APPENDIX A
DESIGN CRITERIA REPORT
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

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Amended
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LIST OF ACRONYMS AND ABBREVIATIONS

BMP	best management practice
CAO	Cleanup and Abatement Order
City	City of San Diego
cm	centimeter
cy	cubic yard
DCR	Design Criteria Report
EIR	Environmental Impact Report
MMRP	Mitigation Monitoring and Reporting Program
QAPP	Quality Assurance Project Plan
Port	Unified Port of San Diego
RAP	Remedial Action Plan
RMP	Remediation Monitoring Plan
SDG&E	San Diego Gas & Electric
Shipyard Sediment Site	San Diego Shipyard Sediment Site
TUOP	Tidelands Use and Occupancy Permit
Water Board	San Diego Regional Water Quality Control Board

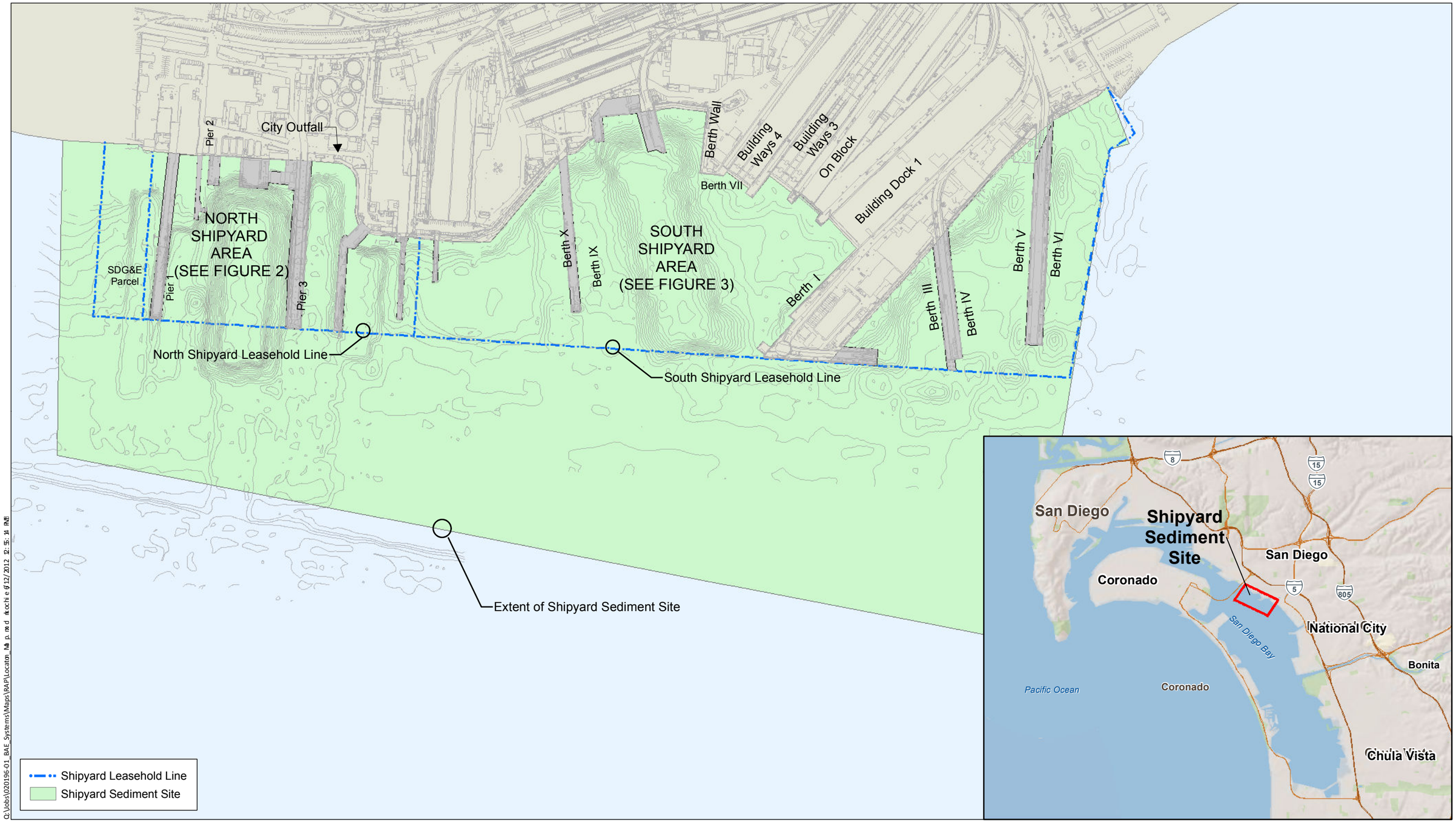
1 INTRODUCTION

This Design Criteria Report (DCR) is one component of the Remedial Action Plan (RAP) for the San Diego Shipyard Sediment Site (Shipyard Sediment Site), comprised of the North Shipyard and South Shipyard (Figure 1). The RAP is a compilation of several interrelated documents that are intended to create a detailed framework for execution of the remedial action, while providing, at a minimum, all informational elements mandated by Directive B.1 of Cleanup and Abatement Order No. R9-2012-0024 (CAO; Water Board 2012a). This DCR provides the technical parameters upon which the remedial design will be based and describes technical criteria for design, construction, and developing appropriate design elements to ensure the work is successfully completed. This report is organized as follows:

- **Section 1.** Introduction
- **Section 2.** Dredging Design
- **Section 3.** Sediment Management and Disposal
- **Section 4.** Clean Layer Placement Under Piers
- **Section 5.** Structural Protection
- **Section 6.** Environmental Protection
- **Section 7.** Schedule and Coordination
- **Section 8.** References

For each component of the remedial design (Dredging Design, Sediment Management and Disposal, Clean Layer Placement Under Piers, Structural Protection and Environmental Protection), the particular Section of the DCR addressing that component details each of the subelements called for by the CAO Directive B.1, as applicable. These subelements are:

(i) Waste characterization
(ii) Volume and types of each medium requiring removal or containment
(iii) Removal or containment schemes and rates
(iv) Required qualities of waste streams
(v) Performance standards
(vi) Technical factors of importance to the design, construction, and implementation of the selected remedy



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Feet
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Figure 1
Site Map
San Diego Shipyard Sediment Site

For ease of reference, this DCR also includes three other required elements of the RAP (per CAO Directives B.1.g, B.1.h, and B.1.n) that are not specifically required to be included within the DCR but have been included here to enhance the comprehensiveness of the RAP:

(i) Wastes generated
(ii) Pilot testing
(iii) Contingencies

Table 1 notes all CAO requirements that this document fulfills.

Table 1
Elements Required by the CAO

Required Element	Completed	Location within DCR
Design Criteria Report (B.1.i)		
I. Waste characterization	✓	• For Dredging Design: Sections 2.2.2, 2.2.3, and 2.4.2 • For Sediment Management and Disposal: Section 3.4.2
II. Volume and types of each medium requiring removal or containment	✓	• For Dredging Design: Sections 2.4.1 and 2.4.2 • For Sediment Management and Disposal: Sections 3.4.1 and 3.4.2 • For Clean Layer Placement: Sections 4.3.1 • For Structural Protection: Sections 5.3.1
III. Removal or containment schemes and rates	✓	• For Dredging Design: Sections 2.4.1 and 2.4.2 • For Sediment Management and Disposal: Sections 3.4.1 and 3.4.2
IV. Required qualities of waste streams (i.e., input and output rates to stockpiles, influent and effluent qualities of any liquid waste streams such as dredge spoil return water, potential air emissions, and so forth)	✓	• For Dredging Design: Sections 2.4.1 and 2.4.2 • For Sediment Management and Disposal: Sections 3.4.1 and 3.4.2 • For Clean Layer Placement: Sections 4.3.1 • For Structural Protection: Sections 5.3.1
V. Performance standards	✓	• For Dredging Design: Section 2.5 • For Sediment Management and Disposal: Sections 3.5 • For Clean Layer Placement: Sections 4.4 • For Structural Protection: Sections 5.4 • For Environmental Protection: Section 6.2 *Further detail provided in Sections 5.1.1, 5.2.1, 5.3.1, and 5.4.1 of the QAPP (Appendix B)*

Required Element	Completed	Location within DCR
VI. Compliance with applicable local, state and federal regulations	✓	• Section 6 *Further details provided in Sections 4.6 and 6 of the RAP and Sections 2.2.4 and 4 of the RMP (Appendix C)*
VII. Technical factors of importance to the design, construction, and implementation of the selected remedy including use of currently accepted environmental control measures, constructability of the design, and use of currently acceptable construction practices and techniques	✓	• For Dredging Design: Sections 2.2, 2.2.2, 2.2.3 • For Sediment Management and Disposal: Sections 3.1, 3.2, 3.3 • For Clean Layer Placement: Sections 4.1, 4.2 • For Structural Protection: Sections 5.1, 5.2 • For Environmental Protection: Section 6
Wastes Generated (B.1.g)	✓	• For Dredging Design: Section 2.4.2 • For Sediment Management and Disposal: Sections 3.4.2
Pilot Testing (B.1.h)	✓	• Section 3.4.3
Contingencies (B.1.n)	✓	• Section 2.3

2 DREDGING DESIGN

2.1 Design Criteria

Required Element	Completed
Design Criteria Report (B.1.i)	
I. Waste characterization	✓
II. Volume and types of each medium requiring removal or containment	✓
III. Removal or containment schemes and rates	✓
IV. Required qualities of waste streams	✓
V. Performance standards	✓
VI. Compliance with applicable local, state and federal regulations	
VII. Technical factors of importance to the design, construction, and implementation of the selected remedy	✓
Wastes Generated (B.1.g)	✓
Pilot Testing (B.1.h)	
Contingencies (B.1.n)	✓

The proposed remedial action identified in the CAO requires removing chemically impacted sediments from the remedial footprint to concentrations less than 120 percent of the post-remedial dredge area concentrations (defined in Table A.2.a of the CAO).

The remedial footprint targets dredging from 23 projected areas (Figure 2). The vertical depth of cleanup in each area was determined by identifying the required cleanup depth, or the maximum depth of concentration exceedances, in that area and rounding it to the next deeper foot. An additional foot of volume was anticipated as a result of inherent inaccuracies in the dredging process. The assumed horizontal extents of each area were based on Thiessen polygons. Table 2 summarizes the projected dredging depths and volumes associated with each of the areas to be dredged.

Table 2
Estimated Design Depths and Dredge Volumes

Cleanup Area	Depth of Measured Chemical Exceedance (feet)	Estimated Minimum Required Dredging Depth (feet)[1]	Approximate Volume of Dredged Material (cy)[2]
NA06	>3.9	5	11,200
NA09	>8	9	10,900
NA15	>0.06 (>2 cm)	7[3]	7,100
NA17	4	5	8,200
NA19	>5.8	7	9,500
SW01	4	4	6,200
SW02	4.9	5	8,200
SW04	4.1	5	3,600
SW05	>0.06 (>2 cm)	3[4]	4,200
SW08	6	6	2,400

Cleanup Area	Depth of Measured Chemical Exceedance (feet)	Estimated Minimum Required Dredging Depth (feet)[1]	Approximate Volume of Dredged Material (cy)[2]
SW09	>0.06 (>2 cm)	3[4]	16,400
SW10	2	3	
SW13	>0.06 (>2 cm)	3[4]	
SW14	>0.06 (>2 cm)	3[4]	
SW16	>0.06 (>2 cm)	3[4]	
SW17	6.2	7	13,900
SW20	2.4	3	9,400
SW21	>0.06 (>2 cm)	3[4]	
SW22	>0.06 (>2 cm)	3[4]	
SW23	>0.06 (>2 cm)	3[4]	
SW24	3	3	
SW27	4.25	5	17,200
SW28	<5.3	6	12,100
SW29	2	3	2,900
Estimated Approximate Total Volume			**143,400**

Notes:
cm = centimeters
cy = cubic yards
1 Not Including additional 1 foot of allowable overdredge
2 Including additional 1 foot of allowable overdredge
3 Dredging depth estimated based on the anticipated depths requiring cleanup in adjacent areas.
4 Three-foot dredging depth reflects a practical minimum amount of dredging for areas where only the surficial 0.06 foot was sampled.

The volumes and dredging cleanup areas presented in Table 2 will be refined during the design process, as additional site-specific information becomes available, such as calculated dredging offsets from structures and inclination angles of dredged side slopes. Further design development may lead to refinement of these volumes, and post-dredge monitoring may lead to removal of additional sediments from specific areas, which would increase overall dredge volumes.

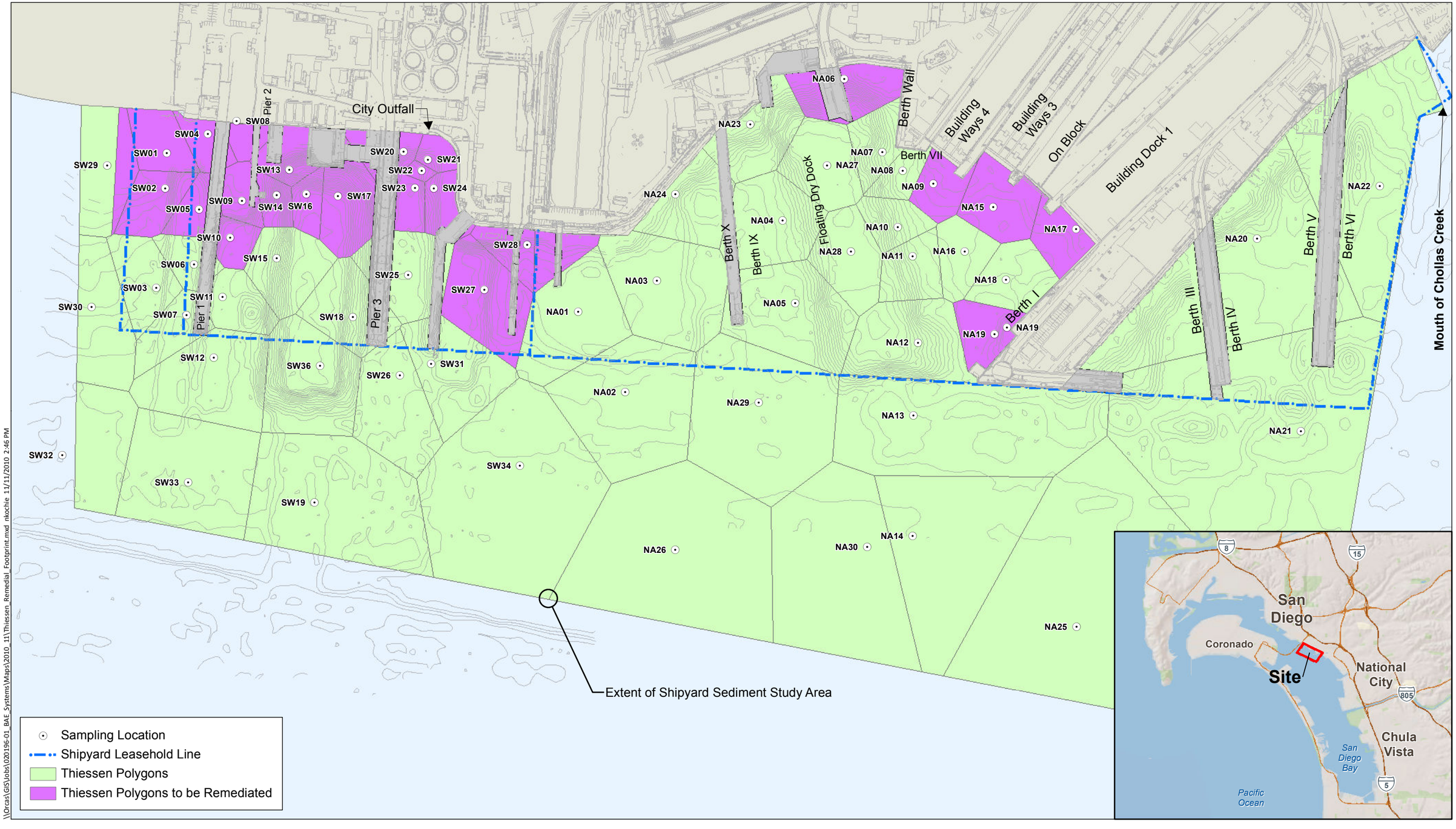

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Figure 2
Thiessen Polygon and Required Cleanup Areas
San Diego Shipyard Sediment Site

2.2 Dredging Design Process

The development of the dredging plan must account for technical feasibility and site restrictions that may affect the ability to meet all cleanup objectives. Important design considerations include sediment properties, physical constraints, equipment selection, and dredging performance criteria. It is expected that all dredged sediment will be dredged via mechanical means, dewatered, transported overland, and disposed of at one or more off-site landfills. It is further assumed that sediment is not suitable for open-ocean disposal and that there is not suitable space at the Shipyard Sediment Site for confined disposal of sediments.

2.2.1 Pre-Design Site Surveys

A series of investigations and surveys will be conducted prior to beginning the dredging design to better understand the surrounding site and characteristics of the dredge material. Having a thorough understanding of the remedial footprint and surrounding site reduces the risk of unknown conditions being encountered during construction. At a minimum, the following investigation and surveys must be conducted at the beginning stages of the design process:

- **Site topographic survey.** This survey will inventory and delineate the exact locations of existing facilities, structures, shoreline features, utilities, and other noteworthy site features that are located within and adjacent to the remedial footprint.
- **Bathymetric survey.** A multi-beam survey will delineate the surface mudline elevations within the cleanup areas. The extents of the survey will cover the entire remedial footprint, including the surrounding areas within 50 feet of the anticipated top of slope. In areas where survey coverage is obstructed or limited (e.g., under piers and along the shoreline slope), the survey will be supplemented with leadline depth soundings.
- **Debris survey.** A survey will identify submerged features that may be present within the remedial footprint that will require special handling and removal as well as quantify the amount of debris that can be expected during dredging. This survey can be performed by either side-scan sonar, magnetometer equipment, or by divers. The survey extents will cover the entire remedial footprint.

2.2.2 Waste Characterization and Pre-Design Evaluation of Sediment Properties

Project design must be preceded by a physical characterization program for site sediments, because this will be a key step in completing dredge design and finalizing disposal alternatives. An additional round of sediment cores will be obtained from within the areas targeted for dredging where additional information is desired to define the remedial depth. Each core will be logged with complete physical descriptions, composited, and analyzed for bulk chemistry and leachability (as required by landfill operators).

This sampling event is also intended to provide further detail on sediment physical characteristics, which will be necessary to determine dredge design details such as side slopes, overdredge allowances, and equipment selection. The additional characterization will not be used to change the boundaries of the remedial footprint but instead will enable details of the design and bidding process (side slopes, overdredge allowances, and equipment selection) to be finalized. It will also be used to obtain a conditional determination of whether the sediment qualifies for disposal at a local landfill (such as the Otay or Sycamore Landfills in San Diego County) or as California hazardous waste requiring disposal at a more remote regional landfill. This will enable the Project Team to obtain conditional permission for landfill disposal prior to starting the construction process.

It is anticipated that local landfills will require test results from 75 samples to fully represent the planned volume of sediment for disposal (143,400 cy), with each sample obtained by vibracoring to the projected dredge depth. Because open-ocean disposal is not being targeted, no biological or bioassay testing is anticipated.

The Sampling and Analysis Plan (Appendix D) provides further detail on these sampling activities.

2.2.3 Development of Dredging Plan

Once pre-design investigations and surveys have been completed, the findings can be used to aid in the final design of the dredging plan.

In order to create an orderly and systematic dredging plan for a dredging contractor's use, the site remedial footprint will be divided into separate units of dredging, termed sediment management units (SMUs). These SMUs will represent the final project dredging plan and will be defined with the following considerations:

- **Vertical and Horizontal Extents of Cleanup Levels.** The SMUs will be generally identified based on the depth of maximum cleanup level exceedance(s) within each area. The vertical depth and horizontal extents of sediment removal need to achieve targeted cleanup levels in a given area.
- **Constructability.** Because typical dredge widths are between 50 and 80 feet, SMU widths will generally be within this range, or wider. Areas where the mudline is sloping may be identified as separate SMUs to distinguish them from "flat" areas, where dredging methodology would be different.
- **Marine Structures.** Dredging under piers or in other limited access areas, may require different, specialized equipment such as backhoes or divers with a hydraulic suction dredge to remove contaminated sediments in these restricted areas. These considerations will be reflected in the designation of SMUs.
- **Shipyard Operations.** Recognizing that sediment remediation activities must minimize any interruptions to shipyard operations, the delineation of SMUs will consider dredge sequencing. For example, a SMU that lies between a berth and the navigation channel line could be dredged with a vessel in the berth. SMUs that lie beneath existing dry docks may require temporary relocation of the dry docks to permit dredging. By defining SMUs in this manner, a sequencing plan will be more easily established as well as more flexible.
- **Property Ownership.** SMUs may be divided along leasehold and property lines, enabling separation of areas within one leasehold area from those in another.

Figures 3 and 4 present a preliminary, potential layout of SMUs at the site, based on currently known information. The SMU arrangement will be refined as the dredge design process proceeds, via the steps described in this section.

North Shipyard Area

Pier 1

Pier 2

Pier 3

Pier 4
- To be removed prior to remedial action

Pier 5
- To be removed prior to remedial action

Timber Pier
- To be demolished prior to remedial action

SDG&E Parcel

3'

Preliminary Arrangement of Sediment Management Units (SMUs) - Subject to Refinement

SMU Below Overwater Structure

Remedial Footprint

Shipyard Leasehold Line

Thiessen Polygon Boundary

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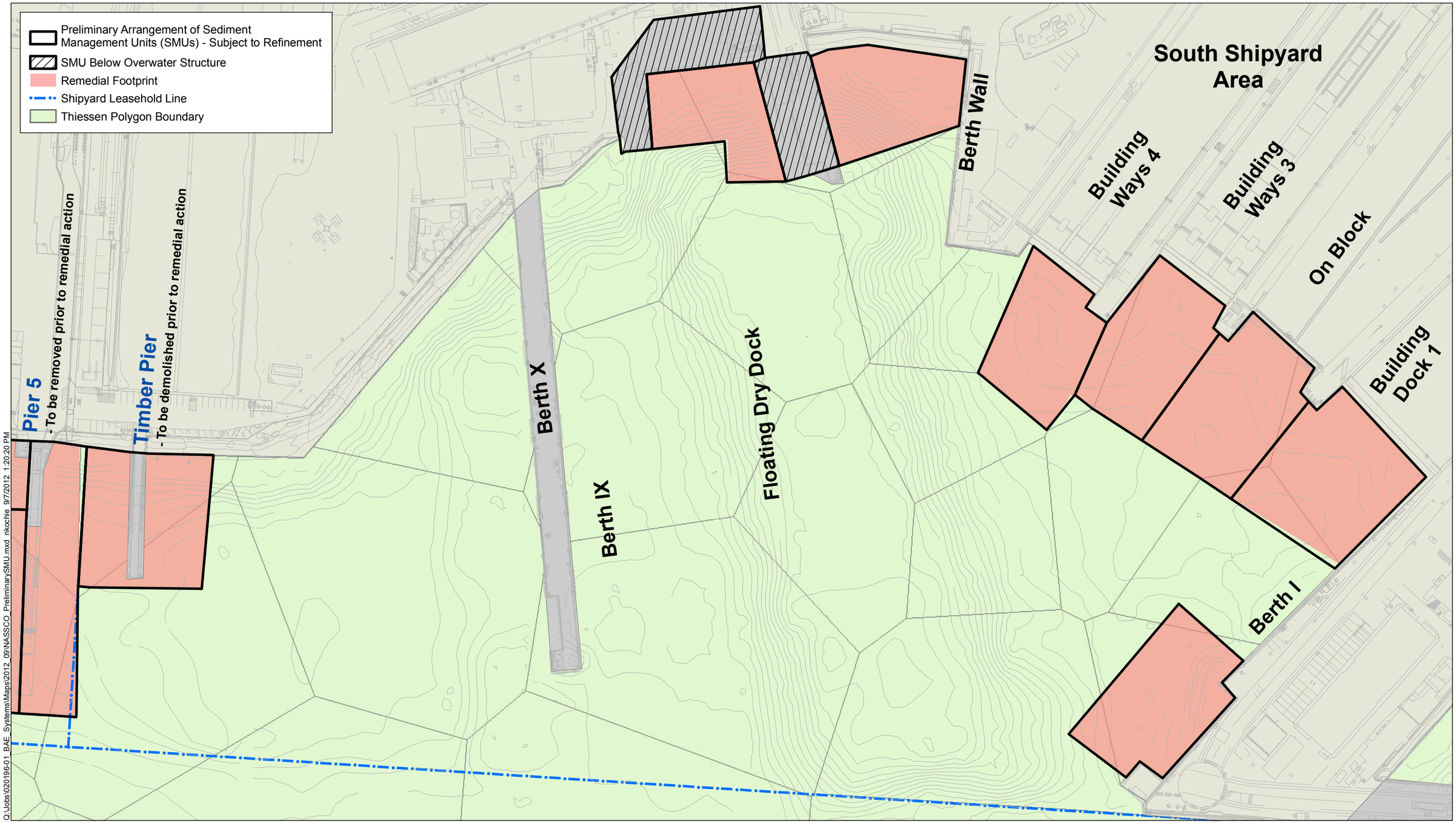
San Diego Shipyard Sediment Site Group

ANCHOR QEA

Feet
0 125 250

Figure 3
North Shipyard Area Remedial Footprint and SMUs
San Diego Shipyard Sediment Site



San Diego Shipyard Sediment Site Group

ANCHOR QEA

Feet
0 125 250

Figure 4
South Shipyard Area Remedial Footprint and SMUs
San Diego Shipyard Sediment Site

The following additional evaluations will be conducted as part of dredging design:

- Assessment of the geotechnical properties of the soils and determine the likely angle of repose of sediments to define dredging side slopes
- Assessment of the strength and stability of the soils and evaluate their possible effects on dredging equipment, effectiveness of sediment removal, and transport and disposal methods
- Identification of physical constraints within the Shipyard Sediment Site that will limit equipment access and mobility
- Identification of existing structures and shoreline features that must be protected throughout the duration of construction activities
- Identification of protective measures to ensure long-term stability of existing structures is maintained after the remedial action is complete, which may be needed in upland portions of the Shipyard Sediment Site as they need to remain operational during the remedial action (see Section 5)
- Identification of the type and amount of debris that can be expected to be encountered during dredging activities and determine if special action should be taken (e.g., debris separation for disposal)
- Identification of any large debris or submerged structures—such as concrete or timber piles, marine railways, pier demolition, anchors, chains, and munitions—that may be present and require separate removal and considerations
- Updated calculations of dredging volumes and a series of cross sections at regular intervals depicting the work
- Identification of environmental restrictions or permit conditions that will influence design (see Section 6)

2.3 Contingencies

The CAO requires the RAP to address any contingencies (per CAO Directive B.1.n). As discussed in the Remediation Monitoring Plan (RMP; Appendix C), post-remedial confirmatory sampling will be used to determine if cleanup objectives have been successfully achieved by the dredging. If confirmatory samples indicate that cleanup objectives have not been met by the initial dredging plan, then additional measures may be used to achieve these objectives. These measures may include:

- Placing a clean sand cover over the dredged surface when chemical exceedances in

the new surface sediment are considered marginal or when hard, undredgeable material is encountered

- Performing an additional dredging pass to remove chemical exceedances that extend to greater depths than expected

2.4 Construction Implementation

2.4.1 Equipment

Dredging will be performed via barge-mounted, mechanical dredging equipment with either a clamshell bucket or cable-arm bucket suspended from a crane. Sediments will be removed with the bucket and placed into a scow or barge positioned adjacent to the dredging equipment. A survey vessel, work skiffs, and a tugboat will also likely be used during construction to assist with the dredging operations.

It is expected that dredging will be conducted 24 hours per day and 6 to 7 days per week with the exception of downtime for equipment maintenance and movement of equipment between dredging footprints and for shipyard traffic. A production rate of approximately 1,200 cy per day is expected to be achieved using the equipment types described in the previous paragraph.

Owning to regulatory protection of the California least terns (*Sterna antillarum browni*) in southern California, dredging and marine construction work is typically restricted to the months of September through March, a "construction window" of 7 months. Additionally, dredging work will likely be slowed down by the implementation of environmental mitigation requirements (e.g., a double silt curtain enclosure) and ongoing shipyard operations. Due these factors, it is expected that the work will likely span 2 or 3 construction seasons.

Special equipment, custom fabrication, or materials requiring a long lead time for procurement are not expected to be required to accomplish this work.

2.4.2 Wastes Generated

The RAP is required to discuss wastes generated (per CAO Directive B.1.g). Wastes generated during dredging activities are expected to include:

- Sediment
- Debris, including all material that is not sediment (e.g., rocks) and anything that is manmade (e.g., anchors, chains, plastic bags)

In an effort to meet cleanup requirements, it is estimated that 143,400 cy of sediment will need to be dredged. Due to the possibility of dredging residuals being left behind on the bottom surface or the possibility of chemical exceedances at depths beyond those identified in the CAO, additional sediments may need to be removed to meet the project objectives. Assuming an additional 2 feet of material is required to be removed over one-half of the entire dredged footprint; this would equate to an additional 28,200 cy of sediment possibly needing removal.

All dredged sediment will be removed via mechanical dredging methods, rehandled to a landside dewatering facility, and ultimately disposed of at an approved upland landfill facility based on the material's physical and chemical properties. See Section 3 for more detail.

At this time, no site-specific information is available to quantify the amount of debris located within the dredging footprint. In the absence of a debris survey, a best professional estimate regarding the volume of debris that is present at the Shipyard Sediment Site has been estimated as being equivalent to roughly 5 percent of the total dredging volume, resulting in approximately 7,200 cy of debris that will need to be disposed of separately. It is expected that any encountered debris can be removed from the dredging area using standard dredging equipment and can be separated from the sediment either manually or with the use of debris screens and will be stockpiled separately from the dredged material. Any segregated debris will be required (per the technical specifications) to be transported and disposed of at an upland approved facility, such as a Subtitle D landfill (see Section 3).

Wastes generated as a result of the contractor's activities (e.g., oil or fuel spill) will be the contractor's responsibility to manage, cleanup, and dispose of properly. Procedures for such cleanup activities will be documented in the contractor's dredging and disposal work plan,

which will be verified and fully documented by the Project Team and subject to review and approval by the San Diego Regional Water Quality Control Board (Water Board).

2.4.3 Pilot Testing

Pilot tests are a means by which processing systems and physical or chemical modification techniques can be tested on a small scale so that they can be optimized for their application at the full scale of construction. The CAO indicates that the RAP should include a discussion of pilot testing (per CAO Directive B.1.h); however, since mechanical dredging methods have been identified as most suitable for remediation of the Shipyard Sediment Site, pilot testing is not anticipated to be necessary.

2.5 Performance Standards

The following performance standards will apply to the Dredging Design element of the remedial action:

- The Quality Assurance Project Plan (QAPP) for the Shipyard Sediment Site (Appendix B) details procedures that will be implemented to verify that the dredging activities have been completed to the horizontal and vertical extents specified in the technical specifications.
- The QAPP also includes details on specifying sand materials that may be used in select areas as post-dredging clean cover:
  - Establish a specification for acceptable physical parameters for clean sand material
  - Establish chemical concentration limits for clean sand material
  - Establish an acceptance process prior to material being placed
- The RMP (Appendix C) describes procedures that will be implemented to verify the post-remedial sediment surface is in compliance with the cleanup objectives.

3 SEDIMENT MANAGEMENT AND DISPOSAL

3.1 Design Criteria

Dredged material will be offloaded to an onshore stockpiling location where it will be dewatered, loaded into trucks, and transported to one or more off-site disposal locations. This disposal method will require classifying the material for disposal, identifying a candidate landfill for disposal, and identifying and using a land-side area for sediment offloading and stockpiling. The size of the selected sediment offloading and stockpiling area will influence the availability of various methods of sediment dewatering, such as natural air drying, additional of chemical admixtures, or other methods.

Required Element	Completed
Design Criteria Report (B.1.i)	
I. Waste characterization	✓
II. Volume and types of each medium requiring removal or containment	✓
III. Removal or containment schemes and rates	✓
IV. Required qualities of waste streams	✓
V. Performance standards	✓
VI. Compliance with applicable local, state and federal regulations	
VII. Technical factors of importance to the design, construction, and implementation of the selected remedy	✓
Wastes Generated (B.1.g)	✓
Pilot Testing (B.1.h)	✓
Contingencies (B.1.n)	

3.2 Design Process

At a minimum, the following evaluations will be conducted to manage sediment disposal:

- Determination of material suitability for disposal and identify suitable disposal location, which will require evaluating results from the sediment characterization investigation (discussed in Section 2) and consulting with landfill representatives to determine if material properties (chemical and physical) meet their requirements for disposal as either daily cover material, as solid waste at a local landfill (such as the Otay Landfill in San Diego County), or as California hazardous waste that requires disposal at a more remote regional landfill.
- Determination of whether debris encountered during dredging needs to be segregated and disposed of separately.
- Assessment of whether the use of admixtures (e.g., cement and lime) will be beneficial in accelerating the removal of "free liquids" from the dredged material.

3.3 Selection of Sediment Offloading and Stockpiling Area

Dredged sediment will need to be moved onto land so that it can be loaded into trucks or railcars for disposal. This will require identifying and using a land-side area for sediment offloading and stockpiling. Neither the North or South Shipyard Areas has available on-land area that would suffice for this processing; therefore, arrangements must be made with a third-party for use of an off-site stockpiling area.

During the design process, the selection of an offloading and stockpiling location will be finalized. Ideally, such an area would meet the following criteria:

- Situated on or adjacent to a waterfront dock, wharf, or seawall with sufficient depth to enable a sediment-loaded barge to pull immediately adjacent for offloading
  - Waterfront area should be long enough to allow the mooring of one to two barges at a time
- Structurally capable of holding offloading equipment (such as a crane), the sediment stockpiles, and any ancillary dewatering equipment (if used)
- Situated at or on a road or rail spur so that trucks or railcars can be brought in and loaded with dewatered sediment for haul-off and disposal
- Enough square footage to hold dredged material for enough time to undergo dewatering, whether that be through passive dewatering (by air-drying action supplemented by regular reworking, potentially accelerated with the use of water absorbent additives or cement) or via a more active process involving filter presses or other equipment
  - Passive air-drying dewatering process is the slowest; the amount of time needed for this process is dependent on weather conditions and physical character of the sediment
- Enough square footage to allow haul-off and disposal of sediment at the same overall rate as the sediment is being dredged and contain enough space to accommodate segregated stockpiles if some sediment does not pass the requirements for disposal at local landfills
- Be available for the full duration of the work

- Necessary duration of leasing the off-site stockpiling area should include an additional month before and after construction for setup, preparation, breakdown, and cleanup

The area tentatively identified for off-loading, classification, and disposal preparation of dredged material is immediately to the north of the North Shipyard Area (Figure 5). This area, while currently used for parking and shipyard operations, is under sublease from San Diego Gas & Electric (SDG&E) and has been identified for use because of its proximity to the Shipyard Sediment Site and immediate access to San Diego Bay. At this time, no other locations have been identified as being available or appropriate for this purpose. However, use of this area must be authorized by or between SDG&E and the Unified Port of San Diego (Port), as BAE Systems has limited use rights that do not include use as required for sediment management. This location is on Port Tidelands property, under Tidelands Use and Occupancy Permit (TUOP) to SDG&E and subsequent subpermit to BAE Systems. Some improvements are anticipated to be needed prior to using the area for off-loading, dewatering, temporary storage, and perimeter containment. Improvements may include dredging, bulkhead improvements, grading, and surface paving. The area will also have to be incorporated into existing and future regulatory permits.

Ultimately, the shipyards will work with the appropriate managing entities to obtain full approval for preparation and usage of a stockpiling area. This process is underway for the identified parcel north of the North Shipyard Area. While logistical and contractual issues remain to be resolved, the parties believe all such issues can be resolved. However, if that option becomes infeasible, the Project Team will direct its attention to one or more of the other identified options.

The sediment offloading and stockpiling area will be outfitted to contain the sediment and any water (effluent) that drains from it, through the use of best management practices (BMPs; e.g., closed perimeter barriers, base liner, sand, asphalt, liners, and water handling facilities).

L:\AutoCAD Project Files_Projects\0918-Gallagher\SD Shipyard\0918-RP-001-SDGE.dwg FIG 5

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SOURCE: Drawing prepared from Bing maps.
HORIZONTAL DATUM: California State Plane Zone 6, NAD83.

LEGEND:

- Property line
- Parcel line
- Sediment offloading and staging area

0 80
Scale in Feet

San Diego Shipyard Sediment Site Group

ANCHOR QEA

Figure 5
Proposed Sediment Offloading Area
San Diego Shipyard Sediment Site

3.4 Construction Implementation

3.4.1 Equipment

Dredged material will be offloaded to an onshore stockpiling location where it will be dewatered, loaded into trucks, and transported to one or more off-site disposal locations. The dredged material will be unloaded from the haul barges using a rehandling bucket and could either be stockpiled on site or placed in shipping containers lined with plastic sheets for dewatering. Waterside equipment will be similar to those identified in Section 2 while onshore equipment would likely include a front-end loader, an excavator, and a bobcat. If any specialized dewatering techniques are needed due to the limited space for stockpiling and air drying, then additional dewatering equipment might also be needed, such as mixing units for chemical additives.

Any ponded water in the haul barges may need to be pumped off of the barge to avoid barge overflow, as will likely be required per permit conditions. The rest of the dewatering process will occur by gravity drainage and open-air drying while the material is stockpiled on land. All water (effluent) that drains from the sediment stockpiles on land will be contained, sampled, and tested to identify appropriate disposal options, which could include the Shipyard Sediment Site's stormwater system, the City of San Diego's (City's) water treatment system, or an off-site disposal facility, depending on the results of water testing. Once sediments have been sufficiently dewatered, they are anticipated to be loaded onto trucks or railcars for transport to the appropriate landfill for disposal.

It is expected that sufficient dewatering by passive air-drying methods will require approximately 3 days after which the sediment can be loaded onto trucks for removal from the Shipyard Sediment Site. Depending on the actual size of the offloading and dewatering facility, the contractor may elect to use chemical admixtures to accelerate the dewatering process (see Section 3.5.3), which could reduce the dewatering time to 1 to 2 days.

Special equipment, custom fabrication, or materials requiring a long lead time for procurement are not expected to be required to accomplish this work.

3.4.2 Wastes Generated

Wastes generated during offloading and dewatering activities are expected to include:

- Sediment
- Debris
- Used hay bales/straw waddle, filter fabric, or other similar materials used to prevent free flow of material
- Effluent water

The quantity of waste generated will be a function of the volume of dredged sediment, properties of the dredged sediment, whether admixtures are used, size of the dewatering facility, and the contractor's selection of materials used in setting up the facility. All wastes generated as a result of the sediment offloading and dewatering activities will be required to be properly disposed of at an upland facility per the technical specifications.

All effluent water released during the dewatering process will be collected, tested, and treated, if required and feasible, prior to discharge to on-site stormwater conveyance system, the City's water treatment system or off-site disposal. If the effluent water contains traces of chemicals above City standards for on-site discharge or discharge in the sewer system, provisions will be specified in the technical specifications for disposal at an alternate facility where further treatment can be conducted.

3.4.3 Pilot Testing

While pilot testing is not anticipated to optimize the remedial action, one possible exception is that the contractor may elect to use chemical admixtures or mechanical methods to accelerate the dewatering process. In this event, a series of pilot tests may be considered to determine the correct ratio of chemical admixture (lime or cement) to sediment. This pilot test will be more crucial if the identified offloading and dewatering area is small enough to limit production rates, which may require amplification of the natural drying process through chemical additives, filter presses, or other means.

3.5 Performance Standards

The following performance standards will apply to the Sediment Management and Disposal element of the remedial action:

- The contractor will be required to implement preventative measures to preclude spills or discharges of sediment into the water. Such measures will include:
  - Scows and haul barges that transport dredged material to the offloading facility for disposal will be sealed to prevent leakage during transport and be equipped with electronic monitoring equipment.
  - Overtopping of the scows or barges will not be allowed.
  - A spill prevention apron will be installed to prevent material spillage during the transfer of the dredged material from the scow or barge to the offloading facility.
  - Handling and offloading of dredged material will be controlled so that it is placed on land only within the offloading facility and that no sediment is placed outside the facility limits.
  - A containment area will be installation around the offloading and stockpiling area by using impermeable liners, concrete barricades, a drainage sump, or other methods.
- The contractor will also be required to meet all transportation and disposal requirements, including passing the "paint-filter" test to demonstrate that no free liquid is present in the sediment load.
- The QAPP (Appendix B) details monitoring procedures that will be implemented during construction.

4 CLEAN LAYER PLACEMENT UNDER PIERS

4.1 Design Criteria

Sediment removal under piers and overwater structures is impractical and technically infeasible; therefore, an alternative remedial approach is needed to achieve cleanup objectives in these areas as identified in the CAO. To promote mixing and natural recovery of contaminated sediments under piers and overwater structures within the remedial footprint, a layer of clean sand and gravel will be placed on the surface of the existing sediment layer. Ongoing processes of sediment mixing and transport is anticipated to result in a mixed surface under the piers, which will allow long-term achievement of the cleanup objectives.

Required Element	Completed
Design Criteria Report (B.1.i)	
I. Waste characterization	
II. Volume and types of each medium requiring removal or containment	✓
III. Removal or containment schemes and rates	
IV. Required qualities of waste streams	✓
V. Performance standards	✓
VI. Compliance with applicable local, state and federal regulations	
VII. Technical factors of importance to the design, construction, and implementation of the selected remedy	✓
Wastes Generated (B.1.g)	
Pilot Testing (B.1.h)	
Contingencies (B.1.n)	

4.2 Design Process

At a minimum, the following will be conducted to specify the clean layer placement:

- Establish a specification for acceptable physical characteristics of clean sand and gravel material
- Obtain and review as-built construction plans for overwater structures
- Assess the substrate conditions of the underpier areas and determine where protection measures are appropriate
- Identify readily available and cost-effective materials that can be used to serve the cleanup objectives
- Identify implementable construction and placement methods
- Establish chemical concentration limits for clean sand and gravel material
- Establish an acceptance process prior to material being placed

4.3 Construction Implementation

4.3.1 Equipment

It is anticipated that clean sand and gravel material will be available from a local supplier and transported by trucks to the sediment offloading area. The sand and gravel material would need to be loaded onto barges using a rehandling bucket for placement under piers and overwater structures. Placement would likely occur by pumping, conveying, or laying the sand and gravel material over the prescribed areas using a tremie pump, conveyor, or long-reach bucket arm (or other customized equipment) that is advanced under the structures. Similar to dredging operations, a survey vessel, work skiffs, and a tugboat will also likely be utilized to assist with placement activities.

A nominal (minimum) 1-foot layer of sand and gravel material is assumed to be required to be placed under piers and overwater structures within the remedial footprint to meet the project objectives. This equates to approximately 42,200 cy of material being placed in-water. During the design process, further evaluations will be conducted to formulate the exact material types and thickness that will be required to meet the mitigation measures required by the Environmental Impact Report (EIR).

Special equipment, custom fabrication, or materials requiring a long lead time for procurement are not expected to be required to accomplish this work.

4.3.2 Wastes Generated

Wastes are not anticipated to be generated as a part of this work.

4.3.3 Pilot Testing

No bench scale or pilot scale studies have been conducted or have been identified that will optimize the remedial design as it relates to the placement of a clean sand and gravel layer under piers and overwater structures.

4.4 Performance Standards

The following performance standards will apply to the clean layer placement under piers element of the remedial action:

- The contractor will be required to demonstrate and document that the imported clean sand/gravel materials comply with all physical and chemical requirements, as stated in project specifications and permits
- The contractor will be required to place the clean layer material to the horizontal and vertical extents required by the technical specifications.
- The QAPP (Appendix B) details monitoring procedures that will be implemented during construction.

5 STRUCTURAL PROTECTION

5.1 Design Criteria

Dredging near any shoreline structure has the potential to create an unstable condition due to the removal of passive earth pressures or undermining of the structure. In addition to moving dry docks to gain access to underpier areas, precautionary measures will be taken to retain the stability of the structures when dredging along the shoreline and near marine structures to ensure their long-term stability. Such measures are expected to take the form of the recommendations in Moffat and Nichols Engineers' 2002 structural review.

Required Element	Completed
Design Criteria Report (B.1.i)	
I. Waste characterization	
II. Volume and types of each medium requiring removal or containment	✓
III. Removal or containment schemes and rates	
IV. Required qualities of waste streams	✓
V. Performance standards	✓
VI. Compliance with applicable local, state and federal regulations	
VII. Technical factors of importance to the design, construction, and implementation of the selected remedy	✓
Wastes Generated (B.1.g)	
Pilot Testing (B.1.h)	
Contingencies (B.1.n)	

These measures would include specifying dredging offsets to prevent damage from impacts of dredging equipment or installing a protective rock backfill along the side slopes and wharf faces to protect against unstable conditions that may result from material removal. Alternatively, a clean sand cover may be required to meet cleanup objectives in areas where dredging would significantly impact infrastructure and overwater structures.

5.2 Design Process

Similar to the beginning stages of dredging design, a pre-design investigation will be performed by a professional structural engineer to assess the condition of all vessel berthing slips and facilities located within and immediately adjacent to the remedial footprint. At a minimum, the following evaluations will be conducted:

- A review of as-built drawings of all existing site features and confirm conditions with either surveys or a visual site investigation
- A visual structural assessment of the overwater structures to determine existing condition of all structures and whether additional in-depth investigations are needed.
- A reconnaissance of the underpier areas to determine current conditions of the structures that may include inspecting the substrate bottom along the mudline to determine the presence of debris and/or rock and topography (divers may be used for

this purpose)

The following evaluations will be completed by a professional structural engineer:

- Review of the geometry and condition of marine structures near and beneath which the work will be completed
- Assessment of geotechnical information of sediment strength to determine stability of structures in response to adjacent dredging
- Assessment of the rapid visual structural assessment and diver reconnaissance survey findings and provide recommendations on either offset distances for dredging or other protective measures (if necessary, specify maximum allowable length of time after dredging is completed in the immediately adjacent area to minimize the time span during which the structures or slopes are unprotected)
- Assessment of whether retrofitting or otherwise improving selected structures (or portions thereof) is required to preserve their condition.

5.3 Construction Implementation

5.3.1 Equipment

It is expected that quarry rock will be available from a local supplier, transported by trucks to the offloading area, and placed onto barges using a rehandling bucket for placement. Quarry rock may also be brought directly to the Shipyard Sediment Site by barges. Placement of the quarry rock will likely be accomplished by using a clamshell bucket or long-reach bucket arm, as material will have to be carefully placed to achieve the proper thickness and extents in accordance with design requirements. A survey vessel, work skiffs, and a tugboat will also likely be used to assist with quarry rock placement.

A 4-foot-thick quarry rock blanket placed along the length of the shoreline and overwater portions of the structures is assumed to be required to protect them from impacts associated with the dredging operations. This equates to approximately 21,200 tons of rock being placed in-water.

Special equipment, custom fabrication, or materials requiring a long lead time for procurement are not expected to be required to accomplish this work.

5.3.2 Pilot Testing

No bench scale or pilot scale studies have been conducted or have been identified that will optimize the remedial design as it relates to the protection of existing structural elements.

5.4 Performance Standards

The following performance standards will apply to the Structural Protection element of the remedial action:

- The dredging plan will be designed such that existing structures are not undermined or otherwise disturbed as a result of the work. This plan will include specified offsets from the structures to prevent damage from impacts of construction equipment and the installation of a protective rock buttress or backfill along the side slopes and wharf faces to protect against unstable conditions. The contractor will also be required to place protective rock material within a prescribed timeframe deemed appropriate by the construction management team in order to minimize the amount of time during, which the structure or slope remains exposed with lessened stability.
- The contractor will be required to protect all structures and place any protective material to the horizontal and vertical extents required by the technical specifications.
- The QAPP (Appendix B) details monitoring procedures that will be implemented during construction.

6 ENVIRONMENTAL PROTECTION

Dredging and transport of sediments is expected to create turbidity in the water column, an effect that will be short-term in duration but must be minimized by the contractor through the use of operational BMPs and institutional controls. Water quality conditions will be monitored throughout construction, and the contractor will be required to meet all applicable water quality standards specified in the Section 401 Water Quality Certification for the work or substantive equivalent. Construction Documents, where applicable, will specify best management practices and mitigation measures consistent with the Mitigation Monitoring and Reporting Program (MMRP).

Required Element	Completed
Design Criteria Report (B.1.i)	
I. Waste characterization	
II. Volume and types of each medium requiring removal or containment	
III. Removal or containment schemes and rates	
IV. Required qualities of waste streams	
V. Performance standards	✓
VI. Compliance with applicable local, state and federal regulations	✓
VII. Technical factors of importance to the design, construction, and implementation of the selected remedy	✓
Wastes Generated (B.1.g)	
Pilot Testing (B.1.h)	
Contingencies (B.1.n)	

6.1 Contractor Controls and Best Management Practices

To ensure water quality standards are maintained throughout construction, permits, and the technical specifications will require the contractor to implement a water quality control plan and follow BMPs. The contractor's performance will be documented by a required water quality monitoring program, which will either be implemented by the contractor or the Project Team.

6.1.1 Water Quality Criteria

Water quality monitoring will be conducted in accordance with the EIR (Water Board 2012b) and with regulatory permits obtained for this work. Specifically, water quality monitoring will be required through the Section 401 Water Quality Certification issued by the Water Board. If not in compliance with the water quality criteria, the contractor will be required to correct the condition.

The frequency of water quality of manual monitoring will initially be daily, but may be lessened to weekly if no exceedances of the water quality monitoring criteria are observed

for 3 consecutive days of monitoring. Consistent with the requirements of the Technical Report (Water Board 2012b), monitoring frequency will return to daily if a significant change (i.e., exceedance of criterion) in operations occurs. Monitoring frequency can again be reduced to weekly if 3 consecutive days of monitoring show there are no exceedances. The RMP (Appendix C) presents more detail on the elements of the expected water quality monitoring requirements for the Shipyard Sediment Site and contractor controls that can be implemented to bring water quality back into compliance, if necessary.

6.1.2 Specialized Equipment

Double floating silt curtains will be required during dredging activities to help control turbidity via loss of suspended solids beyond the immediate work area. As part of the technical specifications, the contractor is required to maintain the silt curtains around all dredging work as to reduce the potential for water quality impacts and the escape of significant suspended solids beyond the remedial footprint.

Numerous BMPs will be incorporated into the technical specifications and will be implemented by the contractor during construction for the purpose of protecting water quality at the Shipyard Sediment Site. Possible BMPs are discussed in detail in the RMP (Appendix C).

The contractor will also be required to use a cable-arm clamshell bucket (frequently referred to as an environmental bucket). This bucket design typically reduces loss of sediment and turbid water during closing and withdrawal of the bucket from the water. However, a cable-arm bucket may not be sufficiently strong to excavate denser sediments or large debris. A standard clamshell bucket may be needed at times, which will be subject to the contractor's choice and discretion. If a clamshell bucket is required due to material density, the contractor will supplement appropriate sequencing and production rates to ensure water quality criteria requirements are maintained.

6.2 Performance Standards

The following performance standards will apply to the Environmental Protection component of the remedial action:

- The contractor will be required to abide by all permits and EIR mitigation measures,

such as water quality, biological monitoring, construction noise, air quality, and other measures (Water Board 2012b).

- The RMP (Appendix C) details how these measures will be monitored during construction.

7 SCHEDULE AND COORDINATION

7.1 Schedule

A remediation schedule is set forth in the RAP (per CAO Directive B.1.n). Additional detail regarding the anticipated schedule, and certain constraints including coordination with shipyard operations and vessel traffic, is provided in this section.

Ongoing shipyard activities associated with the active shipyard (e.g., scheduling vessel berthing timeframes and related shipyard work) will be taken into consideration when coordinating and scheduling construction.

Environmental protection of the California least tern will also restrict construction. Dredging and marine construction work is typically restricted to the months of September through March, allowing for a construction window of 7 months per year that avoids critical nesting periods (except as may be authorized by the resource agencies). Because of these operational and environmental work restrictions, final compliance with the CAO may require three construction seasons (or potentially more) before all sediment is removed from the cleanup areas given the expected extent of dredging needed to accomplish this cleanup (143,400 cy, plus more if additional dredging is needed) and the array of ongoing shipyard activities that will likely impede production. While the respective shipyards will work to accommodate the dredging, the work will also likely be impacted by ongoing operations.

7.2 Coordination

Ongoing shipyard operations and vessel traffic within the Shipyard Sediment Site will have an impact on dredging activities and daily productivity. Communication and advanced planning will be crucial to the completion of the work. The technical specifications will detail to the extent possible the expected vessel berthing schedules and measures to ensure shipyard operations are not impeded. Where possible, the specifications will detail the following:

- Daily vessel traffic
- Windows of work where cleanup areas around overwater structures will be available for construction activities
- Timeframes when navigational channels or other areas can be occupied by the

contractor or likewise times when areas must remain open as to not impede shipyard operations

- Other construction and/or contractors that are also working at the Shipyard Sediment Site and where construction activities must be coordinated

7.3 Site Security

As a result of U.S. Naval security requirements, the Shipyard Sediment Site is controlled by a perimeter security boom (Force Protection Barrier) that provides demarcation of the security access points. Additionally, when dredging (or any other vessel/small boat traffic) is occurring within the Shipyard Sediment Site, and especially when in close proximity to any Naval ship, heightened security communications are required. Such communication will include advance notice to all vessels within the Shipyard Sediment Site and stand-off distances from Naval ships.

Additional coordination measures that are planned during construction are detailed in the QAPP (Appendix B).

8 REFERENCES

Moffat and Nichol Engineers, 2002. *Review of Impacts to Waterfront Structures Subjected to Variable Dredging Depths, NASSCO, San Diego, California*. Final Report. August 2002.

Water Board (San Diego Regional Water Quality Control Board), 2012a. Cleanup and Abatement Order R9-2012-0024 for the Shipyard Sediment Site. March 14, 2012.

Water Board, 2012b. *Final Environmental Impact Report*. March 14, 2012.