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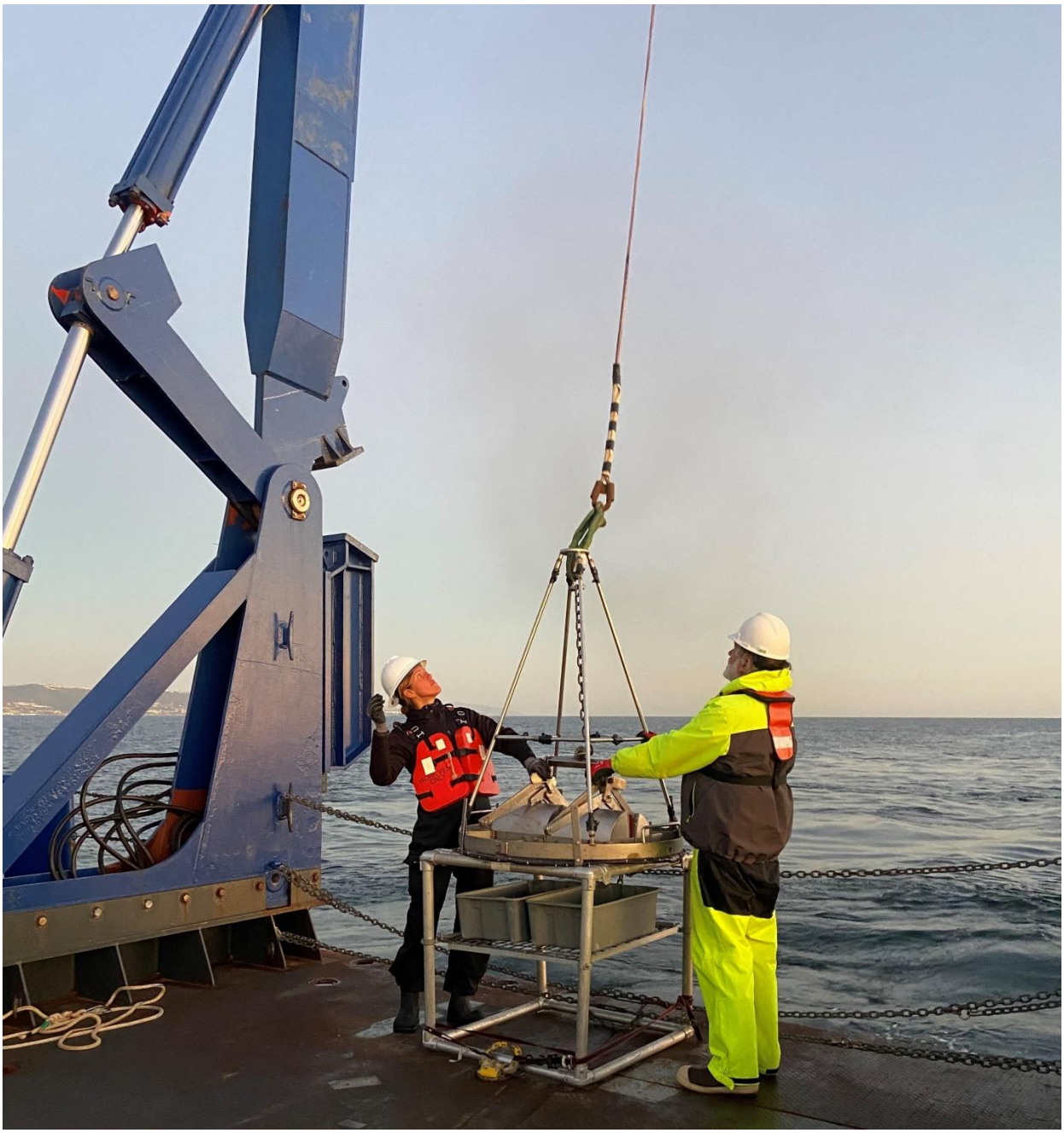
2021 National MPRSA Ocean Site Monitoring Assessment Report



EPA Marine Protection Permitting Program
July 2025

Executive Summary

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the transportation and disposition (dumping) of any material into ocean waters. Under the MPRSA, the U.S. Environmental Protection Agency (EPA) is responsible for designating and managing MPRSA ocean sites used for permitted activities. The U.S. Army Corps of Engineers (USACE) is responsible for issuing MPRSA permits for dredged material using the EPA's environmental criteria; MPRSA permits for ocean dumping of dredged material are subject to the EPA's review and written concurrence. For all other materials, the EPA is responsible for issuing MPRSA permits. The EPA, together with USACE, develops site management and monitoring plans (SMMPs) for each MPRSA ocean site designated for the ocean dumping of dredged material. The EPA's management and monitoring of these ocean sites ensures that MPRSA permitted activities will not unreasonably degrade or endanger human health, welfare, amenities, the marine environment, ecological systems or economic potentialities.

In 2021, the EPA managed 98 MPRSA-designated ocean sites located off the U.S. Atlantic, Gulf of America and Pacific coasts, and near Puerto Rico, Hawaii, Guam and American Samoa. This National MPRSA Site Monitoring Assessment Report provides a comprehensive overview of the EPA's 2021 monitoring activities conducted at eight MPRSA ocean sites in five of the EPA's coastal Regions:

- Massachusetts Bay, MA Disposal Site (MBDS) (Region 1)
- Historic Area Remediation Site (HARS), NJ (Region 2)
- Dam Neck, VA Ocean Dredged Material Disposal Site (ODMDS) (Region 3)
- Charleston, SC ODMDS (Region 4)
- Port Everglades, FL ODMDS (Region 4)
- Coos Bay H, OR ODMDS (Region 10)
- Yaquina, OR North and South ODMDSs (Region 10)

Based on the results of these 2021 oceanographic surveys, the EPA determined that environmentally acceptable conditions were met at all surveyed ocean sites and the permitted disposition of dredged material under MPRSA can continue at these sites.

Additionally, the EPA will use the data and information collected in 2021 to:

- Confirm that at the Region 1 Massachusetts Bay Disposal Site, dredged material disposed in the former "Industrial Waste Site" spread over the targeted area while minimizing disturbances to the existing seafloor; and confirm that dredged material disposed in the area of the site designated in 1993 had been deposited properly within the site boundaries;
- Determine that polychlorinated biphenyls (PCBs) and dioxin concentrations found in worm tissue exceeded the established HARS-specific thresholds at five stations within the HARS and to inform where and how much additional material would be deposited within the site to meet the HARS's remediation goals;
- Determine that sediments in two locations at the Region 3 Dam Neck ODMDS should be further investigated to better understand the presence and bioaccumulation potential of contaminants of concern measured at the site;
- Investigate whether the fine-grained material observed at one station within the Region 4 Charleston ODMDS resulted from incorrect disposal operations;
- Confirm that there was no evidence of hardbottom environments in the proposed expanded area of the Region 4 Port Everglades ODMDS;
- Refine future data collection efforts necessary to inform the Region 10 Coos Bay Site H site expansion; and

- Inform future oceanographic monitoring and surveying methods at the Yaquina North and South ODMDSs as Region 10 transitions away from using benthic otter trawls to collect epibenthic fish and invertebrate data in favor of towed benthic video imagery.

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ACRONYMS AND ABBREVIATIONS

AET	Apparent Effects Threshold
aRPD	apparent redox potential discontinuity
AUV	autonomous underwater vehicle
CFR	Code of Federal Regulations
COC	contaminant of concern
DDX	Dioxin (refers to broader family of polychlorinated dioxins)
EPA	Environmental Protection Agency
ER-L	Effects Range Low
ER-M	Effects Range Median
FR	Federal Register
ft	ft
g	gram
HARS	Historic Area Remediation Site
IWS	Industrial Waste Site
kg	kilogram
km	kilometer
km^2	square kilometer
m	meter
m^3	cubic meter
MBES	multibeam echosounder
MDL	method detection limit
MDS	Mud Dump Site
mg	milligram
MDL	method detection limit
MPRSA	Marine Pollution, Research, and Sanctuaries Act
MRL	method reporting limit
M/V	motor vessel
nmi	nautical mile
nmi^2	square nautical mile
NOAA	National Oceanic and Atmospheric Administration
ODMDS	Ocean Dredged Material Disposal Site
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	Probable Effects Level
ppb	part per billion
pg	picogram
pptr	parts per trillion
PRA	Priority Remediation Area
ROV	remotely operated vehicle
RSET	Regional Sediment Evaluation Team
R/V	research vessel
SBZ	Shipwreck Buffer Zone
SCDNR	South Carolina Department of Natural Resources
SEF	Sediment Evaluation Framework
SMMP	Site Management and Monitoring Plan
SPI	sediment profile image

SQG	Sediment Quality Guideline
SVOC	semi-volatile organic compound
TEL	Threshold Effects Level
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USC	United States Code
yd	yard
yd^3	cubic yard

1.0 Introduction

The Marine Protection, Research, and Sanctuaries Act (MPRSA) regulates the dumping and transportation for the purpose of dumping of any material into the ocean. The MPRSA defines "dumping" broadly as a "disposition of material" which includes release for both disposal and non-disposal purposes (33 U.S.C. Section 1402(f)).

The MPRSA prohibits or restricts (primarily in terms of material type, amount, and location) the disposition of materials into the ocean that would adversely affect human health, welfare, or amenities; the marine environment; ecological systems; or economic potentialities. Section 101 of the MPRSA (33 U.S.C. 1411) generally prohibits the transportation of any material for the purpose of dumping, except as authorized by a permit.

In the United States today, the primary material (in terms of volume) permitted under the MPRSA is uncontaminated dredged material, which is sediment that is excavated or otherwise removed from our nation's waterways. The removal of sediment supports a network of coastal ports and harbors that are used for commercial, transportation, national defense and recreational purposes. In 2020, this marine transportation network, partially facilitated by the dredging of waterways, contributed more than $77 billion and 687,000 jobs to the U.S. economy (National Ocean Economics Program). Other materials that are permitted under the MPRSA include fish wastes, vessels, marine mammal carcasses, ice piers in Antarctica, and human remains for burial at sea.

Under the MPRSA, the U.S. Environmental Protection Agency establishes marine protection criteria for the evaluation of all MPRSA permit applications. Under the MPRSA, the EPA is the permitting authority for all materials other than dredged material. In the case of dredged material, the U.S. Army Corps of Engineers issues MPRSA permits (or, in the case of federal navigation projects, directly authorizes activities under the MPRSA) using the EPA's marine protection criteria (40 CFR Parts 227 and 228). All MPRSA permits and federal projects involving the disposition of dredged material into the ocean are subject to the EPA's review and written concurrence.

Dredged material that is proposed for permitting under the MPRSA is evaluated and tested to ensure that the material will not adversely affect human health and the marine environment. The sediments dredged from our nation's waterways sometimes are contaminated by historical pollution. If biologically available, contaminants may be ingested or absorbed by marine organisms, resulting in toxicity or bioaccumulation (accumulation of pollutants in the organism's tissues), which, in turn, exposes other organisms in the food web, potentially including humans. *The Evaluation of Dredged Material Proposed for Ocean Dumping,* a national testing manual commonly known as the Green Book (EPA 503/8-91-001), contains technical guidance for determining the suitability of dredged material for ocean dumping through chemical, physical and biological evaluations. Only dredged material found suitable for permitting under the MPRSA using the procedures in the Green Book can be released in an MPRSA ocean site.

The EPA establishes the criteria for the designation of MPRSA ocean sites and is responsible for designating these sites under the MPRSA (40 CFR sections 228.5 and 228.6). To minimize the adverse impacts of MPRSA-permitted activities on human health and the marine environment, the EPA designates ocean sites based on environmental studies of the proposed site and the regions adjacent to the proposed site, as well as historical knowledge of the impact of dumping on areas with similar physical, chemical and biological characteristics. The EPA analyzes these impacts through environmental assessments or environmental impact statements. In general, the EPA designates sites only in areas

where MPRSA permitted activities will not have a significant impact on various amenities, such as fisheries, coral reefs and endangered species.

The EPA is also responsible for managing all ocean sites designated under the MPRSA. Managing MPRSA ocean sites involves:

- regulating the times, quantity and characteristics of the material released at the site;
- establishing disposal controls, conditions and requirements to minimize potential impacts to the marine environment; and
- monitoring the site and surrounding environment to verify that unanticipated or significant adverse effects are not occurring from historical or continued use of the site and that terms of the MPRSA permit are met.

All designated MPRSA ocean sites are required to have a site management and monitoring plan (SMMP). The EPA, in conjunction with USACE, develops an SMMP for each site. Each SMMP includes, but is not limited to:

- a baseline assessment of site conditions;
- a monitoring program for the site;
- special management conditions or practices to be implemented at the site that are necessary for protection of the environment;
- consideration of the quantity of disposed material and the presence, nature, and bioavailability of the contaminants in the material;
- consideration of the anticipated long-term use of the site; and
- a schedule for review and revision of the SMMP.

1.1 MPRSA Ocean Site Monitoring

In 2021, the EPA managed 98 MPRSA-designated ocean sites off the U.S. Atlantic, Gulf of America, and Pacific coasts; and near Puerto Rico, Hawaii, Guam, and American Samoa.

The EPA monitors environmental conditions in and around ocean sites as part of its implementation of the MPRSA. Under the MPRSA and its implementing regulations, the EPA uses monitoring data to:

- Evaluate potential ocean sites and designate ocean sites (MPRSA 102(c)(1); 40 CFR 228.4(b), 40 CFR 228.6(a));
- Assess trends in environmental impact (40 CFR 228.9(a)(1));
- Evaluate impacts after site use (40 CFR 228.10(a) and (b));
- Modify site use (40 CFR 228.11(a) and (d));
- Prohibit permitted activities where necessary (MPRSA 102(c)(2)); and
- Develop a site management and monitoring plan for each site, which must be reviewed and revised at least every 10 years (MPRSA 102(c)(3)).

The EPA's Regional MPRSA Coordinators and Chief Scientists plan and conduct oceanographic surveys to assess the physical, biological, and chemical conditions at ocean sites and the surrounding marine environment. The EPA typically evaluates environmental impact at a site by comparing current conditions to those at the time of designation (baseline conditions) along with any other historical survey data. For example, the EPA may use monitoring information to evaluate movement and deposition of the permitted material to determine whether or how to modify site use. Ocean areas near the MPRSA ocean site which are not affected by permitted activities are used for comparisons to assess the impact from site use. The quantity and distribution of samples collected in each monitoring survey

are determined based on survey- and site-specific factors. The information collected from these site assessments informs the EPA's ongoing planning and decision-making regarding the management and monitoring of ocean sites.

As part of oceanographic surveys of the sites, the EPA may collect a variety of data to ensure that the permitted dredged material is being adequately tested and that there are no unexpected adverse impacts at and around the sites. Sediment samples, water samples, organisms from benthic trawls, sediment plan view images (PVI) (photographs of the surface of the seafloor) and/or sediment profile images (SPI) (photographs of a cross-section of the upper 6-8 in [15-20 cm] of the sediment-water interface) may be collected to evaluate the physical and biological state of the benthic environment in and around the ocean site and at reference areas. Parameters used to evaluate benthic habitat or benthic habitat quality include but are not limited to: sediment grain size; depth of oxygenated sediment; depth of the apparent redox potential discontinuity (aRPD), which indicates habitat quality by measuring interactions between sediment chemistry and biological activity within sediment; and sediment penetrability (Rhoads and Germano, 1982). Benthic community health can be classified using defined successional stages and species diversity. Successional stages at a site can range from stage zero (recently disturbed) to stage three (mature). Species diversity is a metric which combines species richness (the number of different species) and evenness (the relative abundance of species) to provide an overall indication of community structure.

The EPA may also analyze sediment samples for contaminants of concern (COCs) including metals, polychlorinated biphenyls (PCBs), persistent pesticides and semi-volatile organic compounds (SVOCs) including polycyclic aromatic hydrocarbons (PAHs), organotins and/or dioxins. To evaluate the extent to which MPRSA-permitted dredged material may impact benthic communities at or near sites, the EPA commonly compares contaminant concentrations in sediments collected at and around ocean sites to sediment quality guidelines (SQGs), which are informal benchmarks used to relate chemical concentrations in sediments to the potential toxicity to benthic or aquatic organisms. Many of the EPA Regions rely on effects range low (ER-L) and effects range median (ER-M), which are national SQGs developed by the National Oceanic and Atmospheric Administration (NOAA) (NOAA, 1999). Chemical concentrations below the ER-L are not likely to cause adverse effects, while chemical concentrations above the ER-M are likely to cause adverse effects. Similar to ER-M and ER-L, some EPA Regions use threshold effects levels (TELs) or probable effect levels (PELs) as sediment quality benchmarks. Regions use these benchmarks to evaluate the potential toxicity of sediment on benthic or aquatic organisms. A chemical's TEL represents the concentration below which adverse effects are rarely expected to occur, while PEL values indicate the concentration above which adverse effects are frequently expected to occur.

2.0 Report Objectives

In 2021, the EPA's Chief Scientists conducted oceanographic surveys at eight MPRSA ocean sites (Table 1, Figure 1) to inform planning and ongoing decision-making with respect to the management and monitoring of these sites. This national report serves as a comprehensive summary of these monitoring efforts which were conducted at five of the seven EPA coastal Regions.

Table 1: *Area and depth of ocean sites surveyed in 2021.*

EPA Region	MPRSA Ocean Site	Area (nmi²)	Depth (ft)
1	Massachusetts Bay, MA	4.61	230-299
2	Historic Area Remediation Site, NJ	15.7	39-138
3	Dam Neck, VA	8.15	51*
4	Charleston, SC	11.8	29-44
4	Port Everglades, FL	3.2	587-761
10	Coos Bay H, OR	0.14	160-210
10	Yaquina, OR North Yaquina, OR South	0.7 0.7	112-151 112-151

**Depth reported as a site average*

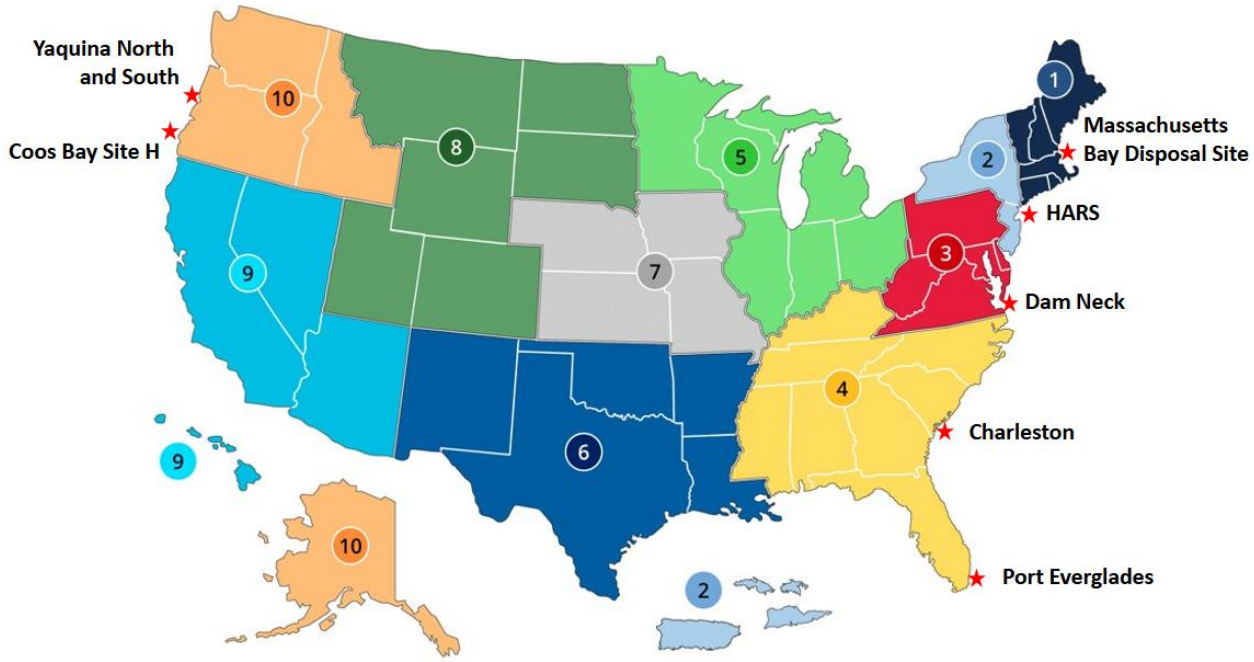

Figure 1: *Approximate locations of the eight ocean sites surveyed in 2021. Numbers and colors indicate the EPA's Regions.*

3.0 Summary of Monitoring Surveys

A summary of 2021 survey objectives, activities and results, as well as conclusions and recommended management actions resulting from these surveys, is presented below.

3.1 Region 1 – Massachusetts Bay Disposal Site

3.1.1 Background

The Massachusetts Bay Disposal Site is centrally located within Massachusetts Bay approximately 20 nautical miles (nmi; 37 km) east of Boston Harbor adjacent to the Stellwagen Bank National Marine Sanctuary (Figure 2). The Massachusetts Bay Disposal Site covers an area of 4.61 nmi^2 (8.5 km^2) with depths ranging from 230 ft to 299 ft (70.1 m to 91.1 m). Region 1 designated the Massachusetts Bay

Disposal Site under the MPRSA in 1993; however, historical notes and records show that the general vicinity had been used for disposal since the early 1900s.

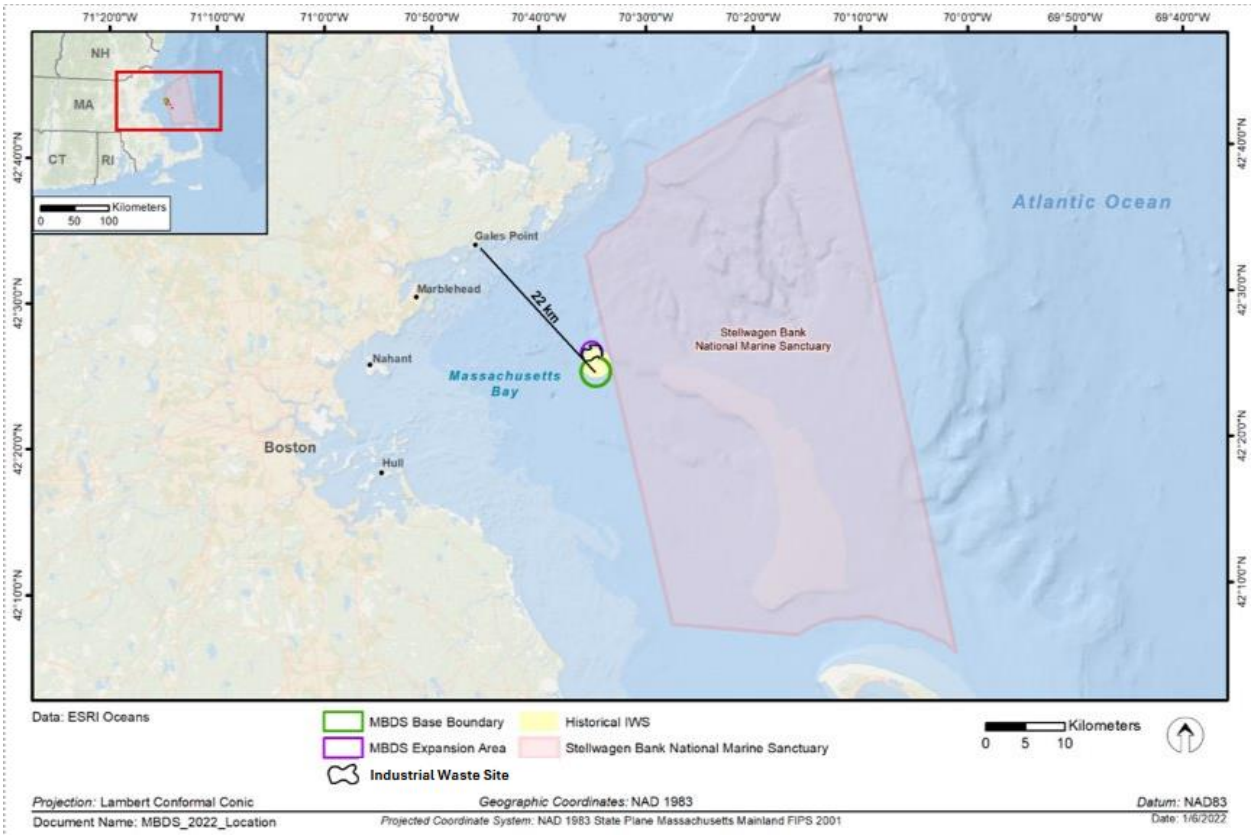

***Figure 2**: Location of the Massachusetts Bay Disposal Site.*

As designated in 1993, the boundaries of the Massachusetts Bay Disposal Site overlapped with two historical disposal areas:

1) the southern portion of the former Industrial Waste Site which was used until 1977 to dispose of various wastes including dredged material, derelict vessels, construction debris, ordnance, chemical wastes, and barrels of low-level radioactive wastes. (When the Massachusetts Bay Disposal Site was designated in 1993, the site boundaries overlapped with the southern portion of the Industrial Waste Site but excluded the area with the highest density of exposed debris and waste containers on the seafloor.) and
2) an interim[1] Massachusetts Bay Disposal Site that was used between 1977 and 1992.

Oceanographic monitoring conducted in the area by the EPA and other agencies in the 1970s, 1980s, and 1990s did not identify any unacceptable human health or environmental risks associated with the exposed debris and waste containers in the Industrial Waste Site; however, general concerns remained regarding the long-term disposition of waste containers and munitions on the seafloor (EPA 2018).

[1]Interim ocean disposal sites are no longer available for use. Amendments enacted in 1992 under the MPRSA require that no permits for ocean dumping shall be issued for an EPA-established ocean disposal site after January 1, 1997, unless the site has received a final designation. In 2008, the EPA repealed expired, and therefore obsolete, provisions regarding interim ocean disposal sites.–73 Fed. Reg. 74983 (Dec. 10, 2008).

During the design phase of the Boston Harbor Deep Draft Navigation Project, approximately 11 million yd^3 (8.4 million m^3) of sediments were proposed to be dredged from the harbor. Discussions between Region 1 and USACE identified the potential to use the dredged material from the Boston Harbor Deep Draft Navigation Project determined to be suitable for ocean disposal to spread over the area of the former Industrial Waste Site with the highest density of waste containers and debris exposed on the seafloor. By disposing of dredged material from the deepening project over the former Industrial Waste Site, the dredged material could serve as a protective layer on the seafloor by isolating the historically disposed debris and waste barrels from the surrounding marine environment and thereby protecting important marine resources in the area. Additionally, in consultation with the EPA, USACE began developing and piloting a technique for disposing dredged material from standard split-hulled scows in a manner to minimize impacts on the ambient seafloor (Sturdivant and Carey 2017).

Based on the success of the pilot demonstration, the EPA, in collaboration with USACE, completed an Environmental Assessment to support expanding the Massachusetts Bay Disposal Site boundary to encompass the area of the historic Industrial Waste Site with the highest density of waste containers exposed on the seafloor. In 2018, Region 1 modified the boundaries of the Massachusetts Bay Disposal Site (FR Doc. 2018-11324) by expanding the site to accommodate the disposal of dredged material from the Boston Harbor Deep Draft Navigation Project (Figure 3).

From its designation in 1993, to 2021, more than 16 million yd^3 (12.2 million m^3) from the Boston Harbor and other navigational dredging projects in the area have been disposed at the Massachusetts Bay Disposal Site. From 2018 to 2020, 11.5 million yd^3 (8.8 million m^3) of dredged material from the Boston Harbor Deep Draft Navigation Improvement Project was disposed over the former Industrial Waste Site within the Massachusetts Bay Disposal Site. Any rocky material encountered during the Boston Harbor Deep Draft Navigation Improvement Project was disposed in a separate portion of the site, identified as the rock placement area in Figure 3.

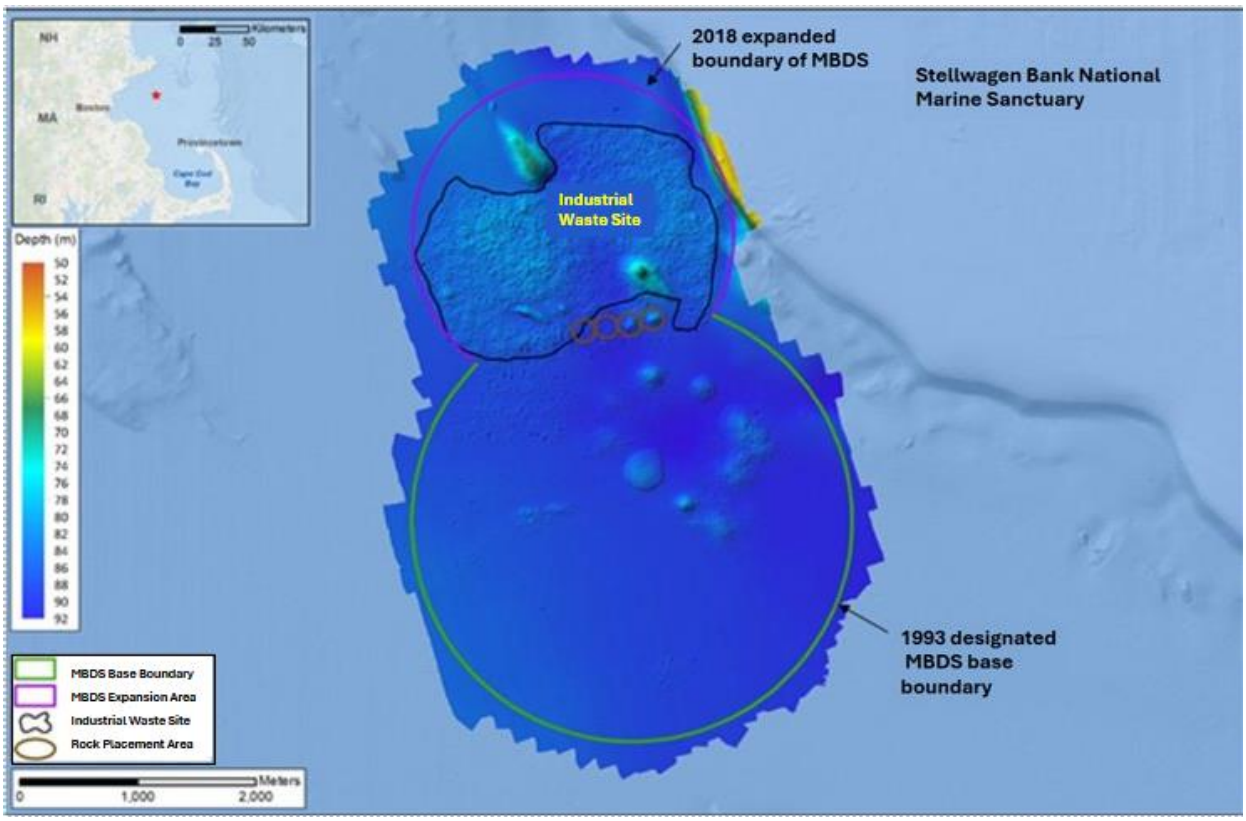

Figure 3**:** *Bathymetric depth data over an acoustic relief model of the Massachusetts Bay Disposal Site based on the June 2021 multibeam acoustic survey.*

3.1.2 Survey Objectives, Activities, and Findings

Region 1 designed their 2021 multibeam acoustic and sediment sampling survey to address three main objectives: 1) assess the aerial coverage and thickness of the Boston Harbor dredged material disposed of over the former Industrial Waste Site within the Massachusetts Bay Disposal Site; 2) characterize the sediment quality over the former Industrial Waste Site within the Massachusetts Bay Disposal Site to confirm that the disposal approach did not result in contaminated material being displaced to the sediment surface; and 3) collect samples from 1993 designated portion of the Massachusetts Bay Disposal Site (i.e., not from portion of the site that was expanded in 2018) to determine whether MPRSA permitted material disposed at the rock placement area as well as other areas of the site that received dredged material had been deposited within the site boundaries and localized impacts were consistent with predictions given the use of the site for dredged material disposal activities.

Region 1 conducted an acoustic survey of the entire Massachusetts Bay Disposal Site, including the former Industrial Waste Site, from June 29 to July 1, 2021, and collected sediment grab samples from the study area on July 20 and July 21, 2021, aboard the 55-ft research vessel (R/V) *Jamie Hanna*. During the acoustic survey, Region 1 utilized a Teledyne Reson T20R multibeam echosounder to collect bathymetric, side-scan, and backscatter data. Region 1 used the data collected during the acoustic survey to determine water depths and physical properties of the seafloor. Once processed, these data resulted in maps showing topography, texture, and roughness of the seafloor allowing Region 1 to distinguish the ambient seafloor from the areas that have received dredged material. Due to dredged material being deposited on the seafloor, Region 1 observed that the water depths across the former Industrial Waste Site decreased by an average of 6.1 ft (1.86 m).

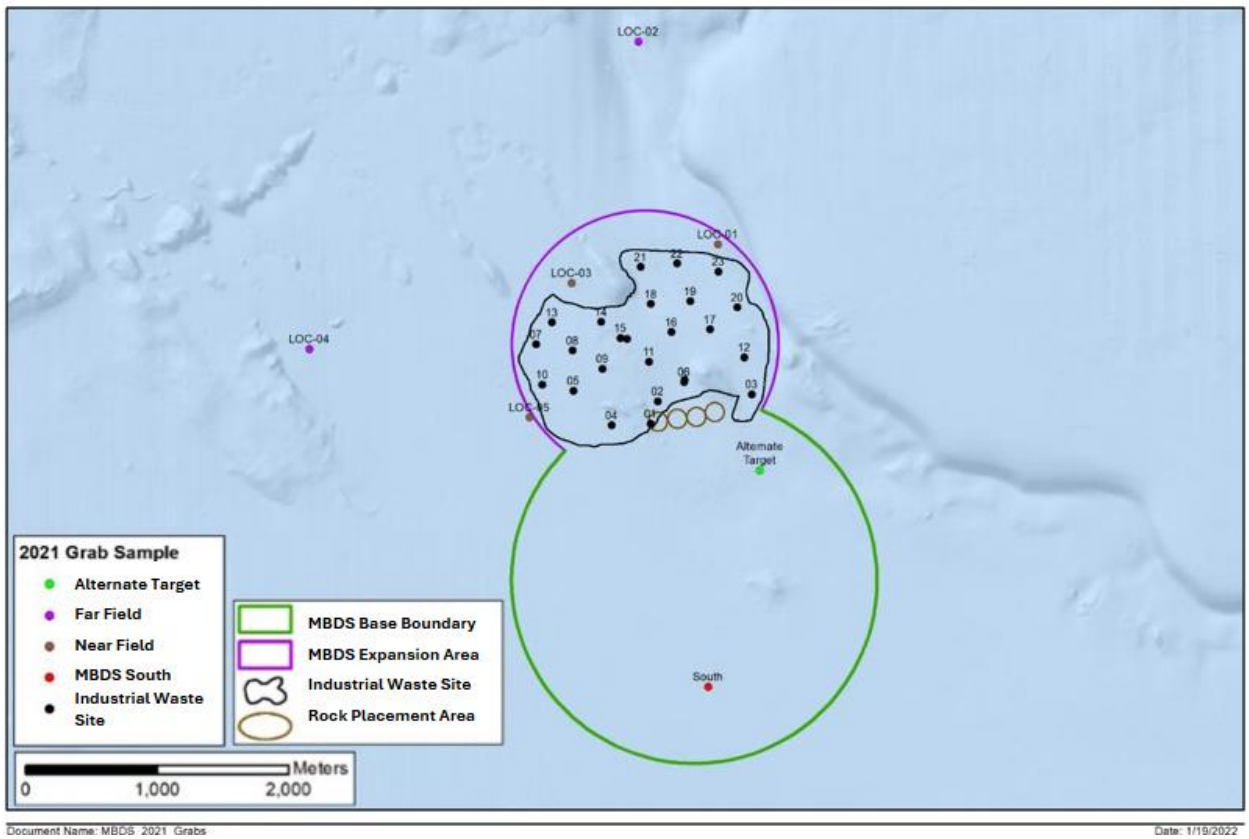

Figure 4**:** *Sediment grab sample station locations within the former Industrial Waste Site and the 1993 designated area of the Massachusetts Bay Disposal Site.*

Region 1 conducted a sediment survey where they collected sediment from the seafloor using a 0.1 m^2 Van Veen grab sampler, to be analyzed for grain size, total organic carbon (TOC), metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), polyaromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs) and radionuclides. The majority of the sediment sampling stations (26 stations) were located within the former Industrial Waste Site. Region 1 collected sediments from this area to characterize the sediment quality and confirm that dredged material disposal did not displace contaminated sediment to the surface of the seafloor. Additionally, Region 1 collected sediments from two stations (LOC-01 and LOC-03) within the 1993 designated area of the Massachusetts Bay Disposal Site (i.e., not from portion of the site that was expanded in 2018) and from two stations (LOC-02 and LOC-04) outside of the site boundaries (Figure 4).

Results from the sediment grain size analyses showed that sediment grain sizes varied across the study area. The stations within the former Industrial Waste Site had higher fractions of gravels and coarse sand while the sediments from the 1993 designated area of the site and the sediments collected from outside of the site boundaries were composed predominantly of silt and clay. The differences in grain size were expected as the grain sizes observed within the former Industrial Waste Site were analogous with the grain size disposed at that location. Total organic carbon was generally low across all stations, ranging from a minimum of 0.26% to a maximum of 2.08%. Generally, and as expected, TOC content increased with increasing proportions of fines (silt and clay fractions).

Region 1 found that cadmium, chromium, copper, lead, mercury, and zinc concentrations were below ER-L concentrations across all stations, however, arsenic and nickel concentrations exceeded ER-L levels at several stations including two stations in the former Industrial Waste Site, two stations within the 1993 designated area of the site, and one station outside of the site boundaries. All metal concentrations were below their respective ER-M across all stations. Results from sediments that were tested for concentrations of total PAHs were consistent across the study area and concentrations of total PAHs from each station were below the ER-M. At most of the stations, total PAHs were also below the ER-L, however, one station outside of the boundaries of the site and three stations within the former Industrial Waste Site had total PAH concentrations above the ER-L. Concentrations of total PCBs were generally consistent across the study area and concentrations of total PBCs from each station were below the ER-M. At most of the stations, total PCBs were also below the ER-L, however, one station outside of the boundaries of the site, one station within the 1993 designated area of the site, and eight stations within the former Industrial Waste Site had total PCB concentrations above the ER-L. All chemicals were below their respective ER-M across all stations suggesting that disposal activities are not causing lasting impacts to sediment quality across the study area.

Results from the radionuclides analyses showed that the majority of the 15 radionuclides analyzed were below the minimum detectable concentration and six (Ac-228, Ra-226, Ra-228, Ur-233/234, Ur-235/236, and Ur-238) were measured in concentrations above the minimum detectable concentration. Concentrations of the radionuclides detected during the 2021 survey were consistent with naturally occurring radioactive materials in soils in the northeast United States, measurements of these radionuclides in previous surveys, and concentrations detected in dredged material sampled in 2019 (AECOM and CR Environmental 2021).

3.1.3 Conclusions and Recommended Management Actions

The 2021 survey Region 1 conducted at the Massachusetts Bay Disposal Site provided high-quality data that allowed for assessment of the site. With the results from the survey, Region 1 confirmed that 1) dredged material disposed in the former Industrial Waste Site within the Massachusetts Bay Disposal Site was spread over the targeted area, 2) the disposal activities did not displace contaminated sediment to the surface of the seafloor, and 3) dredged material disposed at the 1993 designated area of the Massachusetts Bay Disposal Site (i.e., not from portion of the site that was expanded in 2018) has been deposited properly within the site boundaries and localized physical impacts were consistent with expectations given the use of the site for dredged material disposal activities.

Based on the data collected during the 2021 survey, Region 1 recommends that the expanded portion of the Massachusetts Bay Disposal Site be closed to any further dredged material disposal and future monitoring of this area of the site should focus on sampling the benthic community to document benthic recovery in the former Industrial Waste Site within the Massachusetts Bay Disposal Site. Because Region 1 did not observe any lasting impacts to the 1993 designated area of the Massachusetts Bay Disposal Site, they also recommend that suitable dredged material can continue to be permitted under the MPRSA for disposal in that portion of the site.

3.2 Region 2 – Historic Area Remediation Site

3.2.1 Background

The Historic Area Remediation Site (HARS) is located in the New York Bight Apex, approximately 3.5 nmi (6.5 km) east of Highlands, New Jersey, and 7.7 nmi (14.3 km) south of Rockaway, New York. Since the 1800s, the New York Bight Apex has been used for disposal of dredged material and a variety of other

wastes including municipal garbage, building materials, sewage sludge, and industrial waste. The HARS, which is 15.7 nmi^2 in area and an average of 89 ft (27 m) in depth, encompasses several of these historical disposal sites, including the former New York Bight dredged material disposal site known as the Mud Dump Site.

The Mud Dump Site was closed in 1996 after surveys revealed dioxin and PCB accumulation in benthic invertebrates within and around the site. The EPA designated the HARS in 1997 for placement of dredged material. The management priority for the HARS is to reduce the impacts from previous disposals to return environmental conditions to acceptable levels, as defined in the HARS-specific guidance, by covering the surface of the site with uncontaminated dredged sediments. As such, the EPA designated the HARS as an ocean remediation site, restricting dumping in the area solely to remediation material (a significant portion of the material placed at the HARS is rocky and glacial till material from various deepening and widening projects in the New York and New Jersey Harbor). The placement of such remediation material renders toxic sediments unavailable to marine organisms and prevents further exposure to contaminated sediments. The area targeted for remediation within the HARS is comprised of nine individual priority remediation areas (PRAs) measuring approximately 1 nmi^2 in size (Figure 5). The HARS is jointly managed by EPA and USACE, and multiple stakeholders and government agencies collaborate on this effort including state and federal agencies, port authorities, non-governmental organizations, and academics.

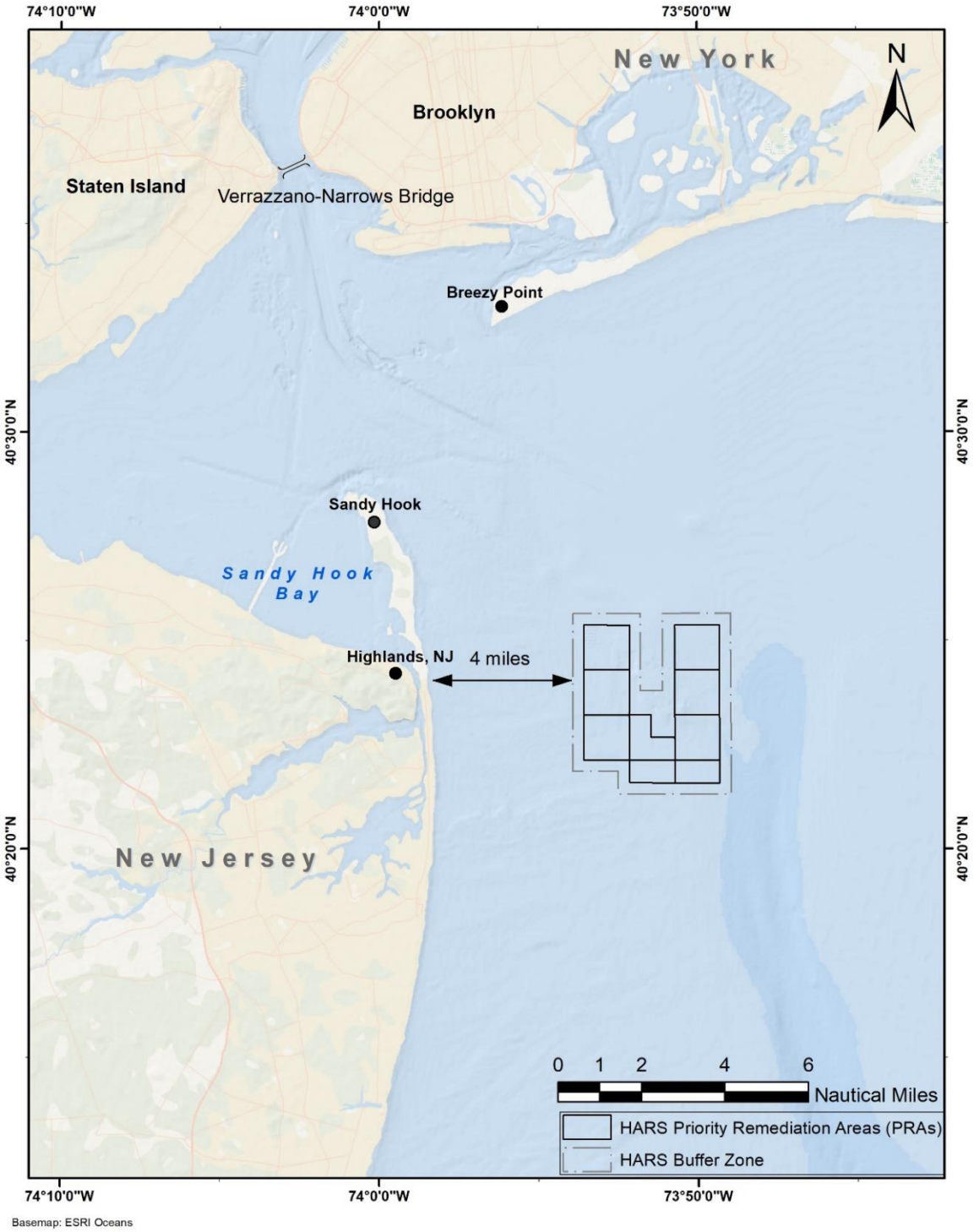

Figure 5. *Location of the Historic Area Remediation Site (HARS)*

The HARS is divided into nine Priority Remediation Areas (PRAs) where remediation material is placed, a surrounding HARS Buffer Zone where dredged material placement is avoided, a No Discharge Zone where depths are insufficient for dredged material disposal, and Historic Shipwreck Buffer Zones (SBZs) (Figure 6). SBZs were designated within the HARS as areas where dredged material placement is

prohibited due to the potential presence of shipwrecks and associated debris. Region 2 conducted a survey of the HARS in 2020 to investigate previously identified side-scan sonar targets using a remotely operated vehicle (ROV). During the 2020 survey, Region 2 did not confirm the presence of any shipwrecks in SBZ 1 (in PRA 3) or SBZ 4 (in PRA 9); however, the presence of shipwreck-associated debris was confirmed in SBZs 2 and 3 (in PRA 1).

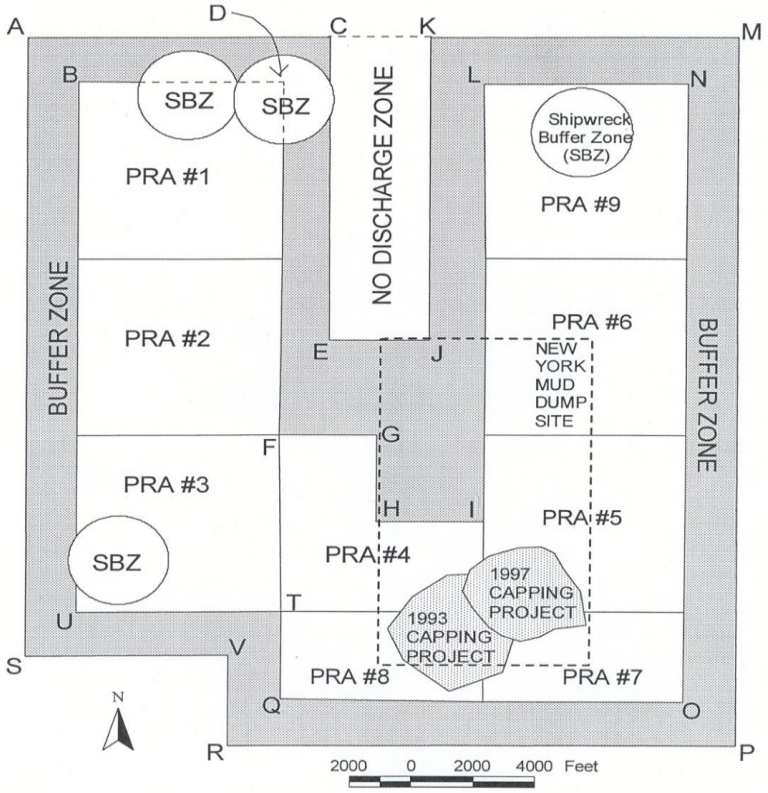

Figure 6**:** *The Historic Area Remediation Site (HARS). Locations of nine Priority Remediation Areas (PRAs), HARS Buffer Zone, No Discharge Zone, Historic Shipwreck Buffer Zones (SBZs), and Category II dredged material capping project areas are indicated.*

An SMMP for the HARS, revised in July 2020, was developed in accordance with MPRSA Section 102 (c)(3)(B) to verify that placement of remediation material improves sediment conditions (relative to the HARS baseline) and causes no significant adverse environmental impacts. The SMMP requires regular evaluation of environmental conditions within the HARS, including the measurement of PCB and dioxin concentrations in the tissues of resident worm populations. As outlined in the SMMP, the HARS will be remediated only with dredged material that meets EPA's marine protection criteria, will not cause significant undesirable effects through unacceptable toxicity or bioaccumulation, and will not cause bioaccumulation of contaminants in test organisms exposed to the material to levels exceeding dioxin concentrations of 1 part per trillion (pptr) and the HARS-specific worm tissue PCB criterion of 113 parts per billion (ppb). Monitoring surveys have been conducted to assess post-remediation conditions in HARS areas where 3.26 ft (1 m) of remediation material has been placed. Prior to Region 2's 2021 survey, the most recent survey that included post-remediation monitoring was in 2018. The 2018 HARS survey included sampling at stations in PRAs 3, 4, and 8 where worm tissue concentrations measuring over 75% of the HARS-specific PCB and dioxin decision points (greater than 84.75 ppb and 0.75 pptr respectively) were recorded at several stations in PRAs 3 and 8.

3.2.2 Survey Objectives, Activities, and Findings

Region 2 conducted a survey of the HARS from October 19 to 25, 2021, to:

- Obtain updated background sediment and worm tissue data from areas outside the HARS;
- Delineate areas of higher worm tissue concentrations of dioxins and PCBs in PRAs 3, 4, and 8, previously identified during a survey conducted in 2018;
- Perform post-remediation monitoring in PRAs 5 and 7, where at least 3.26 ft (1 m) of material has been placed, to determine whether concentrations of PCBs and dioxins were below HARS-specific values in resident worms; and
- Characterize contaminant concentrations in sediment and worms in SBZs 1 and 4, where no shipwrecks have been confirmed to be present.

Region 2 will utilize these data, along with data collected from previous surveys, to inform whether it is necessary to add additional remediation material to areas within the PRAs to improve sediment conditions (relative to the HARS baseline).

Region 2 used a 0.1 m^2 Young-modified van Veen grab to collect sediment and worm samples from PRAs 3, 4, and 8. The Region analyzed sediment samples for grain size, TOC, dioxins, PCBs, PAHs and chlorinated pesticides. After collecting the worm samples, Region 2 froze and subsequently analyzed them for lipid content, dioxins, PCBs, PAHs and chlorinated pesticides.

In total, Region 2 collected 81 sediment samples from 27 stations and worm samples from 15 of those stations (Figure 7). Due to time constraints and low worm density, the Region was unable to collect samples at eight stations in PRAs 4 and 8 (PRA4-18, PRA4-19, PRA4-21, PRA4-23, PRA4-25, PRA8-17, PRA8-20, and PRA8-22). However, the Region did collect sediment and worm samples at all other planned stations in PRAs 3, 4, and 8, and collected sediment samples at four additional stations in PRA 3 (PRA3-11S, PRA3-12S, PRA3-13S, PRA3-14S).

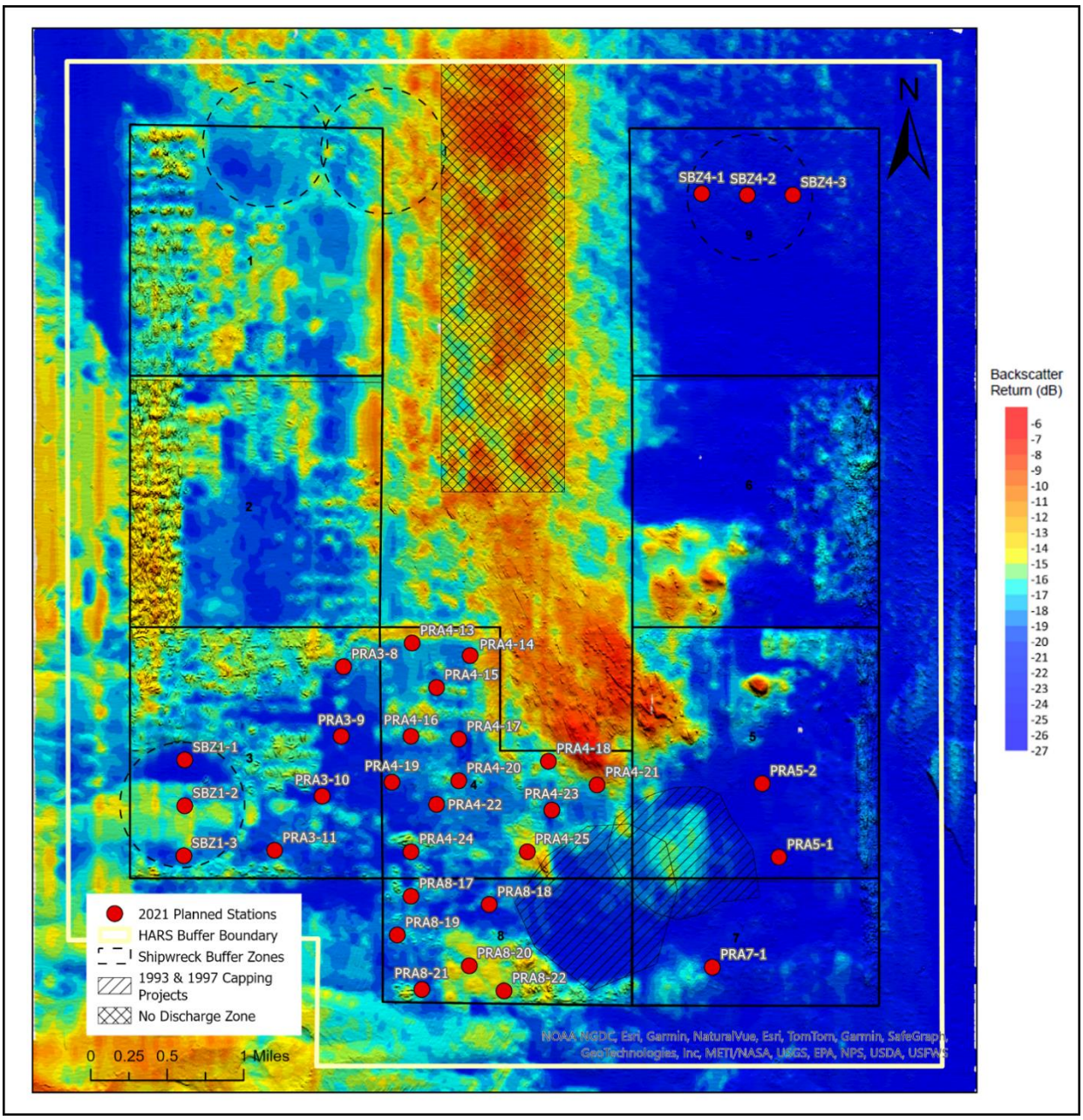

Figure 7: *HARS 2021 Planned Sampling Locations shown on a filtered backscatter image collected from monitoring conducted in 2020. Two background stations in each direction (N, S, E, & W) outside of the HARS are not pictured but were also part of the 2021 survey plan.*

Table 2 summarizes the results of the physical and chemical analyses performed on sediments collected at the site as well as the results from the chemical analyses performed on worm tissues. Region 2 observed that grain size, TOC, and concentrations of contaminants, in sediments and worm tissues, varied across all stations and within PRAs. Generally, stations with higher average percentages of fine sediments had higher variability and average TOC and concentrations of contaminants. The four stations sampled furthest north, PRA3-8, PRA4-13, PRA4-14, and PRA4-15, had low sediment concentrations of contaminants and were mostly 99-100% sand. PRA4-15 had two sediment samples with 99-100% sand and a third sediment sample that contained some fines and gravel which brought the station average

sand content down to 89%. At these sandy stations, tissue concentrations were below 75% of the HARS decision points for total PCBs and dioxin, 84.75 ppb and 0.75 pptr, respectively.

Conversely, tissue concentrations of dioxin measured 0.66, 0.51, and 0.62 pptr from worm tissues collected from stations PRA4-13, PRA4-17, and PRA8-19, respectively, despite the sediment samples having low dioxin concentrations, low TOC, and high percentages of sand (99-100% sand). These tissue dioxin concentrations are not at or approaching the HARS decision point for dioxin (1 pptr), but the concentrations are not as low as the other tissue concentrations measured from samples collected from stations with >99% sand (i.e., <0.4 pptr).

Region 2 measured the highest tissue concentrations of dioxins, total PCBs, total DDXs, and total PAHs in PRA 8 and the southern two-thirds of PRAs 3 and 4. Though the worm sample from PRA3-10 showed the highest dioxin concentration (0.90 pptr), this station did not have the highest average dioxin sediment concentration. The worm sample from PRA8-18 had the highest measured tissue concentrations of total PCBs (134 ppb) and total DDXs (15.9 ppb). Sediment samples from PRA8-18 showed the highest average total PCB concentration (83.4 ppb) and the second-highest average total DDX concentration (8.79 ppb). PRA8-18 also had the highest average TOC (1.55%) and the highest average gravel content (34%). PRA4-24 had the highest total PAH tissue concentration (442 ppb), and samples from this station showed the highest average sediment total PAH concentration (3,129 ppb).

Table 2: *HARS chemical analysis results.*

Matrix	**Analysis**	**Range of Station Averages**	**Notes**
Sediment	% Sand	38.2% to 100%	High average fines stations had TOC > 0.4, high of 1.55
	TOC	0.14% to 1.55%	Lowest at PRA3-10 Highest at PRA8-18
	PAHs	6.3 to 3,130 ppb	Lowest at PRA4-21, Highest at PRA4-24
	DDXs	0.25 to 10.8 ppb	Highest at PRA8-21
	Aldrin	0.03 to 1.2 ppb	Highest at PRA3-11S
	Dieldrin	0.03 to 0.18 ppb	Highest at PRA4-25 and -24
	α-chlordane	0.03 to 2.46 ppb	Highest at PRA3-11S
	Trans-nonachlor	0.03 to 0.1 6ppb	Highest at PRA8-21
	Heptachlor (+ epoxide)	0.08 to 0.22 ppb	Highest at PRA3-13S
	Endosulfans	0.09 to 1.41 ppb	Highest at PRA4-25
	PCBs	1.5 to 83.4 ppb	Highest at PRA8-18
	Dioxin	0.061 pptr to 1.47 pptr	Lowest at PRA3-11, Highest at PRA3-13S
Worm Tissue	PAHs	75 to 442 ppb	Highest at PRA4-24
	Total DDXs	3.0 to 15.8 ppb	Highest at PRA8-18
	Aldrin	0.013 to 0.107 ppb	Highest at PRA3-11
	Dieldrin	0.009 to 0.347 ppb	
	α-chlordane	0.01 to 0.425 ppb	Highest at PRA8-21
	Trans-nonachlor	0.013 to 0.54 ppb	Highest at PRA3-10

Matrix	Analysis	Range of Station Averages	Notes
	Heptachlor (+ epoxide)	ND to 2.26 ppb	Highest at PRA4-22, >10x next highest
	Endosulfans	0.16 to 2.27 ppb	Highest at PRA8-21
	PCBs	20 to 134 ppb	Highest at PRA8-18, with 4 other stations >85 ppb (75% of the 113 ppb HARS-specific criterion)
	Dioxin	0.18 to 0.90 pptr	Highest at PRA3-10, no others > 0.75 pptr

3.2.3 Conclusions and Recommended Management Actions

Region 2 did not meet all objectives due to the survey being cut short by a nor'easter. The Region did not complete the planned sampling in PRAs 5 and 7, SBZs 1 and 4, or background stations outside of the HARS. Additionally, the Region did not complete worm sample collection at several sandy/rocky stations due to low abundance of worms in the substrate.

Region 2 plans to conduct additional sampling during future surveys in areas identified as having high tissue concentrations of PCBs and dioxins. Region 2 will consider tissue data collected from this survey, as well as previous surveys, to inform future determinations to cover areas with additional remediation material. Additionally, Region 2 plans to include the objectives they were not able to accomplish on this survey as part of a future survey.

3.3 Region 3 – Dam Neck Ocean Dredged Material Disposal Site

3.3.1 Background

In 1988, the EPA designated the Dam Neck Ocean Dredged Material Disposal Site (ODMDS) to receive dredged material from three federally maintained navigation channels: Thimble Shoals, Cape Henry, and the Atlantic Ocean. The Dam Neck ODMDS is located approximately 3.5 nmi (6.5 km) off the coast of Virginia Beach and spans a total of 8.15 nmi^2 (15.1 km^2) with an average depth of 51 feet (15.5 m). To manage dredged material disposal, Region 3 divided the site into seven cells (Cells 1-7) based on grain size (Figure 8). The Region utilizes Cells 1, 3, and 4 for sand and coarse grain material and Cells 2, 5, 6, and 7 for silt, clay, and fine-grained materials. Each cell measures approximately 0.87 nmi^2 (1.6 km^2).

At designation, the EPA and USACE forecasted that a total of 50 million yd^3 (45.7 million m^3) of dredged material would be dumped at the site at an average rate of approximately 600,000 yd^3 (458,733 m^3) per year. However, the USACE has dumped an average of 900,000 yd^3 (688,100 m^3) of dredged material per year at the site, resulting in an amount approximately 50% greater than what they initially projected when the site was designated in 1988. Over the last 10 years, the EPA's monitoring efforts at the site focused on sediment chemistry, benthic infaunal community structure (EPA, 2013), and bathymetry (EPA, 2018).

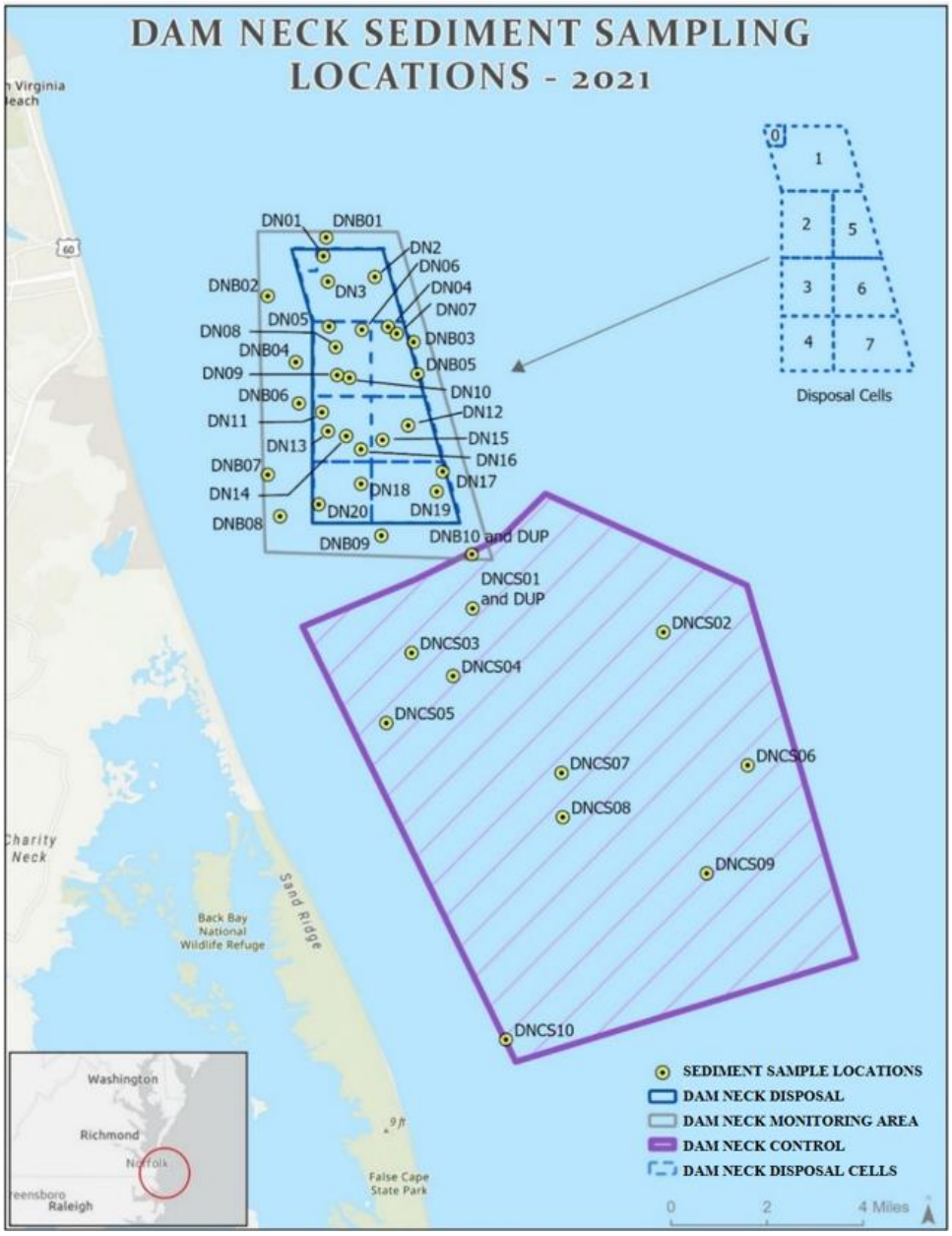

Figure 8: *Map of the study area for the 2021 Dam Neck ODMDS survey. Region 3 collected samples from locations (yellow dots) within the Dam Neck ODMDS (polygon outlined in blue), the area directly surrounding the Dam Neck ODMDS (polygon outlined in gray, identified in the image as Dam Neck monitoring area), and from the Dam neck control location (polygon outlined in purple).*

3.3.2 Survey Objectives, Activities, and Findings

Region 3 had two main objectives to for their 2021 survey, to collect: 1) sediment samples from locations within the Dam Neck ODMDS, within the monitoring area outside of the site boundaries, and from the control site southeast of the ODMDS site to analyze for contaminants of concern and to evaluate potential dredged material disposal impacts on the marine environment, and 2) bivalve and polychaete tissue and sediments from identified areas within the Mid-Atlantic Bight to establish a better understanding of the background levels of contaminants present in tissues of the macroinvertebrates representative in the marine benthic environment in the area.

Region 3 used a double-Young Modified Van Veen dredge to collect a total of 40 sediment samples from the Dam Neck ODMDS, monitoring area outside of the site boundaries, and control site. Once on board, Region 3 scientists homogenized the samples and processed them to be sent to a laboratory for further analyses. Sediment samples were analyzed for grain size distribution and concentration of metals, PCBs, PAHs, pesticides, and dioxins. Additionally, Region 3 sampled eight areas within the Mid-Atlantic Bight, collecting sediment and tissue from both bivalves and polychaetes.

Region 3 analyzed sediment grain size for each sampled area, finding that most of the substrate within and around the ODMDS consisted of fine sand. The subdominant substrate within Dam Neck ODMDS included silt, with some sites containing a low percentage of clay (up to 16% at DN07). The substrate within the monitoring area outside of the site boundaries was dominated by fine sand and silt. These grain size distribution patterns (i.e., higher percentages of fine sediments within the disposal site) observed at the site are characteristic of disposal activity.

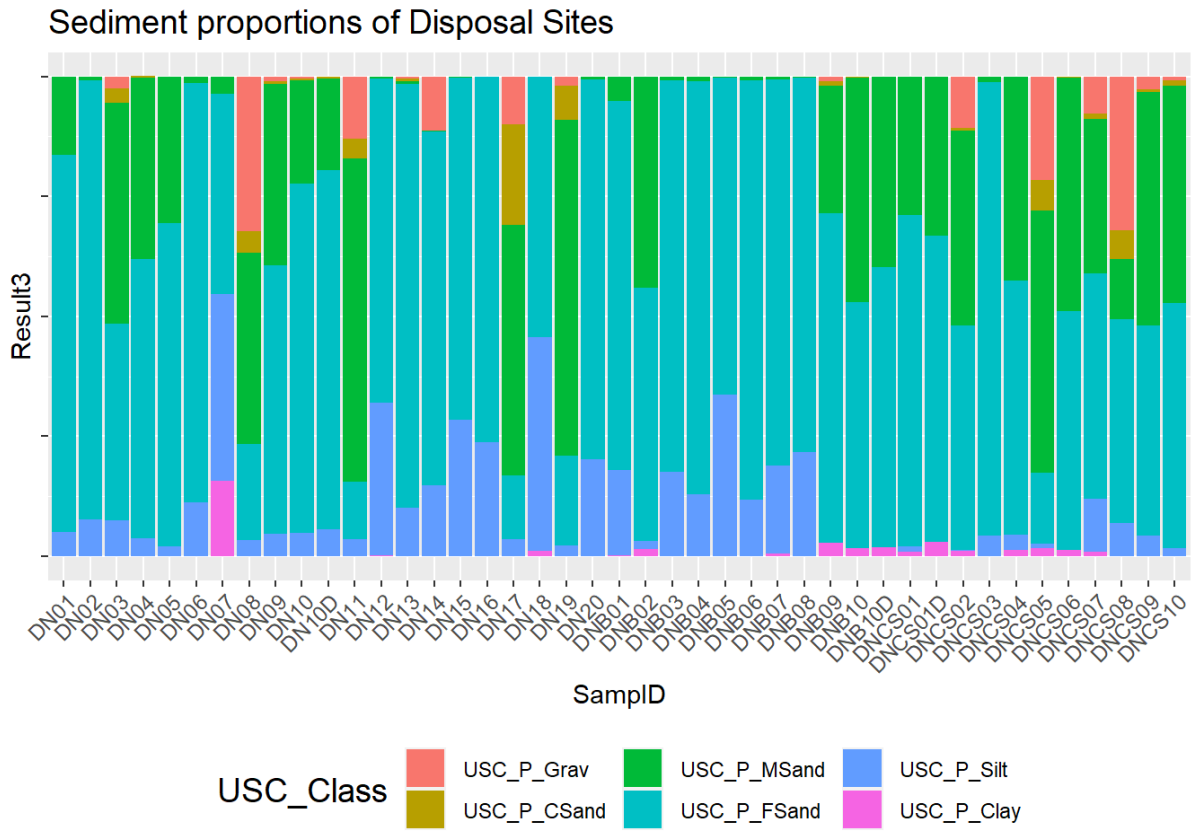

Figure 9: *2021 Dam Neck ODMDS grain size data.*

Region 3 compared metal concentrations to their respective TELs for those metals with established TEL values (Buchman, 2008). They found that all metals were below TEL values, except for sampling station DN04, where the arsenic level slightly exceeded the TEL value of 7.24 mg/kg but remained below the ER-L value of 8.2 mg/kg and the apparent effects threshold (AET) of 35.0 mg/kg.

Region 3 found that PCBs were undetected within the Dam Neck ODMDS but detected two instances in the monitoring area outside of the site boundaries, both below TEL levels. PAHs were detected at most

stations within the monitoring area outside of the site boundaries, control sampling site, and ODMDS. Two co-located sampling stations (DN04 and DN07) within Dam Neck ODMDS had the highest concentrations of total PAHs sampled (80.75 µg/kg and 82.93 µg/kg), well below established thresholds (TEL for total PAH is 1684 µg/kg). Region 3 measured pesticide concentrations in Dam Neck ODMDS and compared them to TELs. They found 4,4'-DDE at five stations (DN02, DN07, DN08, DN10, and DN17) with levels above the TEL of 2.07 µg/kg but below the ER-M value of 27 µg/kg, ranging from 2.9 to 9.5 µg/kg.

Region 3 compared dioxin concentrations to its Biological Technical Assistance Group screening values and TELs. Elevated dioxin levels were found at multiple disposal cell locations within Dam Neck ODMDS, with several stations exceeding the screening value of 0.75 pg/g and the toxicity equivalent quotient of 0.85 pg/g. Station DN07 recorded the highest detected dioxin value of 5.45 pg/g; other notable values included DN18 at 2.09 pg/g, and DN15 at 1.00 pg/g.

The tissue and sediment collected from the Mid-Atlantic Bight was analyzed to understand the grain size distribution of the native sediments and background concentration levels of metals, PCBs, PAHs, pesticides, and dioxins/furans present in the marine benthic environment in the area.

3.3.3 Conclusions and Recommended Management Actions

The data and information collected during this survey provided critical insights to Region 3 to evaluate the impacts of dredged material disposal activities on the marine environment. Region 3 identified two areas of concern: (1) station DN07 consistently had higher concentrations of metals, pesticides, and dioxins compared to all other sites sampled in 2021; and (2) three stations (DN07, DN15, and DN18) had elevated dioxin when compared to screening levels for dioxin concentrations in marine sediments. Region 3 noted that DN07 contained the highest percentage of clay among the stations sampled within the Dam Neck ODMDS and stations DN15 and DN18 also contained a higher percentage of finer-grained materials. Generally, stations with higher average percentages of fine sediments have higher variability and average concentrations of contaminants and could explain the higher concentrations of contaminants at the station.

For future surveys of the Dam Neck ODMDS, Region 3 recommends incorporating increased biological and sediment sampling to obtain additional data on the contaminate levels at the site and to understand the bioaccumulation potential of contaminants at the site. The Region also recommends evaluating the benthic community for diversity and richness in comparison to the control site. These data will inform Region 3 on whether adjustments to site management and updates to the site's SMMP are necessary to further minimize impacts to the marine environment.

Additionally, Region 3 plans to use the tissue and sediment data collected from the Mid-Atlantic Bight in the next update of the Mid-Atlantic Regional Implementation Manual and to inform sediment evaluations associated with MPRSA Section 103 permitting.

3.4 Region 4 – Charleston ODMDS

3.4.1 Background

The EPA designated the Charleston ODMDS, located approximately 6.1 nmi (11.3 km) off the coast of South Carolina, to receive material from both maintenance and deepening dredging operations associated with Charleston Harbor. Areas in the vicinity of the Charleston ODMDS have been used historically for dredged material disposal since 1896. Since the original ODMDS designation in 1987,

several modifications have occurred with respect to site location and size of the areas where permitted activities could be conducted.

The current Charleston ODMDS, modified in 2016, has a total area of 11.8 nmi^2 (40.8 km^2) with depths ranging from 29 ft to 44 ft (8.8 m to 13.4 m). The site includes four central disposal zones (D1 – D4), eight inner boundary zones (I1 – I8), and eight outer boundary zones. This site configuration was established when the site was expanded to accommodate dredged material from the Charleston Harbor Post 45 deepening project and reflects input from an interagency Task Force (including EPA, USACE, NOAA and USFWS as well as the South Carolina Department of Natural Resources and State Ports Authority) that established after the discovery of sensitive hard bottom reef habitat within the western portion of the ODMDS (South Carolina, 2001). The Post 45 project, which began in 2018, focused on improving navigation in Charleston, South Carolina, by deepening the entrance channel, extending the channel seaward, and deepening the inner harbor areas to accommodate larger vessels at the Port of Charleston.

The Charleston ODMDS is managed by utilizing different zones of the site for different types of dredged material. Finer materials are dumped in the four central disposal zones (D1-D4) and coarser materials are dumped in the eight inner boundary zones. The eight outer boundary zones serve as background areas for impact assessment. Figure 10 illustrates the zones of the ODMDS, the stations sampled during the 2021 survey, and depth across the study area.

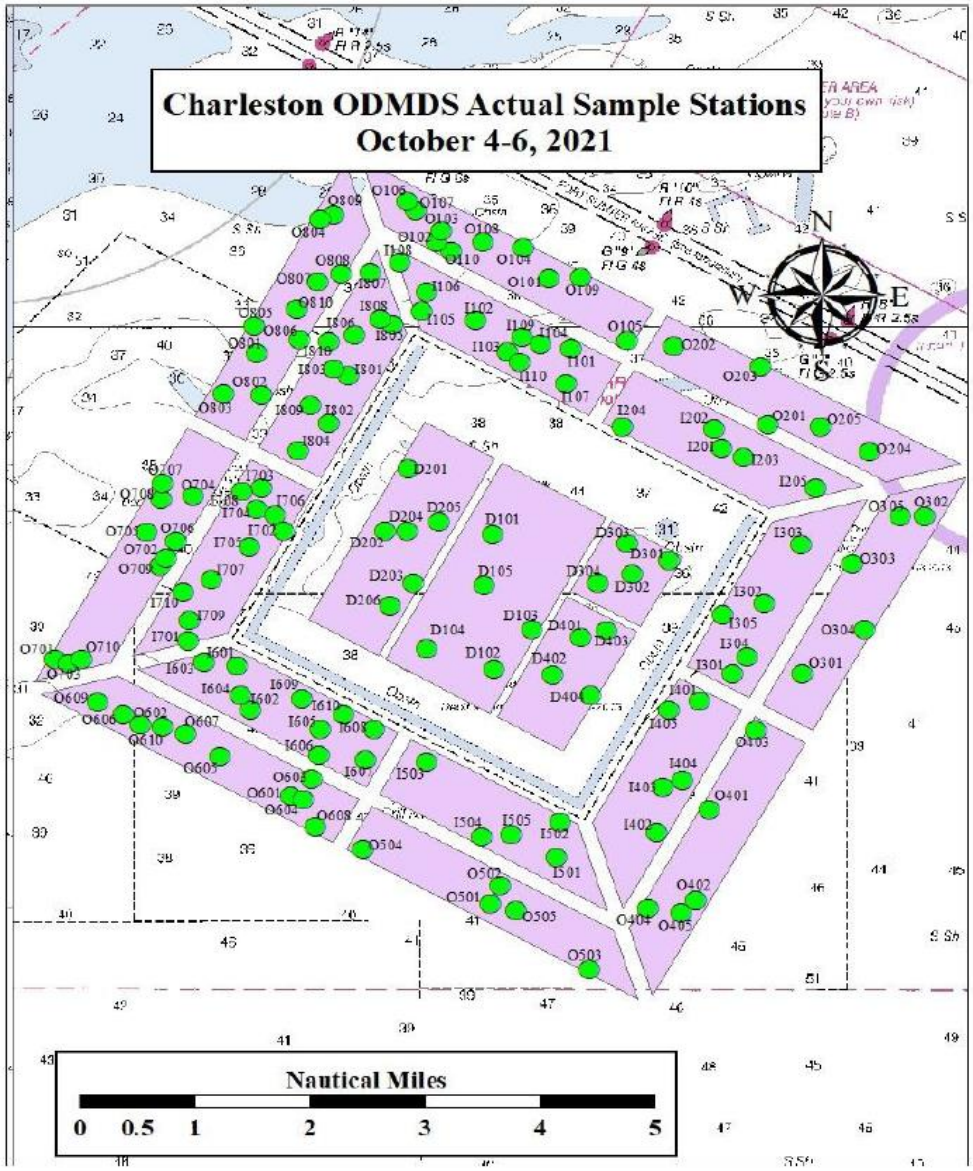

Figure 10: Charleston ODMDS, disposal zones, and stations sampled during the 2021 survey.

3.4.2 Survey Objectives, Activities, and Findings

Region 4's objective for this oceanographic survey was to conduct chemical analyses of the sediments within Charleston ODMDS after dredged materials from the Post 45 Project were disposed at the site in order to evaluate potential impacts from disposal activities. Region 4 conducted this survey from October 7 to 12, 2021, aboard the University of Georgia's research vessel, R/V *Savannah*. Using a double-0.04 m^2 Young Grab, the Region collected sediment samples from 139 stations across each of the 20 zones of the Charleston ODMDS. Except for samples collected from one station, CH-I1-07, samples collected from each station were homogenized and following the survey these samples were analyzed for metals, PCBs, pesticides, SVOCs, TOC, and total solids. Sediment characteristics at station CH-I1-07 differed significantly from those at the other nine stations within zone CH-I1; station CH-I1-07 showed very fine cohesive muddy material with no sand compared to the other CH-I1 stations, which contained mostly sand. As a result, Region 4 sampled and analyzed station CH-I1-07 separately from the remaining stations within zone CH-I1.

Results from Region 4's sediment chemistry analyses showed that, except for arsenic, chromium, lead, and nickel, all other metals remained at or below the method reporting limit (MRL) and the TEL. Mean arsenic concentrations ranged from 3.3 mg/kg in the Inner Zone to 6.2 mg/kg in the disposal zone. The other mean concentrations for metals in the Inner Zone and disposal zone ranged from 6.4 mg/kg to 16 mg/kg for chromium, 0.9 mg/kg to 1.6 mg/kg for lead, and 0.9 mg/kg to 4.9 mg/kg for nickel. Notably, the results from the outlier station CH-I1-07 exceeded the disposal zone average for each of these metals, with arsenic levels reaching 11 mg/kg, surpassing the 7.2 mg/kg TEL but still below the ER-M (70 mg/kg). For SVOCs, sediment concentrations at all stations were at or below the MRL. In several cases, such as with acenaphthene, acenaphthylene, and dibenz(a,h)anthracene, the MRL exceeded the TEL, but no analyte was detected above the lower method detection limit (MDL). The pesticide analysis found all results at or below the MRL, with several instances where the TEL fell between the MDL and an elevated MRL, but no detections exceeded the MDL. The PCBs analysis also found all results at or below the MRL.

3.4.3 Conclusions and Recommended Management Actions

The data and information collected from this survey generally show that dredged material disposal activities have resulted in little change to the physical and chemical characteristics of the Charleston ODMDS. Chemical analyses suggested that none of the analytes tested for were present in significant amounts, and disposal activities at the Charleston ODMDS did not cause elevated levels of contaminants of concern (COCs) within the study area.

An issue that Region 4 identified during this survey involved the material found at station CH-I1-07. The material had a higher concentration of fine-grained sediments, unlike the sandy sediments observed throughout the rest of the study area. The presence of this material at CH-I1-07 could have resulted from an incorrect disposal and Region 4 is collaborating with the USACE Charleston District to investigate this issue further.

Additionally, Region 4 intends to continue to routinely monitor the Charleston ODMDS to document any changes to the area, ensure that short-term anticipated impacts stay within the boundaries of the ODMDS and that disposal activities are not causing lasting adverse impacts, and inform updates to the site's SMMP.

3.5 Region 4 – Port Everglades ODMDS

3.5.1 Background

The EPA designated the Port Everglades ODMDS in 2005 approximately 4.3 nmi (8 km) off the eastern coast of Florida. This site originally covered an area of 1 nmi^2 (3.4 km^2) and was designated to accommodate approximately 30,000 yd^3 (22,937 m^3) of dredged material annually from periodic maintenance dredging of Port Everglades Harbor. In March 2020, anticipating future needs for increased capacity for dredged material disposal at the site, the EPA proposed to expand the site. EPA expanded the ODMD to a total area of 3.21 nmi^2 (5.94 km^2) (Figure 11); the final rule to expand the site was published on July 22, 2021. Region 4's 2021 survey of the Port Everglades ODMDS and surrounding area took place in two phases: a video survey using an ROV and a sampling survey for sediment chemistry and marine macroinvertebrates.

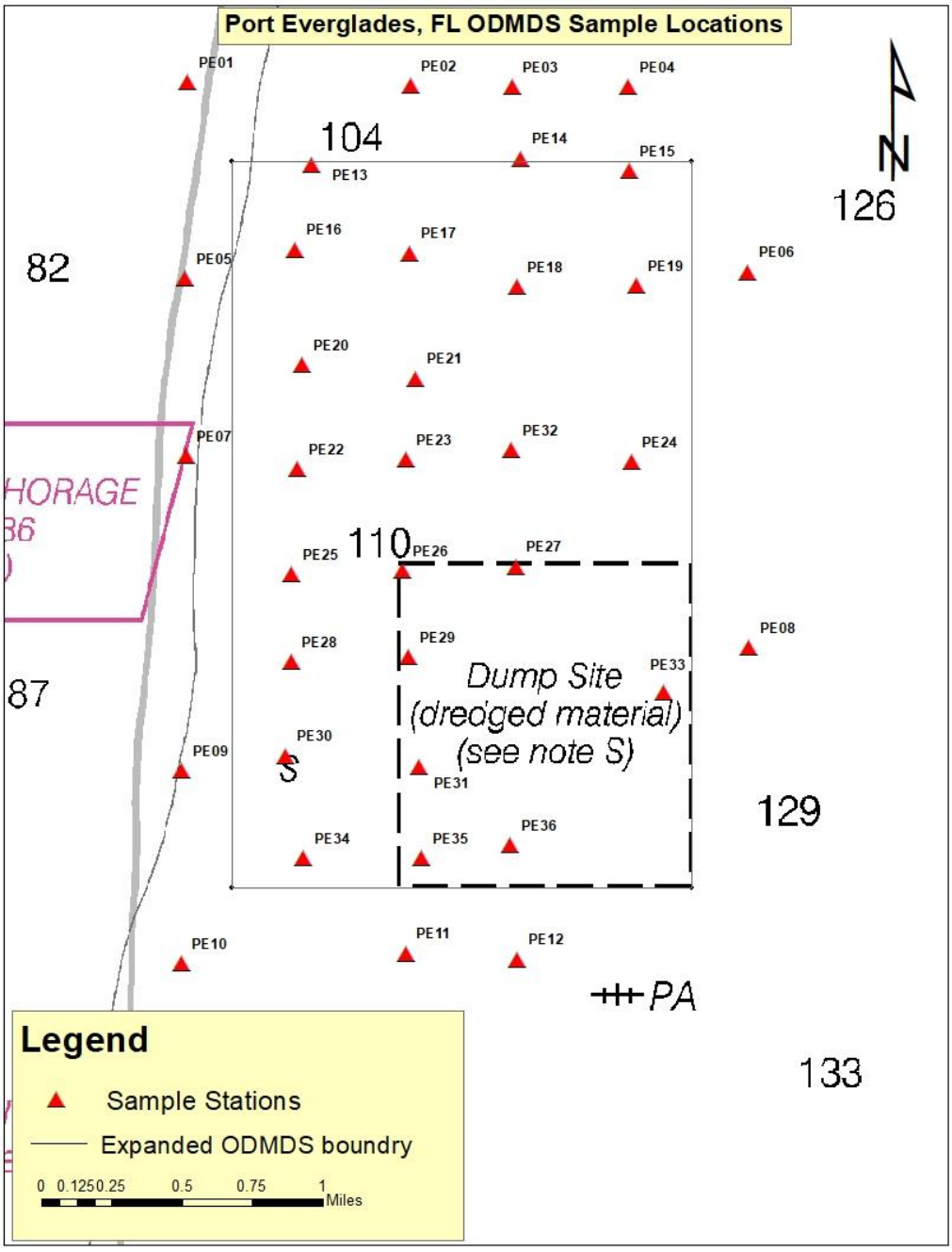

Figure 11: Original and expanded boundaries of the Port Everglades ODMDS and stations sampled during the 2021 survey.

3.5.2 Survey Objectives, Activities, and Findings

Region 4's surveys at the Port Everglades ODMDS focused on three main objectives. The first was to use an ROV to delineate deep-water hardbottom habitats, capture imagery of seafloor substrates, and identify any federally managed fish species, such as tilefishes and deep-water groupers, that might be present within the designated priority areas of the ODMDS. The second objective was to collect sediment samples to analyze the physical characteristics and chemical composition of the sediment, including grain size, metals, SVOCs, pesticides, PCBs and butyltins, to obtain a baseline understanding of the sediment quality within the expanded ODMDS. The final objective was to collect benthic

macroinvertebrates to evaluate the composition and distribution of marine macroinvertebrate communities within the ODMDS, comparing the diversity and abundance of taxa inside and outside the disposal site. Region 4 will use these data to evaluate potential impacts from disposal activities and inform future management of the site.

3.5.2.1 ROV Survey

Region 4's ROV video survey took place from April 21 to 23, 2021, aboard the M/V *Go America*. Following the National Marine Fisheries Service's benthic survey method, Region 4 conducted five ROV dives in water depths ranging from 574 ft to 689 ft (175 m to 210 m). These dives resulted in 15 video transects of varying lengths, over 1,000 video frame grabs, and 247 still images.

Results from the ROV survey revealed that the seafloor within the surveyed areas predominantly consisted of a featureless sand bottom with prevalent bioturbation, such as mounds, burrows, and worm tubes. Additionally, Region 4 identified considerable debris scattered throughout the area, including discarded bottles, cans, concrete culverts, and tree trunks. Region 4 scientists did not identify any hardbottom habitats within the areas surveyed.

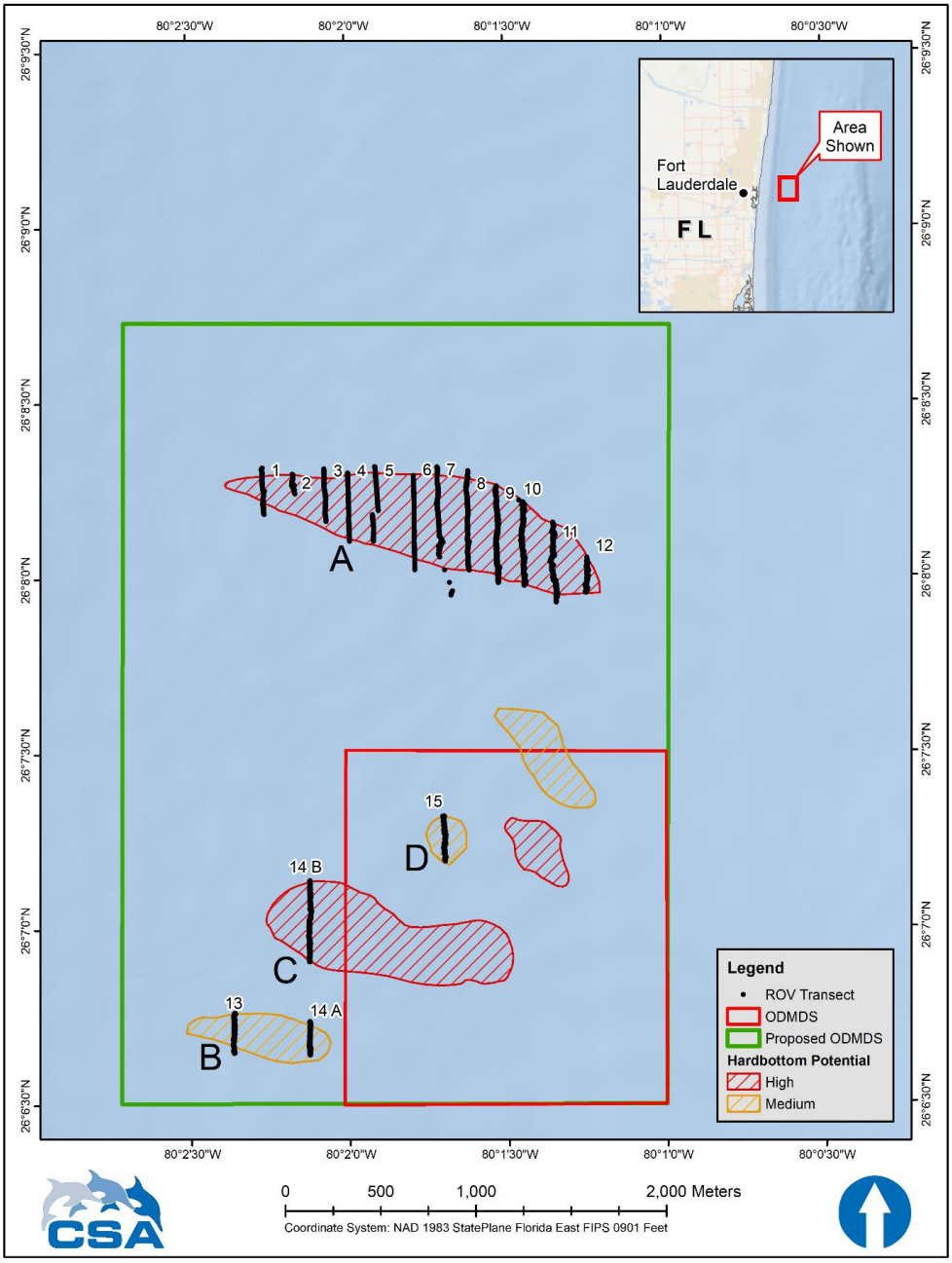

Figure 12: Survey transects in four survey area polygons (A, B, C, D) within the Port Everglades ODMDS.

3.5.2.2 Sediment Sampling

Region 4 conducted the sediment sampling survey on the R/V *Walton Smith* from May 2 to 6, 2021. They utilized a double 0.04 m^2 Young Grab to collect sediment samples at various stations within the expanded ODMDS to analyze for a range of physical and chemical parameters, including grains size, metals, SVOCs, pesticides, PCBs, and butyltins. Results from the sediment grain size analysis revealed consistency across stations, both inside and outside the ODMDS, with most samples containing a mixture of fines (silt and clay), fine sand, and medium sand. Results from Region 4's chemistry analyses showed that concentrations of all metals were either below detectable levels or below the TEL value. While SVOCs were not detected outside the ODMDS boundary, Region 4 detected SVOCs, including acenaphthene, acenaphthylene, and dibenz(a,h)anthracene, at four of the 24 stations inside the

ODMDS. However, the concentrations at all stations were below the TEL. Region 4 did not detect measurable concentrations of pesticides from most stations, although the MRL exceeded the probable effects level (PEL) for gamma-BHC (Lindane) and TEL for 4,4'-DDD and 4,4'-DDT (p,p'-DDT), indicating that these analytes could be present in concentrations above the TEL. Results from Region 4's butyltin analyses showed concentrations of butyltins were detected at several stations. Generally, stations where butyltins were detected were within the original ODMDS boundary or just outside of the original site boundaries but within the newly expanded portion of the site.

Several sediment samples exceeded their holding times for butyltin analyses because the samples were delayed during shipping to the laboratory for analysis. Because holding times were exceeded on samples collected from stations PE04, PE16, PE17, PE19 and PE30, butyltin concentrations were considered estimates.

3.5.2.3 Macroinvertebrates

Region 4 collected marine macroinvertebrate samples at 24 of the 36 stations using the double 0.04 m^2 Young Grab. Annelids dominated the taxa at all stations, with proportions ranging from 41.7% to 77.3% outside the ODMDS and 46.5% to 76.1% inside. Mollusks and arthropods followed, with mollusks averaging 18.1% outside and 19.8% inside the ODMDS, and arthropods averaging 13.9% outside and 15.0% inside the ODMDS.

3.5.3 Conclusions and Recommended Management Actions

The ROV survey revealed no hardbottom present within the expanded footprint of the ODMDS, thus no hardbottom habitats would be impacted within the site's new borders. The sediment grain size analysis showed consistency both inside and outside the ODMDS, with most stations predominantly consisting of fine sand, typical to native sediments in this area. Region 4 did not identify any concerns with respect to the physical, chemical, and biological aspects of the seafloor within and around the site that would indicate disposal activities within the original footprint of the site were causing lasting impacts to the marine environment within the study area.

Region 4 intends to continue to routinely monitor the Port Everglades ODMDS to document any changes to the area and ensure that disposal activities are not causing lasting adverse impacts. The data Region 4 collected during the 2021 surveys will serve as a baseline comparison for future monitoring efforts at this site.

3.6 Region 10 – Coos Bay H ODMDS

3.6.1 Background

EPA designated the Coos Bay H ODMDS in 1986. Site H is 0.14 nmi^2 (0.26 km^2) and located off the central Oregon coast in depths of 160 to 210 ft (49 - 64 m). The EPA designated this site for the disposal of dredged material from the USACE-maintained federal navigation channel and adjacent, non-federal projects in Coos Bay permitted by USACE's Regulatory Program. In 2020, the EPA and USACE identified a need to expand Site H to support future maintenance of the Coos Bay federal navigation channel and adjacent, marine-dependent facilities.

During this 2021 survey, Region 10 collaborated with NOAA's Northwest Fisheries Science Center to collect benthic seafloor data that provided valuable insights on the marine ecosystems within the ODMDS and in the surrounding areas that are being considered for site expansion.

3.6.2 Survey Objectives, Activities, and Findings

Region 10's survey at Coos Bay Site H had two primary objectives. Using NOAA's SeaBED Autonomous Underwater Vehicle (AUV), Popoki, Region 10 collected high-resolution still images of the seafloor to 1) describe the epibenthic community by identifying and counting invertebrate and vertebrate epifauna and 2) assess the composition of the seafloor substrate, including the presence of boulders, rocks, mud, and marine debris. Region 10 will use these data to evaluate potential impacts from disposal activities and inform future management of the site.

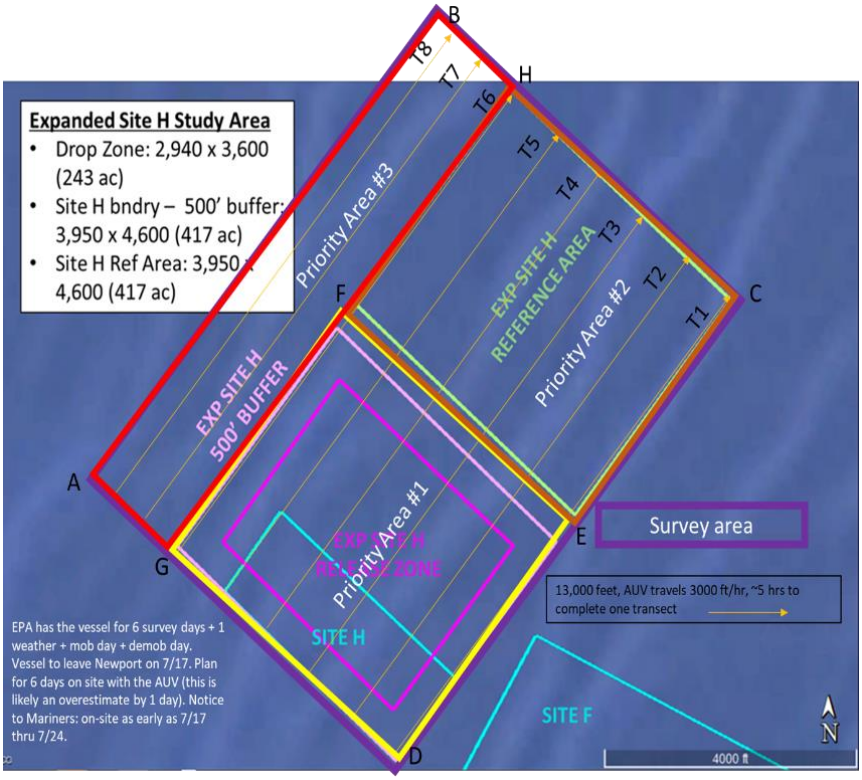

Figure 13: EPA priority study area (Priority Areas #1, #2, and #3).

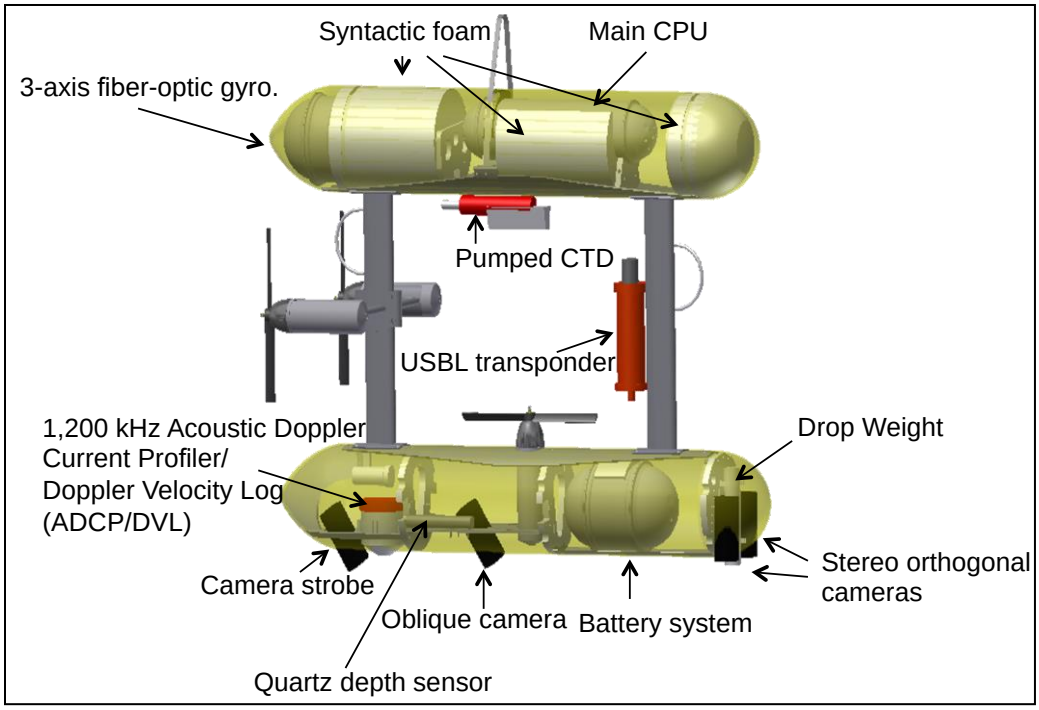

Figure 14: Diagram of SeaBED AUV *Popoki* and its sensors

Region 10 conducted the survey between July 19 and 22, 2021, where they completed six dives with the AUV. During the first two dives, Region 10 and NOAA scientists tested the AUV's ballasting and photographic lighting, refining its capabilities to ensure optimal performance. The scientists used the remaining four dives to collect high-resolution images across various transects within the three priority areas. The AUV followed pre-programmed tracks, capturing images every eight seconds at an altitude of 8.2 ft (2.5 m) above the seafloor. These images allowed science crew to estimate the density of marine species and document the types of substrates present in the survey areas.

During dive three, Region 10 and NOAA scientists surveyed transects 1 through 4 of Priority Area 1, analyzing 3,239 images collected from an area of 5.38 nmi^2 (9.96 km^2). The survey revealed that the seafloor substrate was primarily mud, with small areas of mixed boulders and cobbles. Additionally, the science crew captured images primarily of flatfish, with the most abundant fish being small, unidentifiable flatfish under 10 cm. Region 10 noted that smelt were also present in the images in in significant numbers.

Dive four covered the deeper portions of Priority Area 1 and parts of Priority Area 2. Region 10 and NOAA scientists analyzed 3,005 images from this dive, collected from an area of 5.16 nmi^2 (9.56 km^2). Region 10 and NOAA scientists noted that the substrate was soft throughout the area and flatfish species, including sanddabs, rex sole, English sole, slender sole, Dover sole, and butter sole, were the most abundant, along with invertebrates such as sea stars, anemones, and Dungeness crab. The science crew identified that sea pens were the only coral species present.

During dive five, the science crew surveyed transects 1 through 4 of Priority Area 2, analyzing 3,197 images collected from an area of 6 nmi^2 (11.1 km^2). Region 10 and NOAA scientists noted that the seafloor substrate in this area remained consistently soft. During this dive, the AUV lost its dive weight partway through, causing it to rise slightly in the water column, which made fish identification more

challenging. The most abundant fish observed by the science crew were small flatfish; sea stars, anemones, and Dungeness crabs were the most common invertebrates. This dive also covered the only area where giant-plumose anemones were observed.

For dive six, Region 10 and NOAA scientists planned to survey transects 7 and 8 of Priority Area 3 but completed only Transect 7 because the AUV became entangled in a crab pot. Before this incident, the AUV surveyed 0.83 nmi^2 (1.54 km^2) and collected 484 images of the seafloor. The science team noted increased turbidity near the seafloor, which reduced the visibility of epifauna. The substrate was soft, and the most abundant species observed were flatfish, followed by sculpins, sea stars, and Dungeness crabs.

3.6.3 Conclusions and Recommended Management Actions

The data and information collected from this survey indicated that the current disposal practices have not significantly impacted the benthic environment, as evidenced by the presence of diverse and abundant marine species across the surveyed areas. The data collected during this survey will serve as a critical benchmark for future monitoring efforts, allowing for comparisons over time to detect changes in the seafloor environment or species distribution as a result of continued dredged material disposal. Additionally, Region 10 will utilize this data to refine future data collection efforts to inform the Coos bay Site H expansion.

3.7 Region 10 – Yaquina Bay North and South ODMDS

3.7.1 Background

EPA designated the Yaquina North and South ODMDSs in 2012, located approximately 2 nmi (3.7 km) offshore of Newport, Oregon. These sites play a vital role in managing the disposal of dredged material from Yaquina Bay, which is essential for maintaining navigable waterways for commercial shipping, fishing, and recreational activities. The history of offshore dredged material disposal in this region dates back to the early 1980s, with the North Site being used exclusively from 2001 until 2011. In 2012, disposal began at the South Site to provide another option for disposal, helping to distribute the deposition of dredged material and minimize localized impacts on the seafloor and marine ecosystems.

The Yaquina North and South ODMDSs each measure 0.66 nmi by 1.07 nmi (1.22 km by 1.98 km), a total area of 0.7 nmi^2 (2.4 km^2), with depths ranging from 112 to 151 ft (34.1 m to 46 m). The EPA selected these depths and locations during site designation to ensure that dredged material disposal would not adversely impact highly valued habitats, fisheries, or water quality. During the site designation process, EPA Region 10 conducted extensive environmental assessments and stakeholder consultations to inform site management. Region 10 continues to monitor and manage the Yaquina North and South ODMDSs to assess the long-term effects of dredged material disposal on marine ecosystems.

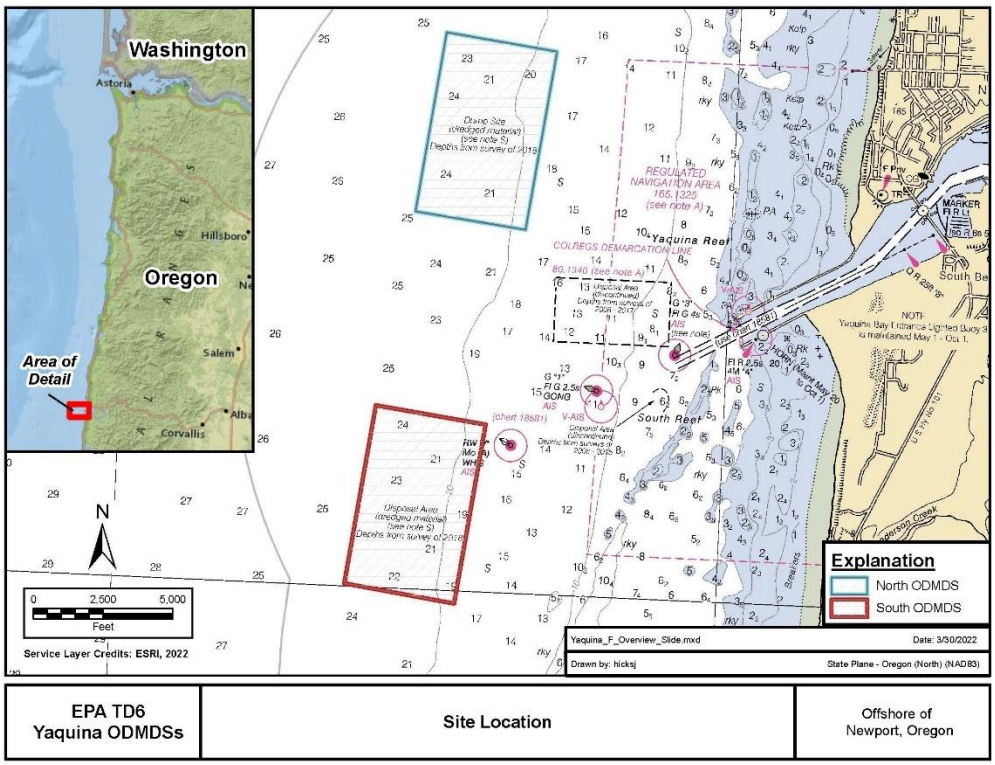

Figure 15: Yaquina North and South ODMDS locations.

3.7.2 Survey Objectives, Activities, and Findings

During this oceanographic survey, Region 10 collected data to assess the environmental effects of dredged material disposal at the Yaquina North and South ODMDSs and to inform future management of the site. Region 10's specific survey objectives included:

- collecting physical sediment data (grain size, total solids, and TOC) to characterize the sediments at each station within and around each of the disposal sites,
- assessing current levels of chemical contaminants within the ODMDSs using regional screening levels to ensure that dredged material disposal is not causing contamination of benthic communities,
- evaluating benthic infaunal community diversity within the ODMDSs compared to reference areas, and
- assessing the diversity of epibenthic invertebrates and fish within the ODMDSs compared to reference areas using seafloor video imagery.

Using the R/V *Zephyr* as their survey platform, Region 10 conducted sediment sampling from September 9 to 12, 2021, at 44 stations within and around the North ODMDS and 36 stations within and around the South ODMDS. From September 13 to 17, 2021, Region 10 conducted five benthic otter trawls within each ODMDS and five additional trawls outside the sites for reference (Figure 16). Alongside these activities, the team collected near-bottom water quality data including depth, temperature, conductivity/salinity, and dissolved oxygen at a subset of benthic stations and trawls to provide context for the biological results. Region 10 attempted to conduct video imagery of the seafloor but was unable to complete this effort due to poor visibility from high density of flocculent material, as a result of a phytoplankton bloom, near the seafloor.

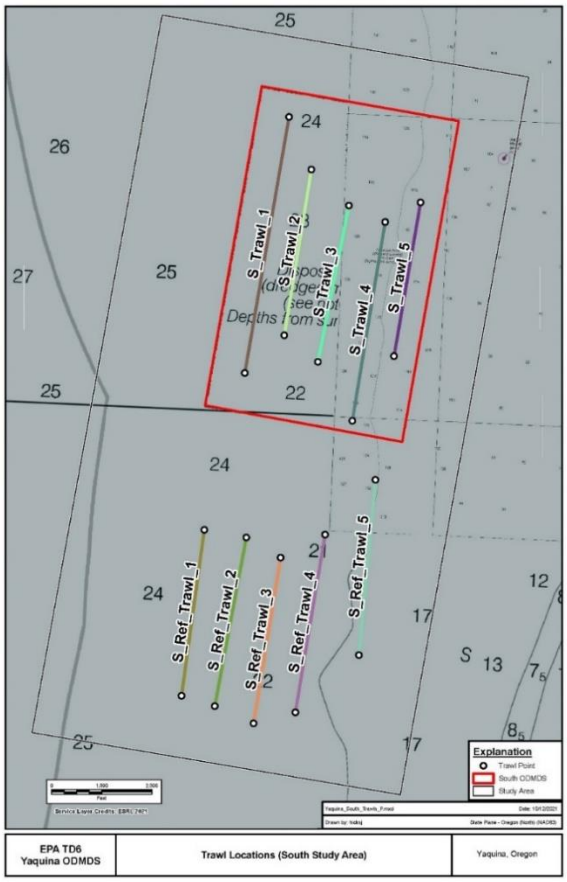

Figure 16: Locations where Region 10 conducted otter trawl transects in the Yaquina South ODMDS study area.

Results from Region 10's sediment analyses showed that the sediments at the Yaquina North and South ODMDSs were primarily composed of sand (>96%), with medium and fine sand as the dominate grain sizes. Two stations to the west of the Yaquina North ODMDS (YN20 and YN22) had higher content of fine sand, and YN22 had the highest percentage of fine sand (27.5%) and TOC levels. TOC values at most stations remained below 0.1%, except at three stations where TOC ranged from 0.13% to 1.1%.

Chemical analyses of the sediments confirmed that metal concentrations did not exceed Region 10's 2018 Sediment Evaluation Framework (SEF) marine benthic toxicity screening levels. Butyltins, diesel range, or motor oil organics were not detected at any station. Pesticides were detected at both Yaquina ODMDSs, but none exceeded the SEF screening levels. PCBs (Aroclors) were not detected in any of the sediment samples. Several PAHs were detected at a few stations in the Yaquina North ODMDS, mostly low molecular weight compounds, except for one high molecular weight PAH, fluoranthene, detected at one station (YN37). The PAHs that were detected had estimated concentrations, which were all below the benthic toxicity screening levels. PAHs were detected in fewer samples collected from the South ODMDS when compared to the number of samples where PAHs were detected in sediments collected from the North ODMDS. None of the samples where PAHs were detected had concentrations exceeding the SEF screening levels. Phthalates and phenols were detected at multiple stations in the North ODMDS; bis(2-ethylhexyl) phthalate was detected above the MRL at two stations. Phenol and 2-methylphenol levels exceeded SEF screening levels at nine stations in the North ODMDS and 12 stations in the South ODMDS. The higher concentrations of phenol and 2-methylphenol were likely a result of decaying phytoplankton and zooplankton at the seafloor, where large areas of visual flocculants were

observed in the study area; these conditions are typically a result of a seasonal upwelling causing a prior phytoplankton bloom.

In total, 113 invertebrate taxa and 45,521 individual organisms were identified within the Yaquina North ODMDS compared to 138 taxa and 53,550 organisms at the north reference stations. At the Yaquina South ODMDS, 114 taxa and between 1,186 and 1,990 organisms were identified, while the south reference areas identified 127 taxa and a range of 714 to 12,267 organisms. These findings revealed variation in species richness and abundance between the Yaquina South ODMDS and its respective reference area.

Data from the benthic trawl transects were combined to assess epibenthic invertebrates and fish diversity. At the North ODMDS, Region 10 identified 20 fish species, with English sole being the most common, and 15 invertebrate species, with Crangon shrimp being the most abundant. Although the reference area exhibited a higher overall density, one station heavily influenced this outcome; other stations showed similar densities between the North ODMDS and the reference area. The trawl survey showed dominance of English sole, speckled sanddab, and Crangon shrimp at the North ODMDS. At the South ODMDS, Region 10 identified 17 fish species, including butter sole and English sole, and 22 invertebrate genera, with Crangon shrimp and Dungeness crab being the most common. The South ODMDS displayed a higher density of organisms, but the South reference area exhibited greater taxa richness, diversity, evenness, and Margalef's index.

3.7.3 Conclusions and Recommended Management Actions

The data and information collected from this survey generally show that dredged material disposal activities have resulted in little change to the physical, chemical, and biological characteristics of the Yaquina North and South ODMDSs. Region 10 identified several factors to take into consideration that could influence future surveys, including the visual presence of flocculants near the seafloor which significantly influences the ability to collect visual imagery of the benthos, the detection of phenol and 2-methylphenol in sediments and its connection with the extreme organic load from the phytoplankton blooms, and the near-hypoxic conditions at the seafloor which are common occurrences on the Oregon Coast. These findings underscored the need to understand the oceanographic context in which these two disposal sites are located. Region 10 intends to continue to routinely monitor the Yaquina North and South ODMDSs to document any changes to the area and ensure that disposal activities are not causing lasting adverse impacts.

Region 10 is transitioning away from using benthic otter trawls to collect epibenthic fish and invertebrate data in favor of using towed visual imagery. Region 10 will continue to pursue collecting video imagery of the seafloor during future surveys to refine this method of data collection for use off the coast of Oregon.

4.0 Next Steps

The EPA conducts oceanographic surveys to monitor the impacts of MPRSA permitted/authorized dumping at MPRSA-designated ocean disposal sites and to inform EPA management and monitoring decisions under the MPRSA and its implementing regulations. The EPA monitors to ensure that dumping will not unreasonably degrade or endanger human health or the environment, to verify that unanticipated adverse effects are not occurring from past or continued use of the site, and to ensure that terms of MPRSA permits and MPRSA federal project authorizations are met.

Based on the results of these 2021 oceanographic surveys, the EPA determined that environmentally acceptable conditions were met at all surveyed ocean sites and the permitted disposition of dredged material under MPRSA can continue at these sites.

Additionally, the EPA will use the data and information collected in 2021 to:

- Confirm that at the Region 1 Massachusetts Bay Disposal Site, dredged material disposed in the former "Industrial Waste Site" spread over the targeted area while minimizing disturbances to the existing seafloor; and confirm that dredged material disposed in the area of the site designated in 1993 had been deposited properly within the site boundaries;
- Determine that polychlorinated biphenyls (PCBs) and dioxin concentrations found in worm tissue exceeded the established HARS-specific thresholds at five stations within the HARS and to inform where and how much additional material would be deposited within the site to meet the HARS's remediation goals;
- Determine that sediments in two locations at the Region 3 Dam Neck ODMDS should be further investigated to better understand the presence and bioaccumulation potential of contaminants of concern measured at the site;
- Investigate whether the fine-grained material observed at one station within the Region 4 Charleston ODMDS resulted from incorrect disposal operations;
- Confirm that there was no evidence of hardbottom environments in the proposed expanded area of the Region 4 Port Everglades ODMDS;
- Refine future data collection efforts necessary to inform the Region 10 Coos Bay Site H site expansion; and
- Inform future oceanographic monitoring and surveying methods at the Yaquina North and South ODMDSs as Region 10 transitions away from using benthic otter trawls to collect epibenthic fish and invertebrate data in favor of towed benthic video imagery.

5.0 Acknowledgements

This report was developed with the support of the Marine Protection Permitting Program staff from the EPA's Headquarters and all coastal Regional offices.

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