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August 17, 2012

Executive Officer
California Regional Water Quality Control Board
San Diego Region
9174 Sky Park Court, Suite 100
San Diego, California 92123-4340

Re: Modified Remedial Action Plan
San Diego Shipyard Sediment Site
Cleanup and Abatement Order No. R9-2012-0024
Geotracker Site ID No. T10000003580

Dear Executive Officer:

We are pleased to submit this Modified Remedial Action Plan (RAP) to the Cleanup Team (CUT) on behalf of National Steel and Shipbuilding Company Shipyard Facility (NASSCO) and BAE Systems San Diego Ship Repair Facility (BAE Systems) and look forward to working alongside CUT to finalize and implement the RAP. The enclosed modifications to the June 12, 2012, RAP incorporate comments provided by CUT during meetings held on August 6 and 10. Modifications are intended to clearly demonstrate that each element in Cleanup and Abatement Order No. R9-2012-0024, and the associated Technical Report, is addressed at a sufficient level of detail for the reader to understand the planning and implementation steps for the cleanup. We have also addressed written comments provided by the San Diego CoastKeeper on August 10, although a number of those comments will require additional discussion as they relate to implementation specifics.

It is our understanding that between now and September 10, 2012, when an Amended RAP will be submitted to the San Diego Regional Water Quality Control Board (Water Board) for public comment, we will have the opportunity to meet with CUT to discuss the Modified RAP. We also understand that CUT will provide any further comments or clarifications during this time period that may be necessary to ensure that the Amended RAP will address the Water Board staff's concerns. We propose to meet with CUT, the other Dischargers, and Coastkeeper on Wednesday (August 22), Thursday (August 23), or Friday (August 24) of next week, as CUT's schedule permits, and I will be contacting Vicente Rodriguez next week to confirm a date for these discussions. Please do not hesitate to contact me at (206) 910-4279 or at dtempleton@anchorqea.com with any questions about this submittal.

Sincerely,

David Templeton, Anchor QEA, L.P.
Project Coordinator

cc:
Michael Whelan, Anchor QEA, L.P.
San Diego CoastKeeper
NASSCO
BAE Systems
City of San Diego
Campbell Industries
San Diego Gas and Electric
U.S. Navy
San Diego Unified Port District
Star & Crescent Boat Company

REMEDIAL ACTION PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

Prepared by

Anchor QEA, L.P.

26300 La Alameda, Suite 240

Mission Viejo, California 92691

Modified

August 17, 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

µg	microgram
BAE Systems	BAE Systems San Diego Ship Repair Facility
CAO	Cleanup and Abatement Order
CCA	California Coastal Act
City	City of San Diego
COC	contaminant of concern
CRP	Community Relations Plan
CWA	Clean Water Act
cy	cubic yard
DCR	Design Criteria Report
EIR	Environmental Impact Report
EFH	Essential Fish Habitat
ESA	Endangered Species Act
HASP	Health and Safety Plan
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
kg	kilogram
mg	milligram
NASSCO	National Steel and Shipbuilding Company Shipyard Facility
NEPA	National Environmental Policy Act
QAPP	Quality Assurance Project Plan
Port	San Diego Unified Port District
PCB	polychlorinated biphenyl
RAP	Remedial Monitoring Report
RMP	Remediation Monitoring Plan
Shipyard Sediment Site	San Diego Shipyard Sediment Site
SAP	Sampling and Analysis Plan
SDG&E	San Diego Gas & Electric
SWAC	surface-weighted average concentration
TBT	tributyltin
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

Water Board	San Diego Regional Water Quality Control Board
WDR	Waste Discharge Requirements
WQC	Water Quality Certification

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

T. MICHAEL CHEE		8/17/12
Print Name NASSCO	Signature	Date
S. HALVAX		8/17/12
Print Name BAE Systems	Signature	Date

1 INTRODUCTION

Discharges of metals and other pollutant wastes to San Diego Bay over the years have resulted in the accumulation of pollutants in marine sediments along the eastern shore of central San Diego Bay, in San Diego, California. This accumulation has resulted in conditions identified by the San Diego Regional Water Quality Control Board (Water Board) as adversely impacting beneficial uses (aquatic life, aquatic-dependent wildlife, and human health).

The Water Board identified the affected areas as including waters adjacent to two adjoining, active shipyard facilities in San Diego Bay—the North Shipyard (owned by BAE Systems San Diego Ship Repair Facility [BAE Systems]) and the South Shipyard (owned by National Steel and Shipbuilding Company Shipyard Facility [NASSCO]), together termed the San Diego Shipyard Sediment Site (Shipyard Sediment Site). In March 2012, the Water Board issued Cleanup and Abatement Order No. R9-2012-0024 (CAO; Water Board 2012a) for the remediation of marine sediments containing elevated chemical concentrations within the Shipyard Sediment Site. Section 2.1 lists the identified contaminants of concern (COCs) and the numeric cleanup objectives stipulated by the Water Board in the CAO.

This Remedial Action Plan (RAP) is submitted in compliance with CAO Directive B.1 and describes the process by which cleanup of the Shipyard Sediment Site will be managed, designed, planned, implemented, and monitored in accordance with the CAO and is consistent with the U.S. Environmental Protection Agency's (USEPA's) National Contingency Plan. This RAP is also the basis of design for the detailed engineering of the project that will then be used to inform and control the remedial action to: 1) obtain construction bids; and 2) ensure that that project is implemented in a manner that achieves the directives of the CAO. The RAP also provides detail on the timing and scoping of subsequent submittals that require Water Board approval. Implementation of activities set forth in this RAP may commence as soon as 60 calendar days after submittal, although elements may need to be adjusted or updated as project permits are received, if additional regulatory requirements are identified.

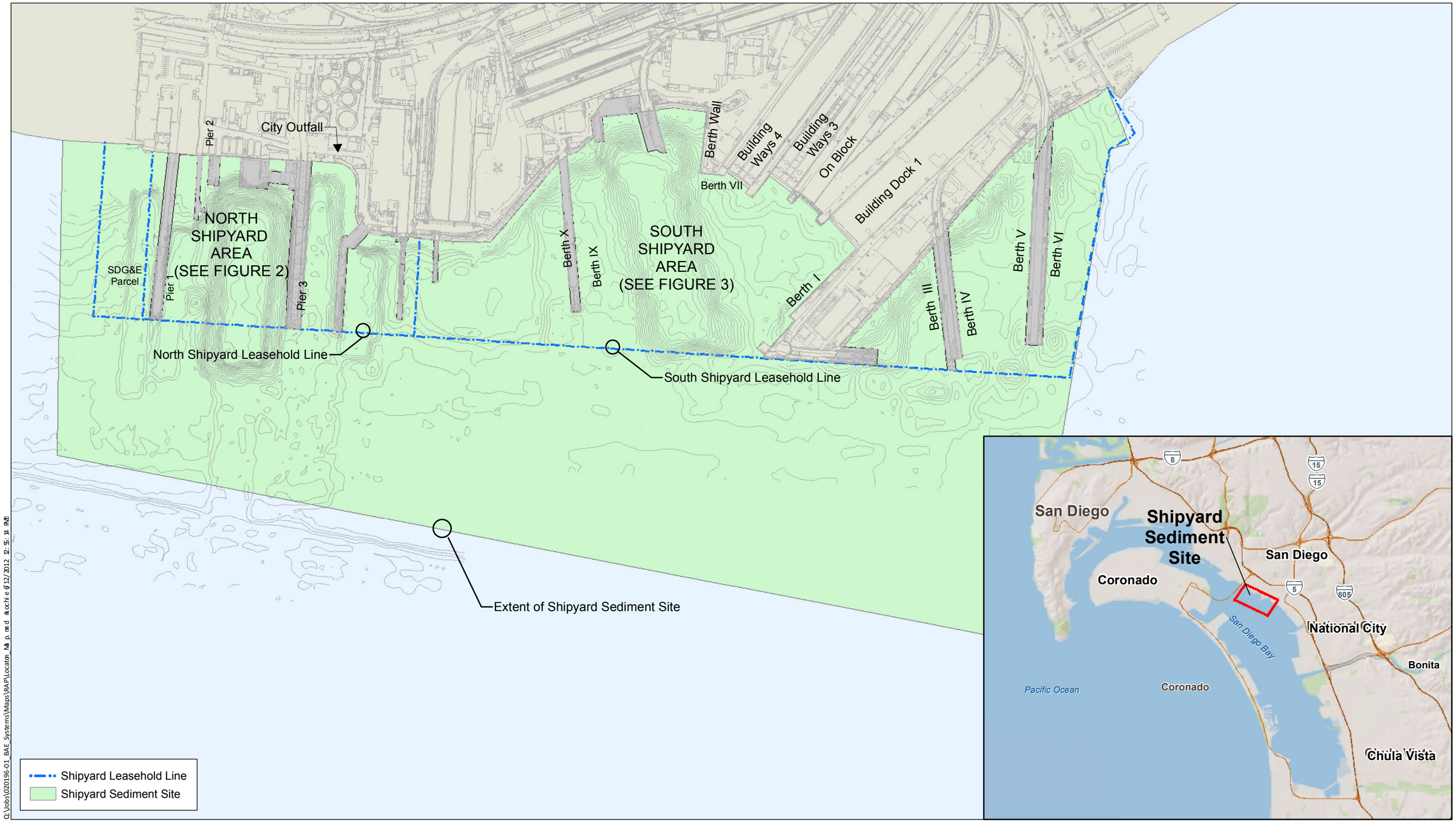
1.1 Description of Shipyard Sediment Site and History

Figure 1 depicts the location of the Shipyard Sediment Site and the layout of the North and South Shipyard Areas. The remedial footprint extends from the U.S. Bulkhead Line (shoreline) to San Diego Bay's main shipping channel to the west.

The North Shipyard is a ship repair, alteration, and overhaul facility located on approximately 39.6 acres of tidelands (23 acres on land and 16.6 acres offshore). Shipyard activities have taken place at this location since 1979, formerly under the title Southwest Marine, Inc., and now known as BAE Systems San Diego Ship Repair Inc. ("BAE Systems"). Site features include offices; buildings for washing, blasting, and painting; five piers (one of which is slated for demolition and replacement); one floating dry dock; and two remnant in-water portions of marine railways (which were partly removed in 1998).

The South Shipyard is owned and operated by NASSCO, a subsidiary of General Dynamics, and is a full-service ship construction, modification, repair, and maintenance facility that spans 126 acres of tidelands property (80 acres on land and 46 acres offshore). The South Shipyard serves the U.S. Navy and commercial customers and activities have taken place at this location since at least 1960. Current site features include office buildings, warehouses, shops, steel fabrication facilities, a floating dry dock, a graving dock, two shipbuilding ways, and five piers, providing 12 berthing spaces.

From the early 1900s through February 1963, the City of San Diego (City) was the Trustee of all relevant portions of the San Diego Bay tidelands, which include the Shipyard Sediment Site, and leased the tidelands to various operators. In 1962, the San Diego Unified Port District (Port) was created by an act of legislature, and in 1963, the Port became the Trustee for the tidelands, including the North and South Shipyard Areas leaseholds. The Port continues to maintain that role, with the North and South Shipyards as leaseholders, today.



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Feet
0 200 400 600 800

Figure 1
Site Map
San Diego Shipyard Sediment Site

1.2 Structure of this Document

This RAP is a compilation of several interrelated documents are intended to lay out a detailed framework for execution of the remedial action while providing (at a minimum) all informational elements and sub-elements mandated by Directive B.1 of the CAO. The various documents included in this compilation are:

- This report: Remedial Action Plan (RAP)
- Appendix A: Design Criteria Report (DCR)
- Appendix B: Quality Assurance Project Plan (QAPP)
- Appendix C: Remediation Monitoring Plan (RMP)
- Appendix D: Sampling and Analysis Plan (SAP)
- Appendix E: Community Relations Plan (CRP)
- Appendix F: Health and Safety Plan (HASP)

The following paragraphs provide a brief description of the content and purpose of each separate document that are included as an appendix to this RAP.

1.2.1 Design Criteria Report (Appendix A)

The DCR defines in detail the technical parameters upon which the remedial design will be based. These parameters include, among other factors, the preliminary design assumptions and parameters; anticipated waste characterization; volumes and types of medium requiring removal; anticipated construction rates; performance standards removal rates; compliance with applicable local, state, and federal regulations; and technical factors of importance to the project design and implementation.

1.2.2 Quality Assurance Project Plan (Appendix B)

The QAPP describes the project objectives and organization, functional activities, and quality assurance/quality control protocols as they relate to the remedial action.

1.2.3 Remediation Monitoring Plan (Appendix C)

The RMP describes the water quality, sediment, and disposal monitoring programs and procedures to demonstrate that the implementation of the selected remedial action does not result in violations of water quality standards outside the construction area, to confirm that

the selected remedial action has achieved target cleanup levels within the remedial footprint, and to adequately characterize dredged sediments in order to identify appropriate disposal options.

1.2.4 Sampling and Analysis Plan (Appendix D)

The SAP defines sample and data collection methods to be used for the project, a description of the media and parameters to be monitored or sampled during the remedial action, a description of the analytical methods to be used, and an appropriate reference for each.

1.2.5 Community Relations Plan (Appendix E)

The CRP describes measures for informing the public about activities related to the final remedial design, the schedule for the remedial action, the activities to be expected during construction and remediation, provisions for responding to emergency releases and spills during remediation, and any potential inconveniences, such as excess traffic and noise, that may affect the community during the remedial action.

1.2.6 Health and Safety Plan (Appendix F)

The HASP describes health and safety measures to be used during the design, construction, and post-construction monitoring phases of the work, including employee training, protective equipment, medical surveillance requirements, standard operating procedures, and contingency plans.

1.3 Summary of RAP Elements Required by CAO

CAO Directive B.1 presents required elements of the RAP. Table 1 identifies each element required by the CAO and the location of the element in this RAP and/or its appendices.

Table 1
Elements Required by the CAO

Required Element	Completed	Location
Introduction (B.1.a)	✓	Section 1
Selected Remedy (B.1.b)	✓	Section 2
Health And Safety Plan (B.1.c)	✓	**HASP is provided Appendix F**

Required Element	Completed	Location
Community Relations Plan (B.1.d)	✓	**CRP is provided as Appendix E**
I. Activities related to the final remedial design	✓	Refer to CRP
II. Schedule for the remedial action	✓	Refer to CRP
III. Activities to be expected during construction and remediation	✓	Refer to CRP
IV. Provisions for responding to emergency releases and spills during remediation	✓	Refer to CRP
V. Any potential inconveniences such as excess traffic and noise that may affect the community during the remedial action	✓	Refer to CRP
Quality Assurance Project Plan (B.1.e)	✓	**QAPP is provided as Appendix B**
Sampling and Analysis Plan (B.1.f)	✓	**SAP is provided as Appendix D**
I. Sample and data collection methods to be used for the project	✓	Refer to SAP *Further detail in Sections 2.2.5.1 and 3.3.1 of the RMP (Appendix C)*
II. Description of the media and parameters to be monitored or sampled during the remedial action	✓	Refer to SAP *Further detail in Sections 2.2.1 and 3.3.3 of the RMP (Appendix C)*
III. Description of the analytical methods to be utilized and an appropriate reference for each	✓	Refer to SAP *Further detail provided in Post-Remedial Monitoring Plan (Exponent 2012)*
Wastes Generated (B.1.g)	✓	Section 5.2 *Further detail provided in Sections 2.4.2 and 3.4.2 of the DCR* (Appendix A)
Pilot Testing (B.1.h)	✓	Section 4.2 *Further detail provided in Section 3.4.3 of the DCR (*Appendix A)
Design Criteria Report (B.1.i)	✓	**DCR is provided as Appendix A**
I. Waste characterization	✓	Refer to DCR
II. Volume and types of each medium requiring removal or containment	✓	Refer to DCR
III. Removal or containment schemes and rates	✓	Refer to DCR

Required Element	Completed	Location
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)	✓	Refer to DCR
V. Performance standards	✓	Refer to DCR *Further detail provided in Sections 5.1.1, 5.2.1, 5.3.1, and 5.4.1 of the QAPP (Appendix B)*
VI. Compliance with applicable local, state and federal regulations	✓	Refer to DCR *Further detail provided in Sections 4.6 and 6 of the RAP (this document) and in 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	✓	Refer to DCR
Equipment, Services, and Utilities (B.1.j)	✓	Section 5.3 *Further detail provided in Sections 2.4.1, 3.4.1, 4.3.1, and 5.3.1 of the DCR (Appendix A)*
Regulatory Permits and Approvals (B.1.k)	✓	Section 6
Remedial Monitoring Plan (B.1.l)	✓	**RMP is provided as Appendix C** *Further detail provided in Section 5.5 of the RAP (this document)*
I. Water quality monitoring	✓	Refer to RMP
II. Sediment monitoring	✓	Refer to RMP
III. Disposal monitoring consistent with Section 34.1 of the Technical Report	✓	Refer to RMP
Site Map (B.1.m)	✓	Figures 1 through 4
Contingencies (B.1.n)	✓	Section 2.3 of the DCR (Appendix A)
Remediation Schedule (B.1.o)	✓	Section 7

1.5 Duty to Use Registered Professional

This RAP was prepared under the direction of qualified professionals in accordance with the California Business and Professions Code Sections 6735, 7835, and 7835.1.

David Templeton
Project Coordinator

Michael Whelan, P.E.
Project Engineer

2 SELECTED REMEDY

2.1 Cleanup Objectives and Cleanup Levels

The cleanup of sediments with primary COCs must be completed to comply with cleanup objectives stipulated by the Water Board in the CAO. COCs with established cleanup levels include mercury, copper, high-molecular-weight polycyclic aromatic hydrocarbons (HPAHs), total polychlorinated biphenyls (PCBs), and tributyltin (TBT).

After implementation of the remedial action, the post-remedial surface-weighted average concentrations (SWACs) of the COCs are anticipated to meet the cleanup objectives set forth in the CAO and detailed in Table 2.

Table 2
Cleanup Objectives Mandated by the CAO

Chemical	Units (dry weight)	Targeted Post-Remedial Dredge Area Concentrations	Estimated Post-Remedial SWAC	Post-Remedial Trigger Concentrations
Copper	mg/kg	121	159	185
Mercury	mg/kg	0.57	0.68	0.78
HPAH[1]	µg/kg	663	2,451	3,208
Total PCB Congeners[2]	µg/kg	84	194	253
TBT	µg/kg	22	110	156

Notes:
Table taken from the CAO (Water Board 2012a).
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
1 HPAHs = sum of six PAHs: Fluoranthene, Perylene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenzo(a,h)anthracene.
2 Total PCBs Congeners = sum of 41 congeners: 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194, 201, and 206.

2.2 Remedial Footprint

The Shipyard Sediment Site was characterized in 2002 through a series of 65 sampling stations (surface samples and sediment cores) that were subjected to chemical and biological testing as part of a detailed sediment investigation (Exponent 2003). A limited set of supplementary samples were also obtained in July 2009. As a means of facilitating comparative evaluations of feasibility, environmental protectiveness, and cost, the Shipyard

Sediment Site was subdivided into a set of Thiessen polygons (bounded by half the distance between adjacent sampling stations), each of which is represented by a single sampling station at or near its mid-point. The distribution and extents of Thiessen polygons at the Shipyard Sediment Site are depicted on Figure 2.

Based on considerations of chemical and biological exposure and risk detailed in the Water Board's Technical Report (Water Board 2012b), 23 individual sampling stations and their accompanying Thiessen polygon areas have been targeted for cleanup, with the goal of achieving the desired SWAC values across the Shipyard Sediment Site (see Table 2). Five areas are located within the South Shipyard Area, 17 areas are located within the North Shipyard Area, and one area is shared by both areas. Based on available data, the proposed cleanup is intended to meet the cleanup levels for primary COCs.

The individual cleanup areas were converted from their Thiessen polygon geometry to more realistic design/construction boundaries within the North and South Shipyard Areas. Figures 3 and 4 depict the relevant Thiessen polygons and assumed equivalent remedial extents for the North and South Shipyard Areas, respectively. These figures show the remedial footprint and include open-water areas in red and underpier areas in green.

2.3 Corrective Actions

Directive A.2 of the CAO states that "the Dischargers shall take all corrective actions necessary to remediate the contaminated marine bay sediment at the Shipyard Sediment Site" (Water Board 2012a). Several different remedial techniques were considered by the Water Board and the North and South Shipyards for their applicability to meeting this goal. The techniques considered were mechanical dredging, hydraulic dredging, subaqueous capping, natural recovery, confined aquatic disposal, and nearshore confined disposal. Further consideration was given to the final disposition of contaminated sediments, including treatment in-place, offshore disposal, nearshore disposal, beneficial reuse (beach renourishment), and landfill disposal. All of these techniques have been used successfully on other marine or waterfront remedial actions.

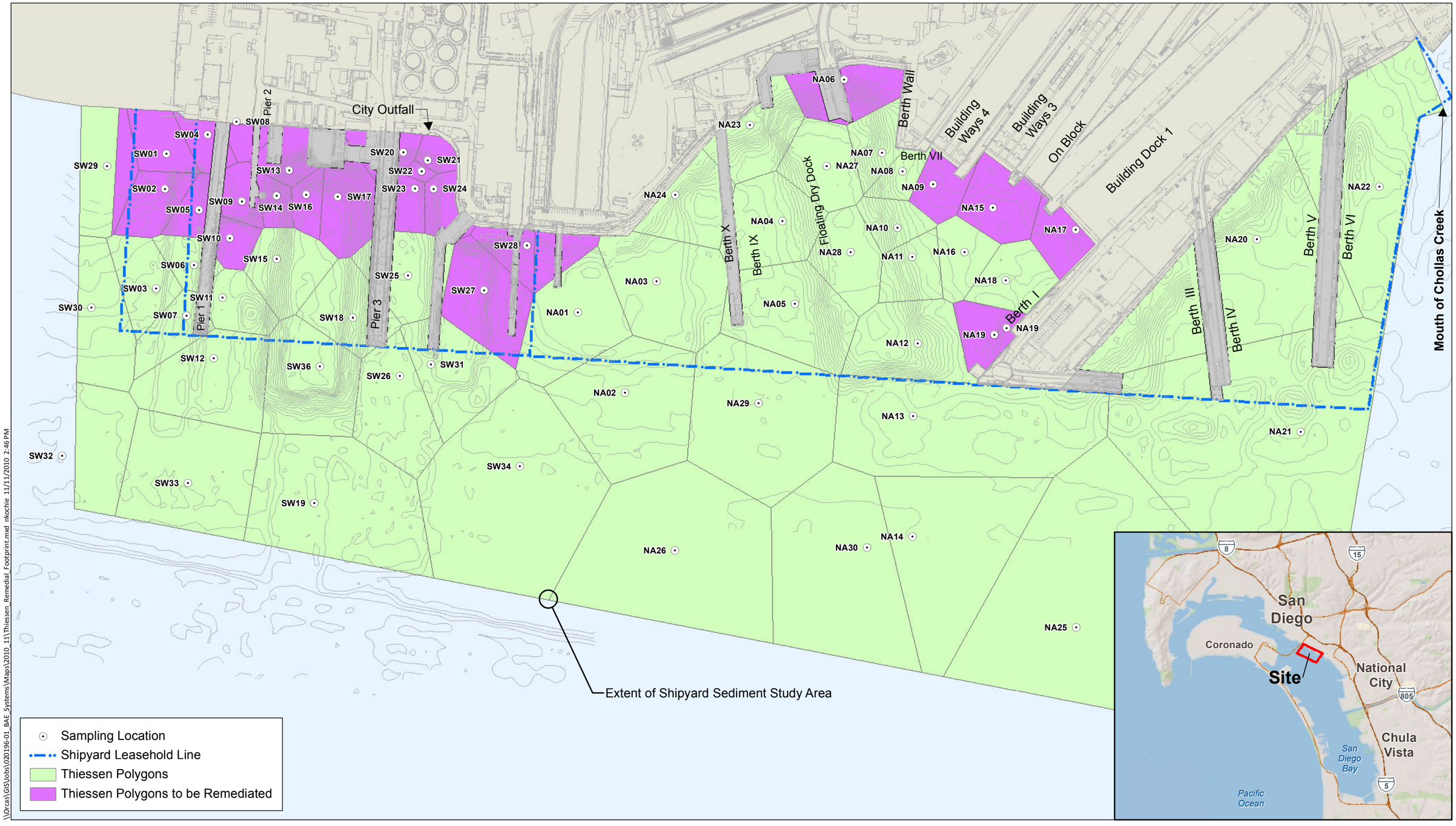

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Figure 2
Thiessen Polygon and Required Cleanup Areas
San Diego Shipyard Sediment Site

North Shipyard Area

SW04 Outfall Area

SW29 3'

SW01 4'

SW02 5'

SW04 5'

SW05 3'

SW08 6'

SW09 3'

SW10 3'

SW06

SW03

SW30

SW07

SW11

SW12

SW13 3'

SW14 3'

SW15

SW16 3'

SW17 7'

SW18

SW36

SW20 3'

SW21 3'

SW22 3'

SW23 3'

SW24 3'

SW25

SW26

SW27 5'

SW28 6'

SW31

NA01

PIER 1

PIER 2

PIER 3

PIER 4 - To be removed prior to remedial action

PIER 5 (To be demolished)

SDG&E Parcel

Sampling Location (Exponent 2003)

4' Estimated Dredging Depths (not including 1-foot overdepth)

Remedial Footprint

Shipyard Leasehold Line

Overwater Structure

Thiessen Polygon Boundary

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San Diego Shipyard Sediment Site Group

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Feet

0 125 250

Figure 3
Remedial Footprint within North Shipyard Area
San Diego Shipyard Sediment Site

South Shipyard Area

NA06 5'
NA23
NA07
NA27
NA08
NA09 9'
NA24
NA15 7'
NA04
NA10
NA17 5'
NA28
SW28 6'
NA11
NA16
NA03
NA18
SW27
NA05
NA01
NA19 7'
NA12
NA29
NA13

Timber pier (To be demolished)
Berth X
Berth IX
Floating Dry Dock
Berth Wall
Building Ways 4
Building Ways 3
On Block
Building Dock 1
Berth I
Berth III

Sampling Location (Exponent 2003)
3' Estimated Dredging Depths (not including 1-foot overdepth)
Remedial Footprint
Overwater Structure
Thiessen Polygon Boundary
Shipyard Leasehold Line

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San Diego Shipyard Sediment Site Group

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Feet
0 75 150 225 300

Figure 4
Remedial Footprint within South Shipyard Area
San Diego Shipyard Sediment Site

The following summarizes each alternative corrective action considered; more detail is available in the Sediment Investigation Report (Exponent 2003):

- Mechanical dredging is technologically feasible at the site and is expected to be relatively cost-effective.
- Hydraulic dredging requires a sizable facility to store slurry generated, which could be three times greater than the volume of sediment removed. Owing to the highly restricted land space available at the North and South Shipyard Areas, this option would be very difficult to implement.
- Subaqueous capping would not be feasible for the site because of the potential for scour and damage from passing vessels, as well as the need to avoid restricting water depths to allow for ongoing shipyard activities.
- Natural recovery is currently ongoing at the site but has not been demonstrated to the Water Board's satisfaction to be substantially likely to achieve long-term remedial success at the site within a reasonable period of time.
- Confined aquatic disposal can be a successful means of permanently storing sediment in a stable, capped location offshore, but a suitable location has not been identified at the site.
- Nearshore confined disposal can be a successful means of permanently storing sediment in a stable, nearshore location, potentially reusable as upland space, but a suitable location has not been identified at the site.
- Sediment treatment in-place is suitable only under a specific range of circumstances and has not been demonstrated to the Water Board's satisfaction to be likely to achieve long-term remedial success at the site.
- Offshore disposal of sediment requires that sediment pass a comprehensive set of tests mandated by the USEPA and U.S. Army Corps of Engineers (USACE), to demonstrate that it will not adversely affect marine life. Although the full set of required tests has not been conducted on sediment, it appears unlikely that sediments will qualify for offshore disposal.
- Nearshore disposal of sediment requires that sediment pass a comprehensive set of tests mandated by state and federal agencies, to demonstrate that it will not adversely affect nearshore beneficial uses. Although the full set of required tests has not been conducted on sediment from the Shipyard Sediment Site, it appears unlikely that sediments will qualify for nearshore disposal.
- Beneficial reuse, such as placement on beaches, requires physical and chemical testing

commensurate with the intended use. Sediments from the shipyards site are chemically impacted and have too low of a sand content to qualify for beach nourishment. No other feasible reuse alternatives have been identified.

- Landfill disposal is technologically feasible, although costly. Certain local and regional landfills are known to be able to accept dredged San Diego Bay sediment.

After considering these corrective action alternatives, mechanical dredging with landfill disposal was selected by the Water Board as the remedial action for cleanup of the remedial footprint.

Dredging will be conducted to remove impacted sediments from all accessible portions of the Shipyard Sediment Site. Dredged material will be offloaded to an onshore stockpiling area where it will be dewatered, loaded into trucks, and transported to one or more off-site disposal locations. Mechanical dredging will be supplemented, where necessary, by localized placement of clean sand cover in cleanup areas (depending on various factors, including the results of post-remediation confirmatory sampling) as a mechanism for further enhancing the sediment surface. Cleanup areas below overwater structures will receive a cover layer of clean sand and gravel rather than being dredged, owing to accessibility issues and the need to maintain stability of the structures.

The target depth for remediation is the maximum depth of chemical exceedance relative to CAO target cleanup levels. Based on preliminary calculations, dredging to a point where the target sediment levels are achieved will result in the removal of approximately 143,400 cubic yards (cy) of material. Further design-level evaluations (e.g., calculation of structural setback distances and dredged side slopes) will better refine this estimated dredge volume. All dredged material will be offloaded to an onshore stockpiling area where it will be dewatered, loaded into trucks, and transported to one or more off-site disposal locations. Following sediment removal, the stability of existing marine structures, seawalls, and side slopes will be maintained, if needed, by placing a ridge or blanket of protective rock material adjacent to the structure in question, thereby replacing the stabilizing effect of sediment removal.

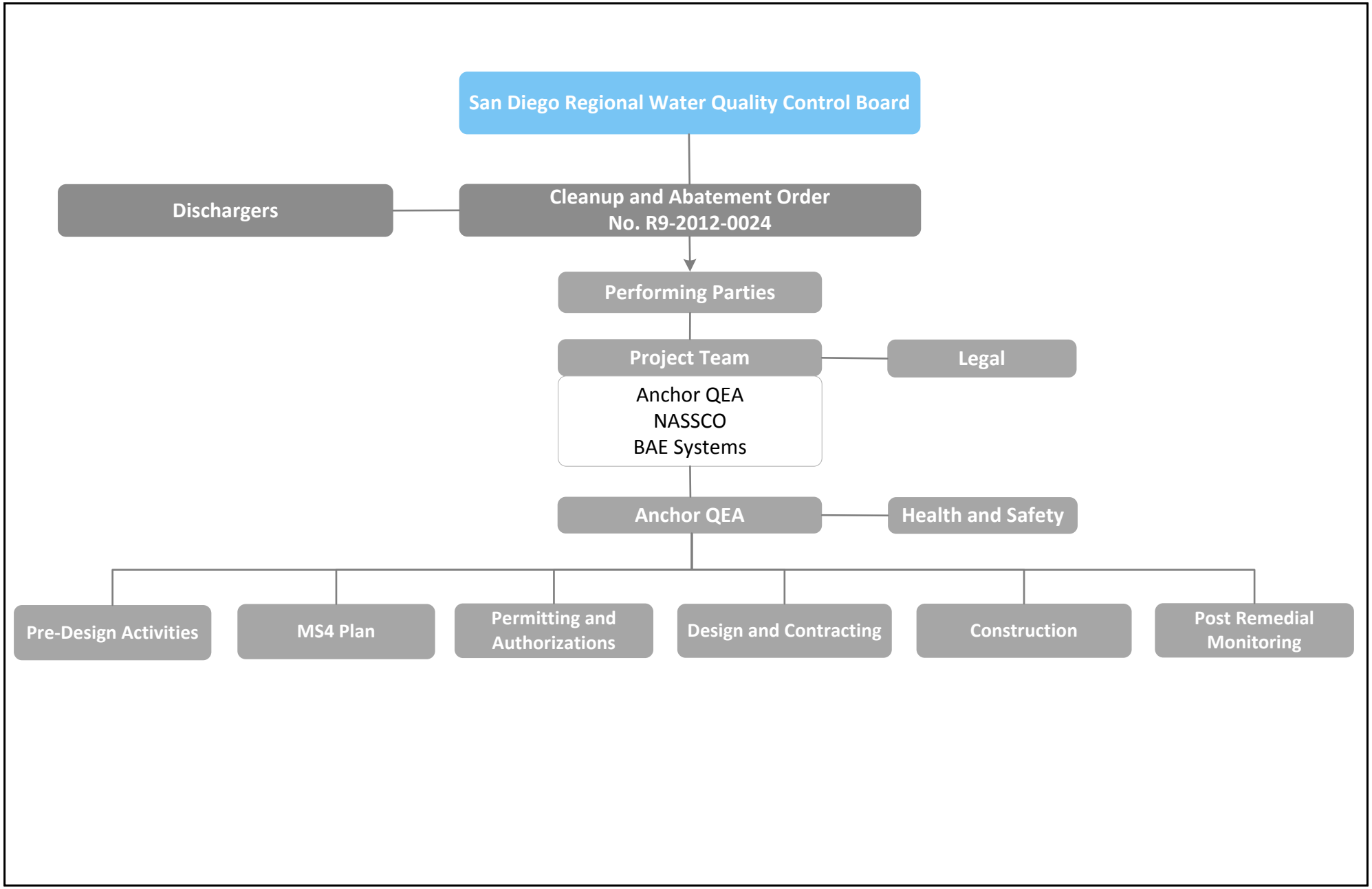
3 PROJECT TEAM AND ORGANIZATION

The CAO identifies "Persons Responsible" as those parties that "caused or permitted the discharge of waste to the Shipyard Sediment Site resulting in the accumulation of waste in the marine sediment" (Water Board 2012a). The parties listed in the CAO are NASSCO; BAE Systems; the City; Campbell Industries; San Diego Gas & Electric (SDG&E), a subsidiary of Sempra Energy Company; the U.S. Navy; and the Port. Collectively, these parties are referred to as the "Dischargers."

Figure 5 presents an organizational chart for the Project Team, which will consist of representatives from NASSCO and BAE Systems, their respective Project Coordinator, and other representatives of the Dischargers.

For matters of CAO compliance, the Water Board will serve as a point of communication and information dissemination for other governmental agencies (as necessary), including the USACE, National Oceanic and Atmospheric Administration, and California Department of Fish and Game. Separate matters of permit compliance may be communicated and managed directly with individual agencies.

Commentary from stakeholders, the public, and non-governmental organizations, such as environmental groups, will be managed by the Water Board until the RAP is finalized. During the execution of the elements of the RAP, the Project Team will perform outreach directly to the public and to stakeholders in coordination with the Water Board and in accordance with the CRP (Appendix E).



San Diego Shipyard Sediment Site Group

ANCHOR QEA

Figure 5
Project Team Organizational Chart
San Diego Shipyard Sediment Site

4 PREPARATION AND PLANNING FOR THE REMEDIAL ACTION

The Dischargers, both directly and through their Project Coordinator, will maintain close and regular communication and coordination with the Water Board regarding project progress and success. At a minimum, communications will include:

- Attending briefings with Water Board representatives as necessary
- Sending notifications to the Water Board as required under the CAO
- Submitting quarterly progress reports
- Reviewing and approving of various permit applications necessary to attain required permits and approvals
- Reviewing and approving various technical memoranda developed during the design and permitting
- Reviewing and approving the Cleanup and Abatement Completion Report

4.1 Pre-Design Site Investigations

A number of additional site studies will be required to support the first step of the remedial action: project design and permitting. This step includes a pre-design sediment sampling program that will be used to obtain physical and geotechnical information on sediment properties (needed for engineering design) and to determine sediment and waste characterization suitability for disposal acceptance at local and/or regional landfills.

Additional details regarding the pre-design investigations are provided in the DCR (Appendix A). Corresponding methods of sampling and analysis for the pre-design investigations are detailed in the SAP (Appendix D).

4.2 Pilot Testing

Pilot tests are a means by which processing systems and physical or chemical modification techniques can be tested on a small scale in order to optimize their application for the full scale of construction. Because mechanical dredging methods have been identified as most suitable for remediation of the Shipyard Sediment Site, pilot testing is not anticipated to be necessary. 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

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 and filter presses.

4.3 Engineering Design Analyses

Using the information obtained during pre-design site investigations, engineering analyses will be conducted to evaluate methods, rates, vertical depths, and side slopes of the cleanup areas. Similarly, sand and/or gravel material types will be selected for underpier clean cover placement. Elements of structural protection will also be evaluated and selected as part of the design process.

Details regarding the engineering design process and the design criteria to be applied are provided in the DCR (Appendix A).

4.4 Suitable Sediment Stockpiling Area

Dredged material must be moved onto land to be loaded into trucks for disposal. This effort will require identifying and using a land-side area for sediment offloading and stockpiling. Neither the North nor South Shipyard Areas' facilities have available on-land area that would suffice for this processing; therefore, arrangements must be made with a different party for use of an off-site sediment stockpiling area. To effectively allow for sediment stockpiling and dewatering, while accommodating a reasonable sediment production and disposal rate, the area should have the following characteristics:

- Be 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. The waterfront area should be long enough to allow for the mooring of one to two barges at a time.
- Have waterfront structure (dock, wharf, or seawall) that is structurally capable of holding offloading equipment (such as a crane), the sediment stockpiles, and any ancillary dewatering equipment (if used).
- Be situated at or on a road or rail spur to allow trucks or railcars to be brought in and loaded with dewatered sediment for haul-off and disposal.
- Be at least 2 acres. The stockpiling area must have enough square footage area to hold sediment 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 via a more active process involving filter presses or other equipment. The passive air-drying dewatering process is the slowest, while the amount of time needed for this process is dependent on weather conditions and physical character of the sediment. It is expected that 3 days will generally be sufficient.

- Be enough square footage to allow haul-off and disposal of sediment at the same overall rate as the sediment is being dredged. It is also beneficial to have enough space to accommodate segregated stockpiles if some sediment does not pass the requirements for disposal at local landfills.
- Be an area that remains available for the full duration of cleanup activities. The 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 currently proposed for the sediment stockpiling area is located immediately north of the North Shipyard Area. This location is on Port Tidelands property, under Tidelands Use and Occupancy Permit to SDG&E and subsequent subpermit to BAE Systems. Although there are other conceptual options for sediment stockpiling, as delineated in the Environmental Impact Report (EIR; Water Board 2012c), none of these have any indication of acceptance from their property owners.

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

For more information on the selection, preparation, and use of a temporary sediment offloading and stockpiling area, refer to Section 3 the DCR (Appendix A).

4.5 Community Relations Plan

Public coordination will be an important component of implementing the remedial action and will be accomplished in a manner consistent with community outreach elements used for other highly public environmental cleanup projects. Public outreach will commence prior to the start of construction operations and will be ongoing throughout the work's duration. Recognizing the cultural diversity of the San Diego Bay area, community outreach efforts will be done in both English and Spanish.

A detailed CRP has been prepared for this project, and is provided as Appendix E. That document provides further detail on planned community outreach efforts.

4.6 Contract Documents

Once engineering design tasks have been completed, all technical design details, including performance criteria, monitoring requirements, and compliance with all applicable local, state, and federal regulations will be documented in a set of construction plans and technical specifications. These documents, in conjunction with legal contract language, will comprise a set of contract documents that will be used by the contractor(s) in preparing bids for the work and that will then form the basis for the execution, monitoring, approval, and payment for the work.

4.7 Contract Award

The construction plans and technical specifications previously described in Section 4.6 will be used to create a bid-ready set of contract documents that will be made available to selected, qualified contractors for bidding. The Project Team will select a responsive and responsible contractor for the work based on the value of their bid and on their capabilities to perform the work.

5 EXECUTION AND MONITORING OF THE REMEDIAL ACTION

Once a remedial contractor has been selected and contracted to perform the remedial action, the execution of the work will begin, in accordance with project permits and contract documents (construction plans and technical specifications). During construction, a remedial monitoring program will be undertaken to determine whether cleanup activities have been successfully completed without violation of any permit provisions.

This section describes each of the remedial action execution and monitoring steps in greater detail.

5.1 Review of Construction Activities

The majority of the remedial footprint will be remediated by removing impacted sediments by dredging. Post-dredge confirmational samples will be used to determine whether dredging has been sufficient to remove sediments with elevated levels of COCs. If not, additional dredging, or placement of a clean sand layer, may be done. Dredged material will be hauled to a landside offloading and stockpiling area, where it will be dewatered, placed on haul trucks, and sent to one or more appropriate off-site disposal facilities or landfills.

Underpier areas will not be accessible to dredging equipment; these areas will be remediated through the placement of a clean cover layer consisting of sand and possibly gravel materials.

Dredging in the vicinity of existing slopes and marine structures will be offset a safe distance from these features to avoid undermining or destabilizing them. Protective buttresses or ridges of armor stone are also expected to be placed along these areas to structurally offset the loss of adjoining sediment.

5.2 Wastes Generated

Wastes generated during dredging activities are expected to include:

- Sediment (approximately 143,400 cy is anticipated to be removed per the CAO)
- Debris, which includes all material that is not sediment (e.g., rocks) and anything that is manmade (e.g., anchors, chains, and plastic bags)
- Effluent water from dredged material, both within haul barges and in the on-land

stockpiling area
- Used hay bales/straw waddle, filter fabric, or other similar materials used to prevent free flow of material
- Contractor waste (e.g., oil, spilled fuels, other chemicals)

Sediments and debris encountered within the remedial footprint will be disposed of at one or more upland approved facilities, such as a Subtitle D landfill (see DCR; Appendix A). Effluent water from dredged sediment will be collected and tested to determine whether it can be disposed of in the North and South Shipyards' stormwater system, sent to City wastewater treatment, or sent off-site to a different disposal facility. Wastes generated as a result of the contractor's activities (e.g., used best management practices, oil, chemicals, or spilled fuel) 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 subject to review and approval by the Project Team and Water Board.

For more details on the anticipated waste generated and on how it will be managed, refer to the DCR (Appendix A).

5.3 Equipment, Services, and Utilities

Because the remedial action will involve dredging and off-site sediment disposal, with clean cover material placed in underpier areas, no elements or components of the remedial action are expected to require custom fabrication or long lead-time for procurement. All equipment and materials anticipated to be used are expected to be readily available.

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 placed into a scow or barge and offloaded to an onshore stockpiling area where it will be dewatered, loaded into trucks, and transported to one or more off-site disposal locations.

Placement of clean materials in underpier areas is expected to use similar equipment, possibly supplemented with a conveyor, tremie tube, or similar device for placing material in hard-to-access locations.

For more details on the anticipated equipment and materials that will be used during the course of the remedial action, refer to the DCR (Appendix A).

5.4 Construction Oversight

The Project Team will oversee the construction process to ensure and document compliance with contract documents and project permits. Continuous communication will be maintained with the contractor in order to alert them to any need to change or modify their equipment or methods. The contractor will be required to meet all construction performance standards, as described in the DCR (Appendix A).

Elements of construction management, construction oversight, and remedial monitoring are described in the QAPP (Appendix B) .

5.5 Remediation Monitoring Plan

Throughout the construction process, a remediation monitoring program will be conducted for the following purposes:

- To determine whether target cleanup levels have been reached within the remedial footprint
- To determine whether cleanup activities have violated water quality standards outside the remedial footprint
- To assess appropriate disposal options for the dredged sediment

Further details on how each of these goals will be accomplished are documented in the RMP (Appendix C). Corresponding methods of sampling and analysis for monitoring elements are detailed in the SAP (Appendix D).

5.6 Final Cleanup and Abatement Completion Report

After the work has been completed, a Final Cleanup and Abatement Completion Report will be prepared to verify completion of the remedial action. The report will include the following information:

- Compilation of results of all confirmatory sampling that demonstrates that cleanup areas have been remediated in compliance with the CAO

- Demonstration that all underpier areas have been remediated in compliance with the CAO
- Compilation of results of all confirmatory sampling that demonstrate compliance with required post-remedial SWAC values

5.7 Post-Remedial Monitoring Plan

The CAO requires that post-remedial monitoring be conducted at the Shipyard Sediment Site. The post-remedial monitoring is intended to verify that remediation is effective in reducing and maintaining chemical concentrations in sediment to an acceptable level. The work plan detailing the field sampling plan, quality assurance project plan, and data analysis and interpretation of results procedures are provided in the Post-Remedial Monitoring Plan (Exponent 2012).

6 REGULATORY PERMITS AND APPROVALS

The following state and federal permits and approvals must be received prior to implementation of the remedial action.

6.1 California Environmental Quality Act

The Water Board has determined that an EIR is required to comply with the California Environmental Quality Act, with the Water Board acting as the lead agency. On November 16, 2011, the Water Board certified the Final Program EIR and adopted the Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Plan as incorporated within the Resolution. The work will comply with the preferred alternative selected in the EIR.

6.2 Rivers and Harbors Act Section 10 and Clean Water Act Section 404 Permits

Rivers and Harbors Act Section 10 and Clean Water Act Section 404 permits are needed for the work. The USACE will act as the lead agency for obtaining these permits and will be the lead agency for required Endangered Species Act (ESA) and Essential Fish Habitat (EFH) consultations. Because construction activities are a required component of the CAO, the USACE has the ability to issue a letter of verification for Nationwide Permit 38, which applies to "containment stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority (notice)" (Federal Register 77:34). The USACE does, however, also have the discretion to require a Standard Individual Permit.

The USACE will act as the lead National Environmental Policy Act (NEPA) agency. The USACE's decision on permit forms affects the form of the NEPA review. An Environmental Impact Statement is not anticipated to be required.

6.3 Endangered Species Act/Magnusson-Stevens Fishery Conservation and Management Act

Consultation under Section 7 of the ESA and under the Magnusson-Stevens Fishery Conservation and Management Act is required for this work. Consultations concern

potential effects to federally listed, threatened, or endangered species and EFH issues. The USACE will act as the lead agency for consultations with the U.S. Fish and Wildlife Service and National Marine Fisheries Service and will make the final determination on requirements to comply with these regulations. Project construction activities may be limited to the period between September 15 and March 31 in order to protect the endangered California least tern (*Sterna antillarum browni*); although work within the least tern season may be requested per the terms of the EIR (Water Board 2012c). A Biological Assessment and EFH Evaluation Report will be required to support the consultation, and work windows may be confirmed during that process. Some other sensitive species, such as sea turtles, are known to be present near the Shipyard Sediment Site. An eelgrass survey will be required.

6.4 Section 401 Water Quality Certification and Waste Discharge Requirements

Clean Water Act Section 401 Water Quality Certification and Waste Discharge Requirements (WQC/WDRs) are needed for the work. The Water Board will publish its WQC/WDRs after submission and acceptance of the QAPP (Appendix B) and review and approval of the WQC/WDR application.

6.5 California Coastal Act Consistency

A California Coastal Act (CCA) consistency determination will be needed for the work. The Port is anticipated to act as the CCA agency through the Port's environmental process, as NASSCO and BAE Systems are Port tenants. The Port can consider the work under its California Coastal Commission approved Port Master Plan.

6.6 Other Reports and Entitlements

A project Stormwater Pollution Prevention Plan and construction and stormwater National Pollutant Discharge Elimination System permits may be required as a result of the upland sediment dewatering facility. The need for these items will be confirmed through discussions with the Water Board. Additionally, access agreements (right-of-entry, easements, etc.) and some form of a Memorandum of Understanding or lease for the use of an onshore dewatering facility may also be required by the Port or other land owners adjacent to the Shipyard Sediment Site.

7 REMEDIATION SCHEDULE

The CAO states that implementation of the RAP may commence 60 calendar days after it has been submitted to the Water Board (unless otherwise directed in writing by the Water Board). The official timeline for implementation of the remedial action will begin when the Project Team receives notification from the Water Board that the RAP has been approved.

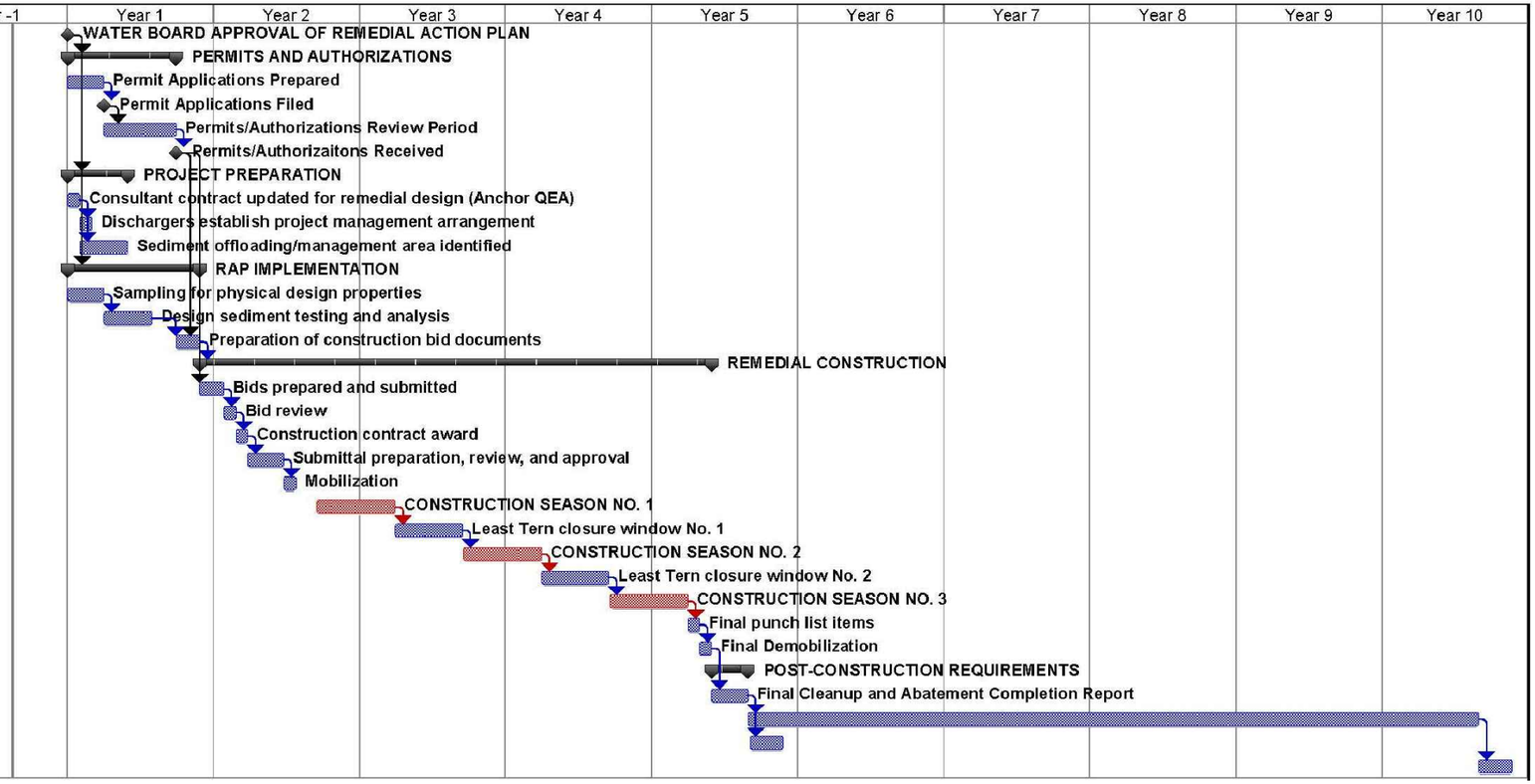
Figure 6 presents a schedule detailing the sequence of events and the timeframe for each activity based on the shortest practicable time required to complete each activity. This schedule reflects the implementation of the remedial action required by the CAO, as detailed in this document.

Initial implementation steps include applying for and securing project permits, conducting design analysis, and preparing a bid-ready set of contract documents.

Once construction is underway, the project schedule may be constrained by the limited dredging window (September 15 through March 31) to protect the endangered California least tern (unless and except as authorized by resource agencies, as provided for in the EIR [Water Board 2012c]). As a result, dredging and marine construction work is typically restricted to the months of September through March. Further scheduling impacts are expected to result from the variety of ongoing and planned shipyard activities. Because of the reduced dredging window, at least three annual dredging episodes are anticipated to complete the required remedial action.

Once remedial construction activities have been completed and the CAO objectives have been met, the Dischargers will prepare and submit a Final Cleanup and Abatement Completion Report (CAO Directive C) to document the closure of construction activities. Implementation of the RAP will be followed by post-remedial monitoring activities (CAO Directive D) to ensure long-term compliance with the objectives of the CAO. These activities will begin 2 years after the remedial action implementation activities are completed.

ID	Task Name
1	WATER BOARD APPROVAL OF REMEDIAL ACTION PLAN
2	**PERMITS AND AUTHORIZATIONS**
3	Permit Applications Prepared
4	Permit Applications Filed
5	Permits/Authorizations Review Period
6	Permits/Authorizaitons Received
7	**PROJECT PREPARATION**
8	Consultant contract updated for remedial design (Anchor QEA)
9	Dischargers establish project management arrangement
10	Sediment offloading/management area identified
11	**RAP IMPLEMENTATION**
12	Sampling for physical design properties
13	Design sediment testing and analysis
14	Preparation of construction bid documents
15	**REMEDIAL CONSTRUCTION**
16	Bids prepared and submitted
17	Bid review
18	Construction contract award
19	Submittal preparation, review, and approval
20	Mobilization
21	**CONSTRUCTION SEASON NO. 1**
22	Least Tern closure window No. 1
23	**CONSTRUCTION SEASON NO. 2**
24	Least Tern closure window No. 2
25	**CONSTRUCTION SEASON NO. 3**
26	Final punch list items
27	Final Demobilization
28	**POST-CONSTRUCTION REQUIREMENTS**
29	Final Cleanup and Abatement Completion Report
30	**POST-REMEDIAL MONITORING PLAN IMPLEMENTATION**
31	Post-Remedial Sampling and Analysis Year 2
32	Post-remedial Sampling and Analysis Year 5



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San Diego Shipyard Sediment Site Group

ANCHOR QEA

Figure 6
Remediation Schedule
San Diego Shipyard Sediment Site

8 REFERENCES

Exponent, 2003. *NASSCO and Southwest Marine Detailed Sediment Investigation.* Volume 1. Prepared for NASSCO and Southwest Marina, San Diego, California. October 2003.

Exponent, 2012. *Post-Remedial Monitoring Plan, San Diego Shipyard Sediment Site*. Prepared for the Regional Water Quality Control Board. June 2012.

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. *Technical Report for Cleanup and Abatement Order No. R9-2012-0024 for the Shipyard Sediment Site*. March 14, 2012.

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

DESIGN CRITERIA REPORT
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

Prepared by
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26300 La Alameda, Suite 240
Mission Viejo, California 92691

Modified
August 17, 2012

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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

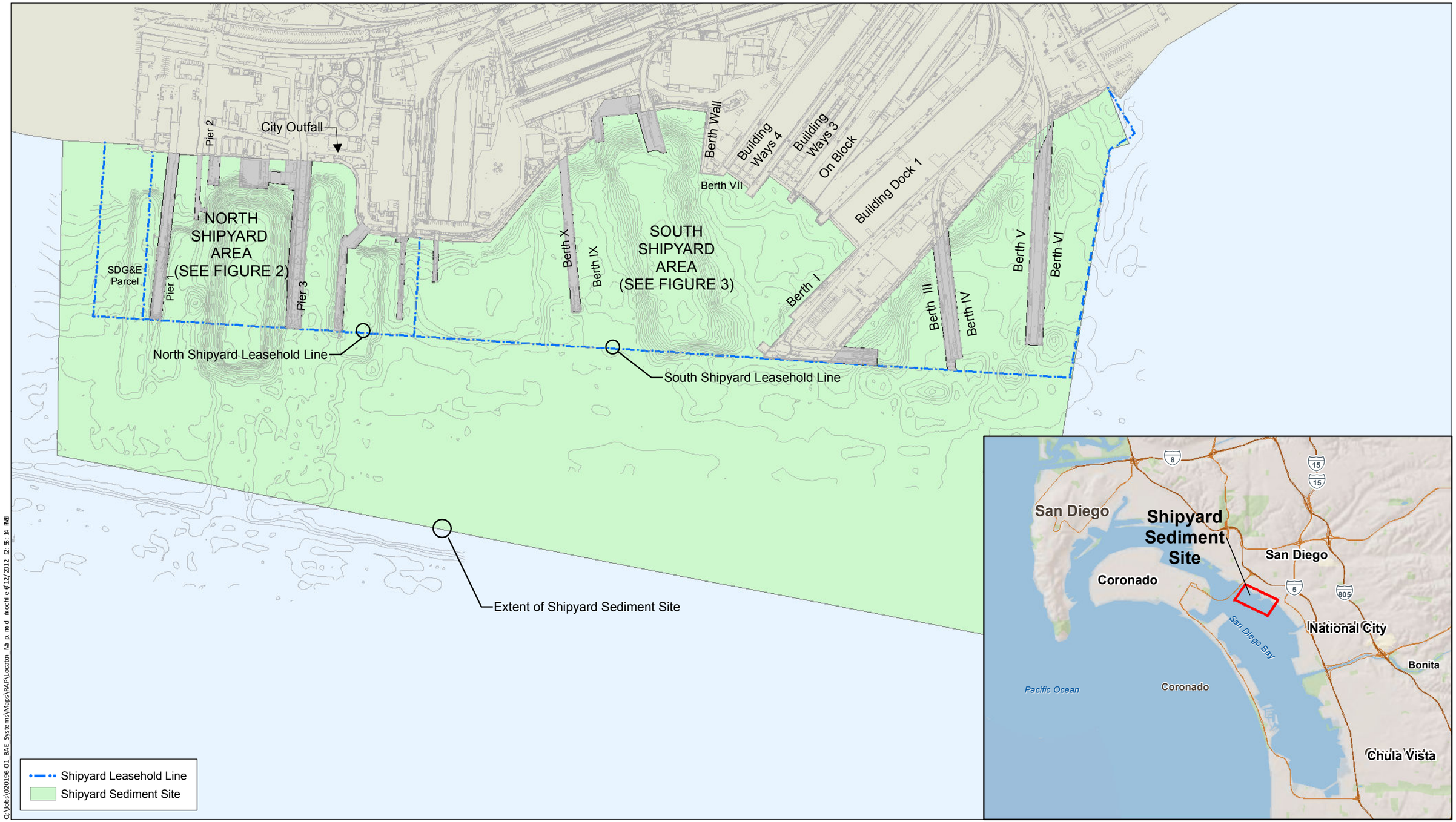
1 INTRODUCTION

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 Underpiers
- **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 Underpiers, 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 comprehension 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 and
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

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). 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
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	

Cleanup Area	Depth of Measured Chemical Exceedance (feet)	Estimated Minimum Required Dredging Depth (feet)[1]	Approximate Volume of Dredged Material (cy)[2]
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 vertical depth of cleanup in each area was determined by identifying the depth requiring cleanup 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. 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.

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.

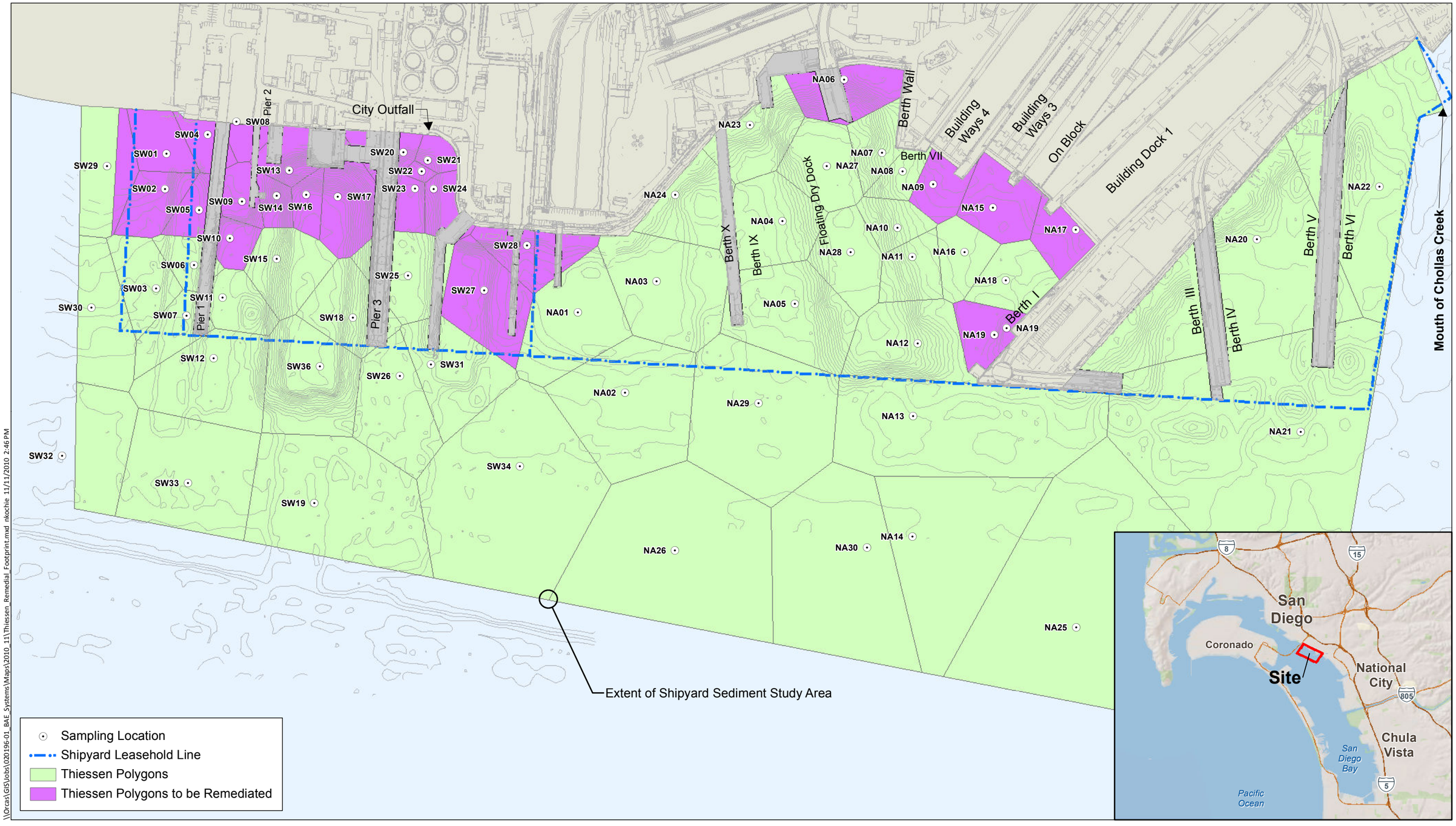

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Figure 2
Thiessen Polygon and Required Cleanup Areas
San Diego Shipyard Sediment Site

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., underpiers 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. The following evaluations will be conducted:

- 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 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.

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.
- Evaluation 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 3). 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. No other location has been

identified that is more 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).

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.

L:\AutoCAD Project Files_Projects\0918-Gallagher\SD Shipyard\0918-RP-001-SDGE.dwg FIG 3

Jun 12, 2012 11:57am ghowell

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 3
Proposed Sediment Offloading Area
San Diego Shipyard Sediment Site

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 UNDERPIERS

4.1 Design Criteria

Sediment removal underpiers 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 underpiers 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.

4.2 Design Process

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

- Obtaining and reviewing as-built construction plans for overwater structures
- Assessment of the substrate conditions of the underpier areas and determine where protection measures are appropriate
- Identification of readily available and cost-effective materials that can be used to serve the cleanup objectives
- Identification of implementable construction and placement methods

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 underpiers 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 underpiers 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 underpiers and overwater structures.

4.4 Performance Standards

The following performance standards will apply to the Clean Layer Placement Underpiers element of the remedial action:

- 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.

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:

- Obtaining and reviewing 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:

- Reviewing 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).

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 monitoring will initially be high (e.g., once per day) but may be lessened as dredging proceeds and data are collected to document the results, provided that few water quality exceedances are noted. 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 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.

QUALITY ASSURANCE PROJECT PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

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Modified
August 17, 2012

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LIST OF ACRONYMS AND ABBREVIATIONS

BMP	best management practice
CAO	Cleanup and Abatement Order
CDFG	California Department of Fish and Game
CHASP	Contractor's Health and Safety Plan
CQAPP	Contractor's Quality Assurance Project Plan
CQC	Construction Quality Control
DMP	Dredging Management Plan
EIR	Environmental Impact Report
EPP	Environmental Protection Plan
EPS	Electronic Positioning System
MMRP	Mitigation Monitoring and Reporting Program
NOAA	National Oceanic and Atmospheric Administration
OSHA	Occupational Safety and Health Administration
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAP	Remedial Action Plan
RMP	Remediation Monitoring Plan
Shipyard Sediment Site	San Diego Shipyard Sediment Site
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
Water Board	San Diego Regional Water Quality Control Board
WQMP	Water Quality Monitoring Plan

1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is one component of the Remedial Action Plan (RAP) for the Shipyard Sediment Site. This document describes quality assurance/quality control (QA/QC) protocols to be taken during construction to ensure that the cleanup meets design specifications, the objectives of the cleanup action, and the requirements set forth in regulatory permits, when received.

The purpose of this QAPP is to describe and explain project objectives, organization, and functional activities, including dredging oversight and environmental monitoring as well as the rationale used to develop those activities. This document also identifies the QA/QC protocols to be used in construction management, including monitoring actions, reporting mechanisms, and documentation formats. This QAPP describes how environmental monitoring will be performed and how modifications to construction procedures will be made, as necessary, in response to the results of environmental monitoring. In addition, this QAPP defines QA methods and protocols to ensure that project personnel have a complete understanding of monitoring, feedback, and adjustment mechanisms.

The cleanup contractor will use this QAPP, together with the Construction Plans and Technical Specifications, to develop a Cleanup Construction Schedule, Contractor's Health and Safety Plan (CHASP), Contractor's Quality Assurance Project Plan (CQAPP), Dredging and Disposal Work Plan, Borrow Source Characterization Report, Environmental Protection Plan (EPP), and Vessel Management Plan.

The remainder of the QAPP is organized as follows:

- **Section 2.** Project Roles and Responsibilities
- **Section 3.** Contractor/Subcontractor Qualifications
- **Section 4.** Documentation and Reporting
- **Section 5.** Cleanup Construction Elements
- **Section 6.** Summary of Inspection Activities and Construction Monitoring
- **Section 7.** Final Report
- **Section 8.** References

2 PROJECT ROLES AND RESPONSIBILITIES

The roles and responsibilities of the parties involved in the Shipyard Sediment Site cleanup are discussed below. The Project Team (as described in the RAP) will be responsible for design, permitting, contractor selection, shipyard coordination, budgets, and communication. It is anticipated that the construction work will extend over a number of seasons.

2.1 Regulatory Oversight

The Water Board is the lead agency and is responsible for overseeing and authorizing the cleanup process and steps described in the RAP.

Additional regulatory agencies, including the U.S. Army Corps of Engineers (USACE), National Oceanic and Atmospheric Administration (NOAA), and California Department of Fish and Game (CDFG), will review and comment on the implementation of the remedial action and may issue additional regulatory authorizations.

2.2 Construction Contractor

One or more construction contractors will be selected to perform construction activities, including dredging and disposal of sediments, placement of clean sand cover, and other required cleanup activities. The selected contractor will have demonstrable experience with dredging, sediment rehandling, and sediment disposal and placement. The contractor's activities will be performed in accordance with the Construction Plans and Technical Specifications, pursuant to the remedial action and associated permits. The Construction Plans and Technical Specifications will contain specific, detailed requirements for accomplishing the work and achieving suitable overall quality compliance for the construction project.

The contractor will be responsible for QC during all phases of construction and will designate one or more job site superintendents with the responsibility to observe that the work is conducted in accordance with the contract requirements. The Technical Specifications will require the contractor to develop a CQAPP and to fully implement this plan, with documentation, throughout performance of the work. Details on the documentation required are presented in Section 4.

2.3 Subcontractors

The contractor may employ subcontractors to perform selected phases of the work for which they have special expertise; for example, the contractor might employ the services of a firm specializing in bathymetric surveys to perform these surveys. Subcontractors are responsible to their prime contractor for the quality of their work, and for the health and safety of their project personnel in accordance with the contractor's submittals (as outlined in Section 4). The subcontractor's principals will designate a job site superintendent or foreman with the responsibility to observe that work is conducted in accordance with contract requirements.

3 CONTRACTOR/SUBCONTRACTOR QUALIFICATIONS

The contractor involved with the project will be required to name one or more QC managers who must have documented qualifications and experience to perform independent checks on the contractor's operations that are necessary to determine compliance with the contract provisions. Additionally, any subcontractors used in the work must have demonstrated to the satisfaction of the Project Team that they are qualified and have satisfactorily performed the type of work for which they will be engaged. Responsibility for subcontractor performance rests with the prime contractor.

The contractor and all subcontractors will be required to have all health and safety training required by the state of California and will be required to follow applicable guidance from Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (USEPA).

The contractor will keep (as part of their permanent organization) high caliber, knowledgeable, and experienced key personnel to perform their jobs. These individuals will have demonstrable experience in the type of work being contracted. All operators, surveyors, and other personnel performing key jobs must have demonstrated the ability and skills to satisfactorily perform these assignments.

4 DOCUMENTATION AND REPORTING

This section summarizes the various submittals required of the contractor prior to, during, and at the completion of the required construction work. This information will also be required in the Technical Specifications, establishing it as minimum requirements for executing the work.

4.1 Documentation and Submittals prior to Construction

4.1.1 Dredging Management Plan

Prior to beginning work on the project, the contractor will be required to submit a detailed Dredging Management Plan (DMP) for review by the Project Team, the Water Board, and other regulatory agencies as necessary. The DMP will outline the equipment, materials, methods, procedures, and personnel that will be employed in the work. The Dredging cannot proceed until approval of the work plan is received. Within the DMP, the Contractor will also be required to submit the following additional documents.

4.1.2 Environmental Protection Plan

For construction activities, the contractor will be required to submit an EPP to the Project Team for approval. No physical work is to be performed at the Shipyard Site until the EPP is reviewed and approved by the Project Team and the construction management team. The EPP will present methods and equipment that will be used by the contractor to prevent or minimize potential environmental impacts resulting from the contractor's operations. It will address monitoring and prevention of leakage and other loss of contaminants into the surrounding environment, response to spills, cleanup, and control of water quality during the work.

4.1.3 Contractor's Quality Assurance Project Plan

The CQAPP will present the system through which the contractor ensures that the requirements of the contract and permits are in compliance. The CQAPP will identify a Construction Quality Control (CQC) supervisor and other personnel involved with executing QC activities, as well as all procedures, methods, instructions, inspections, records, and forms to be used in the CQC system.

The CQAPP will include information regarding equipment specifications and techniques to be used for positioning control, bathymetric surveys, and tracking and documentation of ongoing dredging and material placement activities in "real time" as the construction proceeds.

4.1.4 Cleanup Construction Schedule

The contractor will be required to submit a Cleanup Construction Schedule identifying areas of activity of the contractor and subcontractors for the various items of work. The contractor shall maintain the schedule throughout the construction period, record changes in responsibilities, and distribute the revised schedule on a weekly basis. The weekly revised schedule shall provide a 3-week forecast of planned construction activity. The Project Team may require the contractor to modify its equipment, methods, or operations if construction progress falls behind schedule.

4.1.5 Wastes Generated Plan

The contractor will be required to submit a Wastes Generated Plan, which will describe the plans for management, treatment, testing, storage, and disposal of all wastes generated by the remedial action. Management and disposal of sediment will also be detailed in the Construction Plans and Technical Specifications.

4.1.6 Borrow Source Characterization

The contractor will submit a Borrow Source Characterization Report prior to any on-site placement of import materials. This characterization report will include source identification (including a map documenting the origin of the material), site inspection documentation, and material sampling results for characterization (physical and chemical testing, as specified) to ensure that the import material will uniformly meet the specifications of its intended use. Additional verification of import material will be performed by the overall project manager (or designee) after the material has been delivered to the site. The overall project manager will verify that import material continues to meet the physical and chemical specifications specified in the Construction Plans and Technical Specifications. These verifications will occur at on a periodic basis throughout the remedial action.

4.1.7 Vessel Management Plan

The contractor will be required to prepare a Vessel Management Plan prior to initiation of site activity. The Vessel Management Plan will document the means by which the contractor will coordinate its activities with other vessels and marine activities in the shipyard areas and adjoining locations in San Diego Bay. Commercial activities taking place at the shipyard areas will have precedence over the contractor's activities.

4.1.8 Health and Safety Plan

The contractor will submit a CHASP that presents the minimum health and safety requirements for job site activities and the measures and procedures to be employed for protection of on-site personnel and area residents from physical, chemical, and all other hazards posed by the cleanup construction. The CHASP will cover the controls, work practices, and other health and safety requirements that will be implemented by the contractor in connection with the cleanup construction. The CHASP will describe the training required by all applicable state and federal regulations and will be developed in accordance with OSHA requirements.

The Project Team's Health and Safety Plan is included as Appendix F, as required by Subsection B.1.c of the CAO.

4.2 Documentation and Submittals during Construction

During construction activities, the contractor will be required to participate in weekly construction meetings throughout the project duration and to submit daily and monthly reports to the Project Team. The Project Team and their construction management team, in turn, will submit regular reports to the Water Board. A brief description of key documentation to be prepared and submitted during the construction process is provided in Sections 4.2.1 and 4.2.2. The Technical Specifications will provide to the contractor all requirements for this documentation.

4.2.1 Daily Quality Control Report

The contractor will prepare a Daily QC Report for each day of active construction work at the Shipyard Sediment Site and will be required to submit it to the Project Team on the next

business day. The report will summarize the work performed by the contractor, the equipment used, and the QC inspection results, including water quality monitoring results.

When dredging activities are in progress, the Daily QC Reports will detail dredging and disposal operations for that day and will include the following, at a minimum:

- Daily and cumulative volume estimates of dredged material removed from each dredge area
- Depiction of areas in which dredging was accomplished that day and cumulatively for the project through that date
- Daily and cumulative estimates of dredged material moved to the off-site sediment offloading and stockpiling area
- Daily and cumulative estimates of dredged material hauled from the site for disposal, including truck tickets and disposal documentation from landfill(s)

When sand or rock placement activities are in progress, the Daily QC Reports will include the following, at a minimum:

- Shipping receipts and material volumes for all shipments of import fill materials used
- Daily and cumulative volume estimates of material placed
- Depiction of areas in which material placement was accomplished that day and cumulatively for the project through that date

4.2.2 Bathymetric Progress Surveys

The contractor will be required to conduct a daily bathymetric progress survey that covers, at a minimum, the area(s) in which dredging or material placement work occurred that day. Daily progress surveys will be required to be submitted to the Project Team within the ensuing calendar day with the Daily QC Report and will include a plot of the survey results, which will be contoured or color coded to facilitate interpretation, one or more cross-sectional presentations through the area surveyed, "isopach" plots comparing that day's survey to the pre-construction conditions (depicting the total thickness of dredging and/or material placement to that date), and the electronic data file of the survey results for the use of the Project Team and their construction management team.

4.3 Post-Construction Documentation

The following submittals will be prepared following the completion of cleanup construction activities at the Shipyard Site.

4.3.1 Pre-Final Punch List

The pre-final "punch list" will be used by the Project Team as the basis for a final inspection, after the contractor has completed the required remedial construction work. Following a pre-final inspection of the completed work with the Project Team, the construction management team, the appropriate agencies, the contractor, and the Project Team will prepare this consolidated list of items that are required to be completed or corrected after inspection.

4.3.2 As-Built Drawings and Post-Remediation Bathymetric Survey

The contractor will be required to submit as-built drawings and a post-remediation bathymetric survey following completion of the cleanup work. These as-built drawings will include all areas that were dredged and where rock and clean sand materials were placed, including previously dredged areas, underpier areas, areas adjacent to marine structures, and slopes. As-built drawings will also be required for any areas on land or any overwater structures where the contractor made changes to pre-existing conditions, including the off-site offloading area(s).

4.4 Document Storage

All documents submitted to or by the Project Team relating to the project, including pre-construction submittals and daily construction reports, will be stored by the Project Team at their selected office(s). The Project Team will retain these documents as specified in the CAO. The contractor will maintain its own set of records.

5 CLEANUP CONSTRUCTION ELEMENTS

The work described herein includes dredging and disposal of contaminated sediments, protection of marine structures and slopes during dredging work, and localized placement of clean cover material in underpier areas and other areas as may be determined necessary during the work. The contractor shall meet performance standards associated with dredging, transport, and disposal of dredged material as well as with placement of clean cover materials, per the project's Construction Plans and Technical Specifications, 401 Water Quality Certification, and other permits for this work (all of which are currently pending).

The contractor will be required to perform the following activities (see Sections 5.1 through 5.4 for further detail):

- Dredging
- Management and disposal of sediments
- Protection of marine structures and slopes
- Placement of clean sand cover (including underpier areas)

All related work will be conducted in strict accordance with the Construction Plans and Technical Specifications. These documents contain specific, detailed requirements to achieve the overall quality of the construction product.

In this section, the following issues are discussed for each work activity:

- **Description.** A description of the tasks required for accomplishing the construction activity and the overall goal of the activity.
- **Potential Problems, Concerns, and Remedies.** A description and evaluation of potential construction concerns, sources of information regarding potential problems, and common or anticipated remedies.
- **Monitoring, Contingency Plans, and Corrective Actions.** A plan for monitoring to be performed during remediation, required laboratory tests and their interpretation, a description of applicable criteria, and common or anticipated remedies.
- **Description of Equipment, Monitoring, and Maintenance.** A description of the equipment likely to be used by the contractor to complete the work and monitor construction activities. This discussion will also include monitoring and maintenance of the construction equipment.

- **Documentation.** A description of the documentation that will be required for each activity (in addition to that described in Section 4).

5.1 Dredging

5.1.1 Description

Dredging includes the removal of sediments from specific areas of the Shipyard Site to prescribed depths, as depicted in the design details and performance standards of the Construction Plans, which represent the Project Team's estimate of the dredging depths necessary to achieve the remedial goals. The contractor may be required to perform additional dredging based on the results of post-dredge confirmational sampling, as necessary to achieve the required post-remedial concentrations. All sediment to be removed is designated for disposal at one or more permitted and approved off-site locations.

The primary factors governing the selection of dredging techniques and equipment are the physical characteristics of sediment, such as its density and grain size gradation; the depth, condition, and slope of the mudline; the required depth and extent of dredging; the sediment's disposal location; accessibility to dredge areas as dictated by confinements and obstructions; equipment availability; timing and construction duration; and environmental factors, such as the minimization of contamination to the water column.

Based on these factors, sediments will most likely be removed by mechanical dredging equipment, with either a clamshell or cable-arm bucket and placed into a scow or barge for transportation to sediment offloading and dewatering area (discussed in Section 5.2).

5.1.2 Potential Problems, Concerns, and Remedies

The main concerns in the dredging process include the following:

- **Achieving Specified Dredging Depths and Extents.** The Construction Plans will identify the extents and estimated depths of contaminated sediments designated for removal. These sediments must be satisfactorily removed to the depths and lateral extents required.
- **Achieving Post-Remedial Concentrations in Dredge Areas**. Following dredging activities, the post-dredge surface will be evaluated by the Project Team for

conformance with CAO requirements. If post-remedial dredge area concentrations are not met, the contractor will be required to undertake additional actions, including further dredging or placement of clean cover material over the surface.

- **Maintaining Water Quality Requirements during Dredging.** The Project Team and Contractor will be responsible for carrying out a water quality monitoring program during the work. The elements of this program, which are also applicable to the contractor's activities involving placement of clean materials (sand cover), are summarized in this section and described in detail in the Remediation Monitoring Plan (RMP; Appendix C).

The following subsections provide further detail on the dredging concerns described herein.

5.1.2.1 Achieving Specified Dredging Depths and Extents

To ensure that the actual dredging depths are accurately determined, the contractor will be required to employ a sonar sounding device on the dredging equipment. An automatic electronic tide recording system is also required for all dredging and surveying operations. Tide boards or gages will be installed at the site.

The contractor must ensure that contaminated sediments will be removed to the full lateral extent as depicted on the Construction Plans. In this regard, the contractor will be required to employ an Electronic Positioning System (EPS) for accurately locating and tracking the movement of its dredging equipment. The control for this system must meet Third Order, Class I accuracy standards (plus or minus 1 meter) as defined in standard bathymetric survey manuals; however, it is anticipated that better accuracy will be obtained due to the close proximity of the survey control.

To verify that the specified dredging depths and extents have been met, the contractor will perform pre- and post-dredge QC bathymetric surveys, as will be described in the Technical Specifications. To establish actual excavated depths and extent of dredging, these surveys will be performed for each dredging area following completion of dredging in that area. The contractor will also be required to perform and submit daily progress surveys, such that the Project Team can continuously monitor dredging progress and adequacy.

Additionally, the Project Team and its construction management team will work closely with the contractor's QC manager and bathymetric survey crew to independently verify the dredge's horizontal position and dredging depth. This verification may be completed either by evaluating the contractor's daily QC surveys or positioning data or by conducting independent surveys, or through a combination of both methods. If the Project Team determines that the contractor is not dredging at the proper depth or in the correct location, they will immediately contact the contractor's superintendent to correct the situation. Any such direction and corrective action will be documented on that day's Daily QC Report.

5.1.2.2 Achieving Post-Remedial Concentrations in Dredge Areas

The contractor will be required to remove sediments to depths and extents shown on the Construction Plans, which will be verified through bathymetric surveys. Once it has been adequately demonstrated that the required dredging depths have been achieved, the adequacy of sediment removal will be determined by evaluating chemical concentrations in the post-dredge subsurface sediments. The Project Team will collect post-dredge confirmation samples to determine if the cleanup levels are achieved or if further cleanup activities are required (as detailed in the RMP [Appendix C]). The RMP provides further information on using post-dredge sediment cores to verify that sediment quality objectives have been achieved in dredging areas.

5.1.2.3 Maintaining Water Quality Requirements during Dredging

The contractor will be required to maintain water quality at the Shipyard Site during dredging, in accordance with regulatory and Water Board requirements. A water quality monitoring program (described in the RMP [Appendix C]) will be carried out by the Project Team to oversee the contractor's activities and to measure water quality at the Shipyard Site. The contractor will be required to employ several best management practices (BMPs) during dredging to avoid and minimize impacts to water quality as a result of project activities. These BMPs include:

1. Using a floating boom around the point of dredging.
2. Controlling dredge cycle time. Longer cycle time reduces the velocity of the ascending loaded bucket through the water column, which reduces the potential for sediment to be washed from the bucket. Limiting the velocity of the descending bucket reduces the volume of sediment that is picked up and requires more total bites

to remove the project material. The majority of the sediment resuspension for a clamshell dredge occurs when the bucket hits the bottom.

3. Avoiding multiple dredge bites. When the clamshell bucket hits the bottom, an impact wave of suspended sediment travels along the bottom away from the dredge bucket. When the clamshell bucket takes multiple bites, the bucket loses sediment as it is reopened for subsequent bites. Sediment is also released higher in the water column as the bucket is raised, opened, and lowered.
4. Ensuring that the clamshell bucket is entirely closed when withdrawn from the water and moved to the barge. This action requires extra attention when debris is present to make sure that debris does not prevent the bucket from completely closing.
5. Installing two closure switches on each side of the bucket near the top and bottom to provide an electrical signal to the operator that the bucket is closed. Use of the switches shall minimize the potential for sediment to leak from the bucket into the water column during travel to the surface.
6. Prohibiting bottom stockpiling. Bottom stockpiling of the dredged sediment in silty sediment has an effect similar to that of multiple bite dredging—an increased volume of sediment is released into the water column from the operation.
7. Prohibiting sweeping or leveling the bottom surface with their dredge bucket.
8. Not overfilling the digging bucket because overfill results in material overflowing back into the water. Use of instrumentation such as Clam Vision® shall allow the operator to visualize in real time the depth of cut that shall be designed to prevent overfilling.
9. Using barges that have watertight containment to prevent return water from re-entering San Diego Bay.
10. Ensuring that sediment haul barges do not overflow. Because haul barges will necessarily be positioned outside of the silt curtain enclosure to allow timely traffic to and from the sediment offloading and disposal site, the contractor will be required to ensure that the barge does not overflow during loading of sediment into the barge, transportation of dredged material to the offloading location, and sediment offloading. Each material barge shall be marked in a way that allows the operator to visually identify the maximum load point. The marking should allow sufficient interior freeboard to prevent spillage in rough water, such as that resulting from ship wakes during transit. Initiating the material barge marking shall minimize impact of load spillage during transit to the unloading area.

11. Placing material in the material barge such that splashing or sloshing does not occur, which could send sediment back into the water. Splashing can be controlled by restricting the drop height from the bucket.
12. Avoiding overdredging, both vertically and laterally, to the maximum extent possible, minimizes the amount of sediment being dredged and, therefore, available to be resuspended into the water column.
13. Using silt curtains. The contractor will be required to install a double set of silt curtains around the dredging area to further ensure against turbidity and water quality monitoring exceedances. These silt curtains should extend only a partial distance below the water surface (i.e., 5 to 10 feet). Extending silt curtains well below the surface has been shown to be an ineffective means of controlling turbidity at depth, and can have the deleterious effect of trapping fish in the enclosure. The other BMPs listed above will be significantly more effective than deploying a full-length silt curtain.
14. Implementing automatic monitoring of dredge operations. Automatic systems will be used to monitor turbidity and other water quality conditions in the vicinity of the dredging operations in accordance with Mitigation Measure 4.2.1 of the Mitigation Monitoring and Reporting Program (MMRP; Water Board 2012b).

5.1.3 Monitoring, Contingency Plans, and Corrective Actions

The key type of environmental monitoring that will be performed during dredging is water quality monitoring. Water quality in the area surrounding the dredging activity will be monitored in accordance with the 401 Water Quality Certification to be issued by the Water Board for this project.

The contractor will be required to implement automatic monitoring of dredge operations. Automatic systems will be used to monitor turbidity and other water quality conditions in the vicinity of the dredging operations in accordance with Mitigation Measure 4.2.1 of the MMRP (Water Board 2012b). In addition, a periodic water quality monitoring program (WQMP) will be implemented by the Project Team to confirm that requirements of the Section 401 Water Quality Certification are being met and to inform interpretation of the automatic monitoring performed by the contractor.

5.1.4 Description of Equipment, Monitoring, and Maintenance

Equipment for the dredging operations will likely be barge-mounted, mechanical dredging equipment, with either a clamshell bucket or cable-arm bucket suspended from a crane. Scow or barges will be used for sediment collection and tugboats and work skiffs will also likely be used to assist with maneuvering of the various dredging equipment. Dredging equipment will be equipped with automatic monitoring equipment, and water quality monitoring will be performed to confirm there are no violations of water quality standards outside the construction area.

In accordance with the technical specifications, the equipment will be maintained in good working order and in safe working condition at all times. Survey equipment will be maintained and calibrated for the life of the contract. Calibration techniques are prescribed to ensure that the equipment performs to the accuracy required.

5.1.5 Documentation

As described in Section 4, the contractor will be required to keep daily records of the dredging operations as part of his daily report. These daily reports will be required to be included as part of the Daily QC Report and will document daily and cumulative volume estimates of dredged material removed from each dredge area and will provide a depiction of areas in which dredging was accomplished that day and cumulatively for the project through that date. Additionally, the contractor will be required to perform daily progress surveys that cover the previous days dredging areas and submit them to the construction management team for review.

After dredging operations are complete, a post-dredge bathymetric survey will be performed to ensure that the required dredging depths and extents have been achieved. Post-dredge confirmation sampling will also be conducted to ensure the post-dredge surface is in compliance with the project objectives.

5.2 Management and Disposal of Sediments

5.2.1 Description

Dredged sediments will be transported to an off-site nearshore offloading facility by scow or barge where the sediments will be stockpiled and dewatered, in preparation for off-site

disposal at one or more permitted and approved locations (i.e., solid waste landfills). Once sufficiently dewatered, the dredged material will be transferred to land-based vehicles (trucks or railcars) and hauled by road or rail to the permitted landfill facility. Specific design criteria and performance standards will be specified in the Construction Plans.

At the conclusion of dredging and marine construction, the contractor will be required to remove all equipment and materials from the offloading area and will be required to return the area to its pre-construction conditions, including any cleanup or improvements that are necessary.

5.2.2 Potential Problems, Concerns, and Remedies

The main concerns during the offloading, dewatering, and transporting of the dredged sediments to the offloading facility include the following:

- **Releases of Dredged Sediments.** To prevent contaminated sediments from re-entering the San Diego Bay or surrounding waters, the contractor will be required to avoid leakage or release of dredged sediments into the bay during transport and offloading activities.
- **Contamination of the Sediment Offloading Area.** To ensure that the sediment offloading area remains clean and free of contaminants, the contractor will be required to maintain the offloading area and ensure all dredged sediments are properly disposed of in the appropriate manner.
- **Overflow of Water into the San Diego Bay.** To ensure that waters surrounding the offloading area are not contaminated by sediment, the contractor will be required to contain all free water and prevent it from flowing into the bay. The effluent water will be contained, sampled, and tested to identify appropriate disposal options which could include the shipyard site stormwater system, the City of San Diego's water treatment system, or an offsite disposal facility.
- **Suitability of Sediments for Hauling and Disposal.** For proper transport of sediments off site, "free liquids" must be removed from the sediments. Prior to sediments leaving the offloading site, the contractor will be required to demonstrate all sediments have passed "paint-filter" testing criteria.
- **Appropriate Transport of Sediments.** To ensure that sediments are not lost or otherwise improperly disposed of, all trucks or railcars will be required to follow all

applicable federal and state guidelines set for the hauling of dredged sediments.

The following subsections provide further detail on the dredging concerns described herein.

5.2.2.1 Releases of Dredged Sediments

The contractor will be required to prevent any releases of dredged sediment into San Diego Bay during transport of the material from the dredging area to the offloading facility or during offloading activities.

Scows or haul barges that transport dredged sediment to the offloading facility for disposal must be sealed to prevent leakage during transport and be equipped with electronic monitoring equipment. Any barges or scows that do not seal properly will be removed from operation until satisfactory repairs are made. Overtopping of the scows or barges will not be allowed, so as to prevent sediments or water from flowing over the scow or barge during transport and reentering the San Diego Bay or surrounding waters.

The contractor will be required to install a spill prevention apron to prevent material spillage during the transfer of the dredged material from the scow or barge to the offloading facility. No transfer will be allowed to begin until the apron is approved by the construction management team and in place. Any spillage on the apron will be required to be removed as soon as practicable and disposed of properly. Any spillage outside of the enclosed offloading or into the bay will be required to be promptly cleaned up, possibly including dredging of sediment that has spilled offshore.

The contractor will be required to control its handling and offloading of dredged sediment so that it is placed on land only within the offloading facility, and that no sediment is placed outside of the facility limits.

5.2.2.2 Contamination of the Sediment Offloading Area

To prevent contaminated sediments or effluent water from contaminating the areas used for sediment offloading and stockpiling, the contractor will be required to fully contain the dredged material and prevent the uncontrolled runoff of dewatered or dredged material. Depending on the characteristics of the offloading facility that is used, this containment

could be accomplished using impermeable liners, concrete barricades, a drainage sump, or other methods.

Upon completion of the dredging, the contractor will be required to remove all vestiges of dredged sediments and other contaminants from any and all areas used for sediment storage, stockpiling, offloading, or dewatering, and will be required to clean up the offloading area to the pre-project condition

5.2.2.3 Overflow of Water into San Diego Bay

To ensure that waters surrounding the offloading area are not impacted by effluent from the storage and rehandling area, the contractor will be required to contain all free water and off-flow that drains out of the sediment while stockpiled on land. The contractor will be required to collect all water in a temporary containment facility or tank(s), test it, and treat it as necessary to meet water quality criteria prior to it being discharged through one of the following disposal options:

- Shipyard site stormwater system
- City of San Diego's sanitary sewer system
- Off-site disposal facility

5.2.2.4 Suitability of Sediments for Hauling and Disposal

For proper transport of sediments off site, free liquids must be removed from the sediments. Prior to sediments leaving the offloading site, the contractor will be required to demonstrate all sediments have passed the paint filter test to ensure that sediments have been sufficiently dewatered and do not contain free liquids. At the contractor's discretion, and as approved by the construction management team, an additive may be mixed in with the sediment to bind available water and decrease the dewatering time. The contractor may be required to perform additional analytical testing of disposal sediment to meet landfill acceptance criteria.

5.2.2.5 Appropriate Transport of Sediments

Truck traffic will be required to comply with all relevant provisions of the Environmental Impact Report (EIR) and MMRP (Water Board 2012b). All trucks or railcars will be required to follow all applicable federal and state guidelines set for the hauling of dredged sediments.

Project team representatives will also make regular checks to ensure that materials are transported to and disposed at the appropriate locations and facilities.

5.2.3 Monitoring, Contingency Plans, and Corrective Actions

During transport of materials to the offloading facility, the contractor will be required to monitor the surrounding waters for noticeable signs of turbidity that may indicate overtopping or leakage is occurring. If turbidity is noticed, the construction management team will be required to be notified to assess the situation. If a leak in the scow or barge is determined, the contractor will be required to remove equipment from the Shipyard Site until appropriate repairs have been made. In the event that sediment is lost during transport, the contractor will be required to cleanup and recover, to the extent feasible, whatever contaminated material was lost.

The contractor's procedures for offloading sediments from barges into the offloading facility will be continuously observed to ensure appropriate methods are used. If offloading activities are determined unacceptable by the construction management team, or if there is evidence of loss of sediment or turbid water into the bay at the offloading point, the contractor will be instructed to immediately modify its equipment, facility, or methods of transfer.

The contractor will be required to monitor water quality for any signs of spillage or leakage during all transport and offloading activities. The Project Team will also observe these activities as possible. The contractor will be required to test any outflow water from stockpiled sediment prior to it entering the City of San Diego's sanitary sewer system.

Monitoring Parameters and Performance Criteria. Water quality protection provisions will be documented in the Technical Specifications and will be designed to ensure compliance with the Clean Water Act and with the Section 401 Water Quality Certification that will be issued by the Water Board.

Operational Modifications if Out of Compliance. If sediment transport, offloading, or disposal is found to result in impacts to water quality or are out of compliance with the

Section 401 Water Quality Certification issued by the Water Board for this project, the contractor will immediately take the actions described herein.

5.2.4 Description of Equipment, Monitoring, and Maintenance

Equipment used for this phase of work will consist of scows or barges for the transport of dredged sediments to the offloading facility. At the offloading facility, it is anticipated that a variety of equipment will be used, as selected by the contractor. Equipment could include crane-mounted clamshell buckets or other earth-moving equipment to unload sediment from the scow or barge and transfer it into trucks or railcars. Upon transfer of the dredged material into the offloading facility, the contractor will use earth-moving equipment to distribute the dredged material evenly within an area to promote dewatering and drying and to prevent excessive mounding of the material in the offloading area.

It is anticipated that the containment area at the offloading facility will be enclosed by a suitable barrier (i.e., Jersey Barrier, "Ecology" blocks, or similar method) that is lined along its interior with an impermeable liner of polypropylene or similar material. Sand, asphalt, hoses, wastewater handling facilities, and dewatering equipment are also anticipated to be used at the site. The height and weight of the stockpiles will not exceed restrictions applicable to the offloading site.

The contractor's containment enclosure will be required to have protective fencing, signs, placards, or reflective barriers placed around it that are highly visible at night in order to avoid inadvertent or purposeful entry by the public.

In accordance with the contract terms, all equipment will be maintained in good working order and in safe working condition at all times.

5.2.5 Documentation

As described in Section 4, the contractor will be required to keep daily records of operations during the transport, offloading, and disposal phases of work on the daily report. These daily reports will be required to be included as part of the Daily QC Report and will document the daily number of barge loads transported to the offloading facility, daily volume estimates of sediment transported and offloaded in the offloading facility, daily weight certificates of

material removed from the offloading site, and tonnage weight certificates of disposal records at the landfill.

5.3 Protection of Marine Structures and Slopes

5.3.1 Description

Dredging near marine and shoreline structures and side slopes has the potential for creating an unstable condition due to removal of passive earth pressures or the possible undermining of the features. It is, therefore, necessary to take precautionary measures to retain the stability of the structures and slopes when dredging in the near vicinity. Such contingency measures in the design details and performance standards of the Construction Plans will include specifying 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 protective rock buttresses and backfills are anticipated to consist of quarry rock obtained from a local supplier, transported by truck to the project site, and rehandled onto a barge where it will be placed into the water. It is also possible that the rock material will be brought to the site via barge (for example, if it originates on Catalina Island).

Two dormant timber structures within Thiessen polygon SW28 are planned for demolition as part of this remedial effort because implementing the protection measures prescribed for other structures would be cost-prohibitive for these structures. Demolishing these timber structures will allow the sediment underlying these piers to be remediated by dredging.

5.3.2 Potential Problems, Concerns, and Remedies

The primary concerns during the protection of marine structures and slopes are as follows:

- Appropriate Offset of Dredging Work from Structures and Slopes. To prevent damage to existing structures and shoreline features during dredging, the contractor will be required to maintain a prescribed (nominal 4-foot) offset from overwater structures. This offset will be monitored in the field and will also be verified by daily surveys provided by the contractor. In the event that any damage occurs to any structure by the contractor's negligence, the contractor will be required to

immediately repair the structure.

- **Correct Placement of Protective Rock Material.** Once dredging has been completed alongside a portion of an overwater structure or the shoreline, the contractor will be required to place a layer or buttress of protective rock back over the area for protection against future unstable conditions. This action is intended to correct for the lessening of passive earth pressures in front of existing structures as a result of dredging.
- **Timing of Placement of Protective Rock Material.** The contractor will 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 establish and maintain control for placement of the protective rock buttress to ensure rock is placed in the prescribed locations and to the extents and thicknesses indicted in the contract documents. The contractor will also be required to place rock in a manner that avoids significant displacement or damage to underlying materials or in a manner that could cause breaking of stones.

To minimize the amount of time an existing structure is exposed to unstable or undermining conditions, the contractor will be required to place the protective rock in an area within a predetermined amount of time following the completion of dredging in that area. If the contractor is not placing the protective rock within the allocated time after dredging, the Project Team will require the contractor to modify its equipment, methods, or operations.

5.3.3 Monitoring, Contingency Plans, and Corrective Actions

The contractor will be required to perform daily progress surveys of areas where rock material was placed, so that the total thickness and extent of rock placed can be verified on a daily basis. The contractor will also be required to report, on a daily basis, the quantity (in tons) of rock material placed during that day, the area over which rock was placed (verified by vessel positioning system), and the cumulative tonnage of rock placed on the project to that date. These quantities will be monitored by the Project Team and the construction management team such that the adequacy of the work can be continuously evaluated.

The Project Team may supplement these monitoring techniques by using divers to directly observe the placed rock material and to ensure that rock is being placed where it is intended, that required thicknesses are being achieved, and that coverage of the area is consistent and complete. Additionally, the construction management team will field-monitor the contractor to ensure all rock is being placed in the required time after dredging has occurred.

5.3.4 Description of Equipment, Monitoring, and Maintenance

Equipment for placement of rock material will likely consist of a floating dredge with clamshell bucket or reticulated long-reach excavator arm. Additional equipment may include a conveyor, hopper, and tremie or hydraulic system from a haul barge.

In accordance with the Technical Specifications, the equipment will be maintained in good working order and in safe working condition at all times. Survey equipment will be maintained and calibrated for the life of the contract. Calibration techniques are prescribed to ensure that the equipment performs to the accuracy required.

5.3.5 Documentation

The contractor will be required to keep daily records of operations during rock placement in Daily QC Reports. These reports will document daily estimates of tonnage of rock placed and areas of rock placed by stationing and offset. Additionally, the contractor will be required to perform daily surveys during the rock placement and submit them to the construction management team for review.

After protective rock placement is complete, a post-rock placement survey will be performed to ensure that the areas indicated on the Construction Plans are covered appropriately. A dive team may also be employed to visually inspect the coverage areas and confirm that the work has been satisfactorily performed.

5.4 Placement of Clean Sand Cover (Including Underpier Areas)

5.4.1 Description

The design details and performance standards of the Construction Plans will include placement of a layer of clean sand in prescribed areas where dredging is not feasible. Specifically, clean sand cover will be placed in these two areas:

- Areas within the required remedial footprint that are beneath piers and other overwater structures, which will receive a layer of clean sand cover material placed over the pre-existing grade
- Dredged areas that have been subjected to confirmatory sampling, as described in the RMP (Appendix C)

Clean sand materials will be obtained from an off-site source approved by the Project Team and subject to physical and chemical testing requirements prior to use.

5.4.2 Potential Problems, Concerns, and Remedies

The main concerns in the process of placing clean sand cover include the following:

- **Verification of Import Material Quality.** The chemical and physical characteristics of the clean sand cover material must be verified as appropriate for its intended use, as specified in the contract documents.
- **Achieving Specified Placement Thickness and Extent of Clean Sand Cover.** Clean sand cover material must be satisfactorily placed over the required areas and to the required thicknesses depicted on the Construction Plans.

The following subsections provide further detail on the dredging concerns described herein.

5.4.2.1 Verification of Import Material Quality

Import material used as clean sand cover must meet chemical and physical (grain size) requirements presented in the Technical Specifications. Prior to the use of an imported material, the contractor must submit a Borrow Source Characterization Report for the material (as described in Section 4), verifying its specified physical properties, chemical properties, and gradation, as described below and further described in the Technical

Specifications. A minimum of three representative samples should be analyzed to ensure that key chemical constituents are well below the cleanup levels listed in the CAO. Individual delivery loads will be visually inspected by the Project Team's designated inspector to ensure that objectionable content, unsuitable coatings, or unsuitable materials (i.e., debris, organics, etc.) are not present and that the load complies with the general physical requirements of the Technical Specifications. If necessary, the inspectors may obtain representative samples for physical testing to confirm compliance with the gradation. The Project Team's inspector will have the right to refuse any loads, in which case the contractor shall return the load and obtain an acceptable load in its place, at no additional cost to the Project Team.

5.4.2.2 Achieving Specified Thickness and Extent of Clean Sand Cover

The effectiveness of clean sand cover placed over dredged areas will be determined by ensuring that the thickness of the cover and its horizontal extents are consistent with cleanup requirements and Construction Plans and Technical Specifications. To ensure that proper coverage and thickness of clean sand cover is achieved, the contractor will be required to perform daily progress surveys of areas where clean sand material was placed to allow daily verification of thickness and extent of sand cover. The contractor will also be required to provide daily reports of the extent and quantity (in tons) of sand placed in underpier areas on that day and the cumulative tonnage of sand placed on the project to that date. The extent of cover placement will be monitored and mapped using real-time GPS locating and positioning equipment. The Project Team may supplement these monitoring techniques by using divers to directly observe the placed sand material and to ensure accurate horizontal extent and depth of cover. Divers could observe areas to determine if sand coverage is consistent and if the required amount of sand cover has been achieved, using probes or push cores to directly observe sand cover thickness at selected, representative locations.

Because it is likely that progress surveys will be difficult to conduct in underpier areas, evaluation of clean sand cover in these locations will be based a comparison of the quantity of sand placed to the overall area covered; the overall tonnage per square foot of area should be consistent with the target sand layer thickness.

The Project Team may also use divers to survey underpier areas where clean sand cover was placed as described in Section 5.4.3. If at any time it is determined that the contractor is not placing clean sand cover materials in the correct location or to the prescribed thickness, the contractor will be immediately required to correct the situation. Any such direction and corrective action will be documented on the Daily QC Report for that day's activities.

5.4.3 Monitoring, Contingency Plans, and Corrective Actions

The contractor will be required to perform daily progress surveys of areas where clean sand material was placed, such that the total thickness and extent of sand can be verified on a daily basis. The contractor will also be required to report, on a daily basis, the quantity (in tons) of sand placed during that day, the area over which sand was placed (verified by its vessel positioning system), and the cumulative tonnage of sand placed on the project to that date. The overall tonnage per square foot of area should be consistent with the target sand layer thickness. These quantities will be monitored by the Project Team and the construction management team for adequacy of the work can be continuously evaluated.

The Project Team may elect to supplement these monitoring techniques by using divers to ensure accurate horizontal extent and depth of cover. Divers would survey areas to determine if sand coverage is consistent and without voids, which will be accomplished using probes and/or push cores to directly observe sand cover thickness at selected, representative points, to determine if required thicknesses were achieved. Push cores may also be used to determine material thickness. Additionally, the construction management team will field-monitor the contractor to ensure that all sand is being placed in the required timeframe after dredging has occurred.

5.4.4 Description of Equipment, Monitoring, and Maintenance

Cover placement equipment will likely consist of a floating dredge with clamshell bucket or long-reach excavator arm. Additional equipment may include a conveyor, hopper, and tremie or hydraulic system from a haul barge. In accordance with the Technical Specifications, the equipment will be maintained in good working order and in safe working condition at all times. Survey equipment will be maintained and calibrated for the life of the contract. Calibration techniques are prescribed to ensure that the equipment performs to the accuracy required.

Equipment used for this phase of work will likely consist of flat deck barges or scows for the transport of clean sand materials to the Shipyard Site. The barges or scows will likely be unloaded using clamshell buckets or other typical earth-moving equipment and placed directly through the water column onto the targeted subgrade area or loaded into conveyor systems or tremie tubes for delivery to the mudline.

In accordance with the contract terms, the equipment will be maintained in good working order and in safe working condition at all times. Survey and settlement monitoring equipment will be maintained and calibrated for the life of the contract. Calibration techniques will be prescribed to ensure that the equipment performs to the accuracy required.

5.4.5 Documentation

The contractor will be required to keep daily records of operations during sand cover placement on its Daily QC Report. These reports will document daily estimates of tonnage of sand placed and areas of sand placed by stationing and offset. Additionally, the contractor will be required to perform daily surveys during clean sand placement and submit to the construction management team for review.

After clean sand cover placement is complete, a post-placement survey will be performed to ensure that the areas indicated on the Construction Plans are covered appropriately. A dive team may also be employed to visually inspect the coverage areas and confirm the work has been satisfactorily performed.

6 SUMMARY OF INSPECTION ACTIVITIES AND CONSTRUCTION MONITORING

The Project Team will arrange for or conduct sufficient inspections, independent checks of surveying, independent sampling and testing, and monitoring activities to ensure compliance with the terms of the contract. The required inspections, surveying, and material sampling and testing activities as well as the frequency for each of the remedial activities are described below. The results of these inspections, surveys, sampling, and testing activities will be documented as specified in Section 4. The contractor will be required to provide corrective measures for out-of-compliance work identified during inspection by the Project Team.

The inspection activities include the following items to be accomplished by the Project Team and its construction management team:

- Verify that the contractor performs checks on the location (stationing, offset, and elevation) of each dredging and clean cover placement activity within the remedial area. At a minimum, the bathymetric surveys performed by the contractor before and after remedial activities will be verified. The Project Team will accomplish additional inspections through independent means or verification of the contractor's CQC checks. These checks are critical to ensure that contaminated sediments are removed and clean cover materials are placed to the limits and depths specified.
- Verify compliance with the sediment quality cleanup objectives through the collection and laboratory analysis of confirmatory sediment samples.
- Verify conformance of field data collected by the contractor with the water quality monitoring procedures and compliance with the Section 401 Water Quality Certification for this project during in-water remedial activities at the Shipyard Sediment Site.
- Verify sand cover thickness and surface quality through review of contractor surveys (supplemented by diver observations and probing).
- Perform QC checks on the stockpiling, transportation, and eventual disposal of sediments.
- Provide verification that imported sand cover materials comply with contract requirements for quality, durability, gradation, and chemical quality prior to delivery to the job site. The contractor shall provide test results to the Project Team prior to delivery of materials to the job site. The Project Team will provide the Water Board with copies of these import material test reports, as necessary, for review.

- Perform a pre-final inspection following completion of discrete construction elements. Final inspections will then be conducted after completion of any additional work identified in the pre-final inspection reports.

6.1 Management of Changed Conditions

In the event that a change or changed condition is encountered, as defined in the Technical Specifications, the Project Team will review the condition and make a determination as to what revision in the construction activity or construction process is required, if any. This review and determination will be made in recognition of the project design documents.

If the changed condition(s) leads to a design change, the Project Team will notify the Water Board of the purpose and nature of the adjustments or changes made.

7 FINAL REPORT

As required by the CAO (Water Board 2012a), the Project Team will prepare and submit a Cleanup and Abatement Completion Report verifying completion of remedial cleanup construction activities on the project. This report is intended to demonstrate that dredging has achieved the sediment quality cleanup levels identified in the CAO, as demonstrated by sound technical analysis. Specific elements of the Cleanup and Abatement Completion Report will include:

- Key progress surveys demonstrating adequacy of dredging and sand cover placement
- Final post-cleanup bathymetry throughout the site
- Results of post-dredge confirmatory sampling and corresponding decisions regarding additional dredging
- Results of material testing on imported materials
- Quantities of dredged material and clean sand placement
- Contractor's Daily QC Reports and interim progress reports
- Results of water quality monitoring

This report will be submitted as a draft document to the Water Board and will be finalized after incorporating any comments received from the Water Board.

8 REFERENCES

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.

REMEDIATION MONITORING PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

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1 INTRODUCTION

This Remediation Monitoring Plan (RMP) is one component of the Remedial Action Plan (RAP) for the San Diego Shipyard Sediment Site (Shipyard Sediment Site). This document describes provisions for water quality and sediment monitoring sufficient to demonstrate that implementation of the remedial action does not result in violations of water quality standards and that target cleanup levels are achieved by the work. Consistent with Directive B.1.l of Cleanup and Abatement Order No. R9-2012-0024 (CAO; Water Board 2012a) and Section 34.1 of the Technical Report (Water Board 2012b), this RMP includes discussion of the following key remedial monitoring elements:

- Water quality monitoring
- Sediment monitoring
- Disposal monitoring

In addition, information is provided on Biological Monitoring, which may be needed during the project. Table 1 notes all CAO requirements that this document fulfills.

Table 1
Elements Required by the CAO

Required Element	Completed	Location within RMP
Remedial Monitoring Plan (B.1.l)		
I. Water quality monitoring	✓	Section 2
II. Sediment monitoring	✓	Section 3
III. Disposal monitoring consistent with Section 34.1 of the Technical Report	✓	Section 5

The RMP is organized as follows:

- **Section 1.** Introduction
- **Section 2.** Water Quality Monitoring
- **Section 3.** Sediment Monitoring
- **Section 4.** Biological Monitoring
- **Section 5.** Disposal Monitoring
- **Section 6.** Reporting

Note that the information contained in this RMP is supplemented by the description of sampling and analysis procedural details, under separate cover in the Sampling and Analysis Plan (SAP; Appendix D). Also note that procedures for air quality monitoring are not included in this RMP, as they are not a requirement of the Mitigation Monitoring and Reporting Program (MMRP) of the Environmental Impact Report (EIR; Water Board 2012c).

1.1 Objectives of the Remediation Monitoring Plan

Monitoring during remediation activities is stipulated by the CAO to document that the following cleanup objectives are achieved:

- Water quality standards are met outside the remedial footprint (as determined by water quality monitoring).
- Dredging successfully achieves target cleanup levels within the remedial footprint (as determined by sediment monitoring).
- Sensitive biological resources, such as eelgrass, marine mammals and sea turtles, are protected (as determined by biological monitoring).
- Sediment is characterized appropriately for disposal throughout the construction process (as determined by disposal monitoring).

Monitoring activities will be the responsibility of the Project Team, consisting of representatives from the National Steel and Shipbuilding Company Shipyard Facility (NASSCO) and BAE Systems San Diego Ship Repair Facility (BAE Systems), their respective Project Coordinator, and other representatives of the Dischargers, who will be acting in coordination with San Diego Regional Water Quality Control Board (Water Board) representatives. Certain aspects of monitoring activities will also be the responsibility of the contractor; the Project Team will oversee all contractor activities to make sure that the contractor's construction and monitoring work is carried out correctly and effectively.

2 WATER QUALITY MONITORING

Water quality will be monitored during all marine construction activities, including dredging, placement of rock for the protection of marine structures and slopes, remediation of underpier areas, and placement clean cover. The objectives of the water quality monitoring program are as follows:

- Ensure that water quality conditions are within the prescribed limits of relevant regulatory requirements.
- Designate water quality monitoring procedures.
- Plan appropriate project best management practices (BMPs) to avoid and minimize project impacts to the extent practicable.
- Describe corrective actions should water quality exceedances occur.
- Document the results of water quality performance monitoring.

By collecting water quality samples at a prescribed frequency throughout the marine construction activities, short-term water quality impacts from dredging activities can be monitored to allow for corrective actions or procedure modifications to be made to bring construction activities into compliance with water quality performance criteria.

This monitoring program has been developed to ensure full compliance with the *Water Quality Control Plan for San Diego Basin* (Basin Plan; Water Board 1994) and the *Water Quality Control Plan for Ocean Waters of California* (Ocean Plan; SWRCB 2005). In addition, this RMP has been developed to address substantive anticipated requirements of the Section 401 Water Quality Certification associated with implementation of the remedial action.

2.1 General Water Quality Protection Measures

Several BMPs can be used by the contractor to meet contract and permit requirements for minimizing resuspension, spillage, and misplacement of sediment during dredging and material placement activities. A list of possible BMPs, including operations controls and silt curtain deployment, is presented in the Quality Assurance Project Plan (QAPP; Appendix B).

2.2 Water Quality Monitoring Program

The objective of water quality monitoring is to confirm that water quality criteria are met or to describe corrective actions that may be implemented following temporary exceedances of water quality standards during any construction activity that may affect the water column. This monitoring program described here was designed to meet the objectives in the EIR (Water Board 2012c) and its associated MMRP (Section 7 of the EIR).

The water quality monitoring program, including monitoring parameters, compliance criteria, monitoring station locations and depths, field procedures, and monitoring personnel and responsibilities, is described subsequently.

2.2.1 Monitoring Parameters

The following parameters will be monitored outside of the construction area during removal action construction activities:

- Visual parameters
  - No floating particulates, suspended materials, grease, or oil
  - No significant discoloration of the water surface
- Field parameters
  - Turbidity (in nephelometric turbidity units [NTU])
  - Dissolved oxygen (DO; in milligrams per liter [mg/L])
  - Hydrogen ion concentration (pH)

2.2.2 Monitoring Locations and Depths

During each monitoring event, water quality parameters, including DO, turbidity and pH, will be measured to ensure compliance with the water quality criteria listed in Table 2. All water quality parameters measurements will be monitored on two arcs downcurrent of the construction area: one arc at 250 feet and one arc at 500 feet. In accordance with the Technical Report (Water Board 2012b), samples will be collected from a depth of 10 feet below the water surface. Monitored water quality measures will be compared to ambient background measurements outside the construction area, including San Diego Bay conditions and effects of non-remedial shipyard activities. Measurements from the 250-foot arc are intended to warn of potential problems with the point of compliance at the 500-foot arc.

Station descriptions are as follows:

- **Background (B)**, a single station located 800 feet (or more) and upcurrent from the outermost dredging and sand placement limits, at a distance and location that is far enough away from the activities to be relatively uninfluenced by them and a water depth similar to the active dredging water depth.
- **Compliance (C)**, located on a 500-foot arc downcurrent from the construction area. This arc defines the site compliance zone boundary.
- **Early Warning (E)**, located on a 250-foot arc downcurrent from the construction area. This arc is an additional "early warning" boundary.

Water quality will be monitored 10 feet below the surface at each of the stations.

2.2.3 Monitoring Frequency

Consistent with Mitigation Measure 4.2.1 of the MMRP (contained in the EIR; Water Board 2012c), turbidity and other water quality conditions (DO and pH) will be monitored by an automatic system throughout dredging operations, so as to allow real-time feedback to the dredge operator. The automatic system will include threshold alarms so that the dredge operator and other appropriate personnel recognize that one or more water quality criteria have been exceeded.

The automatic system will be supplemented by a robust system of manual water quality monitoring that will be conducted by Project Team field representatives. During dredging, samples will be collected after dredging operations have been underway for a minimum of 1 hour. A reference or upcurrent station and outside of the influence of dredging will also be sampled at similar depths and frequency for comparison to the samples collected from the dredge area.

Water quality parameters (i.e., turbidity, DO, and pH) will be measured daily for the first 2 weeks of dredging operations. In accordance with the Technical Report (Water Board 2012b), sampling will be reduced to weekly sampling if no water quality exceedances are observed. During weekly water column monitoring (after the first 2 weeks), all water quality parameters will continue to be measured. In accordance with the Technical Report (Water Board 2012b), if a significant change in operations occurs (i.e., exceedance of

criterion listed in Table 2), the monitoring frequency will increase to daily monitoring until results show that there are no water quality exceedances for 3 consecutive days; monitoring will again be reduced to weekly.

2.2.4 Compliance Criteria

Consistent with the requirements of Mitigation Measure 4.2.1 of the EIR (Water Board 2012c), water quality criteria that will be applied to this project are based on the Basin Plan (Water Board 1994). Specific criteria are discussed subsequently and specified in Table 2. The point of compliance with these criteria will be located 500 feet from the edge of the construction area. The construction area is defined as the area(s) occupied by the dredging barge(s), the sediment scow(s), sand and rock placement equipment, demolition work, and other work, as delineated by the outermost silt curtain.

Table 2
Water Quality Compliance Criteria

Parameter	Compliance Boundary Standard
Visual	• No significant floating particulates, suspended materials, grease, or oil shall be visible • No aesthetically undesirable discoloration of the water surface
Turbidity	• No more than 20 percent above background turbidity levels when background is less than 50 NTU • No more than 10 NTU above background when background is between 50 and 100 NTU • No more than 10 percent above background turbidity levels when background is greater than 100 NTU
DO	• Not depressed more than 10 percent below the background DO levels
pH	• No more than 0.2 above or below background levels • Within limits of 6.0 and 9.0 at all times

Notes:
Table taken from Basin Plan (Water Board 1994).

2.2.4.1 Visual

There shall be no visible floating particulates, suspended materials, grease, or oil sheens determined to be emanating from the construction area. There shall be no distressed or dying fish as a result of the site construction activities.

2.2.4.2 Turbidity

At the point of compliance (i.e., 500 feet from the edge of the construction area), turbidity shall not have a 20 percent increase over background levels when background turbidity is less than 50 NTU. When background turbidity is between 50 and 100 NTU, turbidity shall not exceed 10 NTU over background at the compliance boundary. If background turbidity is greater than 100 NTU, turbidity at the point of compliance shall not have a 10 percent increase over background levels.

2.2.4.3 Dissolved Oxygen

At the point of compliance, DO shall not have a 10 percent decrease from background DO levels.

2.2.4.4 Hydrogen Ion Concentration

At the point of compliance, pH shall not be 0.2 above or below background levels. pH shall not be lower than 6 and shall not be higher than 9 at any time.

2.2.5 Field Procedures

2.2.5.1 Methods and Equipment

Water quality parameters (turbidity, DO, and pH) will be measured using a multi-parameter instrument capable of in situ monitoring and profiling with internal data logging capabilities. The instrument must be capable of in situ sampling of depth, pH, DO, temperature, and turbidity. The YSI Model 6820 V2 Sonde, or comparable instrument, outfitted with appropriate sensors to meet sampling needs is suggested for this effort.

2.2.5.2 Sample Location and Depth Control

A laser range finder and/or differential global positioning system (DGPS) will be used to locate and establish station locations. Location control data will be documented on a water quality monitoring form.

2.2.5.3 Station Identification

All stations will be properly identified on the water quality monitoring form and consistently applied from one monitoring event to the next. Station names will use the following identification scheme consisting of four alphanumeric characters:

A-B-C-

Where:

A The first character defines the monitoring station number.

B The second character will be used to identify the construction activity being monitored:

- D = dredging
- P = material placement

C The next character will be used to identify the water quality monitoring location:

- B = background station
- E = early warning station
- C = compliance station

2.2.5.4 Field Documentation

Water quality measurement data that is automatically recorded will include date, time, turbidity, pH, and DO measurements.

Documentation of visual water quality monitoring will include the following:

- Location of observations
- Date and time
- Relevant description of observation(s)

- Tidal phase (flood, ebb, or slack)
- Predominant direction of current
- Weather and wind conditions

Any instances of apparent water quality exceedances or alarms will be brought to the attention of the Project Coordinator.

2.2.5.5 Water Quality Field Equipment Calibration and Maintenance

Monitoring equipment will undergo routine and ongoing calibration according to the manufacturers' instructions prior to use in the field. Instruments and equipment will be tested and inspected before each monitoring event. Any field equipment that is faulty or not functioning properly will not be used for monitoring.

2.2.6 Potential Response Actions: Water Quality Monitoring

This section describes the contingency actions that will occur if the monitoring crew reports an exceedance of a visual or conventional water quality parameter. In the event of an exceedance, the contractor shall immediately notify the Project Team and begin to implement additional or enhanced operational or engineering BMPs. The QAPP (Appendix B) provides a standard list of construction BMPs to protect water quality. Additional operational modifications are provided in the following subsections.

2.2.6.1 Responses to Visual Monitoring

If visual monitoring indicates potential exceedance of water quality criteria during the removal action (i.e., visible turbidity attributed to site construction activities), preventative or corrective actions will be implemented and followed.

2.2.6.2 Exceedance of Water Quality Measures

If conventional parameters (turbidity, DO, or pH) are exceeded at the compliance boundary during removal action construction activities, the following contingency actions will be implemented:

- Evaluate the concurrent measurements at Background and Compliance monitoring stations and supporting visual evidence to determine whether the exceedance is

caused by site construction activities versus other ambient conditions in San Diego Bay (e.g., wind waves, boat wakes, barge/ship traffic, and storm inflow).

- If the exceedance is confirmed, immediately notify the contractor and the Project Team. The contractor will be directed to immediately modify operations or implement additional BMPs to mitigate the exceedance (see QAPP for list of construction BMPs to protect water quality and this section for a list of additional modifications to operations).
- Reevaluate field measurements at all relevant stations 30 minutes later, after additional BMPs or operational modifications are implemented.
- The contractor shall take actions to mitigate the exceedance. If the water quality exceedance continues to persist, even with additional BMPs or operational modifications, a path forward will be discussed with the Project Team. The path forward could include some or all of the following:
  - Implement more aggressive BMPs or operational modifications.
  - If additional measures are not successful at controlling the water quality exceedance, it may be necessary to stop work to further assess the source of the exceedance, identify effective mitigation measures, and allow the water column to recover.

2.2.6.3 Operational Modifications

In addition to the standard BMPs listed in the QAPP, the following operational modifications can be implemented individually or in combination as part of the response to a confirmed water quality exceedance:

- Adjust the sequence and/or speed of dredging and disposal operations.
- Reposition dredge operations in such a way as to ensure future exceedances do not occur.
- Fix, maintain, and/or upgrade floating silt curtains.
- Modify, either on a temporary or permanent basis, dredge equipment (such as the dredging bucket size or type).

2.2.6.4 Discharge of Oil, Fuel, or Chemicals

In the event of a discharge of oil, fuel, or chemicals into San Diego Bay, the source of the spill or leak shall be identified and controlled, and cleanup efforts shall begin immediately. The contractor shall immediately notify the Shipyard Sediment Site emergency response personnel, who will make all appropriate regulatory notifications in accordance with site emergency notification procedures. Cleanup shall include appropriate disposal of any spilled material and cleanup material.

2.2.7 Water Quality Monitoring Personnel and Responsibilities

Key monitoring personnel required to implement the water quality monitoring program include the following:

- Water Quality Field Leader
- Monitoring personnel

Persons fulfilling these roles will be designated at least 1 week prior to the start of monitoring activities, and contact information will be provided at that time to the Water Board and the Project Team. All monitoring personnel will be experienced in the collection and measurement of water quality parameters.

2.2.7.1 Project Team Responsibilities

The Project Team will be responsible for the following:

- Reviewing field reports to verify that appropriate field methods and quality control procedures are being implemented in accordance with the procedures specified in this RMP
- Coordinating with the contractor to ensure appropriate construction BMPs are being implemented and to strategize ways to add BMPs or enhance the effectiveness of existing BMPs, as necessary, to mitigate unacceptable water quality effects
- Submission of records to regulatory agencies as required by permits

3 SEDIMENT MONITORING

Prior to initiation of a sediment monitoring program, a post-remedial bathymetric survey will be performed to verify that the contractor has reached the target dredging depths and extents to accomplish full removal of chemically impacted sediment.

3.1 Confirmation Sampling Objectives

The objective of sediment monitoring is to determine if cleanup activities have met the cleanup objectives prior to the demobilization of the construction operation.

3.2 Sediment Monitoring Approach

The sediment monitoring program was designed to follow the requirements specified in the Technical Report (Water Board 2012b), which include the following:

- Confirmation sediment sampling will consist of core sediment sample collection in each remedial footprint polygon.
- Sediment core samples analyzed for chemical constituents will be those horizons that represent the first undisturbed depth beneath the dredge depth.
- Core horizons representing the first undisturbed depth beneath the dredge depth will be determined based on the accuracy that the dredge operator can guarantee the depth that they dredge.

Based on the above requirements, sediment core samples will be collected within the remedial footprint polygons. The target number of samples and any compositing schemes for each polygon will be finalized after the development of a final dredge design for the project.

The target core length has been estimated to be as long as 60 centimeters (cm), which represents the accuracy that some dredge operators can guarantee the depth that they dredge, as specified in the Technical Report. However, final target core length will be determined after the dredge contractor and their dredging accuracy has been determined.

For purposes of determining whether the targeted contamination has been removed, sediment below the residual (top 5 cm) horizon will be analyzed for the contaminants of concern (COCs); specifically, the Technical Report indicates that the first undisturbed depth

beneath the dredge depth starts at a minimum of 5 cm (see Section 34.1.2, page 34-3, first bullet; Water Board 2012b) below the sediment surface. The top 5 cm is likely suggested, because this layer may represent the thin surface layer of unconsolidated or residual sediment that is anticipated to remain in place after dredging has been completed. The subsurface samples are important because they will indicate the contaminant level in the undredged materials and, therefore, will be more representative of actual post-dredging bottom conditions. Modifications to horizons to be analyzed for COCs may be proposed, however, if the residual layer is found to vary from the 5-cm layer discussed previously.

3.3 Methods, Locations, and Timing

A brief summary of the monitoring methods, locations, and timing is provided in the following subsections, and more detailed procedures for sediment core sampling are provided in the SAP (Appendix D) for this work. Laboratory analysis methods are also listed in SAP. Detailed field and laboratory quality assurance and quality control criteria, including method specifications, detection limits, accuracy, and precision requirements, are provided in the Post-Remedial Monitoring Plan (Exponent 2012) and apply to both the remedial monitoring and post-remedial monitoring.

3.3.1 Sediment Sampling Methods

The confirmation subsurface sediment samples will be collected using a vibracore coring device or similar deployed from a winch line on a sampling vessel. Cores will be advanced up to 60 cm or until refusal.

3.3.2 Sediment Sample Locations

Subsurface sediment sample locations will be systematically distributed to confirm performance objectives have been achieved in each cleanup area. The horizontal extents of the final cleanup areas will be determined during final design, as described in the RAP and Design Criteria Report (Appendix A). Once cleanup areas have been established, confirmation sediment sample locations will be designated.

3.3.3 Chemical Analytical Parameters

The subsurface depth horizon (approximately 5 to 60 cm) samples will be analyzed for and compared to the post-remedial dredge area concentrations provided in Table 3. Aliquots from the 0- to 5-cm interval, or residual layer, will be archived. Consistent with the post-remedial program requirements and best dredge practices, these samples may be used to determine the need for a clean sand cover.

3.3.4 Monitoring Timing

All confirmational sediment sampling is estimated to occur within 24 to 48 hours after dredging has been completed within each cleanup area. This timeframe is needed to allow dredge residuals (sediment suspended during dredging) sufficient time to settle and, should additional remedial activities be required, ensure that the test results are received prior to the contractor demobilizing from the Shipyard Sediment Site.

3.4 Performance Standards for Dredging

The contractor will be required to remove sediments to depths and extents shown on the construction plans, which will be verified through bathymetric surveys, as indicated in the QAPP (Appendix B). Once it has been adequately demonstrated that the required dredging depths have been achieved, the effectiveness of sediment removal will be determined by evaluating the sediment quality of the post-dredge subsurface, as described previously. The Project Team will conduct post-remedial confirmatory sampling to determine if cleanup levels are achieved or if further cleanup activities are required, as described in Section 5.3. If concentrations of primary COCs in subsurface sediments (deeper than 5 cm or the residual layer) are above 120 percent of post-remedial dredge area concentrations (Table 3) after completion of initial dredging, the potential response actions described in Section 5.2 and 5.3 will be evaluated.

Table 3
Post-Remedial Dredge Area Concentrations

Chemical	Units (dry weight)	Post-Remedial Dredge Area Concentrations	120 Percent of Post-Remedial Dredge Area Concentrations
Copper	mg/kg	121	145
Mercury	mg/kg	0.57	0.68
Tributyltin	µg/kg	22	26
HPAH[1]	µg/kg	663	796
Total PCB Congeners[2]	µg/kg	84	101

Notes:
Table taken from CAO (Water Board 2012a).
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
1 HPAHs = sum of six PAHs: Fluoranthene, Perylene, Benzo(a)anthracene, Chrysene, Benzo(a)pyrene, and Dibenzo(a,h)anthracene.
2 Total PCBs = sum of 41 congeners: 18, 28, 37, 44, 49, 52, 66, 70, 74, 77, 81, 87, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 138, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 177, 180, 183, 187, 189, 194, 201, and 206.

3.5 Potential Response Actions: Sediment Monitoring

A decision matrix for interpreting the results of the confirmation subsurface sediment monitoring is provided in Table 4. Final response actions will be dependent on finalization of the dredge design. The threshold for additional action (including additional sampling, additional dredging, and clean sand placement) is an average subsurface (approximately 5 to 60 cm) chemical concentration greater than 120 percent of the post-remedial dredge area concentration (Table 3).

If the average concentration is less than 120 percent of the post-remedial dredge area concentration, cleanup is complete and no further action is required, though a sand cover may be applied to provide restorative layer for biological growth. If average concentrations are greater than the threshold, further testing and/or remedial actions will be required, as discussed subsequently.

3.5.1 Sediment Monitoring Exceedance

If subsurface concentrations within areas are confirmed to be greater than post-remedial dredge area concentrations, the following additional remedial actions will be evaluated:

- Additional dredging of localized hotspot
- Clean sand placement

Table 4

Confirmational Sample Remedial Action Decision Matrix

Sediment Chemistry	Sediment Condition	Remedial Action
Subsurface (approximately 5 to up to 60 cm) is less than 120 percent of the post-remedial dredge area concentration (Table 3)	**Cleanup Complete** The area weighted average concentration is below the cleanup levels.	• No further remedial action; dredging activities are complete in this area. • Sand cover may be applied as a biologically restorative layer.
Subsurface (approximately 5 to up to 60 cm) exceeds 120 percent post-remedial dredge area concentration (Table 3)	**Subsurface Contamination** Further testing and/or remedial actions may be required.	• If subsurface concentrations within the area are confirmed to be greater than post-remedial dredge area concentrations, then remedial actions may include the following: – Additional dredging – Placement of clean sand (if additional dredging is determined to be inefficient or infeasible)

4 BIOLOGICAL MONITORING

As required by the MMRP (Water Board 2012c) mitigation measures, the following biological monitoring measures will be implemented:

- A pre- and post-remedial eelgrass survey will be performed per Southern California Eelgrass Mitigation Policy; if impacts are noted, mitigation measures will be implemented in accordance with resource agency requirements.
- Eelgrass beds will be identified and marked prior to construction by a biologist to protect sea turtles.
- Measures (e.g., speed restrictions and off-limit areas) will be implemented on construction equipment and operations to ensure eelgrass beds are not impacted as a result of the construction activities.
- Construction activities will be temporarily stopped if a sea turtle or marine mammal is sighted within 100 meters of the construction area.

In addition, the project specifications are expected to limit construction activities, such that they are performed only during the open environmental windows for least tern. Therefore, Endangered Species Act (ESA) monitoring is not anticipated to be required. If construction activities extend into the least tern window, the appropriate ESA monitoring requirements per the EIR (Water Board 2012c) will be implemented.

5 DISPOSAL MONITORING

Prior to sediments leaving the offloading site, the contractor will be required to demonstrate all sediments have passed the paint filter test to ensure that sediments have been sufficiently dewatered and do not contain free liquids. At the contractor's discretion, and as approved by the construction management team, an additive may be mixed in with the sediment to bind available water and decrease the dewatering time.

The contractor will also be required to perform additional analytical testing of stockpiled sediment as dictated landfill acceptance criteria, to demonstrate and document the material's suitability for disposal at selected landfills. Specific requirements for waste characterization at the disposal site will be developed after one or more disposal facilities have been identified. Specific testing requirements will be based on the Waste Discharge Requirements of the disposal facilities because each disposal facility has specific testing requirements that are often volume- and analyte-specific.

For example, local landfills (such as the Otay Landfill in Chula Vista) require test results from 75 samples to fully represent the planned volume of sediment for disposal (143,400 cubic yards), with each sample obtained by vibracoring to the projected dredge depth. Required testing to determine dredged material disposal suitability for the Otay Landfill includes paint filter, percent moisture, Title 22 metals, volatiles, semi-volatiles, pesticides/herbicides, polychlorinated biphenyls (PCBs), and total petroleum hydrocarbon extended range (C_4 – C_{40}). Analytical methods for these analyses are listed in the SAP (Appendix D) for this work.

Because open-ocean disposal is not planned, no biological or bioassay testing is anticipated.

6 REPORTING

6.1 Weekly Reports

As required by the MMRP (Water Board 2012c), the Project Team will prepare and submit weekly water quality monitoring reports, which provide results from each week's water quality monitoring activities and will compile the results into a summary table with a comparison to water quality compliance criteria.

6.2 Quarterly Reports

As required by the CAO, the Project Team will prepare and submit quarterly progress reports, which describe all actions taken toward achieving compliance with the CAO, as well as results of any sampling, testing, analyses, data collection, or other evaluations. Quarterly reports will be submitted by or before the 15th of March, June, September, and December of each year following the CAO's effective date. Each quarterly report will summarize current schedule and any delays or modifications to that schedule.

7 REFERENCES

Exponent, 2012. *Post-Remedial Monitoring Plan, San Diego Shipyard Sediment Site*. Prepared for the Regional Water Quality Control Board. June 2012.

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Water Board, 2012b. *Technical Report for Cleanup and Abatement Order No. R9-2012-0024 for the Shipyard Sediment Site, San Diego Bay, San Diego, CA.* March 14, 2012.

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SAMPLING AND ANALYSIS PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
µg	microgram
CAO	Cleanup and Abatement Order
COC	chain-of-custody
COPC	chemical of potential concern
CVAA	cold vapor atomic absorption
CVAFS	cold vapor atomic fluorescence spectrometry
DGPS	digital global position system
ICP-MS	inductively coupled plasma-mass spectrometry
GC/FPD	chromatography/flame photometric detector
GS/MS	gas chromatography/mass spectrometry
kg	kilogram
NAD83	North American Datum 1983
MLLW	mean lower low water
PPE	personal protection equipment
PSEP	Puget Sound Estuary Program
SIM	selected ion monitoring
PRMP	Post-Remedial Monitoring Plan
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RAP	Remedial Action Plan
RMP	Remediation Monitoring Plan
SAP	Sampling and Analysis Plan
Shipyard Sediment Site	San Diego Shipyard Sediment Site
USEPA	U.S. Environmental Protection Agency

1 INTRODUCTION

This Sampling and Analysis Plan (SAP) is one component of the Remedial Action Plan (RAP) for the Shipyards Sediment Site. This document describes detailed methodologies for sediment sampling as required for pre-design field investigations and confirmation of dredging completion. Consistent with Directive B.1.l of the Cleanup and Abatement Order No. R9-2012-0024 (CAO; Water Board 2012a) and Section 34.1 of the Technical Report (Water Board 2012b), this SAP includes discussion of the following key elements:

- Sample and data collection methods to be used for the project
- Description of the media and parameters to be monitored or sampled during the remedial action
- Description of the analytical methods to be used

Table 1 notes all CAO requirements that this document fulfills.

Table 1
Elements Required by the CAO

Required Element	Completed	Location within SAP
Sampling and Analysis Plan (B.1.f)		
I. Sample and data collection methods to be used for the project	✓	Sections 2 and 3 *Further detail provided in Sections 2.2.5.1 and 3.3.1 of the RMP (Appendix C)*
II. Description of the media and parameters to be monitored or sampled during the remedial action	✓	Section 4 *Further detail provided in Sections 2.2.1 and 3.3.3 of the RMP (Appendix C)*
III. Description of the analytical methods to be utilized and an appropriate reference for each	✓	Section 5 *Further detail provided in Post-Remedial Monitoring Plan (Exponent 2012)*

Furthermore, the SAP includes details on the following additional topics:

- Decontamination procedures
- Sample identification procedures
- Sample collection schedule
- Sampling documentation, sample handling, and chain-of-custody procedures

- Quality assurance and quality control (QA/QC) requirements
- Waste management

2 GENERAL FIELD OPERATIONS

This section describes the sediment sample collection activities as they pertain to the Remediation Monitoring Plan (RMP; Appendix C). Methods for water quality monitoring are described in detail in the RMP and are not included in this SAP. As indicated in the Quality Assurance Project Plan (QAPP; Appendix B), import material testing and disposal monitoring will be performed by the contractor and are also not included in this SAP.

Subsurface sediment sampling will be conducted to: 1) inform design activities; 2) to confirm remedial actions have achieved the remediation goals outlined in the RAP; and 3) to inform additional removal action if necessary. The remainder of this section provides information that is consistent for all sediment sampling methods, including station positioning, equipment, and laboratory analytical parameters. The following sections provide method-specific collection and processing procedures.

2.1 Station Positioning

The objective of location control is to accurately determine horizontal and vertical positioning of sampling locations. To achieve this objective, each sample location will be referenced to known survey control points using the methods described below.

The following parameters will be documented at each sampling location, if applicable:

- Location coordinates (California state plane, north zone, North American Datum 1983 [NAD83], international survey feet)
- Vertical elevation in feet National Geodetic Vertical Datum (mean lower low water [MLLW], including mudline and tidal elevation above mudline)
- Actual water depth
- Time and date
- Tidal elevation referenced to MLLW

These parameters will be measured using a differential global positioning system (DGPS), pre-surveyed, visual horizontal triangulation to known control points and/or landmarks on shore if necessary, and vertical control using weighted tape measures.

2.1.1 Differential Global Positioning System

Location control will be performed with a DGPS unit onboard the sampling vessel. DGPS coordinates for each sampling location will be recorded at the time of sampling.

2.1.2 Visual Horizontal Triangulation Methods

Visual horizontal triangulation methods will be used as a backup method to the DGPS. This system will use pre-surveyed markers and/or established landmarks on shore. This method determines sampling locations based on horizontal distances to survey control points and/or landmarks identifiable on base maps. Locations will be identified by measuring the horizontal distance from the actual sampling location to the known control point or landmark to the nearest foot using a tape measure. Horizontal measurements can be calculated from registered base maps so field measurements can be translated to state plane coordinates. Buoy markers may be used to mark the sampling location.

2.1.3 Vertical Control

The vertical control parameters measured will be depth to sediment (mudline) and tidal elevation. The depth to sediment will be measured during each sampling event using a hand-held weighted tape (lead line). The tape will be dropped from the work platform to the bottom, pulled taut, and read to the nearest 0.1 foot. This observation will be cross-checked against the onboard depth sounder.

Tidal readings will be taken periodically from a tide board installed on site and checked against daily tide charts for San Diego Bay. Tidal elevations and time will be monitored and recorded before each sample is collected to the nearest 0.1 foot. Sample elevations will then be corrected to MLLW.

2.2 Equipment List

The following general equipment will be required during sample collection procedures:

- Personal protective equipment (PPE), as required by the Health and Safety Plan (Appendix F)
- Navigation and site maps
- Camera

- Field notebook
- Aluminum decked boat equipped with outboard motor
- Calibrated rod or ruler for sediment depth measurement
- Sampling device (vibracore sampler or similar device)
- Weighted tape measure calibrated in 0.1-foot increments
- Decontamination supplies

2.3 Decontamination Procedures

Sample containers, instruments, working surfaces, technician protective gear, and other items that may come into contact with collected samples must meet high standards of cleanliness. All equipment that comes into contact with sampling media will be decontaminated prior to each day's use and between sampling locations. The decontamination procedure is as follows:

- Pre-wash rinse with site water
- Wash with solution of laboratory grade non-phosphate-based soap
- Rinse with site water
- Rinse three times with laboratory-grade distilled water
- Store in clean, closed container or wrap in aluminum foil for next use

Additionally, the laboratory will provide pre-cleaned and labeled sample containers.

2.4 Sample Identification

All sediment samples will be properly identified on their attached labels as well as in any forms or other documentation. All sample identifications will be consistent with the following identification scheme:

- The first two characters will be "SD" to identify the samples as Shipyard Sediment Site samples.
- The next character will be used to designate North Shipyard ("N") or South Shipyard ("S") area samples.
- The next character will identify whether the sample has been obtained for pre-design purposes ("P") or for post-dredge confirmatory purposes ("C").
- The next characters will identify the station location. Station location names will be

determined during final design.

- The next character will indicate the whether the sediment sample is discrete ("D") or composite ("C")
- The next four characters will indicate the depth interval (in centimeters) of the sample:
  - 0005 (0 to 5 cm)
  - 0560 (5 to 60 cm)
  - Or otherwise, per this numbering protocol
- The last six characters will indicate the sample date by YYMMDD.

For example, following this identification scheme, SD-N-C-[Station ID]-D-0560-120607 indicates a discrete confirmatory sediment sample of the 5 to 60 cm interval collected at the North Shipyard Area on June 7, 2012.

3 SAMPLE AND DATA COLLECTION METHODS

This section describes the sampling methods and procedures specific for collecting and processing subsurface sediment samples and submitting samples for analytical chemistry.

Collection of sediment cores will be conducted using an experienced vibracore contractor.

3.1 Sampling Methods

Sediment cores will be collected using vibracoring methods. The Project Team will coordinate vibracore sample collection, sediment compositing (if necessary), and sample transport to the analytical laboratory. Cores will be collected at the locations to be determined as part of the final remedial design. Sediment core locations may be adjusted in the field as necessary if difficult conditions are encountered such as refusal, poor recovery, underwater obstructions, or vessel obstructions.

3.1.1 Sediment Coring Procedures

Sediment cores will be collected using a 3-inch or 4-inch vibracorer, or equivalent sampling technology. The vibracorer is typically deployed using an A-frame and winch assembly. The vibracorer will be lowered to the bottom, where the unit will be energized and advanced to the appropriate depth. As described in the Remediation Monitoring Plan (Anchor QEA 2012a), the target core length has been estimated to be as long as 60 cm, which represents the accuracy to which some dredge operators can guarantee the depth to which they dredge, as specified in the Technical Report (Water Board 2012b). However, the final target core length will be determined after the dredge contractor, and their dredging accuracy, has been determined.

Cores will be driven to this target depth or to refusal. If refusal is encountered at any core location, the core sample will be offset from 10 to 100 feet, and the station will be re-attempted at a comparable water depth. After three rejections or refusals at a given station, the core will be processed using the available recovered intervals. If field evidence suggests refusal is caused by dense or gravelly native alluvium, it may be assumed that this material is below screening levels. If refusal at multiple locations results in significant changes to the SAP, these changes will be discussed with the project manager.

Recovered core tubes will be cut into sections, capped, stored upright (vertical) onboard the vessel, and sent to the logging and processing site at the end of the day or periodically throughout the day. The core tubes will be individually labeled with core orientation clearly marked. Labels identifying the core section will be etched into the tube or securely attached to the outside of the casing and wrapped with transparent tape to prevent loss or damage of the label.

3.1.2 Sample Acceptance Criteria

Sample acceptance criteria are listed below. If acceptance criteria are not achieved, the core will be rejected and another collection attempt will be made.

Following are the sediment core acceptance criteria:

- The core penetrated to (and retained material to) the project depth or refusal.
- Recovery was at least 75 percent of the length of core penetration.
- Sediment does not extend out of the top of the core tube or contact any part of the sampling apparatus at the top of the core tube.
- There are no obstructions in the cored material that might have blocked the subsequent entry of sediment into the core tube and resulted in incomplete core collection.
- There are no significant air gaps in the core tube or evidence of significant loss of material out of the cutter head during retrieval.

3.2 Sample Processing

This section describes core processing procedures, including sample compositing procedures, equipment decontamination, sample storage, and preservation requirements. Sediment processing will likely be conducted at an onshore processing area at the San Diego Shipyard. Core sections will be offloaded from the sampling vessel and transferred to the crew at the onshore processing area. At the processing facility, cores will be opened, described, and subsampled. Sediment samples will be homogenized, labeled, and dispatched under chain-of-custody procedures (described in Section 4) to the analytical laboratory.

3.2.1 Core Logging

Core tubes will be cut longitudinally using a clean carpet knife, reciprocating saw, or similar device, taking care not to penetrate the sediment too deeply while cutting. Each core will be described and documented on standardized core log forms. The core logs will include the following observations, as relevant:

- Sample recovery (recovered sediment depth relative to penetration depth) and calculated percent compaction
- Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density, color, etc.)
- Odor (e.g., hydrogen sulfide, petroleum, etc.)
- Presence of vegetation
- Presence of man-made debris (e.g., trash)
- Biological activity (e.g., shells, tubes, burrows, organisms, etc.)
- Presence and depth of the redox layer, if observed
- Depth and distinctness of geologic contacts
- Any other distinguishing characteristics or features

3.2.2 Subsampling and Compositing

A final subsurface sediment subsampling and compositing scheme (if necessary) will be developed during after the final dredge design is complete and approved.

Each container will be clearly labeled with the following information:

- Project name
- Sample identification number
- Type of analysis
- Date and time
- Initials of the person preparing the sample

This information will be recorded in the log book and on the chain-of-custody forms. Field quality control samples will also be documented and identified in the field logs. Following proper sealing and labeling, all sample containers will be placed on ice in a cooler and maintained at 4 degrees plus or minus 2 degrees Celsius (°C) during storage and transport to the analytical laboratory.

3.3 Sample Collection Schedule

The schedule of sample collection events is identified in the RMP (Appendix C).

4 MEDIA AND PARAMETERS TO BE MONITORED AND SAMPLED

Subsurface sediment samples will be analyzed for copper, mercury, nickel, silver, zinc, tributyltin, polychlorinated biphenyl (PCBs), and polycyclic aromatic hydrocarbons (PAHs). The specific list of individual PCBs and PAHs to be analyzed will be consistent with those described in the Post-Remedial Work Plan (PRWP; Exponent 2012) and Table 2 of the RMP (Appendix C). Conventional analytes such as grain size, total organic carbon, and ammonia will also be analyzed. Approximately 500 mL will be collected for these analyses.

Subsurface sediment samples will also be used to perform waste characterization during the design phase to identify a suitable disposal location as discussed in Section 2 of the Design Criteria Report (Appendix A). Landfill representatives will be consulted to determine what analyses are required 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 if any of the sediment qualifies as California hazardous waste and requires disposal at a more remote regional landfill. Required testing to determine disposal suitability of dredged sediments for the Otay Landfill includes paint filter, percent moisture, Title 22 metals, volatiles, semi-volatiles, pesticides/herbicides, PCBs and TPH extended range (C_4 – C_{40}).

Collection of water quality field parameters are described in detail in the RMP (Appendix C) and are not included in this SAP. As indicated in the QAPP (Appendix B), import material testing and disposal monitoring will be performed by the contractor and are also not included in this SAP.

5 ANALYTICAL METHODS

All laboratories for this study will have established protocols and QA procedures that meet or exceed any applicable U.S. Environmental Protection Agency (USEPA) or ASTM guidelines. A description of analytical methods to be used and an appropriate reference for each is provided in the subsequent subsections. Laboratory procedures and chemical analyses of sediment monitoring samples are consistent with the Post-Remedial Monitoring Plan (PRMP; Exponent 2012).

5.1 Sediment Monitoring

5.1.1 Polycyclic Aromatic Hydrocarbons

Analyses for PAHs will be completed using gas chromatography/mass spectrometry (GC/MS) with selected ion monitoring (SIM). The SIM method is more sensitive than the commonly used USEPA Method 8270C, typically yielding reporting limits of 5 micrograms per kilogram (µg/kg) in sediment. Samples will be subjected to gel permeation chromatography (USEPA Method 3640) to remove interferents. QA/QC procedures will be completed as described in USEPA Method 8270C, whenever applicable, with modifications made as necessary to accommodate the greater sensitivity of the SIM method (e.g., lower spiking levels for surrogate compounds, matrix spikes, and internal standards).

5.1.2 Polychlorinated Biphenyl Congeners

PCB congeners will be analyzed by USEPA Method 8082. Samples will be extracted using sonication (USEPA Method 3550C). Sample extracts will be cleaned using sulfuric acid and, if necessary, potassium permanganate (USEPA Method 3665A). Additional cleanup procedures (e.g., gel permeation chromatography or Florisil column chromatography) will be used if necessary to remove interferences from the sample extracts. The surrogate hexabromobiphenyl will be used rather than decachlorobiphenyl to avoid potential coelution of PCB Congeners with the surrogate. 2,4-Dibromobiphenyl will be used for the internal standard. Analyses for PCB congeners will be completed by simultaneous dual-column gas chromatography with electron capture detection. The temperature program will be modified and the run time extended to allow better separation of individual congeners. Calibration standards, laboratory control sample, and matrix spike/matrix spike duplicate spiking solutions will include all congeners of interest. A five-point initial calibration will be completed for each congener.

5.1.3 Organometallic Compounds

Analyses for tributyltin will be completed using Stallard et al. (1989). For this method, samples are extracted with methylene chloride and/or n-hexane (containing up to 0.2 percent tropolone). After extraction and concentration, tributyltin is derivatized with hexylmagnesium bromide and analyzed by gas chromatography/flame photometric detector (GC/FPD).

5.1.4 Metals

Metals analyses will be completed by inductively coupled plasma-mass spectrometry (ICP-MS) according to USEPA Method 6020. Analyses for mercury in sediments will be completed by cold vapor atomic absorption (CVAA) spectrometry using USEPA Method 7471A will be completed by cold vapor atomic fluorescence spectrometry (CVAFS) using USEPA Method 1631, Revision E (USEPA 2002).

5.1.5 Conventional Analytes

Ammonia will be analyzed according to USEPA Method 350.1. Total organic carbon and grain size will be completed according the 1986 Puget Sound Estuary Program (PSEP; PSEP 1986) guidelines.

5.2 Waste Characterization

As discussed in Section 4, landfill representatives will be consulted to determine what analyses are required to determine if material properties (chemical and physical) meet their requirements for disposal at a local landfill (such as the Otay Landfill in San Diego County), or if any of the sediment qualifies as California hazardous waste and requires disposal at a more remote regional landfill. Required testing to determine disposal suitability of dredged sediments for the Otay Landfill includes paint filter, percent moisture, Title 22 metals, volatiles, semi-volatiles, pesticides/herbicides, PCBs and total petroleum hydrogen extended range (C_4 – C_{40}). Chemical analytical methods for these analytes are subsequently listed in Table 2.

Table 2
Analytical Methods

Analytes	Method
Title 22 metals	USEPA Method 6010B/7471A
Volatile organics	USEPA Method8260B
Semi-volatile organics	USEPA Method 8270C
Pesticides	USEPA Method 8081A
Herbicides	USEPA Method 8150
PCBs	USEPA Method 8082
Total petroleum hydrocarbon (C_4-C_{40})	USEPA Method 8015B

6 DOCUMENTATION, SAMPLE HANDLING, AND CHAIN-OF-CUSTODY

The following sections outline the requirements for documentation, sample handling, and chain-of-custody procedures related to the sample collection events.

6.1 Documentation

Field activities and samples must be properly documented during the sample collection process. Documentation of field activities provides an accurate and comprehensive record of the work performed sufficient for a technical peer to reconstruct the day's activities and provide certification that all necessary requirements were met. General requirements include:

- Use of a field activity log to formally document activities and events. The field activity log can be a standard or project-specific form or a bound field book. Preprinted standard forms are available for many activities and should be used whenever possible. These forms will provide prompts and request additional information that may be useful and/or needed, and that the author is not aware of at the time. Project-specific field forms may be generated or existing forms may be modified to meet specific project needs. As required, client-supplied forms may be substituted.
- Appropriate header information documented on each page, including project title, project number, date, weather conditions, changes in weather conditions, other persons (if any) in the field party, and author. The specific information requested depends on the nature of the work being performed and on the form being used. Information fields that are not applicable should be noted "N/A" or with other appropriate notations.
- Field documentation entries using indelible ink.
- Legible data entries. A single line should be drawn through incorrect entries and the corrected entry should be written next to the original strikeout. Strikeouts are to be initialed and dated by the originator.
- Applicable units of measurement with entry values.
- Field records maintained in project files unless otherwise specified by a client or stipulated by a contract.

6.1.1 Documentation Entries

A chronology of field events will be recorded. General entry requirements include:

- Visitors to the removal action area, including owner and regulatory representatives
- Summary of pertinent project communications with the client, regulators, or other removal action area visitors
- Other contractors working at the removal action area
- A description of the day's field activities, in chronological sequence using military time notation (e.g., 9:00 am: 0900, and 5:00 pm: 1700)
- If applicable, calibration of measuring and test equipment and identification of the calibration standard(s) and use of a calibration log, if available, with cross-reference entered into the field book
- Field equipment identification, including type, manufacturer, model number, or other specific information
- General weather conditions, including temperature, wind speed, and direction readings, including time of measurement and units
- Safety and/or monitoring equipment readings, including time of measurements and units
- If applicable, reference in the field notebook to specific forms used for collection of data
- Subcontractor progress and/or problems encountered
- Changes in the scope of work
- Other unusual events

6.1.2 Specific Requirements

6.1.2.1 Sample Collection

Sample collection data will be documented in a bound field book and/or on a sample collection form. Where both are being used, information contained in one is cross-referenced to the other. Entries include:

- Sample identification number, location taken, depth interval, sample media, sample preservative, collection time, and date
- Sample collection method and protocol
- Physical description of the sample (standard classification system for soil)

- If a composite sample, the sample's make up, including number and location of samples incorporated
- Quality control-related samples collected (e.g., duplicates, blinds, trip blanks, field blanks)
- Container description and sample volume
- Length and depth intervals of each core section and estimated recovery for each sediment sample, as measured in MLLW
- Pertinent technical comments
- Location of each station, as determined by DGPS
- Elevation of each station sampled, as measured in MLLW
- Names of field supervisor and person(s) collecting and handling the sample
- Observations made during sample collection, including weather conditions, currents (if any), ship traffic, and other relevant field conditions
- Descriptions of apparent resistance of sediment column to sampling (i.e., sediment density and coring conditions)
- Any deviation from the approved SAP

6.1.2.2 Sample Labeling

Sample labels must be prepared and attached to sample containers. Labels will either be provided by the laboratory performing the analyses or will be generated internally. The information to be provided includes:

- Sample identification number
- Sample date and collection time
- Physical description of the sample (e.g., water, solid, gas)
- Analytical parameters
- Preservatives, if present
- Sample location
- Client

6.2 Sample Handling

Sample handling procedures include correctly labeling and packing all sample containers prior to transport for laboratory testing. Sample containers will be obtained from the

analytical laboratory. Each container will be labeled appropriately with all relevant information, including at a minimum:

- Sample type
- Project number and site name
- Sample identification
- Date
- Time
- Sampler's initials

Samples will be stored and shipped in a properly packed container at 4°C. All samples will be delivered to the laboratory as soon as possible after the time of collection to facilitate a fast turnaround time.

6.3 Chain-of-Custody

An important component of data collection is the ability to demonstrate that the samples were obtained from the stated locations and that they reached the laboratory or archive without alteration. Evidence of collection, shipment, laboratory receipt, and laboratory custody until disposal or archive must be properly documented. Documentation will be accomplished through the use of a COC form that documents each sample and identifies the individuals responsible for sample collection, shipment, and receipt. A sample is considered in custody if at least one of the following criteria is met:

- The sample is in a person's actual possession
- The sample is in unobstructed view, after being in the person's actual possession
- The sample is locked and only accessible by the custodian after having been in the person's actual possession
- The sample is in a secured area, restricted to authorized personnel (e.g., laboratory)

A laboratory typically will not accept samples for analysis without a correctly prepared COC form. The COC form must be signed by each individual who has the sample in his or her custody. A COC form is to be prepared for each sample shipped to a laboratory for analysis. Information on this form correlates with other supporting documentation, including sample labels and sample collection logs.

The COC form accounts for the elapsed time and custodians of the sample from the time of its collection. The individuals who have physically handled the sample or witnessed initial sample collection and packaging (e.g., a sample team member) must be identified on the form. A sample team member relinquishes the sample by signing the COC form. Individuals who either relinquish or receive samples must include their complete names, company affiliation, and the date and time the samples were relinquished and received. The times that the samples are relinquished and received by the next custodian should coincide, with the exception of transfer by commercial carriers. Commercial carriers will not be required to sign the COC form.

If a sample is to be stored for a period of time (e.g., overnight), measures are to be taken to secure the sample container in a manner that provides only the custodian of record with access. If samples are relinquished to a commercial carrier (e.g., UPS or Federal Express), the carrier waybill number will be recorded and a copy of the waybill will be attached to the COC form. The original COC form is sealed inside the shipping container with the samples. Extra copies of all documents will be maintained with other field documentation.

If a correction is made to the COC form, the correction should be made by the originator of the change, who will draw a single line through the error, initial and date the correction and, if necessary, provide an explanation of the change. The documentation should have sufficient detail to clearly document the change to a third-party reviewer.

7 QUALITY ASSURANCE AND QUALITY CONTROL REQUIREMENTS

All analyses described in this SAP will be conducted in accordance with the standard QA/QC procedures described in the PRMP (Exponent 2012). Analytical instruments will be maintained and calibrated regularly. Log books will be maintained for major field and laboratory instrumentation to document servicing, maintenance, and instrument modification.

7.1 Analytical Chemistry

Quality procedures are described for each analytical method in the PRMP. The type and frequency of QA/QC samples analyzed by the laboratory will be according to the specified analytical method. Necessary corrective actions will be taken to address problems, according to the guidelines for a particular method. All corrective actions will be reported, along with any deviations from the standard protocols.

Results of all laboratory QA/QC analyses and anything that might affect the integrity of the results will be reported. Any deviations from the standard testing guidelines, QA/QC limits, and acceptability criteria will be reported, including a discussion of their effect on data validity. All data sheets will be checked to ensure that test conditions are within the protocol specifications, and project data will be reviewed to determine their usability for making suitability determinations.

8 WASTE MANAGEMENT PLAN

This waste management plan presents the procedures that will be used to properly dispose of field-generated waste from the field work associated with sediment grab samples. Waste in the category of disposable sampling materials and PPE will be placed in heavy-weight garbage bags or other appropriate containers.

All disposable sampling materials and PPE used in sample processing (e.g., disposable coveralls, gloves, and tubing) will be placed in heavyweight garbage bags or other appropriate containers. Disposable materials will be placed in an on-site refuse container for disposal at a solid waste landfill.

9 REFERENCES

Exponent, 2012. *Post-Remedial Monitoring Plan, San Diego Shipyard Sediment Site*. Prepared for the Regional Water Quality Control Board. June 2012. PSEP (Puget Sound Estuary Program), 1986. *Recommended protocols for measuring conventional sediment variables in Puget Sound*. Prepared for U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA. Puget Sound Estuary Program.

Stallard et al. (Stallard, M.O., S.Y. Cola, and C.A. Dooley), 1989. *Optimization of butyltin* measurements *for seawater, tissue, and marine sediment samples*. Appl. Organomet. Chem. 3:105 114.

USEPA (U.S. Environmental Protection Agency), 2002. Method 1631, Revision E: *Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry*. USEPA/821/R-02-012. USEPA, Office of Water.

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. *Technical Report for Cleanup and Abatement Order No. R9-2012-0024 for the Shipyard Sediment Site, San Diego Bay, San Diego, CA.* March 14, 2012.

COMMUNITY RELATIONS PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

Prepared by
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Mission Viejo, California 92691

Modified
August 17, 2012

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1 INTRODUCTION

This Community Relations Plan (CRP) is one component of the Remedial Action Plan (RAP) for the San Diego Shipyard Sediment Site (Shipyard Sediment Site). This plan describes the approach to communicating with the public regarding implementation of the remedial action. Table 1 notes all Cleanup and Abatement Order No. R9-2012-0024 (CAO) requirements that this document fulfills.

Table 1
Elements Required by the CAO

Required Element	Completed	Location within the CRP
Community Relations Plan (B.1.d)		
I. Activities related to the final remedial design	✓	Sections 2 and 4
II. Schedule for the remedial action	✓	Section 2 and Figure 2 *Further detail provided in Section 7 of the RAP*
III. Activities to be expected during construction and remediation	✓	Sections 2 and 4
IV. Provisions for responding to emergency releases and spills during remediation	✓	Sections 2 and 4
V. Any potential inconveniences such as excess traffic and noise that may affect the community during the remedial action	✓	Sections 2 and 4

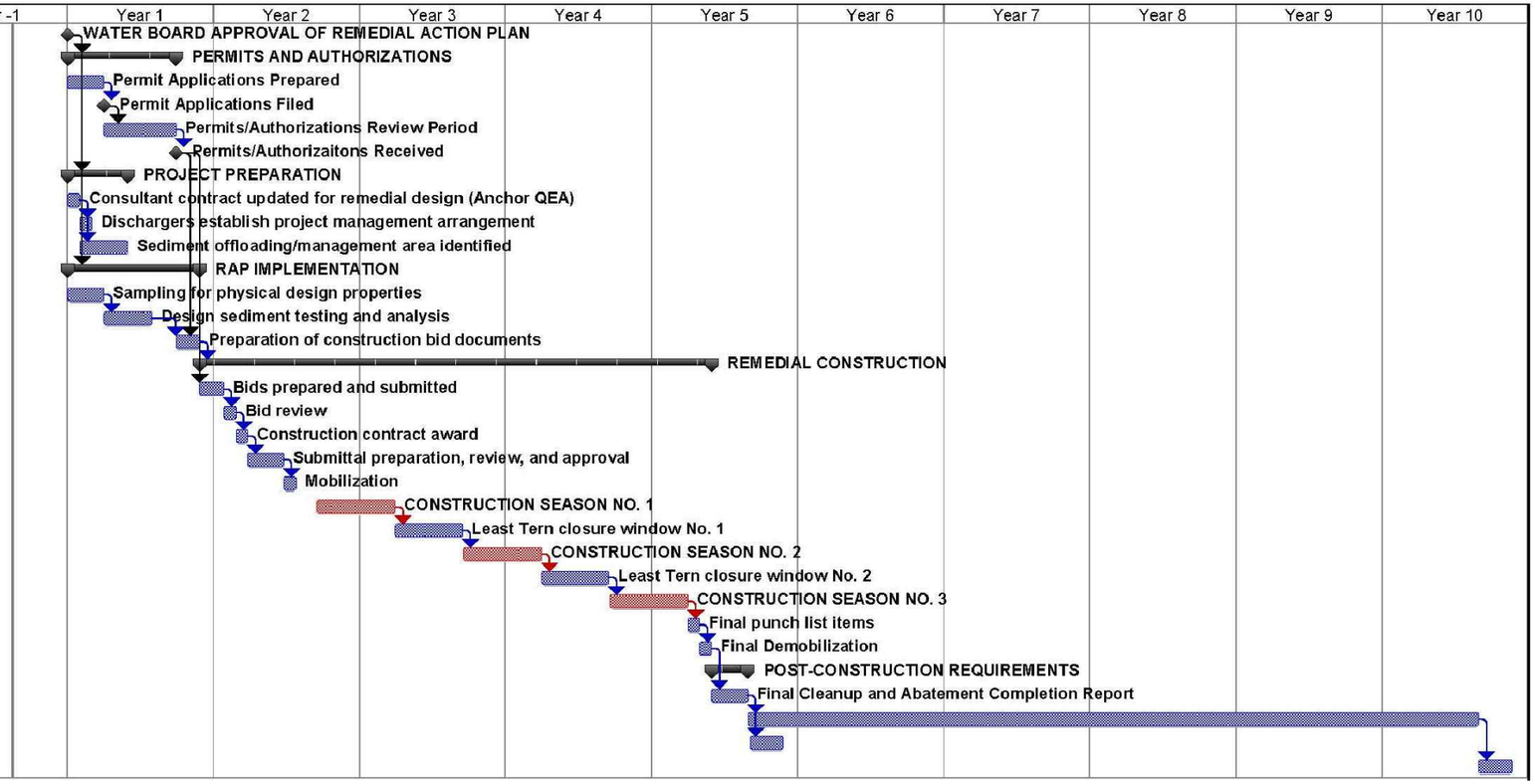
The Dischargers are committed to public involvement methods designed to ensure that individuals and groups with varying schedules, locations, and communication preferences will have access to project information. The community needs to have access to information and have the opportunity to understand how the remedial action may affect them. Information will be distributed using appropriate methods described below at each phase of the project and will focus on construction schedules, project activities, provisions for responding to emergency releases and spills during remediation, and any potential inconveniences that may affect the community during the remedial action.

Specifically, the purpose of this CRP is to describe steps for informing the public about:

- Activities related to the final remedial design
- The schedule for the remedial action
- Activities to be expected during construction and remediation
- Provisions for responding to emergency releases and spills during remediation
- Any potential inconveniences, such as excess traffic and noise, that may affect the community during the remedial action

Figure 1 presents the anticipated remediation schedule.

ID	Task Name
1	WATER BOARD APPROVAL OF REMEDIAL ACTION PLAN
2	**PERMITS AND AUTHORIZATIONS**
3	Permit Applications Prepared
4	Permit Applications Filed
5	Permits/Authorizations Review Period
6	Permits/Authorizaitons Received
7	**PROJECT PREPARATION**
8	Consultant contract updated for remedial design (Anchor QEA)
9	Dischargers establish project management arrangement
10	Sediment offloading/management area identified
11	**RAP IMPLEMENTATION**
12	Sampling for physical design properties
13	Design sediment testing and analysis
14	Preparation of construction bid documents
15	**REMEDIAL CONSTRUCTION**
16	Bids prepared and submitted
17	Bid review
18	Construction contract award
19	Submittal preparation, review, and approval
20	Mobilization
21	**CONSTRUCTION SEASON NO. 1**
22	Least Tern closure window No. 1
23	**CONSTRUCTION SEASON NO. 2**
24	Least Tern closure window No. 2
25	**CONSTRUCTION SEASON NO. 3**
26	Final punch list items
27	Final Demobilization
28	**POST-CONSTRUCTION REQUIREMENTS**
29	Final Cleanup and Abatement Completion Report
30	**POST-REMEDIAL MONITORING PLAN IMPLEMENTATION**
31	Post-Remedial Sampling and Analysis Year 2
32	Post-remedial Sampling and Analysis Year 5



Aug 17, 2012 12:33pm ghowell L:\AutoCAD Project Files_Projects\0918-Gallagher\SD Shipyard\0918-RP-002-GANTT.dwg FIG 1

San Diego Shipyard Sediment Site Group

ANCHOR QEA

Figure 1
Remediation Schedule
San Diego Shipyard Sediment Site

2 PROJECT COMMUNICATION

The complete administrative record file is publicly available on the Water Board's website at: http://www.swrcb.ca.gov/rwqcb9/water_issues/programs/shipyards_sediment. The website will be periodically updated. The administrative record file, among other pertinent information, includes the following documents related to environmental assessment and remediation of the project site:

- Cleanup and Abatement Order No. R9-2012-0024 and accompanying Technical Report
- Response to Comments and Revisions for Tentative Cleanup and Abatement Order R9-2011-0001 Draft Technical Report
- Draft and Final Program Environmental Impact Report (PEIR)
- Responses to Comments on Draft and Final PEIR
- RAP, including this CRP

A public meeting will be held approximately 30 days prior to construction at a venue in close proximity to the Shipyard Sediment Site and that can support a sufficient number of individuals. The public meeting will introduce the project and outline opportunities for community involvement and public outreach, construction schedules, and anticipated activities that will occur during the first week of construction. A Spanish-speaking translator will be present during the meeting to accommodate the demographic of the community in the vicinity of the remedial area. Notification of the public meeting will be conveyed to stakeholders and the public via the methods previously outlined.

In addition to regularly published newsletters, quarterly newsletters will be prepared to update stakeholders and the public on an ongoing basis throughout the project design process and during construction. Ongoing coordination with Water Board staff will ensure these newsletters are sent to interested stakeholders and surrounding property owners and residents. Newsletters will also be accessible on the Water Board's website for review by all interested members of the public. These newsletters will include information and activities related to the final remedial design for the cleanup, after it has been established, as well as any updates to the anticipated remedial schedule set forth on Figure 2. These newsletters will be in the form of a fact sheet and include the following information:

- Information about the status of the remedial action, including activities expected to

occur during that quarter and a schedule
- A contact list, including responsible parties charged with overseeing the cleanup and Water Board staff
- The Water Board's website address, which provides pertinent documents available for review
- Notifications and document plan titles in English and Spanish

If there is sufficient community interest in response to a quarterly newsletter, as determined by the responsible parties in consultation with Water Board staff, an additional public meeting(s) may be held to facilitate community communication and input. A notice including the project description and contact list will be posted at the fence line of the staging area during implementation of the remedial action. Other posting locations will be identified with input from the Water Board and interested parties (CoastKeepers, Environmental Health Coalition, etc.). The quarterly newsletters and notice at the staging area will encourage members of the public to communicate to Water Board staff and responsible parties any comments or concerns they have regarding the remedial action. Newsletters and guest blogs may also be provided to interested parties for direct communication via existing websites.

The above-mentioned elements are intended to ensure that individuals and groups with varying schedules, locations, and communication preferences will have access to project information.

Upon discovery of an emergency release or spill during implementation of the remedial action, notification will promptly be provided to surrounding property owners and residents within a 1,000-foot radius (or other distance as determined to be necessary by Water Board staff based on the circumstances) and placed on the Water Board's website. This information will be provided in the form of a fact sheet and will contain the following information:

- Information about the release/spill and proposed cleanup activities
- A contact list, including responsible parties charged with overseeing the cleanup and Water Board staff
- The Water Board's website address, which provides pertinent documents available for review
- Notification in English and Spanish

If, as implementation of the remedial action proceeds, excess traffic, noise, or other potential inconveniences (beyond what was contemplated in the CAO, Technical Report, and Final PEIR) occur or are expected to occur and may affect the community, notice will be promptly provided to surrounding property owners, residents, and stakeholders and posted on the Water Board's website.

The implementation of these communication techniques and tools are summarized in Table 2 and will be used to communicate with the public on an ongoing basis throughout project design process and during construction.

Table 2
Potential Community Relations Tools and Materials

Tool	Purpose
Advertisements, flyers, and postcards	To advertise and notify stakeholders and the public about meetings and other project events, as detailed in Section 2
Online comment/contact database and mailing lists (postal and email)	To allow the project to track and store stakeholder contact information and correspondence and to develop lists for sending announcements via postal mail and email (a current draft of the contact list is located online at: http://www.waterboards.ca.gov/sandiego/water_issues/programs/shipyards_sediment/docs/sediment_cleanup/contact_list/contact_list.xls)
Guest Blogs	To provide information and updates directly to community
Folios, fact sheets, and frequently asked questions	To provide reader-friendly information (through text and graphics) about specific elements of the project
Information displays	To inform the general public about the project, provide current information, and highlight upcoming opportunities for public comment
Presentations and briefing packets	To clearly demonstrate the need for the project, note issues the Water Board is considering, and provide current project information (e.g., construction timing, traffic impediments, and progress)
Website	To provide timely and accurate information about specific elements of the project

3 COMMUNITY OUTREACH AND IDENTIFICATION OF POTENTIALLY AFFECTED INTERESTS

Public outreach is a key component of the California Environmental Quality Act (CEQA) process that was used to determine the focus and content of the PEIR. The main objective of the CEQA process is to provide the public and potentially affected resource agencies with information on the proposed project and to solicit public input regarding the issues and concerns that should be evaluated in the environmental documentation. The scoping process is generally intended to provide the lead agencies with information regarding the range of actions, alternatives, resource issues, and mitigation measures that are to be analyzed in depth in the PEIR and to eliminate from detailed study those issues found not to be significant. The Water Board functioned as the lead agency under CEQA and has the principal responsibility for preparing environmental documents, engaging the public and responsible agencies, and exercising its discretion to approve or disapprove the proposed project. A summary of the CEQA process and public outreach opportunities, as well as key areas of controversy or concern, are summarized below.

- On December 22, 2009, the Water Board submitted an Initial Study/Environmental Checklist for the project in accordance with the CEQA and the State CEQA Guidelines (14 California Code of Regulations [CCR] Section 15000, et seq.).
- On January 21, 2010, the Water Board held a CEQA scoping meeting to obtain comments concerning potential project alternatives, significant environmental impacts, and mitigation measures for the project. Major issues and concerns raised at the scoping meeting and comments submitted in writing during the Notice of Preparation process included:
  - Disproportionate impacts to low-income and/or minority communities (environmental justice)
  - Release of contaminants during cleanup activities and the effects to marine biological resources
  - Additional information regarding a confined aquatic disposal alternative
  - Questions about the need for CEQA review of the CAO
- On June 16, 2011, the Water Board distributed a Draft PEIR for public review and comment. A Notice of Availability was sent to the State Clearinghouse, responsible agencies, and interested parties. The Draft PEIR was circulated for a 45-day public

review period (June 16 to August 1). Copies of the Draft PEIR were distributed to all responsible agencies and to the State Clearinghouse in addition to various public agencies and interested organizations. Copies of the Draft PEIR were also made available for public review at Logan Heights Public Library, at the Water Board's office, and on the Water Board's website. Comments were accepted for a period of 45 days as required by CEQA. A Notice of Availability was also filed with the County Clerk on September 20.

- On September 15, 2011, the Water Board prepared and distributed for public review a proposed Final PEIR consisting of the Draft PEIR, comments received on the Draft PEIR, responses to comments received during the public comment period, and minor revisions to the Draft PEIR. A CEQA Mitigation Monitoring and Reporting Program is contained within the proposed Final PEIR. Together, these documents constitute the required environmental documentation under CEQA (14 CCR Section 15132.).
- On November 16, 2011, the Water Board certified the Final PEIR and adopted the Findings of Fact, Statement of Overriding Considerations, and Mitigation Monitoring and Reporting Plan as incorporated within the Resolution. Responses to comments received on the Final PEIR were issued prior to the Water Board's November 16 CEQA approval.

4 REFERENCES

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

HEALTH AND SAFETY PLAN
SAN DIEGO SHIPYARD SEDIMENT SITE

Cleanup and Abatement Order No. R9-2012-0024

Prepared by
Anchor QEA, L.P.
26300 La Alameda, Suite 240
Mission Viejo, California 92691

Modified
August 17, 2012

CERTIFICATION PAGE

Project Manager	Field Lead
Date:	Date:

The information in this Health and Safety Plan has been designed for the scope of work presently contemplated by the San Diego Shipyard Project Team (Project Team). Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by the Project Team. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, the Project Team only intends this plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT FORM

Project Number: 120981-01.01 Project Name: San Diego Shipyard Sediment Site

My signature below certifies that I have read and understand the policies and procedures specified in this Health and Safety Plan (HASP). For non-Anchor QEA employees, this HASP may include company-specific appendices to this plan developed by entities other than those directly affiliated with the San Diego Shipyard Project Team. Non-affiliated personnel may be required to sign an indemnity form located in Attachment A.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

SITE EMERGENCY PROCEDURES

Site Maps

The following figure provides an overview of the general site location.

Figure A
General Site Location Overview

Emergency Contact Information

Table A

Site Emergency Form and Emergency Phone Numbers*

Category	Information	
Possible Chemicals of Concern	Copper, mercury, high-molecular-weight polycyclic aromatic hydrocarbons (HPAHs), polychlorinated biphenyls (PCBs), and tributyltin	
Minimum Level of Protection	D	
Site(s) Location Address	Shoreline from Sampson Street Extension to Chollas Creek and out to main shipping channel	
Emergency Phone Numbers		
Ambulance	911	
Fire	911	
Police	911	
Poison Control	1-800-222-1212	
Client Contact	Name (To Be Determined)	Office: Cell:
Project Manager (PM)	Name (To Be Determined)	Office: Cell:
Field Lead (FL)	Name (To Be Determined)	Office: Cell:
Corporate Health and Safety Manager (CHSM)	David Templeton	Office: (206) 287-9130 Cell: (206) 910-4279
National Response Center	1-800-424-8802	
Emergency Response System (San Diego County Office of Emergency Services)	1-858-565-3490	
EPA Environmental Response Team	1-201-321-6600	

* In the event of any emergency contact the PM and FL.

Table B
Hospital Information

Category	Information
Hospital Name	Sharp Coronado Hospital
Address	250 Prospect Place
City, State	Coronado, CA 92118-1943
Phone	619-522-3600
Emergency Phone	911

Hospital Route Map and Driving Directions

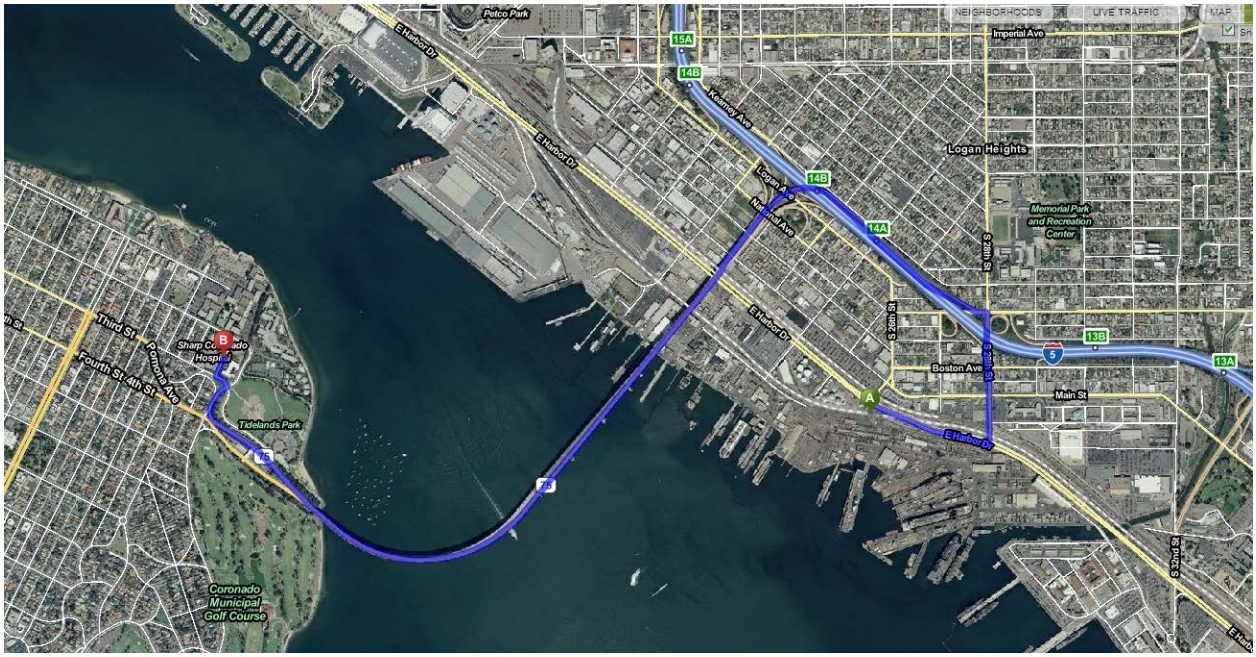


Figure B
Hospital Route Map

1. Start out at Point A, going east on E Harbor Drive toward S 28th Street (0.3 miles).
2. Take the first left onto S 28th Street (0.7 miles).
3. Turn left onto National Avenue (0.7 miles).
4. Merge onto I-5 N (1.0 miles).
5. Merge onto CA-75 S via EXIT 14A toward Coronado (3.3 miles).
6. Turn slight right onto Glorietta Boulevard (3.5 miles).
7. Turn left onto 3rd Street / Third Street (3.5 miles).
8. Take the first right onto Prospect Place (3.6 miles).
9. Arrive at Point B, 250 Prospect Place, on the left.

Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this HASP for a description of the role and responsibility of each.

Client Contact: Name (To Be Determined)	Office: (xxx) xxx-xxxx Cell: (xxx) xxx-xxxx
Project Manager (PM): Name (To Be Determined)	Office: (xxx) xxx-xxxx Cell: (xxx) xxx-xxxx
Field Lead (FL): Name (To Be Determined)	Office: (xxx) xxx-xxxx Cell: (xxx) xxx-xxxx
Corporate Health and Safety Manager (CHSM): David Templeton	Office: (206) 287-9130 Cell: (206) 910-4279

Emergency Response Procedures

In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline:

- Survey the situation to ensure that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Ensure that all protocols are followed. If applicable, review Material Safety Data Sheets (MSDS) to evaluate response actions for chemical exposures.
- Call the appropriate emergency number (911) or direct someone else to do this immediately (see Table A). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
- Have someone retrieve the nearest first aid kit and Automatic External Defibrillator (AED), if available. Note: Only use an AED if you have been properly trained and are currently certified to do so.
- Decontaminate the victim without delaying life-saving procedures (see Section 8).
- Administer first aid and cardiopulmonary resuscitation (CPR), if properly trained, until emergency responders arrive.
- Notify the Project Manager (PM), Field Lead (FL), and owner.
- Complete the appropriate incident investigation reports.

First Aid and CPR Guidelines

Personnel qualified and current in basic first aid and/or CPR procedures may perform those procedures as necessary. Personnel qualified and current in basic first aid and/or CPR are protected under Good Samaritan policies as long as they only perform the basic tasks that they were taught. Do not perform first aid and/or CPR tasks if you have not been trained in first aid and/or CPR.

Injury Management/Incident Notification

Observe the following injury management/incident notification procedures and practices:

Injury Management

- Once a personal injury incident is discovered, the first action will be to ensure that the injured party receives appropriate medical attention.
- If it is safe to do so, the nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident.
- Render first aid and call 911 or the appropriate emergency number as soon as possible.
- Escort the injured person to the occupational clinic or hospital or arrange for an ambulance.
- Proceed immediately to Notification Requirements, below.

Notification Requirements

- Directly after caring for an injured person, the FL will be summoned. The FL will immediately make contact with the PM or other designated individual to alert them of the medical emergency. The FL will advise them of the following:
  - Location of the victim at the work site
  - Nature of the emergency
  - Whether the victim is conscious
  - Specific conditions contributing to the injury, if known
- Contact the PM (if not contacted previously) immediately.

- The PM will contact upper line management, and client representative(s) including the Corporate Health and Safety Manager (CHSM).
- The CHSM will facilitate the incident investigation.

All client requirements will also be adhered to pertinent to personal injury incident reporting.

Incident Other Than Personal Injury

All incidents including, but not limited to, fire, explosion, property damage, or environmental release will be responded to in accordance with the site-specific Health and Safety Plan. In general, this includes securing the site appropriate to the incident, turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify the client of any major incident, fire, equipment or property damage, or environmental incident with a preliminary report. A full report will be provided within 72 hours.

Near-Miss Reporting

All near-miss incidents (those that could have reasonably lead to an injury, environmental release, or other incident) must also be reported to the FL and/or PM immediately so they can take action to ensure that such conditions that lead to the near-miss incident can be readily corrected in order to prevent future occurrences.

Spills and Releases of Hazardous Materials

When required, notify the National Response Center and local state agencies. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility

The emergency telephone number for the National Response Center is 1-800-424-8802. If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained
- Containers of waste are removed or isolated from the immediate site of the emergency
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
- No waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed

Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

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LIST OF ACRONYMS AND ABBREVIATIONS

° C	degrees Celsius
° F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
ASTM	American Society for Testing and Materials
CAO	Cleanup and Abatement Order
CFR	Code of Federal Regulations
CHSM	Corporate Health and Safety Manager
COC	chemical of concern
CPR	Cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dbA	A-weighted decibel
dB	decibel
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
eV	electron volts
EZ	Exclusion Zone/Hot Zone
FL	Field Lead
GFCI	Ground Fault Circuit Interrupter
H:V	horizontal to vertical
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	High Efficiency Particulate Air
HMIS	Hazardous Material Information System
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
IP	Ionization Potential
JSA	Job Safety Analysis
kV	kilovolts

LEL	Lower Explosive Limit
LO/TO	Lockout/Tagout
mg/m^3	milligrams per cubic meter
MHR	Maximum Heart Rate
MLLW	mean lower low water
MSDS	Material Safety Data Sheets
MUTCD	Manual of Uniform Traffic Control Devices
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
NRR	Noise Reduction Rating
OEL	Occupational Exposure Limit
OSHA	Occupational Safety and Health Act or Administration
OV	Organic Vapor
OVM	Organic Vapor Monitor
PAHs	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEL	Permissible Exposure Limit
PFD	personal flotation device
PM	Project Manager
PPE	Personal Protective Equipment
Project Team	San Diego Shipyard Project Team
PVC	Polyvinyl Chloride
QLFT	Qualitative Fit Test
RAP	Remedial Action Plan
REL	Recommended Exposure Limits
RCRA	Resource Conservation and Recovery Act
STEL	Short Term Exposure Limit
SZ	Support Zone/Clean Zone
TLV	Threshold Limit Values
TSD	Treatment, Storage, and Disposal Facility
TWA	Time Weighted Average
TWIC	Transportation Worker Identification Credentials

UL	Underwriters Laboratories Inc.
USCG	U.S. Coast Guard
VOC	Volatile Organic Compound
WBGT	Wet Bulb Globe Temperature

1 INTRODUCTION

This Health and Safety Plan (HASP) has been prepared on behalf of the San Diego Shipyard Project Team (Project Team) and presents health and safety requirements and procedures that will be followed by Project Team personnel and at a minimum by its subcontractors during work activities at the San Diego Shipyard Sediment Site (the site). This HASP has been developed in accordance with Title 29 of the Code of Federal Regulations (CFR), Part 1910.120 (b), and will be used in conjunction with Anchor QEA's Corporate Health and Safety Program. See Section 1.1 for HASP modification procedures.

The provisions of this HASP are mandatory for all Project Team personnel assigned to the project. Subcontractors are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project. Any subcontractor HASPs must include the requirements set forth in this HASP, at a minimum. All visitors to the work site must also abide by the requirements of this HASP and will attend a pre-work briefing where the contents of this HASP will be presented and discussed.

Personnel assigned to work at the project site will be required to read this plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of the HASP.

Subcontractors are ultimately responsible for the health and safety of their employees. Subcontractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

The objectives of this HASP are to identify potential physical, chemical, and biological hazards associated with field activities; establish safe working conditions and protective measures to control those hazards; define emergency procedures; and describe the responsibilities, training requirements, and medical monitoring requirements for site personnel.

This HASP prescribes the procedures that must be followed during specific site activities. Significant operational changes that could affect the health and safety of personnel, the

community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Corporate Health and Safety Manager (CHSM).

Issuance of this approved plan documents that the workplace has been evaluated for hazards. A hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d) - Personal Protective Equipment, General Requirements (general industry), 1910.134 – Respiratory Protection, 1926.28 – Personal Protective Equipment (construction industry), and 1926.55 – Gases, vapors, fumes, dusts and mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

1.1 Health and Safety Plan Modifications

This HASP will be modified by amendment, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the Field Lead (FL) using the "Modification to Health and Safety Plan" form included in Attachment 1. Modifications will be reviewed by the CHSM or authorized representative and approved by the PM.

2 SITE DESCRIPTION

2.1 Site Description

The study area for the sediment removal project is located along the eastern shore of central San Diego Bay, extending approximately from the Sampson Street Extension on the northwest to Chollas Creek on the southeast, and from the shoreline out to the San Diego Bay main shipping channel to the west. The site comprises approximately 15.2 acres that are subject to dredging and 2.3 acres that are subject to clean sand cover, primarily under piers. The project consists of marine sediments in the bottom bay waters that contain elevated levels of pollutants above San Diego Bay background conditions. This area, combined with the potential upland staging areas are collectively referred to as the "project site."

The principal structural components within the site include the concrete bulkheads, piers, and dry dock facilities associated with the two shipyard facilities. Bathymetry at the site varies substantially due to the presence of shipways, dry docks, and berths, and ranges from -2 mean lower low water (MLLW) along the bulkheads to -70 feet MLLW at the BAE Systems dry dock sump area. The marine habitat within the sediment removal area contains both vegetated and un-vegetated subtidal soft-bottom habitats, pier pilings, and bulkhead walls. The vegetated habitat species include sparse beds of eelgrass (*Zostera marina*). The entire extent of the sediment removal area shoreline is artificially stabilized and generally consists of a vertical sheetpile bulkhead and seawall. The marine habitat types include vertical bulkhead walls and dock structures, vegetated and un-vegetated soft-bottom subtidal habitats, and open water. These habitats support marine plants, invertebrates, and fish.

Additional information regarding the site is presented in the Remedial Action Plan (RAP).

3 SCOPE OF WORK

3.1 Project Scope of Work

Currently, the site is subject to a Cleanup and Abatement Order (CAO) requiring the submittal of a RAP, to which this HASP is appended. As described in the RAP, the planned remedial action consists of mechanical dredging of impacted sediments. As part of the design and implementation of the RAP, the following potential field activities are addressed in concept by this HASP. Upon finalization of specific work tasks, task-specific Job Safety Analyses (JSAs) will be completed and added to the HASP (JSAs are discussed in more detail in Section 6.1).

- Pre-design field activities
- Sediment, surface water, or soil sampling activities
- Non-invasive assessments (bathymetric surveys, habitat inspections)
- Construction observation
- Water quality monitoring activities
- Sediment confirmatory sampling

As stated above, the HASP addresses these potential work tasks in concept and provides information and procedures that assume a general approach to these tasks, based on Anchor QEA experience conducting similar tasks at multiple sediment cleanup sites. Specific data, where available (such as chemicals of concern [COCs]), are included in the HASP.

4 AUTHORITY AND RESPONSIBILITIES OF KEY PERSONNEL

This section describes the authority and responsibilities of key Anchor QEA project personnel. The names and contact information for the following key safety personnel are listed in the Emergency Site Procedures section at the beginning of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the site. The emergency phone number for the site is **911**, and should be used for all medical, fire, and police emergencies.

4.1 Project Manager

The PM provides overall direction for the project. The PM is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM will be in regular contact with the FL and CHSM to ensure that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM:

- Oversees the preparation and organization of background review of the project, the work plan, and the field team.
- Ensures that the team obtains permission for site access and coordinates activities with appropriate officials.
- Briefs the FL and field personnel on specific assignments.
- Together with the FL, sees that health and safety requirements are met.
- Consults with the CHSM regarding unsafe conditions, incidents, or changes in site conditions or the scope of work.

4.2 Field Lead

The FL reports to the PM, has authority to direct response operations, and assumes control over on-site activities. The FL will direct field activities, coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing this

site-specific HASP and Corporate Health and Safety Program requirements. The FL will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FL and any other member of the field crew have **STOP WORK AUTHORITY**—the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field crew or environment, or if conditions arise that warrant revision or amendment of this HASP. The following include, but are not necessarily limited to, the functions of the FL related to this HASP:

- Conduct and document daily safety meetings, or designate an alternate FL in his or her absence.
- Execute the work plan and schedule.
- Conduct periodic field health and safety inspections to ensure compliance with this HASP.
- Oversee implementation of safety procedures.
- Implement worker protection levels.
- Enforce site control measures to ensure that only authorized personnel are allowed on site.
- Notify, when necessary, local public emergency officials (all personnel on site may conduct this task as needed).
- Follow-up on incident reports to the PM.
- Periodically inspect protective clothing and equipment for adequacy and safety compliance.
- Ensure that protective clothing and equipment are properly stored and maintained.
- Perform or oversee air monitoring in accordance with this HASP.
- Maintain and oversee operation of monitoring equipment and interpretation of data from the monitoring equipment.
- Monitor workers for signs of stress, including heat stress, cold exposure, and fatigue.
- Require participants to use the "buddy" system.
- Provide (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers of the local hospital, poison control center, fire department, and police department.
- Communicate incidents promptly to the PM.
- Maintain communication with the CHSM on site activities.
- If applicable, ensure that decontamination and disposal procedures are followed.

- Maintain the availability of required safety equipment.
- Advise appropriate health services and medical personnel of potential exposures.
- Notify emergency response personnel in the event of an emergency and coordinate emergency medical care.

The FL will record health-and-safety-related details of the project in the field logbook. At a minimum, each day's entries must include the following information:

- Project name or location
- Names of all on-site personnel
- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FL will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, medical monitoring clearance, and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

4.3 Corporate Health and Safety Manager

The CHSM (or his/her designee) will be responsible for managing on-site health and safety activities and will provide support to the PM and FL on health and safety issues. The specific duties of the CHSM are to:

- Provide technical input into the design and implementation of this HASP.
- Advise on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards.
- Ensure that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 1910.134, 1926.25, and 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document.
- Consult with the FL on matters relating to suspending site activities in the event of an emergency.

- Verify that all on-site Anchor QEA personnel and subcontractors have read and signed the HASP Acknowledgement Form.
- Verify that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective.

The CHSM or his/her designee will have completed the required OSHA 40-hour HAZWOPER training and annual updates, the 8-hour Supervisor training, and have medical monitoring clearance. In addition, the CHSM or his/her designee will have current training in first aid and CPR.

4.4 Project Field Team

All project field team members will attend a project-specific meeting conducted by the FL concerning safety issues and project work task review before beginning work. All field crew, including subcontractors, must be familiar with and comply with this HASP. The field crew has the responsibility to immediately report any potentially unsafe or hazardous conditions to the FL, and all members of the field crew have STOP WORK AUTHORITY—the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field crew or environment, or if conditions arise that warrant revision or amendment of this HASP. The field team reports to the FL for on-site activities and is responsible for:

- Reviewing and maintaining a working knowledge of this HASP
- Safe completion of on-site tasks required to fulfill the work plan
- Compliance with the HASP
- Attendance and participation in daily safety meetings
- Notification to the FL of existing or potential safety conditions at the site
- Reporting all incidents to the FL
- Demonstrating safety and health conscious conduct

Per OSHA 1910.120(e)(3)(i)[1], newly assigned HAZWOPER 40-hour trained field team members must have at least 3 days of field work supervised by an experienced FL (preferably

1 "General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous

an individual with HAZWOPER Supervisor training). It is the responsibility of the PM to identify such "short service" personnel and ensure that their supervised field experience occurs (or has occurred) and is documented in the project field notes and on the Daily Safety Briefing form (Attachment 1).

substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor."

5 PROJECT-SPECIFIC REQUIREMENTS

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the scope of work and the COCs.

5.1 Activity-Specific Level of Protection Requirements

Refer to Section 10 of this plan for general requirements for PPE. Level D is the minimum acceptable level for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs; i.e., if the results of air monitoring reveal that action levels have been exceeded. Hearing protection must be worn when there are high noise levels. Workers must maintain proficiency in the use and care of PPE that is to be worn.

It is assumed at this time that only Level D and Modified Level D will be required for on-site work. If conditions or requirements dictate the need for Level C or higher, this HASP will be amended accordingly.

Table 1, Project Job Tasks and Required PPE, describes the specific means of protection needed for the conceptual work activities.

5.2 Project Air Monitoring Requirements

It is assumed at this time that only Level D and Modified Level D will be required for on-site work and, accordingly, air monitoring is not required. As such, if conditions or requirements dictate the need for air monitoring, this HASP will be amended accordingly.

Table 1

Project Job Tasks and Required PPE

Job Tasks		PPE Requirements
• Construction observation, site visits, activities where proximity to chemicals of concern is unlikely	☐	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to American Society for Testing and Materials (ASTM) F2412-05/ASTM F2413-05
	☒	Traffic Safety Vest
	☐	Chemical-resistant clothing check appropriate garments: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type:**
	☐	Disposable inner gloves (surgical)
	☐	Disposable chemical-resistant outer gloves **Material Type:** Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type:** Rubber or leather
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☐	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 decibels [dB] based on an 8-hour time-weighted average [TWA]). **Type:** Fill in
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear
	☒	Orange, U.S. Coast Guard (USCG)-approved personal flotation device (PFD) (if working on any water vessel or without fall protection within 10 feet of water)
	☐	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if water temperatures are below 50° F
	☐	Half-face Air-Purifying Respirator (APR) (OSHA/NIOSH-approved)

Job Tasks		PPE Requirements
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to be Used:** ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**
• Sampling or Survey Activities[2] – sediment coring, surface water sampling, habitat surveys, water quality monitoring, etc.	☐	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05
	☒	Traffic Safety Vest
	☒	Chemical-resistant clothing <u>check appropriate garments</u>: ☒ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type:** Impermeable
	☒	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves **Material Type:** Nitrile
	☐	Chemical-resistant boots with safety toe and steel shank conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type:** Rubber or leather
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:**
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)
	☐	Long cotton underwear
	☒	Orange, USCG-approved PFD

[2] Please refer to JSAs for task-specific PPE requirements. The PPE requirements provided in this table are default for potential sampling or survey activities.

Job Tasks		PPE Requirements
	☒	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if water temperatures are below 50° F
	☐	Half-face APR (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to be Used:** ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**

6 RISK ANALYSIS AND CONTROL

The following sections discuss the potential worker health and safety hazards associated with potential field tasks for this project. These hazards are addressed through the mechanical and physical control measures, use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the scope of work covered by this HASP must be communicated to the PM and CHSM, and an amendment to this HASP must be created as needed (see Section 1.1). Any task conducted beyond those identified in the scope of work and this HASP must be evaluated using the JSA process prior to conducting the work.

6.1 Job Safety Analysis

As specific work tasks are identified and designed, JSA documents will be developed that detail the chemical, physical, and biological hazards associated with these tasks, along with the specific control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to ensure that these tasks are conducted in a safe manner.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents and for communicating such information to the CHSM. The CHSM will provide support, as needed, to the PM and/or the FL, who will have primary responsibility to develop project-specific JSAs.

The contents of the JSA documents shall be communicated to project personnel during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

A JSA template document is located in Attachment 2 of this HASP.

6.1.1 Augmented JSA Process

If significant work tasks are identified during the course of the project that were not previously addressed in the current JSA documentation at that time, then a task-specific JSA document must be developed at the project site prior to conducting the work. The PM

and/or FL shall develop this document(s) with input from the CHSM, as needed, and this HASP will be amended to include the document (see Section 1.1 for HASP modification procedures). Project personnel shall be trained on the contents of the developed task-specific JSA prior to its implementation. A copy of the task-specific JSA form used in this process is supplied in Attachment 2 of this HASP.

6.2 Exposure Routes

Possible routes of exposure to the chemicals potentially encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. A further discussion of PPE requirements is presented in Section 10.

6.2.1 Inhalation

Inhalation of particulates, dust, mist, gas, or vapor during field activities is possible. Whenever possible, work activities will be oriented so that personnel are upwind of the sampling location. An organic vapor monitor (OVM) may be used to monitor ambient air and the breathing zone within the work area for organic compounds. The need for and details of task-specific air monitoring will be evaluated during identification and design of specific tasks.

6.2.2 Dermal Contact

Dermal contact with potentially contaminated soil, sediment, or surface water during field activities is possible. Direct contact will be minimized through the use of appropriate PPE and decontamination procedures.

6.2.3 Ingestion

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper hygiene, decontamination, and contamination reduction procedures should reduce the probability of this route of exposure.

6.3 Chemicals of Concern Profile

Table 2 provides a summary profile for the COCs for this project. As available, this profile is based on recent site history and site characterization information. For more detailed and specific information, always refer to the Material Safety Data Sheet (MSDS) or equivalent information for the chemical (see Attachment 3).

Table 2
Chemicals of Concern Profile

Chemical	Exposure Routes, Symptoms, Target Organs[1]	TWA[1]	STEL[1]	Odor Threshold[1]	LEL (%)[1]	IP (eV)[1]
Copper (as Cu dust)	■ Inhalation, ingestion, contact ■ Irritant to eyes, upper respiratory tract, skin, metallic taste ■ Eyes, skin, respiratory system, liver, kidneys, risk of Wilson's Disease	1 mg/m^3	--	--	--	--
Mercury (inorganic)	■ Inhalation, absorption, ingestion, contact ■ Irritant to eyes and skin, cough, chest pain, difficulty breathing, bronchitis, pneumonia, tremors, insomnia, irritability, indecision, headache, lassitude, stomatitis, salivation, gastrointestinal disturbance, anorexia, weight loss, proteinuria ■ Eyes, skin, respiratory system, central nervous system, kidneys	0.025 mg/m^3	--	--	--	--
HPAHs (as benzo (a) pyrene)	■ Inhalation, contact ■ Dermatitis, bronchitis [potential occupational carcinogen] ■ Respiratory system, skin, bladder, kidneys [lung, kidney and skin cancer]	0.1 mg/m^3	--	-- (slightly aromatic)	--	> 10.6

Chemical	Exposure Routes, Symptoms, Target Organs[1]	TWA[1]	STEL[1]	Odor Threshold[1]	LEL (%)[1]	IP (eV)[1]
PCBs (chlorodiphenyl @ 54% chlorine)	■ Inhalation, absorption, ingestion, contact ■ Irritant to eyes, chloracne, liver damage, reproductive effects [potential occupational carcinogen] ■ Skin, eyes, liver, reproductive system	0.001 mg/m^3	--	-- (hydrocarbon odor)	--	Unknown
Tributyltin (as Sn, organic compounds)	■ Inhalation, absorption, ingestion, contact ■ Irritant to eyes, skin, respiratory system, headache, dizziness, psycho-neurological disorders, sore throat, cough, abdominal pain, vomiting, urine retention, paresis, focal anes, skin burns, pruritis ■ Eyes, skin, respiratory and central nervous systems, liver, kidneys, urinary tract, blood	0.1 mg/m^3	0.2 mg/m^3	-- (gasoline-like odor)	--	--

Notes:
1 – *NIOSH Pocket Guide to Chemical Hazards* (NIOSH, September 2007), cross referenced to *TLVs and BEIs* (ACGIH 2012)
eV – electron volts
HPAHs – high-molecular-weight polycyclic aromatic hydrocarbon
IP – Ionization Potential
LEL – Lower Explosive Limit
mg/m^3 – milligrams per cubic meter
OEL – Occupational Exposure Limit (identifies the most restrictive exposure limit, e.g., federal or state OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLV), and/or National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL) for the chemicals of concern.
PCB – polychlorinated biphenyl
STEL – Short-term exposure limit
-- – no value or not applicable

7 SITE CONTROL AND COMMUNICATIONS

The primary purposes for site controls are to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergency situations.

7.1 General Site Control Safety Procedures

The following are standard safe work practices that apply to all Anchor QEA site personnel and subcontractors and shall be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces must be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio or hand signals will be established to maintain communication.
- During site operations, each worker will consider him/herself as a safety backup to his/her partner.
- Visual contact will be maintained between buddies on-site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established in this HASP, will be subject to corrective action, potentially including, but not limited to, reprimanded and immediate dismissal.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

7.2 Work Area Access Control

If work is performed in public areas, the following precautions shall be taken to protect both the workers and the public. Access control to the work area will be accomplished by the use of a combination of the following devices and/or methods:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape
- Other methods to keep the site secure and provide a visual barrier to help keep unauthorized personnel from entering the site and active work areas

7.3 Hazardous Waste Site Work Control Procedures

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contaminant Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry.

Site work zones will include:

- **Exclusion Zone/Hot Zone (EZ).** The EZ will be the "hot zone" or contaminated area inside the site perimeter (or sample collection area of boat). The EZ is the defined area where potential respiratory and/or health hazards exist. All personnel entering the EZ must use the required PPE, as set forth in this HASP, and meet the appropriate training and medical clearance. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT). Personnel and equipment decontamination must be performed upon exiting the EZ.
- **Contaminant Reduction Zone (CRZ).** The CRZ, also known as the "warm zone," is a transitional zone between the EZ and the SZ (also known as the "cold zone" or "clean zone"). The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the CRZ. If, at anytime, the CRZ is compromised, a new CRZ will be established.

- **Support Zone/Clean Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.

A log of all personnel visiting, entering, or working on the site shall be maintained by the FL. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f) (and 29 CFR 1926.1101(k)(9), (m) if appropriate). Visitors will attend a site orientation given by the FL and sign the HASP.

7.4 Site-Specific Work Zone Requirements

This section contains guidelines for maintaining safe conditions when working from a boat, in a roadway, or at an excavation site.

7.4.1 Sediment Sampling Work Zones

This subsection contains guidelines concerning health and safety aboard marine sampling vessels. The vessel captain, onshore coring operator, and the FL will delineate the boundaries of the work zones aboard the vessel and will inform the field crews of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas.

Two work zones will be observed aboard the vessel. One will encompass the "moonhole" of the vessel where the samplers will be deployed and recovered. Only the coring crew may enter this zone unless assistance is required by other personnel. The second work zone will be a sample processing area on the vessel. The contractor crew will deliver sediment core tubes to this zone and open them. Anchor QEA personnel will log and process the sediment cores either on the boat or on shore.

Both the collection and processing areas on the vessel and onshore will have a SZ outside the CRZ to stage clean equipment, don PPE, take rest breaks, or perform any other site activities that do not involve potentially contaminated materials.

7.4.1.1 Vessel Decontamination Area

A station will be set up for decontaminating sample processing equipment and personnel gear such as boots or PPE. The station will have the buckets, brushes, soapy water, rinse water, or wipes necessary to perform decontamination operations. Plastic bags will be provided for expendable and disposable materials. The decontamination fluids will be stored in sealable containers and will be properly disposed of.

7.4.1.2 Access Control

Security and control of access to the sampling vessel and onshore area will be the responsibility of the captain and FL. Additional security measures may be placed into effect by the client, or as required by national security threat levels determined by the federal government. Access to the vessel and onshore areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

7.4.1.3 Safety Equipment

In addition to PPE that will be worn by shipboard personnel, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs)
- First aid kit adequate for the number of personnel
- Emergency eyewash

Anchor QEA and/or subconsultants will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to ensure its readiness for use.

7.4.2 Working in a Roadway

Work conducted in public streets may require coordination with local city and/or county governments and development and submittal of a traffic control plan in accordance with the U.S. Department of Transportation (DOT) Manual on Uniform Traffic Control Devices (MUTCD). Use of personnel qualified as Flaggers may also be required to provide temporary traffic control.

Observe the following site control practices and procedures when working in roadways:

- Wear a traffic vest and hardhat when a vehicle hazard exists.
- Use cones, flag-mounted cones, caution tape, and/or barricades.
- Use a vehicle strobe light and block area with truck.
- Develop a traffic flow plan for high-traffic situations (as appropriate):
  - Use a flag person
  - Use a flashing arrow sign
  - Use "MEN WORKING" signs liberally
  - Obtain lane closing permits
  - Engage police details

See Sections 12.1.9 and 12.1.10 for additional information regarding motor vehicle operation and vehicular traffic.

7.5 Field Communications

Communications between all Project Team representatives and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 3 for a list of the types of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to ensure proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in daily safety meetings.

Table 3
Field Communication Methods

Type of Communication	Communication Device	Signal
Emergency notification	On-site Telephone or Cellular Telephone	Initiate phone call using applicable emergency numbers
Emergency notification among site personnel	Two-way Radio	Initiate radio communication with Code Red message
Hailing site personnel for non-emergency	Compressed Air Horn	One long blast, one short blast
Hailing site personnel for emergency evacuation	Compressed Air Horn	Three long, continuous blasts
Hailing site personnel for distress, need help	Visual	Arms waved in circle overhead
Hailing site personnel for emergency evacuation	Visual	Arms waved in criss-cross over head
Contaminated air/strong odor	Visual	Hands clutching throat
Break, lunch, end of day	Visual	Two hands together, break apart

8 DECONTAMINATION PROCEDURES AND PRACTICES

8.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

Personnel

- Do not walk through spilled materials
- Do not handle, touch, or smell sample media directly
- Make sure PPE has no cuts or tears prior to use
- Protect and cover any skin injuries
- Stay upwind of airborne dusts and vapors
- Do not eat, drink, chew tobacco, or smoke in the work zones

Sampling Equipment and Vehicles/Vessels

- Use care to avoid getting sampled media on the outside of sample containers
- If necessary, bag sample containers before filling with sampled media
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media
- Keep contaminated equipment and tools separate from clean equipment and tools
- Fill sample containers over a plastic tub to contain spillage
- Clean up spilled material immediately to avoid tracking around the vehicle/vessel

8.2 Decontamination Equipment

All vehicles, vessels, and equipment that have entered potentially contaminated areas will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with an appropriate detergent and water. If the vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Tools will be cleaned in the same manner. Rinsate from all decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ.

The following supplies will be available to perform decontamination activities (additional or differing decontamination procedures may be identified for specific tasks):

- Wash and rinse buckets
- Tap water and phosphate-free detergent
- Scrub brushes
- Distilled/deionized water
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate
- Paper towels and plastic garbage bags

8.3 Personnel Decontamination

The FL will ensure that all site personnel are familiar with personnel decontamination procedures as listed below. All personnel wearing PPE in a work area (EZ) must undergo decontamination prior to entering the SZ. Personnel will perform the following decontamination procedures:

- Wash and rinse outer gloves and boots in portable buckets to remove gross contamination.
- If suit is heavily soiled, rinse it off.
- Remove outer gloves; inspect and discard if damaged. Leave inner gloves on. Personnel will remove their outer garment and gloves, dispose of them, and properly label container or drum. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items then will be hand-carried to the next station. Remove inner gloves.
- Thoroughly wash hands and face before leaving CRZ.
- Sanitize respirators and place in a clean plastic bag.

8.4 Sampling and Processing Equipment Decontamination

To prevent sample cross-contamination, sampling and processing equipment in contact with soil, sediment, or water samples will undergo the following decontamination procedures when work is completed in the CRZ and prior to additional use:

1. Rinse with potable water and wash with scrub brush.
2. Wash with phosphate-free detergent (Alconox®).

3. Visually inspect the sampler and repeat the scrub and rinse step, if necessary. If scrubbing and rinsing with Alconox® is insufficient to remove visually observable tar-related contamination on equipment, the equipment will be scrubbed and rinsed using hexane (or similar type solution) until all visual signs of contamination are absent.
4. Rinse external sampling equipment with potable water three times prior to use. Rinse homogenizing equipment once with potable water and three times with distilled water prior to and between sample processing.

8.5 Handling of Investigation-Derived Waste

All remaining soil or sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, or others) will be placed into appropriate containers and staged on site for disposal.

8.5.1 Disposable PPE

Disposable PPE may include Tyvek suits, inner latex gloves, and respirator cartridges. Dispose of PPE according to the requirements of the client and state and federal agencies.

8.5.2 Non-disposable PPE

Non-disposable PPE may include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out the respirator with a disinfecting pad prior to donning.
- Decontaminate the respirator on site at the close of each day with an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate the boots or gloves outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect the boots or gloves from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

8.6 Sanitizing of Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles must not only be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

8.7 Emergency Personnel Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

8.8 Containment of Decontamination Fluids

As necessary, spill control measures will be used to contain contaminated runoff that may enter into clean areas. Use plastic sheeting, hay bales, or install a spill control system to prevent spills and contain contaminated water.

8.9 Pressure Washing

The following procedure is required when using high-pressure washing equipment for decontamination purposes:

- Wear modified Level D protection, including a face shield and safety goggles.
- Ensure that other personnel are out of the area prior to decontamination.
- Secure the area around the decontamination pad with cones, caution tape, or barricades.
- Ensure that safe work practices and precautions are taken to minimize the potential for physical injury from high-pressure water spray. Follow the manufacturer's operating instructions.
- The pressure washer wand must be equipped with a safety release handle.

- Ensure that the area is clean after equipment is decontaminated. Barricades, cones, or caution tape must be left in place and secured at all times.

9 HEALTH AND SAFETY TRAINING AND INFORMATIONAL PROGRAMS

This section describes the health and safety training and informational programs that Anchor QEA project site personnel must comply with.

9.1 Initial Project Site Orientation

Work on the project site will require participation in an initial health and safety orientation presented by the PM or FL that will consist of, at a minimum, the following topics:

- A review of the contents of this HASP, including the scope of work and associated site hazards and control methods and procedures.
- Provisions of this plan are mandatory for all personnel assigned to the project.
- Subcontractors are also expected to follow the provisions of this plan unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- Visitors to the work site may be required to abide by the requirements of this plan.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this plan. Personnel not directly affiliated with the project (i.e., visitors) may also be required to sign an indemnity form.

9.2 Daily Safety Meetings

Daily safety meetings ("tailgate meetings") make accident prevention a top priority for everyone and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning prior to conducting site activities.
- The Daily Safety Briefing form in Attachment 1 will be used to document each meeting.
- Copies of the completed Daily Safety Briefing forms will be maintained on-site during the course of the project.

9.3 Hazardous Waste Operations Training

Personnel working on project sites that present a potential exposure to hazardous wastes or other hazardous substances shall be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site will also have received 8 hours of refresher training if the time lapse since their previous training has exceeded 1 year.
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel shall be current in first aid/CPR training.
- Other training may be required depending on the task to be performed (e.g., confined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

9.4 Transportation Worker Identification Credentials (TWIC)

All Anchor QEA field personnel will maintain current TWIC status, pursuant to the Maritime Transportation Security Act of 2002, unless this requirement is waived specifically in writing by relevant property owners.

9.5 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and subcontractors according to 29 CFR 1926.59.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide a MSDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association [NFPA], Hazardous Material Information System [HMIS], or other), but the labels must

contain similar types of information. Maintain manufacturer labels if at all possible. The label may use words or symbols to communicate the following:

- The name of the chemical
- The name, address, and emergency telephone number of the company that made or imported the chemical
- The physical hazards (Will it explode or catch fire? Is it reactive? Is it radioactive?)
- Any important storage or handling instruction
- The health hazards (Is it toxic? Could it cause cancer? Is it an irritant? What is the target organ?)
- The basic protective clothing, equipment, and procedures that are recommended when working with the chemical

Upon identification and design of specific work tasks, MSDS for all chemicals brought onto the site or anticipated to be encountered on site shall be appended in Attachment 3 of this HASP. These MSDS shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and not distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (approved safety can), even if it is for immediate use only, the contents of the portable container (for example, acetone, gasoline, etc.) must be identified.

10 GENERAL PPE REQUIREMENTS

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection (D and C). Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Workers must maintain proficiency in the use and care of PPE.

Refer to Section 5 of this plan for site-specific job task and level-of-protection requirements.

10.1 Minimum Requirements – Level D Protection

The minimum level of protection on project sites will be Level D protection, which consists of the following equipment:

- Standard work uniform/coveralls
- Work boots with safety toe conforming to American Society for Testing and Materials (ASTM) F2412-05/ASTM F2413-05
- Approved safety glasses or goggles (meets ANSI Z87.1 – 1989 requirements for eye protection)
- Hard hat (meets ANSI Z89.1 – 1986 requirements for head protection)
- Traffic safety vest
- Hearing protection when there are high noise levels

Level D protection will be used only when:

- The atmosphere contains no known hazards
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV)

10.1.1 Modified Level D Protection Requirements

Depending on the future field tasks and the potential hazards to be encountered, Level D protection shall be modified to include additional protective equipment such as USCG-approved PFDs, face shields/goggles, chemical-resistant clothing, and disposable gloves of

varying materials depending on the chemical substances involved. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform.

10.2 Respiratory Protection Requirements

Respiratory protection is not anticipated at this time for field tasks on this project.

10.2.1 Level B and A Protection Requirements

An upgrade to Level B protection occurs when the results of air monitoring reveal that action levels have been exceeded (site personnel must meet training requirements). Prior to upgrading to Level B, stop work and contact the PM and/or FL and CHSM if air monitoring results exceed the Level C protection levels.

11 GENERAL AIR MONITORING REQUIREMENTS

11.1 General Requirements

Air monitoring is not anticipated at this time for field tasks on this project. However, in the event that air monitoring is deemed necessary, this section provides reference information. Specific air monitoring procedures and action levels will be determined at that time.

In general, air monitoring shall be conducted when the possibility of hazardous atmospheres, chemical volatilization, or contaminated airborne dust exists (e.g., from intrusive activities involving contaminated soils and/or groundwater, developing new monitoring wells, wells containing known COCs, confined space entry, or others).

12 HEALTH AND SAFETY PROCEDURES AND PRACTICES

In addition to the task-specific JSAs that would be created, listed in Section 6.1, and presented in Attachment 2 of this HASP, this section lists the health and safety procedures and practices applicable to the tasks reasonably foreseen for this project. For additional information, consult with the PM.

12.1 Physical Hazards and Controls

12.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury or splash must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- On a project-specific basis, personnel working on or near bodies of water shall wear USCG-approved PFDs.
- Certain project sites may have newly finished work (e.g., concrete, paving, framing, habitat reconstruction, or sediment caps) that may be damaged by unnecessary contact, or that could cause dangerous conditions for personnel (e.g., slipping, sinking, or tripping). Personnel working in or around these areas shall communicate with the PM, FL, and property owner as needed to prevent damaging new work or entering dangerous conditions.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.

- Hazardous work, such as handling hazardous materials and heavy loads and equipment operation, should not be conducted during severe storms.
- All temporary electrical power must have a ground fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

12.1.2 Slip/Trip/Fall

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for slip/trip/fall potential prior to each work task.
- Slip/trip/fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

12.1.3 Sediment Core Sampling

Sediment samples will be collected using a "Mud Mole" or vibracore sampling equipment operated from a boat. Please see Section 12.1.12 for additional safety information regarding working on or near the water.

All operations involving the use of powered sediment coring rigs will follow generally accepted drilling/coring practices. One person will be assigned the responsibility of Lead Driller/Corer. Additional personnel will assist with equipment as needed. The Lead Driller/Corer will be responsible for operating the drilling/coring rig and ensuring safety.

General rules associated with drilling/coring rig operations will be as follows:

- While drilling, all non-essential personnel shall remain at a distance that is past the radius of any moving parts.
- All operators and crew members will be familiar with the rig operations and will have received practical training.
- All personnel will be instructed in the use of the emergency kill switch/shutdown on the drill rig.

- No loose-fitting clothing, jewelry, or free long hair is permitted near the drilling rig or moving machinery parts.
- A first aid kit and fire extinguisher will be available at all times.
- No drilling will occur during impending electrical storms or tornadoes, or when rain, ice, snow, or wind conditions create undue potential hazards.
- Never allow "horsing around" within the vicinity of the drill rig and tool and supply storage areas, even when the drill rig is shut down.

12.1.4 Underground/Overhead Utility Line Contact Prevention

Observe the following underground/overhead utility line contact prevention procedures and practices:

- Prior to conducting work, the PM or FL shall ensure that all existing underground or overhead utilities in the work area are located per the state or local mark-out methods. Documentation of utility mark-out shall be completed using the Utility Contact Prevention Checklist form (see Attachment 1). No excavation work is to be performed until all utility mark-outs are verified.
- The PM or FL shall conduct a site survey to search for signs of other buried or overhead utilities. The results of such surveys shall be documented on the Utility Mark-out documentation form.
- The property owner or facility operator shall be consulted on the issue of underground utilities. As-built drawings shall be reviewed, when available, to verify that underground utility locations are consistent with the utility location mark-outs. All knowledge of past and present utilities must be evaluated prior to conducting work.
- If on-site subsurface utility locations are in question, a private locating service shall be contacted to verify locations. If the investigation calls for boreholes in an area not covered by the municipal One-Call system, then a private utility locate firm shall be contacted to determine the location of other underground utilities.
- The PM shall have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of any fiber optic cables.
- **Only hand digging is permitted within 3 feet of underground high voltage, product, or gas lines.** Once the line is exposed, heavy equipment can be used, but must remain at least 3 feet from the exposed line.

- Elevated superstructures (e.g., drill rig, backhoe, scaffolding, ladders, and cranes) shall remain a distance of 10 feet away from utility lines and 20 feet away from power lines. Distance from utility lines may be adjusted by the FL depending on actual voltage of the lines.
- Overhead utility locations shall be marked with warning tape or flags where equipment has the potential for contacting overhead utilities.

Table 4 shows the minimum clearances required for energized overhead electrical lines.

Table 4
Overhead Utility Clearance Requirements

Minimum Clearance from Energized Overhead Electric Lines	
Nominal System Voltage	**Minimum Required Clearance**
0 to 50 kV	10 feet
51 to 100 kV	12 feet
101 to 200 kV	15 feet
201 to 300 kV	20 feet
301 to 500 kV	25 feet
501 to 750 kV	35 feet
751 to 1000 kV	45 feet

Notes:
kV – kilovolts
Whenever equipment operations must be performed closer than 20 feet from overhead power lines, the Field Leader (FL) must be notified. When clearance to proceed is received from the FL, the electric utility company must be contacted to turn the power off or physically insulate (protect) the lines if the operation must be performed closer to the power line than is allowed in this table. For voltages not listed on this table, add 0.4 inches per kV to obtain the safe distance between equipment and power lines.

12.1.5 Electric Safety

Observe the following procedures and practices to prevent electric shock:

- General
  - Use only appropriately trained and certified electricians to perform tasks related to electrical equipment. A good rule of thumb is to defer any task that would not normally and reasonably be completed by the average public consumer.
  - Ensure that all equipment is grounded with either an appropriate plug (i.e., "three-pronged") or by using a GFCI.

  - Test all GFCIs prior to use.
  - Use only extension cords that are in good condition—if in doubt, throw it out.
  - Use only 16-gauge, heavy duty, three-wire, Underwriters Laboratories Inc. (UL)-approved three-pronged extension cords
  - Be sure to locate extension cords out of traffic areas or, if this is unavoidable, flag cords and protect workers from tripping over them (i.e., use barricades, tape the cord down, etc.)
  - Do not stage extension cords or powered equipment in wet areas, to the degree possible. Elevate cords and equipment out of puddles.

- Specific
  - If unsure if a task requires specific electrical training, err on the side of caution and contact the PM and FL prior to proceeding.
  - If subsurface work is to be performed, follow the guidelines in Section 12.1.4 and conduct utility locating prior to work and in accordance with local ordinances.
  - If lock out/tag out (LO/TO) procedures are required (i.e., de-energizing machinery or equipment so work may be performed), the equipment owner must provide LO/TO procedures and training. By default, the equipment owner should perform any LO/TO. If it becomes necessary for Anchor QEA personnel to perform LO/TO tasks, contact the PM and FL prior to doing so.
  - Maintain appropriate distance from overhead utilities (see Table 4).
  - If unexpected electrical equipment is encountered (i.e., buried wire) assume it is live, stop work, and contact the PM and FL immediately.

12.1.6 General Falls/Ladders

Observe the following general falls/ladders procedures and practices:

- Assess work areas for fall hazards. A fall protection system that meets OSHA and ANSI Z3591 standards must be used if work is conducted 6 feet or more above the surface.
- Use Type 1A rated ladders.
- Make sure ladder rungs are sturdy and free of cracks.
- Use ladders with secure safety feet.
- Pitch ladders at a 4 horizontal to 1 vertical (4H:1V) ratio.
- Secure ladders at the top or have another person at the bottom to help stabilize it.

- Ladders used to access an upper landing surface shall extend at least 3 feet above the upper landing surface.
- Use non-conductive ladders near electrical wires.
- The top rung of a ladder should not be used as a step.
- Do not carry any object or load that could cause a loss of balance or a fall.

12.1.7 Heavy Equipment Operations

Observe the following heavy equipment operations procedures and practices:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than 6 feet, ensure that all employees have fall protection that meets OSHA and ANSI Z3591 standards.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.
- The subcontractor or Anchor QEA equipment operator must conduct pre-operational inspections of all equipment. In addition, daily inspections will be conducted on the equipment prior to site activities.
- Maintain the appropriate distance from overhead utilities (see Table 4).
- Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator.
- All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
- Conduct a site evaluation to determine proper positioning for the unit. Make sure the surface is level. Cordon off holes, drop-offs, bumps, or weak ground surfaces.
- When using a crane, do not use hands when the load is being lifted or lowered. Use non-conductive tag line to help direct and position the load.
- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible

12.1.8 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.

- Worn tools are dangerous. For example, the "teeth" in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.
- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to "mushroom." Keep them dressed to avoid flying spalls. Use tool holders.
- Do not force tools beyond their capacity.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Also inspect for adequate lighting, proper lubrication, and abandoned tools or material that could "vibrate into trouble."
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be "bled down" before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before start-up. Remove cranks, keys, or wrenches used in service work.

12.1.9 Motor Vehicle Operation

All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. The use of hand-held wireless devices is prohibited by Anchor QEA while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law. Additionally, site-specific motor vehicle requirements must be followed, if any.

When driving to, from, and within the job site, be aware of potential hazards including:

- Vehicle accidents
- Distractions
- Fatigue
- Weather and road conditions

To mitigate these hazards, observe the following procedures and practices regarding motor vehicle operation:

- Wear a seat belt at all times and make sure that clothing will not interfere with driving.
- Inspect fluid levels and air pressure in tires, adjust mirrors and seat positions appropriately, watch the fuel level, and fill up when the fuel level is low.
- Plan your travel route and check maps for directions or discuss with colleagues.
- Clean windows and mirrors as needed throughout the trip.
- Wear sunglasses as needed.
- Follow a vehicle maintenance schedule to reduce the possibility of a breakdown while driving.
- Stop driving the vehicle, regardless of the speed (i.e., even 5 mph) or location (i.e., a private road), when the potential of being distracted by conversation exists.
- Drivers are prohibited from using hand-held communication devices (e.g., cell phones) while operating any motor vehicle.
- Get adequate rest prior to driving.
- Periodically change your seat position, stretch, open the window, or turn on the radio to stay alert.
- Pull over and rest if you are experiencing drowsiness.
- Check road and weather conditions prior to driving.
- Be prepared to adjust your driving plans if conditions change.
- Travel in daylight hours, if possible.
- Give yourself plenty of time to allow for slowdowns due to construction, accidents, or other unforeseen circumstances.
- Use lights at night and lights and wipers during inclement weather.

12.1.10 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear a traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.
- Use a vehicle to block work area.
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.

- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the DOT MUTCD and/or local requirements.

See Section 7.4.2 for additional information regarding work in roadways.

12.1.11 Boating Operations

The following precautions shall be followed when conducting boating trailer and launch activities:

- Follow the trailer and boat manufacturers' instructions for securing the boat to the trailer.
- Follow the trailer manufacturer's instructions for securing the trailer to the towing vehicle.
- Prohibit workers from moving into trailer/vehicle pinch points without advising the vehicle operator.
- Use experienced operators when backing trailers on boat ramps.
- Wear proper work gloves when the possibility of pinching or other injury may be caused by moving or handling large or heavy objects.
- Maintain all equipment in a safe condition.
- Launch boats one at a time to avoid collisions.
- Use a spotter for vehicles backing boats to the launch area.
- Understand and review hand signals.
- Wear boots with non-slip soles when launching boats.
- Wear USCG-approved PFDs when working on or near the water.
- Keep ropes and lines coiled and stowed to eliminate trip hazards.
- Maintain three-point contact on dock/pier or boat ladders.
- Ensure that drain plugs are in place, as present.

The following precautions shall be followed when conducting boating operations:

- Maintain a current boater's license(s) as required.
- Wear USCG-approved PFDs for work activities on or near the water.
- Obtain and review information regarding dams that may be present in work areas, particularly with regard to "no boating" zones and safety buoys, cables, and warning signage.

- Maintain boat anchorage devices commensurate with anticipate currents, distance to shore, and water depths.
- Provide a floating ring buoy with at least 90 feet of line in the immediate boat launch/landing areas.
- Step into the center of the boat.
- Keep your weight low when moving on the boat.
- Move slowly and deliberately.
- Steer directly across other boat wakes at a 90-degree angle to avoid capsizing.
- Steer the boat facing forward.
- Watch for floating objects in the water.
- Right-of-way is yielded to vessels on your boat's right, or starboard, and vessels with limited ability to maneuver such as any wind-propelled vessel.

The following precautions shall be followed when working on a boat:

- Observe proper lifting techniques.
- Obey lifting limits (see Section 12.1.14)
- Use mechanical lifting equipment (i.e., pulleys or winches) to move large or awkward loads.
- Wear USCG-approved PFDs for work activities on or near the water.

The safety-related items listed in Table 5 shall be available when conducting boating operations:

Table 5

Safety Equipment Specific to In-water Work

Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard (USCG) Requirements:	
• Proper vessel registration, numbering, and documentation (registered with state, certificate of vessel registration number displayed, and carrying a valid certificate of number) • USCG-approved personal flotation devices (PFDs; or life jackets) for every person on the sampling vessel (Type II PFD required, Type I PFD preferred as it will turn most unconscious wearers face up in the water) • Appropriate, non-expired, visual distress devices for day and night use from the following: - Three hand-held red flares (day and night), or - One hand-held red flare and two parachute flares (day and night), or - One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only) • Alternate means of propulsion (oars or paddles) • Dewatering device (pump or bailer) • Properly maintained and inspected USCG-approved fire extinguishers (no fixed system = (2) B-1 or (1) B-2 type extinguishers; fixed system = (1) B-1 type extinguisher) • Proper ventilation of gasoline-powered vessels • Sound-producing device (whistle, bell, or horn) • VHF 2-way radio • Proper navigational light display • Throwable life ring with attached line (any vessel larger than 16 feet is required to carry one Type IV [throwable] PFD)	
Additional USCG Recommended Equipment Includes:	
• Extra visual distress signals • Primary and spare anchor • Heaving line • Fenders • First aid kit • Flashlight • Mirror • Searchlight • Sunburn lotion • Tool kit • Spare fuel	• Boat hook • Spare propeller • Mooring line • Food and water • Binoculars • Spare batteries • Sunglasses • Marine hardware • Extra clothing • Spare parts • Pertinent navigational chart(s) and compass

12.1.12 Working Over or Near Water

12.1.12.1 Personal Flotation Devices

PFDs are not required where employees are continuously protected from the hazard of drowning by railings, nets, safety belts, or other applicable provisions.

Type III, Type V, or better USCG-approved International Orange PFD shall be provided and properly worn by all personnel in the following circumstances:

1. On floating pipelines, pontoons, rafts, or stages.
2. On structures extending over or next to the water, except where guard rails or safety nets are provided for employees.
3. Working alone at night where there are drowning hazards, regardless of other safeguards provided.
4. In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit.
5. Whenever there is a drowning hazard.

The following precautions shall be followed when using PFDs:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective devices or devices with less than 13 pounds buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.
- Thirty-inch USCG-approved ring buoys with at least 150 feet of 600-pound capacity line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.
- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is a potential need for life rings to be used after dark. On shore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights or light stanchions) is not provided.

12.1.12.2 Cold Water Work

When the water temperature is below 50° F, field personnel working on or near water shall wear either a float coat and bib-overalls (e.g., a full two-piece "Mustang" survival suit or similar), or a one-piece survival suit. Suits or float coats shall be USCG approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed. Work activities will be continually reviewed and adjustments made if wearing a survival suit during work activities potentially poses a hazard due to warm air temperatures, or limited mobility or agility. In addition, proximity of water work to shore and scope/duration/timing of work activities will be considered when stipulating the above

requirement. Overall, if water craft will be used during work, or work will be conducted near water, it is imperative that site specific conditions are considered and evaluated so that proper safeguards and procedures are in place prior to beginning work.

In addition to considering the use of apparel appropriate for anticipated air, weather, and water conditions, field teams shall identify any procedures necessary for cold-water "man-overboard" scenarios. These procedures should be identified in the site-specific HASP, described in the JSA used for boating activities and, if prudent, practiced before work.

12.1.13 Noise

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to disposable ear plugs with a Noise Reduction Rating of not less than 30.
- Ear plugs must be worn in any environment where workers must raise their voices to be heard while standing at a distance of 3 feet or less.
- Ear plugs must be worn by any personnel operating concrete cutting or sawing equipment.

Hearing protection is required for workers operating or working near noisy equipment or operations, where the noise level is greater than 85 A-weighted decibels (dbA) (Time Weighted Average [TWA]), as well as personnel working around heavy equipment. The FL will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

When needed, a sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter. When used, noise monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dbA at any location within the work area, warning signs will be posted. Workers and visitors will be notified that hearing protection is required. Appropriate hearing protection (i.e., ear plugs or ear muffs) will be worn

whenever personnel or visitors are working in that location. A supply of ear plugs will be maintained on site.

Action levels in Table 6 will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dbA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by EPA. The calculation for a hearing protection device's effectiveness is:

Noise reading dbA - (NRR - 7 dB) < 90 dbA

Table 6
Noise Exposure Action Levels

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or Dosimeter	> 80 dbA to 85 dbA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	> 85 dbA to 90 dbA	Hearing protection required. Limit work duration to 8-hour shifts.
	> 90 dbA to 115 dbA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts.
	> 115 dbA	Stop work. Consult CHSM.

12.1.14 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, drums, etc.).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs over 60 pounds. Multiple employees or mechanical lifting devices are required for objects over the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; keep the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.

- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Ensure that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

12.1.15 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.
- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Ensure fire safety integrity of equipment installations according to National Electrical Code (NEC) specifications.

12.1.16 Static Electricity and Transfer of Flammable Liquids

Observe the following procedures and practices regarding static electricity when transferring flammable liquids:

- Electrically bond and ground pumps, transfer vessels, tanks, drums, bailers, and probes when moving flammable liquids.
- Electrically bond and ground vacuum trucks and the tanks they are emptying.
- Do not splash fill containers with flammable liquids.
- Pour flammable liquids slowly and carefully.
- Two fire extinguishers (2A20:BC) must be available, charged, inspected, and readily accessible.

12.1.17 Cleaning Equipment

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox®, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

12.2 Environmental Hazards and Controls

12.2.1 Heat Stress

Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate workers in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.1.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.

12.2.1.1 Signs, Symptoms, and Treatment

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn since they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing, rubber boots, or impermeable waders. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing. Take measures to prevent heat rash by changing clothes often to maximize use of dry garments, or taking frequent breaks to allow doffing of equipment and drying of skin.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, remove the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, remove the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105° F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Since heat stroke is a true medical emergency, transport the patient to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the patient in a sheet soaked with water. Fan the patient vigorously while transporting to help reduce body temperature. If available,

apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the patient in a cool-water bath (however, be careful not to over-chill the patient once body temperature is reduced below 102° F). If this is not possible, keep the patient wrapped in a sheet and continuously douse with water and fan.

12.2.1.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% saltwater solution, a commercial mix such as Gatorade, or a combination of these with fresh water. The replacement fluid temperature should be kept cool, 50° F to 60° F, and should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All workers are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

12.2.1.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90° F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77° F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature

(WBGT), and physiological. The Heat Stress Monitoring Record form (see Attachment 1) will be used to record the results of heat stress monitoring.

Note that some states such as Washington and California have specific regulatory standards for protection of employees from heat stress-related injuries.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25° C (77° F), the work regiment in Table 7 should be followed.

Table 7
Permissible Heat Exposure Threshold Limit Values

Work/Rest Regimen	Workload		
	Light	Moderate	Heavy
Continuous work	86° F (30.0° C)	80° F (26.7° C)	77° F (25.0° C)
75% work, 25% rest each hour	87° F (30.6° C)	82° F (28.0° C)	78° F (25.9° C)
50% work, 50% rest, each hour	89° F (31.4° C)	85° F (29.4° C)	82° F (27.9° C)
25% work, 75% rest, each hour	90° F (32.2° C)	88° F (31.1° C)	86° F (30.0° C)
These TLVs are based on the assumption that nearly all acclimated, fully-clothed workers with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4° F (38° C).			

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 8 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 8.

Table 8
WBGT Correction Factors

Clothing Type	WBGT Correction
Summer lightweight working clothing	32° F (0° C)
Cotton coveralls	28° F (-2° C)
Winter work clothing	25° F (-4° C)
Water barrier, permeable	86° F (-6° C)
Fully encapsulating	14° F (-10° C)

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Since individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The two parameters that are to be monitored at the beginning of each rest period are:

- **Heart Rate** – The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of their calculated MHR (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of their calculated MHR.
- **Temperature** – Each individual will measure his/her temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6° F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4° F

12.2.1.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

13 MEDICAL SURVEILLANCE PROGRAM

This section describes the medical surveillance program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

13.1 General Requirements

Anchor QEA employees shall be enrolled in a medical surveillance program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances:

If they are involved with any of the following operations:

- *Cleanup operations* required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained).
- *Corrective actions* involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 U.S.C. 6901 et seq)
- *Voluntary cleanup operations* at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites.
- *Operations involving hazardous wastes* that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations.
- *Emergency response operations* for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

And, if the employee(s) meets the following criteria:

- Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year.

In addition, employees are required to be enrolled in the medical surveillance program if they meet any of the following conditions:

- Wear a respirator for 30 days or more per year
- Are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operations
- Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical surveillance program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Prior to assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical surveillance and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

13.2 Crew Self Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be

serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

ATTACHMENT 1
HEALTH AND SAFETY LOGS AND FORMS

ATTACHMENT 2
JOB SAFETY ANALYSIS (JSA) DOCUMENTS

ATTACHMENT 3
MATERIAL SAFETY DATA SHEETS (MSDS)