone around each pipeline, cable, and cable area was assumed during the screening; the exception were the cable areas in the vicinity of Fishers Island as marked in Figure 5 by the red polygon.

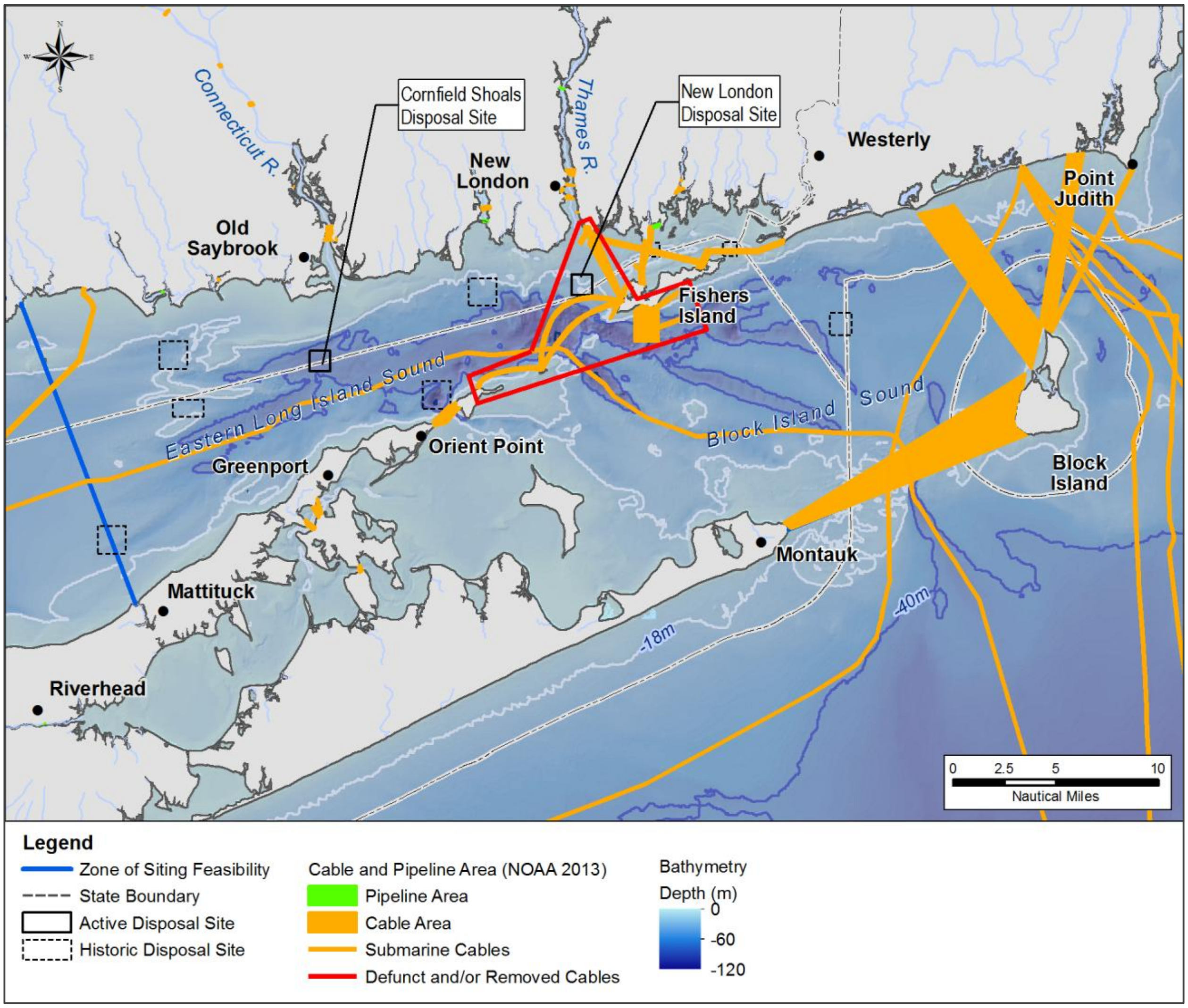

Figure 5. Utilities (pipelines, cables, and cable areas) in the ZSF. Cable areas within the red polygon near Fishers Island appear on current NOAA charts; however, inquiries indicate that either they no longer contain cables, or cables are no longer in use and have at least partially been removed. (Data source: NOAA, 2013a)

3.4 Interference with Navigation [40 CFR 228.5(a)]

There is active commercial vessel traffic within the ZSF, which includes ferry operations (Figure 6). Recreational traffic is included in Figure 3. Generally, vessel traffic (especially recreational vessel traffic) was less of a concern for the selection of alternative ODMDSs given the open water conditions in the ZSF and the generally short time duration that dredged material transport barges would be present at a site during dredged material disposal. Therefore, commercial and recreational traffic was not considered during Tier 1 screening, but will be discussed in the SEIS.

There are also several anchorage areas within the ZSF (Figure 6). These areas were considered during Tier 2 screening.

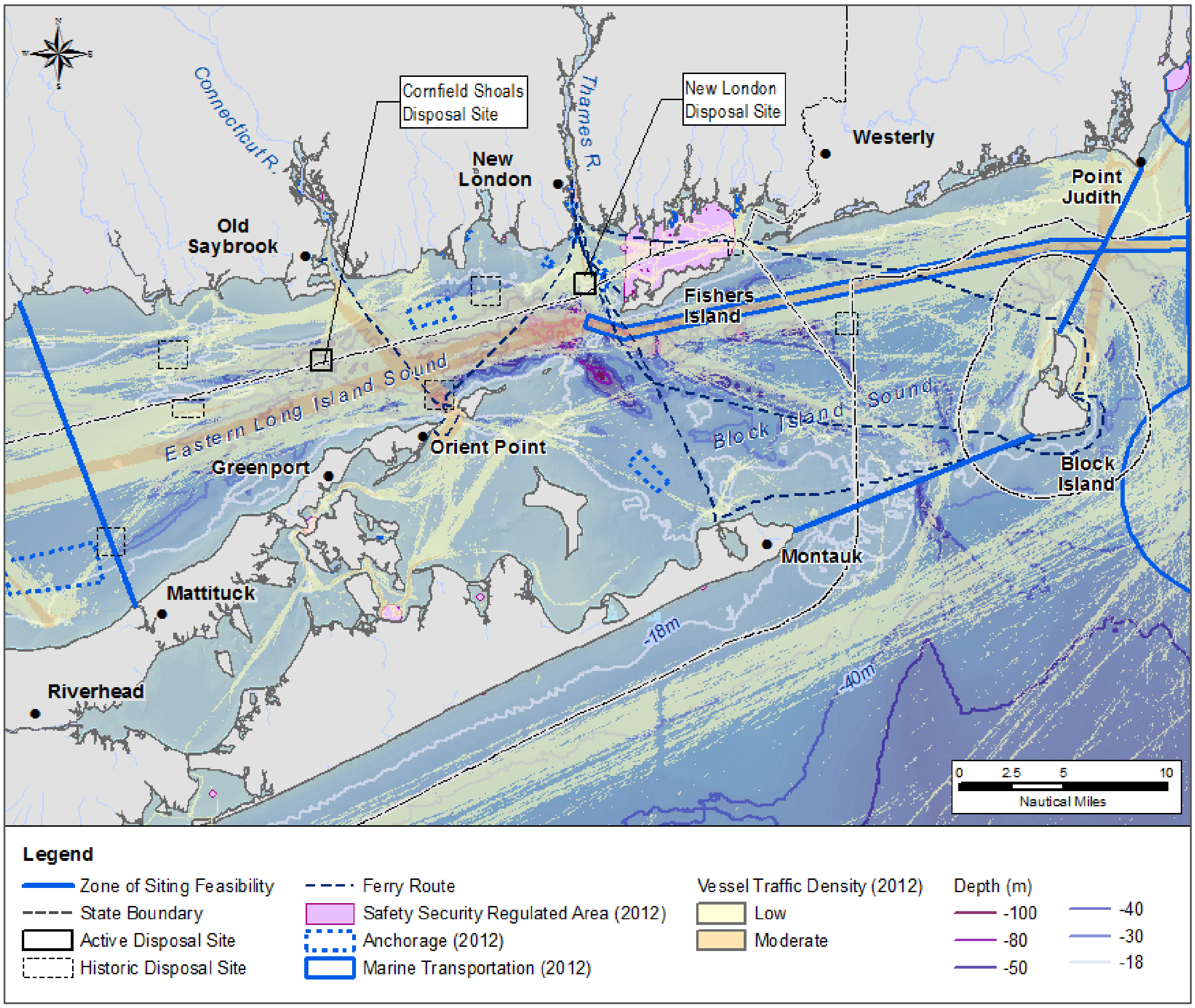

Figure 6. Density of commercial vessel traffic, marine transportation routes, and anchorage areas in the ZSF. (Data Sources: U.S. Coast Guard, 2012; NOAA, 2013a).

3.5 Shellfisheries Areas [40 CFR 228.5(a)]

Shellfish beds (Figure 7) were considered areas within which alternative ODMDSs would not be sited. Shellfish beds are generally identified based on the abundance of attached shellfish (oysters) and shellfish with limited mobility (clams, scallops).

Shellfishing zones were considered mostly under Tier 2 screening (see Section 4.6). However, zones of "Approved" shellfishing were considered under Tier 1 screening; these zones were removed from consideration for siting alternative ODMDSs.

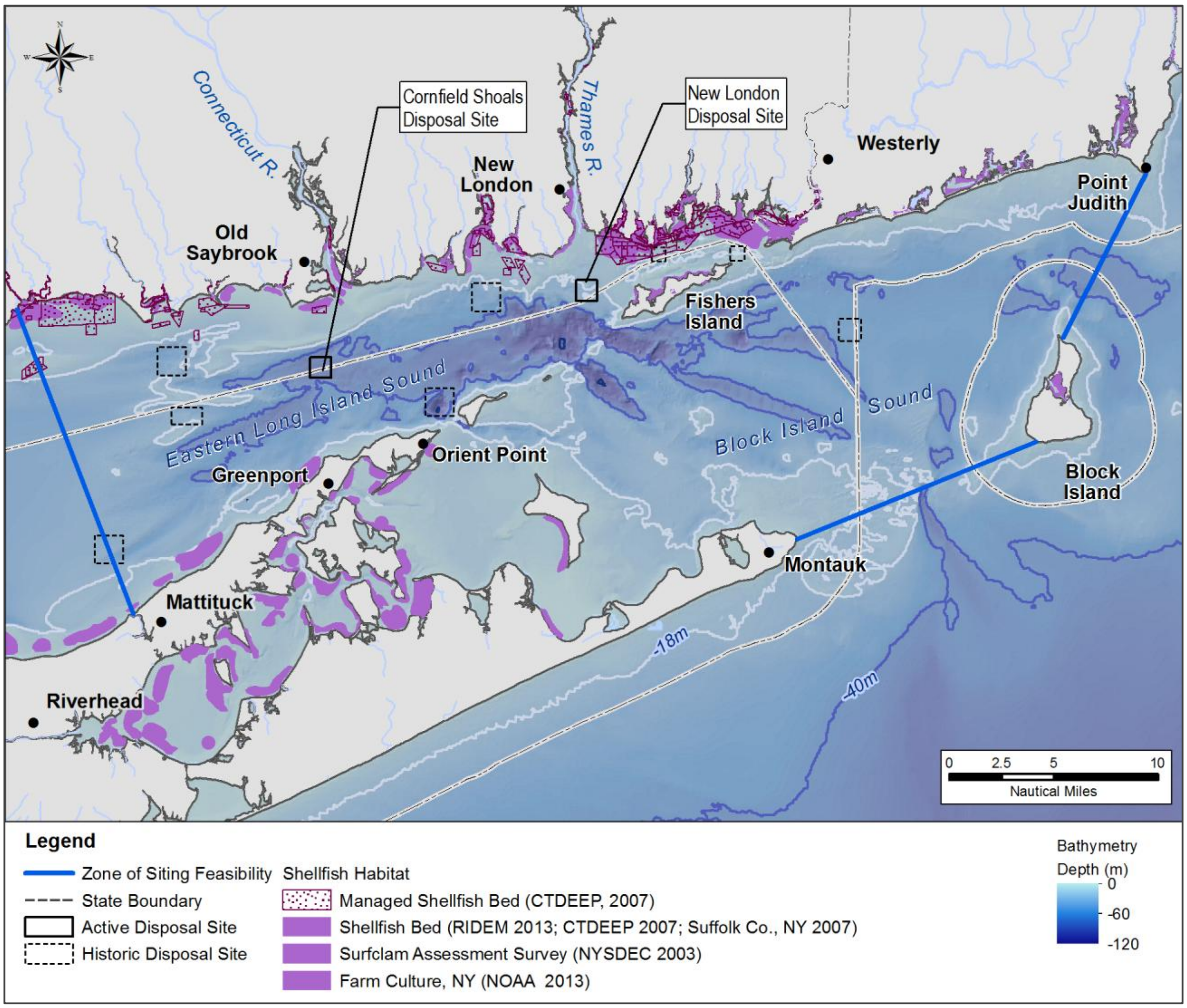

Figure 7. Shellfish beds in the ZSF. (Data sources: GIS data bases from States, Suffolk County [NY], and NOAA [2013a])

3.6 Valuable Marine Habitats [40 CFR 228.5(a), 228.6(a)(2)]

Generally, sediment texture (*e.g.*, clay/silt, sand, gravel, boulders) and seafloor morphology (*e.g.*, rock outcrops, sand waves, and mud flats) affect the suitability of the habitat for benthic organisms (including oysters, clams, worms, etc.). Specifically, sediment texture and morphology affect breeding, spawning, nursery, feeding, and shelter of species at various life stages. Benthic habitats vary considerably in the ZSF. Areas of extensive hardbottom (rock outcrops and boulder fields) in the ZSF were considered important marine habitats because they provide topographic relief important to living marine resources. Therefore, they were not considered for siting alternative ODMDSs. Sediment texture in the ZSF in water depths below 59 feet (18 m) is presented in Figure 8. Unusual seafloor morphology (*e.g.*, shoals, ridges, scour holes) and tidal conditions in the ZSF may result in unique habitats, such as in The Race (the area between Fishers Island and Little Gull Island), Plum Gut (the area between Plum Island and Orient Point), and Montauk Point Shoals. These three areas have been designated as Significant Coastal Fish and Wildlife Habitats (NYSDOS, 2002, 2005a, 2005b; see Section 5 for additional information). The areas are included in Figure 4 under the category "Marine Habitat".

3.7 Areas of High Dispersion Potential [40 CFR 228.6(a)(6)]

The estimated future dredging needs for communities in the ZSF (USACE, 2009) and available site capacities were factors for considering containment site(s) versus dispersive site(s). This consideration included the type of sediment to be dredged and disposed. The majority of sediment from the eastern Long Island Sound region would consist of fine-grained material from harbors. This type of sediment should be disposed in containment sites for appropriate management and monitoring. The active CSDS is a dispersive site selected by the USACE for coarser-grained material.

3.8 Summary of Tier 1 Considerations

Figure 8 summarizes the Tier 1 screening considerations, with sediment texture as background. The areas removed from consideration are shaded in black (water depth shallower than 59 feet [18 m], reefs, and significant marine habitats), solid brown (cables, cable areas, pipelines), and cross-hatched brown (approved shellfishing zones). Hardbottom areas were also not considered for siting alternative ODMDSs. The remaining areas, not screened out under Tier 1 were considered further under Tier 2.

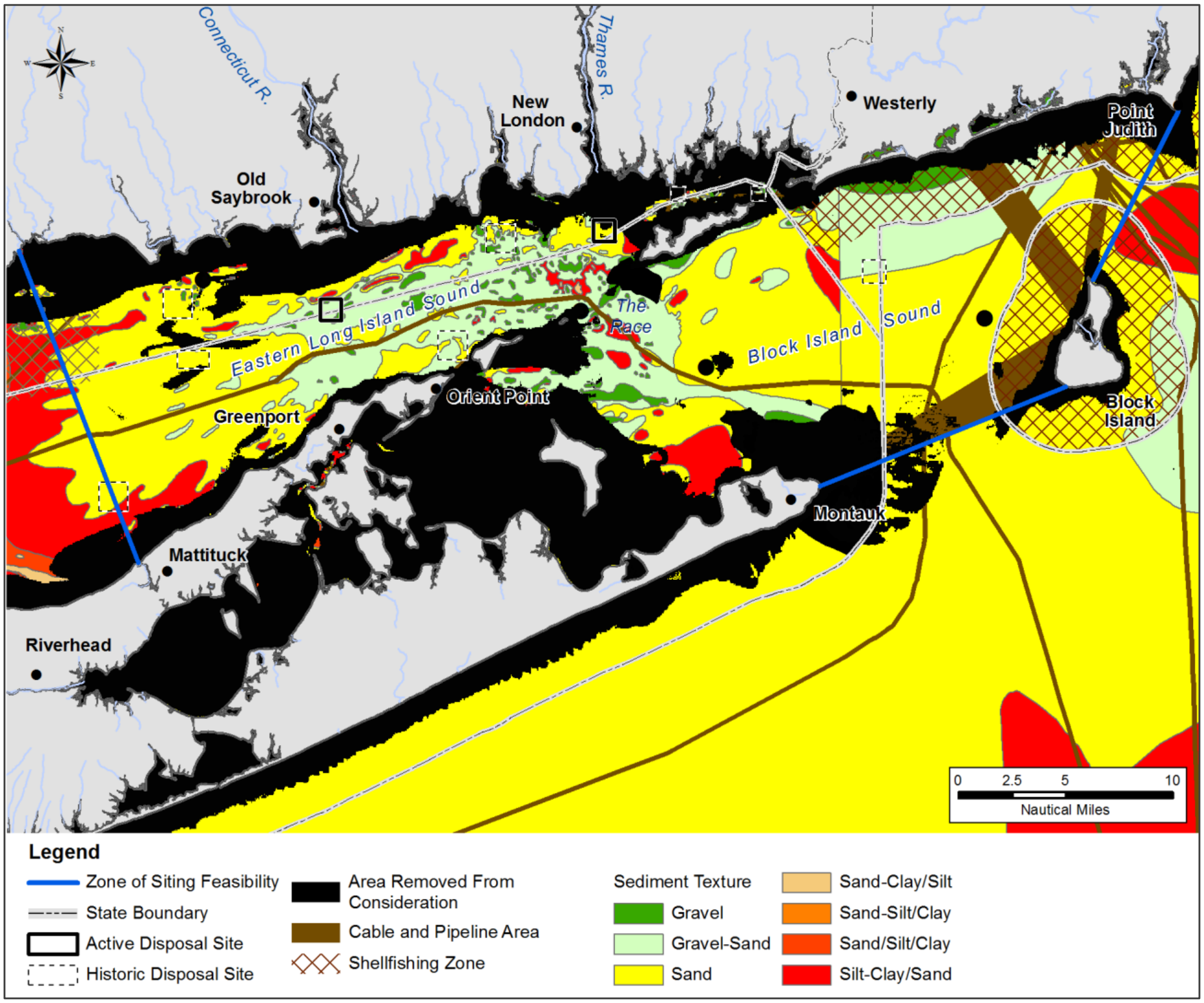

Figure 8. Summary of Tier 1 screening considerations. The background represents sediment texture (Source: Poppe et al., 2000).

4. TIER 2 SCREENING

The objective of Tier 2 screening was to identify specific alternative ODMDSs within the areas remaining after Tier 1 screening for further evaluation in the SEIS.

4.1 Active and Historic Disposal Sites [40 CFR 228.5(e)]

There are two active disposal sites and seven historic sites in the ZSF (Figure 9). Preference was given to historic disposal sites for siting alternative ODMDSs, although the two historic disposal sites within Fishers Island Sound (North Dumpling and Stonington) were not considered due to the more enclosed nature of this waterbody.

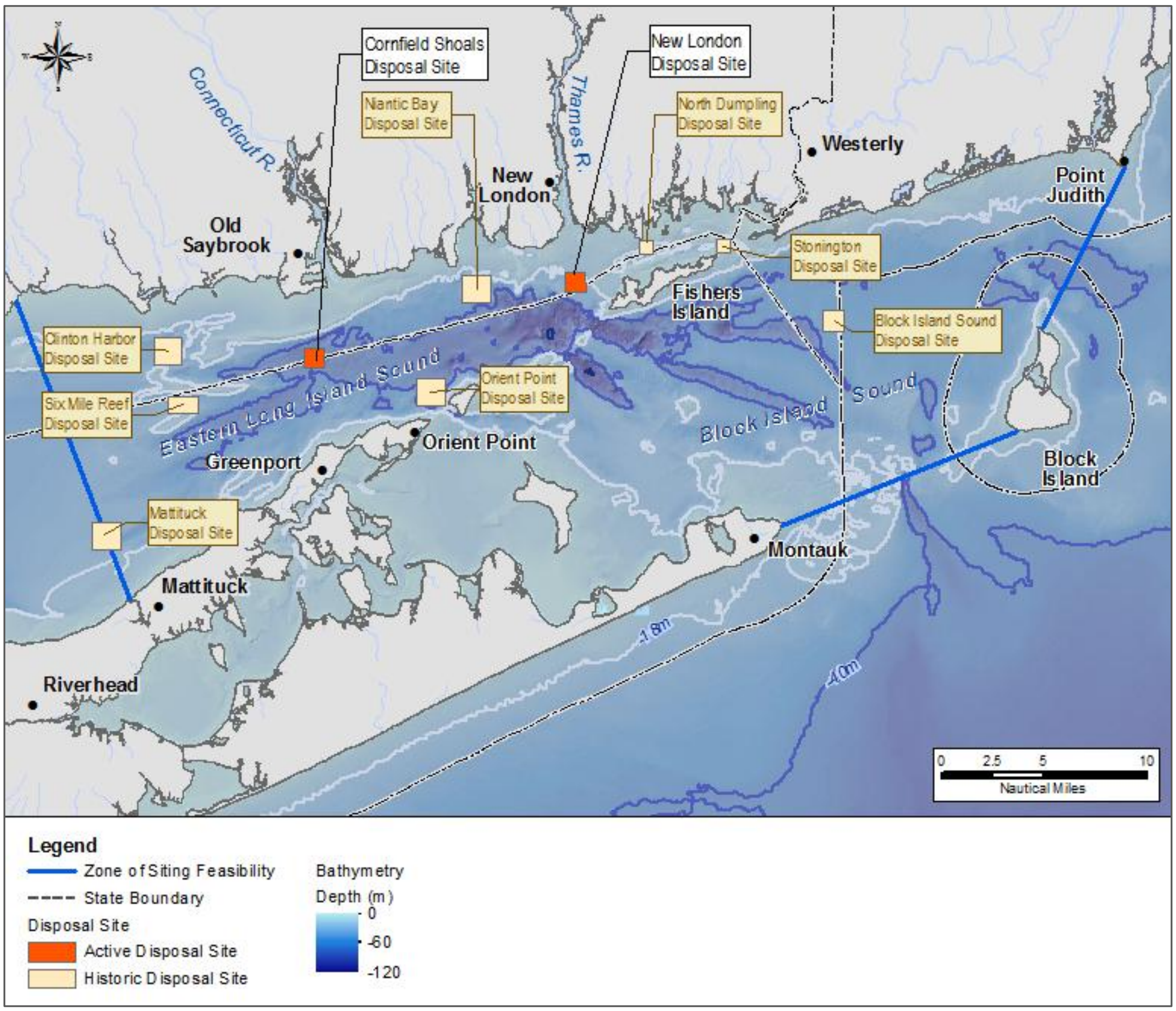

Figure 9. Active and historic dredged material disposal sites in the ZSF. (Source: Database of the USACE, New England District).

Use of historically used disposal sites would avoid modifying the bottom type and habitat of additional areas in the ZSF and additionally could address potential adverse sediment quality issues resulting from the historical use of these sites. This consideration is consistent with 40 CFR 228.5(e) which directs the USEPA to, "wherever feasible, designate ocean [disposal] sites … that have been historically used."

4.2 Minimize Impacts to Archaeological Resources [40 CFR 228.5(a)(11)]

There are a number of shipwrecks within the ZSF (Figure 10). Information was gathered from NOAA's Automated Wreck and Obstruction Information System (AWOIS), which provides a historical record of selected wrecks and obstructions including a brief history and descriptive details.

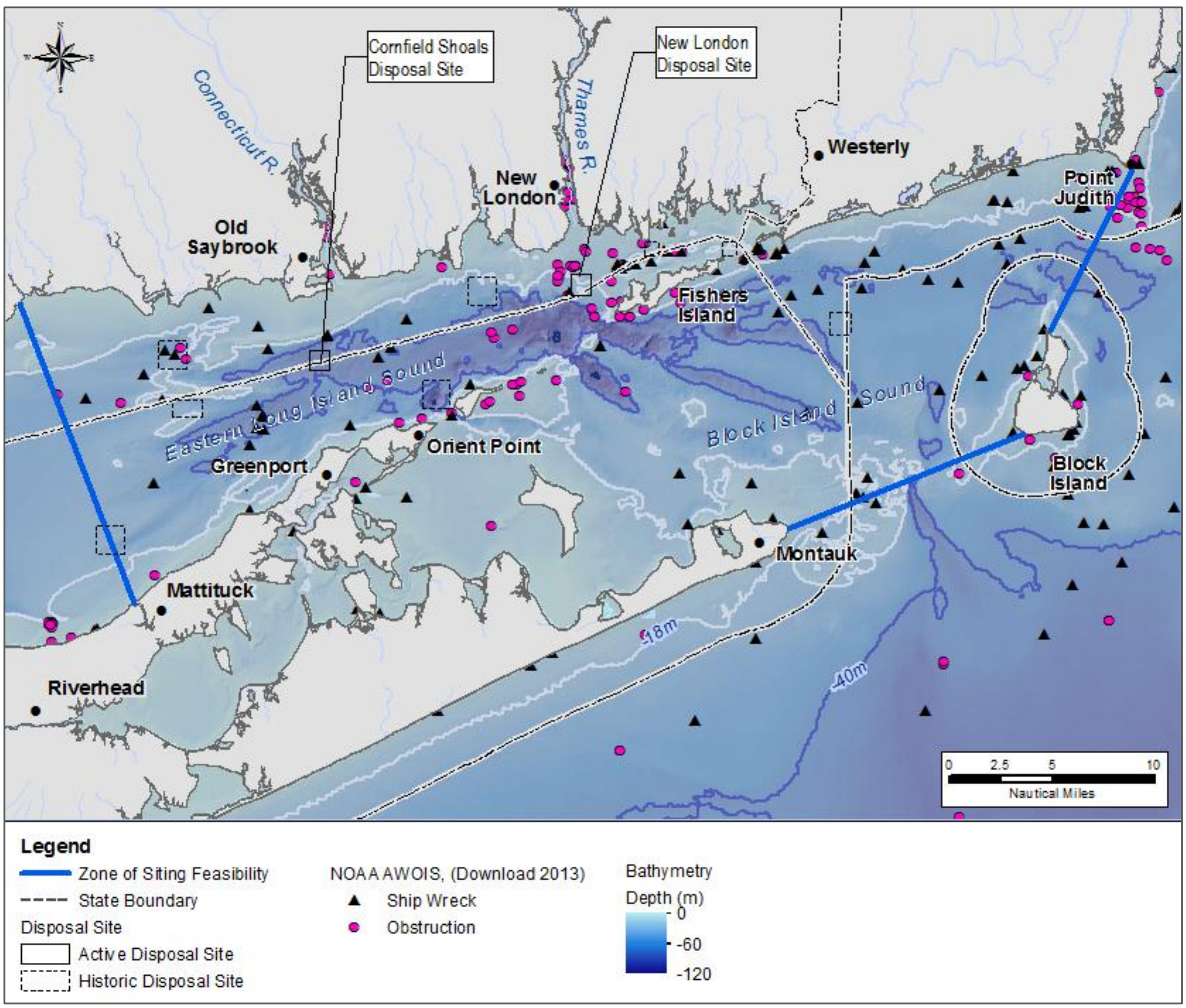

Figure 10. Shipwrecks and obstructions in the ZSF. (Data source: NOAA, 2013b)

4.3 Minimize Impact to Fish Habitats and Fish Concentrations [40 CFR 228.5(a), 228.6(a)(8), 228.6(a)(9)]

The alternative ODMDS siting should minimize significant impacts to fish habitat and fish concentrations. Recent fish habitat and fish concentrations data from CTDEEP's monitoring program, conducted since 1984, were considered (*e.g.*, Gottschall and Pacileo, 2012; 2014). The program surveys an area from New London to Greenwich, Connecticut, and includes both Connecticut and New York State waters ranging in depths from 16 to 150 feet (5 to 46 m). Typically, Long Island Sound is surveyed in the spring, from April through June, and in the fall, from September through October. Since 2003, twenty finfish species and two invertebrate species (lobster and long-finned squid) have been measured. Generally, fish catches (measured in catch-per-unit-effort [CPUE]) indicate that there is higher finfish abundance in the western and central Long Island Sound compared to the eastern Long Island Sound.

Tetra Tech (2014) analyzed the CTDEEP data and in addition performed a fishing activity survey. In essence, commercial and recreational fishing is generally more extensive in Block Island Sound than in eastern Long Island Sound. In eastern Long Island Sound, review of finfish data from the corridor between NLDS and CSDS indicated that catches in areas of disposal sites were not different from other areas, and that the data did not provide significant insight or discriminatory power for decision making.

Tetra Tech (2014) also assessed lobster fishing in the ZSF through the fishing activity survey and by reviewing CTDEEP fish trawl data (Gottschall and Pacileo, 2012). Overall, the abundance of lobsters in the ZSF is low. The relatively highest commercial lobster fishing activity appears to occur in eastern Block Island Sound. The American lobster population experienced a die-off in Long Island Sound in 1999 as a result of abiotic stressors coupled with disease. As a result, lobster abundance in all of Long Island Sound has declined 40-fold from a peak of approximately 12 million pounds in 1996 to 300,000 pounds in 2011 (LISS, 2013).

4.4 Minimize Impact to Living Resources (Breeding, Spawning, Nursery, Feeding, and Passage Areas) [40 CFR 228.228.6(a)(2)]

Living resources were evaluated by reviewing biological data as well as the seafloor morphology as an indication of the habitat. In eastern Long Island Sound, Tetra Tech (2014) examined the biological resources based on CTDEEP fish catch data, benthic sampling, and a fishing activity survey. Seafloor morphology information was obtained from multibeam echosounding surveys of the sea-floor topography by the USGS and NOAA (*e.g.*, Poppe et al., 2011, 2014), as well as recent reports by the DAMOS program (*e.g.*, ENSR, 2005; AECOM, 2009, 2012). Generally, seafloor areas with hardbottom and boulder fields were considered to have higher living resource values.

4.5 Minimize Impacts to Benthic Community [40 CFR 228.6(a)(6)]

The relationship between sediment texture and geomorphology and benthic community was shown for example by Zajac et al. (2000a,b) and Pellegrino and Hubbard (1983). Generally, in

Long Island Sound, species richness[8] is low in western Long Island Sound and increases toward eastern Long Island Sound (Figure 11). Higher species richness in eastern Long Island Sound may be a result of factors such as a larger potential species pool at the eastern end of Long Island Sound and the connection to the open coastal waters of Block Island Sound and the Atlantic Ocean (Lopez et al., 2014).

Samples of the benthic infauna[9] in eastern Long Island Sound were obtained in July 2013, including from the NLDS and CSDS (Tetra Tech, 2014). The benthic community was observed to be well-developed and highly diverse. However, no differences were apparent between taxa from samples within the disposal sites and outside disposal sites. This finding is consistent with findings from ongoing ODMDS monitoring that has demonstrated recovery to typical benthic communities within short time periods after dredged material disposal at existing sites in Long Island Sound (*e.g.*, ENSR, 1998, 2001; AECOM, 2010, 2012).

The maintenance of the continuity of benthic community type was considered during screening to preserve benthic community habitat (*e.g.*, disposal of fine-grained dredged material on fine-grained bottom sediment), if possible.

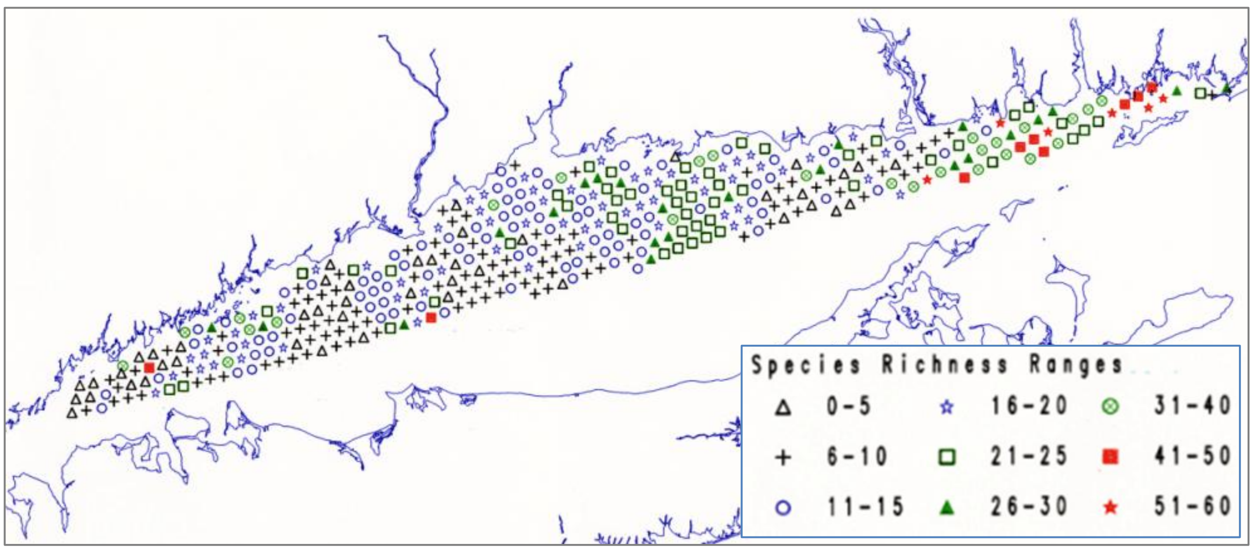

Figure 11. Benthic species richness in Long Island Sound determined by Pellegrino and Hubbard (1983, as provided in Lopez et al., 2014). A generally higher species richness was observed in eastern Long Island Sound (red symbols).

4.6 Minimize Impact to Shellfisheries and Shellfishing Resource Areas [40 CFR 228.5(a), 228.6(a)(8)]

Shellfishing consists of the harvesting of naturally-growing or farmed shellfish. Shellfishing resource areas consist of approved zones for recreational and commercial shellfish harvesting.

[8] Species richness is the number of different species represented in an ecological community, landscape or region.

[9] Benthic infauna consists of organisms that dwell *within* the upper layer of the sediment on the seafloor.

Shellfish collection in waters below 59 feet (18 m) is prohibited at NLDS and CSDS, as well as in coastal waters surrounding Plum Island (Figure 12). Other areas are classified approved, conditionally approved (with various restrictions), conditionally restricted (with various restrictions), or restricted. "Approved" shellfishing areas were eliminated from further consideration for alternative ODMDSs during Tier 1 screening (see Section 3.5). Tier 2 screening considered other types of shellfishing zones, and proximity of alternative ODMDSs to "Approved" shellfishing zones.

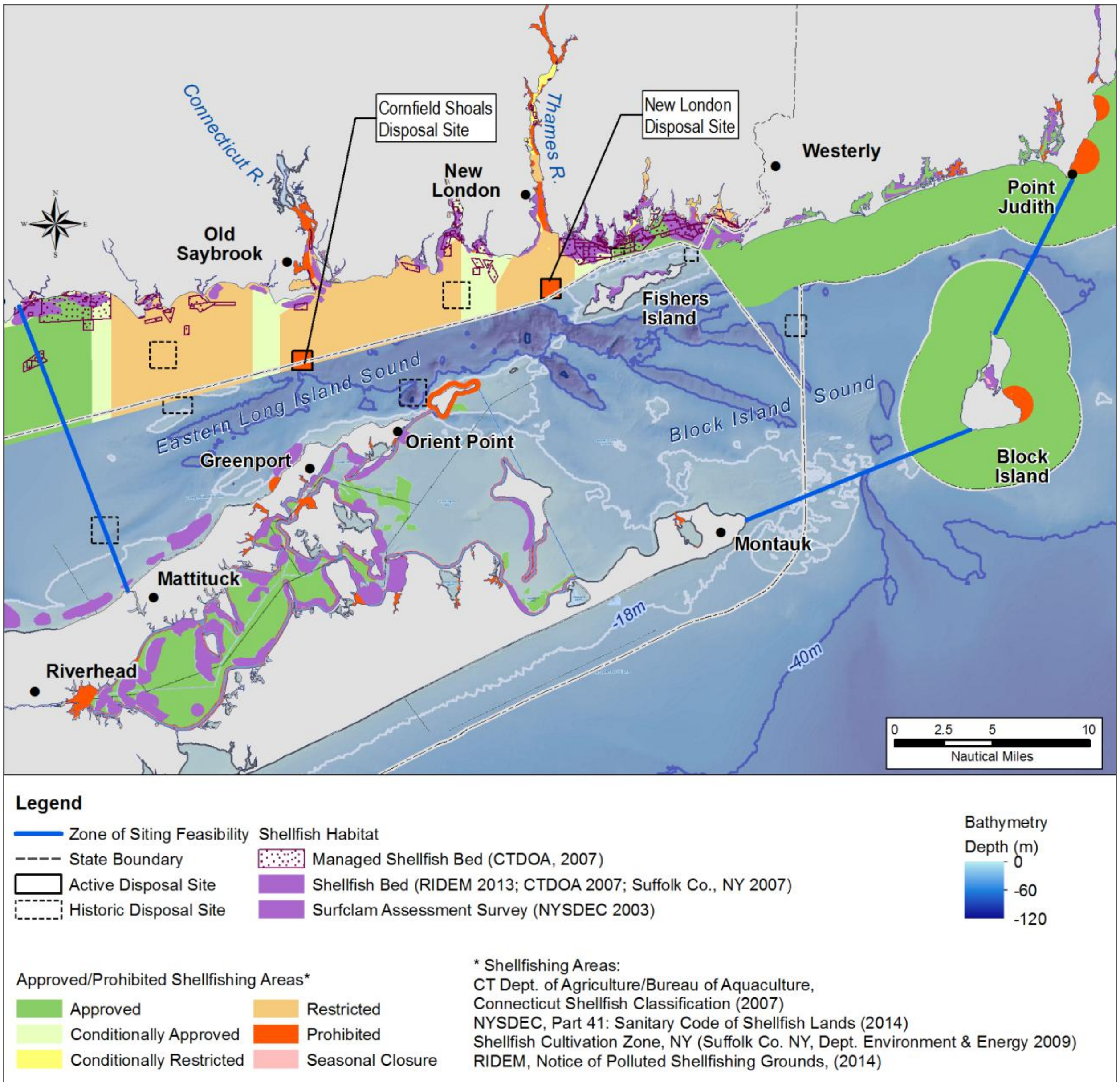

Figure 12. Shellfish beds and shellfishing zones in the ZSF. (Data sources: GIS data bases from States, Suffolk County [NY], and NOAA [2013a]).

4.7 Consideration of Site Characteristics [40 CFR 228.6(a)(6)]

Sediment chemistry data were obtained in eastern Long Island Sound to determine background conditions in eastern Long Island Sound. Specifically, sediments were sampled in eastern Long Island Sound at 35 stations and analyzed for metals (copper, mercury, lead, zinc, cadmium, chromium) and organic compounds (polycyclic aromatic hydrocarbons [PAHs], pesticides, polychlorinated biphenyls [PCBs]), and total organic carbon concentrations (TOC) (UCONN and Louis Berger, 2015). Concentrations of metals and total PAHs, pesticides, and PCBs were generally low or below the analytical reporting limit.

None of the concentrations exceeded the NOAA Effects Range-Medium (ERM) guideline values[10]. TOC in the sediment is an indication of the organic matter content, used as background but not for site screening. TOC is commonly higher in finer- grained sediment (silt/clay) and lower in coarser-grained sediment (sand). TOC concentrations in all sediment samples ranged between approximately 0.2% and 3.5% dry weight (UCONN and Louis Berger, 2015), with highest individual concentrations at the NLDS consistent with the presence of fine-grained sediments at the site.

Concentrations of metals and organic compounds in Block Island Sound sediments are expected to be low due to the comparatively long distance to urban sources for such chemicals and the generally coarse grain size of the sediments (organic compound and metal concentrations are typically higher in finer-grained sediments).

4.8 Site Dimension [40 CFR 228.6(a)(4)]

The two active disposal sites were developed by the USACE for their site selection documentation. Alternative ODMDSs were evaluated based on the need and capacity using a minimum area of 1 nmi^2 (3.4 km^2). Similarly, each site should have sufficient capacity for the placement of all or most of dredged material that is expected to be generated in the eastern Long Island Sound region over the 30-year planning horizon (2008 to 2027). This volume for the eastern Long Island Sound region is 14.4 million cubic yards (cy) (11 million m^3), as determined by the USACE (2009).

4.9 Surveillance and Monitoring [40 CFR 228.5(d), 228.6(a)(5)]

The feasibility of monitoring and assessment in the ZSF is affected by the seafloor morphology and physical oceanographic conditions. This consideration used the USGS/NOAA seafloor morphology data (*e.g.*, Poppe et al., 2011, 2014) and the tidal current information from the physical oceanography (PO) study (O'Donnell, 2014b).

[10] A ERM guideline value is simply a point on a continuum of bulk chemical concentrations in sediment that roughly relates to the median probability of sediment toxicity. The 50th percentile of the ranked data is identified as the ERM. The ERM is indicative of concentrations above which adverse biological effects frequently occur. Guideline values are published in Buchman (1999), based on multiple references therein.

4.10 Interference with other Uses [40 CFR 228.6(a)(8)]

Aside from uses of the ZSF already discussed above, other uses include renewable energy generation potential. Overall, the potential for renewable energy generation is marginal, as follows:

- *Wind energy*: Most of eastern Long Island Sound is classified by the U.S. Department of Energy (USDOE) as Wind Power Class 3 or 4; Block Island Sound is classified mostly as Class 4 or 5 (Figure 13). For reference, the proposed Cape Wind offshore wind farm project is located within Class 5 and 6 areas. Due to the comparatively low wind energy classes in the ZSF, wind energy generation potential was not considered for siting alternative ODMDSs.

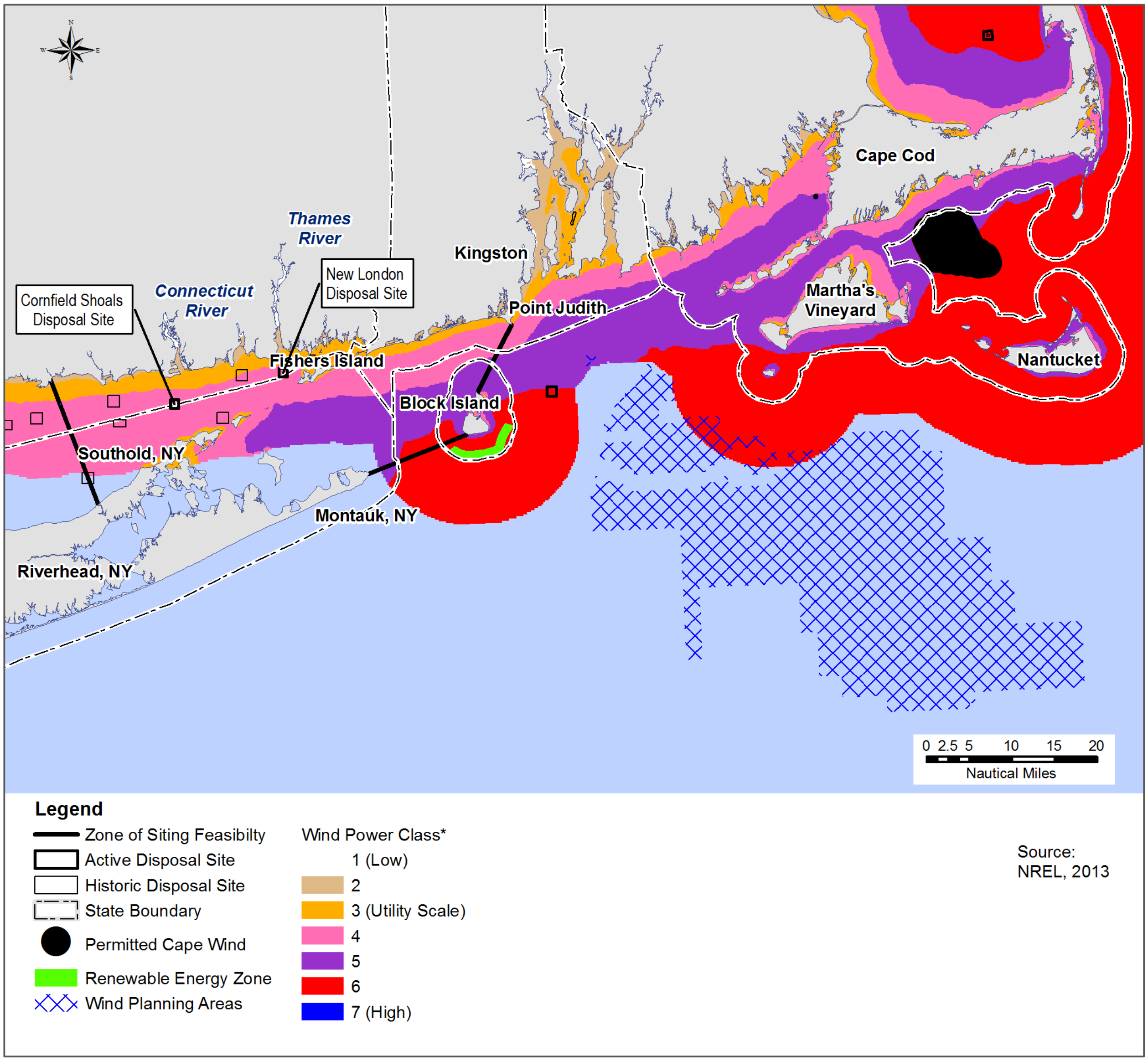

Figure 13. Wind energy potential in the ZSF (Data source: NREL, 2013).

- *Wave energy*: Wave power density is comparatively low throughout the ZSF (NOAA, 2013c). The wave power density is expected to be lower in eastern Long Island Sound than in Block Island Sound due the more protected nature of eastern Long Island Sound. Wave energy was not considered for siting alternative ODMDSs, as all locations in the ZSF have lower potential than the nearby wide-open continental shelf of the Atlantic Ocean.

- *Tidal energy*: The tidal energy potential coincides with tidal current velocities. The relatively highest tidal energy exists in The Race, Plum Gut, and at Montauk Point Shoals (Georgia Tech, 2013); these three areas have also been designated by NYSDEC as Significant Coastal Fish and Wildlife Habitats and were therefore screened out in Tier 1. Tidal energy potential in other areas within the ZSF was not considered for siting alternative ODMDSs, as it is considered minor compared to areas around Martha's Vineyard and Nantucket.

There is no evidence from the physical oceanography study (O'Donnell, 2014a; 2014b) that would modify the results of the USDOE program studies focused on these other renewable energy resources.

Another factor considered during Tier 2 screening was travel distance for barges from dredging centers as higher costs for disposal may prohibit dredging of some public or private shore facilities. Using the same threshold that was used in the WLIS/CLIS EIS (USEPA and USACE, 2004a), candidate disposal sites more than 25 nmi (46 km) from a dredging center in the eastern Long Island Sound region were determined to not be economically and operationally feasible.

5. ALTERNATIVE SITES

Based on the results of the Tier 1 and 2 screening, eleven initial sites were identified. These sites included the two active disposal sites, five areas that were historically used for dredged material disposal, and four 'new' areas not previously used for disposal (Figure 14).

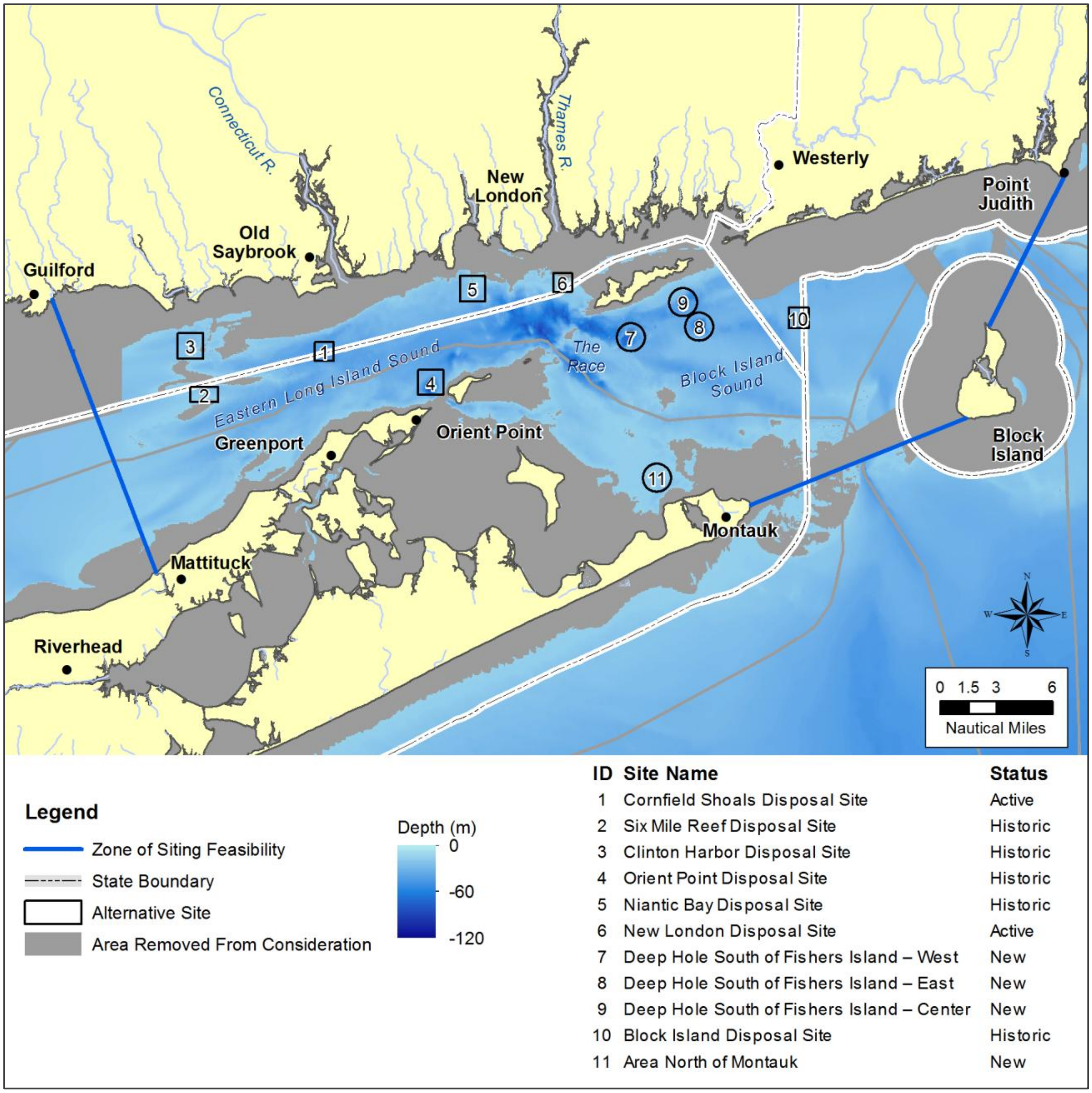

Figure 14. Locations of eleven initially screened potential ODMDSs in the ZSF, as presented to the Cooperating Agency Group on May 20, 2013.

These eleven sites were introduced to the Cooperating Agency Group during a webinar on May 20, 2013. Additional information from the literature was reviewed and data were collected in the field in order to reduce the number of potentially suitable sites that would be evaluated in more detail in the SEIS. Following is a review of each of these eleven sites.

5.1 Cornfield Shoals Disposal Site (Site 1)

The CSDS is an active disposal site, located in a central location in eastern Long Island Sound approximately mid-way between Connecticut and New York. Specifically, the site is located 3.3 nmi (6.1 km) south of Cornfield Point in Old Saybrook, Connecticut (Figure 15). The site has an area of 1 nmi^2 (3.4 km^2) centered at 41°12.6858' N, 72°21.4914' W (NAD83) and a water depth of approximately 150 feet (50 m) (Figure 16). Over 80% of the site is located within Connecticut waters, with the remainder of the site located in New York State waters.

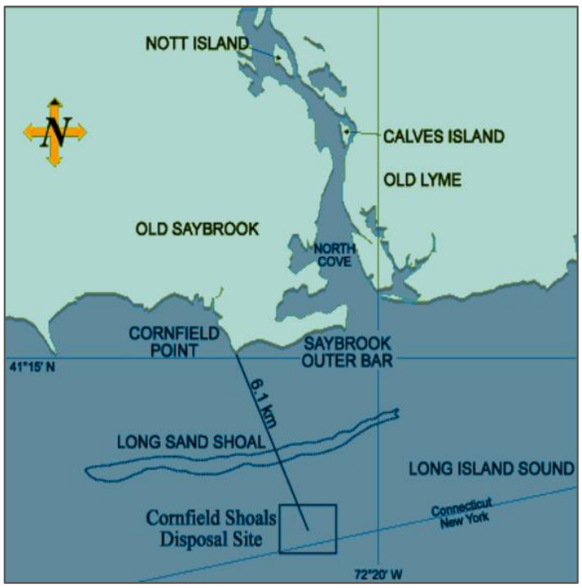

Figure 15. Cornfield Shoals dredged material disposal site (CSDS) south of the mouth of the Connecticut River and of Long Sand Shoal (Source: USACE, 2014b).

Bottom currents are directed generally east-west, due in part to the shallow Long Sand Shoal approximately 0.5 nmi (1 km) to the north of the site. This shoal is an elongate ridge about 2 nmi (3.5 km) off the mouth of the Connecticut River (Figure 15). It is 6 nmi (11 km) long and up to about 1,500 feet (450 m) wide, with a minimum water depth over the shoal of 8 feet (2.4 m) (Williams, 1981).

The seafloor around the CSDS is relatively flat, with longitudinal ripples and other bedforms that suggests that this area is sediment-starved; the site is classified as erosional/nondepositional (Poppe et al., 2013). Surface sediments at the CSDS consist predominantly of gravel and gravelly sediment (Figures 16 and 17). Gravelly sediment consists of a mixture of 50-90% sand, silt and clay; the remaining fraction consists of gravel. Sediment sampling for the SEIS indicates that the dominant size fraction in the gravelly sediment is sand (Tetra Tech, 2014; UCONN and Louis Berger, 2015).

The CSDS was selected as a dispersive site by the USACE using their site selection authority. The use of the site was then further extended by Public law on December 23, 2011 (PL-112-74, Title I, Sec 116). An estimated 1.2 million cy (0.95 million m^3) were disposed at the site between 1960 and 1976 (Oceanic Society, 1982[11]), and additional 1.7 million cy (1.3 million m^3) between 1982 and 2013 (USEPA, 2015).

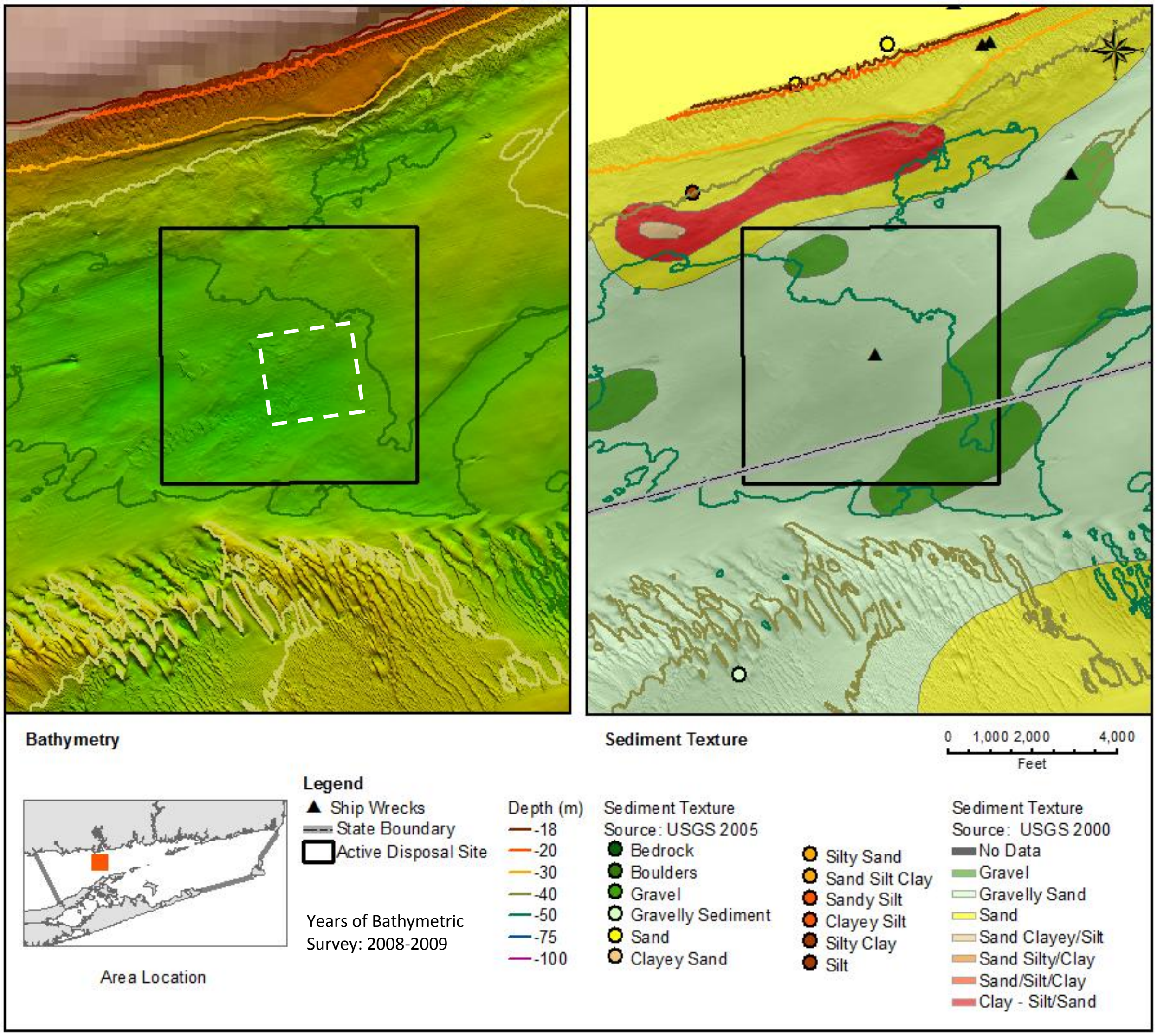

Figure 16. Water depth and sediment texture[12] at the Cornfield Shoals dredged material disposal site. The seafloor at the site is flat and has scour features and bedforms. The approximate area of the close-up in Figure 18 is marked by a white dashed line. (Data sources: Poppe et al., 2000, 2005, 2011).

[11] The Oceanic Society (1982) report cited the CTDEEP and NYSDEC as the source for the dredged material disposal information for the sites in Long Island Sound.

[12] Note that the sediment texture legend is kept uniform for maps of all eleven sites. Not all textures are present at each site.

As part of the DAMOS program, the USACE has monitored the site periodically since 1978 to characterize the hydrodynamics and sediments at CSDS. Well-defined dredged material mounds were not detected at CSDS by bathymetric surveys performed in 1978, 1987, and 1990, 1992, 1994, and 2004 (ENSR, 2005), although the sediment survey in 1990 detected fine-grained dredged material near the center of the site. Between 1994 and 2004, approximately 438,000 cy (335,000 m^3) of dredged material was placed at the center of CSDS. A comparison of the data from 1994 and 2004 bathymetric surveys, performed under the DAMOS program, indicated that limited sediment accretion of less than 3.1 feet (1 m) in thickness was present to the west of the disposal location and limited erosion was observed to the east (ENSR, 2005). The erosion and accretion pattern and the lack of a distinct mound at CSDS were considered consistent with sediment transport patterns observed previously, *i.e.*, they were consistent with the dispersive nature of this site and the dominant east-west transport orientation.

Diffuse mounds[13] of dredged material were also identified during a 2009 multibeam bathymetric survey with the largest spoil mound extending 3.7 feet (1.1 m) above the surrounding seafloor (Poppe et al., 2013; Figure 18). The physical oceanography study for the SEIS confirmed the dispersive nature of the site (O'Donnell, 2014b). Specifically, the maximum bottom stress[14] modeled for the site exceeds the threshold for erosion of typical dredged material. Therefore, disposed dredged material would not be contained at the CSDS over time.

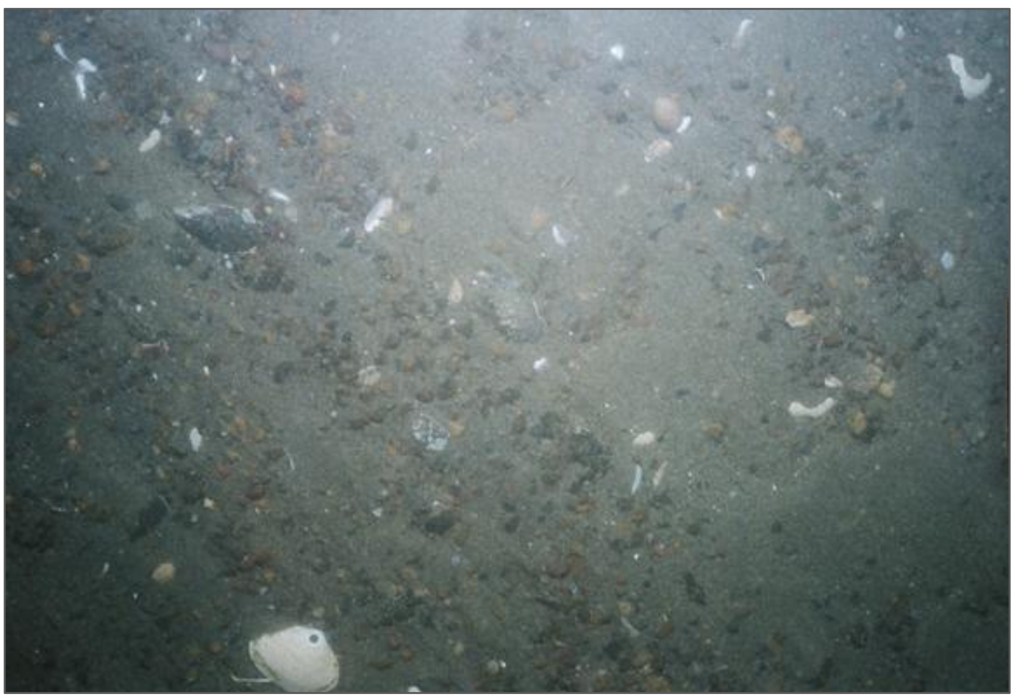

Figure 17. Photograph of rippled sand with some pebble and pea-sized gravel, approximately 0.3 nmi (0.5 km) to the east of the CSDS. Scattered shells and shell debris are concentrated in the troughs of the ripples. (Source: Poppe et al., 2013).

[13] Diffuse mounds are defined as mounds that have been reworked by currents over time.

[14] Bottom stress along with sediment characteristics (primarily grain size and cohesiveness of the sediment) determine the potential for sediment erosion, settling, and resuspension. Bottom stress is largely a function of waves and currents affecting the seafloor.

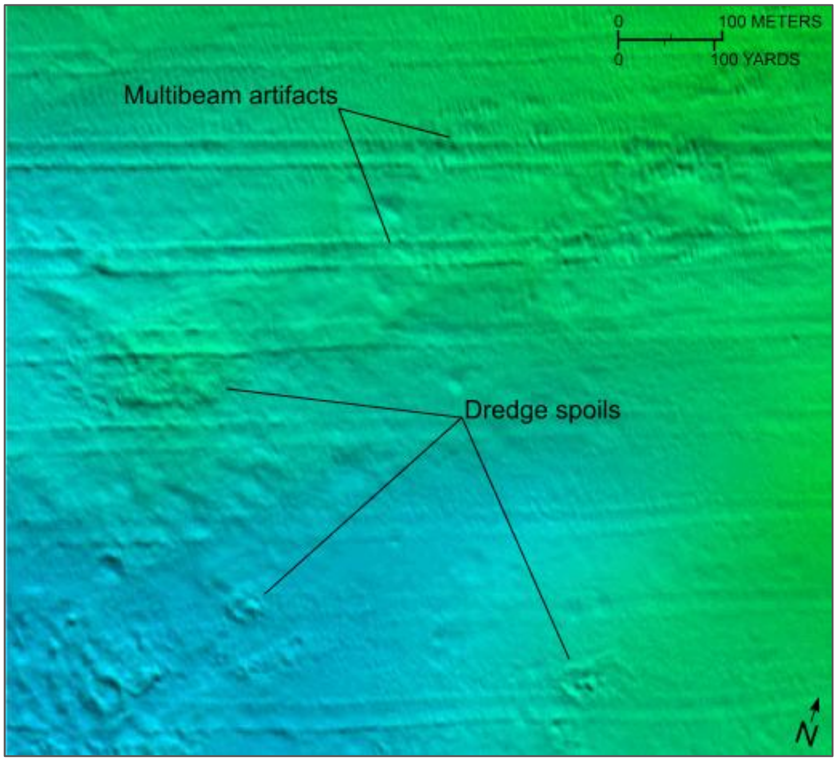

Figure 18. Closeup of bathymetry within the CSDS with diffuse dredged material disposal mounds, as identified by Poppe et al. (2013). See Figure 16 for location of the close-up area. Note that the horizontal lines from left to right are 'multibeam artifacts' (caused by a faulty receiver during data acquisition) and are not features on the seafloor.

A DAMOS program study investigated potential impacts to shellfish beds to the north of Long Sand Shoal (SAIC, 1996); as shown in Figure 7, the closest distance between the CSDS and shellfish beds to the north is approximately 2 nmi (3.7 km). The study concluded that the predominant east-west current direction, the presence of Long Sand Shoal, and the gradual dispersion of disposed sediment over weeks and months reduces concerns about transport of resuspended material over those shellfish beds to the north.

Evaluation: The CSDS is being evaluated in the SEIS as an alternative ODMDS because it has been used as a regional disposal site and monitored by the USACE under the DAMOS program since 1978 (*e.g.*, ENSR, 2005). The site has a predominant east-west transport direction (*i.e.*, approximately parallel to coast rather than toward the coast), has sufficient water depth (*i.e.*, plenty of capacity), and is reasonably close to dredging centers. This site, if designated, would be a dispersive site, not a containment site.

5.2 Six Mile Reef Disposal Site (Site 2)

Six Mile Reef is located within the Mattituck Sill. The Mattituck Sill is a submerged shallow sedimentary area that extends between Mattituck, New York, to Branford, Connecticut. The sill is a remnant of the marine delta at the mouth of the Connecticut River, created from sediments contributed by the draining and erosion of a former glacial lake (Lewis, 2014). As the delta has been reworked by tidal forces, the sediments have been eroded in eastern Long Island Sound and transported westward. Finer sediments were transported into the central basin of Long Island Sound and the sands formed large shoals and fields of giant sand waves. Transport is still ongoing. Six Mile Reef is one of these sandy shoals consisting of a core of postglacial marine deltaic deposits mantled by tidally reworked modern sediments (Poppe et al., 2007a; 2008). The site has active sediment transport, as reflected by sedimentary bedforms such as sand waves and megaripples[15] (Figure 19). These bedforms are gradually moving, mainly from east to west, under the present hydraulic regime.

The historic Six Mile Reef disposal site currently has a water depth of approximately 62 to 110 feet (19 to 35 m). Approximately 80% of the site is located within New York State waters, with the remainder of the site located within Connecticut waters. The site would be a dispersive site as determined by physical oceanographic modeling of the ZSF (O'Donnell, 2014b).

Evaluation: The site is located in an area of large bedforms on the sea floor. Therefore, shifting sands in the area may reduce water depths at the site over time [40 CFR 228.6 (a)(1)] and may also complicate the management of the site. The site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.

[15] "Regular" ripples a spacing between crests of up to 60 cm; the crest spacing in megaripples ranges from 60 cm to 10 m *(e.g., http://geology.uprm.edu/Morelock/barrsys.htm).*

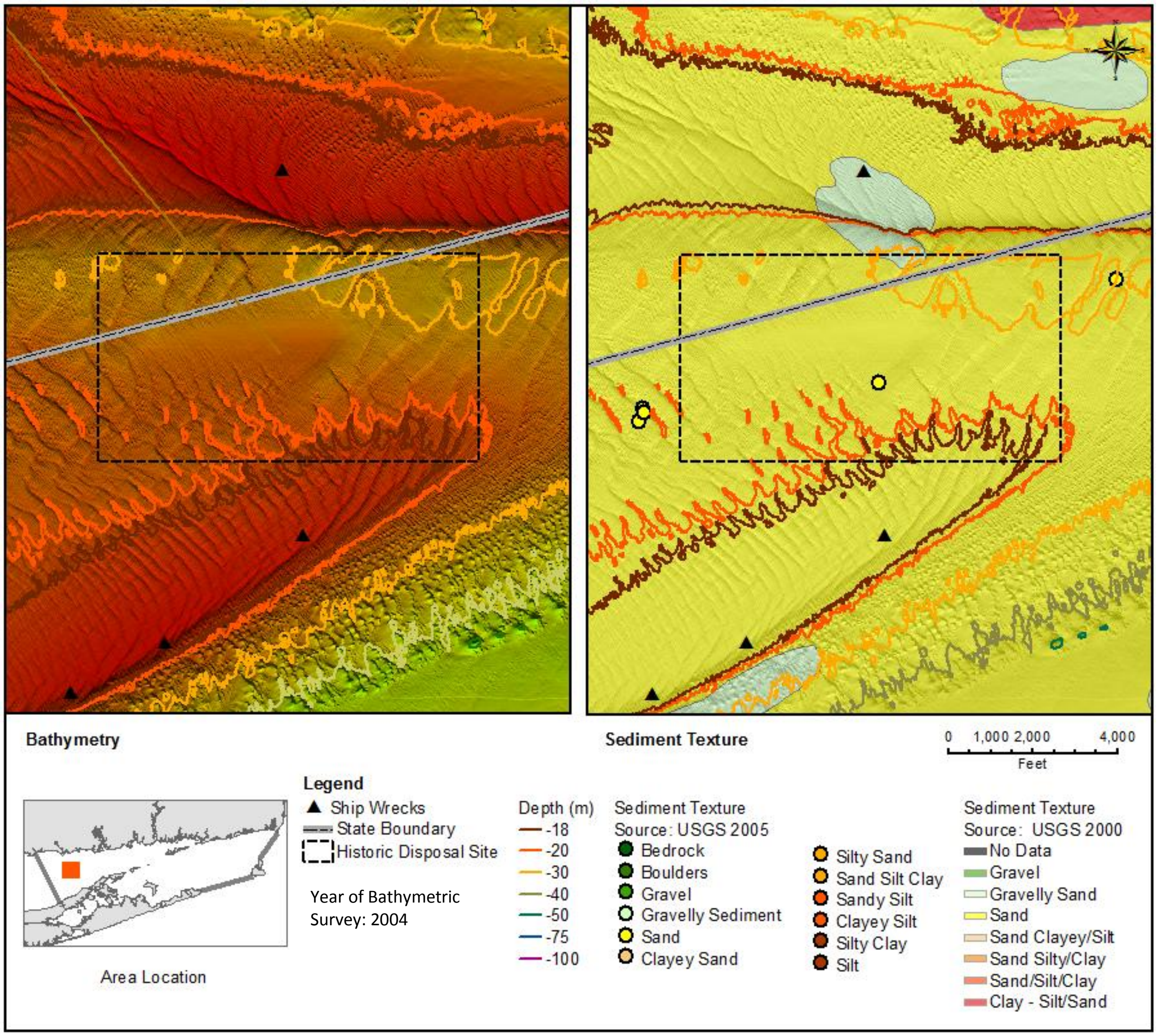

Figure 19. Water depth and sediment texture at the historic Six Mile Reef disposal site. The bottom of the site is marked by sand waves and other bedforms reflecting net sediment transport to the west (Data sources: Poppe et al., 2000, 2005, 2007a).

5.3 Clinton Harbor Disposal Site (Site 3)

This historic disposal site is located about 1.5 nmi (2.8 km) south of Clinton harbor, and is located within the Mattituck Sill. The site currently has a water depth of approximately 65 to 110 feet (20 to 35 m) (Figure 20). The substrate consists predominantly of sand with areas of gravel, boulders, and bedrock. According to the Oceanic Society (1982), approximately 27,000 cy (21,000 m^3) of dredged material were disposed at the Clinton site. There are four shipwrecks scattered throughout the center of the site (NOAA, 2013b) [40 CFR 228.6 (a)(11)].

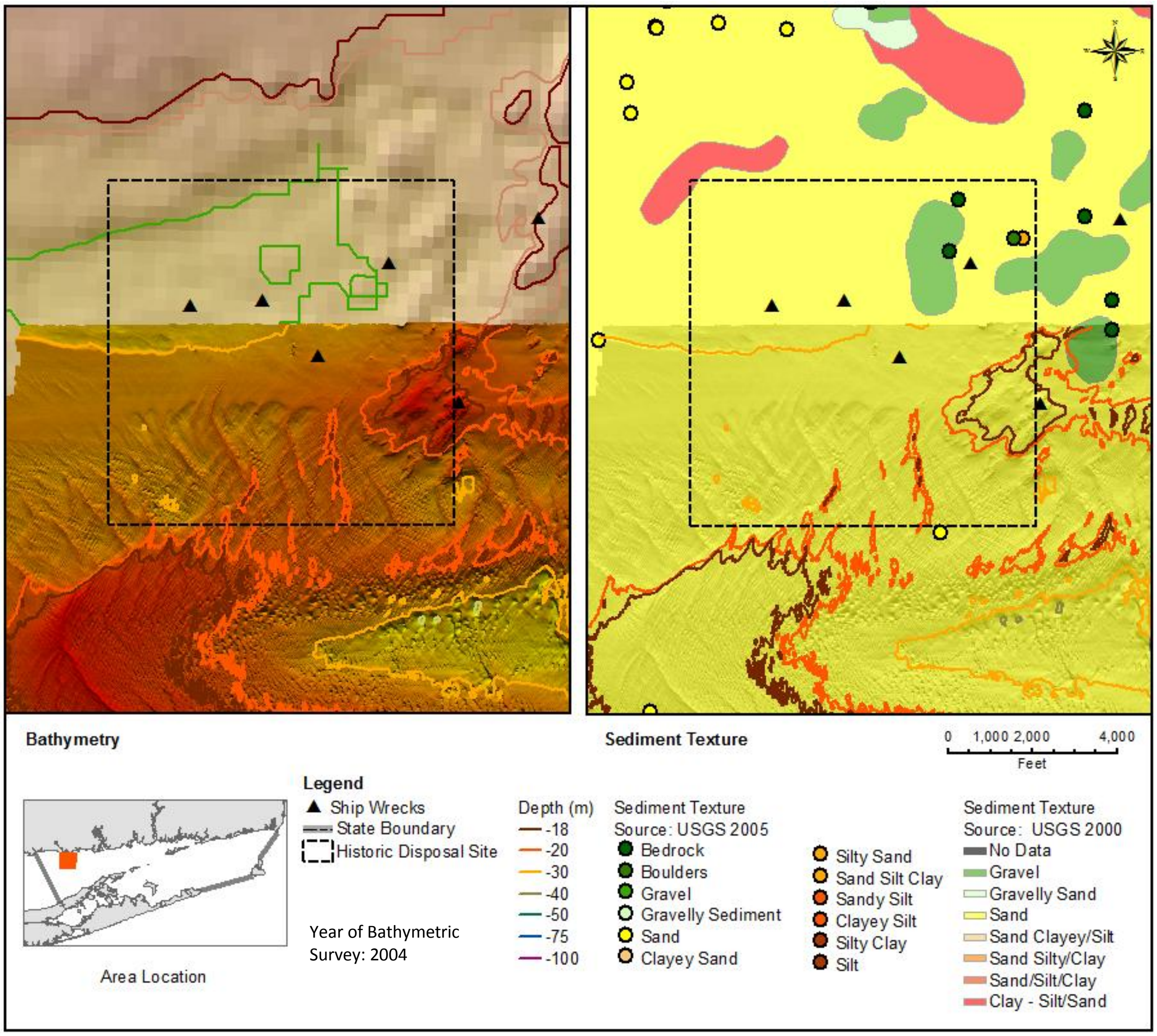

Figure 20. Water depth and sediment texture at the historic Clinton Harbor disposal site. Detailed multibeam bathymetric data are available for the southern half of the site. (Data sources: Poppe et al., 2000, 2005, 2007a)

The site may have a more complex current pattern. While the overall net sediment transport in the general area is to the west, Poppe et al. (2007a) observed a sand-wave morphology at the site that also suggests countercurrents and sediment transport to the east. The site would be a dispersive site as determined by physical oceanographic modeling of the ZSF (O'Donnell, 2014b). The site is located completely within State of Connecticut waters.

Evaluation: As for the historic Six Mile Reef, sediment transport with shifting bedforms and a more complex current pattern may complicate management of the site [40 CFR 228.5 (d)]. The site also contains four shipwrecks. The site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.

5.4 Orient Point Disposal Site (Site 4)

The historic Orient Point disposal site is characterized by a deep scour depression formed by tidal flows entering Long Island Sound through Plum Gut that covers a large part of the site (Figure 21). Plum Gut is the channel between Plum Island and Orient Point. The southeastern corner of the disposal site directly abuts Plum Gut. The site is also close to shore. The closest distance to Plum Island is approximately 0.3 nmi (0.5 km); the closest distance to Orient Point is approximately 0.7 nmi (1.2 km). The scour depression in the center of the site has a water depth of up to 340 feet (103 m) (McMullen et al., 2010). Sediments at the site consist primarily of gravelly sediment and sand. The Oceanic Society (1982) listed the site as an historic or interim site but did not have information available about the volume of sediment disposed at the site. The site is located completely within New York State waters.

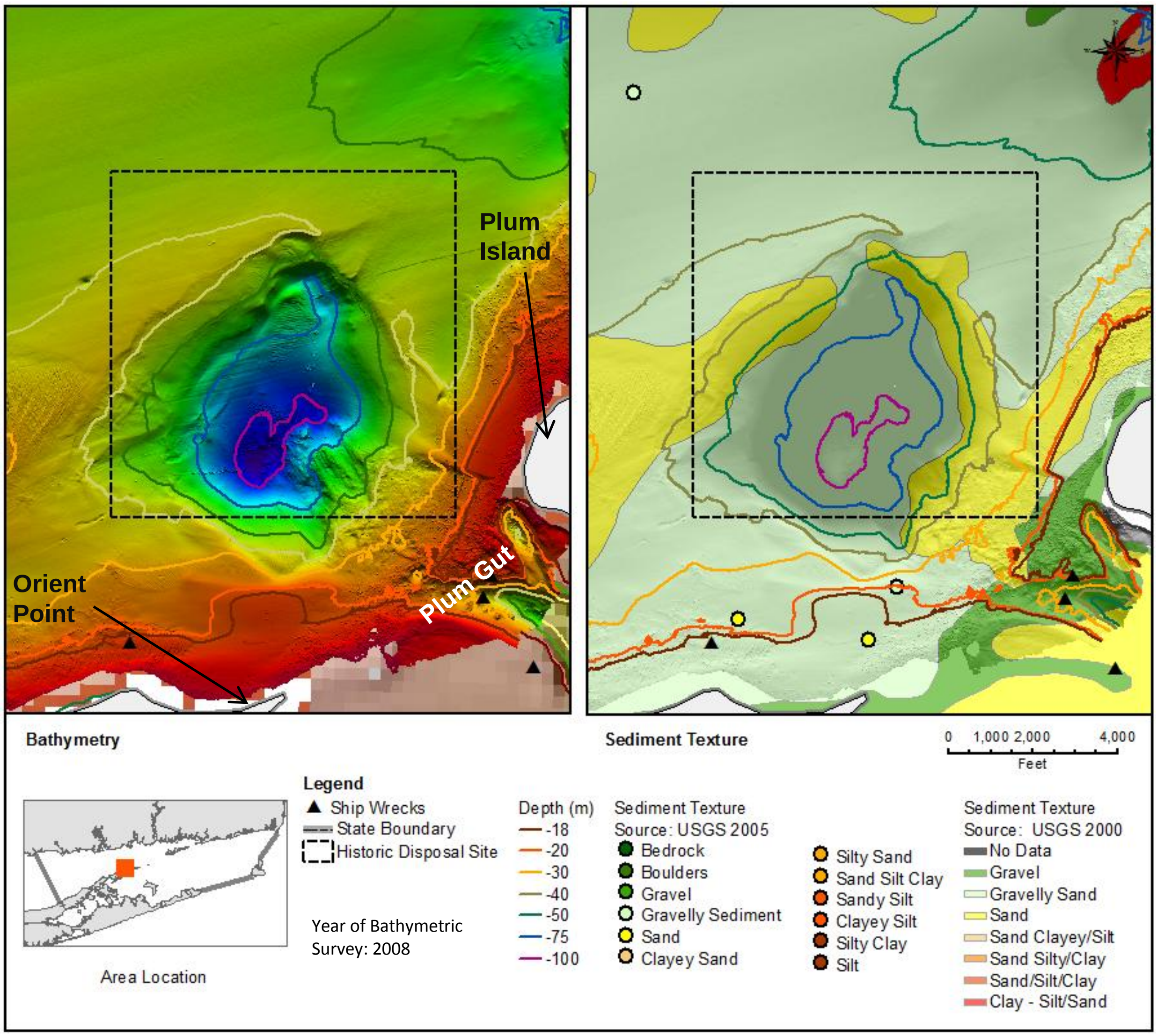

Figure 21. Water depth and sediment texture at the historic Orient Point disposal site. Water depths in the scour depression reach 340 feet. (Sources: McMullen et al., 2010; Poppe et al., 2000, 2005)

Orient Point and Plum Island are part of a terminal moraine left behind by glaciers (*i.e.*, the Roanoke Point-Orient Point-Fishers Island moraine system; Sirkin, 1980). Sediments in terminal moraines are unsorted, containing a wide range of grain sizes from large boulders to silts and clay. As a result, large areas of boulders, covering several square miles, flank the shore north of Plum Island and Orient Point (Figure 22). These areas are rich in benthic life (Figure 23).

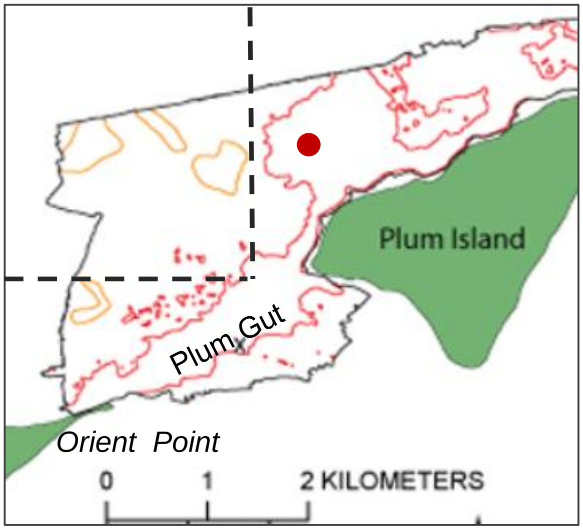

Figure 22. Areas of boulders (delineated by red lines) and sand waves (delineated by orange lines) in Plum Gut. Marked by a black dashed line is the southeast corner of the Orient Point disposal site boundary. The location of photographs of the seafloor (Figure 23) is marked by a red dot. (Source: McMullen et al., 2010).

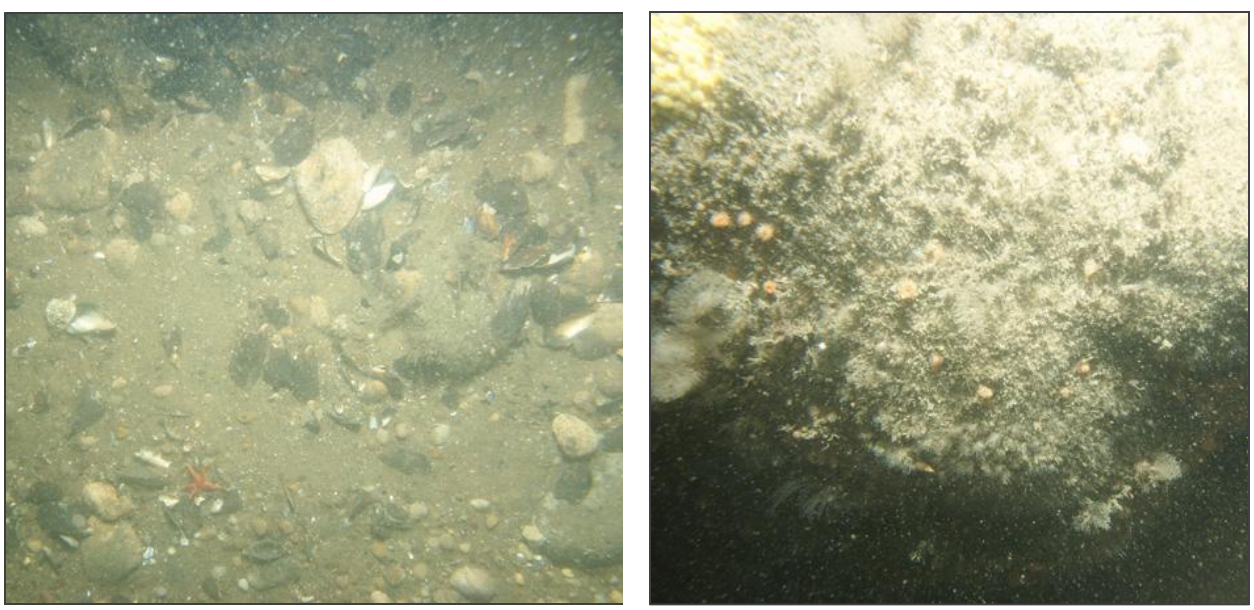

Figure 23. Bottom photographs of the seafloor northwest of Plum Island, near the Orient Point disposal site (see location in Figure 22). The location has boulders colonized by sponges, seaweed, anemones, hydrozoans, and barnacles. Pebble- and cobble-sized gravel and sand variably cover the seafloor between the boulders. Living mussels and mussel-shell debris are common; red starfish are present. (Source: McMullen et al., 2010)

Plum Gut (Figures 21 and 22) is a constricted channel located to the south of the historic disposal site. Plum Gut reaches a depth of about 200 feet (60 m) and has an uneven seafloor, likely due to currents scouring the submerged moraine. The crests of the sand waves and megaripples tend to be northwest-southeast reflecting the direction of tidal currents. Plum Gut was designated in 1987 as a Significant Coastal Fish and Wildlife Habitat; NYSDOS (2005a) describes its fish and wildlife values as follows:

> *"Plum Gut represents an unusual physical environment in New York State. The turbulent marine deepwater habitats and shoals combine to produce a productive and diverse habitat for marine fishes and invertebrates.*
>
> *Significant concentrations of many fish species forage in this area, including striped bass, bluefish, tautog, summer flounder, and scup. Plum Gut is one of two major passage corridors for striped bass, which move into Long Island Sound in spring en route to their spawning grounds, and return to southern overwintering areas during fall. Plum Gut is also thought to be the major corridor for Atlantic salmon returning to the Connecticut (CT) and Pawtucket (RI) Rivers in the early spring.*
>
> *As a result of the abundant fisheries resources in the area, Plum Gut is one of the most popular areas in the northeastern United States for recreational fishing, with an extensive fishery occurring throughout spring, summer, and fall. Much of this activity is due to the involvement of charter boats from Greenport and Montauk Harbor as well as Connecticut. In addition to sportfishing, the commercial trap net fishery and lobster fishery in Plum Gut are of regional significance. The richness and productivity of this area are also reflected in the use of Plum Gut by marine mammals, particularly bottlenosed dolphin, harbor porpoise, harbor seal, and by sea turtles, especially juvenile Atlantic ridley (E) and loggerhead (T) sea turtles."* (p. 2)

Maximum current velocities through Plum Gut are reported as 7.1 knots (3.7 m/s) (E3 Inc., 2007). The scour depression in the center of the Orient Point disposal site was likely caused by tidal flows rushing through Plum Gut into Long Island Sound. Physical oceanographic modeling indicates that, overall, the Orient Point disposal site is a dispersive site (O'Donnell, 2014b).

Evaluation: Considering that the site would overall be a dispersive site, its proximity to shore [40 CFR 228.5(b)], and its proximity to Plum Gut with its significant marine resources [40 CFR 228.5(a), 228.6(a)(1), 228.6(a)(2)] and active recreational fishing [40 CFR 228.6(a)(8)], the site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.

5.5 Niantic Bay Disposal Site (Site 5)

The water depth at the historic Niantic Bay disposal site (NBDS) ranges from approximately 60 to 130 feet (18 to 40 m) (Figure 24). The area of the marked site is approximately 1.8 nmi^2 (6.4 km^2). Bartlett Reef, a bedrock shoal, is located approximately 1.5 nmi (3 km) to the east of the site. The site was used for dredged material disposal between 1969 and 1972 when a total of 176,000 cy (135,000 m^3) of dredged material was placed at this location (Oceanic Society, 1982). The site is located completely within State of Connecticut waters.

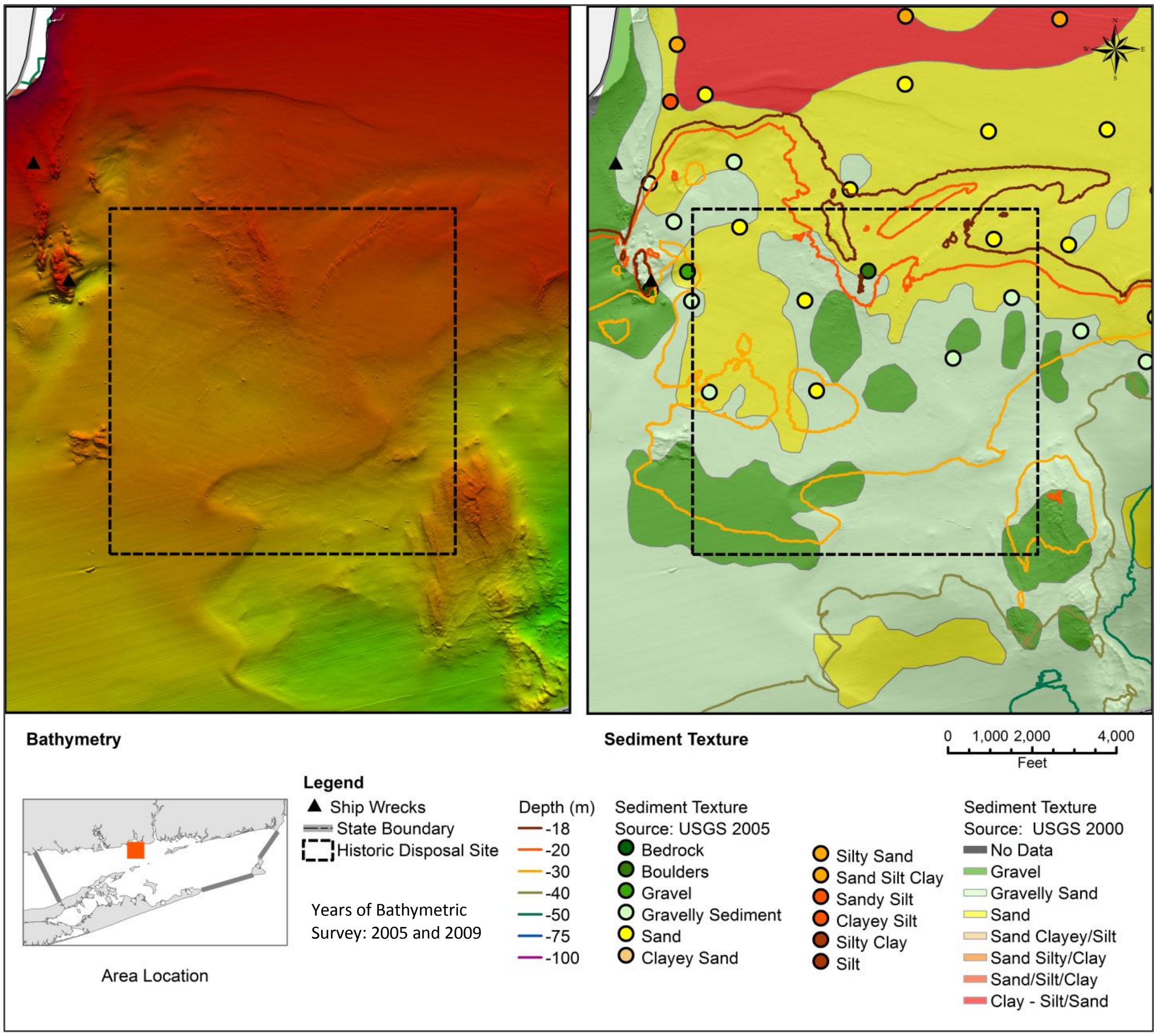

Figure 24. Water depth and sediment texture at the historic Niantic Bay disposal site. (Data sources: Poppe et al., 2000, 2005, 2011).

Sediments at the site consist of sand to the north and northwest, and mostly gravelly sediment with patches of gravel in the remainder of the area (Figure 24). Sediment sampling in 2013 for the SEIS confirmed that the dominant size fraction at the site is sand (Tetra Tech, 2014; UCONN and Louis Berger, 2015). The site contains a boulder area in the northwestern part of the site (Poppe et al., 1998; WHG, 2014; also shown in Figure 25) and scour depressions in the south (Figure 25). The southeastern corner of the site abuts a bedrock area (Poppe et al., 2013).

The depressions around outcrops to the west of the site are an indication of sediment transport by tidal currents, and the asymmetry of scour-marks ('comet marks'[16]; Figure 25) indicates net sediment transport direction toward the west (Poppe et al., 2010). The physical oceanography study for the SEIS determined that maximum bottom stress from currents exceed the threshold for erosion of typical dredged material for most of the site except for the northeastern part (O'Donnell, 2014b). Bottom stress just to the east of the site (but west of Bartlett Reef) was modeled to be below the erosion threshold.

The western and central portion of the site is zoned by the State of Connecticut as "conditionally restricted" for shellfishing, while the eastern part of the site is zoned "conditionally approved". There are no shipwrecks at the site according to the NOAA data base (NOAA, 2013b).

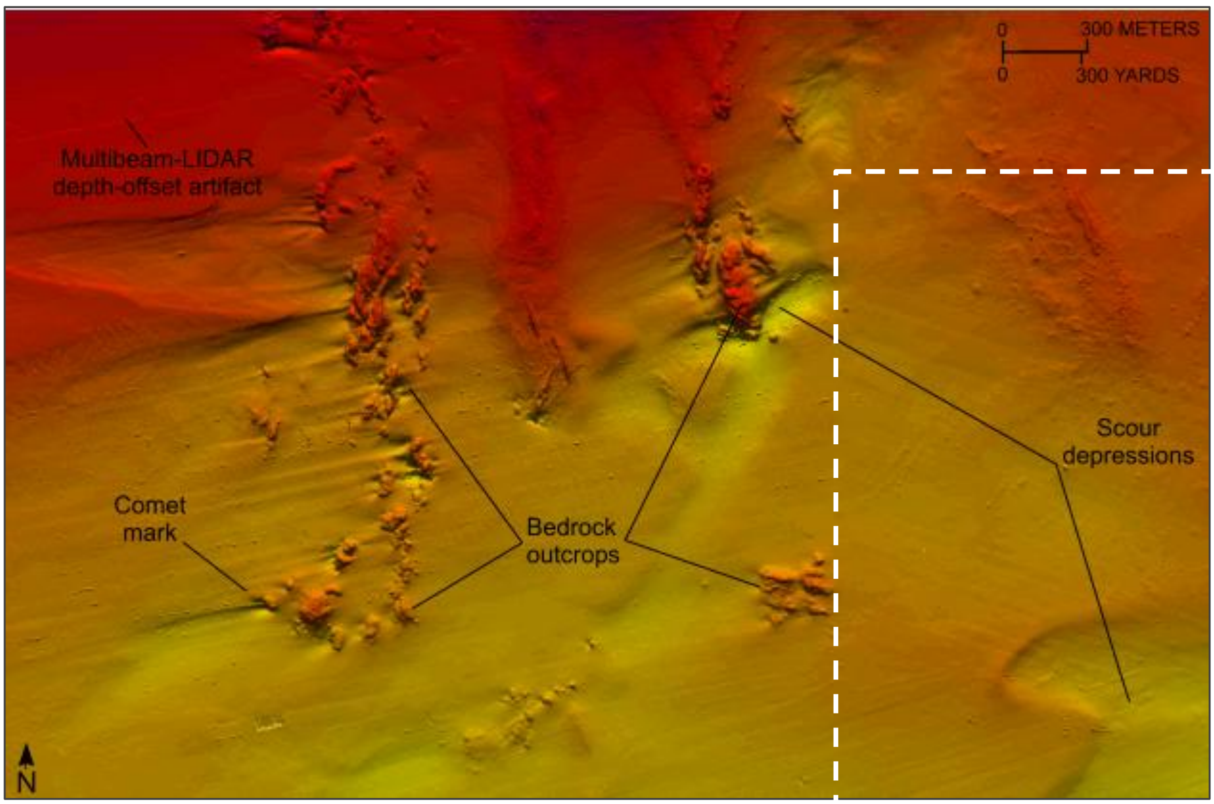

Figure 25. Closeup view of the western portion of the Niantic Bay disposal site (marked by the white dashed line) and surrounding area. Scour depressions in the southwest of the site, and around bedrock outcrops to the west of the site, indicate net westward sediment transport. (Source: Poppe et al., 2010)

[16] 'Comet marks' are areas scoured out behind objects (such has rock outcrops) by currents flowing over and around these objects. The scoured area behind an object indicates the down-current direction.

Evaluation: The historic Niantic Bay disposal site has a predominant east-west transport direction. Biological resources at the Niantic Bay site are similar to other offshore areas in eastern Long Island Sound such as at the CSDS, NLDS, and at control areas outside of these sites (Tetra Tech, 2014). The exception may be the boulder area in the northwestern part of the site and the bedrock area in the southeastern-most corner. However, the historic Niantic Bay site is almost twice as large as the active NLDS and CSDS, thus a potentially designated site at Niantic Bay could be smaller than the historic site, avoiding bedrock and gravel areas. The Niantic Bay site further has sufficient water depth and is reasonably close to dredging centers. For these reasons, the site is *recommended* as an alternative ODMDS to be analyzed further in the SEIS. Most of the historic NBDS would be a dispersive site. The northeastern part of the site would be an containment area based on PO modeling results. In addition to the NBDS, it is recommended to include a 0.75-nmi (1.4-km) wide area to the east of the NBDS in the analysis in the SEIS for added disposal capacity (see Section 5.10 for further discussion). The northern and central part of that area would also be a containment area according to PO modeling results.

5.6 New London Disposal Site (Site 6)

The New London dredged material disposal site (NLDS) is an active open-water disposal site to the south of the mouth of Thames River estuary, approximately mid-way between Connecticut and New York (Figure 26). Specifically, the center of site is located approximately 2.5 nmi (4.6 km) to the southeast of Goshen Point, Connecticut, and 2.3 nmi (4.3 km) to the northwest of Race Point, Fishers Island, New York. It has a square area of 1 nmi^2 (3.4 km^2) centered at 41°16.306' N, 72°04.571' W (NAD83) and water depths ranging from 46 to 79 feet (14 to 24 m) (Figure 27). Over 90% of the site is located within State of Connecticut waters, with the remainder of the site located in New York State waters.

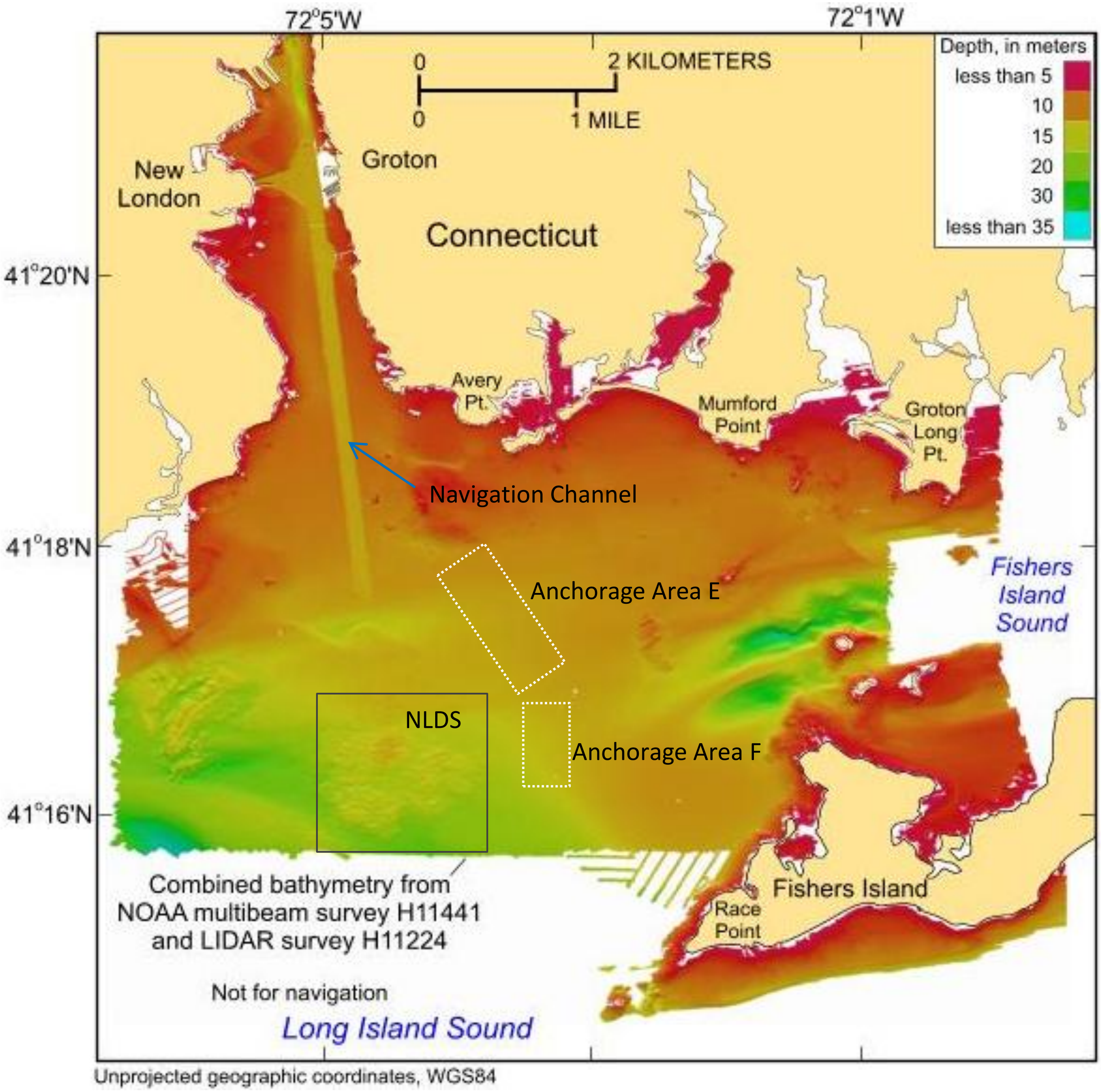

Figure 26. Bathymetry of the mouth of the Thames River, including the New London dredged material disposal site. (Source: Poppe et al., 2010)

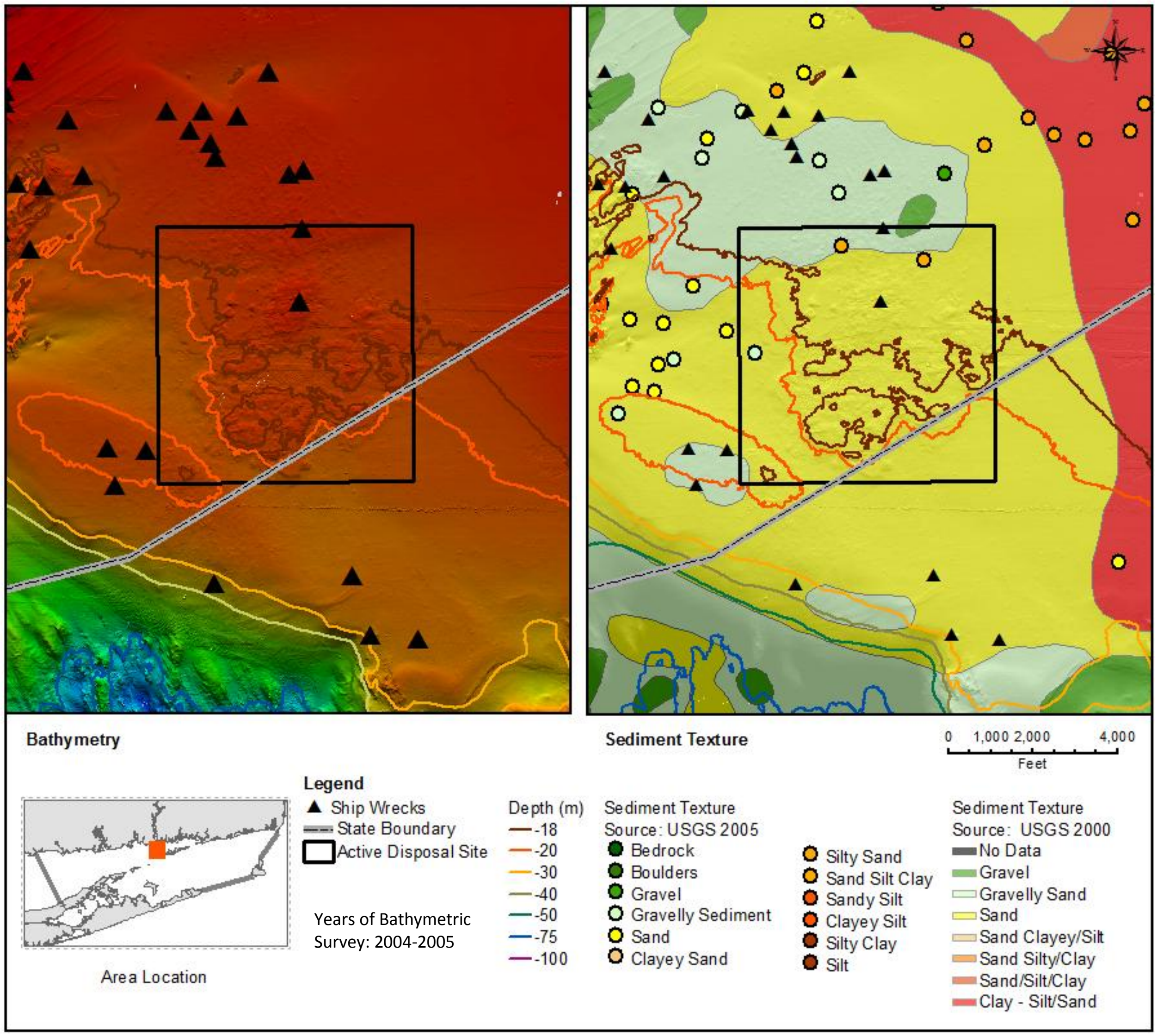

Figure 27. Water depth and sediment texture at the active New London dredged material disposal site. Two anchorage areas are located to the northeast and east of the site. (Data sources: Poppe et al., 2000, 2005, 2011).

The site has been used for dredged material disposal since 1955 (SAIC, 2001). A total of approximately 3.5 million cy (2.6 million m^3) of dredged material were placed at this location since 1982 (USEPA, 2015). In addition, approximately 5.4 million cy (4.1 million m^3) were disposed at the site between 1955 and 1976 (Oceanic Society, 1982). The dredged material (and sediment used to cap some of it) gives the area a hummocky appearance; the deposits can rise 16 to 20 feet (5 to 6 m) above the surrounding seafloor (Figure 28).

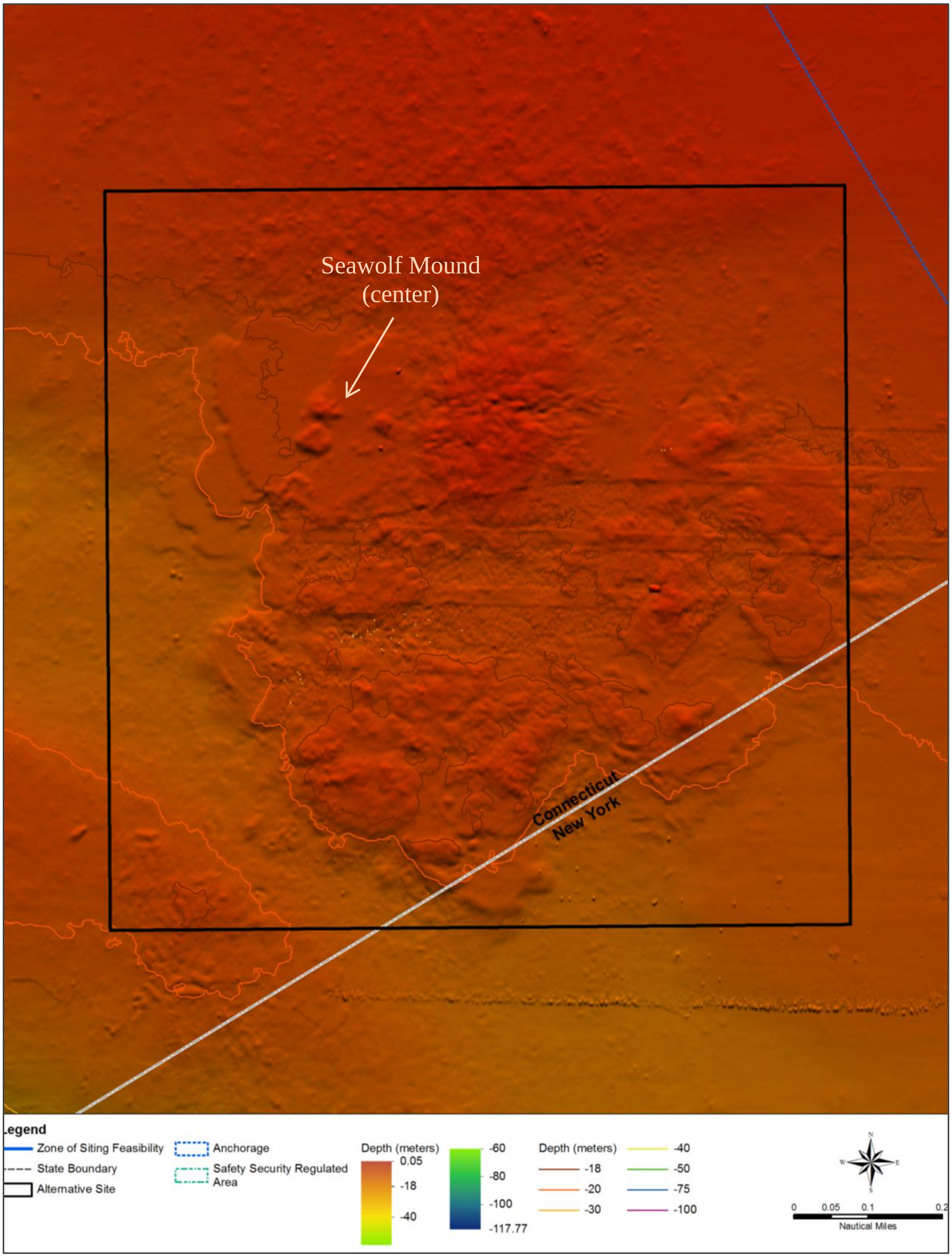

Figure 28. Closeup of the bathymetry at the New London dredged material disposal site (close-up of Figure 27; Poppe et al., 2011). Dredged material mounds are visible. The center of the Seawolf Mound is marked.

The USGS mapped the sediment at the NLDS as predominantly sand (Figure 27); in the northernmost part of the site, sediments were mapped as gravelly sediment. NUSC (1979) described the sediment at the site as generally fine sand. Much of the surface sediments at the site consist of placed dredged material (Figure 28). Sediment sampled by the DAMOS program at locations approximately 0.5 nmi (1 km) to the east and west of the NLDS consisted of silt/clay and very fine silty sand (AECOM, 2009), which may reflect pre-disposal sediment textures at the NLDS. Similar grain sizes of predominantly silty and clayey sand were observed in 2013 by Tetra Tech (2014) and UCONN and Louis Berger (2015).

There are several indications that the placed sediments are stable and the site is a 'containment site'. A survey conducted in 2007 as part of the DAMOS program did not observe any substantial changes in bathymetry since the prior survey in 1997, except for a new disposal mound that had been placed during this period (AECOM, 2009). Similarly, monitoring of the capped Seawolf Mound[17] within the NLDS demonstrated that the cap was stable (SAIC, 2003, 2004; AECOM, 2012). Biological monitoring on the Seawolf Mound has shown a continuance of advanced successional stages and stable benthic habitat conditions, even after a storm in October 2002 (SAIC, 2003).

Another sign of sediment stability at the site is the absence of scour features and bedforms on the seafloor that are characteristic of shifting sediments (Figure 28). Further, the physical oceanography study for the SEIS determined that maximum bottom stress from currents is below the threshold for erosion of typical dredged material (O'Donnell, 2014b). This area of low bottom stress extended westward for approximately another 1.5 nmi (2.8 km).

The site is crossed by ship traffic that enters the federal navigation channel for New London to the north of the NLDS (Figure 26). The channel has a depth of 40 feet (12 m) at mean low water (MLW) and a width of 500 feet (153 m) (Moffat & Nichol, 2012).

There are two general anchorage areas to the northeast (Anchorage E) and to the east (Anchorage F) of the NLDS (Figure 26). Anchorage F is reserved for the use of naval vessels, except during emergencies.

The USGS/NOAA bathymetric survey (Figure 28) was performed in 2004 and 2005. Since Considering that 390,000 cy (300,000 m^3) of dredged material were disposed at the NLDS between 2006 and 2013. The current water volume between a depth of 59 feet (18 m) and seafloor is approximately 4.5 million cy (3.8 million m^3). Therefore, the remaining storage capacity for dredged material is roughly estimated with around 3 million cy (2.3 million m^3), given that disposal mounds have uneven surfaces and thus a "filled" site would have multiple areas remaining with water depths greater than 59 feet (18 m), and also given that the footprint of disposal mounds shall remain within the site boundary.

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[17] The Seawolf Mound was created in 1995/96 by placing material dredged from the Thames River; the material was considered unsuitable for open-water disposal due to elevated trace metal and PAH concentrations. This placed material was then covered with suitable dredged material to form a cap layer and isolate the underlying unsuitable material from the environment.

Evaluation: The NLDS is being evaluated in the SEIS as an alternative ODMDS because it has been used as a regional disposal site and monitored by the USACE under the DAMOS program since 1978. The NLDS is an active site [40 CFR 228.5(e)], sediments on the seafloor are stable (*i.e.*, containment site), the area does not appear to contain unique biological resources. However, considering that the NLDS has limited capacity remaining for the placement of dredged material, it is recommended to include a 1.5-nmi (2.8-km) wide area to the west of the NLDS in the analysis of the SEIS (see Section 5-10 for additional discussion). This area would also be a containment area according to PO modeling results.

5.7 Deep Holes south of Fishers Island – West, East and Center (Sites 7, 8, and 9)

Deep holes, or depressions, in Block Island Sound south of Fishers island were observed by Needell and Lewis (1984) during a high-resolution, seismic-reflection survey. These three depressions were initially considered as potential alternative sites due to their potential for being containment sites. Multibeam bathymetry data were collected in the Block Island Sound between 2008 and 2011 (Poppe et al., 2011 and 2014; McMullen et al., 2015); combined with digital terrain modeling these data provided details of these depressions south of Fishers Island (Figure 29) and allowed for further interpretation of their origin. All three deep holes are completely within New York State waters.

The three deep holes have the following characteristics:

- *Deep Hole south of Fishers Island - West (Site 7):* This depression is an extension of The Race (Figure 30). It is separated from the mid-section of The Race by a terminal moraine consisting of less erosive coarser material (Poppe et al., 2007b). The roughly rectangular-shaped deep hole has dimensions of 1.0 x 0.5 nmi (1.8 x 0.9 km) and a maximum water depth of 309 feet (94 m). The closest distance from the center of this deep hole to Fishers Island is approximately 1.9 nmi (3.5 km).
- *Deep Hole south of Fishers Island - West (Site 8):* This depression is part of an elongate channel in Block Island Sound that extends from The Race toward the southern Block Island Sound opening to the Atlantic Ocean. The circular depression has a diameter of approximately 0.8 nmi (1.5 km) and a maximum water depth of 325 feet (99 m). It is bounded by a comparatively steep wall to the north and east, while the western and southern slopes transition gradually into the channel (Figure 31). The closest distance of the center of this deep hole to Fishers Island is approximately 3.1 nmi (5.7 km).
- *Deep Hole south of Fishers Island - Center (Site 9):* This depression is part of another broad channel in Block Island Sound that extends from Rhode Island Sound westward toward The Race. The roughly triangular-shaped depression is small; it has a length of approximately 0.8 nmi (1.5 km), a width of 0.3 nmi (0.6 km), and a maximum water depth of 246 feet (75 m). It is bounded by a comparatively steep slope to the east, and gradual slopes on its other sides. The steep slope appears to have formed behind a less erosive structural geological feature, possibly a north-south-trending drumlin[18] as suggested by multibeam bathymetry data (McMullen et al., 2015; Figure 31). The closest distance from the center of this deep hole to Fishers Island is approximately 1.4 nmi (2.7 km).

[18] A drumlin is a ridge of coarser-grained sediment that formed underneath a glacier as it slowly moved across the area.

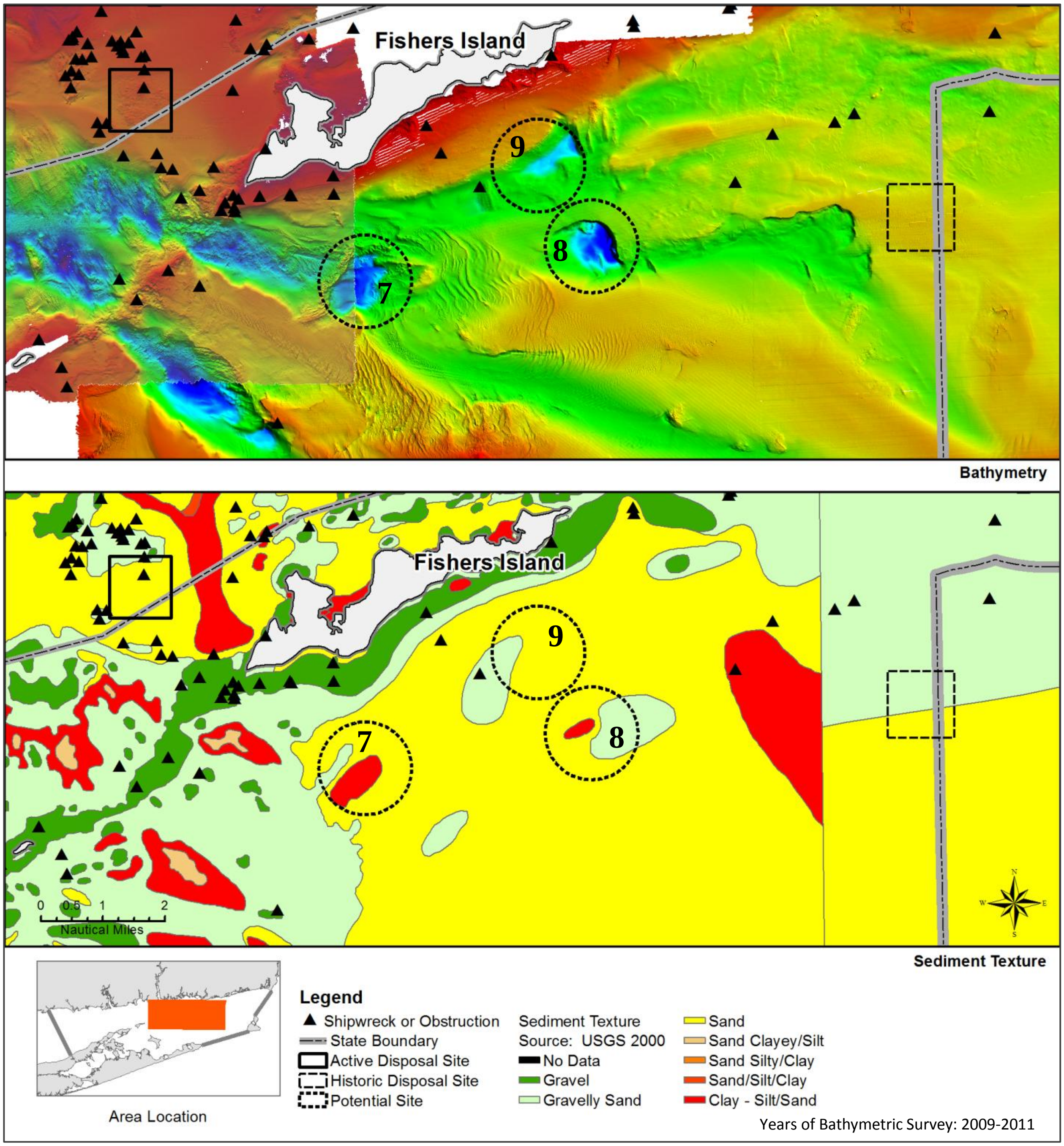

Figure 29. Water depth and sediment texture in northwestern Block Island Sound. The three deep holes are marked (7– West; 8 – East; 9 – Center). (Data sources: Poppe et al., 2000, 2005, 2011, 2014). It is noted that the sediment texture data for the eastern and western Block Island Sound come from two separate USGS data bases.

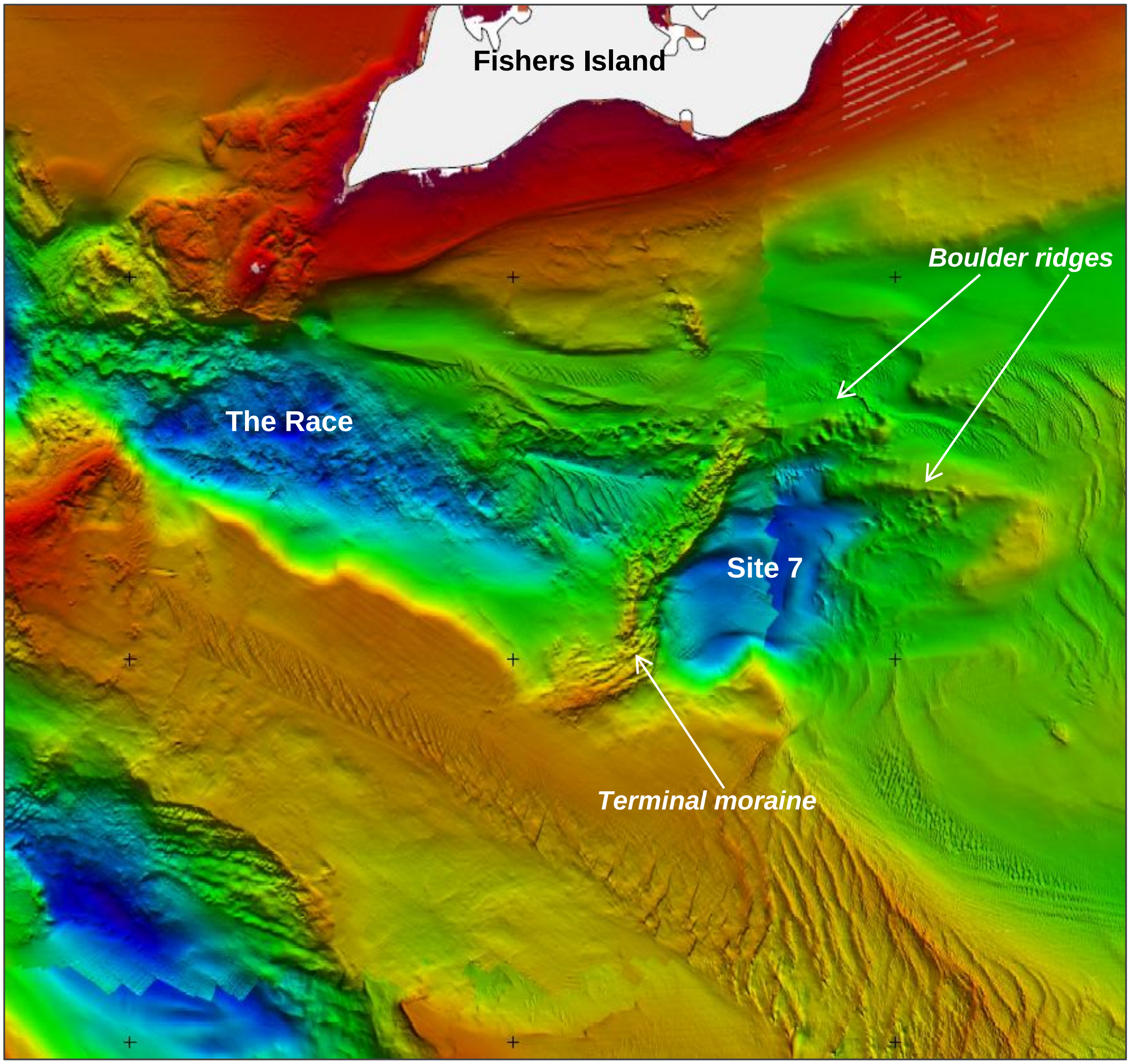

Figure 30. Detailed multibeam-bathymetric image of The Race and the Deep Hole south of Fishers Island - West (Site 7) (Poppe et al., 2011; 2014). Site 7 is bounded on its western side by a terminal moraine, which extends as cobble ridges on its northern and eastern side (McMullen, et al., 2015). There are also areas with sand waves and megaripples around the site.

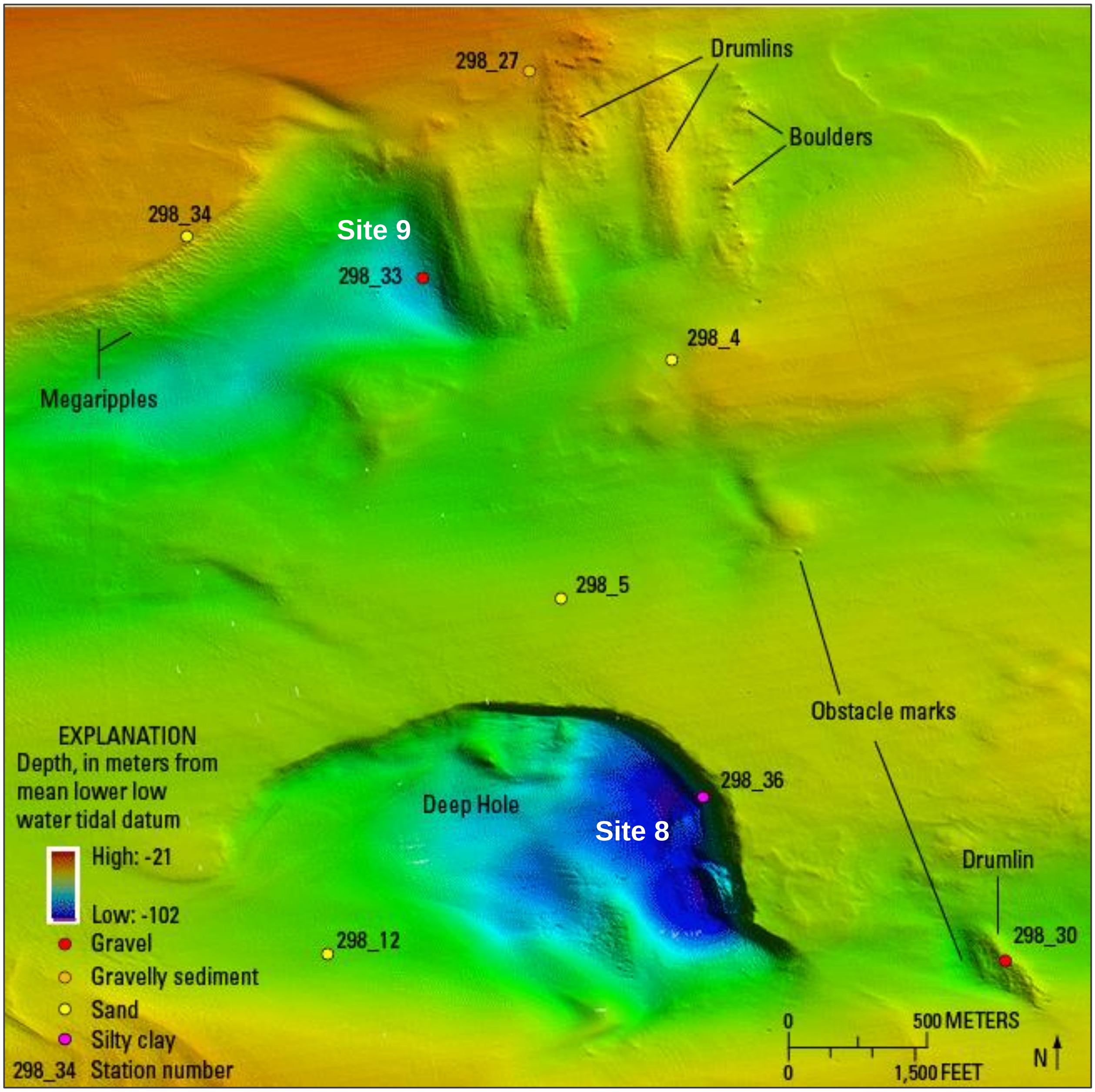

Figure 31. Detailed multibeam-bathymetric image of the Deep Holes south of Fishers Island (West [Site 8] and Center [Site 9]) (Source of image: McMullen et al., 2015). Site 8 has a steep eastern and northern wall composed of silty clay and rip-up clasts (Figure 32). Site 9 has gravel and boulders at the bottom and along the steep eastern slope where it has likely eroded into the nearby glacial drift topped with features interpreted by McMullen et al. (2015) as drumlins.

The texture of the surface sediments in the three deep holes ranges from silt and clay to sand and gravel (Figure 29). In addition, the steep northern and eastern wall of the eastern deep hole (Site 8) consist of varved fine-grained glaciolacustrine deposits. These exposed deposits have been burrowed by worms and other organisms, and fallen to the base of the deep hole as larger rip-up-clasts[19] during tidal scour (Figure 32; McMullen et al., 2015). These clasts likely remain in place until broken down into smaller particles that are then carried away by currents. Due to the likely mix of older glacial sediments and younger sediment transported by tidal currents, grain size may not be a reliable indicator of current strength in the three deep holes. Rocks and boulders are found in the central deep hole (Site 9) (Figure 33), which may be exposed deposits from the drumlin to the east.

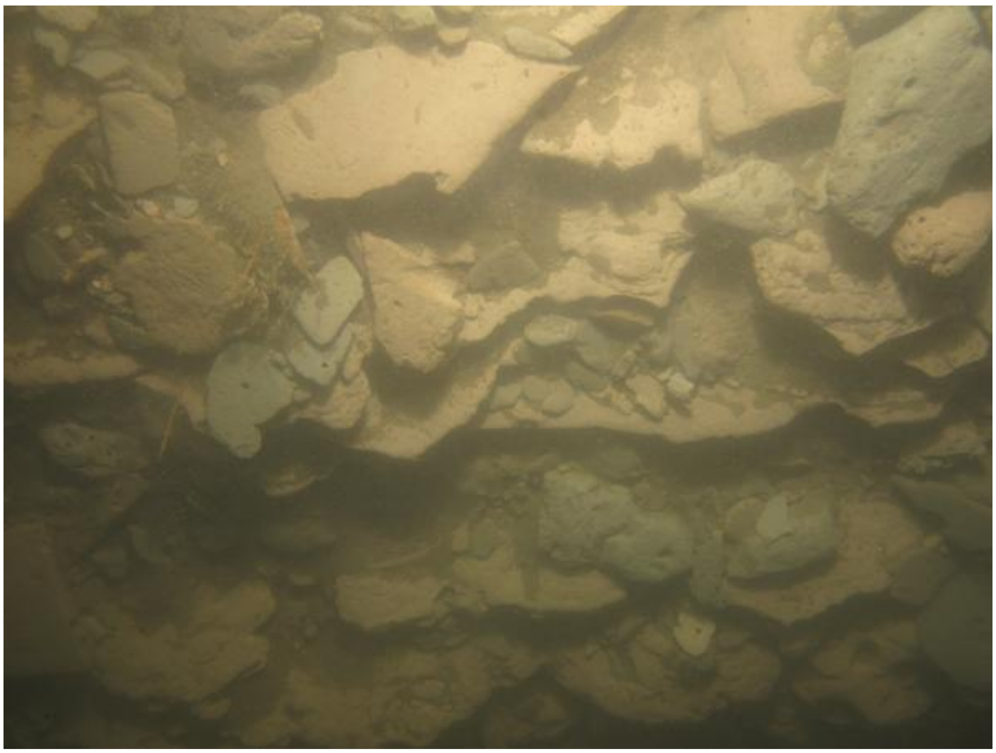

Figure 32. Photograph of the steep wall along the Deep Hole south of Fishers Island - West (Site 8); the wall consists of reddish brown and gray, layered outcrops and rip-up clasts composed of silty clay (see Station 298-36 on Figure 31 for location; source of photograph: McMullen et al., 2015). The authors observed that some clasts showed signs of bio-erosion; they also observed hydrozoans, algae, crabs, and skates along the wall.

[19] Rip-up clasts are pieces of mudstone torn by erosive currents from the substrate and carried over some distance. The clasts are held together by the cohesive nature of the material.

Figure 33. Photograph of the bottom of the deep Hole south of Fishers Island – Center (Site 9) consisting of boulders, gravel, and sand with burrows and amphipod tubes (see Station 298-33 on Figure 31 for location; source of photograph: McMullen, et al., 2015). The authors observed abundant sea life in the deep hole including anemones, hydrozoans, tunicates, sponges, shrimp, skate, sea robin, starfish, lobster, crabs, urchins, and snails. Skate and moon-snail egg cases, shells, and shell hash were present as well.

The bottom morphology of the three holes, the bedforms with sand waves in area, and the presence of tidal currents in the area all indicate that these holes were caused by erosional forces that cut through Holocene sediment into glacial drift and coastal-plain strata. Strong tidal currents funneling through channels in this part of Block Island Sound scour the seafloor around obstacles such as the drumlins and form eddies in the bathymetric depressions; these eddies maintain and continue to erode the depressions (McMullen et al., 2015). These eddies also expose the laminated glaciolacustrine sediments on the steep northern and eastern wall of Site 8, as well as the flanks of a drumlin and underlying glacial deposits to the east of Site 9. There appears to be considerable sediment movement in western Block Island Sound, as indicated by sand waves (Figures 30 and 31).

The physical oceanography study also determined that at the western deep hole (Site 7) the maximum bottom stress from currents exceeds the threshold for erosion of typical dredged material; thus, disposed dredged material would not be contained over time (O'Donnell, 2014b). At the eastern and central deep holes (Sites 8 and 9), this threshold value was not exceeded; however, geomorphological evidence discussed above indicates occasional localized turbulence that created and maintains these deep holes. This turbulence appears to be strong enough to prevent the shifting sand from filling these holes.

The Race, adjacent to the western deep hole (Site 7), is an important recreational fishing location. It was designated in 1987 as a Significant Coastal Fish and Wildlife Habitat. The designated area is located approximately 0.5 nmi (1 km) to the west of Site 7 at its closest point. NYSDOS (2005b) describes the fish and wildlife values of the designated area as follows:

> *"The Race's deep, turbulent waters and shoals combine to generate a productive and diverse habitat for marine fishes. The habitat area represents a physical environment unusual to New York State. Significant concentrations of many fish species forage in this area, including striped bass, bluefish, tautog, summer flounder, and scup. The Race is also one of two primary migration corridors for striped bass, which move into Long Island Sound in spring en route to their breeding grounds. As a result of the abundant fisheries resources in the area, The Race is a nationally renowned sportfishing area and supports an extensive recreational fishery throughout spring, summer, and fall. Much of this activity is by charter boats from Greenport, Montauk Harbor, and Connecticut. In addition to sportfishing, The Race supports a commercial lobster fishery of regional significance."* (p. 2)

Evaluation:

- *Deep Hole south of Fishers Island – West (Site 7):* Considering that this site is an extension of The Race (a significant marine habitat with strong tidal currents), this site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.
- *Deep Hole south of Fishers Island – East (Site 8):* Recent findings by the USGS (McMullen et al., 2015) indicate that this hole is a scour hole carved and maintained by eddies. Erosional walls with rip-up clasts to the north and east of the hole also suggest higher habitat quality than the surrounding area in Block Island Sound. The site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.
- *Deep Hole south of Fishers Island – Center (Site 9):* Recent findings by the USGS (McMullen et al., 2015) indicate that this hole is a scour hole carved and maintained by tidal currents. Bottom sediments contain boulders with higher habitat value. Considering further that this deep hole is comparatively small, it is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.

5.8 Block Island Disposal Site (Site 10)

The historic Block Island disposal site is located to the east of the center of Block Island Sound. Most of the site is located in State of Rhode Island waters; the remaining area is located in open ocean waters. The central coordinates of the site are 41º14.280’ N (latitude) and 71º47.905’ W (longitude) (NAD83). The site is located approximately 6.1 nmi (11 km) southeast of Fishers Island and 9.5 nmi (18 km) northeast of Block Island. The water depth at the site is uniform at approximately 105 feet (32 m) (Figure 34).

Sediments at the site consist primarily of sand with some gravelly sediment to the north (Figure 34; Poppe et al., 2012; Savard, 1966**.** The southern half of the site contains a field of barchanoid megaripples[20]; the asymmetry and orientation of these bedforms indicate net sediment transport to the east (Poppe et al., 2012) (Figure 35). The area has abundant shells and shell debris (Poppe et al., 2012; Figure 36).

The multibeam bathymetry image does not show any indication of remnant dredged material disposal mounds. The physical oceanography study for the SEIS determined that maximum bottom stress from currents were just below the threshold for erosion of typical dredged material in the central and northeastern parts of the site, although stress values in other parts of the site exceeded the threshold (O’Donnell, 2014b).

Site-specific biological data are limited. Bottom photographs taken by Poppe et al. (2012) show crabs, finfish, and small burrows. Historic trawl survey data and a targeted trawl surveys in 2009 at multiple locations in Block Island Sound (including a station near the Block Island disposal site) and Rhode Island Sound indicate that the fish catches near the site are not unique (Bohaboy et el., 2010; Smythe et al., 2010; Malek et al., 2010; RICRMC, 2010). Similarly, the benthic roughness[21] in the area is in the medium range for Block Island Sound (King and Collie, 2010; Figure 37). Benthic roughness may be used as an approximate measure of structural complexity in the benthic environment, which in turn may be used as a proxy for ecological complexity[22].

The Block Island disposal site is located at a considerable distance from dredging centers [40 CFR 228.6(a)(1)] resulting in higher dredging costs (40 CFR 228.6(a)(8)]. For example, New London is located approximately 19 nmi (33 km) from the site. The communities near the mouth of the Connecticut River are located approximately 25 nmi (46 km) from the site.

Evaluation: Considering that overall the site would be a dispersive site, and considering the comparatively long distance to dredging centers, the site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.

[20] Crescent or horn-shaped bedforms on the seafloor with the crescent pointing down-current.

[21] Benthic roughness data are based simultaneously collected swath bathymetric and side-scan sonar data that are processed into side-scan backscatter and bathymetry mosaics (Malek et al., 2010). According to Malek et al. (2010), areas with high bottom roughness tend to correspond with prime fishing areas for several species targeted by commercial and recreational fisheries in Block Island Sound.

[22] This is based on the paradigm is that as bottom complexity increases from smooth sand and mud to rock and cobble, ecological complexity and species diversity about marine benthic communities increases (Malek et al., 2010, and references therein).

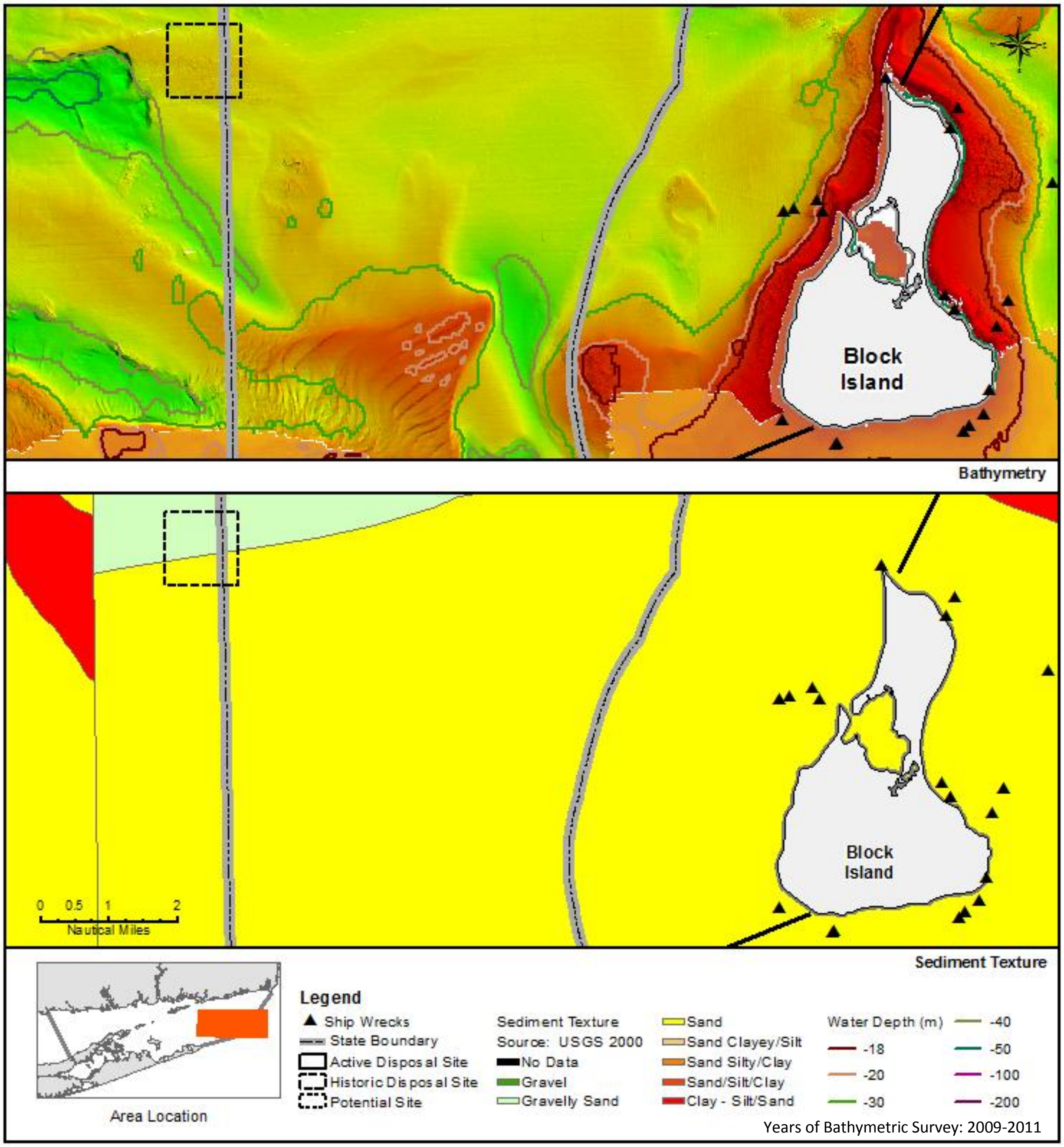

Figure 34. Water depth and sediment texture in eastern Block Island Sound, including at the Block Island disposal site, located in the upper left corner (outlined black box). (Data sources: Poppe et al., 2000, 2012). It is noted that the sediment data for eastern and western Block Island Sound come from two separate USGS data bases.

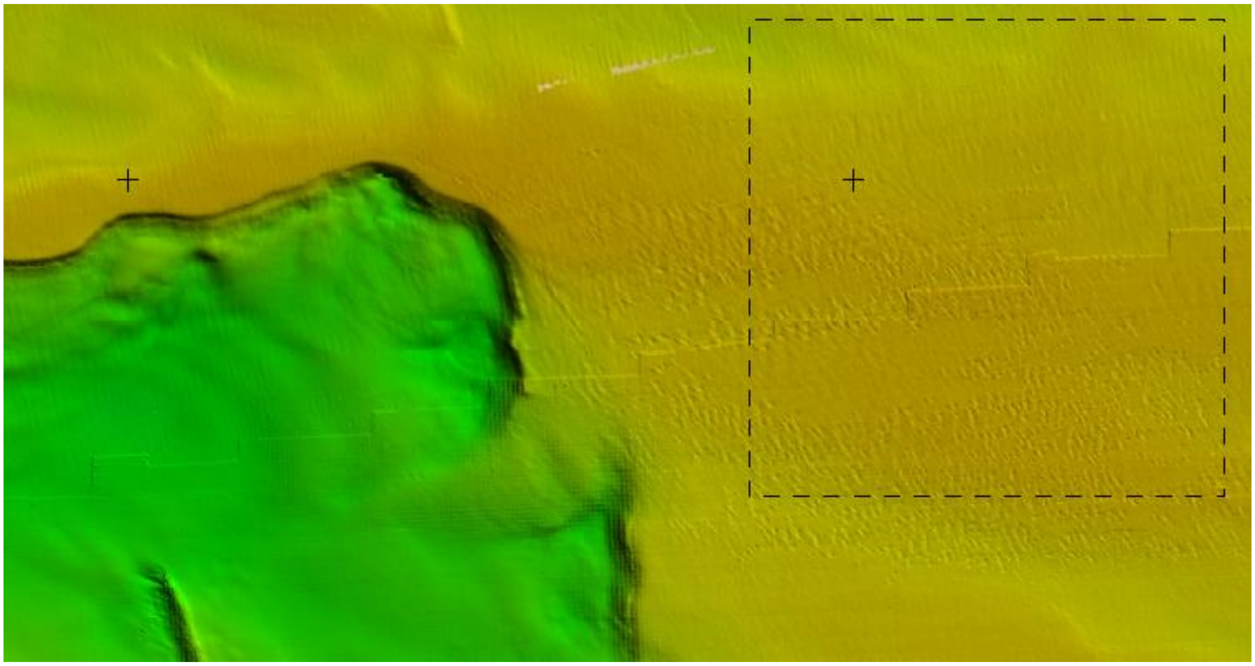

Figure 35. Block Island disposal site (outlined by the black dashed line) surveyed by USGS/NOAA in 2009. The site is comparatively featureless, except for the field of barchanoid megaripples (small marks scattered across the bottom half of the image). The site is located close to a wide tidal channel that appears to have similarly steep walls as observed at Site 8; these walls were possibly also carved by strong tidal eddies. It is noted that the stair-step line across the center of the site is a data-processing artifact. (Source: Poppe et al., 2012)

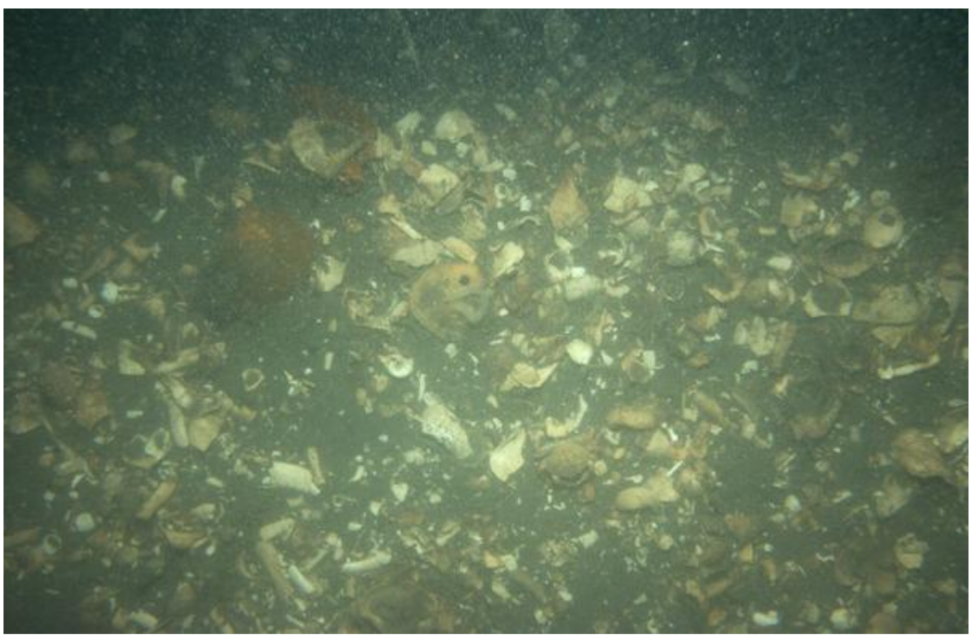

Figure 36. Photograph of the seafloor from the Block Island disposal site. The area has faintly rippled to flat sand with patches of abundant shells and shell debris. Hydrozoans, crabs, finfish, and small burrows are present. (Source: Poppe et al., 2012)

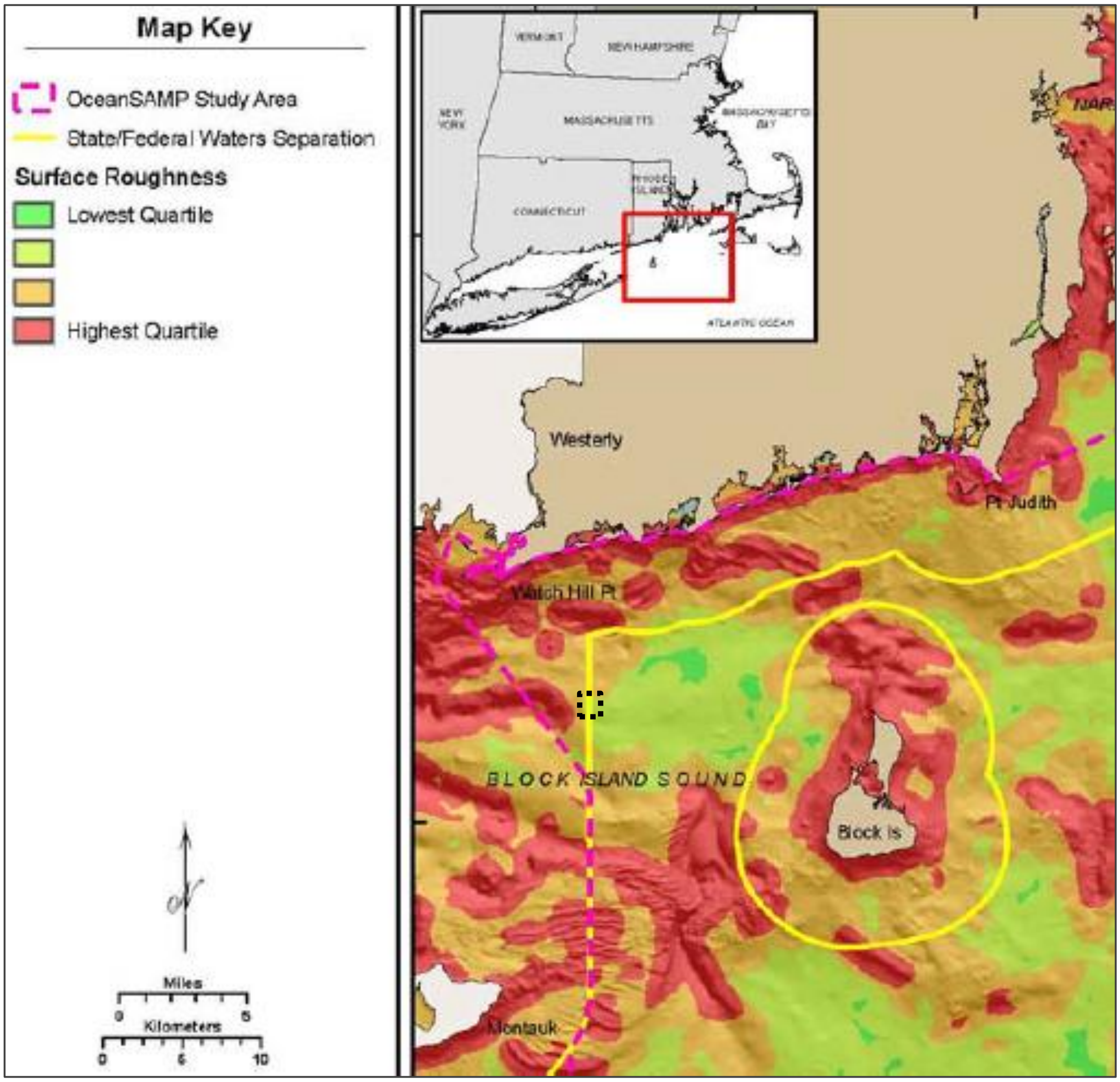

Figure 37. Benthic surface roughness as a first approximation proxy for habitat complexity in the OceanSAMP study area (King and Collie, 2010; accessed in RICRMC, 2010). The Block Island disposal site is marked by a black dashed line.

5.9 Area north of Montauk (Site 11)

The area is located approximately 1 nmi (1.8 km) from the northern shore of Montauk (Figure 38). This site does not appear to have received dredged material in the past and would thus be a new disposal site. Water depths at the site exceed the 59 feet (18 m) threshold depth; depths at the site range from approximately 64 to 73 feet (20 to 22 m) (Figure 39). Overall, the seafloor at the site is flat with an elongate depression between the site and the shoreline; the depression is trending northeast to southwest and reaches a depth of 91 feet (28 m). The site is located completely within New York State waters.

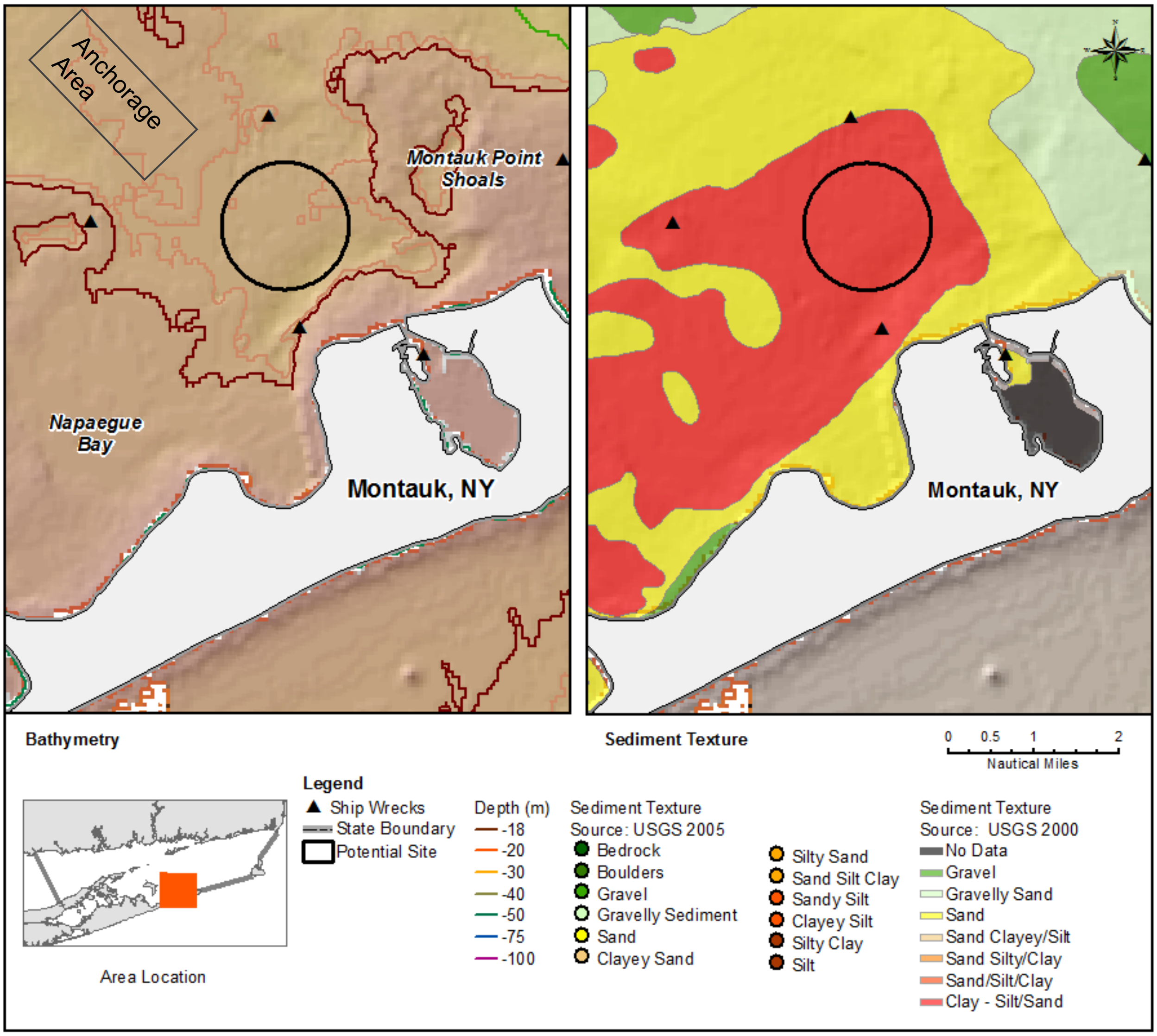

Figure 38. Water depth and sediment texture at the Area north of Montauk (black circle, which has a diameter of approximately 1.5 nmi (2.8 km) as shown. The boundary of the Montauk Point Shoals, located to the east of the site, largely follows the 60 feet (18 m) depth contour line (Data sources: NOAA, 2013a; Poppe et al., 2000; NYSDOS, 2002).

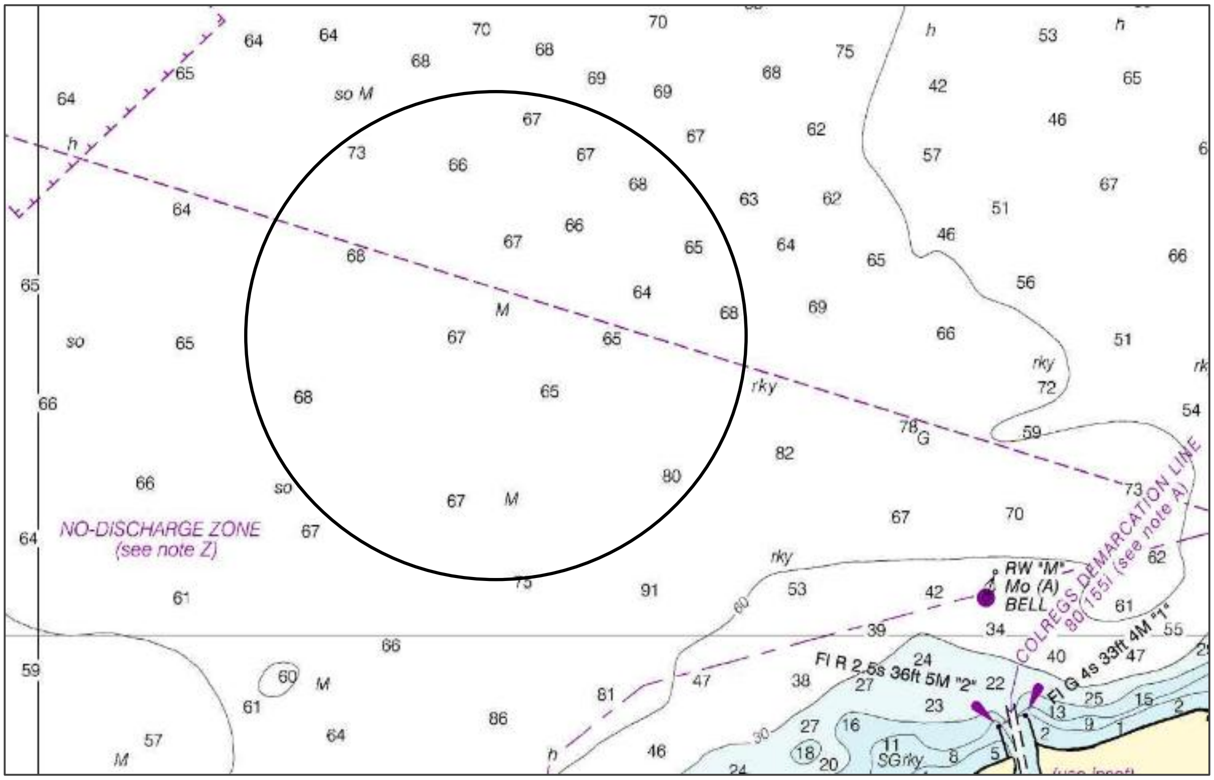

Figure 39. Detailed depth soundings from NOAA chart 13209 of the area (circle).

The bottom sediments at the site are predominantly fine-grained (i.e., sandy or silty clay; Poppe et al., 2003; Figures 8 and 38). The physical oceanography study for the SEIS determined that maximum bottom stress from currents is well below the threshold for erosion of typical dredged material (O'Donnell, 2014b). Thus, sediment disposed at the site is expected to remain in place.

Similar to the north shore of Long Island and the islands between Orient Point and Fishers Island, Montauk is part of a terminal moraine system that extends from central Long Island to Nantucket, and includes the now submerged shoals between Montauk and Block Island. Sediments within the moraine range widely and include rocks and boulders. Tidal currents entering Block Island Sound from the Atlantic Ocean have eroded finer-grained sediments as they cross the Montauk Point Shoals, leaving behind coarser-grained sediment (gravel and rocks; Poppe et al., 2003). This shoal area, consisting of several individual shoals including Endeavor Shoal, Washington Shoal, Montauk Shoal, was designated in 1987 as a Significant Coastal Fish and Wildlife Habitat (Figure 4). NYSDOS (2002) describes its fish and wildlife values, including its recreational fishing, as follows:

> "*The Montauk Point Shoals area is a marine habitat supporting a diverse assemblage of marine and coastal species, rare in the United States. The habitat is within an important migratory corridor for marine mammals and sea turtle species. The area also provides critical overwintering habitat for sea birds and waterfowl significant in the State of New York.*
>
> *The nearshore waters off Montauk Point are one of the most important areas for sea turtles in the New York Bight region. This area provides developmental habitat for*

juvenile Atlantic ridley turtles (E), and is an important feeding area for both leatherback turtles (E) and loggerhead turtles (T). Concentrations of marine mammals, including northern right whale (E), finback whale (E), humpback whale (E), minke whale, and pygmy sperm whale migrate through the area and feed nearshore throughout most of the year (January through September, depending upon the species). Sperm whales (E), normally considered a deep water species (>200 meters), have been observed regularly during spring and fall for more than ten years in waters less than 60 feet (18 meters) deep in an area south of Montauk Point. However, the importance of the Montauk Point Shoals area to this species requires additional documentation. Gray seal and harbor seal regularly use rocky areas off Montauk Point for haulout during winter. An inshore population of bottlenosed dolphin feed along the south shore of the Montauk peninsula during summer and early fall.

Wintering waterfowl concentrations in the Montauk Point Shoals area are of statewide significance. Species occurring here include common loon (SC), common eider, king eider, white-winged scoter, surf scoter, black scoter, bufflehead, common goldeneye, great cormorant, and red-breasted merganser. Harlequin duck (SC) are found in the area during winter, representing the southernmost regular wintering population of this species. To the north of the peninsula, large concentrations of wintering American black duck and oldsquaw have been documented. Sea duck concentrations around Montauk Point during winter are the largest in New York State, and spring, summer, and fall concentrations of pelagic seabirds are also notable.

There is an offshore fishery in this area of commercial and recreational significance in the Middle Atlantic and New England regions of the United States. In the fall, this area is a concentration area for a variety of fish species including striped bass, bluefish, little tunny, weakfish, scup, and black seabass. There are also extensive beds of blue mussel and kelp in the area, of local significance." (p. 2)

The northern portion of the shoal is bounded by the 60-foot (18 m) contour line. The distance to the potential ODMDS is approximately 0.5 nmi (1 km).

The potential ODMDS is also close to an anchorage area. According to 33 CFR 110.150, this anchorage area (110.150) is used by U.S. Navy submarines. Vessels or persons may not approach or need to remain within 500 yards (458 m) of a submarine within this anchorage area.

Similar to the Block Island disposal site, the site north of Montauk is located at a considerable distance from dredging centers [40 CFR 228.6(a)(1)] resulting in higher dredging costs [40 CFR 228.6(a)(8)]. For example, New London is located approximately 16 nmi (30 km) from the site. The communities near the mouth of the Connecticut River are located approximately 21 nmi (39 km) from the site.

Evaluation: Considering the proximity of the site to shore [40 CFR 228.5(b)] and to the Montauk Point Shoals potentially impacting marine resources [40 CFR 228.5(a), 228.6(a)(1), 228.6(a)(2)] and recreational fishing [40 CFR 228.6(a)(8)], and considering the distance to dredging centers, the site is *not recommended* as an alternative ODMDS to be analyzed further in the SEIS.

5.10 Recommended Sites - Summary

Based on information available in the literature and additional field investigations, eight of the eleven initial sites were screened out. The remaining three alternatives sites were recommended for further analysis in the SEIS (Cornfield Shoals, Niantic Bay, and New London) (Figure 40).

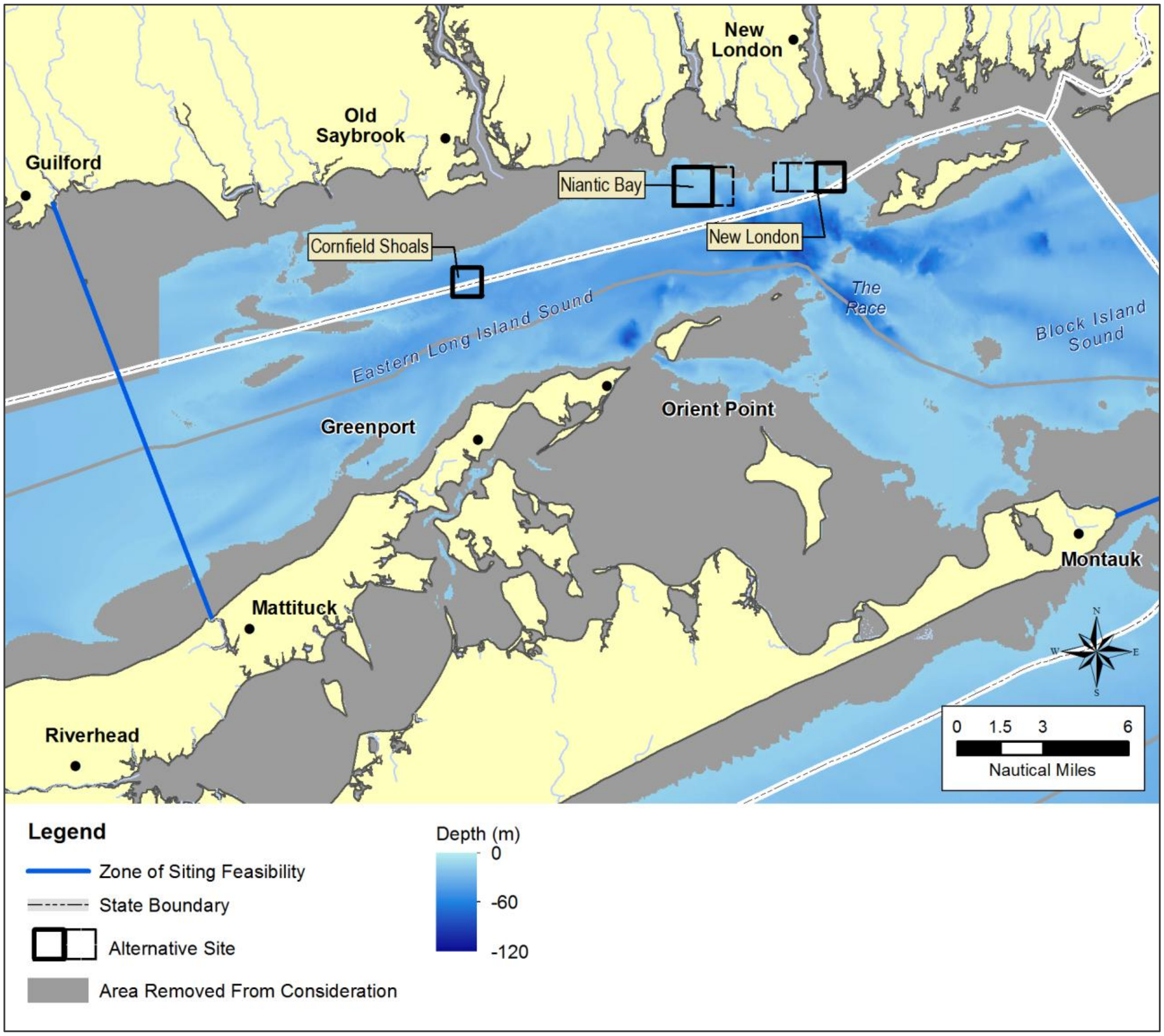

Figure 40. Results of site screening for alternative open-water dredged material disposal sites to be analyzed further in the SEIS.

The recommended Cornfield Shoals Alternative is identical to the active CSDS. However, in order to accommodate the dredged material disposal needs for the eastern Long Island Sound region over for the next 30 years (i.e., 14.4 million cy [11 m^3]; USACE, 2009), the boundaries of the recommended New London and Niantic Bay Alternatives, to be investigated in more detail in the SEIS, were increased from the initially considered boundaries, as follows:

- ***New London Alternative:*** The boundary of the recommended New London Alternative includes the active NLDS as well as two areas immediately to the west (referred to as "Site NL-Wa" and "Site NL-Wb") in order to increase the limited remaining capacity of the NLDS. The current water volume at the NLDS between a water depth of 59 feet (18 m) and the sediment surface is only approximately 4.5 million cy (3.4 million m^3), based on USGS/NOAA bathymetric data from 2005 and considering that an additional 390,000 cy (300,000 m^3) of dredged material were disposed at the NLDS between 2006 and 2013. (Note that the capacity for the disposal of dredged material at the site is somewhat lower than the water volume, given that disposal mounds are sloped and have uneven surfaces and thus a "filled" site would have multiple areas remaining with water depths greater than 59 feet [18 m].)

  Site NL-Wa extends the NLDS westward by 1.0 nmi (1.8 km); Site NL-Wb extends the NLDS westward by an additional 0.5 nmi (0.9 km). With the addition of Sites NL-Wa/b, the capacity at the New London Alternative would be sufficient to accommodate the dredged material disposal needs for the next 30-years. The water volume for Site NL-Wa below a water depth of 59 m (18 m) is approximately 14 million cy (11 million m^3), excluding a boulder zone in its north-central part. The water volume for Site NL-Wb below a water depth of 59 m (18 m) is approximately 10 million cy (8 million m^3). Bottom stress[23] analysis indicates that the NLDS, Site NL-Wa, and most of Site NL-Wb would be containment areas for cohesive fine-grained dredged material (O'Donnell, 2014b).

- ***Niantic Bay Alternative:*** The boundary of the recommended Niantic Bay Alternative includes the area of the historic NBDS and an area immediately to the east (referred to as "Site NB-E") in order to increase the capacity for sediment containment under this Alternative. Site NB-E extends the NBDS eastward by 0.75 nmi (1.4 km). Bottom stress analysis indicates that most of the Niantic Bay Alternative would be a dispersive site, except for a northeastern part of the NBDS (O'Donnell, 2014b). For Site NB-E, however, lower bottom stress in its central and northern parts suggests that it would partially be a containment area for cohesive fine-grained dredged material. The water volume below a water depth of 59 feet (18 m) for Site NB-E in the zone of lower bottom stress is approximately 24 million cy (18 million m^3). (As noted above, the capacity for dredged material disposal would be lower than this volume due to topographic constraints of individual disposal mounds.)

The recommended boundaries of the New London and Niantic Bay Alternatives for evaluation in the SEIS are shown in more detail in Figure 41.

[23] Bottom stress is the force acting on the surface sediments on the seafloor, potentially resuspending sediment is the bottom stress is high enough. This force is primarily a function of the strength of the waves and currents.

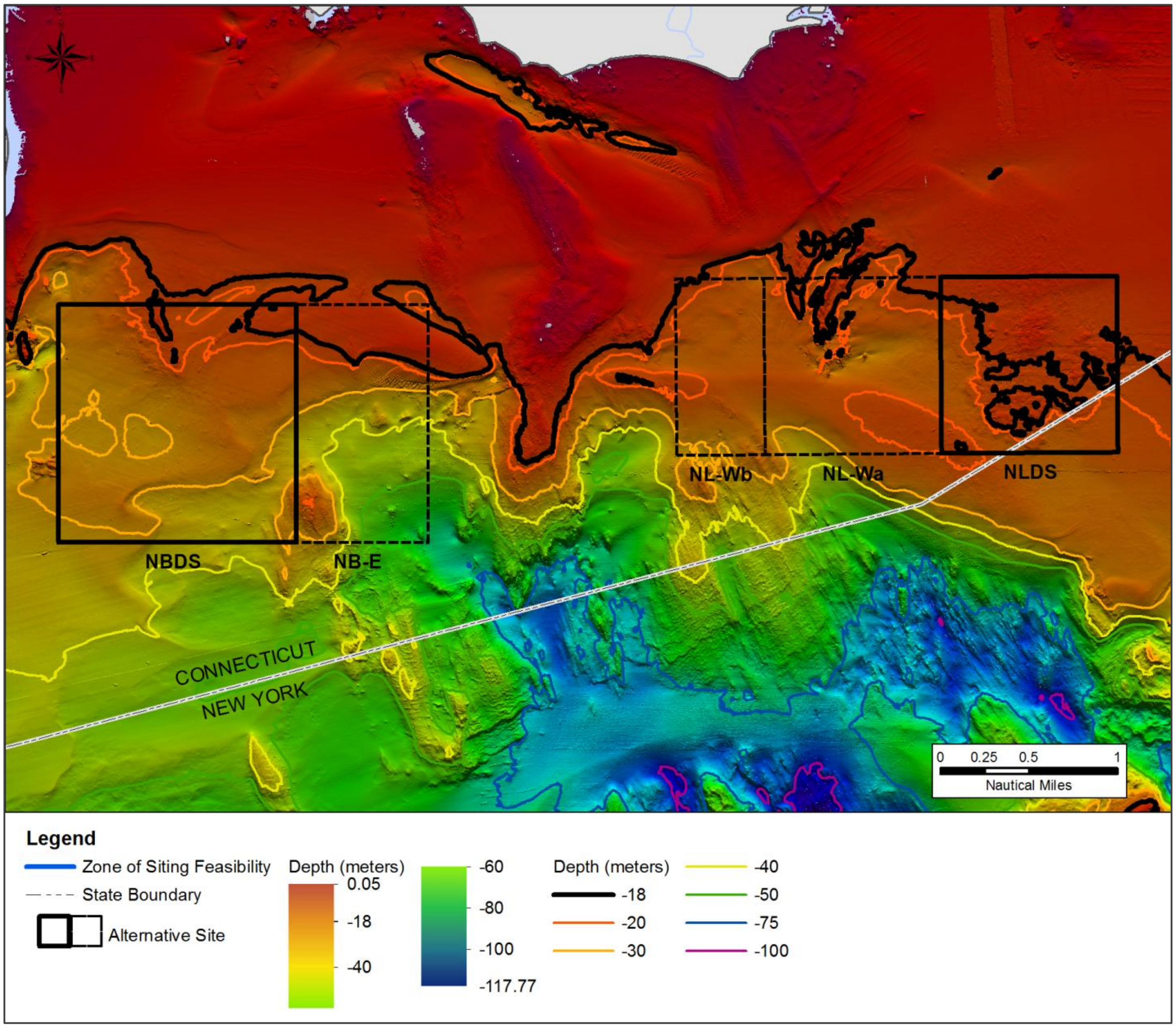

Figure 41. Location of the New London and Niantic Bay Alternatives, superimposed on the USGS/NOAA bathymetry (Source: Poppe et al., 2011).

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