Office of Water
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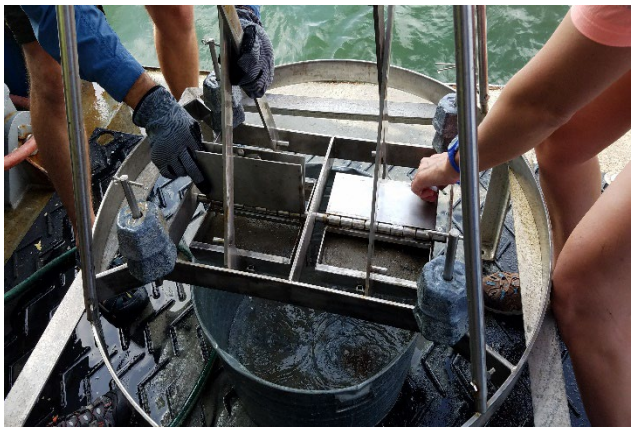
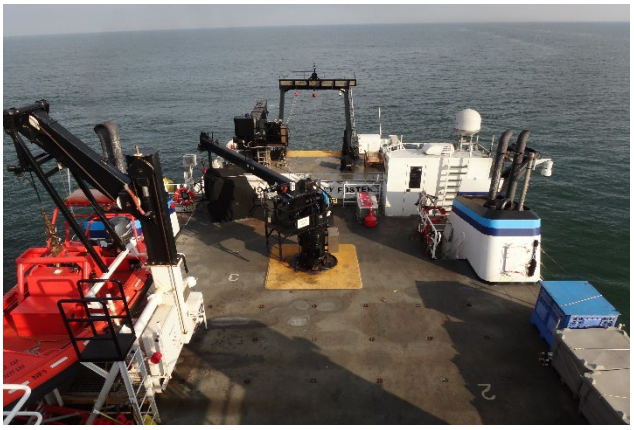
2018 National Site Monitoring Assessment Report



EPA Ocean Dumping Management Program

September 2022

Executive Summary

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

In Fiscal Year (FY) 2018, EPA managed 99 designated ocean disposal sites located off the U.S. Atlantic, Gulf of Mexico, and Pacific Coasts; and near Puerto Rico, Hawaii, Guam, and American Samoa. This National Ocean Dumping Site Monitoring Assessment Report provides a comprehensive overview of EPA's FY 2018 monitoring activities conducted at four ocean dredged material disposal sites (ODMDSs):

- Region 2
  - The Historic Area Remediation Site (HARS), NJ
- Region 3
  - Dam Neck, VA Ocean Dredged Material Disposal Site (ODMDS)
- Region 4
  - Jacksonville, FL ODMDS
- Region 9
  - LA-5, San Diego, CA ODMDS

Based on the results of these FY 2018 ocean disposal site surveys:

- EPA found that environmentally acceptable conditions were met at each of the surveyed ODMDSs. The data collected confirm that site management practices are working well and will inform site management as well as future updates to the SMMP for each site. Permitted disposal of dredged material under the MPRSA can continue at these sites.
- EPA also used the data collected during these surveys to:
  - Identify locations within the Historic Area Remediation Site where placing additional remediation material will continue to isolate the impacts of historic dumping and improve site conditions;
  - Inform future sampling events at the Historic Area Remediation Site (HARS) to include 1) collecting numerous sediment samples from each station to capture the variability of the physical and chemical attributes within the site and 2) collecting sediment and worm tissues samples at several locations outside of the site to compare background contaminant concentrations from the surrounding environment to concentrations measured within the site. EPA designated HARS as an ocean remediation site. Remediation material placed over materials historically disposed of in the area renders toxic sediments unavailable to marine organisms and prevents further exposure to contaminated sediments. Regular sampling within and around the HARS is necessary to ensure that HARS-specific remediation targets are being achieved.
  - Inform future surveys at the Dam Neck ODMDS, including incorporating additional benthic biological samples to assess impacts at the site after the

disposal of large volumes of dredged material associated with anticipated deepening projects; and

- Inform a future trend assessment study at the Jacksonville ODMDS after the Jacksonville Harbor Expansion Project is completed.

Contents

List of Figures and Tables

Acronyms and Abbreviations

aRPD	apparent redox potential discontinuity
CFR	Code of Federal Regulations
cm	centimeter
COC	contaminant of concern
CTD	conductivity temperature depth
DDT	Dichlorodiphenyltrichloroethane
DDX	Dichlorodiphenyltrichloroethane and its isomers
EPA	U. S. Environmental Protection Agency
ER-L	effects range-low
ER-M	effects range-median
ft	feet
FY	fiscal year
g	gram
HARS	Historic Area Remediation Site
ISQG	Interim Sediment Quality Guidelines
m	meter
m^2	square meter
MBES	multibeam echosounder system
mcy	million cubic yards
MDS	Mud Dump Site
MPRSA	Marine Protection, Research, and Sanctuaries Act
M/V	Merchant Vessel
ng/g	nanogram per gram
ng/kg	nanogram per kilogram
nmi	nautical mile
nmi^2	square nautical mile
NOAA	National Oceanic and Atmospheric Administration
N/S	NOAA Ship
ODMDS	ocean dredged material disposal site
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	probable effects level
ppb	part per billion
pptr	part per trillion
PRA	priority remediation area
PVI	plan view imaging/image
R/V	research vessel
SBZ	shipwreck buffer zone
SDZ	surface disposal zone
SMMP	site management and monitoring plan
SPI	sediment profile imaging/image
SQG	sediment quality guideline
SQUIRT	Screening Quick Reference Tables
SVOC	semi-volatile organic compound
TEQ	toxicity equivalent quotient
TEL	threshold effects level
TOC	total organic carbon
USACE	U.S. Army Corps of Engineers
USC	United States Code

1.0 Introduction

The Marine Protection, Research, and Sanctuaries Act (MPRSA), also known as the Ocean Dumping Act, regulates the disposition of any material into the ocean unless expressly excluded under the MPRSA. The MPRSA prohibits or restricts (primarily in terms of material type, amount, and location) ocean dumping that would adversely affect human health, welfare, 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) disposed of in the ocean is uncontaminated dredged material, which is sediment excavated or otherwise removed from our nation's waterways. Removing sediment supports a network of coastal ports and harbors used for commercial, transportation, national defense, and recreational purposes. In 2018, this marine transportation network, partially facilitated by the dredging of waterways, contributed more than $73 billion and 586,000 jobs to the U.S. economy (National Ocean Economics Program). Other materials that are disposed of in the ocean include fish wastes, vessels, marine mammal carcasses, and human remains for burial at sea.

Under the MPRSA, the U.S. Environmental Protection Agency (EPA) establishes environmental criteria for evaluating all permit applications. EPA is the permitting authority for ocean dumping of all materials other than dredged material. In the case of dredged material, the U.S. Army Corps of Engineers (USACE) issues ocean dumping permits (or, in the case of federal projects, authorizes ocean dumping of dredged material) using EPA's environmental criteria. All MPRSA permits and federal projects involving ocean dumping of dredged material are subject to EPA review and written concurrence.

Dredged material that is proposed for ocean disposal 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 historic chemical pollutants. If biologically available, such 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 and, ultimately, humans when contaminated seafood is eaten. The national ocean dumping testing manual, commonly known as the Green Book, contains technical guidance for determining the suitability of dredged material for ocean disposal through chemical, physical and biological evaluations. Only dredged material found suitable for disposal using the procedures in the Green Book can be permitted for disposal in a designated ocean disposal site.

EPA establishes the criteria for the designation of ocean disposal sites and is responsible for designating ocean disposal sites under the MPRSA. EPA considers criteria (published at 40 CFR 228.5 and 228.6) as part of any site designation evaluation. To minimize the adverse impacts of ocean dumping on human health and the marine environment, EPA designates sites based on environmental studies of the proposed site, environmental studies of regions adjacent to the proposed site, and historical knowledge of the impact of disposal on areas having similar physical, chemical, and biological characteristics. EPA analyzes these impacts through environmental assessments or environmental impact statements. In general, EPA designates sites only in areas where ocean dumping will not significantly impact various amenities, such as fisheries, coral reefs, and endangered species.

EPA is also responsible for managing all ocean disposal sites designated under the MPRSA. Management of ocean disposal sites involves:

- regulating the times, quantity, and characteristics of the material dumped 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 ocean disposal site and that terms of the MPRSA permit are met.

In Fiscal Year (FY) 2018, EPA Regions managed 99 designated ocean disposal sites off the U.S. Atlantic, Gulf of Mexico, and Pacific Coasts; and near Puerto Rico, Hawaii, Guam, and American Samoa. All but one of the 99 ocean disposal sites are designated for the disposal of dredged material permitted under the MPRSA. One EPA-designated site, located offshore of American Samoa, is designated for the disposal of fish processing wastes.

All designated dredged material disposal sites are required to have a site management and monitoring plan (SMMP). EPA, in conjunction with USACE, develops an SMMP for each ocean dredged material disposal 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 the 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 Ocean Disposal Site Monitoring

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

- Evaluate potential ocean disposal sites and designate ocean disposal 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 disposal impact (40 CFR 228.10(a) and (b));
- Modify disposal site use (40 CFR 228.11(a) and (d));
- Prohibit dumping where necessary (MPRSA 102(c)(2)); and
- Develop an SMMP for each site, which must be reviewed and revised at least every 10 years (MPRSA 102(c)(3)).

EPA Regional Ocean Dumping Coordinators and Chief Scientists plan and conduct ocean disposal site monitoring surveys using scientifically proven principles and methods to assess the physical, biological, and chemical states of ocean disposal sites and the surrounding marine environment. 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, EPA may use monitoring information to evaluate movement and deposition of the dumped material to determine whether or how to modify site use. Ocean areas near the disposal site that are not affected by disposed materials are used for comparisons to assess the impact of disposal. The quantity and spatial 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 EPA's ongoing planning and decision-making regarding the management and monitoring of sites.

As part of ocean disposal site surveys, EPA may collect a variety of data to ensure that the dumped material is being adequately tested and that there are no unexpected adverse impacts at and around disposal 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 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 disposal site and at reference areas. Parameters used to evaluate benthic habitat or benthic habitat quality include, but are not limited to: sediment grain size, depths of oxygenated sediment and apparent redox potential discontinuity (aRPD) (indicating 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), whereas species diversity is a measure that combines species richness (the number of different species) and evenness (the relative abundance of species) to give an overall indication of community structure.

EPA may also analyze sediment samples for contaminants of concern (COC), including metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), persistent pesticides, semi-volatile organic compounds (SVOCs), organotins, and/or dioxins and furans. To evaluate the potential for disposed dredged material to have an impact on the benthic communities at or near disposal sites, EPA commonly compares contaminant concentrations in sediments collected at and around ocean disposal 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 EPA Regions rely on effects range low (ER-L) and effects range median (ER-M) 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.

2.0 Report Objectives

In FY 2018, EPA scientists conducted surveys at four designated ocean disposal 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 surveys monitoring efforts:

- Region 2
  - The Historic Area Remediation Site (HARS), NJ
- Region 3
  - Dam Neck, VA Ocean Dredged Material Disposal Site (ODMDS)
- Region 4
  - Jacksonville, FL ODMDS
- Region 9
  - LA-5, San Diego, CA ODMDS

Table 1: Area and depth of ocean disposal sites surveyed in FY 2018.

Region	Disposal Site	Area (nmi^2)	Depth (ft)
2	Historic Area Remediation Site, NJ	15.7	40-138
3	Dam Neck, VA	8.15	36
4	Jacksonville, FL	4.56	28-61
9	LA-5, San Diego, CA	0.77	460-660

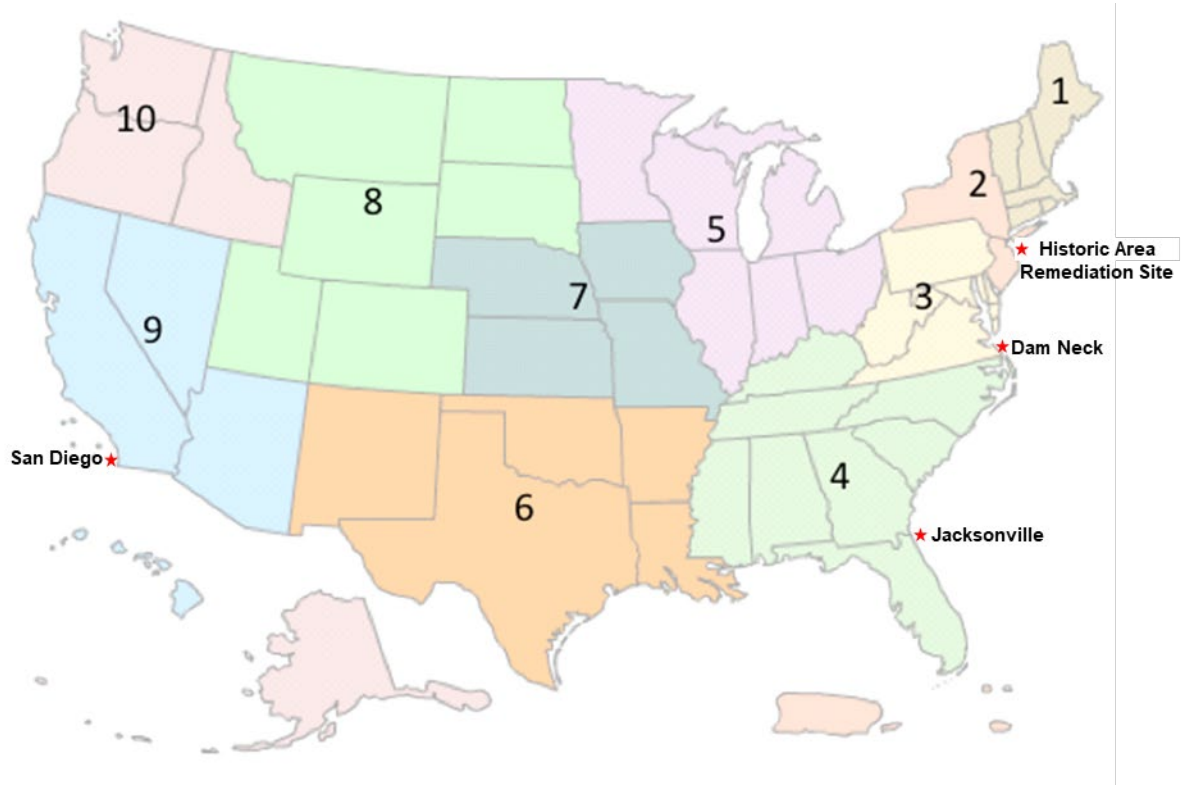


***Figure 1**:* Approximate locations of the four ocean disposal sites surveyed in FY 2018. The numbers and corresponding shaded areas of the U.S. map indicate EPA Regions.

3.0 Summary of Monitoring Surveys

A summary of FY 2018 survey objectives, activities, and results, as well as conclusions and recommended management actions resulting from these surveys, is presented below.

3.1 Region 2 – The Historic Area Remediation Site, New Jersey

3.1.1 Background

From the 1800s until 1972, a variety of wastes were dumped in the New York Bight, including municipal and industrial waste, construction materials, sewage sludge, and dredged material.

After the MPRSA was passed in 1972, EPA formally used the Mud Dump Site (MDS) on an interim basis for the disposal of dredged material.[1] In 1984, EPA designated the MDS on a permanent basis for dredged material disposal to support regional port and harbor maintenance. However, the MDS was closed in 1996 after surveys revealed dioxin and PCB accumulation in benthic invertebrates within and around the site.

As a response to the serious threat presented to the ecosystem and human health by the material historically disposed of at the MDS, EPA designated the Historic Area Remediation Site (HARS) in 1997. The HARS is located 3.5 nautical miles (nmi) off the coast of Sandy Hook, New Jersey, and encompasses the former MDS and the area impacted by historic disposal. It has an area of 15.7 nmi^2 and an average depth of 89 ft (27 m). The management priority for the HARS is to reduce the impacts of previous disposal to acceptable levels, as defined in the HARS specific guidance, by covering the surface of the site with uncontaminated dredged sediments. As such, EPA designated the HARS as an ocean remediation site, restricting dumping 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 New York and New Jersey harbors). 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 PRAs measuring approximately 1 nmi^2 in size (Figure 2). 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.

[1] Interim ocean disposal sites are no longer available for use. Amendments enacted in 1992 under the MPRSA now preclude the issuance of permits for ocean dumping for disposal at an EPA-established ocean disposal site, unless the site has received a final designation in the Federal Register. In 2008, the EPA repealed expired, and therefore obsolete, provisions regarding interim ocean disposal sites from the regulations.

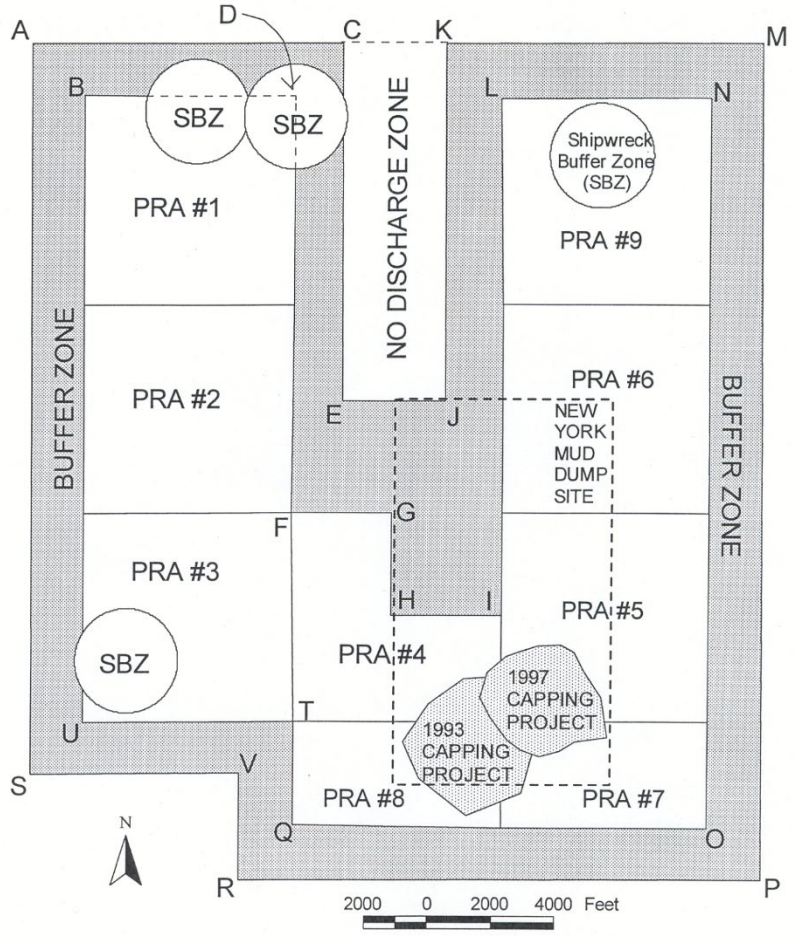


Figure 2: The area designated as the HARS includes the HARS Buffer Zone, nine Priority Remediation Areas (PRAs), a No Discharge Zone, and four Historic Shipwreck Buffer Zones (SBZs). During the 2018 survey, samples were collected from PRAs 1, 2, 3, 4, and 8.

3.1.2 Survey Objectives, Activities, and Findings

As part of EPA's strategy to monitor the effects of dredged material disposal at the site and to verify that placement of uncontaminated dredged material is improving sediment conditions within the HARS (relative to baseline conditions), Region 2 conducted a survey aboard the research vessel (R/V) *Connecticut* in October 2018. During this survey, EPA scientists collected 26 independent sediment samples, eight biological (marine worms) samples, and eight additional composite sediment samples corresponding to locations where biological samples were collected. Region 2 collected all of the samples from sampling stations located in PRAs 1, 2, 3, 4, and 8 (Figure 3) using a 0.1 m^2 Young-modified van Veen grab. Sediment samples collected during this survey were analyzed for sediment toxicity and physical and chemical parameters, including grain size distribution, total organic content (TOC), percent moisture, dioxins, PCBs, metals, PAHs, and pesticides. Region 2 also collected biological samples to analyze worm tissues for several contaminants. To obtain the 40 g of worm tissue necessary for analysis, EPA scientists sieved multiple sediment grabs from each station selected for worm tissue collections. An aliquot of sediment was taken from each of the first ten grabs (processed for worm tissue sampling) and homogenized. Region 2 then analyzed a subsample of this composite sediment sample for physical and chemical parameters. Worm tissues and

corresponding composite sediment samples were analyzed for dioxins, PCBs, PAHs, and pesticides.

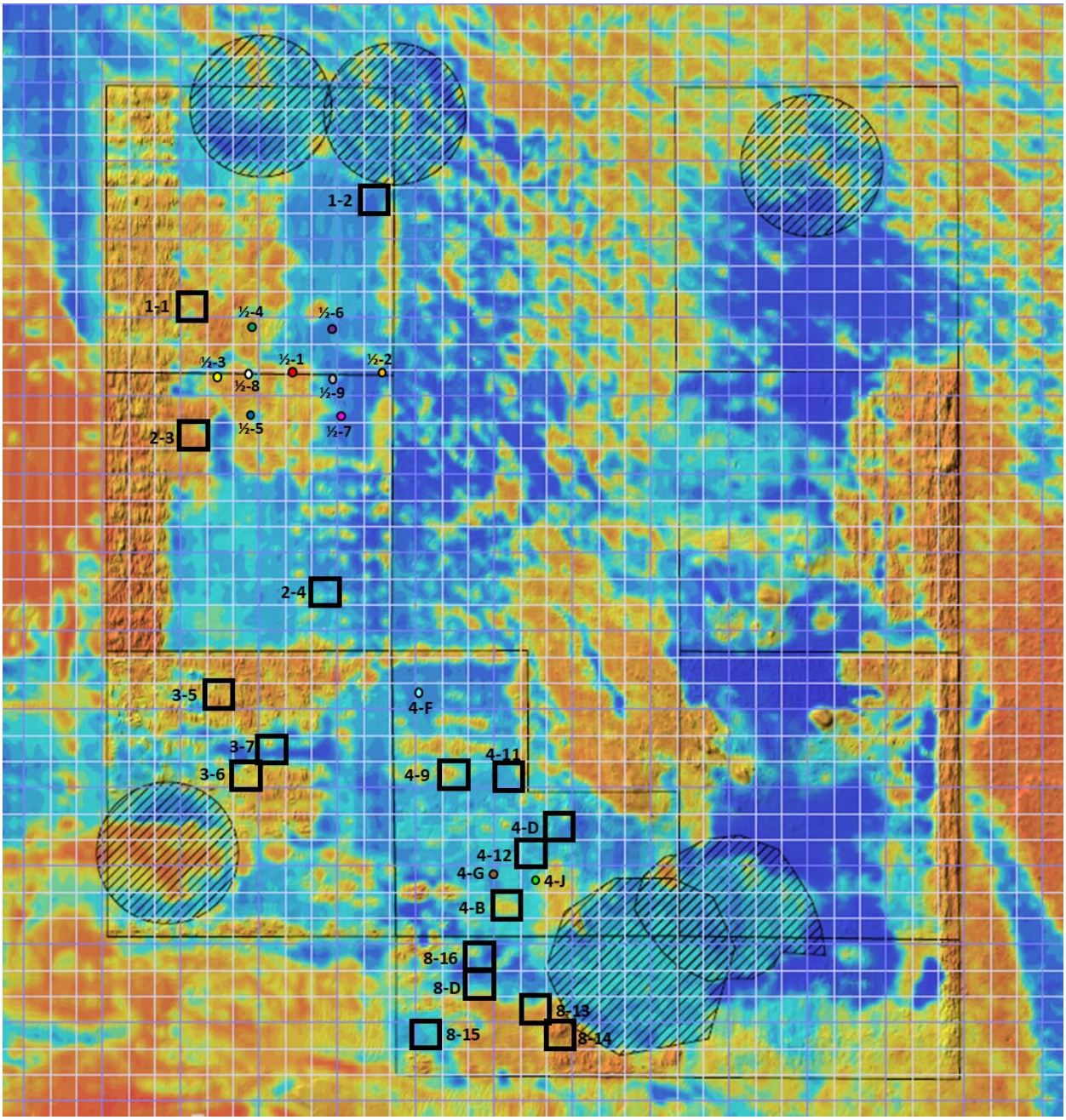


Figure 3: Bathymetric image of the HARS and surrounding area. Locations sampled during the 2018 survey within PRAs 1, 2, 3, 4, and 8 are noted by small black squares, dots, and/or sampling station numbers (e.g., 4-B, 8-16, etc.). All PRAs (large black squares) and SBZs (black circles with hashmarks) within the HARS are also noted in the figure.

3.1.2.1 Sediment Sample Findings

Grain size distribution was variable among stations. Most stations consisted almost entirely of sand (>90%) while the other stations sampled had higher percentages of fines (silt and clay). Sediment samples did not show a high percentage of gravel in any station. Still, gravel was

more prevalent on the western edge of the HARS, with average percentages ranging from 1.2% to 21.5%. Percent total organic carbon (TOC) and percent moisture were generally higher in the sediment samples from stations with higher percentages of fine particles and lower percentages of sand. The grain size distributions observed during sampling were expected, given the ongoing disposal and remediation activities occurring within the PRAs.

Region 2 analyzed sediment samples for concentrations of 17 dioxins and furans, 22 PCB congeners, metals, total and individual PAHs, and pesticides, including dichlorodiphenyltrichloroethane (DDT) isomers and derivatives (i.e., DDX) and non-DDX pesticides (i.e., aldrin, α-chlordane, *trans* nonachlor, dieldrin, endosulfan I, endosulfan II, heptachlor, heptachlor epoxide, and endosulfan sulfate). Contaminant concentrations varied spatially across and within both PRAs and stations. Stations that were relatively high in concentration of one contaminant or class of contaminants did not always have the highest concentrations of all other contaminant classes. Dioxin concentrations in individual samples ranged from 0.006 to 5.18 pptr (ng/kg); average station dioxin concentrations ranged from 0.01 to 2.00 pptr. Total PCB concentrations in individual samples ranged from 2.80 to 307.4 ppb (ng/g) and average station total PCB concentrations ranged from 3.03 to 227.1 ppb. Stations in PRAs 3 and 8 had the highest average sediment metal concentrations. Total PAH concentrations in individual samples ranged from 4.50 to 23200 ppb and average station total PAH concentrations ranged from 14.7 to 8850 ppb. Sediment concentrations of non-DDX pesticides were all below 5 ppb dry weight, with the majority below 0.5 ppb. Total concentrations of DDX measured in individual sediment samples ranged from 0.4 to 66.9 ppb. Sample station averages for DDX concentrations ranged from 0.46 to 35.5 ppb. Sediment toxicity was lower in remediated PRAs than the baseline data ranges collected from the entire area prior to the site's designation.

3.1.2.3 Composite Sediment Sample Findings

Composite sediment samples associated with worm tissue samples were mostly similar in physical parameters and chemical concentrations to the sediments collected from individual grabs; however, there were some exceptions. Noticeable differences in TOC and grain size distribution were measured in four of the eight composite sediment samples when compared to the measurements of individual sediment samples from the same locations. Composite sediment samples in those stations were composed of finer sediments and had higher TOC percentages than individual sediment samples. Differences in dioxin and DDX concentrations were also seen when comparing composite and individual sediments. The patchiness seen in the composite samples further indicates that there could be small areas scattered throughout the HARS where sediments have higher concentrations of PCBs and dioxins.

3.1.2.2 Biological Sample Findings

Region 2 analyzed eight (8) worm tissue samples for 17 dioxin and dioxin-like compounds, PCBs, 17 PAHs, nine non-DDX pesticides, and six DDX compounds. The highest dioxin concentrations, 0.74 ppt and 0.94 ppt, were measured in tissue samples collected from Stations 8-16 and 3-7, respectively. Dioxin concentrations measured in tissue samples from the remaining stations ranged from 0.38 to 0.61 ppt. The total PCB concentration in worm tissue ranged from 57.2 ppb to 110.3 ppb. Several stations (in PRAs 3 and 8) had tissue samples with total PCB concentrations over 75 ppb. The total concentration of PAHs measured in tissue samples ranged from 108.6 to 520.7 ppb. Total DDX concentrations ranged from 6.73 ppb to 10.42 ppb. The highest concentration of any non-DDX pesticide in worm tissues was 0.85 ppb of endosulfan sulfate. While most areas showed low tissue contaminant concentrations, worms

from certain locations had concentrations that approached HARS-specific guidance values. This indicates that there are areas where sediments cause higher accumulations of PCBs and dioxins scattered throughout the HARS.

No sediments were acutely toxic to amphipods in 10-day sediment toxicity tests. For each station, five sediment samples were separately tested for toxicity. The results from the individual samples ranged from 75% to 100% survival. Average percent survival by station ranged from 92% to 100%, compared with 95 to 97% survival in controls.

3.1.3 Conclusions and Recommended Management Actions

The data collected from this survey confirm that placing uncontaminated dredged material at the HARS continues to improve the overall sediment quality (compared to the baseline levels) within the remediated PRAs within the site.

Region 2 found that at some locations within the remediated PRAs, sediment and worm tissues contained levels of PCBs and dioxin that were approaching limiting HARS-specific guidance values. Stations with high TOC tended to have higher organic contaminant concentrations in sediments and the station with the highest measured TOC also had the highest average concentrations of DDX and dioxin and the second highest PCB concentration. Within several sampling stations, a wide range of PCB concentrations indicated that small patches of sediments with higher concentrations of PCBs may be scattered throughout the HARS. Overall, contaminant concentrations measured in worm tissues were less predictable, and the lack of predictable relationships between sediment and tissue concentrations limits the ability to rely solely on sediment concentrations for making remedial decisions. To provide assurance that sediment and worm tissue contaminants are below the HARS-specific guidance values, Region 2 will continue remediation by placing additional dredged material in areas with higher contaminant concentrations.

During future site monitoring surveys, Region 2 will collect multiple sediment samples from each station to capture the variability of the physical and chemical attributes within the site. Additionally, Region 2 will sample sediment and worm tissues at several locations outside of the HARS when feasible, to obtain up-to-date contaminant concentrations from the surrounding environment for use in evaluating site conditions.

3.2 Region 3 – Dam Neck Ocean Dredged Material Disposal Site

3.2.1 Background

The Dam Neck ODMDS has an area of approximately 9 nmi^2 and is located 3 nmi due east of Virginia Beach, Virginia, and 7 nmi south of the mouth of the Chesapeake Bay. EPA designated the site in 1988 for the ocean disposal of dredged material from three federally maintained channels. The site is typically used by USACE on an annual to biannual basis to dump approximately one million cubic yards (mcy) of dredged material into the site from USACE projects. Most recently, 2.4 mcy of sand/silt/gravel from a dredging project completed in 2018 was disposed at the Dam Neck ODMDS. As a result of recent commerce and national security demands, USACE has begun to plan for deepening and/or widening channels to full authorization depths in coastal Virginia.

3.2.2 Survey Objectives, Activities, and Findings

Region 3 anticipates that these deepening projects will result in a significant increase in dredged material being disposed of at the Dam Neck ODMDS over the next five to seven years. For this reason, Region 3 planned its 2018 site monitoring activities to collect information to establish a current baseline of the physical and chemical parameters of the site. The objectives were to collect bathymetric measurements within and along the perimeter of the site and to collect sediment samples to be analyzed for grain size distribution and concentrations of metals, pesticides, PCBs, semi-volatile organic compounds (SVOC), dioxins, and furans. Region 3 collected the bathymetric information to complement bathymetry measurements collected by USACE from within the site boundaries earlier in 2018 and the sediment characterization to provide a physical and chemical baseline to which future sediment measurements can be compared.

Region 3 completed this monitoring effort during two different surveys: a bathymetric survey conducted in November and December of 2018 aboard the R/V *4-Points* and the Merchant Vessel (M/V) *Theory,* and a sediment collection survey conducted in October 2018 aboard the NOAA Ship (N/S) *Nancy Foster*.

Region 3 collected bathymetric measurements using a multibeam echosounder (MBES) at a 2 m resolution. The bathymetry data showed shoaling along the western side of the survey area with depths measuring around 10 m. This shoaling is consistent with the bathymetry of the greater surrounding area on the western side of the ODMDS. Moving eastward through the ODMDS, bathymetry data showed a gradual sloping to a general depth of 15 m, with no discernable features (e.g., debris, short dumps, etc.). During the sediment survey, EPA scientists collected sediment from a total of 40 stations within the site, site boundary buffer area, and reference area.

Region 3 scientists analyzed sediment grain size distribution within and amongst each survey area (within the site, site buffer area, and reference area). Grain size was categorized into clay, silt, sand, and gravel categories. The predominant grain size in the Dam Neck ODMDS, buffer area, and reference area was sand (mean of 87.70%, 86.83%, and 89.20% sand, respectively) (Figures 4 and 5). The Dam Neck ODMDS had the highest mean percent silt, 6.93%, of the three survey areas. 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.

Region 3 compared the concentration of metals, pesticides, PCBs, SVOCs, and dioxins and furans measured in the sediment samples to metals, pesticides, PCBs, SVOCs, and dioxins and furans to Threshold Effects Levels (TEL), laboratory reporting limits, established guidance levels, toxicity equivalence quotients (TEQs), or published effects levels (Buchman, 2008). The concentration of all metals present in the sediment samples was below TEL values. Selenium does not have an established TEL value for marine sediment, however detected selenium levels in the sediment samples were below laboratory reporting limits. Region 3 did not detect pesticides in most of the sediment samples. However, three samples (two within the buffer area, one within the reference area) had detectable concentrations of hexachlorobutadiene (HCBD), and one sample had a detectable concentration of hexachloroethane. The detected concentrations for these four samples were below apparent effect thresholds. Region 3 found that concentrations of PCBs were too low to be detected. Phenol was the only SVOC detected in the sediment samples. Of the samples that had detectible concentrations of phenol, eight were collected from within the site, three were from within the buffer area, and one was from within the reference site. Region 3 evaluated and determined the likely toxicities of these

samples to be well below lethal effects levels in marine organisms (World, 2004). Region 3 calculated TEQs for each sample where dioxin and furan concentrations were measured and compared to Interim Sediment Quality Guidelines (ISQG) and Probable Effects Levels (PEL) (Canadian, 2001). All sample TEQs were below both the ISQG and PEL concentrations, indicating that the concentrations of dioxins and furans in the sampled sediments are unlikely to have an effect on marine aquatic life and are not expected to impact aquatic ecosystem health long term.

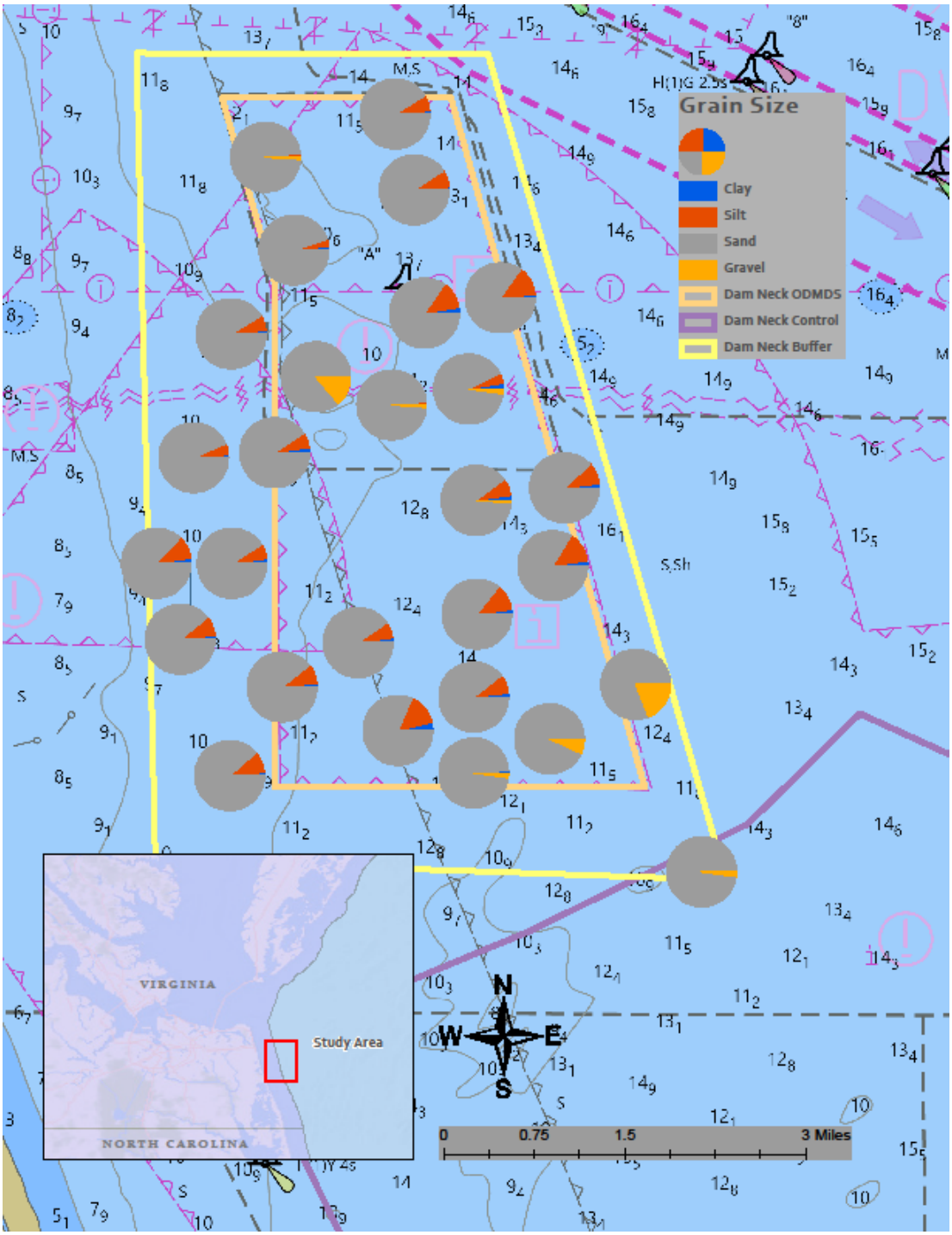


Figure 4: Sediment grain size distribution within the Dam Neck ODMDS.

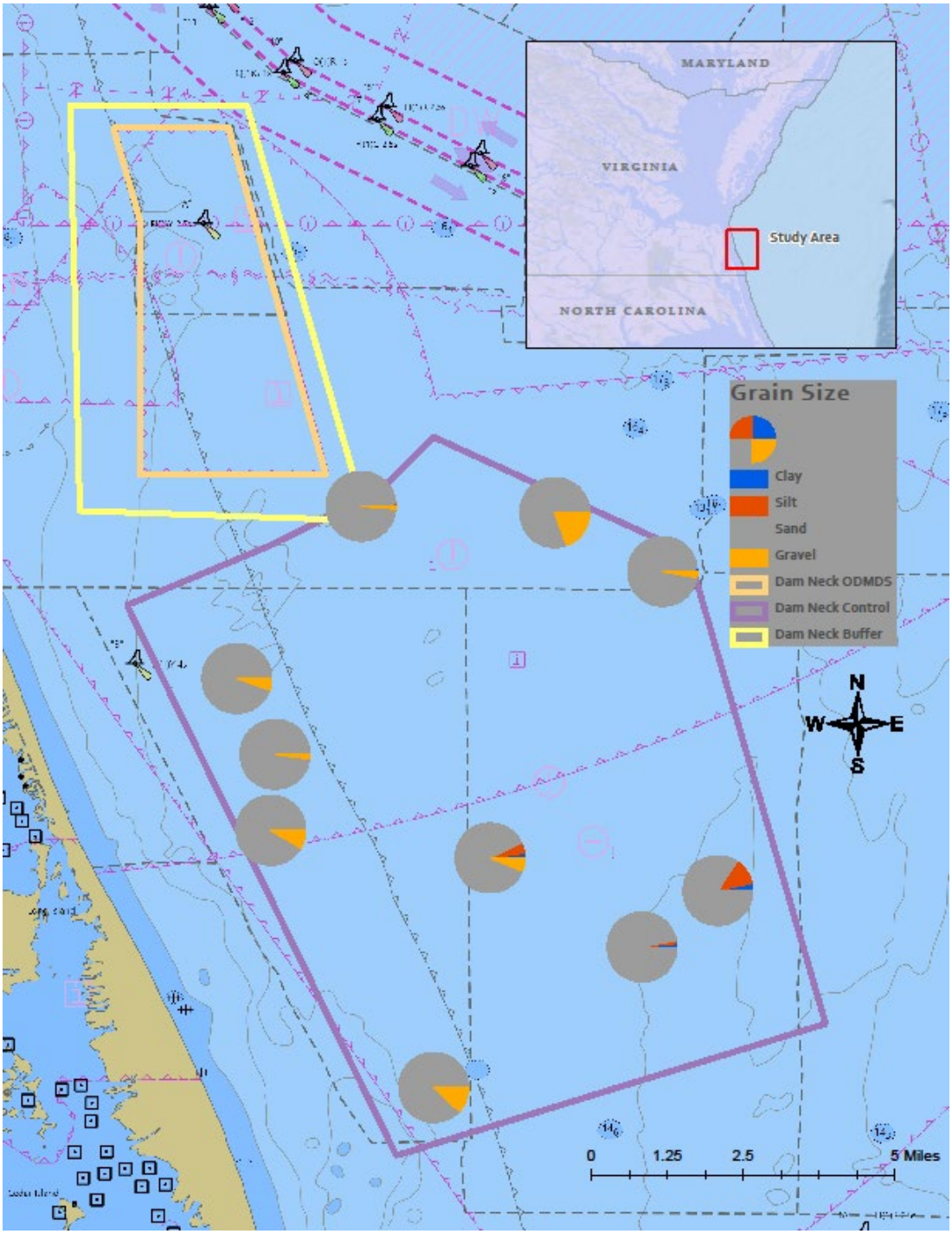


Figure 5: Sediment grain size distribution within the Dam Neck ODMDS reference area.

EPA found that all detected concentrations of all contaminants were below concentrations where effects of toxicity are known to occur. Given the low concentrations at which the sediment chemistry compounds were detected in samples collected during this survey, Region 3 does not anticipate the presence of the detected contaminants to pose any significant potential for environmental impacts.

3.2.3 Conclusions and Recommended Management Actions

The data and information collected from this survey demonstrated that dredged material disposal activities to date have resulted in little change to the physical and chemical characteristics of the Dam Neck ODMDS. The results from the 2018 survey confirm that environmentally acceptable conditions, as outlined in the SMMP, are being met at the Dam Neck ODMDS; while no modifications to the SMMP are necessary at this time, the information collected during Region 3's survey will inform the next update of the SMMP for this site.

Region 3 will use the bathymetric and sediment information collected during this survey to provide a baseline for comparison as site use increases significantly due to upcoming navigation channel deepening projects. During future surveys, Region 3 would like to collect additional benthic biological samples to document any changes to the area as a result of increased dredged material disposal and ensure that no adverse impacts are occurring to the marine aquatic environment.

3.3 Region 4 – Jacksonville Ocean Dredged Material Disposal Site

3.3.1 Background

The Jacksonville ODMDS is located approximately 5 nmi southeast of the mouth of the St. Johns River, along the east coast of Florida. Dredged material from Mayport Naval Station and the Jacksonville entrance channel and harbor is disposed at this site. Areas within the vicinity of the Jacksonville ODMDS have historically been used for the ocean disposal of dredged material since 1952. After the passage of the MPRSA, EPA used the Jacksonville ODMDS as an interim site before designating it permanently in 1983. The 1983 Jacksonville ODMDS measured 1 nmi^2 in area; however, in 2015 the ODMDS was expanded to 4.56 nmi^2.

After the site expansion was completed and to manage the disposal of dredged material at the Jacksonville ODMDS, Region 4 divided the site into four disposal zones based on sediment origin and type. Zone A, located at the northernmost section of the site, encompasses the original 1 nmi^2 and is restricted to having no more than 1 mcy of dredged material from Mayport Naval Station disposed of there annually. The segments along the western boundary of the site are disposal Zone B and are limited to disposals of silty and other fine-grained material. Zone C, where only sandy material can be disposed, is comprised of the segments in the center quadrant of the ODMDS. The segments along the eastern boundary of the ODMDS, disposal Zone D, are utilized for the disposal of rock and boulder material (Figure 6). Since 2009, over 5 mcy of dredged material has been disposed of at the Jacksonville ODMDS from a variety of projects, including maintenance dredging of Jacksonville Federal Navigation Channel and Mayport Naval Station, and new work dredging from the Jacksonville Harbor Expansion Project. EPA last surveyed the Jacksonville ODMDS in 2009, prior to the site's expansion.

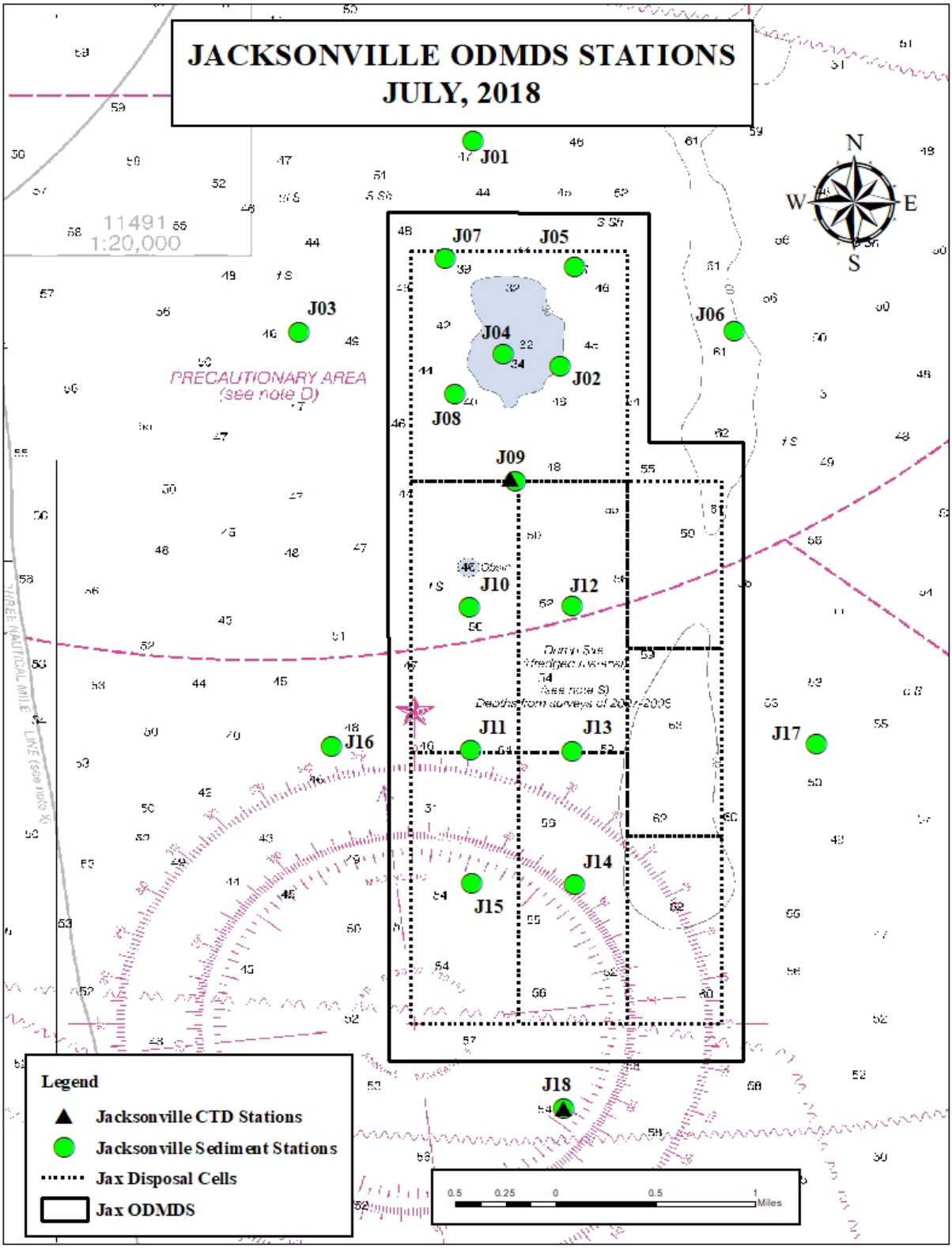


Figure 6: Disposal zones and sampling stations within and outside of the boundaries of the Jacksonville ODMDS. The northernmost section of the ODMDS is disposal zone A; zone B is made up of the

segments along the western boundary of the site, zone C is made of the segments in the center quadrant of the ODMDS, and zone D consists of the segments along the eastern boundary of the ODMDS.

3.3.2 Survey Objectives, Activities, and Findings

In July of 2018, Region 4 conducted a survey of the Jacksonville ODMDS aboard the R/V *Savannah*. This was the first survey completed at the site since its expansion in 2015. Region 4's primary objective was to collect sediment, biological, and water quality data to conduct a routine trend assessment of the area and ensure that disposal activities are not causing adverse impacts to the marine environment. Pursuant to 40 CFR § 228.13, the purpose of a trend assessment survey is to determine the physical, chemical, geological, and biological structure of an existing disposal site at the time of the survey and assess how those parameters change over time. The information collected during trend assessment surveys is also used to evaluate the efficacy of the current SMMP.

During this survey, Region 4 collected benthic (sediment and biological) samples from 18 stations: 12 within the ODMDS and six outside of the site boundaries. Region scientists analyzed the sediment samples for grain size distribution and sediment chemistry, including TOC, total solids, and concentrations of metals, SVOCs, PCBs, pesticides, and PAHs. They analyzed biological samples to determine macroinvertebrate assemblages, including taxa richness, diversity, and evenness. Additionally, Region 4 collected water column profiles from two stations (J09 and J18)—one within the ODMDS and one outside of the site boundaries. To collect both sediment and biological samples, Region 4 used a 0.08 m^2 Double Young Grab (two 0.04 m^2 grabs in one frame); the vessel's Conductivity, Temperature, and Depth (CTD) probe was used to collect water column profiles. Region 4 scientists compared the physical, chemical, and biological results among stations within the ODMDS and to stations outside of the ODMDS. They also compared sediment chemistry results against sediment quality guidelines (SQGs) and historical concentrations at the ODMDS.

Results from the sediment grain size analyses showed that sediment grain sizes were relatively consistent within and outside of the ODMDS, with most samples consisting primarily of fine and medium sand. Sand made up 90.2% and 95.0% of the sediment samples taken from within and outside the site, respectively. Samples collected from Zone A were the most variable and largely consisted of medium and fine sands with small percentages of silts, clays, coarse sands, and gravels. The sediment samples collected from Zones B, C, and D were comprised primarily of fine sands, ranging from 83.4% to 91.3%. Medium sand made up less than 5% of samples taken from within Zones B, C, and D, coarse sand made up less than 1%, and fines (silts and clays) ranged from 6.9 to 15.6%. No gravel was found in sampling stations in Zones B, C, and D. With the exception of station J06, all of the sampling stations outside the disposal area consisted primarily of fine sand, ranging from 83.1 to 93.4%. Station J06 was composed primarily of medium sand (67.4%), with the remainder being mostly fine sand (28.3%). The coarse sand and gravel components at all stations outside of the site were less than or equal to 0.6%. Sediment grain size distribution was very similar inside versus outside the ODMDS suggesting that conditions across the survey area are relatively consistent and that disposal activities are not altering grain size conditions within the site compared to conditions in the surrounding area where no dredged material has been disposed.

The Region's sediment chemistry results showed that all organic and inorganic analyte concentrations were either too low to be detected or below the TEL and PEL toxicity thresholds listed in the NOAA Screening Quick Reference Tables (SQUIRT). All metals were either below detectable levels or measured in concentrations below the TEL value listed in the NOAA

SQUIRT and concentrations inside the ODMDS were similar to background concentrations outside the ODMDS. Concentrations of SVOCs were too low to be detected or below the TEL value listed in the SQUIRT. Concentrations of PCBs, pesticides, and PAHs were also too low to be detected in the sediment. Station J03, located outside the ODMDS, had detectable low levels of PAHs, anthracene, fluoranthene, phenanthrene, and pyrene. Station J02, located on the disposal mound in Zone A, had detectable low levels of PAHs fluoranthene and pyrene; however, in comparing these concentrations to those listed in the SQUIRT, the PAHs were not present in concentrations that caused concern.

A total of 2,403 benthic macroinvertebrate organisms were identified from samples taken from within the ODMDS and 796 organisms were identified from samples taken from outside the ODMDS. Annelids were the dominant taxa group within the original ODMDS (current Zone A) and at all stations outside the site. Stations J10, J12, J13, and J14 (within the recently expanded portion of the ODMDS) were dominated by mollusks, and stations J11 and J15 were co-dominated by annelids and mollusks. Taxa density was significantly higher inside the ODMDS (mean = 2,503 organisms per 1 m^2) versus outside the ODMDS (mean = 1,658 organisms per 1 m^2). There was no significant difference in taxa richness, diversity, or evenness between samples collected from stations inside and outside of the ODMDS. Higher taxa density is generally seen as an indicator of a healthy community. The benthic results from the 2018 survey suggest that disposal activities are not causing adverse impacts to the invertebrate populations within the Jacksonville ODMDS.

The benthic macroinvertebrate results from this 2018 survey were compared to the macroinvertebrate results from the 2009 survey. During the 2009 survey, EPA collected samples using only a single 0.04 m^2 Young Grab, whereas a 0.08 m^2 Double Young Grab (two 0.04 m^2 grabs in one frame) was used in 2018. When comparing the macroinvertebrate samples using the single 0.04 m^2 sample size only, there was no significant difference in taxa richness between the two survey years (Vittor, Barry and Assoc., 2009 and 2019). However, when comparing the results using doubled sample sizes (0.08 m^2), Region 4 saw a mean increase in taxa richness of approximately 35% inside the ODMDS and a mean increase of approximately 33% outside the ODMDS between 2009 and 2018. Taxa density was significantly higher inside of the ODMDS in 2018 when compared to the results from the 2009 survey, even when accounting for the increased number of stations in the expanded portion of the site. However, taxa density outside of the ODMDS was not significantly different between 2009 and 2018. Because taxa density is normalized to 1 m^2, increasing the sample area did not significantly increase the taxa density measurements. Higher taxa richness and density are generally seen as indicators of a healthy community. Similar to the comparison of benthic results from inside versus outside of the site in 2018, when comparing benthic data collected in 2018 to previous survey results, the comparison suggests that disposal activities are not causing lasting impacts on the benthic community and invertebrate populations within the Jacksonville ODMDS have recovered from any disturbances related to disposal activities.

Region 4 collected water column profiles using a CTD probe to measure water depth, temperature, specific conductivity–which indicates salinity–and dissolved oxygen at stations J09, inside the ODMDS, and J18, outside the ODMDS. These *in situ* water column profiles can be used to describe the physical characteristics of the water and serve as a foundation for understanding the local marine environment. By comparing the water column profile from within the disposal site to the profile measured outside of the site, Region 4 can identify anomalies indicative of impacts from disposal activities. The water column profiles at each location were nearly identical to each other except for the salinity and dissolved oxygen concentrations measured at station J09. At the time of sampling, the tidal exchange line from the St. Johns

River Inlet was observed from the surface of the water. This was a distinct line where clear ocean water was observed on one side and turbid river water was observed on the other. This line that resulted between the two water masses is observed in the water column data (Figure 7) with lower salinity and dissolved oxygen concentrations from the surface down to approximately 3 m. Apart from this phenomenon, both stations are almost identical in nature and were relatively well-mixed from the surface of the water to the bottom.

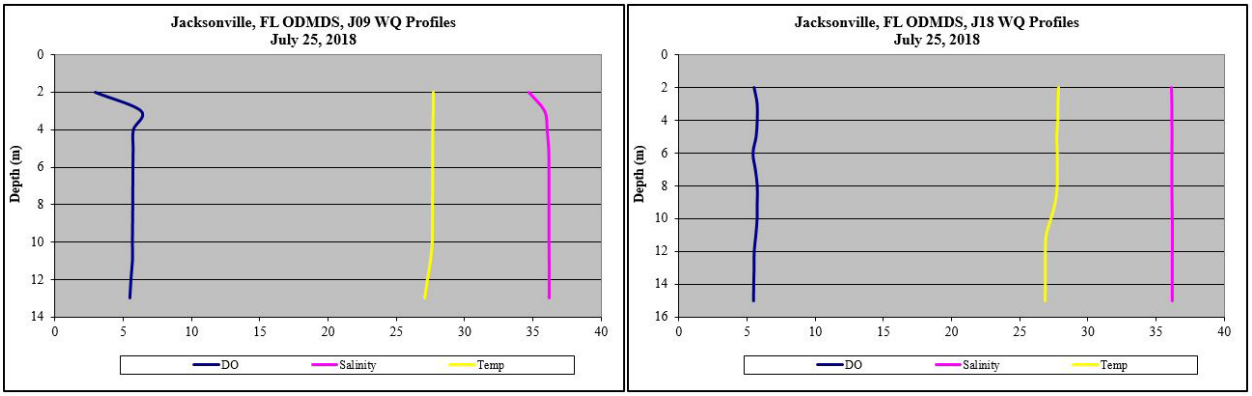


Figure 7: Water quality profiles showing temperature (yellow), salinity (pink), and dissolved oxygen (blue) concentrations measured from stations J09 and J18 at the Jacksonville ODMDS.

3.3.3 Conclusions and Recommended Management Actions

The data and information collected from this survey show that dredged material disposal activities from 2009 through 2018 have resulted in little change to the physical, chemical, and biological characteristics of the Jacksonville ODMDS. The results from the 2018 survey confirm that environmentally acceptable conditions, as outlined in the SMMP, are being met at the Jacksonville ODMDS and that pre-disposal testing and evaluation of dredged material has been effective at preventing any contaminated material from being disposed of at the site. While this information will be incorporated into the next SMMP update, no immediate site management modifications are necessary at this time.

Region 4 intends to continue to routinely monitor the chemical, physical, and biological parameters inside and surrounding the ODMDS to document any changes to the area, ensure that short-term anticipated impacts stay within the boundaries of the ODMDS, and ensure that disposal activities are not causing lasting adverse impacts. Region 4 also plans to conduct a similar study after the Jacksonville Harbor Expansion Project is completed.

3.4 Region 9 – LA-5, San Diego Ocean Dredged Material Disposal Site

3.4.1 Background

EPA designated the LA-5 (San Diego) ODMDS in 1992. LA-5 is located on the continental shelf approximately 7 mi (11.3 km) southwest of Point Loma, CA, at depths ranging from 460 - 660 ft (145 - 200 m). This circular site has an overall radius of 3000 ft (915 m). To ensure the dredged materials being disposed of at the site stay within the site boundaries, Region 9 manages the site by identifying a Surface Disposal Zone (SDZ) where vessels must be located when disposing of dredged materials. This SDZ is centered on the same coordinates as the ODMDS but has a smaller radius of 1,000 ft (305 m).

In the early 2000s, seven mcy of sand were disposed of at the LA-5 ODMDS; this disposal activity created a mound feature on the seafloor in the center of the site. In 2016 and 2017, an additional 1.4 mcy were disposed of at the LA-5 ODMDS. The bulk of the material disposed of in 2016 originated from two large projects and included a large volume of hard-pack formation material (e.g., mudstone). Prior to that disposal, EPA requested that the disposal vessel attempt to spread the hard-pack material closer to the perimeter of the LA-5 ODMDS, as opposed to dumping it directly in the site center, in an effort to distribute the material over a larger area and not add to the existing mound or create a new mound.

3.4.2 Survey Objectives, Activities, and Findings

During this survey, Region 9 set out to collect physical, chemical, and biological data from the LA-5 ODMDS and surrounding area to assess the state of the seafloor and inform site management and any necessary updates to the site's SMMP. These efforts were completed during two different surveys: a bathymetric survey and a benthic sampling survey. The bathymetric survey was conducted in July aboard a small private vessel. During this portion of the survey Region 9 scientists used an MBES to collect high resolution bathymetric and backscatter data from a 30 nmi^2 study area. The study area was centered around the LA-5 ODMDS and included a legacy disposal site, and an area shoreward of the site where potential short dumps may have occurred. In addition to providing high-resolution measurements of the contours of the seafloor, Region 9 scientists used the results from the MBES survey to refine the station locations to be sampled during the benthic sampling survey.

Region 9 conducted the benthic sampling survey in the same study area in September 2018 aboard M/V *Bold Horizon*. During the benthic survey, EPA scientists collected sediment profile images (SPI) and plan view images (PVI) from 95 stations and sediment and biological samples from 32 and 24 stations, respectively, along radial transects extending up to 4.7 mi (7.5 km) from the center of the ODMDS. This sampling approach allowed for samples to be collected from inside and outside of the LA-5 ODMDS and encompassed the majority of the same area as the bathymetric survey (Figure 8). Region 9 scientists used SPI and PVI to map the dredged material footprint and determine infaunal succession stages, which are indicators of how the benthic ecosystem is recovering from disturbances related to disposal activity. Additionally, they used PVIs to identify benthic features in the vicinity of where SPIs are taken. Region 9 analyzed sediment samples for grain size and concentrations of metals, dioxins, pesticides, organotins, PAHs, and PCBs. They analyzed benthic biological samples to determine several community metrics, including taxa abundance, density (per square meter), richness, diversity, and evenness.

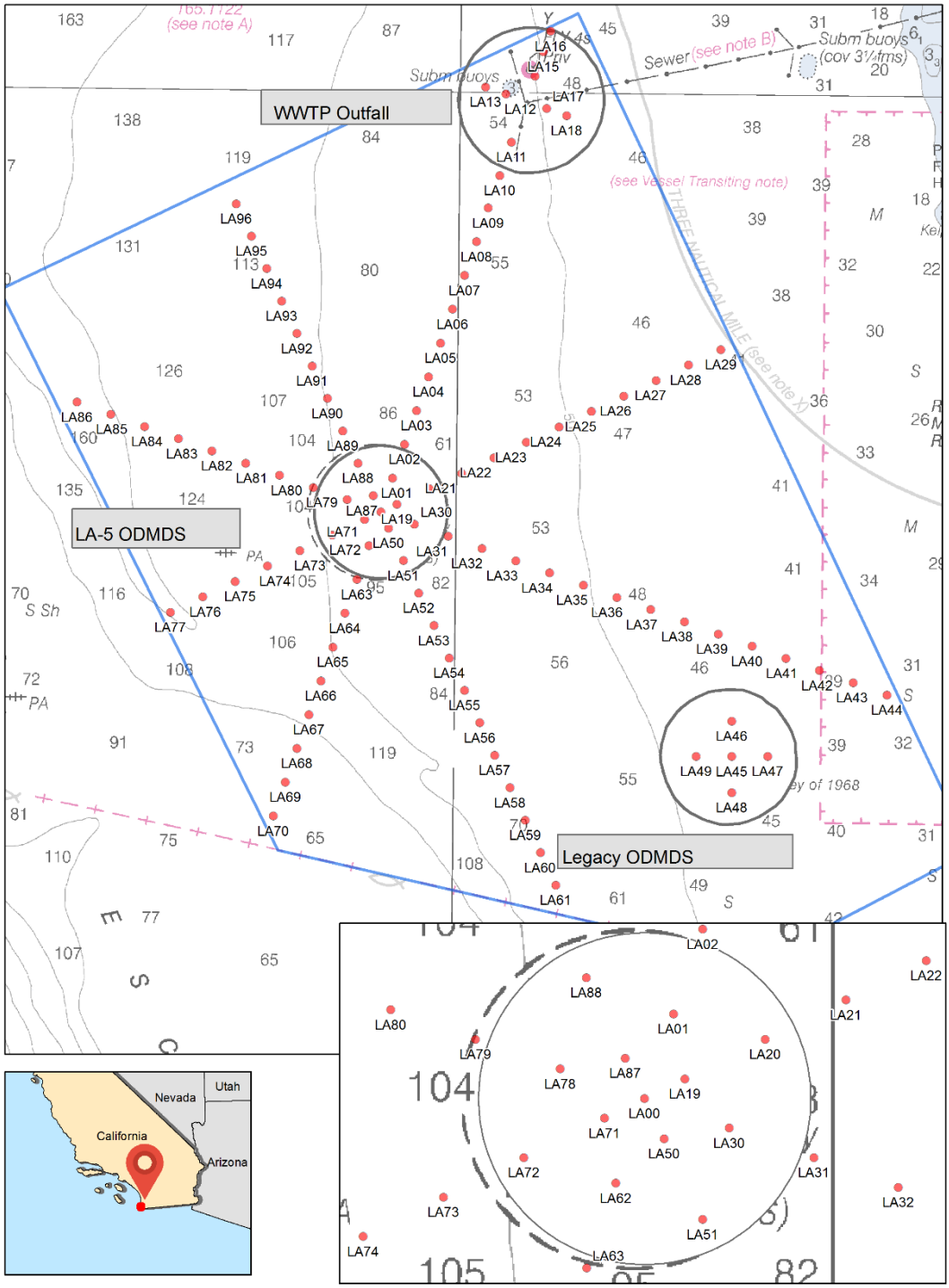


Figure 8: MBES survey area (outlined by a blue rectangle), and benthic sampling stations (red dots) at the LA-5 ODMDS.

Sediment grain size distribution was similar throughout the survey area. There was a slightly higher proportion of gravel outside the LA-5 ODMDS, while there were higher proportions of sand, silt, and clay within the ODMDS. Overall, there was not a significant difference in substrate composition throughout the survey area. Consistent sediment conditions across the study area are indicative that disposal activities are not altering grain size conditions within the

site compared to conditions in the surrounding area where no dredged material has been disposed.

Region 9 compared their sediment chemistry results to effects range low (ER-L) and effects range median (ER-M) thresholds, which are measures of toxicity in marine sediments. Adverse effects are rarely seen in sediments with chemical concentrations below the ER-L. Adverse effects are generally observed in sediments with chemical concentrations above the ER-M. Except copper and total PCBs, all organic and inorganic analyte concentrations within the ODMDS were below the ER-L threshold. Concentrations of copper and total PCBs inside the boundaries of the LA-5 ODMDS were measured in concentrations just above or equal to the ER-L, but were well below the ER-Ms. In contrast, several stations outside the ODMDS boundaries exceeded the ER-L for copper, mercury, nickel, pesticides, PAHs, and PCBs. The concentrations of these chemicals were below the ER-M. Given the concentrations at which the sediment chemistry compounds were detected in samples collected during this survey, Region 9 does not anticipate their presence to pose any significant potential for environmental impacts.

Results from the benthic biological analyses showed that benthic community structure indices inside and outside of the LA-5 ODMDS were generally similar. Infaunal and epifaunal organisms were present throughout the survey area, and the communities were determined to be robust. More specifically, all the stations where sediments were collected were identified as being in Stage 2, Stage 3, or Stage 2 on 3 successional stages. This suggests that disposal activities are not causing lasting impacts on the benthic community and invertebrate populations within the LA-5 ODMDS have recovered from any disturbances related to disposal activities.

3.4.3 Conclusions and Recommended Management Actions

Based on the physical, chemical, and biological data collected during this survey, Region 9 concluded that no long-term adverse impacts resulted from dredged material disposal at the LA-5 ODMDS or in the surrounding area. The copper, mercury, nickel, pesticides, PAHs, and PCBs concentrations measured outside of the LA-5 ODMDS that exceeded the ER-L were not associated with dredged material disposal activities and were not elevated enough to be associated with toxicity to the benthic community. Considering all the results from the LA-5 ODMDS survey, Region 9 concluded that the LA-5 ODMDS is performing as anticipated. While this information will be incorporated into the next SMMP update, no immediate site management modifications are necessary at this time.

Region 9 intends to continue to routinely monitor the chemical, physical, and biological parameters inside and surrounding the ODMDS to document any changes to the area and ensure that short-term anticipated impacts stay within the boundaries of the ODMDS and that disposal activities are not causing lasting adverse impacts.

4.0 Next Steps

EPA conducts oceanographic surveys to monitor the impacts of regulated dumping at ocean disposal sites and to inform management decisions in accordance with EPA roles and responsibilities under the MPRSA and the ocean dumping regulations. EPA monitors ocean disposal sites 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 sites, and to ensure that terms of ocean dumping permits are met.

Based on the results of these FY 2018 ocean disposal site surveys:

- EPA found that environmentally acceptable conditions were met at each of the surveyed ODMDSs. The data collected confirm that site management practices are working well and will inform site management as well as future updates to the SMMP for each site. Permitted disposal of dredged material under the MPRSA can continue at these sites.
- EPA also used the data collected during these surveys to:
    - Identify locations within the Historic Area Remediation Site where placing additional remediation material will continue to isolate the impacts of historic dumping and improve site conditions;
    - Inform future sampling events at the Historic Area Remediation Site (HARS) to include 1) collecting numerous sediment samples from each station to capture the variability of the physical and chemical attributes within the site and 2) collecting sediment and worm tissues samples at several locations outside of the site to compare background contaminant concentrations from the surrounding environment to concentrations measured within the site. EPA designated HARS as an ocean remediation site. Remediation material placed over materials historically disposed of in the area renders toxic sediments unavailable to marine organisms and prevents further exposure to contaminated sediments. Regular sampling within and around the HARS is necessary to ensure that HARS-specific remediation targets are being achieved.
    - Inform future surveys at the Dam Neck ODMDS, including incorporating additional benthic biological samples to assess impacts at the site after the disposal of large volumes of dredged material associated with anticipated deepening projects; and
    - Inform a future trend assessment study at the Jacksonville ODMDS after the Jacksonville Harbor Expansion Project is completed.

5.0 Acknowledgements

This report is based on the monitoring surveys conducted, analyses performed, and conclusions drawn by EPA Regional offices 2, 3, 4, and 9 during FY 2018. This report was developed with the support of Ocean Dumping staff from EPA Headquarters and all coastal Regional offices.

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