# Draft Integrated Feasibility Report and Environmental Impact Statement/Environmental Impact Report

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Redwood City Harbor Navigation Improvement
Feasibility Report and Integrated EIS/EIR

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U.S. Army Corps of Engineers, San Francisco District

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**Abstract**

This is a feasibility report that describes the planning process for improving navigation efficiency at the Port of Redwood City, California. The Report is integrated with an Environmental Impact Statement in compliance with the National Environmental Policy Act and an Environmental Impact Report in compliance with the California Environmental Quality Act. A comprehensive range of structural and non-structural alternatives was identified and evaluated in terms of potential impacts on the natural and built environments. The recommended plan consists of deepening the Redwood City Harbor and San Bruno Shoal Channels from -30 feet MLLW to -32 feet MLLW and slightly realigning the Redwood City Harbor Channel to avoid sensitive environmental features of Bair and Greco Islands. The recommended plan maximizes net national economic development benefits and was identified as the National Economic Development Plan. The Recommended Plan avoids adverse environmental impacts to the maximum extent practicable and includes mitigation measures to offset impacts when necessary.

# Executive Summary

## ES.1 Purpose and Intended Uses of This Document

This document describes investigations and alternatives to improve navigation efficiency at Redwood City (RWC) Harbor and San Bruno Shoal (SBS) Channel, evaluations of the potential environmental impacts of such improvements, and identification of a tentatively selected plan. It integrates the following elements:

- Requirements of the United States Army Corps of Engineers (USACE) feasibility study planning process;
- An Environmental Impact Statement (EIS) prepared in compliance with the National Environmental Policy Act (NEPA); and
- An Environmental Impact Report (EIR) prepared in compliance with the California Environmental Quality Act (CEQA).

The purpose of the Redwood City Harbor Navigation Study is to evaluate alternatives for improving the efficiency of navigation to the Port. This document was prepared by the USACE, San Francisco District, in collaboration with the Port of Redwood City, the non-federal sponsor of the Redwood City Harbor Navigation Project.

The purpose of this DEIS/DEIR is to evaluate the potential significant environmental impacts of the alternatives proposed in the feasibility study. The integrated DEIS/DEIR will be used to support Congressional authorization of the recommended plan for improvements to the Redwood City Harbor Navigation Project.

This DEIS/DEIR will also be used by CEQA lead agencies to ensure that they have met the requirements of CEQA before deciding whether to issue discretionary permits over which they have authority. It may also be used by other state, regional, and local agencies, which may have an interest in resources that could be affected by the project.

## ES.2 Study Area

Redwood City Harbor is located on the southwest side of San Francisco Bay, approximately 18 miles south of San Francisco, California (***Figure ES-1***). It is within the corporate limits of Redwood City, in San Mateo County. The study area includes the existing Federal navigation channel and turning basins at Redwood City Harbor, extending from the mouth of Redwood Creek to deep water in the San Francisco Bay. The Federal navigation channel at San Bruno Shoal in San Francisco Bay is also included in the study area, having been added to the Federal project by the 1945 authorizing legislation. It is located north of Redwood City and lies within the corporate boundaries of the cities of both Brisbane and South San Francisco, California. Both channels are currently authorized to be maintained at -30 feet Mean Lower Low Water (MLLW).

Potential dredged material placement sites that have been considered for this study[1] include:

- Montezuma Wetland Restoration Project,
- Cullinan Ranch Tidal Restoration Project,
- Eden Landing Pond Complex,
- Alviso Pond Complex
- San Francisco Deep Ocean Disposal Site, which is also part of the study area but is located about 50 miles offshore from the Golden Gate Bridge.

The SBS Channel overlays three petroleum pipelines (***Figure ES-1***). Deepening of the SBS Channel would require that these pipelines be relocated.

Bair Island and Greco Island are adjacent to the harbor and are considered to be in the project area because of their proximity to the channel. Bair Island is operated by the U.S. Fish and Wildlife Service (USFWS) and is the site of a restoration project. The bay water around Bair Island and the harbor is within the Don Edwards Marine Protected Area (***Figure ES-2***).

[1] Other potential placement sites were considered during the planning process, but were screened from further consideration.


***Figure ES-1. Study Area***


**Figure ES-2. Redwood City Channel, Turning Basins, and Bair and Greco Islands**

## ES.3 Port Commodities and Traffic

The Port of Redwood City specializes in bulk, neo-bulk, and liquid cargoes. Cargo volumes have been variable over the life of the Port, reflecting economic trends and resulting demand for bulk goods (***Figure ES-3***). During the past 10 years, cargo volumes peaked at 1.9 million metric tons (MMT) in 2005 and then dropped to a low of 842,727 metric tons in 2010.

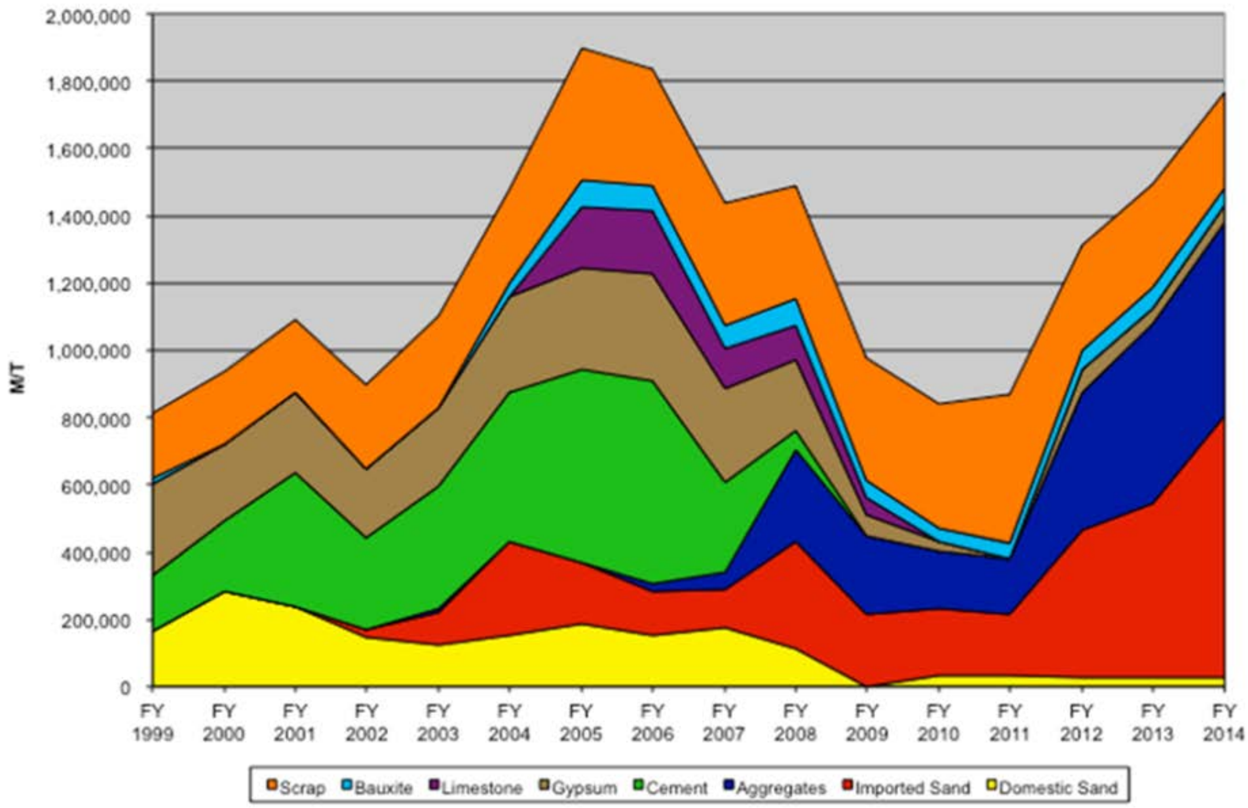


***Figure ES-3. Tonnage by Commodity for Port of Redwood City***

Bulk construction aggregates and scrap metal commodities have been supported by the Port and are expected to continue into the future. The latest statistics show that 1.7 MMT of commodities passed through the Port between 1 July 2013 and 30 June 2014.

The future fleet forecast assumed a 2.8 percent annual growth in overall commodity tonnage, the same as the overall trend over the last 15 years. At the projected 2.8 percent annual growth rate, commodities are expected to grow to a projected level of 2.5 MMT by 2025. The Port's existing infrastructure can accommodate a total throughput of 3.5 million tons per year.

***Table ES-1*** describes the commercial traffic to the Port of Redwood City for the period from 2002 through 2014. It should be noted that barges in earlier years were typically 2,000 to 3,000 tons/barge of domestic sand dredged from San Francisco Bay. However, barges in later years have typically carried between 3,000 and 5,000 tons of aggregates lightered from larger vessels. Ships ranged from 20,000 to 35,000 tons - more in recent years.

***Table ES-1. Port of Redwood City Commercial Traffic***

| Fiscal Year | Cargo Metric Tons | Vessel Calls: Barges | Vessel Calls: Ships | Vessel Calls: Total |
|---|---|---|---|---|
| 2014 | 1,784,659 | 25 | 64 | 89 |
| 2013 | 1,493,190 | 19 | 51 | 70 |
| 2012 | 1,319,198 | 26 | 48 | 74 |
| 2011 | 871,940 | 11 | 36 | 47 |
| 2010 | 842,727 | 16 | 33 | 49 |
| 2009 | 986,727 | 11 | 37 | 48 |
| 2008 | 1,487,064 | 65 | 50 | 115 |
| 2007 | 1,436,626 | 94 | 46 | 140 |
| 2006 | 1,833,022 | 91 | 60 | 151 |
| 2005 | 1,908,172 | 96 | 60 | 156 |
| 2004 | 1,484,720 | 88 | 54 | 142 |
| 2003 | 1,111,000 | 58 | 42 | 100 |
| 2002 | 899,652 | 65 | 30 | 95 |

## ES.4 Redwood City and San Bruno Shoal Channels

The Redwood City Harbor channel extends approximately 5 miles from the Port of Redwood City to deep water in San Francisco Bay (***Figure ES-2***). The channel includes two turning basins: Turning Basin #1 is an outer basin nearest the bay, and Turning Basin #2 is an inner basin nearest the Port. A connecting channel joins the two turning basins. The width of the channel and turning basins ranges from 300 feet to 900 feet. The San Bruno Shoal Channel, located 9 miles northwest of the Port, is also part of the Federal Redwood City Harbor project. It spans approximately 3.5 miles and connects with deep water in San Francisco Bay to the north and south.

The average sedimentation rate for the Redwood City Harbor Channel is about 183,000 cubic yards per year (2004 – 2012 period of record). There are indications that the accretion rate is not constant throughout the year, but varies either seasonally, or in response to storm events. The channel has been scheduled for maintenance dredging by USACE on a two-year dredging cycle since 1965. However, the USACE's ability to dredge the channel to the full authorized depth of -30 feet MLLW depends on receipt of sufficient Federal funds.

Recent channel maintenance dredging occurred in 2004, 2005, 2008, 2012 and 2014 (***Table ES-2***), usually with clamshell-bucket equipment. Maintenance dredged material from the channel has typically been less than 80 percent sand and has been placed at the SF-11 (Alcatraz) disposal site. Additionally, a "knockdown" was performed in late 2009 when sediment in areas with the greatest shoaling was moved to areas of the channel with less shoaling, thereby increasing the limiting navigation depth.

***ES-1. Redwood City Harbor Channel Dimensions and Historical Maintenance Dredging***

| Channel Section | Authorized Depth (MLLW) | Length (feet) | Width (feet) | Area (acre) | Maintenance Frequency (years) | Last Dredged (FY) |
|---|---|---|---|---|---|---|
| Entrance Channel | 30 | 13,900 | 300-350 | 103.7 | 2 | 2014 |
| Outer Turning Basin | 30 | 2,200 | 400-900 | 30.3 | 2 | 2014 |
| Connecting Channel | 30 | 1,300 | 400 | 11.9 | 2 | 2014 |
| Inner Turning Basin | 30 | 1,700 | 900 | 35.1 | 2 | 2014 |
| San Bruno Channel | 30 | 1,800 | 510 | 21.1 | Infrequently | 2005 |

San Bruno Shoal Channel rarely requires maintenance dredging. Surveys of the channel between 2002 and 2014 show that the channel has undergone periods of accretion and erosion, with little net change in channel depth. The channel has been maintained via a hopper dredge at approximately 10-year intervals and was last dredged in 2005. Prior to 2005, less than 3.5 percent of the channel area was shallower than the authorized project depth. The parts that were in need of maintenance required only 16,000 cubic yards of sediment to be removed.

## ES.5 Need for Action

The major problem at Redwood City Harbor is transportation cost inefficiencies. The existing navigation project channels at Redwood City Harbor and San Bruno Shoal do not allow for the efficient operation of the vessel fleet that calls on the Port. A large majority of vessels calling on the Port have design drafts that are greater than the authorized channel depth of -30 feet MLLW. Having to wait for favorable tide is inefficient, requiring the practices of light loading or lightering[2] larger vessels and waiting for favorable tide conditions in order to access the Port.

Three classes of commercial vessels call on the Port: Handysize, Handymax, and Panamax vessels. The design drafts for these vessels range from 33 to 46 feet (***Table ES-3***). Because fully loaded vessels exceed the available draft in the channel, vessels must be only partially loaded or light-loaded. For example, a Panamax vessel must take off approximately 2,000 metric tons

[2] Lightering is the practice of transferring cargo from one vessel to another in order to reduce the vessel draft so that it can safely navigate a channel with limited depth.

of material to reduce its draft by 1 foot. Light loading results in increased transportation costs that are ultimately passed on to consumers.

***Table ES-2. Port of Redwood City Vessel Characteristics***

| Vessel Type/Class | Approximate Dead Weight Tonnage (DWT) | Length Range (feet) | Beam Range (feet) | Draft (feet) | Number in Port (07/2012-06/2013) | Percent Loaded (07/2012-06/2013) |
|---|---|---|---|---|---|---|
| Handysize | 10k-35k | 426-492 | (variable) | 33 | 7 | 75-85% |
| Handymax | 35k-59k | 492-656 | (variable) | 36-39 | 16 | 37-65% |
| Panamax | 60k-80k | <965 | <106 | <39.5 | 30 | 21-58% |

The future without project condition fleet is projected to have the following average annual mix:

- 6 - 10 Handysize
- 12 Handymax
- 50 Panamax (still light-loaded).

The design drafts of all of these vessels exceed the current channel depths in Redwood City and San Bruno Shoal Channels and vessels will continue to incur partial and light loading costs in the future.

## ES.6 Planning Objective, Opportunity, and Constraints

### Planning Objective

The Congressional authority for this report indicates that its purpose is "To improve the efficiency of deep draft navigation at the Redwood City Harbor and San Bruno Shoal Channels." With that charge, and based on existing and future conditions, the specific planning objective of this study is to:

> **Increase efficiencies of deep draft navigation and transportation of goods to and from the Port of Redwood City.**

### Opportunity

Deepening the RWC and SBS Channels would represent an opportunity to support the goals of the San Francisco Bay Long Term Management Strategy for Dredged Sediment (LTMS). The LTMS was developed by the USACE, the U.S. Environmental Protection Agency (USEPA), the San Francisco Bay Conservation and Development Commission, and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The plan addresses San Francisco, San Pablo, and Suisun Bays. It seeks to maximize beneficial reuse of dredged material and limits in-Bay placement of dredged material to 1.25 million cubic yards per year (mcy/year). In view of this strategy, this study has the following opportunity:

> ***Support the Goals of the San Francisco Bay Long Term Management Strategy for Dredged Sediment***

**Planning Constraints**

A planning constraint is a restriction that limits the range of measures or actions that might be implemented to meet the study objectives. Constraints can be related to resource, legal, or policy considerations. The planning constraints identified for this study are:

1) Avoid or minimize adverse impacts to environmental resources at the RWC and SBS Channels.

2) Avoid impacts to the USFWS Bair Island unit of the Don Edwards San Francisco Bay Wildlife Refuge and the Port of Redwood City infrastructure.

3) Avoid adverse impacts to vessel operating safety at the RWC and SBS Channels. Any realignment or deepening should avoid creating conditions that result in unsafe operating conditions or additional navigation hazards.

4) Avoid impacts to the San Mateo Bridge.

## ES.7 Alternatives

The planning process consisted of identifying appropriate management measures based on the planning objectives, formulating alternative plans by combining management measures, screening and evaluating alternative plans, and identifying the TSP.

Management measures are the “building blocks” for all alternative plans. They are specific actions/ideas/programs/regulations that can be taken to address specifically targeted objectives. Management measures were crafted to address specific project objectives and then evaluated qualitatively. Both structural and non-structural management measures were identified. The complete set of management measures was screened to identify those that best met the planning objectives and merited further evaluation. Retained management measures were then combined to form a set of 17 preliminary alternative plans, in addition to the No Action Plan. The preliminary plans consist of combinations of three channel depths (-32, -34, and -37 feet MLLW) and five dredged material placement sites (Cullinan Ranch, Montezuma Wetland Restoration Project, San Francisco Deep Ocean Disposal Site (SF-DODS), Eden Landing Pond Complex, and Alviso Pond Complex) (***Table ES-4***).

***Table ES-4. Summary of Preliminary Alternatives***

| Alt No. | Dredging Option (feet MLLW) | Placement Site Use (cy) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Cullinan | Montezuma | SF-DODS | Eden Landing | Alviso – Pond A2W Delivery | Alviso – Pond A9 Delivery | Total Volume (cy) | Formulation Strategy |
| A-1 | A (-32’) | 1,765,000 | | | | | | 1,765,000 | 100% Beneficial Reuse; lowest cost permitted site |
| A-2 | A (-32’) | | 1,765,000 | | | | | 1,765,000 | 100% Beneficial Reuse; maximum Montezuma use |
| A-3 | A (-32’) | | 46,000* | 1,719,000 | | | | 1,765,000 | Placement at SF-DODS with an allowance for wetland foundation material placement at Montezuma |
| A-4 | A (-32’) | | 46,000* | | 1,719,000 | | | 1,765,000 | Maximum South Bay Beneficial Reuse; maximum Eden Landing use with an allowance for wetland foundation material placement at Montezuma |
| A-5 | A (-32’) | | 46,000* | | | 1,719,000 | | 1,765,000 | Maximum South Bay Beneficial Reuse, maximum Alviso use with an allowance for wetland foundation material placement at Montezuma |
| B-1 | B (-34’) | 2,800,000 | 1,161,000 | | | | | 3,961,000 | 100% Beneficial Reuse; assuming 1 Year of Cullinan use |
| B-2 | B (-34’) | | 81,000* | 3,880,000 | | | | 3,961,000 | Most cost-effective approach |
| B-3 | B (-34’) | 3,000,000 | | 961,000 | | | | 3,961,000 | Maximum Cullinan use; remainder to most cost-effective site |
| B-4 | | | 3,961,000 | | | | | 3,961,000 | 100% Beneficial Reuse, maximum Montezuma use |
| B-5 | B (-34’) | | 81,000* | | 3,880,000 | | | 3,961,000 | Maximum South Bay Beneficial Reuse; maximum Eden Landing use with an allowance for wetland foundation material placement at Montezuma |
| B-6 | B (-34’) | | 81,000* | | | 3,880,000 | | 3,961,000 | Maximum South Bay Beneficial Reuse; |

| Alt No. | Dredging Option (feet MLLW) | Placement Site Use (cy) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Cullinan | Montezuma | SF-DODS | Eden Landing | Alviso – Pond A2W Delivery | Alviso – Pond A9 Delivery | Total Volume (cy) | Formulation Strategy |
| | | | | | | | | | maximum Alviso use with an allowance for wetland foundation material placement at Montezuma |
| C-1 | C (-37') | 2,800,000 | 4,915,000 | | | | | 7,715,000 | 100% Beneficial Reuse; high Cullinan use |
| C-2 | C (-37') | | 138,000* | 7,577,000 | | | | 7,715,000 | Most cost-effective approach |
| C-3 | C (-37') | 3,000,000 | | 4,715,000 | | | | 7,715,000 | 100% Beneficial Reuse; maximum Cullinan use and supporting SF-DODS use |
| C-4 | C (-37') | | 7,715,000 | | | | | 7,715,000 | 100% Beneficial Reuse; maximum Montezuma use |
| C-5 | C (-37') | | 138,000* | | 7,577,000 | | | 7,715,000 | Maximum South Bay Beneficial Reuse; maximum Eden Landing use with an allowance for wetland foundation material placement at Montezuma |
| C-6 | | | 138,000* | | | 7,577,000 | | 7,715,000 | Maximum South Bay Beneficial Reuse; maximum Alviso use with an allowance for wetland foundation material placement at Montezuma |

*Volume that represents 5% of the dredged material from the RWC Channel deepening that is assumed to be unsuitable for wetland cover.

**Final Placement Site Evaluation**

The evaluation of potential placement sites focused on site availability, capacity, and the permit status. Although highly desirable due to their proximity to the dredging sites, both Eden Landing and Alviso Pond Complex sites are still in the early development phase. The Environmental Impact Reports for the sites have not been completed. Even though the site owners indicate that the sites could be ready by 2018, it is not certain that permitting would be complete and the facilities for transporting the dredged material would be constructed and operational by that time. Additionally, there is no proponent that has come forward at this time to finance the operations required to offload and transport the dredged material to the site. Therefore, both the Alviso Pond Complex and Eden Landing sites are not being considered further at this time. As a result, Alternatives A-4, A-5, B-5, B-6, C-5 and C-6 are not being carried forward for evaluation at this time. However, if either Alviso Pond Complex or Eden Landing sites were to be permitted and available by 2018 and were found to be cost effective, use of these sites will be reconsidered. To advance the potential use of the Alviso Pond Complex or Eden Landing, the impacts of using these sites have been evaluated in the main integrated report and ***Appendix A*** to the extent possible with available information.

The two upland beneficial reuse sites, Cullinan Ranch Tidal Restoration Project and Montezuma Wetlands Restoration Project, are already available and permitted, as is the ocean disposal site SF-DODS, so these were retained for use in the final array of alternatives. However preliminary cost numbers on using both Cullinan and Montezuma in combination for placement sites were not cost effective. It was less expensive to use only one or the other. As a result both alternatives B-1 and C-1 were also not carried further for continued evaluation.

Analysis of the impacts of channel deepening determined that a slight realignment of the RWC Channel was necessary to avoid or minimize impacts to adjacent tidal mudflats. The current alignment of the channel near the entrance closely follows the border of outer Bair Island. The realignment would slightly shift the channel (approximately 6 feet) in an easterly direction away from outer Bair Island. As a result, the screened alternatives listed in ***Table ES-5*** include this slight realignment of the RWC Channel.

***Table ES-5. Screened Alternative Plans***

| Alternative | Channel Depth | Placement Site |
|---|---|---|
| A-1 | 32 | Cullinan* |
| A2 | 32 | Montezuma* |
| A-3 | 32 | SF-DODS* |
| B-3 | 34 | Cullinan* |
| B-4 | 34 | Montezuma |
| B-2 | 34 | SF-DODS* |
| C-3 | 37 | Cullinan* |
| C-4 | 37 | Montezuma |
| C-2 | 37 | SF-DODS* |

* 5% of dredged RWC Channel dredged material was placed at Montezuma and remainder was placed at site shown in table.

## ES.8 Identification of the NED Plan

National economic development (NED) benefits are defined as increases in the net value of the national output of goods and services, expressed in monetary units. The NED plan is the plan that maximizes net NED benefits, consistent with the Federal objective. Net NED benefits are calculated by subtracting the average annual costs of an alternative from its average annual benefits.

Cost estimates were prepared for the screened alternative plans to include the costs of dredging and hauling the material to placement sites, mobilization and demobilization, planning engineering and design, construction management, contingency, operations and maintenance, and relocations.

The costs and benefits of deepening to -32, -34, and -37 feet MLLW were analyzed to determine annual project costs, annual NED benefits, and annual net NED benefits. ***Table ES-6*** provides the results of the economic evaluation and provides the basis for identification of the NED plan, which is highlighted in green.

***Table ES-6. Economic Analysis of Alternative Plans***

| Placement Site | Alternative | Depth (ft) | Total Project Cost ($1,000) | Annual Benefits ($) | Annual Project Costs ($) | Annual Net Benefits ($) | Benefit to Cost Ratio | Result |
|---|---|---|---|---|---|---|---|---|
| Montezuma | A-2 | 32 | 75,950 | 3,950,000 | 3,600,000 | 350,000 | 1.1 | Retain |
| | B-4 | 34 | 161,680 | 7,540,000 | 7,653,000 | -113,000 | 1.0 (rounded) | Not carried forward |
| | C-4 | 37 | 315,150 | 8,110,000 | 14,769,000 | -6,659,000 | 0.5 | Not carried forward |
| Cullinan | A-1 | 32 | 73,588 | 3,950,000 | 3,501,500 | 448,500 | 1.1 | Retain |
| | B-3 | 34 | 148,070 | 7,540,000 | 7,085,500 | 454,500 | 1.1 | Retain |
| | C-3 | 37 | 300,450 | 8,110,000 | 14,156,000 | -6,046,000 | 0.6 | Not carried forward |
| SF-DODS | **A-3** | **32** | **73,150** | **3,950,000** | **3,483,000** | **466,800** | **1.1** (1.134 rounded) | **Retain (NED Plan)** |
| | B-2 | 34 | 151,050 | 7,540,000 | 7,209,750 | 330,250 | 1.1 (1.0458 rounded) | Retain |
| | C-2 | 37 | 292,950 | 8,110,000 | 13,843,500 | -5,733,500 | 0.6 | Not carried forward |

The NED plan was identified as Alternative A-3: Channel Deepening to 32 feet with dredged material placed at the SF-DODS. This plan had the greatest net NED benefits (and the highest benefit to cost ratio. The NED plan will provide significant deep draft navigation benefits via a reduction of light loading and lightering operations, which will realize greater efficiencies and transportation cost savings. The NED Plan and all the other plans that resulted in positive annual net benefits were retained for further evaluation.

**Four Accounts Evaluation of Alternatives**

The remaining alternatives were further evaluated in three categories (also called accounts) of effects: Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE). The EQ, RED, and OSE accounts are described below and the results of the evaluation are summarized in ***Table ES-7***.

- ***Environmental Quality (EQ) Account*** addresses ecological, cultural, and aesthetic effects associated with implementation of the alternative plans.
- ***Regional Economic Development (RED)*** is based on regional jobs created as a result of project construction.
- ***Other Social Effects (OSE)*** relates to navigational and public safety.

***Table ES-7. Evaluation Results Using Four Planning Accounts***

| | Montezuma | Cullinan | | SF-DODS | |
|---|---|---|---|---|---|
| **Depth** | **32 (A-2)** | **32 (A-1)** | **34 (B-3)** | **32 (A-3)** | **34 (B-2)** |
| **1.** NED: Annual Net Benefits | $350.0k | $448.5k | $454.5 | $466.8k | $330.3 |
| 2. EQ: Environmental Impacts | Low | Low | Low | Medium | Medium |
| 3. RED: Regional Job Creation | Low | Low | Low | Low | Low |
| 4. OSE: Navigational Safety/Environmental Justice (EJ) | Safe/No EJ impact | Safe/No EJ impact | Safe/No EJ impact | Safe/No EJ impact | Safe/No EJ impact |

**Planning Criteria Evaluation**

***Table ES-8*** provides a final summary of the evaluation using USACE's four planning criteria: completeness, effectiveness, efficiency and acceptability of the alternatives. Plans that are incomplete (i.e., those that don't have viable placement sites) and plans that are ineffective at reducing transportation costs, were eliminated from the final array of alternatives, therefore all remaining alternatives are complete and effective. Efficiency was evaluated based on the net benefits of the plans. Plan A-3: Channel Deepening to 32 feet with dredged material placed at SF-DODS, maximized net NED benefits at $1.5M.

Acceptability will be confirmed prior to finalizing this report. Based on this evaluation, the Tentatively Selected Plan is dredging to 32 feet and placement of dredged material in SF-DODS. This is also the NED Plan.

***Table ES-8. Planning Criteria Evaluation***

| Placement Sites | Montezuma | Cullinan | | SF-DODS | |
|---|---|---|---|---|---|
| **Channel Depths** | **32 (A-2)** | **32 (A-1)** | **34 (B-3)** | **32 (A-3)** | **34 (B-2)** |
| Completeness: *Actions of others required* | Complete Available Capacity Permitted | Complete Available Capacity Permitted | Complete Available Capacity Permitted | Complete Available Capacity Permitted | Complete Available Capacity Permitted |
| Effectiveness: *Transportation Cost Savings* | Meets objective | Meets objective | Meets objective | Meets objective | Meets objective |
| Efficiency: *Net Benefits* | $350,000 | $448,500 | $454,500 | $466,800 | $330,250 |
| Compliance with Fed Law | Meets objective | Meets objective | Meets objective | Meets objective | Meets objective |
| **Result** | **Drop** | **Drop** | **Drop** | **TSP** | **Drop** |

## ES.9 Summary of Environmental Impacts and Mitigation

***Table ES-9*** shows the maximum level of impact that would be expected associated with each project alternative.

**Table ES-9. Comparison of Impacts by Project Alternative**

| | ALTERNATIVE | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Environmental Resource** | **A-1** | **A-2** | **A-3** | **B-1** | **B-2** | **B-3** | **B-4** | **C-1** | **C-2** | **C-3** | **C-4** |
| Air Quality and Greenhouse Gases | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** | -3/ B** |
| Biological Resources | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| Cultural Resources | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Geology/Soils/Seismicity | 0 | 0 | 0 | 0 | -0 | 0 | 0 | -1 | -1 | -1 | -1 |
| Hazards and Hazardous Materials* | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 |
| Land Use | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| Noise | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Recreation | -1 | 0 | 0 | -1 | 0 | -1 | 0 | -1 | 0 | -1 | 0 |
| Socioeconomics | B | B | B | B | B | B | B | B | B | B | B |
| Transportation and Navigation** | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B |
| Utilities and Service Systems* | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 |
| Water Quality and Hydrology | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |

The level of impact assigned to each alternative is based on the highest impact that could occur, even if that impact would occur at only one site in the alternative (for alternatives that contain more than one placement site).

**Impact Rating**:
-3 = significant and unavoidable adverse impact
-2 = significant but mitigable adverse impact
-1 = adverse but not significant impact
0 = negligible or no impact
B = beneficial
* Second rating would apply if dredges are electrically powered, or an electric offloader is used, or sediment is pumped directly to the site via an electrically-powered cutterhead dredge
** First rating is for construction phase/second rating is for post-construction phase

Based on the impact assessment, the expected impacts of the alternative plans are summarized below.

**No Impact or No Significant Impacts to the Following Resources**

- Aesthetics
- Hazards and Hazardous Materials
- Land Use and Planning
- Mineral Resources
- Public Services
- Recreation
- Socioeconomics/Population/Housing
- Transportation/Navigation/Traffic
- Utilities/Service Systems

**With Mitigation, No Significant Impact to the Following Resources**

- Air Quality and Green House Gases
- Cultural Resources
- Geology/Soils/Seismicity
- Noise and Vibration

**Significant and Unavoidable Impacts**

- Biological Resources
- Water Quality

Significant and unavoidable impacts to biological and water quality resources would be the result of turbidity caused by use of the jet sled construction method for relocation of the pipelines crossing the SBS Channel. Two alternative methods for relocating the pipelines, use of clamshell excavation or directional drilling, would have less than significant impacts.

## ES.9 Major Conclusions and Findings

The tentatively selected plan is the NED Plan, identified generally as the **32 foot depth deepening at both Redwood City Harbor and San Bruno Shoal Channels with a slight realignment at Redwood City Harbor to avoid sensitive environmental features of Bair Island and Greco Island including the peripheral mudflats.** The plan features are described below.

- Both channels will be deepened from -30 feet to -32 feet MLLW. The side slopes of both channels will be maintained at 3H:1V. An additional one foot of paid overdepth will be allowed; an additional one foot of overdepth will be allowed but not paid.

- The channel at Redwood City Harbor would range from 350 feet wide near the entrance to 288 feet throughout the rest of the channel. The channel alignment at the turn into Redwood City Harbor will retain the existing width but will be slightly shifted as follows:
    - From Station 80+00 to Station 122+ 00 the channel will be realigned 6 feet to the east away from Bair Island.
    - From Station 127+00 to Station 140+00 the channel will be realigned 6 feet towards the west to avoid impacts to adjacent Greco Island mudflats.
    - From Station 140+00 to Station 155+00 the channel will be shifted 6 feet away from Bair Island.
    - From Station 155+00 to Station 162+00 the channel will be reduced in width by 12 feet so as to avoid impacts to the RWC port facilities and Bair Island.
    - From Station 162+00 to the end of the turning basin, the channel width was reduced by six feet on the Bair Island side only so as to avoid adverse impact to Bair Island.
- The SBS Channel will remain approximately 500 feet wide and 29,850 feet (5.65 miles) long and will not be realigned. Some extension may be required to ensure a smooth transition to the existing channel bottom.
- At approximately station 38+00 on SBS Channel, 10 inch and 12 inch petroleum pipelines that will be adversely impacted due to their location relative to the new deepened channel will be lowered (relocated) to accommodate the increased channel depth. These two pipelines are owned by Kinder Morgan.
- At approximately station 148+70 on the SBS Channel, a ten inch petroleum pipeline owned by the Shell Oil Company that will also be impacted by the deepened channel will be lowered (relocated) to accommodate the increased channel depth.

## ES.10 Areas of Controversy

One issue of known controversy has been identified. As documented in USEPA's comment letter received during the scoping period, resource and regulatory agencies are targeting 100 percent beneficial reuse for deepening projects (the USEPA letter is provided in ***Appendix K***). The USACE's policy for determining the NED Plan requires that national economic development benefits be maximized, which in turn requires use of the lowest cost placement site. For this project, the lowest cost placement option is disposal at SF-DODS. An NED Plan relying primarily on SF-DODS for dredged sediment placement would be controversial.

Should the Eden Landing or possibly Alviso ponds become available as a dredged sediment placement site by the time the proposed Project is ready to go to construction, they may be a less expensive location for dredged sediment placement than SF-DODS.

## ES.11 Regulatory Requirements

Implementation of the Tentatively Selected Plan (TSP) requires compliance with applicable federal, state and local statutes and policies pertaining to dredging and dredged material placement activities, and protection of aquatic and terrestrial resources. Some of these laws require the USACE to obtain permits, certifications, or approvals from other agencies before taking action. The status of coordination required for key federal and state laws applicable to the TSP and for which permits or certifications are required are described below.

### Federal Laws

**National Environmental Policy Act (NEPA):** The USACE will request a 401 Water Quality Certification pertaining to the proposed action concurrent with the Draft EIS/EIR. With issuance of a WQC from the RWQCB, the USACE would be in full compliance with this Act.

**Endangered Species Act (ESA):** The USACE has been coordinating with USFWS and National Marine Fisheries Service (NMFS) through informal meetings and discussions. An ESA Section 7 Biological Assessment will be prepared and appended to this integrated feasibility report and EIS/EIR. The biological assessment will include the USACE's determination of the listed species that may be adversely affected by the proposed project. Formal Section 7 Consultation will be initiated following the release of the Draft EIS/EIR. The USFWS is expected to complete a Biological Opinion in regard to the TSP to complete the consultation requirements. With issuance of a Biological Opinion from the USFWS, the USACE would be in full compliance with this Act.

**Fish and Wildlife Coordination Act (FWCA):** The USFWS and CDFW have participated in evaluating the proposed project and USACE is considering all recommendations proposed by the agencies. A Coordination Act Report (CAR) will be requested. When complete, it will be appended to this integrated feasibility report and EIS/EIR. With issuance of a final CAR from USFWS and CDFW, the USACE would be in full compliance with this Act.

**Magnusun-Stevens Fishery Conservation and Management Act:** An Essential Fish Habitat Assessment will be prepared and appended to this integrated feasibility report and EIS/EIR. The NMFS is expected to issue EFH Conservation Recommendations to avoid, minimize, mitigate, or otherwise offset any identified adverse effects of the project prior to the issuance of the Record of Decision (ROD). The RWC project will be in full compliance with this Act once a response is provided to the EFH conservation recommendations.

**Coastal Zone Management Act (CZMA):** The USACE will prepare a draft CZMA federal consistency determination and submit documentation of compliance with applicable chapters of the CZMA to the San Francisco Bay Conservation and Development Commission (BCDC) after release of the draft EIS/EIR. The USACE will be in full compliance with the CZMA when the BCDC issues a consistency determination.

**Rivers and Harbors Act:** The USACE does not issue itself Section 10 permits, however, it may issue a Section 10 permit to the non-federal sponsor, if required. The USACE will ensure compliance with Section 10 before completion of the NEPA process.

**Clean Air Act (CAA):** A General Conformity Applicability Analysis pertaining to the proposed action is included in this document (***Appendix A***). This consists of calculation of the foreseeable indirect emissions for each alternative. Foreseeable indirect emissions include operational emissions as well as the incremental increase in emissions from recurring operations and maintenance (O&M) dredging. The direct emissions for each alternative plus the indirect emissions are compared to the Federal deminimis levels. If the emissions from the project (including mitigation measures) fall below Federal de minimis levels then no Conformity Determination will be needed. If emissions exceed deminimis levels, a General Conformity Analysis will be prepared. When the EPA issues a Conformity Determination the USACE will be in compliance with the Clean Air Act.

**State Laws**

**California Environmental Policy Act (CEQA):** This EIS is intended to fulfill the requirements of CEQA and the CEQA Guidelines, although as a federal agency, the USACE is not required to comply with CEQA.

**California Endangered Species Act (CESA):** This document analyzes impacts to species listed under CESA to facilitate issuance of a WQC.

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# 1 Study Information

This document describes investigations and alternatives to improve navigation efficiency at Redwood City (RWC) Harbor and San Bruno Shoal (SBS) Channel, evaluations of the potential environmental impacts of such improvements, and identification of a tentatively selected plan. It integrates the following elements:

- Requirements of the United States Army Corps of Engineers (USACE) feasibility study planning process;
- An Environmental Impact Statement (EIS) prepared in compliance with the National Environmental Policy Act (NEPA); and
- An Environmental Impact Report (EIR) prepared in compliance with the California Environmental Quality Act (CEQA).

This report documents a single purpose deep draft navigation study of the Redwood City Harbor Project.

## 1.1 Study Authority

There have been a number of reports since 1882 for Redwood Creek, California. Federal authorizations for improvements are listed in ***Table 1-1***:

***Table 1-1. Study Authorizations***

| Document Containing Report | Authorization | Recommendations |
|---|---|---|
| H. Doc. No. 307; 61st Congress, 2nd Session | June 25, 1910 | 5- foot deep channel |
| H. Doc. No. 142; 70th Congress, 1st Session | July 3, 1930 | 20- foot deep channel |
| River and Harbors Committee Doc. No. 10, 73rd Congress, 1st Session | Aug. 30, 1935 | 27-foot deep channel and added a Turning Basin |
| H. Doc. No. 94; 79th Congress, 1st Session | Mar. 2, 1945 | 30-foot deep channel; enlarged Turning Basin in Redwood Creek; added the dredging of a 30-foot deep channel across San Bruno Shoal. |
| H. Doc No. 104, 81st Congress, 1st Session | 1949 | Changed name to Redwood City Harbor (from Redwood Creek) and further enlarged both turning basin and the channel connecting to the upstream end of the main navigation channel |

Deepening the RWC and SBS Channels to the authorized depth of -30 feet Mean Lower Low Water (MLLW) was completed in 1965. The study documented in this report was authorized by House Resolution 2511 adopted May 7, 1997:

> *"Resolved by the Committee on Transportation and Infrastructure of the United States House of representatives, That the Secretary of the Army is requested to review the report of the Chief of Engineers on Redwood City Harbor, California, published as House Document 104, 81st Congress, 1st Session, and any other pertinent reports to determine whether modifications of the recommendations contained therein are advisable at the present time in the interest of navigation improvements and related purposes at Redwood City Harbor, California, with particular reference to providing increased depths to accommodate new, larger vessels that now call on the port."*

## 1.2 Purpose and Need for Project

The existing navigation project channels at RWC Harbor and SBS, as currently authorized, do not allow for the efficient operation of the existing vessel fleet that calls on the Port. The purpose of this Redwood City Harbor Navigation Improvement Feasibility Report and Integrated EIS/EIR is to document investigations to determine the extent of Federal interest in plans that would improve navigation at RWC and SBS Channels and evaluate the potential environmental impacts of such plans. This report: (1) assesses the environmental and socio-economic conditions associated with the existing navigation project; (2) develops a range of alternative plans for navigation improvements at RWC and SBS Channels; (3) assesses the environmental and socioeconomic impacts of each alternative plan; and (4) identifies the Recommended Plan for implementation.

## 1.3 Project Sponsor and Participants

The Non-Federal Sponsor (NFS) is the Port of Redwood City. The Port was established under Redwood City's Charter as a department of the City and is managed by the Board of Port Commissioners, whose five members are appointed by the City Council. The Port operates from its own revenue and receives no tax dollars. Its' performance in FY 2014 showed increases in both tonnage and record-setting revenue. Cargo tonnage increased 19 percent over last year to almost 1.8 million tons. Vessel traffic also increased to 64 ship calls for the year. Financially, the Port's increased activity generated a nine percent increase in operating revenue for a record total of $6.8 million. And operating income after expenses also increased over last year by 26 percent.

A feasibility cost sharing agreement was signed in July of 2008 with a 50/50 cost share for the feasibility study. The Port of Redwood City will also satisfy the terms of local cooperation for implementation and operation of the recommended plan.

## 1.4 History of Investigations in the Study Area

A Reconnaissance Study was conducted by USACE in 1998 and confirmed the Federal Government's interest in navigation improvements at the Port of Redwood City. The Reconnaissance Study recommended that the next step, a Feasibility Study, be undertaken to evaluate alternatives to improve navigation, including deepening the channels.

## 1.5 Existing Programs, Studies, and Projects

### 1.5.1 San Francisco Bay Long Term Management Strategy for Dredged Material Placement

The San Francisco Bay Long Term Management Strategy (LTMS) for dredged sediment was developed by the San Francisco District, USACE, U.S. Environmental Protection Agency (USEPA), San Francisco Bay Conservation and Development Commission (BCDC), and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The plan addresses San Francisco, San Pablo, and Suisun Bays. Its objectives are to:

- Maintain in an economically and environmentally sound manner those channels necessary for navigation in San Francisco Bay and Estuary and eliminate unnecessary dredging activities in the Bay and Estuary;
- Conduct dredged material disposal in the most environmentally sound manner;
- Maximize the use of dredged material as a resource; and
- Establish a cooperative permitting framework for dredging and disposal applications.

The Plan was adopted in 2002 with a certified EIS/EIR and Record of Decision (ROD) in 2004. It established a policy for placement of dredged material - 40 percent upland, 40 percent ocean, and 20 percent in-Bay disposal. The LTMS Management Committee, in the 12-year review of the LTMS in 2012, described its intent to continue to rely on the 40-40-20 goal and further reduce in-Bay and ocean disposal and achieve 80 percent or greater beneficial reuse placement. Since 2012, the goal has been to limit total annual in-Bay placement of dredged material from all sources to no more than 1.25 million cubic yards (mcy).

The San Francisco District, USACE, and the RWQCB have prepared an Environmental Assessment (EA) and EIR to address the potential environmental effects of the maintenance dredging of federal navigation channels in San Francisco Bay and the associated placement of dredged material for the period from 2015 through 2024. The document is intended to serve as the basis for issuance of a Clean Water Act (CWA) Section 401 water quality certification (WQC) by the Regional Water Quality Control Board (RWQCB) and to support decision making by USACE, the Regional Water Board, and other agencies regarding implementation of its recommendations.

### 1.5.2 South Bay Salt Pond Restoration Project

The South Bay Salt Pond Restoration Project (SBSPR Project) located in South San Francisco Bay was initiated in 2004 with Cargill Salt's sale of 15,100 acres of industrial salt ponds to the U. S. Fish and Wildlife Service (USFWS) and California's Department of Fish and Wildlife (CDFW). The goals are to restore the ponds and aging levees into marsh habitat while improving flood protection and public recreational access. The Project comprises the Alviso Complex (8,000 acres), the Eden Landing Complex (5,500 acres) and the Ravenswood Complex (1,600 acres). ***Figure 1-1*** shows the location and general outline of the Project.

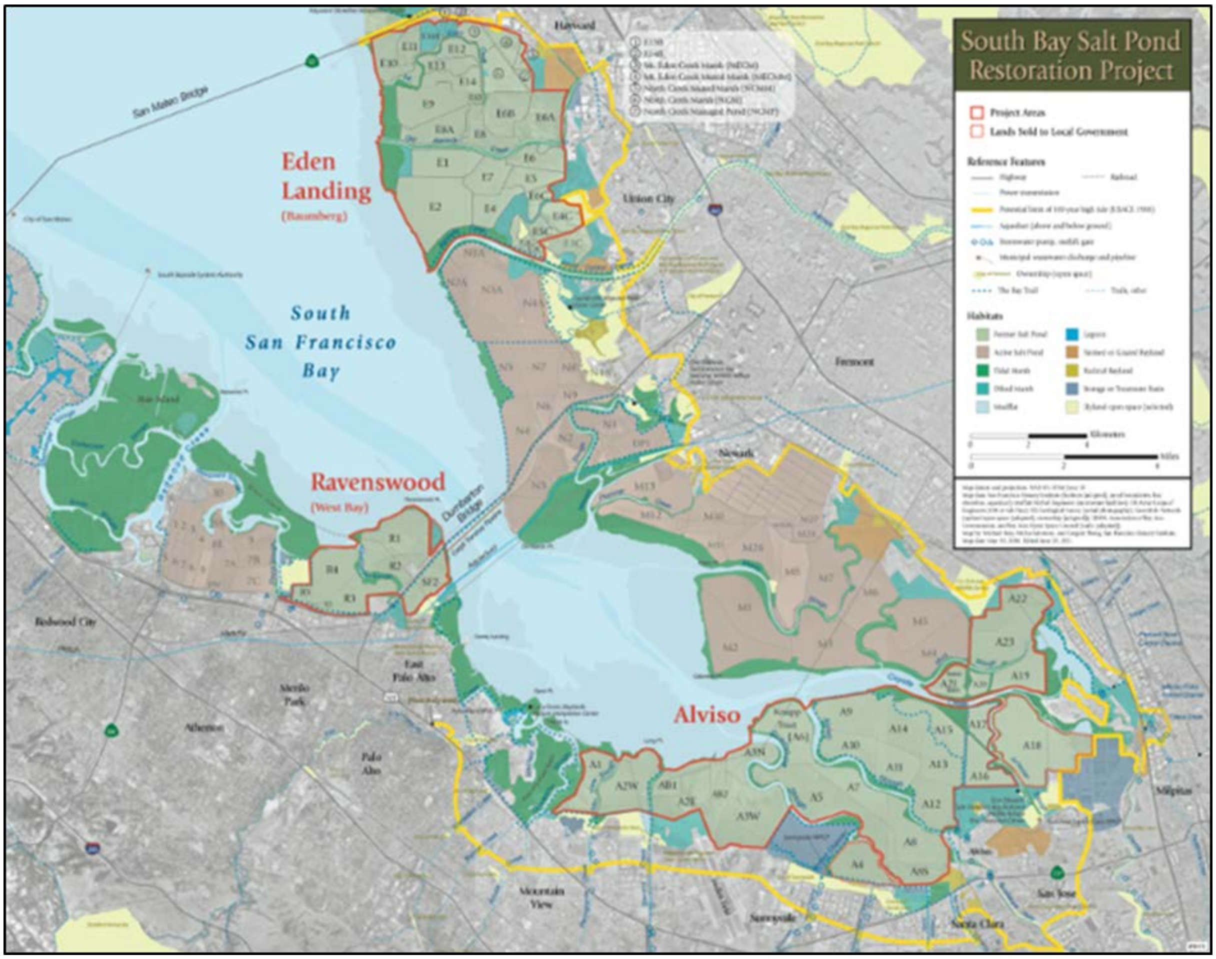


***Figure 1-1. South Bay Salt Pond Restoration Projects: Eden Landing, Ravenswood, and Alviso***

### 1.5.3 **South Bay Shoreline Study**

The South San Francisco Bay Shoreline Study (Shoreline Study) is being conducted by the USACE together with the Santa Clara Valley Water District and the State Coastal Conservancy to identify and recommend flood risk management and ecosystem restoration projects along South San Francisco Bay. Santa Clara County's shoreline is at risk from coastal flooding caused by extreme storm events combined with high tides with increasing risks in the future as sea levels rise. Potential flood damages in Santa Clara County are among the highest in the state.

The Shoreline Study is looking at the feasibility of options for managing flood risk along the South Bay shoreline as well as undertaking ecosystem restoration and expanding public access.

The goal of the Shoreline Study is to protect the parts of Santa Clara County's shoreline with the highest potential damages and threats to human health and safety from flooding, using a combination of flood protection levees and wetlands. This approach involves using natural infrastructure to provide increased flood protection and restored Bay habitats, as well as a flood protection system that can evolve in the future.

The Shoreline Study is being coordinated with the SBSP Project. Once completed, the Shoreline Study recommended plan will likely impact areas surrounding the proposed Alviso Pond Complex Restoration Project.

## 1.6 Planning Process Overview

This study utilized the USACE six step planning process which consists of the following:

1. specification of water and related land resources problems and opportunities;
2. inventory, forecast, and analysis of water and related land resources conditions within the study area;
3. formulation of alternative plans;
4. evaluation of the effects of the alternative plans;
5. comparison of the alternative plans; and
6. selection of the Recommended Plan based upon the comparison of the alternative plans.

In 2011, USACE adopted a new planning paradigm intended to reduce the time and cost required for completion of a feasibility study. SMART (**S**pecific, **M**easurable, **A**ttainable, **R**isk informed and **T**imely) Planning is a risk-based approach that applies the appropriate level of detail, data collection, and model development necessary to manage risk and uncertainty at acceptable levels and conduct and deliver the study. SMART Planning consists of completing a series of decision milestones during the development of a feasibility study (***Figure 1-2***). The traditional USACE six step planning fundamentals process is still utilized, but five decision milestones are incorporated as described below:

1. Alternatives Milestone: The alternatives have been formulated and screened to identify the final set of alternatives to be evaluated in detail.
2. Tentatively Selected Plan (TSP) Milestone: The final alternatives have been evaluated and compared and the TSP is identified.
3. Agency Decision Milestone: Following the concurrent public, technical, policy, and legal review of the draft feasibility report and accompanying environmental documentation, the USACE endorses the recommended plan.

4. Civil Works Review Board Milestone: All public and agency comments have been addressed and the feasibility report and environmental documentation have been finalized. The final report is approved for release for public and agency review.
5. Chief's Report Milestone: the Chief of Engineer's Report is prepared and submitted to Congress for authorization.

An initial step in each milestone is to identify the planning decisions that will be required to complete the milestone, assess the risks associated with the planning decisions, and develop a work plan that applies the level of effort to the planning tasks that is appropriate to control risks to acceptable levels. The SMART Planning process was utilized for completion of the Redwood City Harbor Navigation Improvement Feasibility Study.

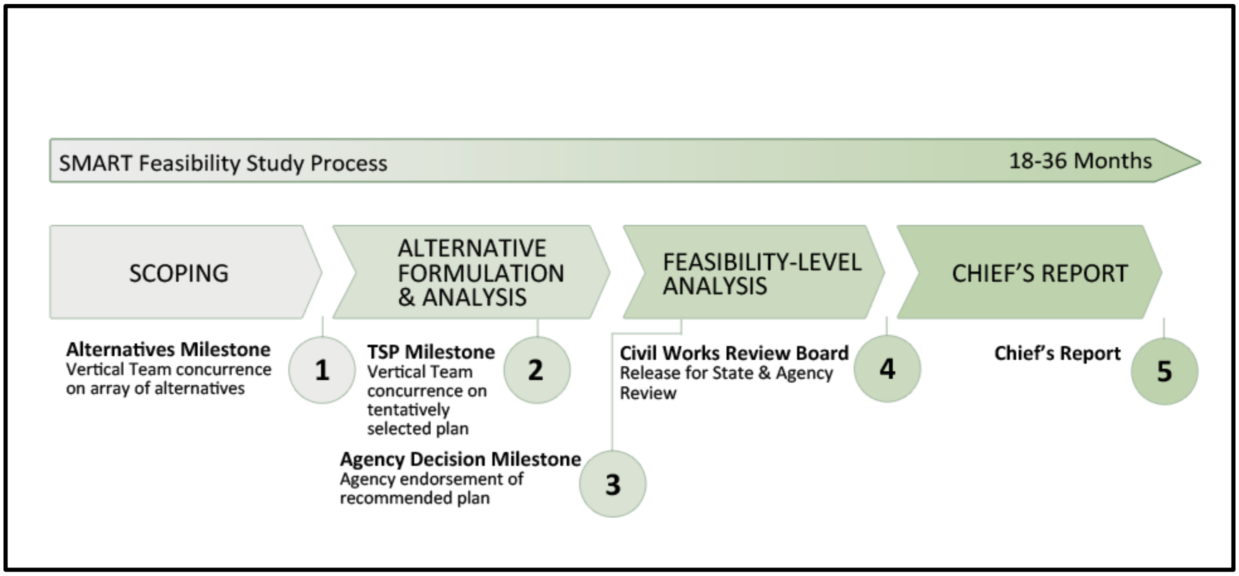


***Figure 1-2. SMART Planning Process***

## 1.7 Report Organization

The chapter headings and order in this report generally follow the six step planning process and the outline of a DEIR/DEIS as follows:

- **Chapter 2, Need for and Objectives of Action**, covers the first step in the planning process (specification of water and related land resources problems and opportunities). It also covers the second step of the planning process (inventory of existing conditions and forecast of future conditions) to the extent necessary to establish the future "without-project condition" prior to development of the alternatives. The "without-project condition" also serves as the basis for defining the No Action (NEPA)/No Project (CEQA) alternative required to be analyzed as part of the EIS/EIR.
- **Chapter 3, Alternatives**, describes the process of identifying and screening structural and non-structural management measures, formulating alternative plans, and identifying a final set of alternative plans to be evaluated in detail.

- **Chapter 4, Affected Environment and Environmental Consequences and Mitigation Measures**, is required for NEPA/CEQA documentation. It covers the second step of the planning process (inventory, forecast and analysis of water and related land resources) in greater detail than what was provided in Chapter 2. Chapter 4 also covers the fourth step of the planning process (evaluation of the effects of the alternative plans).
- **Chapter 5, Other Required Analyses**, presents other required NEPA and CEQA analyses.
- **Chapter 6, Identification of the Tentatively Selected Plan** describes the evaluation and comparison of the alternatives and provides the rational for selection of the TSP.
- **Chapter 7, Public Involvement**, discusses public involvement, review, and consultation.
- **Chapter 8, List of Preparers**, provides a list of individuals involved in the preparation of this document, and their respective areas of responsibility.
- **Chapter 9, Compliance with Applicable Laws, Policies, Plans and Regulations**, describes how the study as well as the Recommended Plan comply with applicable regulatory requirements and USACE policies and guidance.
- **Chapter 10, Recommended Plan**, presents a more detailed description of the Recommended Plan and summarizes the basis for that recommendation
- **Chapter 11, Recommendation**, describes the study recommendations
- **Chapter 12, References**, provide the list of references
- **Chapter 13, Index**

## 1.8 NEPA/CEQA Documentation

Because this report is an integrated Feasibility Report and EIS/EIR, information required for the EIS/EIR is found throughout the document. As required by CEQA, the ***Table 1-2*** presents where the various elements of the EIS/EIR can be found in this report.

***Table 1-2. Location of NEPA/CEQA Sections in this Report***

| NEPA/CEQA Section | Location in this Document |
|---|---|
| Purpose and Need | Chapter 1 |
| Project Description/Description of Alternatives | Chapter 3 & Chapter 6 |
| Environmental Setting | Chapter 4 & Appendix A |
| Environmental Effects | Chapter 4 & Appendix A |
| Mitigation Measures | Chapter 4 & Appendix A |
| Areas of Known Controversy | Chapter 5 |
| Growth Inducing Impacts | Chapter 5 |

# 2 Problem Identification and Planning Objectives

## 2.1 Study Area

Redwood City Harbor is located on the southwest side of San Francisco Bay, approximately 18 miles south of San Francisco, California (***Figure 2-1***). It is within the corporate limits of Redwood City, in San Mateo County. The study area includes the existing Federal navigation channel and turning basins at Redwood City Harbor, extending from the mouth of Redwood Creek to deep water in the San Francisco Bay. The Federal navigation channel at San Bruno Shoal in San Francisco Bay is also included in the study area, having been added to the Federal project by the 1945 authorizing legislation. It is located north of Redwood City and lies within the corporate boundaries of the cities of both Brisbane and South San Francisco, California. Both channels are currently authorized to be maintained at -30 feet MLLW.

Potential dredged material placement sites that have been considered for this study[3] include:

- Montezuma Wetland Restoration Project,
- Cullinan Ranch Tidal Restoration Project,
- Eden Landing Pond Complex,
- Alviso Pond Complex
- San Francisco Deep Ocean Disposal Site (SF-DODS), which is also part of the study area but is located about 50 miles offshore from the Golden Gate Bridge.

Bair Island and Greco Island are adjacent to the harbor (***Figure 2-2***) and are considered to be in the project area because of their proximity to the channel. Bair Island is operated by the USFWS and is the site of a restoration project. The bay water around Bair Island and the harbor is within the Don Edwards Marine Protected Area.

[3] Other potential placement sites were considered during the planning process, but were screened from further consideration.


***Figure 2-1. Study Area***


*Figure 2-2. Redwood City Channel and Bair and Greco Islands*

Port facilities adjacent to the study area include two office complexes, a conference center, a restaurant, and public access facilities (boat launch, walkways, restrooms, and parking). The Port maintains three berth facilities at a depth of 34 feet MLLW, and a small facility used to unload cement and aggregates via barge (***Figure 2-3***).

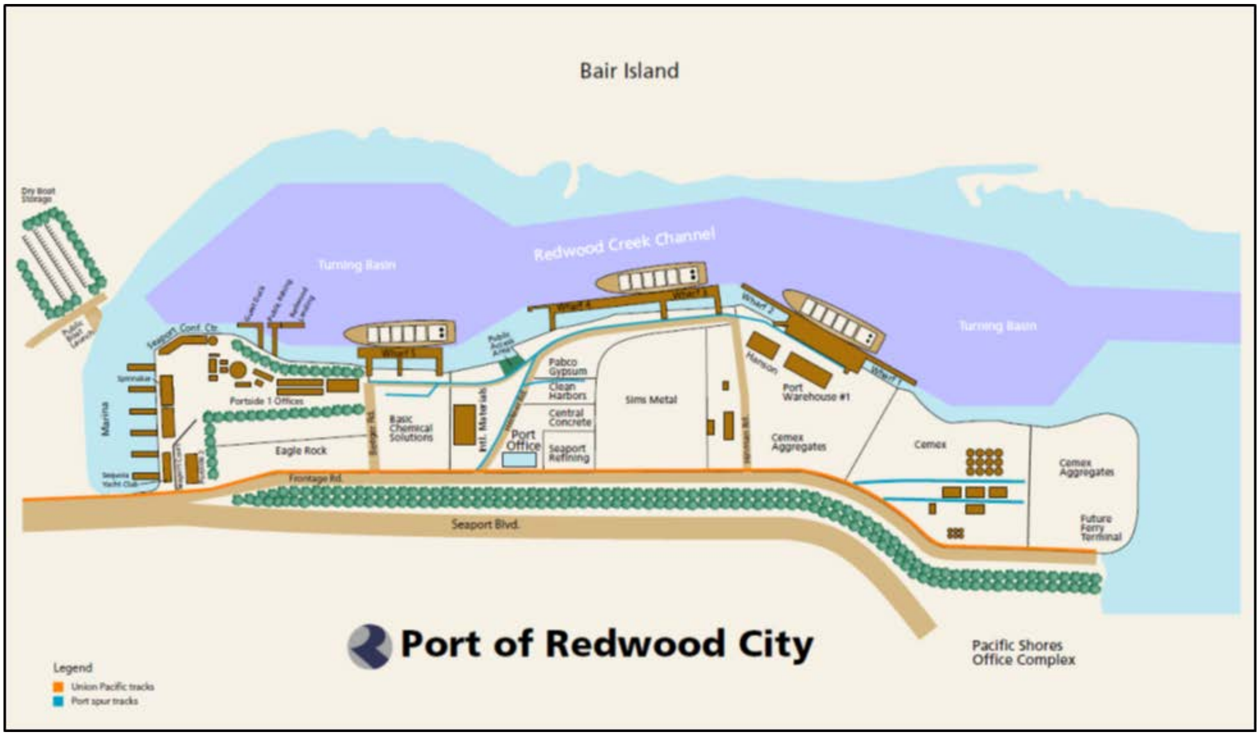


***Figure 2-3. Port of Redwood City***

Union Pacific Railway tracks are located directly alongside the Port facilities. U.S. Highway 101 is approximately one mile south of the Harbor. The area surrounding the Harbor is zoned as General Industrial (GI), Industrial Restricted (IR), and Industrial Park (IP). The area southwest of the Harbor, on the east side of HWY 101, is zoned Commercial General (CG), Commercial General Restricted (CG-R), and Planned Community District (CMD).

The SBS Channel overlays three petroleum pipelines. (***Figure 2-1***). They consist of a 10-inch diameter Shell petroleum line, and 10-inch and 12-inch Kinder-Morgan petroleum lines. Subsurface utility locating information provided a clear identification of the Shell petroleum line. It was located between 3.8 and 6.2 feet below the bottom of the channel; the channel in this area had a bottom elevation ranging from -30 feet MLLW to -33 feet MLLW. The Kinder-Morgan petroleum lines were located in the horizontal plane; however, the sub-bottom profiling was unable to confidently determine the pipeline depths. A filled-in trench ranging from 20 to 30 feet in width was found, with the bottom of the trench at depths between 2.8 and 6.8 feet below the bottom of the channel. While it is assumed that the pipelines would have been laid into the bottom of the trench, no pipeline could be confidently located within the trench. Channel depths in this area ranged from -29 feet MLLW to approximately -33 feet MLLW. Deepening of the SBS Channel would require that these pipelines be relocated.

## 2.2 Port Commodities and Traffic

The Port of Redwood City specializes in bulk, neo-bulk, and liquid cargoes. Cargo volumes have been variable over the life of the Port, reflecting economic trends and resulting demand for bulk goods (***Figure 2-4***). During the past 10 years, cargo volumes peaked at 1.9 million metric tons (MMT) in 2005 and then dropped to a low of 842,727 MMT in 2010.

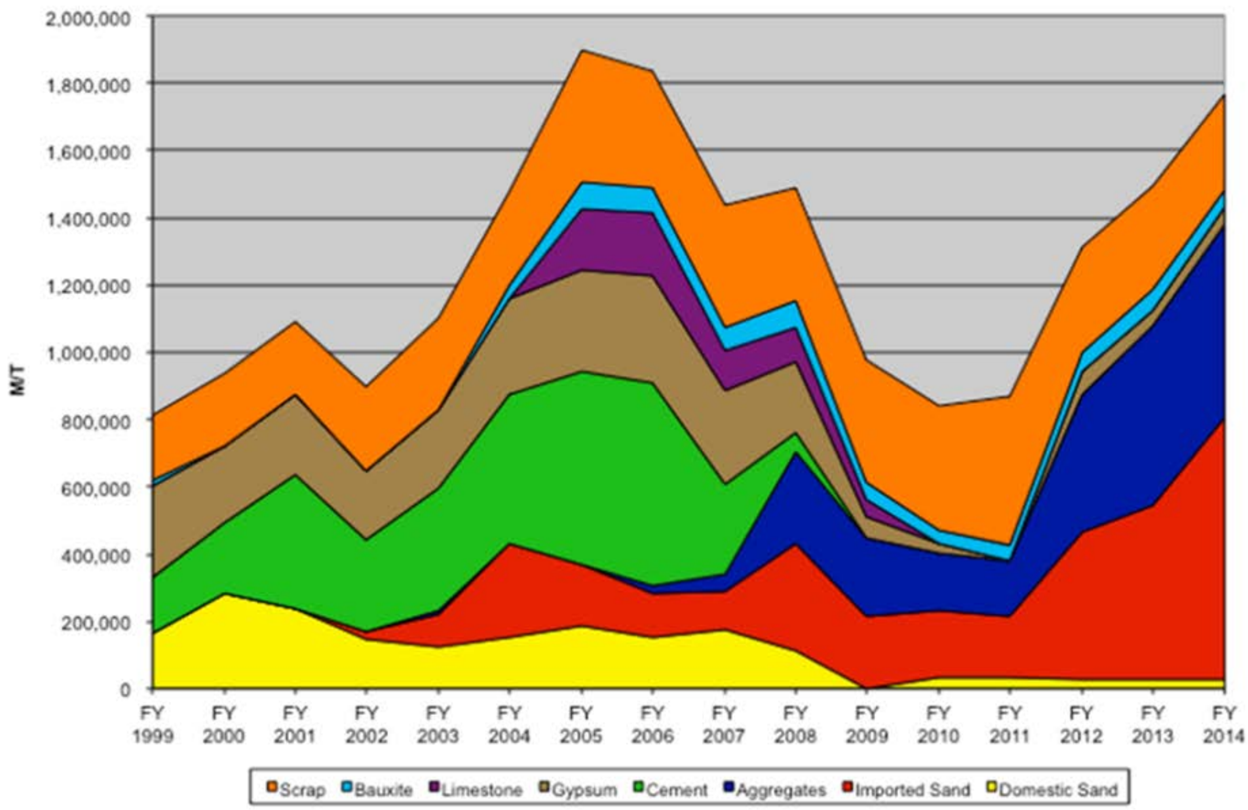


***Figure 2-4***. Tonnage by Commodity for Port of Redwood City

Bulk construction aggregates and scrap metal commodities have been supported by the Port and are expected to continue into the future. The latest statistics show that 1.7 MMT of commodities passed through the Port between 1 July 2013 and 30 June 2014. The future fleet forecast assumed a 2.8 percent annual growth in overall commodity tonnage, the same as the overall trend over the last 15 years. At the projected 2.8 percent annual growth rate, commodities are expected to grow to 2.5 MMT by 2025. The Port's existing infrastructure can accommodate a total throughput of 3.5 million tons per year.

***Table 2-1*** describes the commercial traffic to the Port of Redwood City for the period from 2002 through 2014. It should be noted that barges in earlier years were typically 2,000 to 3,000 tons/barge of domestic sand dredged from San Francisco Bay. However, barges in later years have typically carried between 3,000 and 5,000 tons of aggregates lightered from larger vessels. Ships ranged from 20,000 to 35,000 tons - more in recent years.

***Table 2-1. Port of Redwood City Commercial Traffic***

| Fiscal Year | Cargo Metric Tons | Vessel Calls: Barges | Vessel Calls: Ships | Vessel Calls: Total |
|---|---|---|---|---|
| 2014 | 1,784,659 | 25 | 64 | 89 |
| 2013 | 1,493,190 | 19 | 51 | 70 |
| 2012 | 1,319,198 | 26 | 48 | 74 |
| 2011 | 871,940 | 11 | 36 | 47 |
| 2010 | 842,727 | 16 | 33 | 49 |
| 2009 | 986,727 | 11 | 37 | 48 |
| 2008 | 1,487,064 | 65 | 50 | 115 |
| 2007 | 1,436,626 | 94 | 46 | 140 |
| 2006 | 1,833,022 | 91 | 60 | 151 |
| 2005 | 1,908,172 | 96 | 60 | 156 |
| 2004 | 1,484,720 | 88 | 54 | 142 |
| 2003 | 1,111,000 | 58 | 42 | 100 |
| 2002 | 899,652 | 65 | 30 | 95 |

The future without project condition fleet is projected to have the following average annual mix:

- 6 - 10 Handysize
- 12 Handymax
- 50 Panamax (still light-loaded).

Even though other nearby ports in the San Francisco Bay area have greater authorized depths, it is not anticipated that shippers will prefer them over Redwood City for shipping bulk construction aggregates and scrap metal for the following reasons:

- Redwood City's loading and offloading infrastructure is better suited for handling the construction materials and scrap metal than the other nearby ports.
- Redwood City is the only deep draft port in South San Francisco Bay, strategically located between San Francisco and Silicon Valley. These areas have a large demand for the construction materials that pass through the Port. Trucking material from more distant ports would substantially increase transportation costs. For example, trucking material from the Port of Richmond (53 miles from the South San Francisco Bay area)

would cost about $14 per ton. For a 30,000 ton shipment, the additional trucking cost would be $420,000.

- The ports in the San Francisco Bay area have market "niches" or specialization for some types of cargo. This specialization is expected to continue into the future due to available infrastructure at each port, and the assumption that as profit-maximizing entities, shippers are currently using the ports with the least cost to ship their materials and will continue to do so. The Port of Oakland handles almost all of the region's containerized cargo; Richmond handles liquid bulk, some dry bulk, and autos (which are also handled in Benicia at a private terminal); and Redwood City is primarily dry bulk. When there is overlap it may be due to competition, size of market, or inland transportation costs. An example of competition and size of market is exported recycled metal which is handled in Oakland and Redwood City by two competing companies, neither of which could handle the combined volume of export demand alone.

The Port anticipates future increases in cement, gypsum, bulk cargo, and sand and gravel. A historical commodity for the Port included cement, which has not been shipped through it since 2009 due to economic hardships in the construction industry. The demand for cement in both southern and northern California is currently met by railway transport from southern California. It is anticipated that cement imports will increase in the future as the construction industry recovers from the recession, and the demand for cement exceeds the capacity of railway transport and the supply in southern California. Also, Cemex invested significant capital in their cement unloader constructed at the Port of Redwood City in 1999. Currently, the Port of Redwood City has the only cement marine terminal capable of unloading ships with cement in the San Francisco Area. The maximum historic cement throughput at the Port was 650,000, and the Port is permitted for up to 850,000 tons. The ports of Stockton and West Sacramento also have facilities equipped for unloading, storage, and distribution of imported cement but they are generally too far away to be competitive in the San Francisco Bay Area market.

The movement of sand and gravel aggregates used to make redi-mix concrete for the construction industry is also expected to increase in the future. The growing Silicon Valley economy is driving a boom in construction from San Francisco to San Jose, and is not projected to slow in the foreseeable future. Local northern California supply for sand and gravel is diminishing, costly to truck through congested San Francisco traffic, and insufficient to supply existing and future projected demand. Aggregates imported from the Orco mine in Vancouver Island, Canada have been used in residential and commercial construction since 2003.

The Orca quarry is permitted to produce 6.6 million tons per year. These aggregates have exceeded building specifications and become more widely accepted in the industry, and the U.S. Department of Transportation has found this sand to be durable during seismic events. In 2011 the tonnage of construction aggregate material shipped to Redwood City doubled in one year to 850,000 tons and has grown steady every year since then to reach 1.3 million tons in 2014. CSL International has recently added four Panamax ships with self-unloading conveyors which can unload 35,000 - 40,000 tons at the Port of Redwood City in 18 - 24 hours. The high quality material from the Orca quarry, and the highly efficient transportation system that brings it to the Port of Redwood City, makes this material competitive with locally available material for the production of redi-mix concrete. bThe Port is becoming the leading supplier of this sand to plants in the South San Francisco Bay area. The Port now processes 1.5 million tons per year and expects to increase this to 2.5 million tons per year by 2025. The docks are in place to handle this volume of sand and gravel and the Port is working on land-side improvements (Phase 2 of the Wharves 1 and 2 Reconstruction Project) to expand their throughput based on the recently improved docks.

Gypsum imports are also expected to grow as the construction industry recovers from the recession. Prior to the recession, gypsum was imported from Mexico and then trucked to Newark, California where it was used to make gypsum wall board to satisfy demand in the Bay Area. The demand in the Bay Area was partially met by shipping finished gypsum wallboard from a plant in Las Vegas to Newark. Production at the Las Vegas, Nevada plant far exceeded demand in southern Nevada and Arizona due to local economic conditions. As the demand by the construction industry increases in both the Bay Area and southern Nevada markets, gypsum wallboard production in Newark will resume and result in an increase in gypsum imports through the Port of Redwood City.

There are no plans for the Port to attempt to handle hazardous, toxic, or radioactive waste material as it would be difficult to permit.

### 2.3 Redwood City and San Bruno Shoal Channels

The Redwood City Harbor channel extends approximately 5 miles from the Port of Redwood City to deep water in San Francisco Bay (***Figure 2-2***). The channel includes two turning basins: Turning Basin #1 is an outer basin nearest the Bay, and Turning Basin #2 is an inner basin nearest the Port. A connecting channel joins the two turning basins. The width of the channel and turning basins ranges from 300 feet to 900 feet. The SBS Channel, located 9 miles northwest of the Port, is also part of the Federal Redwood City Harbor project. It spans approximately 3.5 miles and connects with deep water in San Francisco Bay to the north and south.

The average sedimentation rate for the RWC Channel is about 183,000 cubic yards per year (2004 – 2012 period of record). There are indications that the accretion rate is not constant throughout the year, but varies either seasonally, or in response to storm events. The channel has been scheduled for maintenance dredging by USACE on a two-year dredging cycle since 1965. However, the USACE's ability to dredge the channel to the full authorized depth of -30 feet MLLW depends on receipt of sufficient Federal funds.

Recent channel maintenance dredging occurred in 2004, 2005, 2008, 2012 and 2014 (***Table 2-2***), usually with clamshell-bucket equipment. Maintenance dredged material from the channel has typically been less than 80 percent sand and has been placed at the SF-11 (Alcatraz) disposal site. Additionally, a “knockdown” was performed in late 2009 when sediment in areas with the greatest shoaling was moved to areas of the channel with less shoaling, thereby increasing the limiting navigation depth.

***Table 2-2. Redwood City Harbor Channel Dimensions and Historical Maintenance Dredging***

| Channel Section | Authorized Depth (MLLW) | Length (feet) | Width (feet) | Area (acre) | Maintenance Frequency (years) | Last Dredged (FY) |
|---|---|---|---|---|---|---|
| Entrance Channel | 30 | 13,900 | 300-350 | 103.7 | 2 | 2014 |
| Outer Turning Basin | 30 | 2,200 | 400-900 | 30.3 | 2 | 2014 |
| Connecting Channel | 30 | 1,300 | 400 | 11.9 | 2 | 2014 |
| Inner Turning Basin | 30 | 1,700 | 900 | 35.1 | 2 | 2011 |
| San Bruno Channel | 30 | 1,800 | 510 | 21.1 | Infrequently | 2005 |

SBS Channel rarely requires maintenance dredging. Surveys of the channel between 2002 and 2014 show that the channel has undergone periods of accretion and erosion, with little net change in channel depth. The channel has been maintained via a hopper dredge at approximately 10-year intervals and was last dredged in 2005. Prior to 2005, less than 3.5 percent of the channel area was shallower than the authorized project depth. The parts that were in need of maintenance required only 16,000 cubic yards of sediment to be removed.

***Figure 2-5*** (Delta Modeling Associates, 2015) depicts the relative sediment volume (shown on the Y axis) through time in the RWC Channel following periods of accretion and dredging. The zero relative volume on the Y axis is equal to that observed in January, 2006, after dredging occurred in late fall of 2005. Dark blue dots show the relative sediment volume in the channel calculated from the surveys of the channel and are connected by an assumed linear sediment deposition trend between surveys (black dotted lines). Red dots show estimated sediment volumes before and after dredging. The vertical red lines are the reported dredge volumes.

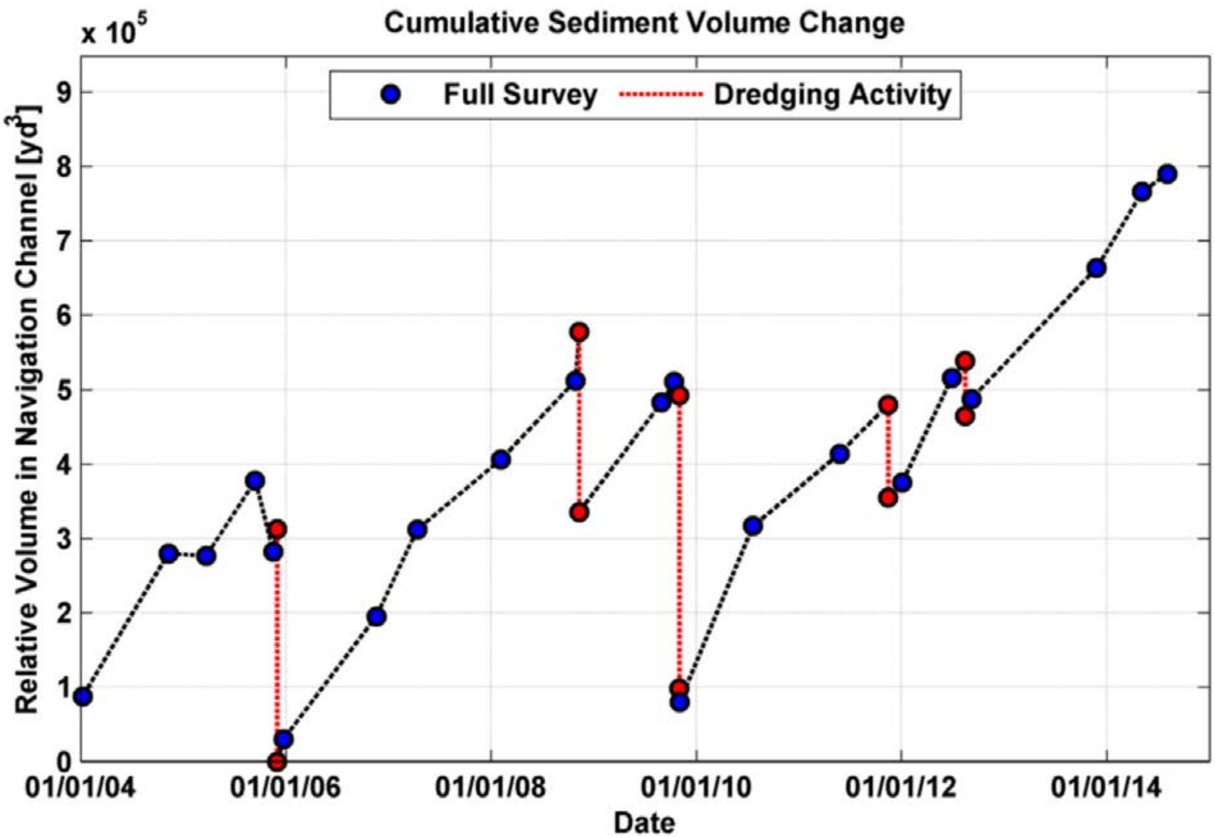


***Figure 2-5*. Sediment Volume Change in RWC Harbor channel 2004-2014 (Delta Modeling Associates, 2014)**

***Figure 2-6*** (Delta Modeling Associates, 2014) depicts relative shoaling throughout the RWC Channel calculated from surveys of the channel. Two "hot spots" were identified that have the greatest cumulative sediment deposition. They are both on the western side of the channel, one southeast of Bair Island and the other on the entrance channel, circled in the Figure.

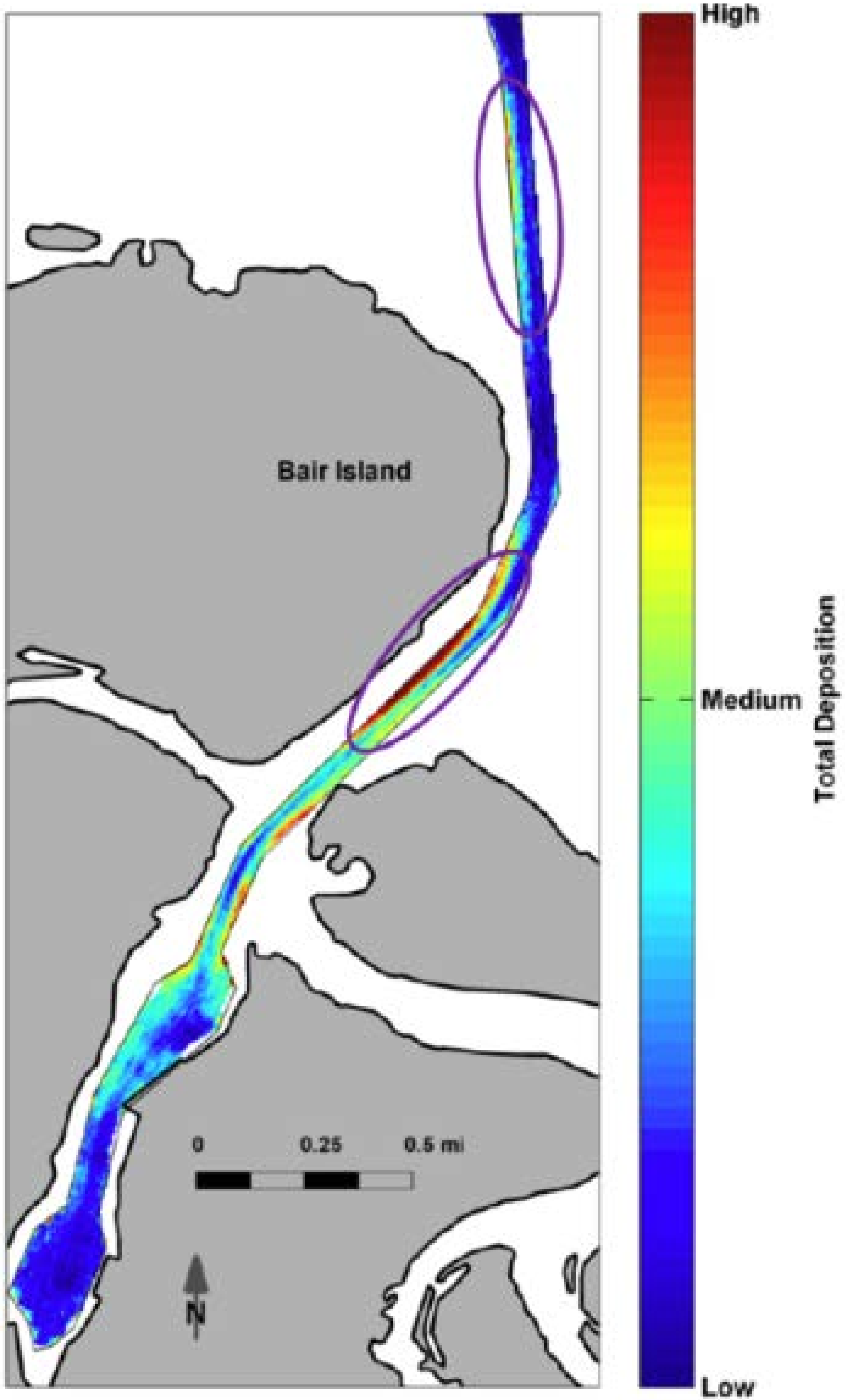


***Figure 2-6. Sedimentation "Hot Spots" on the Redwood City Harbor Channel***

The planned future maintenance dredging is described in the Draft Environmental Assessment and Environmental Impact Report for the Federal Navigation Channels in San Francisco Bay, fiscal years 2015-2024. As laid forth therein, Redwood City would be dredged every 1 to 2 years using a clamshell dredge (***Figure 2-7***). The SBS Channel would be maintained every 4 to 10 years during the 50-year planning period.

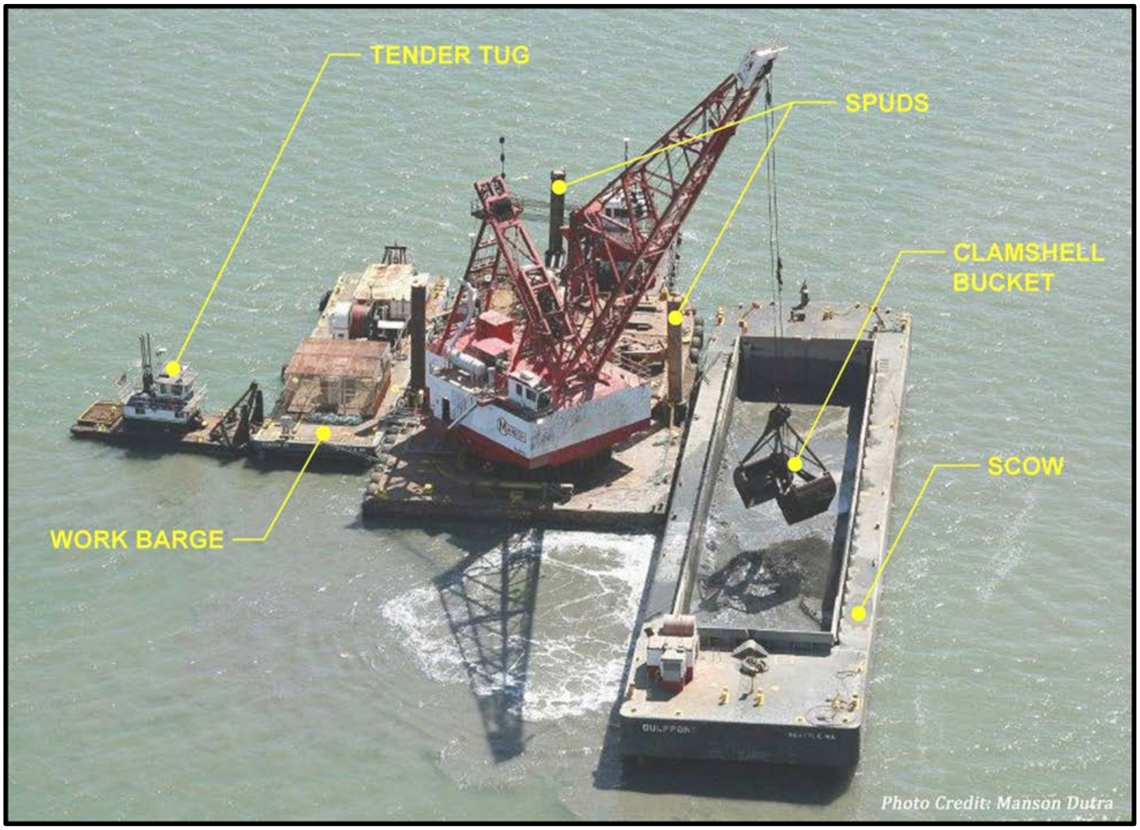


***Figure 2-7. Typical Clamshell Dredge***

## 2.4 Navigation Problems

The existing navigation project channels at RWC and SBS Channels do not allow for the efficient operation of the vessel fleet that calls on the Port. A large majority of vessels calling on the Port have design drafts that are greater than the authorized channel depth of -30 feet MLLW. Having to wait for favorable tide is inefficient, requiring the practice of light loading or lightering[4] larger vessels in order to access the Port.

The design vessel for the Port of Redwood City is the CSL Tecumseh, a Panamax type vessel. Handysize, Handymax, and Panamax vessels call on the Port. The design drafts for these vessels range from 33 to 46 feet (***Table 2-3***). Because fully loaded vessels exceed the available draft in

[4] Lightering is the practice of transferring cargo from one vessel to another in order to reduce the vessel draft so that it can safely navigate a channel with limited depth.

the channel, vessels must be only partially loaded or light-loaded. For example, a Panamax vessel must take off approximately 2,000 metric tons of material to reduce its draft by 1 foot.

***Table 2-3. Port of Redwood City Vessel Characteristics***

| Vessel Type/Class | Approximate Dead Weight Tonnage (DWT) | Length Range (feet) | Beam Range (feet) | Draft (feet) | Number in Port (07/2012-06/2013) | Percent Loaded (07/2012-06/2013) |
|---|---|---|---|---|---|---|
| CSL Tecumseh (design vessel) | 71.4k | 751 | 105 | 45 | n/a | n/a |
| Handysize | 10k-35k | 426-492 | (variable) | 33 | 7 | 75-85% |
| Handymax | 35k-59k | 492-656 | (variable) | 36-39 | 16 | 37-65% |
| Panamax | 60k-80k | <965 | <106 | <39.5 | 30 | 21-58% |

Between 2012 and 2013, Panamax vessels coming into Port were as little as 21 percent full, and on average 44 percent full. Since the existing channel depth does not allow for fully loaded vessels, suppliers must either send a larger number of light-loaded vessels, lighter onto barges prior to entering the Port, or make multiple trips in order to fill orders for materials.

Between 2012 and 2013, more than 90 percent of vessels were partially loaded coming in to or departing from the Port of Redwood City because of the limited available channel depth. In order to operate more efficiently, outgoing vessels may partially load at Redwood City and then stop at a nearby Port with adequate draft to finish loading, a process called topping-off. This requires that the top-off materials be diverted from Redwood City to a second port (often Richmond Harbor), and then loaded at the second port. Additionally, incoming vessels may lighter onto barges to reduce draft so as not to exceed the available channel depth. All of these activities add transportation, docking, and loading fees.

Incoming vessels that are fully loaded often have to be partially unloaded onto barges (or lightered) in the Bay before entering the Port. This adds barge, dockage, and other fees to their cost. It is estimated that every barge required to help unload a vessel adds $60,000 for every 5,400 tons of materials moved to barges.

Even with light loading, lightering, and topping off, vessels may need to wait until high tide to have sufficient available draft to cross through the RWC channel. High tides occur twice daily, about 12 hours apart. Often, incoming and outgoing vessels have to wait in the Bay until high tide in order to ensure sufficient channel depth for safe passage.

Approximately 48 to 72 vessels are expected to call on the Port each year. Out of a total of 53 deep draft vessel calls in 2013, 23 of the actual vessel calls had drafts less than 28 ft. The remaining 30 vessel calls came into the Port at 28 feet or greater, indicating that these calls had to use tides in order to meet the required under-keel clearance of 2 feet. Overall, the actual vessel calls ranged in draft from 19.4 feet to 33.3 feet.

The turning basins at Redwood City Harbor provide only the minimal area necessary for turning and maneuvering of the existing fleet of modern vessels. There are two turning basins in Redwood City Harbor, and both have maximum widths of 900 feet. The design draft vessel, CSL Tecumseh, is 751 feet in length. With a 50-foot safety margin fore and aft, 900 feet of turning basin width provides very limited space for turning. Because of the very tight maneuvering required to navigate the turning basins, the bar pilots restrict use of the basins to daylight hours only. Delays due to the daylight restrictions can range from 12-18 hours, so these restrictions add further to transportation cost inefficiencies. However, since the fleet of vessels calling on Redwood City is not expected to change in the future, the problem is not anticipated to worsen.

## 2.5 Navigation-Related Opportunities

***Support the Goals of the San Francisco Bay Long Term Management Strategy for Dredged Sediment***

Deepening the RWC and SBS Channels would represent an opportunity to support the goals of the San Francisco Bay LTMS. The LTMS seeks to maximize beneficial reuse of dredged material and limits in-Bay placement of dredged material to 1.25 mcy/year. USACE is one of many users of the in-Bay sites and its maintenance dredging program is about ½ to ¾ the total limit for in-Bay placement. New work material from a deepening project would exceed the in-Bay disposal limit. The authority to enforce LTMS target goals exists pursuant to the WQC provisions found in Section 401 of the CWA. The designated deep ocean disposal site (SF-DODS) is available for placement of new work dredged material when beneficial reuse is not feasible.

The SBSP Restoration Project is poised to potentially play a key role in meeting the goals of the LTMS in the future. The 50-year implementation plan for the restoration project was divided into two phases. Phase II planning commenced in 2012 with a study of how dredged material and other types of imported material could be used to accelerate the restoration process. The concept was to use dredged or other material to raise the bottom elevation of subsided ponds designated to be restored as tidal habitat and to improve pond levees. The study was completed in a report entitled *The South Bay Salt Pond Restoration Project Beneficial Reuse Feasibility Study* (Moffatt & Nichol 2015). It discusses the needs, concept, and suggested implementation strategies for delivering dredged material to the South Bay pond complexes. It describes and recommends Eden Landing as the pilot beneficial reuse site using dredged material from the Redwood City Harbor deepening project. The introduction of the Beneficial Reuse Feasibility Report states.

> *As the largest wetland restoration project on the West Coast, the SBSP provides a rare opportunity to beneficially reuse millions of cubic yards of dredged and upland material generated in the San Francisco Bay area. In a climate currently where approximately 2.5 mcy of dredged material (annualized) is generated every year, the SBSP has the capacity*

*to be the next significant beneficial reuse site in the Bay Area, and in turn provide the Bay Area with a cost-competitive means to achieve its Long Term Management Strategy (LTMS) beneficial reuse goals.*

### 2.6 Planning Objectives

**Federal Objective:** A plan recommending Federal action is to be the alternative plan with the greatest net economic benefit consistent with protecting the Nation's environment (the National Economic Development (NED) plan), unless the Secretary of the department or head of an independent agency grants an exception to this rule. Exceptions may be made when there are overriding reasons for recommending another plan, based on other Federal, State, local and international concerns (ER 1105-2-100). Because this is a single purpose navigation project, NED benefits are evaluated in terms of reduced navigation costs.

**Non-federal Objectives:** The non-federal sponsor seeks to deepen the federal channels and turning basins to improve the efficiency and sustainability of deep draft navigation at the Redwood City Harbor and San Bruno Shoal.

Also, in order to achieve the LTMS goals for dredged material and to mitigate the increasing costs of the handling and placement of dredged material from port projects, the non-federal sponsor is seeking to use the critical mass of dredged material from the project to start site preparation of a beneficial reuse site for dredged material in South San Francisco Bay.

Planning objectives are statements that describe the desired results from solving problems and realizing opportunities. Planning objectives ultimately provide focus for the formulation of alternatives.

The Congressional authority for this report indicates that its purpose is "To improve the efficiency of deep draft navigation at the Redwood City Harbor and San Bruno Shoal Channels." With that charge, and based on existing and future conditions, the specific planning objective of this study is to:

**Increase efficiencies of deep draft navigation and transportation of goods to and from the Port of Redwood City.**

An objective related to expansion of the turning basins was also considered. However, because the turning basins are bounded to the north by Bair Island, a protected natural area that is part of the Don Edwards San Francisco Bay National Wildlife Refuge, and by the Port of Redwood City's wharves to the south, expansion is not feasible. And even though space restrictions in the turning basin cause maneuvering delays, it is not expected that the turning basin will create an additional constraint on the future fleet of vessels (consisting of the current vessel types using the channel) calling on the Port, beyond the constraints caused by the limited channel depth. Therefore, because of the space restrictions that prevent turning basin expansion and the fact that the future fleet will still be capable of maneuvering in the turning basin (albeit with delays), objectives and alternatives for addressing this problem were not pursued.

The non-federal sponsor seeks to deepen the Federal channels and turning basins to improve the efficiency and sustainability of deep draft navigation at the Redwood City Harbor and San Bruno Shoal. Also, in order to achieve the Long Term Management Strategy Plan goals for dredged material and to mitigate the increasing costs of the handling and placement of dredged material from port projects, the non-Federal sponsor is seeking to use dredged material from the project to start site preparation of a beneficial reuse site for dredged material in South San Francisco Bay.

## 2.7 Planning Constraints

A planning constraint is a restriction that limits the range of measures or actions that might be implemented to meet the study objectives. Constraints can be related to resource, legal, or policy considerations. The planning constraints identified for this study are:

1) **Avoid or minimize adverse impacts to environmental resources at the RWC and SBS Channels.**

San Francisco Bay and nearby areas are home to a diverse array of species. More than 250 species of birds, 120 species of fish, 81 species of mammals, 30 species of reptiles, and 14 species of amphibians regularly occur in the San Francisco Estuary (USFWS & CDFW 2007). It is an essential resting place, feeding area, and wintering ground for millions of birds on the Pacific Flyway. Nearly half of the state's waterfowl and shorebirds and two-thirds of the state's salmon pass through the Bay during their migrations. A number of endemic, endangered, threatened, and rare wildlife species or subspecies reside within the San Francisco Bay Area.

Special Status species within the Project Area are discussed in ***Appendices A and H***. Among the approximately 100 species considered vulnerable in the Bay are the federally endangered Delta smelt (*Hypomesus transpacificus*) and Longfin smelt (*Spirinchus thaleichthys*), species that may be particularly vulnerable to sediment disturbing activities. To avoid impacts to listed fish species, including delta and longfin smelt, dredging work would be restricted to certain periods ("environmental windows") that the LTMS has identified as appropriate for minimizing impacts of dredging activities.

Maintenance dredging work at Redwood City Harbor is not currently subject to environmental work windows for listed bird species as per a coordination letter from the USFWS dated May 28, 2004 that states, "Maintenance dredging of Redwood City harbor and the adjacent Federal navigation channel are not likely to adversely affect the least tern, California clapper rail [now Ridgway's rail], and salt marsh harvest mouse and would not be subject to a timing window."

2) **Avoid impacts to USFWS Bair Island unit of the Don Edwards San Francisco Bay Wildlife Refuge and Port of Redwood City infrastructure.**

Don Edwards San Francisco Bay National Wildlife Refuge is managed as part of the San Francisco Bay National Wildlife Refuge Complex, which includes seven other Wildlife Refuges. It consists of 30,000 acres in South San Francisco Bay and includes parts of Bair and Greco Islands which are located to the north and south of RWC Channel, respectively.

Greco Island covers a total area of 817 acres and includes tidal marsh and mudflats. The island is preserved and managed for its natural resources and wildlife habitat for native species, including harbor seals (Phoca vitulina), Ridgway's rail (*Rallus obsoletus*), and double crested cormorant (*Phalacrocorax auritus*).

Bair Island is a 3000-acre marsh that borders the north side of the RWC Channel (***Figure 2-2***). It is the largest undeveloped island in the San Francisco Bay, and was historically used for farming, grazing and salt production. It consists of three subunits: the Inner, Middle and Outer Bair Islands. In 1996, all three islands were deeded to the larger Don Edwards San Francisco Bay National Wildlife Refuge and in 1997, the Bair Island Ecological Reserve was established on 1,985 acres of the Middle and Outer islands. Bair Island provides critical habitat for the endangered Ridgway's rail and the Salt marsh harvest mouse (*Reithrodontomys raviventris*) and is an important stop for birds on the Pacific Flyway. Habitat restoration work was undertaken between 1997 and 2014, and the refuge now includes a pedestrian walkway and observation platforms.

Bair Island provides critical habitat for a variety of species, including the endangered Ridgway's rail and the Salt marsh harvest mouse, and is an important stop for birds on the Pacific Flyway. Millions of both Federal and local dollars have already been spent in restoring Bair Island.

The Port recently completed major improvements to its wharf infrastructure. Reconstruction of wharves 1 and 2 was completed in 2014 for a cost of $15-20 million. Wharves 3 and 4 were constructed in the mid-1980s, and wharf 5 was constructed in the mid-1960s. The Port is currently conducting a re-fendering study for wharves 3, 4 and 5, and anticipates construction beginning in late fall 2015, at an estimated cost of $2-3 million.

3) **Avoid adverse impacts to vessel operating safety at the RWC and SBS Channels. Any realignment or deepening should avoid creating conditions that result in unsafe operating conditions or additional navigation hazards.**
4) **Avoid impacts to the San Mateo Bridge.**

The San Mateo Bridge crosses the San Francisco Bay just north of Redwood City, intersecting the shipping route between San Bruno Shoal and Redwood City Harbor. Any structural modifications to the bridge would be cost prohibitive.

# 3 Alternatives

This chapter explains how management measures were identified, combined to form an initial set of alternative plans, and screened to arrive at a focused array of alternatives that merit further evaluation. This process was guided by the objectives and constraints outlined in ***Chapter 2***. The evaluation of the focused array is described in ***Chapters 4 and 5***. Comparison of the alternatives and identification of the tentatively selected plan (TSP) is documented in ***Chapter 6***.

## 3.1 Future Without Project Condition

The future without project condition (or the No Action alternative) is a set of assumptions about what is expected to happen in the future in the absence of federal action to improve navigation efficiency to the Port of Redwood City. It is the benchmark against which the action alternatives are compared. Assumptions included in this without condition are:

**Commodities**

- The Port anticipates future increases in cement, gypsum, bulk cargo, and sand and gravel.
- Break bulk cargo (large pieces of scrap metal or wind turbines) is also a possibility for future exports from the Port.
- Even though other nearby ports in the San Francisco Bay area have greater authorized depths, it is not anticipated that shippers will prefer them over Redwood City for shipping bulk construction aggregates and scrap metal.
- There are no plans for the Port to attempt to handle hazardous, toxic, radioactive waste material as obtaining the necessary permits would be difficult.

**Tonnage**. The future fleet forecast assumed a 2.8 percent annual growth in overall commodity tonnage, the same as the overall trend over the last 15 years. At the projected 2.8 percent annual growth rate, commodities are expected to grow to 2.5 MMT by 2025.

**Fleet.** The future without project condition fleet is to remain unchanged from the current fleet as described in ***Section 2.2***.

**Port Calls**. Approximately 48 to 72 vessels are expected to call on the Port each year.

**Lightering and Light Loading**. Lightering is the process of transferring cargo between vessels of different sizes to reduce a vessel's draft in order to enter Port facilities. Light loading refers to vessels carrying less cargo than their design allows for in order to reduce their draft so that they can safely access a channel. Both lightering and light loading are already in place at the Port of Redwood City and are expected to continue in the future without project condition.

**Use of Favorable Tides**. Use of favorable tides refers to vessels entering a channel at high tide so that they can come in at a deeper draft than they would be able to at low tide due to inadequate channel depth. This practice is already in place at the Port of Redwood City and is expected to continue in the future without project condition.

**Navigation Channels**.  RWC and SBS Channels will continue to be in place and function within existing authorized depths of -30 feet (MLLW).

**Turning Basin**.  Even though space restrictions in the turning basins cause maneuvering delays, it is not expected that the turning basins will create additional constraints on the future fleet of vessels (consisting of the current vessel types using the channel) calling on the Port, beyond the constraints caused by the limited channel depths.

**Maintenance Dredging**.  Maintenance dredging will continue to occur every 1 to 2 years at RWC Channel and every 4 to 10 years at the SBS Channel.

### 3.2 Management Measures

Management measures are the “building blocks” for all alternative plans.  They are specific actions/ideas/programs/regulations that can be taken to address specific objectives or constraints.  Management measures can be either structural or non-structural and receive equal consideration.  When beginning the planning process, an interagency and interdisciplinary planning charette was conducted to brainstorm specific management measures for Redwood City Harbor.

The management measures developed during this charette and their corresponding objective and or constraint are provided in ***Table 3-1***.

### 3.3 Initial Screening of Management Measures

The eighteen measures noted in ***Table 3-1*** were evaluated and screened qualitatively using existing information/data as well as discussions with the San Francisco Bar Pilots and the Port of Redwood City.  The efficiency of each measure in addressing the objective it was created to address was analyzed as well as its’ effectiveness in achieving the objective.  The subsections that follow summarize the initial screening process to identify those measures that would not be useful to pursue.  Measures that were found to hold promise for providing strong benefits relative to costs were retained for further consideration.

***Table 3-1. Target Objectives and Accompanying Management Measures***

| Measures to accommodate vessels | Objective |
|---|---|
| 1) Deepen channels at Redwood City Harbor and San Bruno Shoal | Increase efficiencies of deep draft navigation and transportation of goods to and from the Port of Redwood City. |
| 2) Build a lock or dam structure at the Redwood City Harbor | |
| 3) Dredge a separate shallow lane for lighter ships at the Redwood City Harbor | |
| **Measures that would address shoaling** | |
| 4) Realign the channel at San Bruno Shoal | |
| 5) Significantly realign the channel entrance at Redwood City Point (to reduce shoaling) | |
| **Nonstructural Measures that improve efficiency** | |
| 6) Relocate Port facilities (piers) to deeper water, and dock boats in San Francisco Bay | |
| 7) Congestion fees | |
| 8) Traffic management | |
| 9) Lightering and Light Loading | |
| 10) Use of favorable tides and daylight transit | |
| 11) Increase utilization and capacity of related intermodal transportation systems such as highways and rail | |
| **Measures crafted to avoid adverse impacts to Bair Island and Port Infrastructure** | **Constraint** |
| 12) Slightly realign the channel entrance at Redwood City Point | Avoid adverse impacts to Bair Island |
| 13) Bottom-cut the channel near the Port of Redwood City's facilities (the southern end of the channel) | Avoid adverse impact to Port infrastructure |
| **Measures for Dredged Material Placement** | **Opportunity** |
| 14) Place dredged material at placement sites for beneficial reuse | Maximize beneficial reuse of dredged material to support the goals of the LTMS |
| 15) Place dredged material in-Bay at passive sediment transport sites for beneficial reuse | |
| 16) Place dredged material in-Bay at designated open-water disposal sites. | Other options for placement of dredged material |
| 17) Place material at aquatic transfer facilities (ATF's) | |
| 18) Place dredged material at the San Francisco Deep Ocean Disposal Site (SF-DODS) | |

***Objective: To increase efficiencies of deep draft navigation and transportation of goods to and from the Port of Redwood City.***

The following structural and non-structural management measures were developed and subjected to screening based on how well they are expected to address this target objective.

1. **Deepen RWC and SBS Channels.** This structural measure was retained because it would likely be very efficient and effective at achieving the target objective. Approximately 73 percent of vessels that called on the Port in calendar years 2011 and 2012 and 100 percent of the vessels in 2013 had design drafts that exceeded the existing depth of -30 feet MLLW. Deepening the channels would reduce the need for light loading, lightering, topping off, or waiting for high tide by vessels calling on the Port. More commodities moved per trip results in greater efficiency and in turn, greater cost savings.

2. **Build a lock or dam structure at RWC.** This structural measure was screened out because it would not address the lack of available depth for deep draft vessels. Also, the scale and cost of construction is not efficient and it is unlikely to be environmentally acceptable. A lock and dam structure is utilized when navigating water bodies of differing elevations. These structures are mostly used in rivers, such as where natural rivers connect two different bodies of water. The structure is not suited for the San Francisco Bay and RWC Channel since moving vessels along the bay does not require an elevation change. Constructing a lock and dam would not solve the need for a deeper draft depth.

   Furthermore, this measure would require building lock structures over 11 miles of South San Francisco Bay since the channel at San Bruno Shoal would also have to be altered to accommodate the larger vessels. The measure would likely also require major reconstruction of the current Port infrastructure. The Panama Canal construction cost $5 billion. Though the scale of this project was much larger, and a lock and dam system for RWC and SBS channels would only be a fraction of the cost, the proxy still shows that dredging would likely be a far less expensive endeavor than this measure. Finally, environmental compliance for this measure is highly unlikely with potential and significant adverse impacts to the Endangered Species Act (ESA), CWA, etc.

3. **Dredge a separate shallow lane for lighter ships at RWC**. This structural measure was screened out because it does not address the study objective of accommodating deep draft vessels in the RWC and SBS Channels and reducing NED navigation transportation costs. The measure may be effective at addressing traffic congestion, however, this is not a study problem since there is low traffic volume at the Port (approximately four to six vessels a month call on the Port). In addition, the cost of constructing a second shipping lane would be extremely high and may not even be physically possible since the land surrounding the Port is already built up. Further, the

adjacent Bair Island restoration project would likely be negatively impacted by widening for a second lane of traffic because it would encroach on the restoration site.

4. **Realign the SBS Channel.** This measure was screened out because it was judged to be ineffective at reducing shoaling. A review of the current bathymetry of the middle portion of San Francisco Bay indicates that the SBS Channel alignment is already in the optimal location to take advantage of as much natural deep water as possible (Delta Modeling Associates 2015). Realigning the channel would not reduce the amount of dredging necessary to achieve the selected project depth, nor would realignment reduce future maintenance dredging and in fact may increase future maintenance dredging because of increased shoaling.

5. **Significantly realign the channel entrance at RWC Harbor**. The current alignment of the channel near the entrance closely follows the border of Outer Bair Island. This measure would shift the channel alignment in an eastern or southeastern direction away from Outer Bair Island. This measure was initially considered as a potentially effective way to reduce the negative impacts of shoaling at RWC Harbor.

Historical hydrographic surveys from 2004 to 2012 were examined to identify regions of shoaling in the RWC Channel (Delta Modeling Associates 2015). The analysis showed that pronounced shoaling has occurred near the entrance of the channel. The review of hydrosurvey data also showed that sedimentation rates are variable, with periods of net erosion and periods of net accretion.

Sediment transport modeling was performed to evaluate the effects of both deepening the RWC and SBS Channels, as well as realigning the channel at the entrance portion near Bair Island (Delta Modeling Associates 2015). The model was calibrated and validated using recorded data for water level, flow, salinity, sediment concentration, and hydrographic survey data. Future dredging requirements resulting from the potential deepening and realignment were estimated by simulating the continual erosion, deposition and transport of sediment throughout the entire Bay-Delta system. The projected quantities of material to be dredged and placed over the lifespan of the project factor into the alternative plan selection process by providing the data needed to develop both construction costs and future maintenance costs. Fundamental results and conclusions are described below:

- Model validation was performed and demonstrated that the model was sufficiently accurate for investigating sedimentation in the navigation channels over a wide range of conditions.
- For the RWC Channel, an estimated deposition rate of 183,000 cubic yards (cy) per year was derived using available historic hydrosurvey data.

- It was concluded that increasing the project depth would also increase the existing sedimentation rate and future dredging requirements beyond those necessitated solely from the new, deeper design template. Specifically, at RWC Channel, deepening would result in the following changes to sedimentation rates:
  - ✓ 13 percent increase in sedimentation rate (207,000 cy/year) by going to a depth of -32 feet MLLW
  - ✓ 51 percent increase in sedimentation rate (276,000 cy/year) by going to a depth of -37 feet MLLW

  At SBS Channel:
  - ✓ 54 percent increase in sedimentation rate by going to a depth of -32 feet MLLW
  - ✓ 86 percent increase in sedimentation rate by going to a depth of -37 feet MLLW
  - ✓ At SBS only, the predicted sedimentation increases may underestimate the increases in dredging requirements.
- The proposed significant channel realignment was predicted to have little effect on sedimentation in the RWC Channel

The sediment transport modeling results demonstrated that significant realignment of the entrance channel, combined with channel deepening would not reduce shoaling. In addition, it would be costly to dredge a section of the outer harbor that is currently not maintained as part of the existing channel.

6. **Relocate Port facilities (docks and piers) to deeper water and dock boats in the Bay.** This measure was screened out because Port facilities would have to be constructed very far away from the landside Port facilities in order to be built in deep water. The cost of relocating Port facilities and maintaining them in deep water would be cost prohibitive with significant environmental impacts. Given that the commodities would still have to be transported to landside facilities in light loaded vessels, costs would likely increase in relation to benefits.

7. **Congestion fees**. Congestion fees would be charged when high traffic results in delays in unloading or loading cargo. Congestion fees are designed to provide market-based disincentives to using congested vessel routes during peak operating times. The Port does not experience high traffic or congestion. This measure was screened out because congestion in the channels is not a problem.

8. **Traffic management.** The Port does not experience high traffic or congestion. Non-structural traffic management measures were screened out because they do not address the study objectives.

9. **Lightering/light loading.** Lightering is the process of transferring cargo between vessels of different sizes to reduce a vessel's draft in order to enter Port facilities. Light loading refers to vessels carrying less cargo than their design allows for in order to reduce their draft so that they can safely access a channel. This non-structural measure is already in place at the Port of Redwood City and is part of the existing and future without project condition, so it will not be considered further in the development of alternative plans.

10. **Use of favorable tides.** Use of favorable tides refers to vessels entering a channel at high tide so that they can come in at a deeper draft than they would be able to at low tide due to inadequate channel depth. This non-structural measure is already in place at the Port of Redwood City and is part of the existing and future without project condition, so it will not be considered further in the development of alternative plans.

11. **Increase utilization and capacity of related intermodal transportation systems such as highways and rail**. This non-structural measure was screened out because it is likely that Port users are currently using the most cost effective intermodal transportation systems. Movement of commodities through the Port to the ultimate end users involves not only the types of ships and channel conditions, but also the location of the Port, the loading, offloading, and storage facilities at the Port, the location of the end users of commodities shipped through the Port, and the availability of highway or railroad transportation. Over time, free market drivers have forced users of the Port to search out and utilize the most cost effective methods for intermodal transport of commodities. It is unlikely that significant additional cost savings will be available. Furthermore, greater use of highway and rail transport of commodities would result in greater air pollution emissions relative to navigational transport of commodities.

***Constraint: Avoid adverse impacts to Bair Island***

The following structural management measure was developed and subjected to screening based on how well it is expected to addresses this constraint.

12. **Slightly realign the channel entrance at Redwood City Point.** This measure was retained because it may be an effective way to avoid adverse impacts to the adjacent Bair Island Restoration Project. The current alignment of the channel near the entrance closely follows the border of outer Bair Island. This measure would shift the channel to avoid impacts to Bair and Greco Islands (***Figure 3-1***). From station 80+00 to station 122+00, the channel would be realigned 6 feet away from Bair Island. From Station 127+00 to station 140+00, the channel would be realigned 6 feet away from Greco

Island. From station 140+00 to station 155+00, the channel would be realigned 6 feet away from Bair Island.

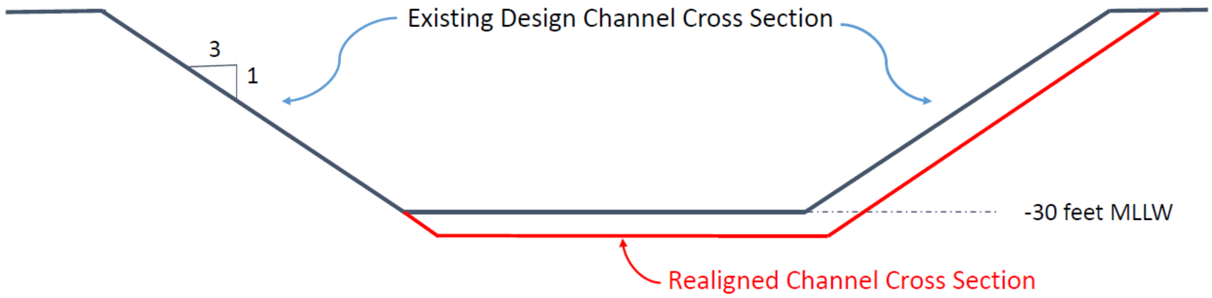


***Figure 3-1. Conceptual Cross Section of Realigned Channel***

***Constraint: Avoid impacts to USFWS Bair Island unit of the Don Edwards San Francisco Bay Wildlife Refuge and Port of Redwood City infrastructure.***

The following structural management measure was developed and subjected to screening based on how well it is expected to addresses this constraint.

13. **Bottom cut the channel toe near the Port of Redwood City facilities (southern end of the channel)**. The measure was retained because it may be an effective way to avoid adversely impacting Bair Island and landside infrastructure at the Port of Redwood City if the channel is deepened. This construction method would result in a reduced bottom width of the channel; the top width would remain the same (***Figure 3-2***). A detailed slope stability analysis will be conducted during final engineering and design to ensure that any modifications would not lead to significant sloughing. Modeling will be conducted to ensure navigational safety is not compromised with reduced bottom width.

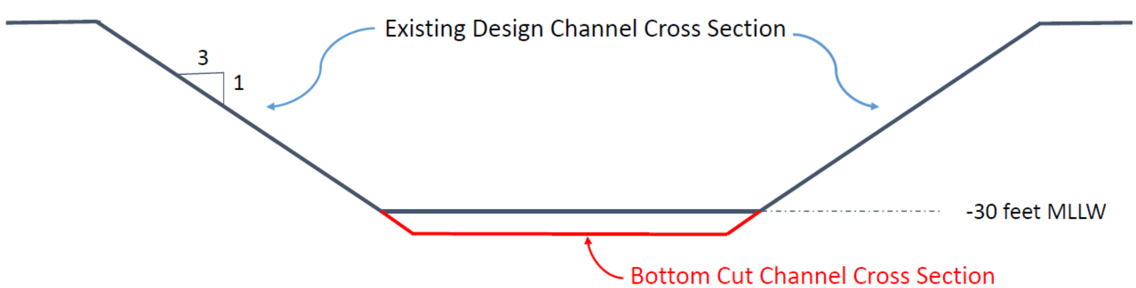


***Figure 3-2. Typical Bottom Cut Channel Cross Section***

Bottom cutting would be required from station 155+00 to station 162+00. From station 162+00 to the end of the turning basin, bottom cutting would be required on the Bair Island side only.

***Opportunity: Support the goals of the San Francisco Bay Long Term Management Strategy.***

The following measures were developed and subjected to screening based on how well they are expected to address this opportunity.

14. **Place dredged material at placement sites for beneficial reuse.** This measure involves transporting dredged material from the channels onto the upland edge of restoration sites in the South San Francisco Bay area for beneficial reuse by others for environmental restoration purposes. It was retained because it would be effective at addressing the opportunity to increase beneficial reuse of dredged material.

15. **Place dredged material in-Bay at passive sediment transport sites for beneficial reuse.** Recent studies of sea level rise in the San Francisco Estuary have indicated that the majority of tidal marshes surrounding the Bay are likely to lose marsh plant communities by 2100 because natural accretion rates will not keep pace with sea level rise. This management measure would place dredged material in natural channels in the Bay with the intention of relying on natural sediment transport processes to move the material from mudflats to feed marsh restoration sites. For this study, In-Bay placement near the Dumbarton Bridge (Passive Sediment Transport) at three separate target locations was considered as an option. The three sites considered are very close to the dredging project and would likely be a low-cost beneficial reuse choice (Delta Modeling Associates 2014). They could also serve as a fallback if mechanical problems or other factors limit use of other preferred beneficial reuse sites.

The three target sites would be located in a natural channel approximately five miles from the RWC channel in open water within San Francisco Bay, just south of the Dumbarton Bridge. Capacity is currently estimated at 350,000 cy per year. The sediment would be clamshell dredged at the site, placed in scows and then bottom-dumped into the natural deep-water channel and dispersed into the marsh and elsewhere by tidal action. It is likely that only easily dispersed sediments, such as unconsolidated fine sediments, would be considered for this site. In addition to the type of material, the wind, waves, tides and currents would be factors in the sediment dispersal. Also, it may be necessary to physically knock down or remove high spots (similar to Alcatraz).

A three-dimensional hydrodynamic wave and sediment transport model was applied as part of the LTMS to examine sediment dispersal throughout the San Francisco Bay and the Sacramento-San Joaquin Delta (Delta Modeling Associates 2014). One focus of the sediment transport modeling effort was to examine the sediment dispersal following dredged material placements. The model evaluated shallow-water dredged material placements in less dispersive areas adjacent to existing marshes or breached salt ponds and indicated an increase in deposition rates within these areas through natural dispersal of the placed sediment. At some locations within the Bay, dredged material placement was effective at supplying sediment to the surrounding mudflats and breached salt ponds resulting in increased accretion rates. These model results suggest dredged material placement in strategic locations may be used in a nature-based strategy to augment sediment supply to mudflats, marshes, and breached salt ponds surrounding San Francisco Bay.

Despite its promising benefits, this management measure was removed from further consideration for this study for the following reasons:

- Hydraulic modeling studies have demonstrated that only 25 percent of the placed material is dispersed with the majority remaining where it was initially placed;
- Placement at this location has the potential to destroy benthic habitat and it could affect species use in the natural deep water habitat; and
- Available technical information is currently insufficient to assess and evaluate just how effective and efficient this measure would be.

***Other measures for placement of dredged material***

The following measures were developed and subjected to screening based on how well they are expected to meet the needs of the channel deepening project.

16. **Place dredged material in-Bay at designated open-water disposal sites**. SF-11 Alcatraz is the only in-Bay placement site that was considered. SF-11 Alcatraz is an existing and permitted site which has historically been used as a disposal site for maintenance dredged material from both RWC and SBS Channels. It is located in open Bay waters near Alcatraz Island. It is proximal to both SBS and RWC Channels. Although the site is not considered to be available because it is not designated for use by new projects and does not have capacity to receive the material, it was tentatively retained during earlier screenings.

Currently, the site's annual and monthly capacity limits are already filled by existing operations and maintenance (O&M) projects, including the existing RWC Project. In emergency situations, it is possible to apply for a permit from the Dredged Material Management Office (DMMO) to place up to 250,000 cy of material at the site. "A dredging emergency is a situation that poses an immediate danger to life, health, property, or essential public service and that demands action by the Board more quickly than the Board's normal permit procedures would allow" (CEPA 2015). Given its low capacity, it would never be suitable for use as a stand-alone disposal site. It is also not considered a beneficial reuse site. SF-11 Alcatraz was therefore eliminated from continued consideration for construction dredging although it may be used for future long term maintenance dredging.

17. **Place dredged material in-Bay at aquatic transfer facilities (ATFs).** There are two types of ATF that can be created; unconfined or confined via a structural enclosure that would isolate the dredged material from the surrounding water. An example of a confined ATF would be walls constructed of steel sheet piles with the tops of the piles visible at both high and low tides. Steel sheet pile walled enclosures would require periodic inspection to ensure no displacement is occurring and cathodic protection is replaced as needed. Periodic assessments of the perimeter walls for scour or shoaling adjacent to the sheet piles would be required. An unconfined or confined ATF in San Francisco Bay could be utilized to transport and place sediment for beneficial use at upland sites. An unconfined in-Bay ATF will facilitate dredge delivery vessels (scows and hopper dredges) to deposit dredged material into the ATF basin. Material placed in the ATF basin would then be re-dredged (probably using a cutterhead dredge) and pumped to the upland site through a transfer pipeline. Construction and maintenance dredging of an access channel may be required to allow access for fully loaded haul scows and hopper dredges to the in-Bay ATF basin.

The proponent for the ATF will be via a separate project or enterprise and not a direct component or feature of the RWC project. Consequently, site preparation would not be required and the Project would only be responsible for transporting the dredged material to the ATF site and would not incur any expense for moving the material to the upland site. The measure may also be effective at meeting the study objective of prioritizing beneficial reuse of dredged material since material could potentially be reused beneficially at upland sites.

The Bay Farm Borrow Pit is an in-Bay placement site, located in South San Francisco Bay, adjacent to Bay Farm Island and is close to the SBS channel. It is considered an ATF option. Historically, developers removed material from this site to use as fill for construction projects around the Bay. The site is not currently designated for any type of dredged material placement, including use as an aquatic transfer facility. Site managers and USEPA Region 9 indicate that the site is not available to receive material. A permit to designate the site as an ATF is not possible because there are no projects that would use the site as a transfer facility. Discussions with USEPA Region 9 indicate that resource agencies assign value to the existing habitat and therefore it is also unlikely that the site would be designated for sub-tidal restoration. Placing dredged material here to restore the site to its former elevation would have a negative impact on the existing habitat. Finally, the City of Alameda objects to the use of the site as a dredged material placement site. Therefore, this management measure was eliminated from further consideration.

18. **Place dredged material at San Francisco Deep Ocean Disposal Site (SF-DODS).** SF-DODS is located in the Pacific Ocean, approximately 50 miles west of the Golden Gate Bridge. The site is approximately 90 miles from RWC Harbor and approximately 80

nautical miles from SBS Channel. The site was established in 1994 by the LTMS agencies and is managed by the USEPA. Use of the site is generally considered an environmentally superior alternative to disposal in San Francisco Bay.

While LTMS goals and environmental compliance considerations recommend beneficial reuse of as much dredged material as possible, it is accepting of dredged material placement at this site. Additionally, the site is currently available, permitted, and has adequate capacity.

## 3.4 Measures Retained for Further Consideration

Of the eighteen management measures evaluated, thirteen were dropped as a result of the initial screening process described above and five were retained for further study to form the basis for the alternative plan development. ***Table 3-2*** summarizes the results of the screening process.

***Table 3-2. Summary of Initial Screening Results***

| Management Measure | Screening Rationale | Result |
|---|---|---|
| 1. Deepen channels at Redwood City Harbor and San Bruno Shoal | ▶ 100 percent of vessels from July 2012 to June 2013 had design drafts greater than the existing depth of 30 ft.<br>▶ Based on the vessels calling on the Port light-loaded, approximately 70 percent of commodities would benefit from deepening.<br>▶ Deepening would reduce the need for vessels currently calling on the Port to lighter, light load, or wait for high tide, resulting in greater efficiency and cost savings. | Retain |
| 2. Build a lock or dam structure at Redwood City Harbor. | ▶ Not effective because there is no elevation change in the study area.<br>▶ It would require major reconstruction of Port infrastructure at a high prohibitive cost. | Drop |
| 3. Dredged a separate shallow lane for lighter ships at Redwood City Harbor. | ▶ Does not address a planning objective.<br>▶ Intended to ease congestion, which is not a problem at the Port.<br>▶ It would adversely impact landside Port infrastructure. | Drop |
| 4. Realign the channel at San Bruno Shoal | ▶ Review of current bathymetry indicates that the channel is already in the optimal location to take advantage of as much natural deep water as possible.<br>▶ Realigning the channel would not reduce the amount of dredging necessary to achieve the selected project depth, nor would realignment reduce future maintenance dredging and in fact may increase future maintenance dredging because of increased shoaling. | Drop |

| Management Measure | Screening Rationale | Result |
|---|---|---|
| 5. Significantly realign the channel entrance at Redwood City Harbor | ▶ Hydraulic Modeling results recently completed demonstrated that a significant realignment of the entrance channel would actually increase the sediment deposition rate. | Drop |
| 6. Relocate Port Facilities to deep water and dock boats in the Bay. | ▶ The measure would not be efficient. Commodities would still have to be transported to landside facilities, resulting in no cost savings. | Drop |
| 7. Congestion fees | ▶ Do not address objective. High traffic is not a problem at the Port. | Drop |
| 8. Traffic management | | Drop |
| 9. Light Loading/Lightering | ▶ Already part of existing condition | Drop |
| 10. Use of favorable tides and daylight transit | | Drop |
| 11. Increase use and capacity of related intermodal transportation systems such as highways and rail | ▶ Does not address study objective and is not efficient. It would require double handling of cargo from vessel to truck, incurring additional cost.<br>▶ Increases traffic congestion on overland networks and increased air pollution. | Drop |
| 12. Slightly realign the channel entrance at Redwood City Point | ▶ A slight realignment would allow deepening to minimize impacts to the mudflats and avoid impacts to Bair Island | Retain |
| 13. Bottom cut channel toe near Port infrastructure if the channel is deepened | ▶ Bottom width would be reduced<br>▶ Top width would remain as-is<br>▶ Modeling required to insure navigational safety | Retain |
| 14. Place dredged material at placement sites for beneficial reuse | ▶ Meets both USACE policy guidelines that favor increased beneficial reuse of dredged material as well as LTMS goals | Retain |
| 15. Place dredged material in-Bay at passive sediment transport sites for beneficial reuse | ▶ New concept, Information to evaluate is lacking<br>▶ Inconsistent with LTMS | Drop |
| 16. Place dredged material in-Bay at designated open-water disposal sites | ▶ Contrary to USACE policy and LTMS goals<br>▶ SF-11 not designated for new work dredging<br>▶ Limited capacity | Drop |
| 17. Place material at aquatic transfer facilities (ATF's) | ▶ No sites are available | Drop |
| 18. Place dredged material at SF-DODS | ▶ Site currently available and permitted to receive dredged material. While not highly desirable option still in line with LTMS recommendations | Retain |

As a result of this screening, three dredging management measures and two placement measures were retained during the screening process for further consideration.

**Retained Dredging Management Measures**

- Deepen RWC and SBS Channels;
- Slightly realign the channel entrance at Redwood City Point; and
- Bottom cut channel toe near Port infrastructure if the channel is deepened.

**Retained Placement Management Measures**

- Place dredged material at placement sites for beneficial reuse; and
- Place dredged material at SF-DODS.

## 3.5 Plan Formulation Strategy

Navigation projects that require dredging must identify strategies to address two issues: 1) removal of the dredged material from the channel and 2) placement of the material at an appropriate site. Therefore, the formulation of alternative plans will consider the three dredging management measures and the two placement measures that have been retained.

### 3.5.1 Dredging Management Measures

The three dredging measures carried forward include:

- Deepening the channels at SBS and RWC Harbor;
- Slightly realigning the channel entrance to RWC Harbor; and
- Bottom-cutting the channel toe as needed to avoid Port infrastructure and impacts to Bair Island.

Slightly realigning the channel and bottom-cutting the channel toe are measures that are dependent upon dredging. They are not standalone measures – they minimize impacts to Bair Island and Port infrastructure if the channel is deepened. Therefore, all three measures are included in each alternative.

Three depths were selected for the evaluation of economic benefits associated with channel deepening. The selected depths were -32 feet MLLW, -34 feet MLLW and -37 feet MLLW. These three depth were evaluated to identify the depth that resulted in the greatest net NED benefits[5].

### 3.5.2 Placement Measures

After the screening of management measures (***Table 3-2***) two management measures were retained for placement of dredged material: placement for beneficial reuse, and deep ocean disposal. A wide range of specific sites were compiled for each of these placement management measure (***Table 3-3***).

[5] Net NED benefits are calculated by subtracting the average annual project costs from the average annual NED benefits.

***Table 3-3. Initial Array of Potential Placement Sites***

| Placement Management Measure | Specific Sites |
|---|---|
| Placement for beneficial reuse | • Ravenswood Pond Complex<br>• Alviso Pond Complex<br>• Eden Landing Pond Complex<br>• Crown Memorial State Beach<br>• Oakland International Airport<br>• Montezuma<br>• Cullinan Ranch<br>• California Delta Islands and Levees |
| Deep Ocean Disposal | • SF-DODS |

### 3.5.3 Placement Site Screening Criteria

Existing data on dredged material chemistry and physical characteristics within the channels to be dredged was compared with the type of material that could be accepted at each placement site. Placement site managers were consulted to the extent possible and the capacity of each site was compared to the dredged material volumes for several dredging depths. Screening criteria used to identify potential placement sites that merit further consideration are described below:

- ***Site Availability***
    - *Metric*: Year the site is available. Sites that would be available and could be permitted by the estimated project base year of 2018 were retained.
- ***Capacity***
    - *Metric*: The volume of dredged material that can be placed on the site. Sites that do not have enough capacity to receive at least 1 mcy[6] of material (approximately equivalent to the estimated volume to be dredged for a 32 foot depth) were screened out.
- ***Material Compatibility***
    - *Metric*: Specific sites have material composition specifications (both physical as well as chemical) that must be met to allow placement.

#### 3.5.3.1 *Material Characterization*

The physical and chemical characteristics of the dredged material were evaluated for suitability for placement at the alternative sites based on available information. In general, the sediment that would be dredged from RWC Channel is predominantly silt and clay, with 2

[6] If a site is being considered to supplement placement at a beneficial reuse site and placement at the site would improve the benefit to cost ratio, a site with less than 1 mcy capacity would be retained.

percent or less sand and gravel (USACE 2014b). The sediment to be dredged from SBS Channel contains a higher percentage of sands – up to 30 percent.

It is assumed that the material dredged from both, RWC and SBS Channels, is suitable for placement at one of the available sites and upland placement in a land fill would not be required. The following factors support this assumption.

- The biological (toxicity) testing generally showed that the contaminated sediment was statistically no more toxic than the reference sediment from SF-DODS.
- There are portions of The Inner Turning Basin (by "eyeball" method, probably something like 2/3 of the area) that had only slightly elevated levels of PCBs that would not require landfill disposal

Therefore, for plan formulation, it was assumed that no dredged material from this Project will require placement in an upland landfill. Sediment sampling is being performed to determine the quality of the sediment to be dredged and to verify this planning assumption. However, the results are not available at this writing. The results of the sediment sampling will be incorporated into the final report.

### 3.5.4 Screening of Potential Placement Sites

#### 3.5.4.1 *Ravenswood Pond Complex*

This site is located within San Francisco Bay along its western shore and is the closest proposed placement site to Redwood City Harbor. The site is part of the Don Edwards San Francisco Bay National Wildlife Refuge and is owned by the USFWS. Bordered by a portion of Greco Island to the north and the Dumbarton Bridge to the south, it consists of four former salt ponds, comprising 240 acres in the process of being restored. These ponds are part of the proposed Phase 2 restoration component of the SBSP Restoration Project, the largest wetland restoration project on the West Coast. Proposed restoration efforts are described in the Draft Phase 2 South Bay Salt Pond Restoration Project EIS/EIR.

There are a number of factors that preclude Ravenswood from further consideration:

- *Environmental Considerations/Timing.* The Ravenswood ponds are currently an ideal location for snowy plovers to thrive as they prefer un-vegetated habitat with a 360 degree view of their surroundings. The existing snowy plover habitat at the site cannot be disturbed until equivalent habitat has re-established across the Bay at Eden Landing Pond Complex. The estimated time for this to occur is 10 years.
- *Capacity.* Site managers indicate that the current capacity at Ravenswood is only 300,000 cy; the minimum quantity to be dredged would be approximately 1 mcy. Any use of this site will require use in combination with additional sites. The site may be considered for future O&M material once it becomes available.

- *Cost.* The Ravenswood site cannot accept hydraulically dredged material. The site is relatively confined and includes a number of natural channels that require protection. Dredged material would have to be dredged with clamshells, loaded onto barges, off-loaded from the barges into a re-handling area and dried to reduce moisture content to sufficiently to prevent free moisture when the material is loaded into trucks. The material would then be trucked to the site for precise placement. The multiple handling steps and inefficient transport process significantly escalates project costs.

Ravenswood was therefore dropped from further consideration.

***Figure 3-3*** displays Ravenswood Pond Complex and two other South Bay Salt Pond Restoration Project beneficial reuse placement sites being considered: Eden Landing Pond Complex and Alviso Pond Complex.

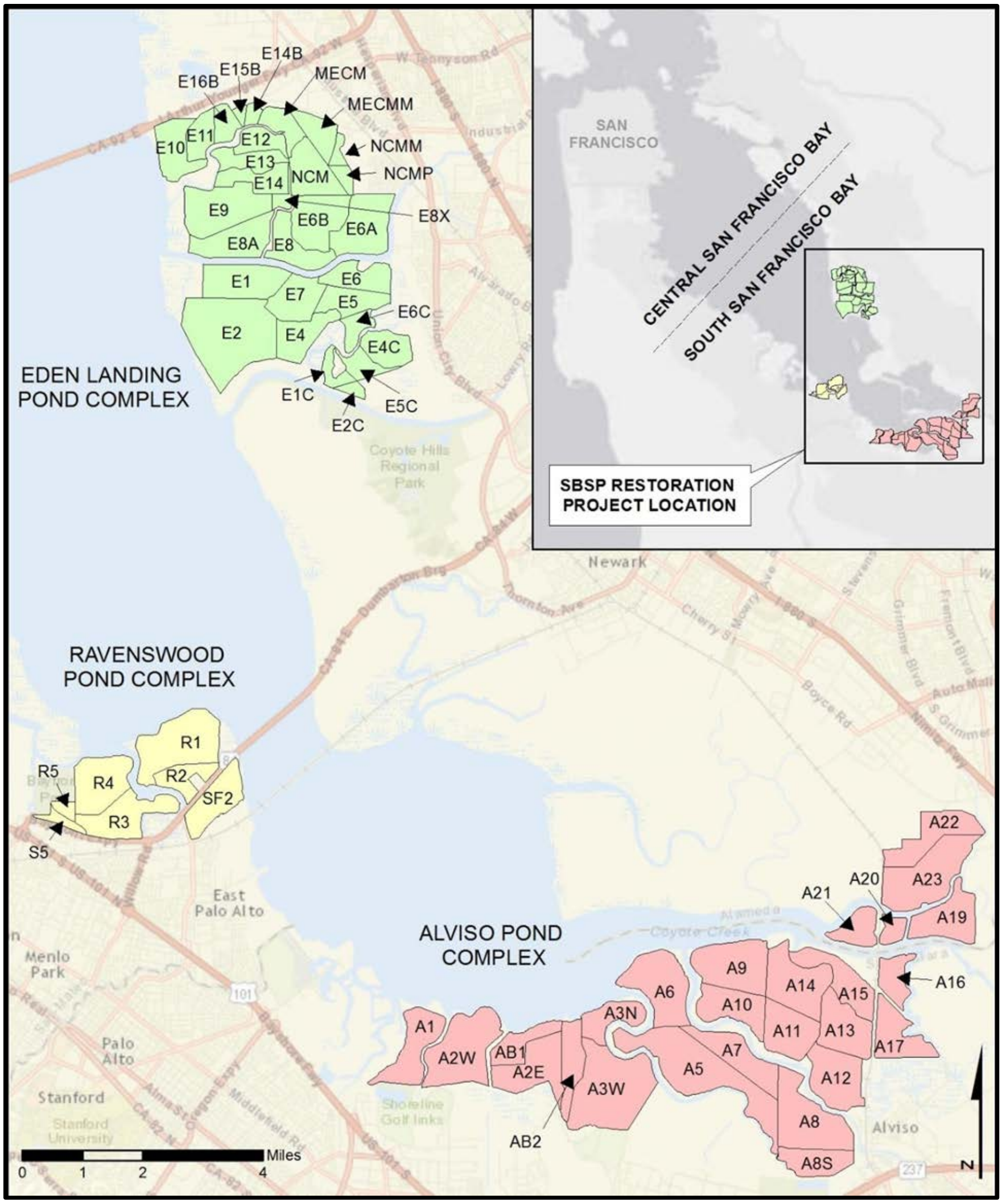


*Figure 3-3. South Bay Salt Pond Restoration – Potential Placement Sites*

### 3.5.4.2 *Alviso Pond Complex*

The Alviso Pond Complex site is a component of Phase 2 of the SBSP Restoration Project. This site is the furthest of the SBSP Restoration sites from both the RWC and SBS channels but is still relatively close. There are three groups of ponds being considered for placement of dredged material:

- Ponds A1 through A2W
- Ponds A5 through A8S
- Ponds A9 through A15

Sediment delivered to the ponds would be used to raise the bottom elevation of the ponds to accelerate tidal marsh development.

Ponds A8 and A8S have a combined capacity of 8 mcy which is sufficient for the highest amount of dredged material that would be produced by any of the alternative plans being considered. These two ponds are the highest priority at Alviso as they have significant subsidence. Further northwest, Ponds A1/A2W (Mountain View Ponds) are also considered a priority due to the need for material to cap existing mercury-laden soil deposits.

Operational considerations for Alviso are similar to those for Eden Landing. Additionally, due to the possibility of disturbing mercury-laden sediments, a monitoring plan for the decant water will be required if sediment is placed into Ponds A8 or AS. Species of concern in this area include steelhead, Longfin smelt, green sturgeon and Ridgeway's rail (formerly California clapper rail).

Alviso was retained for consideration due to high environmental merits, particularly if the sediments can be used to cap existing mercury laden soils which will reduce the potential for mercury exposures to sensitive wildlife and additionally save local agencies annual monitoring costs.

#### 3.5.4.3 ***Eden Landing Ponds***

Eden Landing Ecological Reserve is a former salt pond site that is also part of Phase 2 of the SBSP Restoration Project. The southern portion of this site (referred to in this document as the Eden Landing Ponds, or simply Eden Landing) could receive dredged sediment from the RWC Project. No sediment is proposed to be placed in the northern half of the Eden Landing Ecological Reserve.

The South Bay Salt Pond Restoration Beneficial Reuse Feasibility Study (Moffatt & Nichol 2015) describes the value of Eden Landing as a pilot beneficial reuse project to launch the infrastructure necessary for the delivery of dredged material further south to the Alviso Pond Complex. It is located on the eastern shore of South San Francisco Bay located approximately seven to ten miles away from the RWC channel. Eden Landing is the only beneficial reuse site that is close enough both to the RWC and SBS Channels to allow direct hydraulic delivery of sediment from the dredge. The site would also be able to accept material off-loaded from barges at an off-shore off-loader.

Material would be delivered to the Bayfront levee via pipeline and then placed by others as appropriate for environmental restoration of the former salt ponds. Dredged material delivered to this site must meet wetland cover (wetland surface) specifications. The site can accept Young Bay Mud, sands, and Old Bay Mud, and can therefore accept material from both the RWC and SBS channels. Site managers also indicate that the site may be available in 2018 (Project Year Zero), and that the site has capacity for between 3M to 7 mcy of material. Eden Landing would most likely use ponds E1, E2, E4 and E7 (Bay Ponds), although additional sediment capacity is available at ponds located to the east and south of these four ponds. Primary emphasis for placement will be on ponds E1 and E2, which are on the Bay shoreline.

There are concerns regarding Eden Landing's availability when dredging of RWC and SBS Channels first commences. If available, the RWC Project would deliver material to the site and placement would be accomplished by the site owner. The site owner would charge a tipping fee that would cover capital improvements and operations required to manage and place the dredged material. These improvements may include weirs, water control structures, internal berms, monitoring of decant water, etc.

The RWC Project may or may not need to provide its own off-loader. If sediment is delivered to an off-loader, the off-loader could be installed by the site owner or the RWC Project. If the site owner installs the off-loader, the cost will be reflected in the tipping fee. Material delivered by the RWC Project could be used to construct a landmass (alternative flood control structure), provide ecotone (wetland to upland transition) habitat, accelerate tidal marsh development by increasing the elevation of the ponds, or create habitat features such as nesting islands.

Eden Landing was retained for consideration despite possible availability concerns since it is the closest placement option to the Project site (which would reduce transport time and costs) and because of the beneficial environmental aspects of its use.

#### 3.5.4.4 *Crown Memorial State Beach*

Crown Memorial State Beach is located on the northeast side of South San Francisco Bay on Alameda Island, in close proximity to the SBS Channel. The 2.5 mile beach was restored in 1982 after wind and wave action eroded the beach. Sand is added periodically to maintain the beach. Based on specifications provided by East Bay Parks, Crown Memorial Beach requires clean sand. The material in the SBS Channel is predominantly silty sand, not clean sand, and the material in the RWC Channel consists predominantly of high plasticity clay, not sand. Since the material from the channels is not compatible with placement at this site, it was dropped from further consideration.

#### 3.5.4.5 *Oakland International Airport*

Oakland International Airport is located on the northeast side of the South San Francisco Bay, in close proximity to the SBS Channel. It does not have enough capacity to receive the quantity of material associated with the deepening project. In addition, the silty sand and high plasticity clay material from the RWC and SBS Channels is not compatible with the needs of this site (construction of stone columns and/or deep soil mixing used in ground improvements or construction at the Oakland International Airport). Therefore, this site was dropped from further consideration.

#### 3.5.4.6 *Montezuma Wetlands Restoration Project*

Montezuma Wetlands Restoration Project is a privately owned, ongoing restoration effort. It is currently at the tail end of the Phase 1 construction. About 1 mcy capacity remains in Phase 1 and the remainder of the dredged material would be placed in Phase II, which will provide an additional capacity of 4.5 mcy. Phases 3 and 4 will accommodate additional 2.5 and 5.5 mcy of dredged material placement capacity, respectively.

Montezuma Wetland Restoration Project accepts both wetland cover and wetland non-cover (foundation) quality material from new work and maintenance projects. This site is currently accepting sediment and has an off-loader in place and operating. The project site comprises approximately 2,400 acres at the eastern edge of Suisun Marsh, approximately 17 miles southeast of Fairfield, California (***Figure 2-1***). It is the furthest beneficial reuse placement site from the RWC Project. Ground elevations at the site have subsided up to 10 feet since its tidal marshlands were diked and drained for agricultural purposes more than 100 years ago. All site preparation, monitoring, and reporting is handled by the Montezuma Wetland Restoration Project, which charges a tipping fee for accepting dredged sediment. The tipping fee includes use of the off-loader.

The Montezuma restoration project was retained for further consideration. It is a beneficial reuse site that has both the needed capacity to serve as a stand-alone placement site for the dredging effort and is currently permitted and accepting both cover and non-cover material. The biggest drawbacks are its distance from the RWC Project (62 and 51 miles respectively from RWC and SBS Channels) and the relatively high tipping fee. Delivery of wetland non-cover material may require delivery of sufficient wetland cover material to provide a minimum three foot cap over the wetland non-cover material. Alternatively, wetland non-cover material may have a higher tipping fee.

#### 3.5.4.7 *Cullinan Ranch Tidal Restoration Project*

Cullinan Ranch Tidal Restoration Project is a wetland restoration site that comprises more than 1,500 acres and is located in western Solano County near the City of Vallejo. It is located between State Highway 37 and Dutchman Slough. It is considered a beneficial reuse site and is currently permitted and available. Cullinan Ranch is a former hay/cattle farm that is being restored to tidal marsh. It has a total capacity of 3 million cy of dredged sediment. The sediment will be used to raise up to 290 acres of the site to marsh plain elevation. The site has two permitted off-loader locations, both located in the Napa River, north and south of the mouth of Dutchman Slough, respectively. Both locations are accessible by large scows. The dredged sediment would be delivered to the chosen off-loader location by barge, and then pumped approximately 1 mile from the off-loader into the site. The off-loader could be provided by the site owner or the RWC Project.

The site will charge a small tipping fee to cover the costs of placement (infrastructure and operational costs). The actual tipping fee will depend on whether the RWC Project supplies its own off-loader or not. The average travel distances to the site from RWC and SBS Channels to this site are 46 and 35 miles, respectively. Cullinan Ranch was retained for further consideration as it is a beneficial reuse site. The site is expected to be available until 2020. The site will be retained for further consideration.

#### 3.5.4.8 *California Delta Island and Levees*

The California Bay Delta consists of a web of channels and reclaimed islands at the confluence of the Sacramento, San Joaquin, Cosumnes, Mokelumne, and Calaveras Rivers and the outlet for Central Valley rivers to the San Francisco Bay. Much of the land is below sea level and is outlined by a network of 1,100 miles of levees constructed during the past 150 years to manage the flow of water through the Delta. The network is a mix of federal and non-federal levees and most do not meet USACE levee construction standards and could fail at water levels well below the top of the structures. Historically, the delta was defined by tidal wetlands, primarily comprised of peat soils. However, nearly 95 percent of the historic wetland habitat in the delta has been converted to agricultural and urban uses.

There are concerns that widespread failure of the deficient Delta levees could cause salt water from San Francisco Bay to intrude into the Delta, effectively shutting down the water supply for the 25 million Californians who depend on water pumped from the Delta. This concern resulted in two broad USACE initiatives. The first was the Calfed Levee Stability Program and the second is the California Bay Delta study. All the studies recommend the repair/build-up of existing levee network which will require significant amounts of material that could conceivably be partially provided by the dredging at RWC Channel. The Delta project levees are generally located from the vicinity of Montezuma Wetlands and further to the east. The cost of transporting dredged material to Montezuma and the Delta levees would be greater than the cost of using Cullinan Ranch. Therefore, this site was dropped from further consideration.

#### 3.5.4.9 *San Francisco Deep Ocean Disposal Site (SF-DODS)*

SF-DODS (***Figure 3-4***) is an existing, permitted open ocean disposal site located approximately 90 miles from the RWC Channel and 80 miles from the SBS Channel. The SF-DODS was authorized by the USEPA in 1994 and remains co-managed by the USACE and USEPA Region 9. The site is in approximately 8,200 to 9,840 feet of water on the continental slope off San Francisco. SF-DODS spans an area of approximately 8.6 square miles, and has a disposal capacity of 4.8 mcy of dredged material per year.

Disposal is limited to suitable dredged material from the San Francisco Bay region and other nearby harbors or dredging sites. While the capacity exists, it is quite distant from the RWC Project.

SF-DODS was retained for consideration. Despite the long distance to the site (68 and 57 miles respectively from RWC Channel and SBS Channel) and the fact that it is not a beneficial reuse site, SF-DODS was retained because it is readily available, permitted, and has the most capacity for both long-term and annual placement.

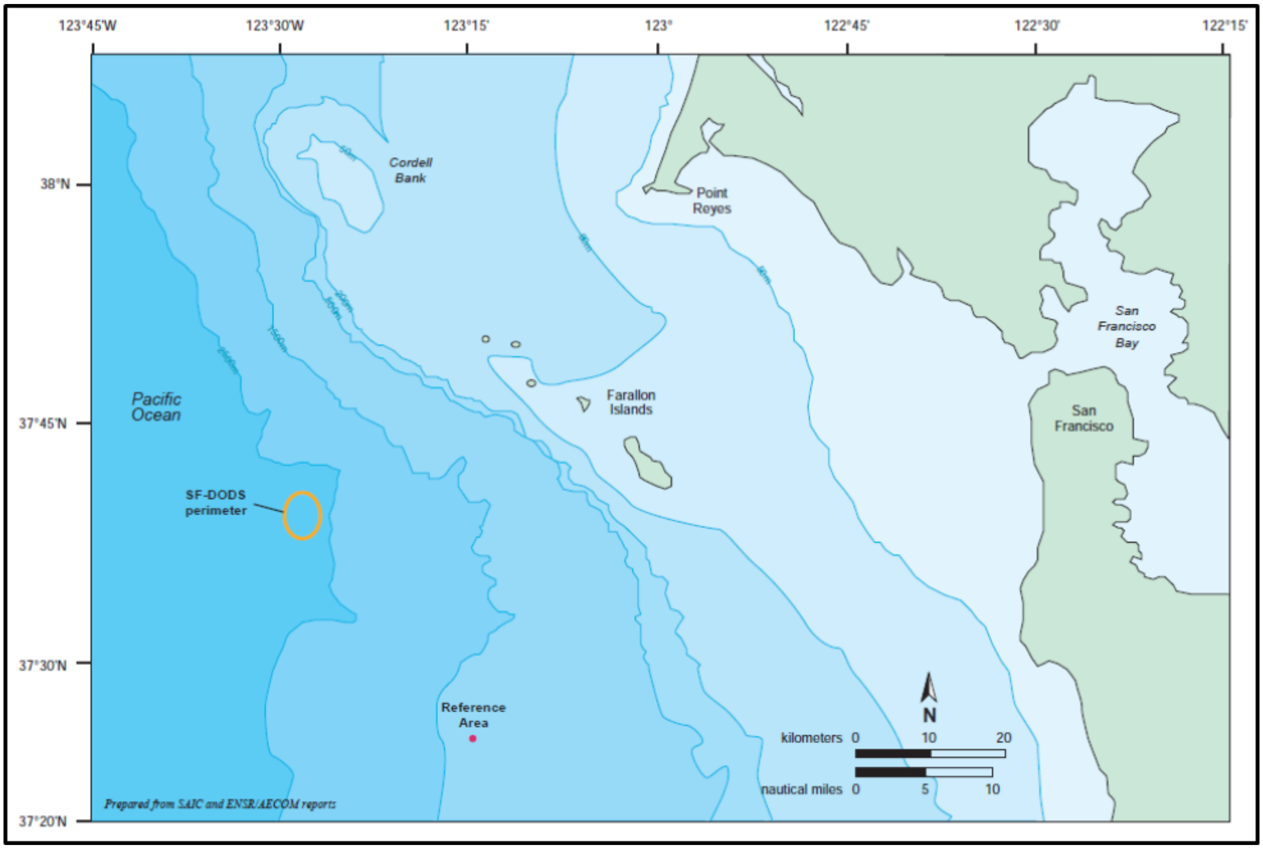


***Figure 3-4. San Francisco Deep Ocean Disposal Site (SF-DODS)***

### 3.5.5 Placement Site Screening Results

The results of the placement site screening process are summarized in ***Table 3-4***.

***Table 3-4. Placement Site Screening Results***

| Placement Site Measure | Screening Rationale | Screening Outcome |
|---|---|---|
| Ravenswood Pond Complex | ▶ Not available until 2023<br>▶ Limited capacity (500,000 cy) | Dropped |
| Eden Landing Pond Complex | Currently available<br>▶ Capacity is 3 to 7 mcy<br>Capacity of 3 mcy<br>▶ Material is compatible with restoration needs<br>Beneficial reuse; material is compatible | Retained |
| Alviso Pond Complex | ▶ Material is compatible with restoration needs<br>▶ Capacity is 34 mcy | Retained |
| Crown Memorial State Beach | ▶ Not compatible; requires clean sand | Dropped |
| Oakland International Airport | ▶ Not enough capacity<br>▶ Material is not compatible | Dropped |
| Montezuma Wetlands | ▶ Currently available<br>▶ Beneficial Reuse<br>▶ Material is compatible with restoration needs | Retained |
| Cullinan Ranch | ▶ Currently available<br>▶ Capacity of 3 mcy<br>▶ Beneficial reuse; material is compatible<br>▶ Material is compatible with restoration needs | Retained |
| California Bay Delta | ▶ Furthest location of beneficial reuse sites<br>▶ Costly to move | Dropped |
| SF-DODS | ▶ Available now<br>▶ Has capacity for entire project volume<br>▶ Material is compatible | Retained |

## 3.6 Focused Array of Alternatives

The focused array of alternatives consists of seventeen action alternatives and the No Action plan. The action alternatives include measures to deepen the channels (-32, -34 and -37 feet MLLW) while avoiding impacts to Bair Island Restoration and the Port facilities, and placement of various quantities of dredged material from the project at five prospective locations. The alternative plans are summarized in ***Table 3-5***. This table shows the estimated sediment volume that would be delivered to each placement site under each alternative. The actual volume of sediment delivered to each placement site would be determined by the actual volumes dredged; the actual volumes dredged could change based, in part, on shoaling during construction and the amount of overdepth actually achieved. Alternatives A-1 through A-5 incorporate Dredging Option A (-32 feet), Alternatives B-1 through B-6 include Dredging Option B (-34'), and Alternatives C-1 through C-6 would use Dredging Option C (-37').

For all dredging depths, it was assumed that 95 percent of the dredged material from RWC Channel and 100 percent of the material from SBS Channel would be wetland cover quality and could be placed at any of the alternative placement sites. The remaining 5 percent of dredged material from RWC Channel was assumed to be wetland non-cover quality and could be placed at either Montezuma or Cullinan. Montezuma was chosen because it is fully set up to receive dredged sediment; at Cullinan an offloader would have to be set up for the sediment, and that is not cost effective if only a small quantity of sediment is being delivered.

Where possible, alternatives were developed for placement of the dredged material for each depth at each of the five placement sites forming 15 alternatives. However, Cullinan has a capacity of 3 mcy which is adequate to accommodate all the material resulting from the -32 feet MLLW deepening, but not all the material for -34 or -37 feet MLLW. Therefore, alternatives were developed for placing 3 mcy at Cullinan and the remaining material at either Montezuma or SF-DODS for the -34 and -37 feet MLLW depths as shown in ***Table 3-5***. The alternatives that include placing all dredged material at Montezuma or a combination of Cullinan and Montezuma would provide 100 percent beneficial reuse of the dredged material.

***Table 3-5***. Summary of Project Alternatives

| Alt No. | Dredging Option (feet MLLW) | Placement Site Use (cy) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Cullinan | Montezuma | SF-DODS | Eden Landing | Alviso – Pond A2W Delivery | Alviso – Pond A9 Delivery | Total Volume (cy) | Formulation Strategy |
| A-1 | A (-32') | 1,765,000 | | | | | | 1,765,000 | 100% Beneficial Reuse; lowest cost permitted site |
| A-2 | A (-32') | | 1,765,000 | | | | | 1,765,000 | 100% Beneficial Reuse; maximum Montezuma use |
| A-3 | A (-32') | | 46,000* | 1,719,000 | | | | 1,765,000 | Placement at SF-DODS with an allowance for wetland foundation material placement at Montezuma |
| A-4 | A (-32') | | 46,000* | | 1,719,000 | | | 1,765,000 | Maximum South Bay Beneficial Reuse; maximum Eden Landing use with an allowance for wetland foundation material placement at Montezuma |
| A-5 | A (-32') | | 46,000* | | | 1,719,000 | | 1,765,000 | Maximum South Bay Beneficial Reuse, maximum Alviso use with an allowance for wetland foundation material placement at Montezuma |
| B-1 | B (-34') | 2,800,000 | 1,161,000 | | | | | 3,961,000 | 100% Beneficial Reuse; assuming 1 Year of Cullinan use |
| B-2 | B (-34') | | 81,000* | 3,880,000 | | | | 3,961,000 | Most cost-effective approach |
| B-3 | B (-34') | 3,000,000 | | 961,000 | | | | 3,961,000 | Maximum Cullinan use; remainder to most cost-effective site |
| B-4 | | | 3,961,000 | | | | | 3,961,000 | 100% Beneficial Reuse, maximum Montezuma use |
| B-5 | B (-34') | | 81,000* | | 3,880,000 | | | 3,961,000 | Maximum South Bay Beneficial Reuse; maximum Eden Landing use with an allowance for wetland foundation material placement at Montezuma |
| B-6 | B (-34') | | 81,000* | | | 3,880,000 | | 3,961,000 | Maximum South Bay Beneficial Reuse; |

| Alt No. | Dredging Option (feet MLLW) | Placement Site Use (cy) Cullinan | Montezuma | SF-DODS | Eden Landing | Alviso – Pond A2W Delivery | Alviso – Pond A9 Delivery | Total Volume (cy) | Formulation Strategy |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | maximum Alviso use with an allowance for wetland foundation material placement at Montezuma |
| C-1 | C (-37') | 2,800,000 | 4,915,000 | | | | | 7,715,000 | 100% Beneficial Reuse; high Cullinan use |
| C-2 | C (-37') | | 138,000* | 7,577,000 | | | | 7,715,000 | Most cost-effective approach |
| C-3 | C (-37') | 3,000,000 | | 4,715,000 | | | | 7,715,000 | 100% Beneficial Reuse; maximum Cullinan use and supporting SF-DODS use |
| C-4 | C (-37') | | 7,715,000 | | | | | 7,715,000 | 100% Beneficial Reuse; maximum Montezuma use |
| C-5 | C (-37') | | 138,000* | | 7,577,000 | | | 7,715,000 | Maximum South Bay Beneficial Reuse; maximum Eden Landing use with an allowance for wetland foundation material placement at Montezuma |
| C-6 | | | 138,000* | | | 7,577,000 | | 7,715,000 | Maximum South Bay Beneficial Reuse; maximum Alviso use with an allowance for wetland foundation material placement at Montezuma |

*Volume that represents 5% of the dredged material from the RWC Channel deepening that is assumed to be unsuitable for wetland cover.

# 4 Affected Environment, Environmental Consequences, and Mitigation Measures

## 4.1 Introduction

This Chapter presents an overview of the affected environment and a description of the proposed Project[7] activities (***Section 4.2***), briefly describes the alternatives analysis process and regulatory setting (***Sections 4.3 and 4.4***, respectively), and then describes the No Action/No Project Alternative and provides a summary of the alternatives evaluation (***Section 4.5***). The detailed description of the affected environment, significance criteria, and impact assessment is provided in ***Appendix A.***

## 4.2 Overview of the Affected Environment

The Project is located in San Francisco Bay. San Francisco Bay is a shallow estuary that drains water from approximately 40 percent of California. Water from the Sacramento and San Joaquin River watersheds passes through the Bay to the Pacific Ocean. San Francisco Bay is characterized by wide shallow areas flanking a central natural deep water channel. The deep channel is a remnant of the ancient drowned river valley that constitutes San Francisco Bay. Portions of the natural deep water channel (former river alignment) have been deepened further to support deep draft vessel navigation.

Shallow water reclamation by infilling along the margins has reduced the original Bay from approximately 700 square miles to its present size of approximately 400 square miles. The central portion of the San Francisco Bay has an average depth of 43 feet. The northern and southern areas have an average depth of 15 to 17 feet, respectively. The Bay's deepest waters lie at the Golden Gate where depths exceed 360 feet (University of Rhode Island and USEPA 2015). San Francisco Bay is commonly divided into four areas: Suisun Bay, North Bay (or San Pablo Bay), Central Bay, and South Bay. ***Figure 4-1*** shows the approximate basin boundaries for the four sub-bays. The Central Bay is the deepest portion of the Bay; the North Bay (San Pablo Bay) is the shallowest. The main part of the Bay measures 3 to 12 miles wide east-to-west and somewhere between 48 miles and 60 miles north-to-south. It is the largest Pacific estuary in the Americas.

### 4.2.1 Project Location

The Project is primarily located within San Francisco Bay; SF-DODS is located in the Pacific Ocean approximately 50 miles west of the Golden Gate. To the west of the Bay are the hills of the San Francisco and Marin peninsulas; to the east lie the Richmond, Berkeley, and Hayward-Fremont Hills; to the south are the San Bonito and Santa Clara Valleys; and to the north are San Pablo Bay and the Napa and Sonoma Valleys. Substantial portions of San Francisco Bay

[7] Chapters 4 and 5 address important requirements of NEPA and CEQA. In these chapters, Project activities or impacts refer to the activities or impacts of the action alternatives.

shoreline have been converted to urban, transportation, agricultural, and industrial uses; nonetheless many areas of the Bay retain their natural character and contain mudflats and tidal marshes, and other sensitive habitat.

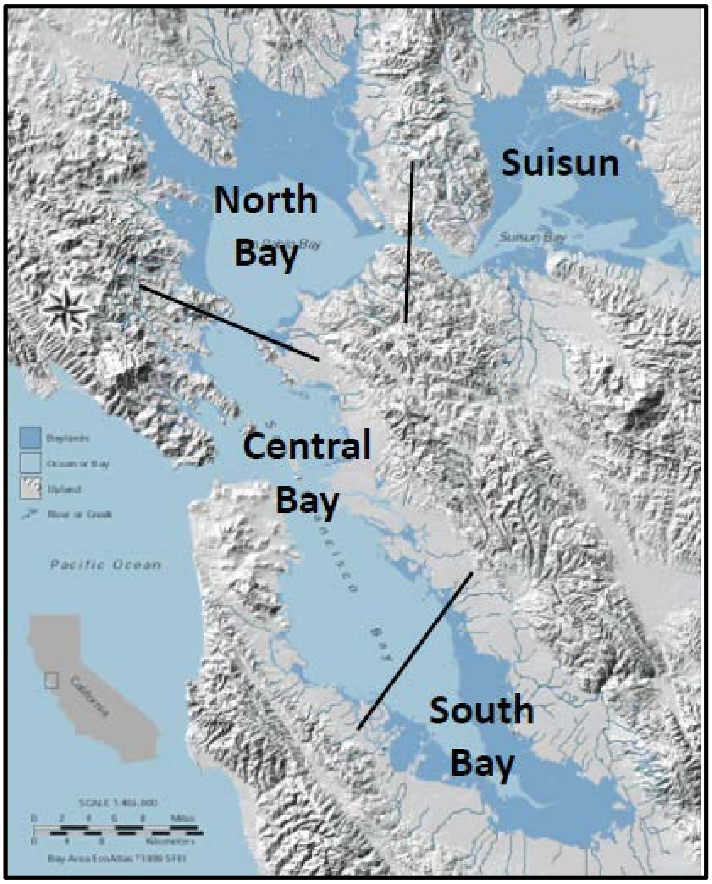


***Figure 4-1. Sub-bays of San Francisco Bay***

As described in ***Chapter 3***, the project area consists of two dredging locations (RWC Channel and SBS Channel), three placement sites (Cullinan, Montezuma, and SF-DODS), two potential placement locations (Eden Landing ponds and Alviso ponds), and the water areas connecting these sites. Cullinan, Montezuma, Eden Landing ponds, and Alviso ponds are beneficial reuse sites that would use dredged sediment to aid the restoration of tidal salt marsh habitat (wetland reuse). SF-DODS is a disposal site. ***Figure 2-1*** shows the dredging locations and San Francisco Bay placement sites. The only Project feature that is outside of ***Figure 2-1*** is SF-DODS, which is shown in ***Figure 3-4.*** The dredging locations and the two potential placement sites (Eden Landing and Alviso) are located in South San Francisco Bay (***Figures 4-2 and 4-3***). Cullinan and Montezuma are located in the Napa River Estuary just north of San Pablo Bay and the eastern margin of Suisun Bay near the confluence of Suisun Bay and the Sacramento-San Joaquin River Delta, respectively (***Figure 4-4***). All dredging locations and beneficial reuse placement sites are located along the shoreline, and are either in or adjacent to sensitive habitat, as described below.  Typical habitats at and in the vicinity of the beneficial reuse sites include open water, mudflat, and tidal marsh.


***Figure 4-2.  Eden Landing Ponds***

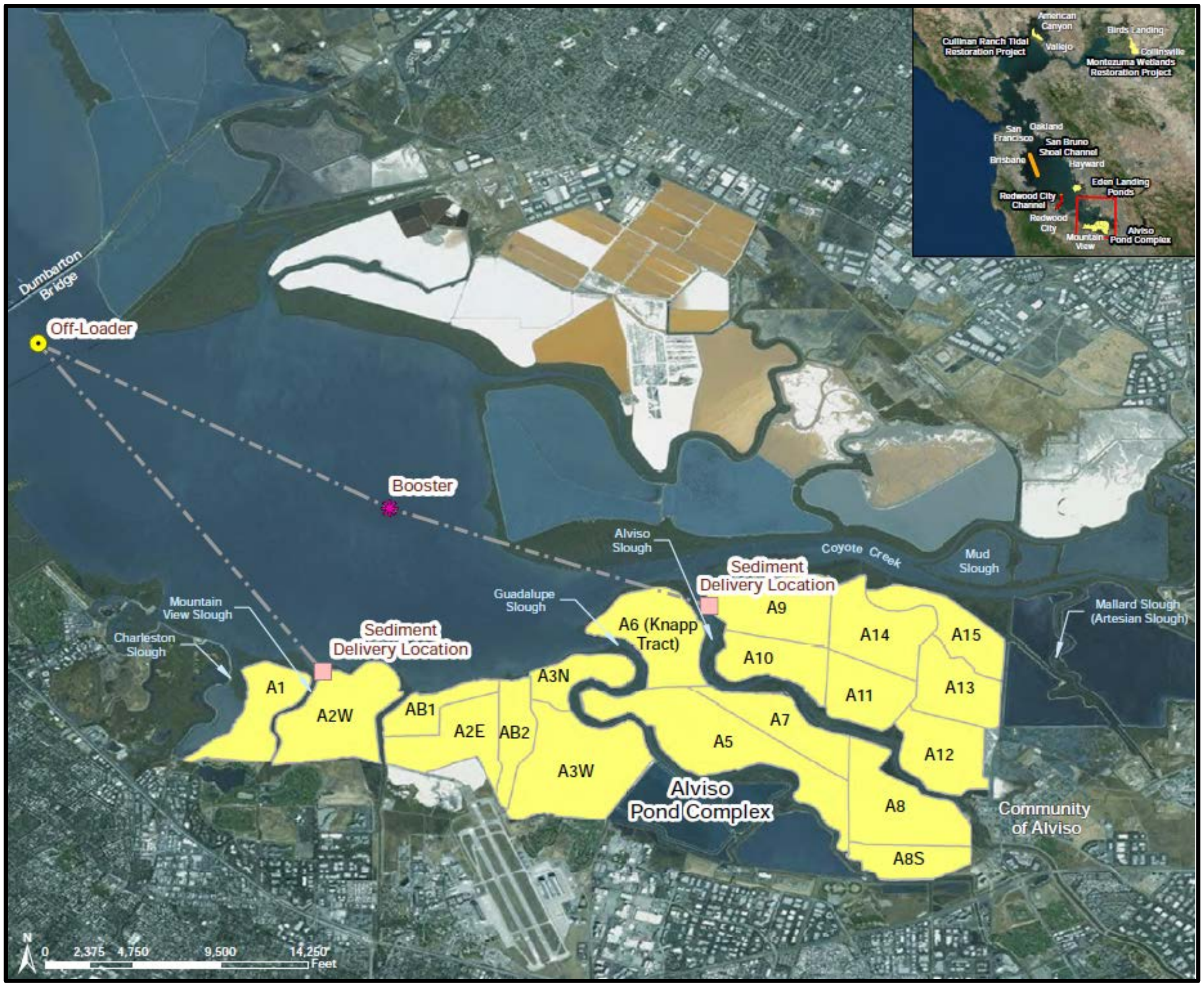


***Figure 4-3. Alviso Pond Complex***

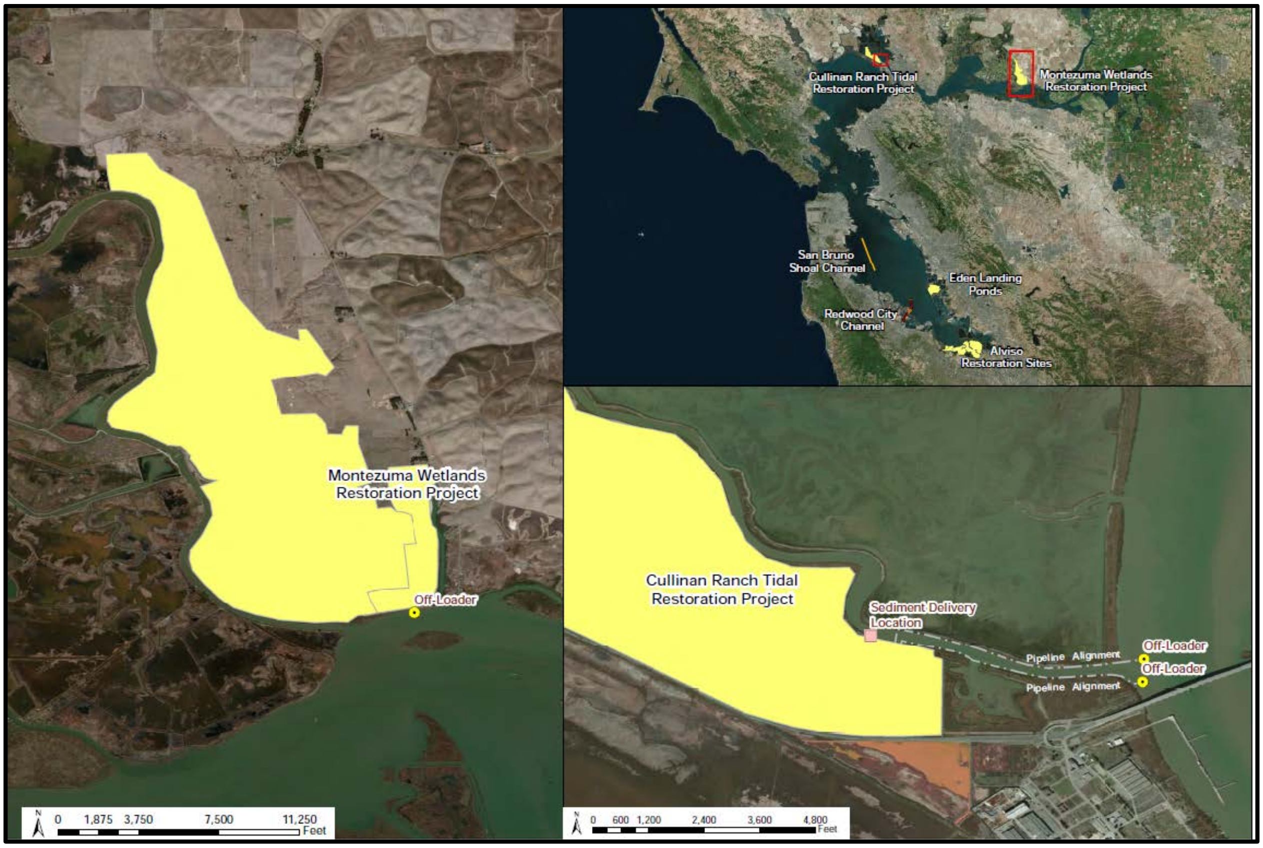


***Figure 4-4. Montezuma Wetland Restoration and Cullinan Ranch Restoration Sites***

### 4.2.2 Project Overview

The Project would consist of dredging two channel locations from their current authorized depth of -30 feet MLLW to a nominal depth of -32, -34, or -37 feet MLLW (Dredging Options A, B, and C, respectively), and reusing and/or disposing of the dredged sediment. Lowering three existing pipelines that cross the SBS Channel would also be required. Dredging of SBS Channel would require lengthening the channel to connect it to the naturally deeper water to the north and south. Lengthening would extend an estimated 3,300 feet to the north, and 2,200 feet to the south.

Dredging may include up to two feet of overdepth.[8] The volume of sediment to be dredged depends on the depth. ***Table 4-1*** shows the estimated volume of sediment to be dredged in cubic yards (cy). The estimated volume to be dredged analyzed for the purposes of the EIS/EIR is the in-place (bank cut) volume with a 20 percent bulking factor, and assumes two feet of overdepth. This is the maximum volume that could be dredged at each of the three depths. Experience has shown that dredgers more typically dredge the equivalent of approximately 1 foot of overdepth, and the cost estimate for each of the three dredging depths was based on

[8] "Overdepth" refers to the fact that, in dredging to attain a given minimum depth, some additional sediment will be removed due to inaccuracies in the dredging operation.

the assumption that only 1 foot of overdepth would be dredged. However, to evaluate the maximum potential impact, the maximum allowable overdepth volume is analyzed for the EIS/EIR. ***Table 4-1*** provides a comparison between the estimated volume to be dredged assuming the maximum volume, and the estimated volume to be dredged as reflected in the cost estimate.

***Table 4-1. Estimated Maximum Volume of Sediment to be Dredged Compared to the Volume used in the Cost Estimate***

| Sediment Source | Volume (cy)[1] | | |
|---|---|---|---|
| | Dredging Option A (-32 feet MLLW) | Dredging Option B -34 feet MLLW | Dredging Option C -37 feet MLLW |
| **RWC Channel Bank Cut Volume** | 286,000 | 924,000 | 1,995,000 |
| **RWC Channel Overdepth (2 feet)** | 636,000 | 704,000 | 770,000 |
| **RWC Channel Berth Deepening** | 17,000 | 34,000 | 60,000 |
| **SBS Channel Bank Cut Volume** | 90,000 | 619,000 | 2,055,000 |
| **SBS Channel Overdepth (2 feet)** | 388,000 | 846,000 | 1,078,000 |
| **SBS Channel Lengthening** | 0 | 54,000 | 266,000 |
| **SBS Channel Lengthening Overdepth (2 feet)** | 54,000 | 120,000 | 205,000 |
| **TOTAL** | 1,471,000 | 3,301,000 | 6,429,000 |
| **Bulking (20%)** | 294,000 | 660,000 | 1,286,000 |
| **TOTAL Including Bulking** | **1,765,000** | **3,961,000** | **7,715,000** |
| **Volume Used in Cost Estimate** | **936,990** | **2,497,619** | **5,476,588** |
| **Non-Cover Material (included in total above)[2]** | **46,000** | **81,000** | **138,000** |

**Notes:**

[1] Volumes are rounded to the nearest 1,000 cy

[2] Contaminated material is only anticipated to occur in RWC Channel; the estimated volume is 5% of the remaining volume (including overdepth) in RWC Channel; the total shown includes bulking of 20%

Source: Matthew Young, pers. comm. 2015

In addition to channel deepening beyond the existing authorized depths, up to an estimated 366,000 cy of sediment would have to be dredged for the purposes of channel maintenance (referred to as maintenance dredging sediment). (366,000 cy is the average estimated sediment accumulation during a two-year period preceding the start of construction). The actual duration of construction would determine the amount of maintenance dredging sediment dredged from the channels during the construction phase. The duration of construction would depend on the dredging depth, the placement site, and the dredging method.

Deepening of existing channels is separate from maintenance dredging, which is conducted to remove sediments that have shoaled into (accumulated in) the existing channel. Maintenance dredging is typically completed as part of the USACE's Bay-wide maintenance dredging program; however, it is more cost-effective to conduct the deepening and maintenance dredging in one pass. Following deepening of the channels, the channels would be maintained at their new, deeper depths. The deepening would result in a slight to moderate increase in the total volume of maintenance dredging, as further discussed below. Potential impacts associated with the maintenance dredging sediment that may be dredged in conjunction with the deepening are addressed through the USACE's maintenance dredging program environmental review.

To take advantage of the deeper channel, the Port would need to deepen its berths. Berths are typically dredged to a depth of four feet below the bottom of the channel to provide underkeel clearance for ships at low tide.

As described in ***Chapter 3***, the RWC Channel footprint would be modified slightly. The deepened portion of the channel adjacent to Port infrastructure would be tapered (narrowed) slightly (between 6 and 42 feet, depending on the channel depth selected) to avoid having to widen the top of the channel and still allow for stable channel side slopes. Further east, the channel footprint would be moved slightly (between 6 and 42 feet, depending on depth) to the south to avoid removal of mudflats adjacent to Bair Island near the entrance to Redwood Creek. The channel would be tapered as necessary to also avoid affecting mudflats at Greco Island. The channel modifications are shown in ***Figure 4-5 (a, b, and c)*.**


***Figure 4-5a. Proposed RWC Channel Realignment at -32 feet MLLW Depth***


***Figure 4-5b. Proposed RWC Channel Realignment at -34 feet MLLW Depth***


***Figure 4-5c. Proposed RWC Channel Realignment at -37 feet MLLW Depth***

All temporary and permanent features constructed by the Project (such as channel side slopes and offloader facilities (***Figure 4-6***) including mooring dolphins and piles), would be constructed to appropriate seismic safety and geotechnical stability standards. Studies would be conducted during pre-construction engineering and design to establish the necessary parameters. The existing channel slopes would be analyzed and the future slopes designed, and constructed in accordance with EM 1110-2-1902 (USACE 2003).

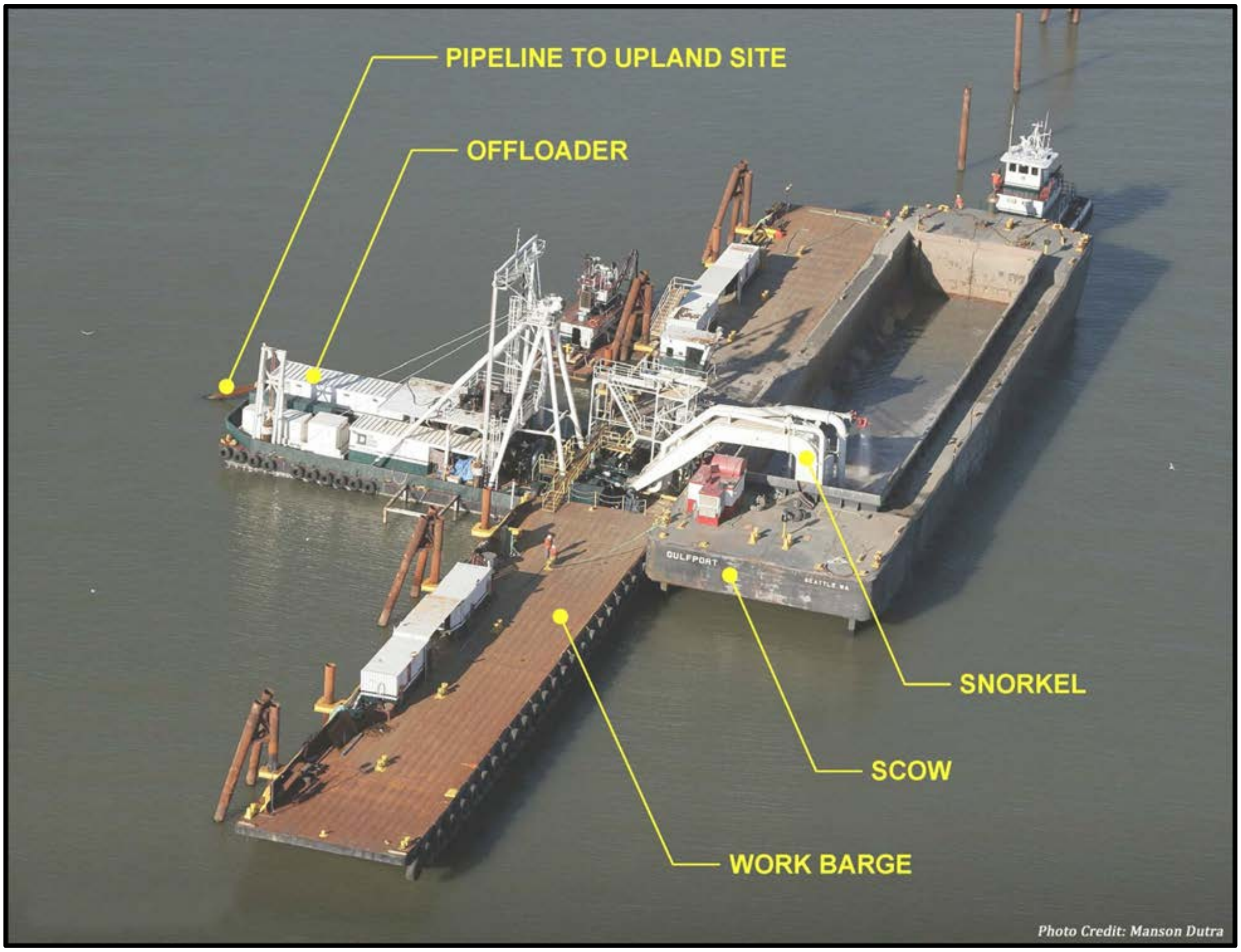


***Figure 4-6. Typical Offloader Facilities***

### 4.2.3 Construction Process

#### 4.2.3.1 *Pre-Construction Investigations and Permitting*

Prior to the start of construction activities, USACE would require the construction contractor to develop various construction plans, as further described below (***Section 4.2.3.2***). Best Management Practices (BMPs) applicable to dredging, construction, hazardous materials handling and management, and habitat and species protection have been incorporated into the Project. The Project has been designed to avoid or minimize potential impacts to the environment where feasible.

Prior to implementing the dredging program, the Corps would conduct a comprehensive sampling and analysis program to characterize the chemical and physical characteristics of the sediment to be dredged. Sampling would be conducted to the maximum allowable overdepth plus 0.5 feet. The latter is also referred to as the Z-layer and characterizes the sediment that would be exposed following construction. Sampling would include sediment on the side slopes, as well as sediment in the berths.

Approval to use specific placement sites is required from the DMMO. The DMMO requires that the dredging project proponent prepare a sampling and analysis plan describing any sampling that would be conducted, as well as quality assurance procedures that would be implemented to ensure the collection of data of appropriate quality to support a decision regarding a suitable placement method. The sampling and analysis plan (SAP) and quality assurance project plan (QAPP) must be prepared in accordance with regional and federal guidance and approved by the DMMO. Following approval of the plan, USACE would sample the sediments in accordance with the approved SAP and QAPP, and submit a sampling and analysis report to the DMMO. Based on this report, the DMMO would determine the suitable placement method for the dredged sediments.

The RWC Project would comply with all applicable provisions in existing permits applicable to the placement sites and meet all applicable federal environmental compliance requirements (e.g., CWA Sections 401 and 404, ESA), including those federal requirements implemented by state agencies (e.g., CWA Section 401, Coastal Zone Management Act (CZMA)), as well as applicable state environmental compliance requirements. The Project would also complete Section 7 consultation with USFWS and NMFS, and Essential Fish Habitat consultation with NMFS.

### 4.2.3.2 *Construction Best Management Practices*

To minimize potential environmental effects associated with the Project, detailed project plans would be developed prior to construction and an extensive set of BMPs, including environmental protection and safety practices, would be incorporated into the Project.

#### 4.2.3.2.1 Project Plans

Prior to the start of construction activities, the USACE would require the construction contractor to develop the following plans:

- Fuel pipeline relocation and response plan
- Stormwater pollution prevention plan (SWPPP)
- Health and safety plan
- Spill prevention and response plan
- Oil transfer plan
- Waste management plan
- Traffic control plan (if needed)

- Air quality management plan
- Cultural resources protection plan

Relocation of the fuel pipelines, if not managed properly, could result in disruptions of the aviation fuel supply for San Francisco International Airport as well as hazards to workers and the environment. The fuel pipeline relocation and response plan would provide a detailed plan for managing fuel flow during relocation of the pipelines, including during unplanned disruptions, and would include a detailed plan for safely installing the new pipeline sections, uncovering and removing the old pipeline sections, connecting the existing and replacement pipeline sections at the tie-in locations. The health and safety plan would evaluate potential hazards associated with the dredging and placement operations, address site-specific work practices to ensure that workers and the environment are protected if contaminated sediment is dredged, and include provisions for communications and emergency response. The oil transfer plan would describe the process for refueling the dredge and any other equipment that is fueled over water (e.g., the booster pumps and equipment required to relocate the pipelines). The oil transfer plan would detail the responsibilities of the individual involved in the transfer, the transfer process, safety precautions, training requirements, and monitoring and communications protocols.

The spill prevention and response plan would address management and protective measures, emergency response measures, methods to capture fuel spills; and require a staging area designed to prevent leaks into the soil or water. The waste management plan would address handling and reuse/disposal of waste which may be generated during construction, including during relocation of the pipelines. The traffic control plan would address any special requirements for bringing oversize loads to any of the land-based staging areas, if needed (the majority of the equipment is expected to be mobilized to the dredging location by water). The air quality management plan is required to ensure that annual project emissions would remain below the federal General Conformity threshold. The contractor would be required to describe its planned equipment use (including engine horsepower, age, load factors, and projected operating hours for all major equipment) and associated air emissions, and to document its compliance with the planned equipment use. The cultural resources protection plan would be required only if the Eden Landing or Alviso placement sites are used. The plan would review the entire proposed alignment of any dredged sediment delivery pipelines (whether from an offloader or from a cutterhead dredge) for the presence of any known archeological or other submerged resources. The plan would define any required modifications to ensure that any known submerged cultural resources are avoided.

#### 4.2.3.2.2 Best Management Practices

Appropriate implementation of BMPs would significantly reduce the potential for environmental impacts and safety concerns. The following BMPs have been incorporated into the Project.

- Air Quality/GHGs
    - Maintain equipment according to manufacturers' specifications.
    - Use diesel oxidation catalysts and catalyzed diesel particulate traps where feasible.
    - Restrict idling of construction equipment (excluding clamshell dredge) to a maximum of five minutes when not in use.
- Navigation safety:
    - Notification of near-by public landowners: Near-by owners of public lands would be notified of proposed dredging and placement activities in the vicinity of their properties to ensure that they are able to notify users of their property regarding the construction activities and the need to proceed with caution. Near-by public landowners would be encouraged to post signs informing the public about the construction activities. USACE would provide signage to the public landowners as requested.
    - Notification to nearby marinas: The contractor would be required to notify the nearby marinas of the proposed dredging and placement work, and provide them with the schedule to ensure that recreational vessel users are aware of the need for safe navigation around the dredge.
    - During dredging and disposal activities, navigational warning markers, lighting, and aids to navigation would continue to be used as needed to prevent navigational hazards from the dredging and offloading equipment, including any floating pipelines.
    - Notice(s) to mariners for dredging activities, pipelines and offloader construction and location: a notice to mariners would be issued requesting mariners to proceed with caution and/or to proceed at no wake speed as required to ensure the safety of both the dredging operation and the transiting vessel.
- Vessel Wake Management
    - Tugs and other vessels that could cause scour of the channel banks would be required to transit within the center of the channel when feasible, and to reduce vessel speeds when operating near sensitive habitat.
- Pile driving noise and vibration controls:
    - Pile driving windows would be used where sensitive wildlife is a concern so that work is done when listed species are least likely to be present. Pile driving windows would be the same as the dredging windows (June 1 through November 30); however, pile driving would only occur for a small number of days.
    - Pile driving would be completed using a vibratory hammer whenever feasible. If sediments are too dense for sole use of vibratory hammer, then an impact hammer may be used to proof the pile and pre-drill, if necessary, to approximately five feet above required pile tip elevation.

  - Bubble curtains would be used to reduce sound levels from the impact hammer, any time an impact hammer is used, to create an underwater wall of air around the pile to dissipate in-water sound waves.
  - Construction workers would employ the "soft start" technique, which allows fish and marine mammals to vacate the area before the pile driver reaches full power. For vibratory hammers, the contractor would initiate the driving at reduced energy for 15 seconds and then wait for one minute. This procedure shall be repeated two more times prior to starting the continuous driving. For impact driving, three initial strikes would be made by the hammer at 40 percent energy, followed by a one minute wait. Then, two subsequent three-strike sets would be completed before initiating continuous driving (URS Group, Inc. 2014b).
- Turbidity control:
  - While using a cutterhead dredge, undercutting would be prohibited to prevent sediment above the area being dredged from slumping in on the cutterhead thereby minimizing turbidity spikes.
- Protection of longfin smelt and Delta smelt:
  - All offloader water intakes would be equipped with fish screens achieving the appropriate approach velocity for the special status species that may be present in the vicinity of the offloader.
  - The USACE would implement a worker education program for listed fish species that could be adversely impacted by project activities. The program would include a presentation to all workers on biology, general behavior, distribution and habitat needs, sensitivity to human activities, legal protection status, and project-specific protective measures. Workers would also be provided with written materials containing this information.
- Construction staging:
  - The temporary construction staging area would be located on an impervious surface and located away from areas that could make it susceptible to damaging waves. The staging area would comply with the Port's storm water discharge permit and BMPs. Any liquids or other materials at the staging area that could spill or runoff during storm events would be located in a bermed area or an area equipped with other types of secondary containment. All materials brought to the Port and not immediately transferred to the dredge or other equipment must be stored within the staging area.
- Spill prevention and response for routine hazardous materials use and for fueling:
  - The contractor would be required to maintain adequate spill response materials at the dredge and/or work site, and train all workers in proper spill response.
  - Catch pans or drop cloths would be used under all equipment utilizing fluids
  - All fuel would be kept in double containment systems with positive shut-off values at the nozzles.
  - All fuel transfer hoses would be drained completely before being disconnected.

- o All dredge engines would be equipped with fuel spill catching skirts; petroleum-fueled dredge engines that are not equipped with fuel spill catching skirts would not be allowed.
- o Dredging would stop immediately following any fuel or hazardous waste leaks or spills, and cleanup actions would be implemented.
- o All chemicals used in an aquatic environment would be approved for use in that environment.

#### 4.2.3.2.3 Fuel Pipeline Relocation

The U.S. Department of Transportation’s Pipelines and Hazardous Materials Safety Administration (PHMSA) regulates interstate and intrastate hazardous liquids transmission pipelines. PHMSA issues pipeline safety regulations addressing construction, operation, and maintenance, inspects pipeline operators, and enforces against violations of pipeline safety laws and regulations. The Fuel Pipeline Relocation and Response Plan would be prepared in accordance with PHMSA regulations as well as California’ Office of the State Fire Marshall regulations. Due to the potentially hazardous nature of the work, special safety training is required for workers and contractors involved in the relocation. In addition, workers may need special security clearance and background checks in accordance with Homeland Security regulations. In general, work on existing fuel pipelines would require the section of the pipeline that may be worked on to first be locked out (i.e., isolated so that no fuel could enter that section of the pipeline) and tagged out (notifications are posted at the lockout locations to notify any worker that the pipeline is locked out). If the pipe is pressurized, it would then be depressurized, drained, and vented. If an explosive condition could occur in the pipeline, it would also be inserted, typically by filling it with nitrogen or another inert gas. These measures, any other required measures, and site-specific requirements would all be described in the Fuel Pipeline Relocation and Response Plan.

#### 4.2.3.2.4 Coordination of Project Activities and Port Operations

Access to the Port’s berths would be coordinated with the Port and San Francisco Bar Pilots to ensure that dredging operations do not cause undue interference with use of Port facilities. The dredge operator and all commercial vessels would be in communication with U.S. Coast Guard (USCG) Vessel Transfer Service (VTS) and monitor Channel 16 to ensure effective coordination of dredging operations and commercial vessel traffic. The San Francisco Bar Pilots, who board all commercial vessels before they enter the Harbor, would be aware of any notices to mariners and would coordinate with the dredge crew and VTS to ensure safe transit of the vessels under their control. To the degree feasible, dredging and fuel pipeline relocation activities would be scheduled to minimize delays to vessels transiting SBS or RWC Channels.

### 4.2.3.3 *Channel Deepening and Maintenance during Channel Deepening*

The Project proposes to deepen RWC Channel from the current authorized depth of -30 feet MLLW to a depth of between -32 feet MLLW and -37 feet MLLW. SBS Channel would also be deepened from its current authorized depth of -30 feet MLLW to between -32 and -37 feet MLLW, and would be lengthened as needed to reach naturally deep water (an estimated 3,300 feet to the north, and 2,200 to the south). Lengthening is required for all three dredging depths. This would allow vessels with drafts of 30 to 35 feet to use the channel without waiting for the tides, or reduce lightering requirements for deeper draft vessels. Squat, trim, and a minimum vessel underkeel clearance for maneuverability reduce the effective depth of a channel. The combined underkeel clearance required in the RWC Channel is two feet.

#### 4.2.3.3.1 Dredging Duration and Schedule

The dredging and sediment reuse/disposal construction period is determined by a combination of factors including the volume of material dredged, air emission thresholds, dredge production rate, and how scows are loaded. The type of dredge used (clamshell or hydraulic cutterhead), and whether any of the dredging and offloading equipment is powered by electricity also affect the dredging duration.

For the proposed Project, the primary factors determining the duration of the dredging effort are the need to limit air emissions to remain below the general conformity threshold, and the assumption that overflow from scows would not be allowed. Coupled with the long transportation to the three permitted placement sites (Cullinan, Montezuma, and SF-DODS), this limits the volume of sediment that can be dredged and transported to a placement site each year to approximately 480,000 cy/year to SF-DODS, 600,000 cy/year to Montezuma, and 700,000 cy/year to Cullinan, based on the -32-foot MLLW (plus overdepth) dredging option. Due to efficiencies in dredging to deeper depths, dredging to -34 feet MLLW or -37 feet MLLW (plus overdepth) results in slightly higher production rates per unit air emissions; however, as a conservative measure, the production rate calculated for the -32-foot depth was used to estimate air emissions for all three depths.

Based on the estimated volume of sediment to be dredged, the minimum construction period evaluated in the EIS/EIR would be 11 months (2 dredging season) at – 32 feet MLLW (if all the sediment is placed at Cullinan), and 14 and 16 months, respectively, if Montezuma or SF-DODS are used as placement sites. These durations could change if changes are made to the project (i.e., if electrical power is used to power the dredge, or if overflow is allowed from the barges), but represent conservative assumptions (maximum durations) for the purposes of evaluating impacts. Durations to Eden Landing and Alviso were not estimated, because there is insufficient information to determine the maximum offloading rate for these sites.

#### 4.2.3.3.2 Dredging Methods

The feasible dredging methods depend on the distance between the placement site and the dredging location. Eden Landing and Alviso ponds are sufficiently close to the RWC Channel dredging activities to allow use of a hydraulic cutterhead dredge (***Figure 4-7***) with direct delivery (pumping) of the sediment to the Eden Landing and Alviso ponds. A cutterhead dredge could also be used for SBS Channel if the Eden Landing ponds are the chosen placement site (several booster pumps would be required); all other placement sites are too far from SBS Channel to permit use of a cutterhead dredge. The cutterhead dredge could be either diesel-powered or electric-powered, with no difference in performance characteristics. However, electric-powered dredges can be more expensive and difficult to operate than diesel dredges because of the movement logistics associated with the power cable. Due to the distance from shore to SBS Channel, a cutterhead dredge used at SBS Channel would be diesel-powered.

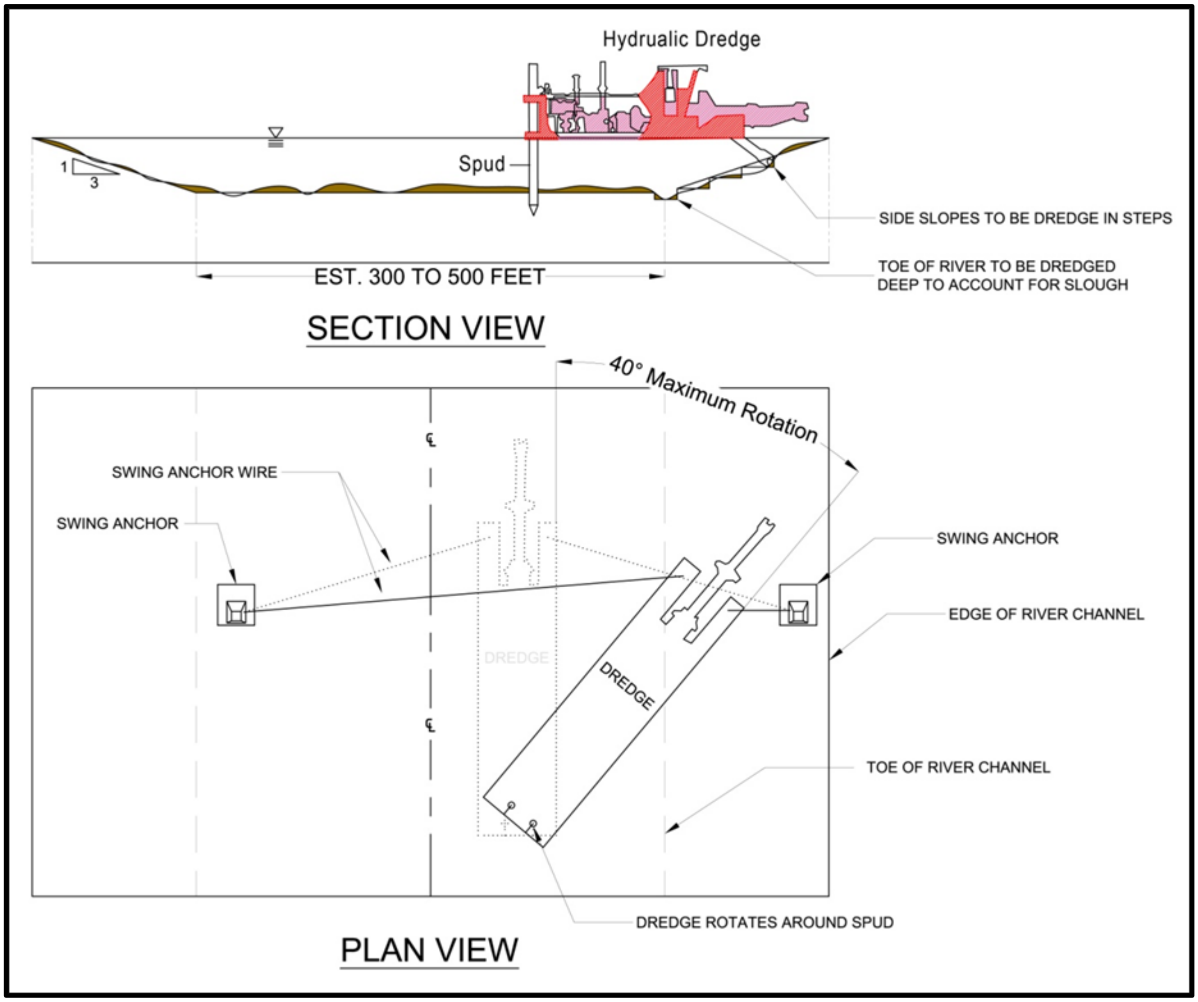


***Figure 4-7. Hydraulic Cutterhead Dredge***

For all other placement sites, dredging would be performed using a clamshell. Clamshells operating in RWC Channel could also be diesel-powered or electric-powered; SBS Channel is too remote to make electrically-powered dredges feasible. The determination whether to use a cutterhead or clamshell dredge when use of both is feasible would made based on cost, including cost of any required mitigation. If a dredge is electrically-powered, power would be supplied via the Port's substation located at Wharves 1 and 2, and a cable between the substation and the dredge. A smaller substation would be located on the dredge to step down power to a voltage usable by the equipment on the dredge.

Dredged material in the RWC Channel is expected to consist primarily of Young Bay Mud, a predominantly fine-grained material. Dredged sediment at SBS Channel is expected to contain up to 30 percent sand. Dredging of the softer muds (fine grained sediments) would be done in such a way as to minimize sediment loss during the dredging cycle, including possibly slower cycling times and the use of environmental buckets.[9]

Sediment dredged with clamshells would be placed into scows. Scows bound for SF-DODS would be dump scows; the other sites could accept material contained in hopper scows which have fewer moving parts than dump scows. Dump scows have hulls that can be opened to dispose of the sediment.

Tugs would haul the scows to the designated placement site. The number of trips necessary to transport the sediment to the placement sites would depend on the size(s) of the scows, the quantity of sediment dredged, and whether overflow from the scows is allowed or not. At SF-DODS, material would be bottom-dumped from the scow. At the beneficial reuse sites, sediment would be offloaded from the scow with an offloader, and pumped into the site. To enable the offloader to pump the dredged material it would be slurried to 5 to 10 percent solids with water drawn from the Bay at the offloader location. The receiving beneficial reuse site(s) would be responsible for conducting environmental analysis of placement-related activities and sediment management. The environmental analysis for this Project assumes that sediment is delivered to a receiving location at an offloader (if provided by the placement site), or to the top of the Bay-front (outboard) embankment of the placement location when the Project would provide the offloading facilities (or if the material is pumped directly to the placement site from a cutterhead dredge).

#### 4.2.3.3.3 Offloading Facilities

A hydraulic offloader consists of a transfer pump connected to the pipeline that runs from the offloader site to the receiving site. The hydraulic offloader pumps water into a scow compartment to create a slurry. An intake line feeds the transfer pump. The offloader would be equipped with fish screen to avoid entrainment of fish.

Typical infrastructure at the transfer (offloader) site is as follows (Moffatt & Nichol 2015):

- Mooring dolphins[10] with navigation lights
- The hydraulic offloader mounted on a barge
- A pipeline, which transports the material from the offloading site to the receiving site

[9] An environmental bucket is a special type of clamshell bucket that is fully enclosed and therefore retains most of the water and loose sediments generated during each cut.

[10] Mooring dolphins are small groups of piles that are tied together with cables or cap. Ships and scows are secured to the mooring dolphins with ropes or cables (i.e., moored).

- One or more booster pumps stationed along the pipeline to increase the pumping production rate, especially along pipeline routes longer than 3.5 miles, and
- Support equipment including scows, diesel generator, and site security

If the offloader and booster pumps have diesel engines then external power is not needed for these elements.

The sediment transfer pipeline would be approximately 24 to 36 inches in diameter. Positioning of the pipeline from the offloader to the dredged material placement site may require limited excavation of mud flats and tidal marsh, and/or shaping of the outboard embankment of the levee at the point of delivery to ensure that the pipeline has a sufficiently secure and level bed. Alternatively, at the point that the pipeline enters the outboard marsh, it may be laid on large wooden mats. The mats would also support any necessary ancillary equipment (e.g., booster pump) that is not placed on the levee itself, and would provide access to the pipeline for routine maintenance and inspection. The estimated work area covered by mats at the dredged sediment placement location would be no more than 2,000 square feet (40 feet by 50 feet). Any material that is excavated as part of the pipeline construction would be stockpiled on top of the outboard embankment near the dredging location and used to restore existing grade in the pipeline alignment once the sediment delivery process has been completed.

At the Eden Landing and Alviso placement sites, a booster pump would most likely be placed on the levee. The booster pumps would require regular fueling and maintenance. If access is available by land via the levees, the booster pumps would be serviced from land. Alternately, the booster pumps could be accessed from the water at high tide.

Dredging would occur 24 hours/day, 7 days a week during the 180-day dredging window. The dredging window was established by Bay Area regulatory and resource agencies to protect sensitive species that may be present at other times. The dredging window extends from June 1 through November 30. The estimated production rate for a clamshell dredge delivering to SF-DODS, Cullinan, and Montezuma is approximately 3,700, 5,300, and 4,300 cy/day, respectively. The Project's dredged sediment delivery rate to Eden and Alviso cannot be estimated at this time because the limitations on off-loading have not been defined. However, because the two sites are much closer to the dredging location, the daily production rate would likely be considerably higher than for the three currently-permitted sites. The theoretical production rate (if the dredging rate is not constrained by limited availability of scows or air emissions) is 10,000 cy/day, and delivery to both Eden Landing and Alviso may achieve this rate. A hydraulic cutterhead dredge could potentially yield a daily production rate of 12,000 – 15,000 cy/day, or more. The Alviso Ponds site may be able to accept sediment delivered at this rate; however, the Eden Landing ponds are likely to have some limitations on the ability to manage decant water from dredging. Consequently, a daily production rate of 10,000 cy was assumed for both Eden Landing and Alviso.

If the dredge is diesel-fueled it would typically be fueled at the dock every 3 – 4 weeks; alternatively if the dredge is too far from the dock to make returning to the dock economical, a licensed contractor may be used to deliver fuel scow to the dredge. The same would be true for the equipment used to relocate the pipelines. Booster pumps and offloaders would most likely be fueled by fuel scow. All fueling operations would comply with USCG, State lands Commission and CDFW's Office of Spill Prevention and Response requirements, as applicable. Some of the offloading equipment could be electrically-powered.

Available scows in the Bay Area range in capacity from less than 1,000 cy to as much as 6,000 cy. Due to the limited availability of 6,000 cy scows the Project would plan on using 4,000 cy scows. These scows have a typical draft of 18 feet. Scows would be loaded to 90 percent capacity for destinations within San Francisco Bay, and to 80 percent capacity for travel to SF-DODS[11]. Estimated travel times for loaded and unloaded scows are discussed in ***Appendix A,*** Air Quality and Greenhouse Gases.

***Table 4-2*** summarizes the placement site operations assumptions for each placement site. The dredging and placement sites are described in more detail in the following sections.

[11] A large percentage of the scow volume would be taken up by water, especially if no overflow is allowed. The cost estimate assumes that the scows would transport 1,600 cy (in place volume) per trip to SF-DODS, and 1,800 cy/trip to Cullinan or Montezuma.

**Table 4-2. Placement Site Operations**

| Placement Site | Dredging Process | Delivery Process | Required Offloading Facilities to be Provided by Project | Offloading Facilities Provided by Placement Site |
|---|---|---|---|---|
| Cullinan | Clamshell | Barge to offloader; pump to site | Option 1: Offloader and approximately 4,300-4,500 feet of pipeline, depending on off-loader location. Booster pump not required. | Option 2: Cullinan site provides offloader and pipeline. (Cullinan would charge increased tipping fee.) |
| Montezuma | Clamshell | Barge to offloader, then pump to site | None | All |
| SF-DODS | Clamshell | Bottom dump | N/A | N/A |
| Eden Landing Ponds | Option 1: Clamshell<br><br>Option 2: Cutterhead | Option 1: Barge to offloader, then pump to site<br>Option 2: Direct pumping from cutterhead dredge | Option 1: Offloader and approximately 3.5 miles of pipeline. 1 or 2 booster pumps required.<br>Option 2: Approximately 6 miles of pipeline from cutterhead in RWC Harbor to placement site. 2 booster pumps required. Up to 16 miles of pipelines from cutterhead in SBS Channel to placement site. Multiple booster pumps required. | None at Present (TBD) |

| Placement Site | Dredging Process | Delivery Process | Required Offloading Facilities to be Provided by Project | Offloading Facilities Provided by Placement Site |
|---|---|---|---|---|
| Alviso Ponds | Option 1: Clamshell; or Option 2: Cutterhead in RWC Channel and Clamshell for SBS Channel | Option 1: Barge to offloader, then pump to site<br>Option 2: Direct pumping from cutterhead dredge in RWC Channel; barge SBS Channel sediment to offloader, then pump to site | Option 1A: Offloader and approximately 4 miles of pipeline to Pond A2W. 2 booster pumps required.<br>Option 1B: Approximately 9 miles of pipeline from cutterhead in RWC Channel to placement site. Multiple booster pumps required. SBS Channel sediment would require use offloader and pipeline.<br><br>Option 2A: Offloader and approximately 6 miles of pipeline to Pond A9. 3 booster pumps required.<br>Option 2B: Approximately 11 miles of pipeline from cutterhead in RWC Channel to placement site. Multiple booster pumps required. SBS Channel sediment would require use offloader and pipeline. | None at present (TBD) |

Staging for dredging activities would be within the Port of Redwood City. The staging area may include storage of equipment and materials, parking for workers, and other necessary support functions. Employees would be transferred to the dredge operations in a crew boat from within the Port or a near-by marina. Crews would contain 16 to 18 workers and would work 12 hour shifts.

Although any accumulated maintenance dredging material would be dredged as part of the deepening process, environmental impacts associated with dredging, transporting, and disposing of maintenance dredging sediment are addressed in the Maintenance Dredging of the Federal Navigation Channels in San Francisco Bay Fiscal Years 2015–2024 Environmental Assessment (EA)/EIR prepared by USACE (USACE and RWQCB 2015). Maintenance "episodes" have separate authorizations from dredging projects that involve deepening, and all maintenance dredging is evaluated with respect to NEPA and CEQA. Consequently, this document does not evaluate the impacts associated with the current level of maintenance dredging. Post-construction maintenance dredging is discussed below.

#### 4.2.3.4 *Fuel Pipeline Relocation*

The SBS Channel overlays three fuel pipelines (***Figure 2-1***). They consist of a 10-inch diameter inactive Shell petroleum line,[12] and 10-inch and 12-inch active Kinder-Morgan petroleum lines. There are three possible construction methods for relocating the three fuel pipelines crossing SBS Channel to a deeper depth. The alignment would not change, or would shift only as much as needed to ensure safe working conditions around the existing fuel pipelines. The three potential methods are:

- Trenching using a clamshell dredge
- Directional drilling, and
- Using a "jet sled" (also referred to as a "jet skid")

These three methods are described below, and all three methods are evaluated in this document. The preferred method would be chosen during the design phase, and would consider environmental effects, cost, and required equipment. USACE would coordinate with the Resource Agencies as well as Kinder-Morgan and Shell to ensure pipeline work is performed safely and in an environmentally sound manner.

In all cases, the pipelines would be lowered to a depth such that the top of the pipeline is a minimum of 6 feet below the maximum depth of the channel[13] as presently understood as appropriate to address safety requirements. For the two methods involving trenching, the pipeline would first be covered with three feet of sand, and then two feet of armor rock for

[12] This pipeline may be abandoned. If so, the work would be reduced to simply cutting and removing the section of the pipeline crossing the channel.

[13] The maximum depth would be the authorized depth (-32 feet MLLW, -34 feet MLLW, or -37 feet MLLW) plus two feet of overdepth.

protection. The remaining depth of the channel pipe trench, and the entire pipe trench outside of SBS Channel would be allowed to fill in naturally with sediment. For directional drilling, the pipeline would be lowered to a sufficient depth such that no sand armor rock protection would be required.

Up to 2,500 feet of each existing pipeline would be replaced and deepened (the 500 feet located below SBS Channel and up to 1,000 feet on either side). Several barges would be required to deliver and lay the pipe. Installation of the replacement pipeline sections would require working from derrick barges. Pipe would most likely be delivered in 100- to 250-foot lengths and welded together on the barge. The pipe would be lowered into the water using a roller system, and the barges would be moved ahead using anchors.

At the end of the replacement sections, the replacement sections would be tied into the existing pipelines. The old pipeline sections would be cut and removed. For the Kinder-Morgan pipelines, one pipeline would continue to operate while the other pipeline is being worked on. The Shell pipeline is inactive. A total of up to 7,500 feet of pipelines would be installed, and up to 7,500 feet of pipelines would be removed.

#### 4.2.3.4.1 Pipeline Tie-In

The replacement pipeline segments could either be tied into the existing pipelines in situ, or above water. The existing pipelines, or a portion of the pipelines that could be isolated, would first be emptied and made inert by purging the empty pipelines of explosive gases, as needed. At the tie-in location, the existing pipelines would be cut, and the new pipeline segments would be welded to the existing pipelines. Once both ends of the replacement pipelines have been connected to the existing pipelines, the existing pipelines under the SBS Channel would be removed. The tie-in process would require approximately one month at each end and tie-ins at the two ends may be performed concurrently to expedite the return of the pipelines to active service. Staging of equipment and materials would occur either at the former Shell dock at San Francisco Airport or at the Brisbane Marina. Workers would be transferred from the staging area to the work area by boat. Tie-in activities would be contained either on a barge (above water tie-in process) or within a dewatered area (in situ tie-in process) to ensure that no petroleum products enter the Bay.

**Pipeline Tie-In Above Water**

If the tie-in is done above water, a sufficiently-long portion of the pipe would be exposed to allow the center of the pipeline to be lifted onto a barge, and cutting and welding operations would occur on the barge. The pipeline sections on both sides of the channel would be exposed by using high pressure water to “jet” the soil away from around the pipeline. This is a commonly used method because it is safer than using a clamshell bucket or an excavator to dig around the buried pipeline.

It is estimated that approximately 1,000 feet of buried pipeline on both sides of SBS Channel would need to be uncovered in order to safely lift the pipeline out of the water and onto a work barge without damaging or kinking the pipeline. Once the pipeline is secured on the work barge, the existing pipeline would be cut and connected to the new section of pipe that will be laid into the newly excavated trench. (The trench would be parallel to the existing pipeline). The cut would be made in an area with appropriate secondary containment and spill response equipment in case there is some residual petroleum product in the pipeline after it was emptied and inerted.

Once the connection is made, the pipeline would be lowered into the prepared trench. This process would be repeated at the other end of the trench where the other connection will be made. After the pipeline has been pressure tested for leaks and certified, it would be covered with sand and armor rock as described above.

**Pipeline Tie-in in Situ**

If the pipeline connection is made in situ, the work area would have to be dewatered. A temporary cofferdam, most likely constructed of steel sheet pile, would be installed at both ends of the pipeline to isolate the area within the work area. Each cofferdam would be located in the shallowest area away from SBS Channel on either side and within 1,000 feet of the channel. Based on current San Francisco Bay National Oceanic and Atmospheric Administration (NOAA) charts, these cofferdams would be in water that is approximately 25 to 29 feet deep. The cofferdam work area would be approximately 10 feet wide by 100 feet long. Once both of the cofferdams are in place and the work areas are fully isolated, each cofferdam would be dewatered. Excavation would then be conducted to expose the end of the replacement pipeline and the existing pipeline. Appropriate secondary containment would be provided in the ara where the cut is to be made, and spill response equipment would be on hand in case there is some residual petroleum product in the pipeline after it was emptied and inerted. Because the cut would be made within the dewatered area, any residual petroleum could readily be contained and prevented from entering the Bay.

The excavated material would be loaded into scows and hauled to the same placement site as the channel deepening material. Once the pipe connection is made, the pipeline would be pressure tested and certified.

#### 4.2.3.4.2 Clamshell Trenching

Clamshell trenching construction would use a clamshell dredge to excavate a trench adjacent to the existing pipeline trench. Excavated sediment would be placed into barges, and disposed of at the same location as the sediment dredged from SBS Channel. The replacement pipelines would be laid into the trenches, covered with 3-feet of sand, and then a 2-foot thickness of armor rock would be placed over the sand, and the remaining foot of trench would naturally backfill over time with sediment. The estimated trench width would be 5 -feet for the Shell pipeline and 10-feet for the two Kinder-Morgan pipelines (both Kinder-Morgan pipelines would be placed into the same trench). The bottom of the trench would be between -40 feet MLLW and -45 feet MLLW; the maximum depth of the trenches would be 6.5 feet below project depth in the SBS Channel and would be as shallow as 2 feet deep in the areas adjacent to SBS Channel. Existing permits for the pipelines require the pipelines to be located at or below depth of -42 feet MLLW below the bottom of SBS Channel, and the current elevation of the pipelines is out of compliance with the permits. The depths discussed in this document is based on establishing a safe distance between the maximum depth of the channel and the top of the pipelines.

The trenches would have estimated side slopes of 2:1 (Horizontal:Vertical). The estimated volume of sediment to be excavated for both of the trenches would range from 8,000 cy to 12,000 cy, depending on the depth of the existing pipeline outside of the SBS Channel. The trenches would range from 12-feet wide to 26-feet wide at the top of the Kinder-Morgan trench and 7-feet wide to 12-feet wide at the top of the Shell trench. The material excavated from the trench would be taken to the same location as the material excavated from SBS Channel.

Trench construction would require a total of 5 to 10 days, depending on the depth and length of the trenches. The Contractor would use the same dredge plant and scows that they would use for channel deepening dredging activities. It is assumed that the trenching would occur during the same time period as the deepening to avoid additional relocation construction costs and additional mobilization and demobilization of equipment. Backfilling the trench once the ends of the relocated segment have been tied into the existing pipeline would require another 5 to 10 days. The total construction period would therefore be 2 to 3 months per pipeline segment, depending on whether both ends of the pipeline are tied in at the same time.

#### 4.2.3.4.3 Directional Drilling

Directional drilling is an alternative to in-water construction. Directional drilling would occur from a water-based staging area in San Francisco Bay (the shorelines are too far away to allow for directional drilling from the shoreline). Directional drilling would not require trenching, but would require exposing the existing pipeline at both ends of the replacement segment to tie-in the replacement segment. The pipeline could be installed to any desired depth, and may be installed more deeply than the minimum depth required by law. More desirable (denser and more consistent) materials may exist deeper below the channel, which may offset the possibility of requiring additional drilling operations should caving or flowing of sands be encountered while drilling at shallower depths. Directional drilling offshore usually consists of three steps: barge/platform preparation, borehole drilling, and pipeline pull back through the drilled hole to the pipeline re-attachment location

The borehole is drilled from the entry point to the exit point following a previously designed profile and alignment. During borehole drilling, a directional guidance system is used to navigate the hole along its pre-designed profile. In some cases the borehole is drilled as a pilot hole, and pilot hole enlarging, known as “pre-reaming,” would be necessary. Pre-reaming would be implemented to provide a borehole diameter large enough so that the pipeline can be installed in the drilled crossing. Once the drilled hole is appropriate for size of pipe to be placed, the pipe is pulled back hydraulically through the hole with the drilling equipment to the reconnection location. The pipeline may be pre-assembled in a single string and placed on rollers prior to pullback. For pullback, a reamer is connected to the drill pipe. The drill pipe is then pulled back towards the entry point until the pipeline is fully installed (USFWS 2015).

##### 4.2.3.4.4 Jet Sled Construction Process

The replacement pipeline sections could also be installed using the "jet sled" method of construction. A jet sled is a piece of equipment that is launched by crane from a barge, and travels along the bottom of the water body on skids. The pipeline is first laid on the Bay bottom, and the jet sled travels over the pipeline. The jet sled uses adjustable width water jets placed on either side of the pipe to slurry sediment in the pipeline alignment, and dredge pumps to suction the slurried sediment out of the pipeline alignment, thereby opening up a trench. The sediment is discharged to either side of the pipeline alignment, and the pipeline sinks into the open trench. Depending on the type of pump used to suction the slurried sediment, the slurried sediment could contain from 10 percent to as much as 40 percent solids.

The trench would have the same dimensions as that for the clamshell construction method. Trench construction would require 150 to 300 days per pipeline segment to cross SBS Channel, depending on the depth of the trench, for a combined total of 300 to 600 days to install just the portion of the pipelines underneath SBS Channel. If the entire 2,500-foot segment of pipeline is excavated using this method, the duration would range from 25 to 50 months per pipeline segment, or a total of 50 to 100 months for both pipelines.

#### 4.2.3.5 *Berth Deepening and Wharf Strengthening*

As discussed above, to take advantage of the deeper channel, berths have to be deepened by a corresponding amount. The berth depths currently range from -23.2 feet MLLW to -29.0 feet MLLW. Maintenance dredging of Berths 1 through 4 is planned for late 2015 and 2016. The Port has recently upgraded Wharves 1 and 2, which are the wharves used with Berths 1 and 2. Berths 1 and 2 can safely be deepened to -40 feet MLLW, which would correspond to a channel depth of -36 feet MLLW.

The wharves at Berths 3 and 4 are currently being studied to determine whether additional strengthening of the wharves is required to allow the berths to be deepened. If required, wharf strengthening could include improving the existing fendering systems (which would require little or no in-water construction, and would transfer the potential load from vessels to the fenders rather than the wharves), driving additional piles, or installing a cutoff wall to reinforce the slope beneath the wharves. Berth 5 would not be deepened. No current or future maritime cargo related projects are under consideration for Wharf 5. Cargo statistics over the past 20 years show virtually no cargoes to Wharf 5. For the purposes of this document, it was assumed that no wharf improvements are required to ensure that the wharves continue to meet existing geotechnical stability criteria.

The estimated volume for berth deepening for Berths 1 through 4 combined is 17,000 cy for deepening commensurate with a -32 foot MLLW channel depth, 34,000 cy for a channel depth of -34 feet MLLW, and 60,000 cy for a channel depth of -37 feet MLLW.

#### 4.2.3.6 *Post-Construction Maintenance Dredging*

There would be increased maintenance dredging associated with the proposed deepening of the two channels. Estimated annual maintenance dredging for RWC Channel would increase by up to 93,000 cy for an estimated total annual maintenance dredging volume of up to 276,000 cy if the channel is deepened to -37 feet MLLW (***Table 4-3***).

***Table 4-3. Estimated Annual Post-Construction Maintenance Dredging Sediment Volume***

| | Annual Volume (cy)[1] | | |
|---|---|---|---|
| | Dredging Option A | Dredging Option B | Dredging Option C |
| Sediment Source | -32 feet MLLW | -34 feet MLLW | -37 feet MLLW |
| RWC Channel Existing Maintenance Dredging Volume | 183,000 | 183,000 | 183,000 |
| RWC Channel Post-Construction Increase in Maintenance Dredging | 24,000 | 51,000 | 93,000 |
| SBS Channel Existing Maintenance Dredging Volume | 3,000 | 3,000 | 3,000 |
| SBS Channel Post-Construction Increase in Maintenance Dredging | 1,000 | 2,000 | 2,400 |
| TOTAL Post-Construction Maintenance Dredging | 211,000 | 239,000 | 281,000 |

The estimated increase in maintenance dredging at SBS Channel would be up to 24,000 cy every 10 years (SBS Channel is currently dredged on approximately a 10-year cycle). The combined volume would represent a 13 to 51 percent increase over the historical maintenance dredging volume for the federal channels.

The estimated annual maintenance dredging requirement for the RWC berths would be expected to increase by a similar percentage, i.e., by up to 7,500 cy annually. Thus the total annualized increase in maintenance dredging of channels plus berths would be up to an estimated 102,500 cy. The placement site for maintenance dredging sediment would be selected based on cost and proximity, and would most likely be SF-11 (Alcatraz). SF-DODS could also be used. Eden Landing (once permitted) and Alviso (once permitted) could also be used, as well as other sites as they become available over time.

As discussed above, maintenance dredging is an on-going program performed by the USACE, and subject to separate CEQA/NEPA analysis. Berth dredging, which is the responsibility of the Port, would typically occur separately from channel maintenance, and would be subject to CEQA review and permitting.

**Redwood City Channel**

RWC Channel would typically be dredged every 1-2 years. The sediment would be placed at SF 11 (Alcatraz), which is preferred for cost reasons, or any other cost-effective permitted placement site. The most likely dredging process would be a clamshell dredge (USACE and RWQCB 2015); however, the material could also be dredged with a cutterhead dredge if a permitted site with sufficient capacity is available close enough to RWC Channel (e.g., if the Eden Landing site becomes available) and the sediment meets the chemical quality criteria established for the site. The expected daily production rate would be 3,000 – 6,000 cy. Dredging would occur during the established work window (June 1 through November 30) only. The dredged sediment is expected to be consistent with current material (i.e., more than 80 percent fines).

**San Bruno Shoal Channel**

SBS Channel would typically be dredged every 10 years. As with RWC Channel, the sediment would be placed at SF-11 (Alcatraz), which is preferred for cost reasons, or any other cost-effective permitted placement site. SF-DODS is considered a possible placement location for maintenance sediment from SBS Channel. The most likely dredging process would be a clamshell dredge; however, the material could also be dredged with a hopper dredge, if available. The expected daily production rate would be 3,000 – 6,000 cy for a clamshell, and 7,000- 8,000 cy for a hopper dredge. Dredging would occur during the established work window (June 1 through November 30) only. The dredged sediment is expected to be consistent with current material (primarily fines with some sand).

While the project would result in an increase in the *volume* of maintenance dredging for the authorized project, the associated environmental *impact* would be insignificant because the deepened Project would be maintained under the LTMS policies, and maintenance dredging and disposal associated with the Project would be consistent with the LTMS program.

#### 4.2.3.7 *Post Construction Operational Changes*

Following completion of the deepened channel and berths, vessels would be able to enter the Port without waiting as long for the proper tides, or be able to enter the Port more heavily loaded. The overall cargo volume is not expected to increase in response to the deepened channel; however, as described in ***Chapter 2***, cargo growth is expected to continue commensurate with overall economic growth in the area. However, because the deeper channel would allow more heavily-loaded vessels to enter the Port, relatively fewer vessel calls would be required to accommodate the growth than under the No Action/No Project condition.

Many factors affect harbor growth and competitiveness, such as land-side development and infrastructure, location of distribution centers for imports, source locations for exports, population and income growth and location, Port logistics and fees, business climate and taxes, carrier preferences, labor stability or volatility, and business relationships. Harbor depth is just one of the many factors involved. USACE analyses, which have included consideration of commodity forecasts, competing ports, port capacities, and land side costs to hinterland origins and destination, proved to a reasonable degree that deepening of a particular harbor would have little to no effect on the total amount of cargo shipped through that Port.

Annual cargo volume through the Port is highly variable and dependent on the status of the economy. USACE has determined that based on projected future growth in the region, annual growth would average 2.8 percent. Over the past 13 years, the total number of vessels calling at the Port has ranged from a low of 47 in Fiscal Year 2010 to a high of 156 in Fiscal Year 2005. In Fiscal Year 2014, 89 vessels called at the Port. A significant number of the vessel calls, ranging from 23 to 68 percent, are barges that are used to lighter ships before they come into the Port. In calendar year 2014, 40 percent of the vessel calls were barges. Barges are shallow draft vessels, and deepening the channel would not affect the economics of using barges; however, the number of barges required to deliver a specified volume of cargo to the Port would decrease with increasing channel depth (reduced lightering of cargo).

Approximately 2 barge calls per month are associated with lightering aggregate cargo; the remaining barges are used to deliver sand from in-Bay sand mining operations (one scow per month, on average), and deliver miscellaneous materials on a very infrequent basis (4 to 5 barges per year). With the deeper channel, less lightering would be required, and the total number of vessel calls and barge calls is projected to decrease initially, although the total tonnage shipped through the Port would be expected to continue to increase over time. A shift to larger vessels would also occur; this shift would be more pronounced with deeper channel depths.

***Table 4-4*** shows the post-construction deep draft vessel call projections for 2018 (estimated start of construction) and 2025. With the forecast growth rate of 2.8 percent, the Port would reach a forecast cargo throughput of 2.5 million tons/year in 2025. \. Increases in cargo throughput capacity would be due to infrastructure improvements, and are not affected by the proposed deepening of the channels. The environmental effects of the increased capacity provided by Phases 1 (complete) and 2 of the Wharves 1 and 2 Reconstruction Project were addressed in the EIR for that Project (Port of Redwood City 2010) and are not analyzed further in this document. With completion of Phase 2, the Port would have an estimated combined annual capacity of 2.5 million tons of sand and aggregate. The Port also has permitted, existing capacity for 850,000 tons of cement, 300,000 tons of gypsum, and is capable of exporting up to 450,000 tons of scrap metal per year. The Port is not currently contemplating any other projects to increase capacity beyond these capacity thresholds. The Port estimates that current aggregate barge calls would be cut in half with deepening to -32 feet MLLW, and that the sand and miscellaneous barge calls would remain unaffected.

***Table 4-4. Deep Draft Vessel Call Projections***

| Project Depth (MLLW) | Fiscal Year | | | |
|---|---|---|---|---|
| | 2014 (Baseline) | 2018 | 2025 | 2067* |
| -30 feet | 64 | 82 | 104 | 104 |
| -32 feet | N/A | 76 | 93 | 93 |
| -34 feet | N/A | 70 | 88 | 88 |
| -37 feet | N/A | 62 | 79 | 79 |

Note: Vessel call projections do not include barge calls (see text)
* End of project life

Increased cargo throughput would lead to a corresponding increase in activity at the Port, including an increase in off-loading equipment use, and an increase in truck movements into and out of the Port. The Port currently operates 24 hours per day when a vessel is in Port, and no changes in operating hours or Port facilities (beyond the planned implementation of Phase 2 of the Wharves 1 and 2 Reconstruction Project) would be required to accommodate the projected growth. With the exception of air emissions, post-construction operational changes would therefore be the same for all alternatives, including the No Action/No Project Alternative. Changes in truck traffic, noise, and related effects associated with projected cargo growth from the Wharves 1 and 2 Reconstruction Project were addressed in that Project's EIR and mitigation was also provided (Port of Redwood City 2010).

### 4.2.4 Overall Physical, Environmental, and Social Setting of Study Area

#### 4.2.4.1 *Dredging Sites*

##### 4.2.4.1.1 Redwood City Harbor Channel

The Port of Redwood City is approximately 18 nautical miles south of San Francisco on the western side of South San Francisco Bay. It provides deep-draft access to the mid-Peninsula and San Jose metropolitan areas. The Port is situated within the confines of Redwood Creek. Redwood Creek is a year-round flowing stream located in the eastern part of Redwood City, and approximately 3.5 miles from downtown Redwood City, in San Mateo County, California. RWC Channel extends from deeper water in South San Francisco Bay into Redwood Creek and consists of the Harbor Entrance Channel, the Outer Turning Basin, Connecting Channel, the Inner Turning Basin, and Inner Channel. The Inner Channel primarily supports recreational craft, and is currently not maintained by the federal government (USACE and RWQCB 2015). Approximately 21,000 feet of the channel would be deepened as part of the RWC Project. The channel and turning basins range in width from 300 feet to 900 feet. Maintenance dredging of the Entrance Channel, Outer Turning Basin, Connecting Channel, and Inner Turning Basin is typically performed every one to two years using clamshell-bucket equipment. These areas were partially dredged in 2014. Dredging to the full authorized depth of – 30 feet MLLW will be completed in 2015. Dredged material from Redwood City Harbor has typically been more than 80 percent fines, and been placed at the SF-11 (Alcatraz) in-Bay disposal site. RWC Channel was last deepened more than 50 years ago, in 1962 (USACE and RWQCB 2015).

Sensitive habitat is present at Bair Island and Greco Island west and east of RWC Channel. Bair Island is an approximately 2,600-acre complex of former tidal salt marsh which has been restored to tidal action. Greco Island is reported to be the largest remaining prehistoric tidal marsh in South San Francisco Bay, covering a total area of 817 acres.

#### 4.2.4.1.2 San Bruno Shoal Channel

SBS Channel is a 30,000-foot channel located in open water in central South San Francisco Bay, in unincorporated San Mateo County. It is 500 feet wide, and is located approximately 2.5 miles east of the western shoreline of the Bay, and 6 miles west of the eastern shore of the Bay. The southern-most point of SBS Channel is approximately 4 miles north of the San Mateo Bridge. SBS Channel is dredged using a hopper dredge at 10-year intervals or greater, and was last dredged in 2005 (USACE 2014a).

The SBS Channel overlays three fuel pipelines (***Figure 2-1***), as described above. Subsurface utility locating information indicated that the inactive Shell petroleum line was located between 3.8 and 6.2 feet below the bottom of the channel; the channel in this area had a bottom elevation ranging from -30 feet MLLW to -33 feet MLLW.

The Kinder-Morgan petroleum lines were located in the horizontal plane; however, the subbottom profiling was unable to confidently determine the pipeline depths. A filled-in trench ranging from 20 to 30 feet in width was found, with the bottom of the trench at depths between 2.8 and 6.8 feet below the bottom of the channel. While it is assumed that the pipelines would have been laid into the bottom of the trench, no pipeline could be confidently located within the trench. Channel depths in this area ranged from -29 feet MLLW to approximately -33 feet MLLW. The eastern approximately 215 feet of pipeline in the channel could not be surveyed. The channel bottom materials changed, and sub-bottom profiling was unsuccessful. Divers confirmed that dense armor rock was present in this area at depths ranging from 1.8 to 3 feet below the bottom of the channel. In the center of the channel divers were able to probe through the armor rock and locate two pipelines approximately 5 feet below the bottom of the channel. The pipelines were separated about 5 feet. A secondary reflector of unknown source was consistently found at depths of approximately 15 feet below the channel bottom (Fugro and HDR 2014).

The permits for the fuel pipelines indicate that the pipeline owners were required to place the pipelines at depths of -42 feet MLLW or greater. The current pipeline elevations are therefore out of compliance with the permits. Because it has not been determined who will be responsible for relocating the pipelines, the environmental effects of relocating the pipelines are evaluated in this document for completeness.

### 4.2.4.2 *Placement Sites*

This section discusses the Cullinan, Montezuma, SF-DODS, Eden Landing ponds, and Alviso ponds placements sites.

#### 4.2.4.2.1 Cullinan Ranch Tidal Restoration Project

The Cullinan Ranch Tidal Restoration Project is an approximately 1,575-acre wetland restoration site located in western-most Solano County between State Highway 37 on the south and Dutchman Slough on the north. The site is owned by the USFWS and is part of the San Pablo Bay National Wildlife Refuge. Cullinan was formerly used as ranch land. The site is being restored to tidal marsh, and is subsided up to 6 feet below tidal marsh elevation. The majority of the Cullinan site was breached to tidal action on January 6, 2015. The breached portion of Cullinan is expected to remain open water habitat for several decades, and complete tidal marsh development may require 60 to 100 years.

The site is bordered by managed ponds that are part of CDFW's Napa Sonoma Marshes State Wildlife Area to the west, and Guadalcanal Village Restoration Site, another tidal restoration site (currently owned by CalTrans), to the east. Immediately north of Dutchman Slough, a tidal slough that is approximately 250 feet wide, is Pond 3. Pond 3 is a tidal marsh restoration area (also part of CDFW's Napa Sonoma Marshes State Wildlife Area) that was breached in 2006. State Highway 37 borders the site to the south.

Dutchman Slough is fringed with very narrow bands of tidal marsh along its margins; wider bands are found near the mouth of Dutchman Slough along the east side of Pond 3. Guadalcanal Village was restored to tidal action by Caltrans as mitigation for their Highway 37 improvement project, and is intended to accrete to tidal marsh.

To accelerate habitat formation at the Cullinan site, the eastern-most 290-acre area was diked off and permits were obtained by USFWS to receive dredged material. This portion of site has a capacity of 3 mcy of dredged sediment and is expected to be available until approximately 2020 (R. Lowgren personal communication 2015a). Cullinan is currently in the process of extending its permit to allow it to receive up to 9 mcy of dredged sediment.

The site can accept both surface (wetland cover) and foundation (wetland non-cover) quality sediment. Wetland foundation material would have to be covered with three feet of wetland surface material (R. Lowgren personal communication 2015b). While the site itself is configured to receive dredged sediment, no offloading facilities have been constructed. Offloading facilities could be provided either by the Cullinan project, or the project delivering dredged sediment. The tipping fee for site use would vary depending on whether the dredging project or the Cullinan project provides offloading operations. Sediment transport to the site would require two 4,000-cy scows and two 1,800-hp hauling tugs. The estimated travel time to the site is 6.1 hours. Scows would moor at the offloading facility while sediments are being unloaded.

The permits for the site allow for two offloader locations in the Napa River, north and south of the mouth of Dutchman Slough (see ***Figure 4-4***). The offloader locations are approximately 1 mile east of the receiving location for dredged sediment, and pipeline corridors for sediment delivery pipelines are also included in the permit. The offloader locations are located in deeper water to allow the use of large scows when delivering sediment to the site. Scows with a capacity of up to 6,000 cy/18-foot draft are acceptable, although navigation considerations may limit the practical size to 4,000 cy. The northern offloader location is less subject to currents than the southern location; the advantage of the southern location is that it is close to Mare Island, and electrical power could be provided from Mare Island to the southern offloader. If power is supplied to the southern offloader, the power line would most likely be installed on temporary power poles. A small substation would be located at the offloader to step down the power to a voltage usable by the offloading equipment.

The stationary offloader would be on a floating 6,000-square-foot platform held in position by two stake supports (18- to 24-inch diameter spuds). Additionally, up to three temporary mooring piles may be driven to accommodate scows and scows. These piles would be either pipe steel or wooden marine piles, typically used for this application. The permitted work area around the offloader is 200 feet by 400 feet. The sediment would be slurried and pumped to Cullinan Ranch through a High Density Polyethylene pipeline. The pipeline would float on the surface of the water along the edge of Dutchman Slough and would be anchored with small dead weight anchors to prevent wandering. If the pipeline crosses a navigable area, weights would be used to hold down and anchor the pipe to the bottom of the channel so boat traffic can proceed unimpeded. Appropriate signage and night-time lighting would be placed on the offloader, spuds and moorings in accordance with the requirements of the USCG (SLC 2012).

Impacts from *use* of this site would occur whether or not the site was used for RWC Project sediments, because it is being used by other projects as well. Therefore, impacts associated with transporting dredged material to this site and transferring it to the top of the levee at the designated sediment delivery location are attributable to the RWC Project, whereas impacts associated with dredged sediment placement, and management are not, since they have been evaluated under separate environmental reviews and would occur independently of the RWC Project. Impacts associated with construction of the offloader, and with offloading and delivery of sediment to the site would be associated with the RWC Project if the RWC constructs the offloader, and therefore are analyzed in this Integrated Document. The analysis assumes that the RWC Project would incorporate the provisions in the Cullinan permits for offloader construction and operation into its permits for use of the site. If the offloader and pipeline are constructed by the Cullinan project, then the RWC Project would only be responsible for impacts associated with transport of sediment to the off-loading location.

#### 4.2.4.2.2 Montezuma Wetlands Restoration Project

The Montezuma Wetlands Restoration Project site is situated near Collinsville in Solano County (see ***Figure 4-4***). Montezuma is the only active wetland restoration site in the Bay Area that has site improvements and a dedicated hydraulic offloading system in place for receiving dredged material. The site can accept both surface (wetland cover) and foundation (wetland non-cover) quality sediment. It is also the only large privately-owned and operated beneficial reuse site. Restoration of wetlands at the site is being accomplished by engineered placement of approximately 17 mcy of dredged sediment to raise the subsided site to elevations appropriate for intertidal marsh. Upon completion the Montezuma project will restore approximately 1,880 acres of tidal and seasonal wetlands, and approximately 480 acres of upland buffer zone habitats at the site (ACTA 2014). Unlike most private wetland restorations, the MWRP is not being constructed as mitigation for any actions – the funding is entirely derived from tipping fees. The owner/operator is Montezuma Wetlands LLC.

The project began accepting material from the Oakland Harbor Deepening Project in December 2003. Through 2013, approximately 4.5 mcy had been successfully placed into Phase I of the MWRP. The Montezuma site has been partially restored and now provides habitat for some species of endangered plants and animals. Montezuma has a remaining capacity of approximately 12 mcy.

The site will be filled in four consecutive and hydrologically independent phases (Phases I through IV), each with its own tidal channel system and separated by phase boundary levees. The remaining capacity of Phase I is estimated to be approximately 1 mcy. Wetland foundation quality sediment, if placed into a dredged sediment cell, is placed into a subcell in the center of the sediment cell. At least three vertical feet of wetland surface quality sediment must be placed above any wetland foundation quality sediments and at least 200 lateral feet of wetland surface quality sediments must be placed between the foundation subcells and the interior cell levees to ensure that the wetland foundation quality sediments remain isolated from plants and animals.

The site has deep-water access, as well as a docking area and dredged material offloading equipment. The offloading equipment is designed for large (i.e., greater than 3,000 cy) scows. The offloading facility consists of the Liberty (an electric offloader specially designed for pumping from dredged material scows), two flat-deck mooring scows that help hold the dredge scows in place during offloading operations, and a small dock to access the Liberty. Water is mixed with sediment in the scows to form a slurry containing about 15 to 35 percent sediment. The slurried sediment is pumped by the Liberty through a 24-inch diameter pipeline to the sediment cells in the restoration area of the site. To allow use of Bay and river water for offloading (groundwater from a make-up water pond at the site is also used), the Liberty's hull intakes were equipped with fish screens when it was in use at the Hamilton Wetland Restoration Project in Marin County. The fish screens achieve an approach velocity of 0.2

ft/sec, as required for protection of Delta smelt. The two fish screens are attached directly to each side of the Liberty hull and are situated about 5 feet below the water surface at all times.

Transport to the site would require two 4,000-cy scows and two 1,800-hp hauling tugs. Scows would moor at the offloading facility while sediments are being unloaded, a process that would take about 3 hours. Travel time to the site is estimated to be 8.3 hours. The site is capable of an average rate of acceptance of 20,000 to 30,000 cy per day and peak of 60,000 cy per day (USACE and Port of Oakland 1998).

As for Cullinan, impacts from *use* of this site would occur whether or not the site was used for RWC Project sediments, because it is being used by other projects as well. Offloading impacts are addressed by the Montezuma project because the Montezuma project provides offloading services. Therefore, only impacts associated with transporting dredged material to this site are attributable to the RWC Project. Potential impacts associated with dredged sediment offloading, placement, and management have been evaluated under separate environmental reviews and would occur independently of the RWC Project.

#### 4.2.4.2.3 SF-DODS

Located about 50 miles west of the Golden Gate Bridge (***Figure 3-4***), SF-DODS is the farthest offshore and deepest (8,000 to 10,000 feet) dredged material disposal site in the United States. It is fully permitted. The site is managed by USEPA and is monitored on a regular basis in accordance with the Site Management and Monitoring Plan (SMMP) for the site. SF-DODS was designated under Section 102 of the Marine Protection, Research, and Sanctuaries Act (MPRSA) (USEPA 2014). MPRSA requires project sponsors to consider feasible, practicable, and environmentally superior alternatives to ocean disposal if they are available.

The disposal location is a 600-meter radius circle located at the center of the approximately 8.1 square mile area designated as SF-DODS. The site has characteristics of a continental slope deep benthic habitat. Sediment would be hauled to the site in large (4,000 cy) bottom dump scows with 3,000-hp ocean-going tugs (***Figure 4-8***). Sediments would be disposed of by opening the hulls of the scows to release the sediment. The estimated travel time to the site would be 9.1 hours.

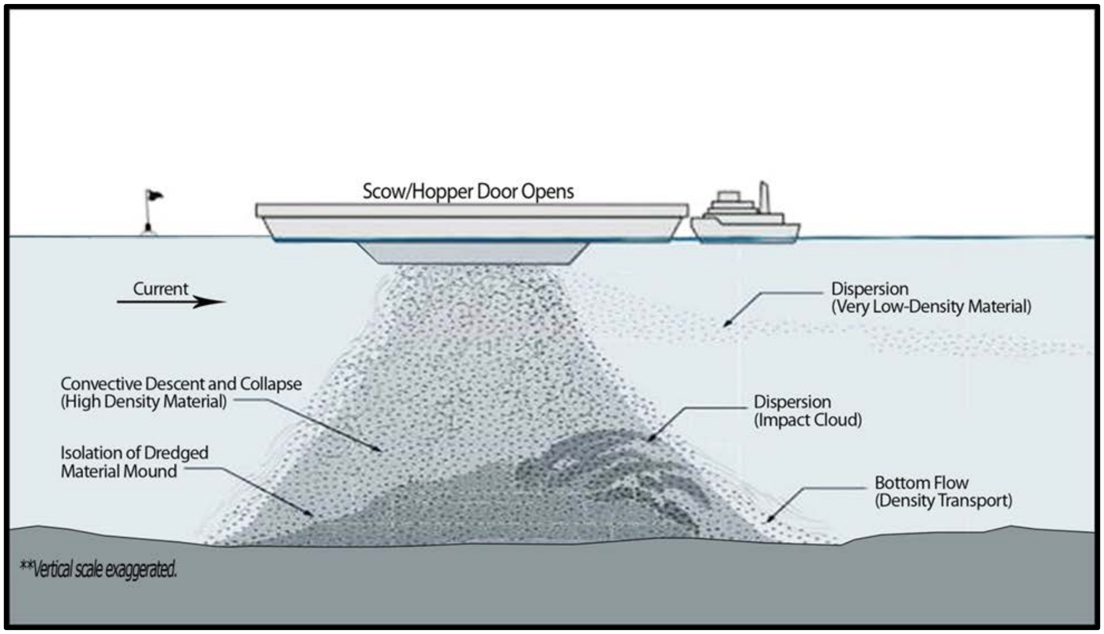


***Figure 4-8. Typical Bottom Dump Scow***

The open-water disposal that occurs at ocean placement sites is considered unconfined, meaning the dredged materials are in direct contact with the aquatic environment. Only dredged material determined suitable for unconfined aquatic disposal (SUAD) may be placed at these sites. SF-DODS is considered a nondispersive site (i.e., sediments disposed of at this location tend to remain in place) (USACE and RWQCB 2015). SF-DODS can accept a maximum of 4.8 mcy per year; therefore, this placement site could easily accept the maximum annual sediment production (approximately 1.8 mcy) from the RWC Project.

#### 4.2.4.2.4 Eden Landing Ponds

The Eden Landing ponds are considered a potential placement site. Eden Landing is the closest to both the RWC Channel and SBS Channel. Delivery to this location would reduce environmental impacts and result in a higher daily production rate for dredging. The site owner, CDFW, is interested in receiving dredged sediment to accelerate restoration of the site to tidal marsh; however, neither permits nor the infrastructure required to accept dredged sediment currently exist.

While this site is not currently ready to accept dredged sediment, it has strong support from the California State Coastal Conservancy (CSCC 2015) as well as CDFW. The SBSP Restoration Project's commitment to beneficial reuse of sediment is reflected in the recent completion of the SBSP Restoration Project Beneficial Reuse Feasibility Study (Moffat & Nichol 2015). Delivery of dredged sediment to the Eden Landing ponds could also serve as a pilot project for future delivery of dredged sediment to the Alviso Ponds.

The Eden Landing ponds are part of the Eden Landing Ecological Reserve (ELER) and part of the SBSP Restoration Project Phase 2 restoration. Phase 1 restoration actions at ELER were focused on the northern half of Eden Landing north of Old Alameda Creek. The Phase 2 actions at Eden Landing are focused on the ponds in the southern half of the complex, in the area between the Old Alameda Creek channel and the federally-constructed Alameda Creek Flood Control Channel (ACFCC). The Eden Landing ponds are within the City of Hayward, and are bordered by the town of Union City to the east.

The southern portion of Eden Landing includes 11 ponds that were divided into three groups based on their locations and their proximity and similarity to each other. The three groups are as follows:

- The Bay Ponds: Ponds E1, E2, E4, and E7 are the four large ponds closest to San Francisco Bay, and the ponds most likely to receive dredged sediment from the RWC Project.
- The Inland Ponds: Ponds E5, E6, and E6C are somewhat smaller ponds in the northeast portion of the complex, near ponds E4 and E7.
- The Southern Ponds: Also called the C-Ponds, Ponds E1C, E2C, E4C, and E5C are in the southeastern portion of the complex. They are separated from the Inland Ponds and the Bay Ponds by an Alameda County–owned freshwater outflow channel and diked marsh areas known collectively as “the J-ponds” (URS 2014a).

RWC Project sediment would be delivered to the closest Bay-front levee at Eden Landing. Pond E2 is the only pond in the Phase 2 restoration area that has a Bay-front levee. Pond E1, while close to the Bay, is separated from the Bay by a small marsh. The primary challenge in delivering dredged material to Eden Landing is the shallow water in the South Bay. While a scow can transport dredged material to within a few miles of the site, the mudflats offshore of the site are too shallow for these vessels to navigate. A water depth of at least 20 feet MLLW is preferred to accommodate large scows. To move the material the last few miles, the scow would be offloaded at a deep water transfer site (offloader) and the dredged material would then be pumped to the site by pipeline. ***Figure 2-1*** shows the preferred deep water offloader location for the Eden Landing ponds, based on evaluations conducted as part of the SBSP Beneficial Reuse Feasibility Study (Moffatt & Nichol 2015). The recommended offloader location is approximately 3.8 miles from the closest point at Pond E2 (Moffatt & Nichol 2015), and approximately 2 miles from the mouth of RWC Channel.

From the offloader, a pipeline would be laid through the shallow portions of the Bay and outboard mudflats at Pond E2. Based on the available information, it is assumed that one booster pump would be adequate to transfer material from the offloader to the Pond E2 levee. Additional booster pumps may be required if higher than anticipated percentages of sand are included in the dredged material, because sand settles faster and requires greater pumping velocities compared to finer sediments (Moffatt & Nichol 2015).

Sediment could also be delivered to the Eden Landing ponds directly from a hydraulic cutterhead dredge. A pipeline would extend from the dredge to the sediment delivery location at Pond E2. The footprint of the pipeline in the vicinity of the Eden Landing site would be the same as for the offloader pipeline. For dredging in RWC Channel, the cutterhead pipeline would extend further west (across the channel and into the dredging area). For dredging at SBS Channel, the pipeline would extend generally north and would likely parallel the natural deep water channel. If a cutterhead dredge is used, a booster pump could be located on the dredge and/or on the Pond E2 levee. Due to the greater distance, multiple booster pumps would be required if a hydraulic cutterhead is used to dredge SBS Channel; these additional booster pumps could be stationed on the Pond E2 levee and in the Bay. The alignment of any sediment delivery pipeline would avoid the two eelgrass beds located offshore from the northern edge of Pond E2.

While the EIR for Phase 2 restoration of Eden Landing has not been completed, it is anticipated that Eden Landing would only be able to accept sediment that meets criteria for wetland surface use. The maximum estimated sediment capacity of the Eden Landing Phase 2 restoration is 7.2 mcy. The maximum capacity for Ponds E1 and E2 combined is 3.4 mcy; the maximum capacity for Ponds E1, E2, E4, and E7 combined is 4.7 mcy. Eden Landing thus has the potential flexibility to accept the majority of the wetland surface quality material from the RWC Project; the small amount of excess material and any sediment that does not meet wetland surface criteria would have to be taken to another site.

#### 4.2.4.2.5 Alviso Ponds

The Alviso ponds are also considered a potential placement site. While slightly farther from RWC than the Eden Landing ponds, this site is much closer to both RWC Channel and SBS Channel than any of the permitted sites, and has a large capacity to accept sediment. The site owner, USFWS, is interested in receiving dredged sediment to accelerate restoration of the site to tidal marsh; however, as for Eden Landing, neither permits nor the infrastructure required to accept dredged sediment currently exist. Because some of the ponds are deeply subsided, less infrastructure may be required to manage decant water from sediment than at Eden Landing. Some of the ponds in the Alviso pond complex have elevated sediment mercury concentrations (a legacy of historic mercury mining operations upstream of the area). As for Eden Landing, the SBSP Restoration Project is committed to beneficial reuse of sediment at the site (CSCC 2015).

The Alviso Pond Complex consists of 25 ponds on the shores of the South Bay in Fremont, San Jose, Sunnyvale and Mountain View, within Santa Clara and Alameda counties. The pond complex is bordered on the west by the Palo Alto Baylands Park and Nature Preserve and the City of Mountain View's Charleston Slough; on the south by commercial and industrial land uses, Mountain View's Shoreline Park, the National Aeronautics and Space Administration (NASA) Ames Research Center, and Sunnyvale Baylands Park; and on the east by Coyote Creek in San Jose and Cushing Parkway in Fremont.

Three groups of ponds within the Alviso Pond complex could potentially receive dredged sediment. Two of these groups (Ponds A1 and A2W, and Ponds A5- A8S) are part of the Phase 2 restoration program for the South Bay Salt Ponds.

- Ponds A1 and A2W, referred to as the Mountain View Ponds, are on the western edge of the Alviso Pond Complex. The City of Mountain View lies immediately to the south, and Charleston Slough and the Palo Alto Flood Control Basin lie to the west. Ponds A1 and A2W are separated by Mountain View Slough (also known as Permanente Creek). Stevens Creek lies to the east of Ponds A2W. The ponds comprise approximately 625 acres, and have an estimated 8.2 mcy dredged sediment capacity. These ponds are the most likely to be restored in Phase 2, and are the closest to the RWC Project dredging locations.
- Ponds A5, A7, A8 and A8S are located in the southern central portion of the Alviso Pond Complex, and referred to as the A8 ponds. They are west of the town of Alviso, and north of Sunnyvale and State Route (SR) 237. They are located between Guadalupe Slough to the west and Alviso Slough to the east. Ponds A8 and A8S were also included in the SBSP Restoration Project Phase 1 work; they were made reversibly tidal through installation of a gate that opened in July 2010 (CSCC and USWFS 2015, in review). Although Ponds A8 and A8S were part of Phase 1 restoration, pursuant to the Adaptive Management Plan for the SBSP Restoration Project, they are also included in Phase 2.[14] Ponds A5 – A8S comprise approximately 1,440 acres, and have an estimated 17 mcy dredged sediment capacity.
- Ponds A9 – A15 are located in the east portion of the Alviso Pond Complex. Restoration of Ponds A9-15 is part of the TSP (and Locally-Preferred Plan) for the South San Francisco Bay Shoreline Study (USACE 2014a).[15] The ponds are located north and west of the town of Alviso, between Alviso Slough and Coyote Creek. The ponds comprise approximately 2,100 acres, and have an estimated 22.5 mcy dredged sediment capacity.

The recommended sediment delivery location for the Mountain View Ponds is on the west side of Pond A2W, near the entrance to Mountain View Slough. The recommended sediment delivery location for both the A8 Ponds and Ponds A9-A15 is on the west side of Pond A9 near the mouth of Alviso Slough (Moffatt & Nichol 2015). The site owner would transfer the sediment across Alviso Slough to the A8 ponds if those ponds are chosen to receive dredged sediment.

The Alviso Pond Complex is far from any maintained deep-water channel; however, the natural deep water channel in San Francisco Bay extends past (south of) the Dumbarton Bridge. A water depth of 35 feet extends to approximately 1.75 miles south of the Dumbarton Bridge and a water depth of 20 feet is available approximately 1 mile further south. The Sediment

[14] Pond A5 was restored to muted tidal action in Phase 1, and could be converted to tidal habitat. It has a capacity of approximately 2.3 mcy.

[15] Pursuant to current USACE policy, USACE cannot do restoration work on USFWS lands, and the restoration effort would have to be conducted by USFWS.

Beneficial Reuse Feasibility Study (Moffatt & Nichol 2015) recommended that the offloader be located between the Dumbarton Bridge and the railroad bridge located approximately 0.75 miles south of the Dumbarton Bridge. This would avoid vessels having to transit the railroad bridge, thereby minimizing scow transport delays while navigating in relatively shallow waters near the railroad bridge.

The distance from the recommended offloader location to the Pond A2W sediment delivery location is approximately 4 miles; the distance to the Pond A9 sediment delivery location is approximately 6 miles. A booster pump would be needed at the shoreline to allow the dredged material to reach the Mountain View Ponds. The Pond A9 sediment delivery location would require a booster pump at the shoreline and an intermediate booster pump between the offloader and the shoreline (Moffat & Nichol 2015). The pumping distance from the recommended offloader location to the Alviso ponds is greater than to Eden Landing. The pumping distance is considerably greater than the pumping distance at Cullinan; however, the travel distance to the Alviso offloader is much less than to Cullinan, and the combined capacity of the ponds is substantially more than any other beneficial reuse site.

Sediment could also be delivered from RWC Channel to the Alviso ponds directly from a hydraulic cutterhead dredge. A pipeline would extend from the dredge directly to either Alviso sediment delivery location. The footprint of the pipeline in the vicinity of the sediment delivery location would be the same as for the offloader pipeline; however, the pipeline would extend much further; it may be up to 5 miles longer when the cutterhead is dredging near the west end of RWC Channel. If a cutterhead dredge is used, one booster pump could be located on the dredge. SBS Channel is too far from the Alviso ponds to allow use of a hydraulic cutterhead.

While the EIS/EIR for Phase 2 restoration of the Alviso Pond Complex has not been completed, and the South San Francisco Bay Shoreline Study Integrated Document is also in the Draft stage, it is anticipated that Alviso ponds would only be able to accept sediment that meets wetland surface criteria. The Alviso site has the capacity to easily to accept all wetland surface quality material from the RWC Project; however, sediment that does not meet wetland surface criteria would have to be taken to another site.

## 4.3 Project Alternatives Analysis Considerations

***Chapter 3*** described the screening of preliminary Project components, including channel modifications, dredging depths, and placement sites, and provided the preliminary list of alternatives. A total of 17 Project alternatives were defined to maximize the flexibility of the Project to select the most cost effective and environmentally sound plan. To streamline the analysis of the large range of alternatives, impacts associated with the three dredging options and use of the various placement sites were evaluated separately (see ***Appendix A)***, and then combined into an alternative-by-alternative assessment and ranking of impacts (see ***Section 4.5). Table 4-5*** presents a summary of impacts and mitigation measures.

***Table 4-5. Summary of Impacts and Mitigation Measures***

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| AQ-1 | Construction Air Emissions | SU | | | All Dredge Options; Cullinan, Montezuma, SF-DODS (Eden Landing and Alviso not analyzed) | SU |
| AQ-2 | Long-term (Future) Operational Emissions | NI | NA | | NA | NI |
| **Biological Resources** | | | | | | |
| BIO-1 | A substantial adverse effect through substantial population decline, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or US Fish and Wildlife Service | SU | BIO-M1 | Minimize Species Entrainment | Dredge Options; Cullinan, Eden, Alviso | SU |
| | | | BIO-M2 | Conduct Entrainment Monitoring | | |
| | | | BIO-M3 | Minimize Entrainment during SBS Channel Pipeline Replacement | | |
| | | | BIO-M4 | Avoid Construction that Could Affect Tidal Aquatic Habitats when Salmonid Species and Other Special Status Fish Species are known to Occur | | |
| | | | BIO-M5 | Limit Speeds for Construction Vessels | | |
| | | | BIO-M6 | Habitat Mitigation | | |
| | | | BIO-M7 | Construction Schedule and Sequencing | | |
| | | | BIO-M8 | Rail Surveys and Noise Windows | | |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| | | | BIO-M9 | Pre-Construction Special Status Wildlife Surveys | | |
| | | | WQ-M1 | Monitor Turbidity and Implement Minimization Measures | | |
| BIO-2 | A substantial adverse effect on any sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or US Fish and Wildlife Service | S | N/A | | Dredge Options | LTS |
| BIO-3 | A substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption- | NI | N/A | | N/A | LTS |
| BIO-4 | Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. | LTS | N/A | | N/A | LTS |
| BIO-5 | Conflict with any local policies or ordinances protecting biological resources | S | BIO-M1 | Minimize Species Entrainment | Cullinan, Eden, Alviso | LTS |
| | | | BIO-M2 | Conduct Entrainment Monitoring | | |
| | | | BIO-M3 | Minimize Entrainment during SBS Channel Pipeline Replacement | | |
| | | | BIO-M4 | Avoid Construction that Could | | |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| | | | | Affect Tidal Aquatic Habitats when Salmonid Species are known to Occur | | |
| | | | BIO-M5 | Limit Speeds for Construction Vessels | | |
| | | | BIO-M6 | Habitat Mitigation | | |
| **Cultural Resources** | | | | | | |
| CUL-1 | Cause a substantial adverse change in the significance of a historical resource. | NI | N/A | | N/A | NI |
| CUL-2 | Cause a substantial adverse change in the significance of an archaeological resource | S | CUL-M1 | USS Thompson shipwreck shall be avoided by all pipeline construction and laying activities | Dredge Options; Cullinan, Eden, Alviso | LTS |
| | | | CUL-M2 | The USACE shall attempt to avoid all known shipwrecks. The USACE shall make reasonable attempts to locate the shipwreck “Echo” and determine whether the dredging and widening activities in San Bruno Shoal Channel would affect the shipwreck. | | |
| | | | CUL-M3 | If the project is found to affect the Morgan Shell, Manana, or City of Glendale shipwrecks, the USACE shall not complete that part of the proposed action until the shipwrecks are evaluated for historical significance and | | |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| | | | | appropriate environmental review is completed. | | |
| | | | CUL-M4 | Mitigate for the potentially substantial adverse change in the significance of other archaeological resources. If an archaeological resource cannot be avoided by project activities, the archaeologist shall prepare an Archaeological Evaluation Plan (AEP) and submit this plan to USACE for approval. The AEP shall create a program to determine the potential of the expected resource to meet the NRHP and CRHR criteria. | | |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| CUL-3 | Directly or indirectly destroy a unique paleontological resource or site or unique geological feature | S | CUL-M5 | If paleontological resources are encountered during Project construction activities, all work shall be temporarily halted or diverted and a qualified paleontologist shall be retained to ascertain the nature of the discovery, the significance of the find, and provide proper management recommendations. | Dredge Options; Cullinan, Eden, Alviso | LTS |
| CUL-4 | Disturb any human remains, including those interred outside of formal cemeteries | S | CUL-M6 | The USACE shall discuss with the descendants all reasonable options regarding the descendants' preferences for treatment and make all reasonable efforts to develop an agreement for the treatment of human remains and associated funerary objects. | Dredge Options; Cullinan, Eden, Alviso | LTS |
| **Geology/Soils/Seismicity** | | | | | | |
| GEO-1 | Expose People or Structures to Potential Substantial Seismic or Other Geologic Hazards that Cannot be Avoided or Reduced through the Use of Standard Engineering Design and Seismic Safety Techniques | LTS | N/A | | N/A | LTS |
| GEO-2 | Significant Soil Erosion Creating Risks to Life, Property, or Waterways, or Damage to Sensitive Habitat | S | GEO-M1 | Conduct Supplemental Hydrodynamic Surveys and Monitor for Erosion | Dredge Options | LTS |
| | | | BIO-M5 | Limit Speeds for Construction | | |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| | | | | Vessels-add | | |
| **Hazards and Hazardous Material** | | | | | | |
| HAZ-1 | Increase in Navigation Incidents or Other Substantial Navigational Safety Risks | LTS | N/A | | N/A | LTS |
| HAZ-2 | Substantial Hazard to the Public or the Environment from Routine Use, Transport, or Disposal of Contaminated Sediment or Hazardous Materials | S | WQ-M1 | Monitor Turbidity and Implement Minimization Measures | Dredge Options | LTS |
| HAZ-3 | Substantial Hazard to the Public or the Environment through Reasonably Foreseeable Accident or Upset Conditions Involving Hazardous Materials | LTS | N/A | | N/A | LTS |
| **Land Use and Planning** | | | | | | |
| LU-1 | Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project | LTS | N/A | | N/A | LTS |
| LU-2 | Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses | LTS | N/A | | N/A | LTS |
| LU-3 | Physical Division of Existing Communities | NI | N/A | | N/A | NI |
| LU-4 | Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan | NI | N/A | | N/A | NI |
| **Noise and Vibration** | | | | | | |
| N-1 | Noise Level Increase of More than 5 dBA at Sensitive Receptor Locations | NI | N/A | | N/A | NI |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| N-2 | Exceedance of Applicable Noise Thresholds | LTS | N/A | | N/A | LTS |
| **Recreation** | | | | | | |
| REC-1 | Restricted or Reduced Availability or Quality of Existing Recreation Opportunities | LTS | N/A | | N/A | LTS |
| **Socioeconomics/Population/Housing** | | | | | | |
| SE-1 | Measurable and Prolonged Decrease in Local Job Supply or Decrease in Revenue from Leading Industries | BE | N/A | | Dredge Options; Cullinan, Montezuma, Alviso, Eden, SF-DODS | BE |
| SE-2 | Disproportionate Benefit to High-Income, White Communities and/or Disproportionate Harm to Low-Income Communities and/or Communities of Color | BE | N/A | | Dredge Options; Cullinan, Montezuma, Alviso, Eden, SF-DODS | BE |
| **Transportation/Navigation/Traffic** | | | | | | |
| NAV-1 | Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade | LTS | N/A | | N/A | LTS |
| NAV-2 | Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area | LTS | N/A | | N/A | LTS |
| **Utilities/Service Systems** | | | | | | |
| UTIL-1 | Potential Damage to Utilities or Service | LTS | N/A | | N/A | LTS |

| Impact No. | Impact Name | LOS* | Mitigation Measure No. | Mitigation Measure Name | Dredge Options & Placement Sites for Which a Significant Impact Could Occur | LOS After Mitigation |
|---|---|---|---|---|---|---|
| | Systems | | | | | |
| UTIL-2 | Interfere with Operations of or Cause Other Disruptions to Utilities or Service Systems | LTS | N/A | | N/A | LTS |
| UTIL-3 | Need to Relocate or Otherwise Protect or Replace Utilities or Service Systems | LTS | N/A | | N/A | LTS |
| **Water Quality and Hydrology** | | | | | | |
| WQ-1 | Creation of or Increase in Contamination, Pollution or a Nuisance, or Violation of a Regulatory Standard  (TSS levels) | SU | WQ-M1 | Monitor Turbidity and Implement Minimization Measures | Dredge Options; Alviso, Eden | SU |
| WQ-2 | Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force | LTS | N/A | | N/A | LTS |
| WQ-3 | Acceleration of Sedimentation resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat | LTS | N/A | | N/A | LTS |
| WQ-4 | Substantial Adverse Effect on State- or Federally-Protected Wetlands (RWC) | LTS | N/A | | N/A | LTS |
| WQ-5 | Substantial Increase in Salinity in Public or Private Wells from Salt Water Intrusion | LTS | N/A | | N/A | LTS |

| | |
|---|---|
| Notes: N/U- Mitigation measure not used | |
| * Dredging options or placement sites for which a significant impact could occur | |
| BE = Beneficial Effect | NI = No Impact |
| LOS = Level of Significance | S = Significant |
| LTS = Less than Significant | SU = Significant and Unavoidable Impact |

The approach taken for the resource analysis in ***Appendix A*** also allows for flexibility in Project execution, particularly with respect to the potential use of Eden Landing and/or Alviso as placement sites. Alternatives involving their use were evaluated to the degree feasible, but because neither site is currently permitted to receive dredged sediment, and neither site has the infrastructure in place to manage dredged sediment, alternatives including these sites cannot currently be selected as a Recommended Plan. Project costs and placement site availability could be reevaluated as the Project moves closer to implementation to determine if a less costly and more environmentally sustainable alternative has become feasible. Pursuant to USACE policy, the selected alternative (TSP) is determined based on an economic (benefit/cost) analysis, as described in ***Chapter 6***.

## 4.4 Overall Regulatory Setting

The Federal, state, regional, and local laws, regulations, policies, and plans that affect the Project are summarized in ***Appendix G***. ***Table G-1*** summarizes the relevant portions of potentially applicable Federal and state laws, regulations, and policies. For each resource area that has been evaluated in detail for the Project, the potentially applicable local plans and policies are summarized in ***Tables G-2 through G-13***.

## 4.5 Evaluation of Alternative Plans

This section summarizes and compares the potential environmental impacts of the No Action/No Project Alternative (a description of the No Action/No Project Alternative is provided below) and the 17 dredging/placement alternatives. As described in ***Section 3.5***, Project alternatives were constructed using each dredging option (to an authorized depth of -32 feet, -34 feet, and -37respectively, all including overdepth), and a variety of placement options, including 100 percent beneficial reuse at placement locations that are currently permitted, maximum beneficial reuse at the SBSP Restoration Project locations (assuming that one of these sites would become available by the time the Project is ready to be constructed), the most economical option, and several combinations of these options.

The Project alternatives are summarized in ***Table 3-5***; the table shows the maximum estimated sediment volume that would be delivered to each placement site under each alternative. The actual volume of sediment delivered to each placement site would be determined by the actual volumes dredged. The actual volumes dredged to deepen the channel could change based on the amount of overdepth actually dredged. Based on past experience, it is likely that instead of the full two feet of overdepth, dredging would capture approximately one foot of overdepth. Including bulking during dredging, this would reduce total dredged sediment volumes by between 647,000 cy to 1,232,000 cy depending on dredging depth. This lower volume was used to estimate construction costs, as described briefly in ***Section 4.2.3***. A reduction in the sediment volume would substantially reduce the duration of Project activities, and would therefore also substantially reduce air emissions from the Project.

Alternatives A-1 through A-5 incorporate Dredging Option A (-32 feet MLLW channel depth), Alternatives B-1 through B-6 include Dredging Option B (-34 feet MLLW channel depth), and Alternatives C-1 through C-6 would use Dredging Option C (-37 feet MLLW channel depth). The sediment volumes for each placement site shown in ***Table 3-5*** typically establish an upper bound on the amount of sediment that would go to each site for the purposes of the impact assessment. ***Table 4-6*** shows the differences in construction duration for alternatives at the three Project depths, and also shows the differences in duration between the cost estimate volume and the maximum dredging volume. The alternatives including Eden Landing and Alviso are not included in this table, because the dredging durations have not been quantified for these locations. However, assuming the maximum volume is dredged, dredging durations are estimated to last 3 - 4 dredging seasons for Dredging Option A, 7 - 9 dredging seasons for Dredging Option B and 13 - 16 dredging seasons for Dredging Option C. These durations are dictated by the need to remain below the conformity threshold for criteria air pollutants; the dredge could work faster than the durations shown (durations could be reduced by 1 to 5 dredging seasons if emissions could be reduced to remain below the conformity threshold).

Although the impact analysis included evaluation of sediment delivery to Alviso Pond A9, none of the action alternatives incorporate placement at Alviso Pond A9. Delivering dredged sediment to Pond A9 would be somewhat more costly than delivering dredged sediment to Pond A2W, because the increased pumping distance would require use of a third booster pump, which would have to be constructed in San Francisco Bay. Thus, from a cost and environmental resources perspective, delivery to Pond A2W would be preferable to delivery to Pond A9. Furthermore, it is currently anticipated that Pond A2W would be the first Phase II restoration pond to be available to receive dredged sediment. Nonetheless, should Pond A9 become available as a permitted dredged sediment placement location in advance of Pond A2W, it would likely be preferable to North Bay (San Pablo Bay) placement sites due to the reduced transport distance to Pond A9.

***Table 4-6. Comparison of Dredging Volumes and Project Construction Durations***

| Dredging Option | Cost Estimate Sediment Volume[1] | Maximum Estimated Sediment Volume[2] | Dredging and Off-Loading Duration (months) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | SF-DODS | | | Cullinan[3] | | | |
| | | | Alternative | Cost Estimate Volume | Maximum Volume | Alternative | Cost Estimate Volume | Maximum Volume | Alternati |
| **A (-32 feet)** | 936,990 | 1,765,000 | A-3 | 8.4 | 15.9 | A-1 | 5.9 | 11.1 | A-2 |
| **B (-34 feet)** | 2,497,619 | 3,961,000 | B-2 | 21.9 | 34.9 | B-3 | 14.6 | 20.2 | B-4 |
| **C (-37' feet)** | 5,476,588 | 7,715,000 | C-2 | 47.6 | 67.2 | C-3 | 40.5 | 57.7 | C-4 |
| | | | **Dredging and Off-Loading Duration (Dredging Seasons[4]) Based on Dr** | | | | | | |
| **A (-32 feet)** | 936,990 | 1,765,000 | A-3 | 2 | 3 | A-1 | 2 | 2 | A-2 |
| **B (-34 feet)** | 2,497,619 | 3,961,000 | B-2 | 4 | 6 | B-3 | 3 | 4 | B-4 |
| **C (-37' feet)** | 5,476,588 | 7,715,000 | C-2 | 8 | 12 | C-3 | 7 | 10 | C-4 |
| | | | **Dredging and Off-Loading Duration (Dredging Seasons[4]) to Meet Confor** | | | | | | |
| **A (-32 feet)** | 936,990 | 1,765,000 | A-3 | | 4 | A-1 | | 3 | A-2 |
| **B (-34 feet)** | 2,497,619 | 3,961,000 | B-2 | | 9 | B-3 | | 7 | B-4 |
| **C (-37' feet)** | 5,476,588 | 7,715,000 | C-2 | | 16 | C-3 | | 15 | C-4 |

**Notes:**

1 Includes SBS Channel lengthening and berth deepening

2 Adjusted volumes used for EIS/EIR analysis include maximum overdepth dredging (additional volume not included in cost estimate)

3 Cullinan capacity is currently 3 mcy. Excess material would be transported to SF-DODS.

4 One dredging season is one 6-month dredging window (i.e., June 1 - Nov 30 of one year)

5 See discussion in Section 4.3.5.1.2

### 4.5.1 No Action/No Project Alternative

For this document, the No Action Alternative (NEPA) and No Project Alternative (CEQA) include the same assumptions, and are therefore evaluated together The No Action Alternative is the NEPA benchmark for assessing environmental effects, including the cumulative impacts, of the Proposed Project. The No Action/No Project Alternative represents the expected future condition if neither the Project nor one of the action alternatives are approved and there is no change from the current channel depth.

The future No Action/No Project Alternative includes reasonably foreseeable projects in the study area that are consistent with the continuation of existing management direction or level of management for plans, policies, and operations by the NEPA and the CEQA lead agencies occurring after 2014 through the end of the analysis period (2030).

Under the CEQA, the No Project Alternative is not the benchmark for assessing the significance of the impacts of the proposed Project and alternatives; the benchmark is the baseline year (2014). The CEQA Guidelines §15126.6 (e)(1) state that "The 'no project' alternative analysis is not the baseline for determining whether the proposed project's environmental impacts may be significant, unless it is identical to the existing environmental setting analysis which does establish the baseline.” The No Project Alternative, then, describes the circumstances that would occur if the project does not proceed [CEQA Guidelines §15126.6 (e)(3)(B)] and, like the No Action Alternative, assumes the continuation of existing Port plans, policies, and operations into the future. Additionally, impacts should be analyzed “projecting what would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services” [CEQA Guidelines §15126.6 (e)(3)(C)].

Similar to the No Action Alternative, although not identified as the baseline, the No Project Alternative allows decision-makers to compare the future condition without the Proposed Project to the future condition with the Proposed Project and use the results as one more tool for alternative selection.

Under the No Action/No Project Alternative dredging of RWC Channel and SBS Channel would not occur. All construction-related activities would be avoided; there would be no need to lower the pipelines below SBS Channel, or to deepen the berths at the Port. Maintenance dredging of RWC and SBS Channels would continue to occur at the same frequency and would generate the same volumes as under current conditions. Maintenance dredging would continue to be managed and environmental review of maintenance dredging would continue to be performed by the USACE. There would be no change in effects to resources from maintenance dredging.

Because there would be no sediment from channel deepening, there would be no need to transport any dredged sediment to any of the placement sites, and there would be no need to construct any offloading facilities. (Absent a supplemental source of dredged sediment, one or more of the placement sites would require longer to achieve the goal of tidal marsh restoration. The delay in habitat formation cannot be quantified because it would depend on the specific site plans and alternate approaches to achieving the target habitat.)

Cargo volume would continue to grow with economic demand, at an estimated average rate of 2.8 percent. The number of vessels calling at the Port would grow in response to increased demand, and vessels would continue to have to be light loaded, lighter into scows, or wait for the tides to enter the Port. It is possible that the number of scow calls at the Port would increase more rapidly than total vessel calls, as a greater percentage of cargo is likely to be lightered into scows, as has occurred during past years with high demand. There would be increases in the duration of offloading activities at the Port corresponding to the increased cargo moving through the Port.

The forecast cargo tonnage by 2025 is2.5 million tons. By 2025, the Port is expected to receive 104 deep draft vessel calls. This represents an increase of 62.5 percent, and would be due to the increased cargo tonnage. With implementation of Phase 2 of the Wharves 1 and 2 and Reconstruction Project, the Port’s sand and aggregate throughput capacity would increase to

2.5 million tons per year. No other improvements that would affect the Port's existing throughput capacity are planned. Gypsum throughput would remain at a maximum of 300,000 tons/year (per the existing permit), and scrap metal exports would remain at or below 450,000 tons/year.

Increases in sand/aggregate throughput capacity were fully analyzed in the EIR for the Wharves 1 and 2 and Reconstruction Project (Port of Redwood City 2010), and mitigation was provided. As a result of increased cargo movement through the Port, there would be increases in noise in the vicinity of the Port, as offloading equipment is operated more frequently, an increase in the number of trucks leaving the Port area to accommodate the increased cargo volume, and increases in air emissions. The Port currently operates 24 hours per day when a vessel is in port. The closest residential receptors are houseboat residents at Docktown Marina; these residents are considerably closer to Highway 101 than to the southern-most portion of the Port, and are surrounded by other commercial and industrial uses.

Under the No Action/No Project Alternative, there would be no effects to air quality during construction (there would be no dredging to deepen the channel), cultural resources (there would no dredging or excavation of previously undisturbed areas); land use (there would be no change in land use); geology, soils, and seismicity (there would be no changes to existing conditions); and water quality and hydrology (there would be no new sources of potential releases). Effects to biology (from increased ballast water exchange); hazards and hazardous materials (from increased fuel and maintenance chemical use and increased vessel traffic); recreation (indirect effect from increased noise); and utilities (from increased use of existing utility lines) would be *de minimis* and would be controlled by compliance with applicable laws and regulations. The increased cargo volume would result in a slight increase in jobs, which would be a benefit to socioeconomics; however, cost of materials would continue to reflect the inefficiencies associated with the -30-foot channel depth. There would be no effects to resources at any of the placement sites because there would be no need for placement sites.

Under the No Action/No Project Alternative there would be an increase in vessel calls; however, this increase in vessel calls is not attributable to the proposed Project because the proposed Project would not cause any growth in cargo throughput. Consequently, increases in air emissions due to increased vessel calls are not an effect of the proposed Project. However, vessel calls would be reduced by between 11% and 24% percent by 2025, with a similar reduction in vessel emissions. The bulk of the transport emissions are due to the transit of a vessel; the increased draft of each vessel would increase drag, but would not have a large effect on fuel consumption.

### 4.5.2 Comparison of Impacts by Dredging Option and Placement Site

***Table 4-7*** provides a summary of the impacts and benefits that would occur at the placement sites, and for the three dredging options. Detailed information regarding the impacts analysis for each resource area is provided in ***Appendix A***. ***Table 4-7*** provides a numerical rating characterizing the maximum level of impact for each resource area that would be expected to be associated with each dredging option and placement site. The level of adverse impact for a given resource is defined as: (0) negligible/no impact; (-1) less than significant; (-2) significant but mitigable; or (-3) significant and unavoidable. Beneficial effects are indicated in the table by a "B." The sections below for each resource area explain the impacts listed in ***Table 4-7***, and compare the advantages and disadvantages of the various dredging options and placement site.

***Table 4-7. Comparison of Impacts by Dredging Option and Placement Site***

| Environmental Resource | Dredging Option A (-32 feet MLLW) | Dredging Option B (-34 feet MLLW) | Dredging Option C (-37 feet MLLW) | Cullinan | Montezuma | SF-DODS | Eden Landing | Alviso |
|---|---|---|---|---|---|---|---|---|
| Air Quality and GHGs | -3/B* | -3/B* | -3/B* | -3/B*B | -3/B* | -3/B* | N/A | N/A |
| Biological Resources | -2/-3** | -2/-3** | -2/-3** | -2 | -1 | -1 | -2 | -2 |
| Cultural Resources | -2 | -2 | -2 | -2 | 0 | 0 | -2 | -2 |
| Geology/Soils/Seismicity | -1 | -1 | -1 | 0 | 0 | 0 | 0 | 0 |
| Hazards and Hazardous Materials*** | -1 | -1 | -1 | -1/0 | 0 | 0 | -1/0 | -1/0 |
| Land Use | -1 | -1 | -1 | -1 | -1 | 0 | -1 | -1 |
| Noise | -2 | -2 | -2 | -2 | -1 | -1 | 0 | -2 |
| Recreation | -1 | -1 | -1 | -1 | 0 | 0 | 0 | -1 |
| Socioeconomics | B | B | B | 0 | 0 | 0 | 0 | 0 |
| Transportation and Navigation**** | -1/B | -1/B | -1/B | -1 | -1 | -1 | 0 | 0 |
| Utilities and Service Systems* | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0 | 0 | 0 | 0 |
| Water Quality and Hydrology | -2 | -2 | -2 | -1 | -1 | -1 | -1 | -1 |

Impact Rating:

-3 = significant and unavoidable adverse impact
-2 = significant but mitigable adverse impact
-1 = adverse but not significant impact
0 = negligible or no impact
B = beneficial

N/A = Not available. Emissions with use of these placement locations could not be estimated, due to lack of specific information regarding offloading operations

* First rating is for construction effects, second rating is for operational effects.

** Second rating would apply if the jet sled method of construction is used for pipeline relocation.

*** Second rating would apply if dredges are electrically powered, or an electric offloader is used, or sediment is pumped directly to the site via an electrically-powered cutterhead dredge

**** First rating is for construction phase/second rating is for post-construction phase

#### 4.5.2.1 *Air Quality and Greenhouse Gases*

Impacts due emissions of criteria air pollutants during construction are related to both the total volume dredged, and the rate of dredging. The greater the total volume of sediment dredged in a given year, the greater the total annual emissions. As stated in Section 4.2.3.2.2, the air quality management plan would ensure that annual emissions remain below the conformity threshold (the duration of the Project would be extended as needed to ensure that annual emissions remain below the conformity threshold). However, even with implementation of available mitigation, it would be impossible to reduce average daily construction-related criteria air pollutant emissions to below the BAAQMD thresholds, and use of any dredging options and placement sites would lead to significant and unavoidable impacts from dredging and transport of dredged material. Conversely, deepening of the channels would reduce the number of vessel calls required to deliver the same volume of sediment, thereby reducing operational air emissions (both of criteria air pollutants and GHGs) and creating a benefit for the Project alternatives relative to the No Action/No Project Alternative. Dredging Option C would lead to the greatest reduction in vessel calls and the lowest operational air emissions.

#### 4.5.2.2 *Biological Resources*

Although there would be impacts to biological resources at RWC and SBS channels that would result from the dredging options, most impacts would be less than significant after mitigation. If the jet sled method of construction is used, the impacts from the pipeline relocation work at SBS Channel would be expected to have significant and unavoidable impacts due to the substantially higher turbidity and the impacts on aquatic species during the construction period. After construction is complete, no long term impacts are expected. At the placement sites, impacts on biological resources would be either be less than significant or no impact would occur. Deepening RWC and SBS Channels is consistent with their purpose to support deep-draft navigation, and deepening in RWC Channel has been designed to minimize impacts to aquatic species in the channels and to avoid the mudflats adjacent to Greco and Bair Islands. Of the three dredging options, Dredging Option A would have the least impact because it results in the shortest dredging duration.

LTMS policies support the beneficial reuse of dredged material from deepening and maintenance projects, and placement of dredged sediment at beneficial reuse site would have a long-term beneficial effect on biological resources. Because the placement sites are closer to the dredging location, and scows can be loaded more heavily in-Bay, use of beneficial reuse sites would also reduce the total dredging period. Compliance with applicable RWQCB permitting requirements; BCDC permitting requirements; LTMS policies; the USFWS and NMFS Section 7 consultations; California Endangered Species Act (CESA) requirements; and NMFS Essential Fish Habitat consultation; and implementation of BMPs and mitigation measures (***Section 4.2.2***) would minimize potential biological resources impacts.

#### 4.5.2.3 ***Cultural Resources***

Potential cultural resources impacts associated with all dredging options are less than significant after mitigation. Impacts of pipeline relocation and dredging would be considered a potentially significant effect on shipwrecks and unknown submerged cultural resources, human remains, and paleontological resources. With the implementation of mitigations measures as described in ***Appendix A***, the impact is less than significant.

At the placement sites, all of the areas on the landward side of the levees where dredged material would be placed and associated areas of disturbance have been evaluated for environmental impacts already by previous CEQA/NEPA documents and are not part of the study area. Existing placement sites (Montezuma and Cullinan) were discussed in the Federal Navigation Channels EA/EIR which found that there are no known paleontological, archaeological, or historical resources within the existing placement sites.

There would be no effects on shipwrecks, archaeological resources, human remains, or paleontological resources due to the placement of dredged material at SF-DODS or Montezuma or from maintenance dredging. At Cullinan, Alviso and Eden Landing there is the potential for significant impacts from the placement of dredged material to unknown submerged cultural resources, archaeological resources, human remains, or paleontological resources. With the implementation of mitigations measures as described in ***Appendix A***, the impact is less than significant.

#### 4.5.2.4 ***Geology, Soils, and Seismology***

No significant impacts to geology, soils, and seismicity are expected to result from any of the dredging options. Seismic-related ground-shaking cannot be prevented or predicted, but the likelihood of potential adverse effects related to seismic hazards during project construction is fairly low since strong seismic events are rare. Slope failure could occur at the dredging sites as a result of a large seismic event, however, channels would be properly designed in accordance with EM 1110-2-1902 to avoid significant impacts. For each dredging option, both RWC and SBS Channels would be dredged, which could result in minimal erosion of the channel side slopes. However, design dimensions of the channels are intended to preclude sloughing of the channel sides and therefore effects would be less than significant. Relocation of the fuel pipelines would require construction of a trench or directional drilling; if a trench is constructed it would be designed to sediment in naturally over the sand and armor rock protection, and any sloughing of material from the side slopes of the trench would contribute to cover over the pipes.

Delivery of dredged sediment to existing permitted placement sites would not be expected to result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse. Transport of dredged sediment would not disturb Bay bottom sediments, and therefore would not result in any significant soil erosion. Any offloaders and pipelines constructed as part of the Project would be designed to the appropriate seismic safety standards. Construction of the offloader and installation of a pipeline from either a cutterhead dredge or an offloader to a dredged sediment delivery location may cause minor soil disturbance, however effects would be limited in extent and duration and are less than significant. Of the three dredging options, Dredging Option A would have the least impact because it would result in the least amount of sediment dredged. No impacts to geology, soils and seismicity impacts would be expected at SF-DODS or Montezuma because no construction would occur.

#### 4.5.2.5 *Hazards and Hazardous Materials*

Potential impacts associated with hazards and hazardous materials are less than significant for all dredging options and all placement sites. The greatest hazard would be associated with the relocation of the fuel pipelines as well as with any over-water fueling of dredging, construction, or off-loading equipment. BMPs incorporated into the project and alternatives and preparation of the Fuel Pipeline Relocation and Response Plan would ensure that potential hazards associated with fuel pipelines and equipment fueling would remain less than significant. Potential hazards associated with over-water fueling would be reduced further if the dredges and/or offloading equipment are powered by electricity.

Other potential hazards include the presence of contaminated soil, and navigational hazards from dredging, construction, or off-loading equipment. Contaminated soil would be dredged and placed in accordance with requirements from DMMO and resource and permitting agencies, which would ensure that potential impacts associated with the contaminated soil would remain less than significant. Similarly, compliance with USCG regulations regarding aids to navigation, notices to mariners, lighting, and vessel traffic lanes would ensure that navigational hazards from dredging and transport of sediment remain less than significant.

#### 4.5.2.6 *Land Use*

No significant land use impacts would result from any of the dredging options. At the placement sites, impacts on land use would be either less than significant or no impact would occur. Deepening RWC and SBS Channels is consistent with their purpose to support deep-draft navigation, and deepening in RWC Channel has been designed to avoid impacts to Greco and Bair Islands. All placement sites, including SF-DODS, have either been specifically permitted to accept dredged sediment, or would be specifically permitted to receive dredged sediment prior to use as a placement site. Less than significant impacts to land use could occur from the presence of dredging, construction, and/or off-loading equipment in areas used for commercial navigation and recreational boating. Of the three dredging options, Dredging Option A would have the least impact because it would result in the shortest dredging duration. No land use impacts would be expected at SF-DODS or Montezuma, because no construction would occur.

#### 4.5.2.7 *Noise*

Potential noise impacts from all three dredging options are similar. All three dredging options may require pile driving to isolate the tie-in locations for the relocated fuel pipelines. With mitigation, no significant noise impacts would result from any of the dredging options.

Although dredging noise could result in harassment for marine mammals, these noise levels are comparable to noise produced by commercial shipping vessels already using the area. At RWC Channel, trail users at Bair and Greco Islands, as well as non-motorized boat users in the area, could potentially experience a less than significant noise impact from the Project due to the temporary construction noise associated with the dredging activities. Neither ambient noise levels nor legal thresholds would be exceeded.

At the placement sites, noise impacts would either be less than significant, adverse but mitigable, or no impact would occur (Eden Landing). In the case of Eden Landing, all sensitive receptors other than wildlife, which is addressed in the biology section, are far enough away that noise would not be a concern. The ambient noise at the Alviso offloader is relatively high due to its proximity to both the highway and the railroad bridge. While some wildlife receptors are potentially located within 0.3 miles of the offloader, with mitigation measures no impact is expected there and the remaining receptors are further away. SF-DODS would have no noise impacts, except for the short-duration transit noise on wildlife, which would be less than significant. At Montezuma, outdoor recreational users and wildlife would experience a less than significant noise impact (noise levels from the Project at the receptor locations would be below ambient noise levels) and there would be no impact to residential areas from noise. Cullinan is the only site where noise levels could temporarily exceed estimated ambient levels. Wildlife is the only identified sensitive receptor at Cullinan (the closest residential receptors are located approximately 0.35 miles away on the south side of Highway 37), and mitigation measures would be used to reduce noise impacts to less than significant levels.

#### 4.5.2.8 *Recreation*

Potential impacts to recreation from the dredging options would be less than significant. Impacts to recreation could occur from dredging, construction at the placement locations, or offloading equipment and activities interfering with use of existing recreational resources. During dredging and sediment delivery, the USACE would coordinate with the USFWS and other agencies as needed on signs and detours to safeguard recreationists during construction and maintain access to unaffected areas. Of the three dredging options, Dredging Option A would have the least impact because it would result in the shortest dredging duration. Construction of offloading facilities at the Cullinan and Alviso placement sites would require work in sloughs, where the presence of construction equipment could block more of the available boating access than on the open Bay. Direct impacts would be limited to immediate work areas, however, and continued access would be provided. Furthermore, the duration required for construction in the sloughs would be short. SF-DODS would result in the least impacts to recreation, because it has the least recreational use of any of the placement areas, and there would be no offloading facilities.

#### 4.5.2.9 *Socioeconomics*

There would be no significant adverse effects to socioeconomics, population, or housing from any of the dredging options or placement sites. The construction phase of the Project would create a small, local increase in jobs, both at the dredging site (i.e., in the vicinity of the Port) and at the chosen placement site if a beneficial reuse site is chosen. The reduced transportation costs for building materials following construction would be a benefit to the local construction industry, and may result in the indirect creation of a few jobs. Neither during construction nor during operations would there be a sufficiently large increase in employment that additional housing or other public facilities would be required.

#### 4.5.2.10 *Transportation and Navigation*

No significant impacts to transportation and navigation would result from this Project. While up to 1,000 scow round trips[16] would result during each construction season, this is only about 0.8 percent of the total number of vessel movements tracked by VTS in 2014. During the post-construction phase, there would be a benefit to navigation in the project area, as vessel delays and lightering (i.e., scow trips) are reduced, and fewer, larger vessels could use the Port. At Eden Landing and Alviso, the effects would be negligible or non-existent and the effects would be less than significant at the other placement sites.

#### 4.5.2.11 *Utilities and Service Systems*

There would be no significant adverse effects to utilities and service systems for either the dredging options or the placement sites. Because there would only be a small number of workers working on the Project, there would be no impacts to service systems such as waste water or potable water treatment facilities. There could be a short-term reduction in fuel transport capacity as the fuel pipelines below SBS Channel are relocated; however, this effect would occur for all three dredging options, and would be limited to several months as the deeper pipeline segments are tied into the existing fuel lines, and provisions for addressing unanticipated interruptions in the fuel supply would be included in the Fuel Pipeline Relocation and Response Plan. Powering either the dredge and/or the Cullinan offloading facilities with electricity would not cause a significant adverse effect to the local electrical supply, however limited construction may be required to bring the power supply to the dredge or offloader.

#### 4.5.2.12 *Water Quality and Hydrology*

Although there would be water quality impacts to the RWC and SBS Channels that would result from any of the dredging options, the impacts would be less than significant after mitigation. At the placement sites, impacts on water quality would be either less than significant or no impact would occur. Deepening RWC and SBS Channels is consistent with their purpose to support deep-draft navigation, and deepening in RWC Channel has been designed to avoid impacts to Greco and Bair Islands, including the outboard mudflats. Of the three dredging options, Dredging Option A would have the least impact because it would result in the shortest dredging duration. All placement sites, including SF-DODS, have either been specifically permitted to accept dredged sediment, or would be specifically permitted to receive dredged

[16] If Eden Landing and Alviso are used; if the more distant sites are used, the maximum annual number of scow trips would be around 400 trips.

sediment prior to use as a placement site. No hydrological impacts would be expected at any of the sites. Compliance with applicable water quality regulations, permits, the implementation of BMPs and mitigation measures WQ-M1 and GEO-1 (***Appendix A***) would ensure that potential water quality impacts would be less than significant for all placement sites.

### 4.5.3 Comparison of Project Alternatives

***Table 4-8*** shows the maximum level of impact that would be expected associated with each project alternative, including the No Action/No Project Alternative. The level of impact in the table for a given resource is noted as: (0) negligible/no impact; (-1) less than significant impact; (-2) significant but mitigable impact; or (-3) significant and unavoidable impact. Beneficial effects are indicated in the table by a "B." The level of impact assigned to each alternative in ***Table 4-8*** is based on the highest impact that could occur, even if that impact would occur at only one site in the alternative (for alternatives that contain more than one placement site). The impacts associated with each resource area for each placement site and for the three dredging options are described in detail in Appendix A and are summarized in ***Table 4-8***. The combined impacts for each alternative, therefore, consist of the combined impacts for the dredging option and the selected placement site(s). The sections below on each resource area briefly discuss the impact levels in ***Table 4-8***, and compare the advantages and disadvantages of the various alternatives relative to each resource area. For each resource area section, the impacts are summarized by alternative unless the impacts are essentially the same for several alternatives, in which case the alternatives with similar impacts are discussed as a group.

***Table 4-8. Comparison of Impacts by Project Alternative***

| | ALTERNATIVE | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Environmental Resource** | **A-1** | **A-2** | **A-3** | **A-4** | **A-5** | **B-1** | **B-2** | **B-3** | **B-4** | **B-5** | **B-6** | **C-1** | **C-2** | **C-3** | **C-4** | **C-5** | **C-6** |
| Air Quality and Greenhouse Gases | -3/ B** | -3/ B** | -3/ B** | N/A | N/A | -3/ B** | -3/ B** | -3/ B** | -3/ B** | N/A | N/A | -3/ B** | -3/ B** | -3/ B** | -3/ B** | N/A | N/A |
| Biological Resources | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| Cultural Resources | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Geology/Soils/Seismicity | 0 | 0 | 0 | 0 | 0 | 0 | -0 | 0 | 0 | 0 | 0 | -1 | -1 | -1 | -1 | -1 | -1 |
| Hazards and Hazardous Materials* | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 | -1/0 |
| Land Use | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| Noise | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Recreation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Socioeconomics | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B | B |
| Transportation and Navigation** | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B | -1/B |
| Utilities and Service Systems* | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 | 0/-1 |
| Water Quality and Hydrology | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 | -2 |

Impact Rating:
-3 = significant and unavoidable adverse impact
-2 = significant but mitigable adverse impact
-1 = adverse but not significant impact
0 = negligible or no impact
B = beneficial
N/A = Not available. Emissions with use of these alternatives could not be estimated, due to lack of specific information regarding offloading operations at the placement sites
* Second rating would apply if dredges are electrically powered, or an electric offloader is used, or sediment is pumped directly to the site via an electrically-powered cutterhead dredge
** First rating is for construction phase/second rating is for post-construction phase

#### 4.5.3.1 *Air Quality/GHGs*

The impacts of each project alternative are compared in ***Table 4-6***. Construction emissions would result in significant and unavoidable impacts associated with emissions of criteria air pollutants. As discussed in ***Section A.2.3 of Appendix A***, increases in operational emissions would be associated only with landside improvements and regional economic activity. Deepening of the channels would not contribute to an increase in cargo throughput. However, the proposed Project would result in reduced emissions of criteria air pollutants and GHGs for all depths relative to the same cargo volume entering the Port at the existing channel depth.

##### 4.5.3.1.1 No Action /No Project Alternative

Under the No Action/No Project Alternative there would be no construction-related emissions. Total cargo tonnage processed through the Port would continue to increase commensurate with economic growth in the region. This would result either an increase in the number of deep draft vessel calls (and the percentages of vessels being light loaded would remain the same), or an increase in the amount of cargo carried by each vessel with increased lightering to allow the vessels to enter the Port. Lightering into barges would continue to increase with increased growth, but would increase more rapidly if the number of deep draft vessel calls remains similar to the baseline, because each vessel would require more lightering. Maintenance dredging would continue at the current level.

Project alternatives emissions associated with the *construction* phase are related to the volume of sediment dredged, and the location and process used to dispose of the sediment. In general, placement locations that are closer to the dredging location would result in lower emissions compared to locations that are farther away. For the purposes of this analysis, “unit emissions” were determined to allow for the most effective comparison. “Unit emissions” were calculated per 10,000 cy of dredged material taken to a specific placement site from a given dredging location. Unit emission factors were calculating for dredging 10,000 cy of sediment at RWC Channel and SBS Channel, as well as for transporting sediment from RWC Channel to Cullinan, Montezuma, and SF-DODS, and for transporting sediment from SBS Channel to these same locations. Due to a lack of data regarding the offloading process at Eden Landing and Alviso (***Appendix A***), air emission calculations could not be performed for these two locations, and therefore Alternatives A-4, A-5, B-5, B-6, C-5, and C-6 could not be evaluated with regard to air quality. ***Table 4-9*** provides the summary of maximum estimated construction emissions for each alternative. Total emissions are directly related to the volume dredged and transport distance; consequently, alternatives involving Dredging Option A (to -32 feet MLLW) result in reduced air emissions compared to the other alternatives, and Alternative A-1, which involves placement at Cullinan has the lowest overall emissions. Detailed calculations of dredging, transport, placement, and other construction emissions are provided in ***Tables A-4*** through ***A-7*** in ***Appendix A***.

***Table 4-9. Construction Phase Air Pollutant Emissions Associated with Each Alternative***

| Alternative | Total Emissions (tons) | | | | | | | No. of Dredging Seasons Required |
|---|---|---|---|---|---|---|---|---|
| | NOx | ROG | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | CO | $CO_{2eq}$ | |
| A-1 | 255.96 | 25.91 | 12.67 | 12.28 | 0.15 | 131.68 | 14,230.83 | 3 |
| A-2 | 299.91 | 30.32 | 14.37 | 13.94 | 0.18 | 160.79 | 17,822.87 | 3 |
| A-3 | 366.85 | 37.12 | 16.99 | 16.48 | 0.24 | 204.96 | 23,225.45 | 4 |
| B-1 | 603.33 | 61.05 | 29.55 | 28.65 | 0.36 | 314.66 | 34,299.53 | 7 |
| B-2 | 814.26 | 82.39 | 37.72 | 36.59 | 0.53 | 454.75 | 51,521.02 | 9 |
| B-3 | 634.80 | 64.25 | 30.79 | 29.85 | 0.39 | 335.41 | 36,834.08 | 7 |
| B-4 | 673.06 | 68.04 | 32.25 | 31.28 | 0.40 | 360.84 | 39,997.95 | 7 |
| C-1 | 1,241.22 | 125.54 | 60.12 | 58.30 | 0.74 | 656.65 | 72,207.21 | 13 |
| C-2 | 1,598.31 | 161.72 | 74.06 | 71.84 | 1.04 | 892.45 | 101,098.46 | 16 |
| C-3 | 1,415.06 | 143.20 | 66.92 | 64.90 | 0.90 | 771.35 | 86,232.57 | 15 |
| C-4 | 1,319.43 | 133.39 | 63.22 | 61.33 | 0.79 | 707.38 | 78,410.53 | 14 |

From an operational standpoint, the deepest channel depth would provide the greatest reduction in the number of vessel calls relative to the No Action/No Project Alternative. Vessels could be loaded more heavily and less lightering would be required. For all dredging options, the total number of vessel calls would be less than under the No Action/No Project Alternative. Vessel offloading operations would be similar to the No Action/No Project Alternative, with potential minor reductions in air emissions as the more efficient large vessel offloading systems are used for a higher percentage of the cargo rather than the less efficient barge offloading process.

### 4.5.3.2 ***Biological Resources***

#### 4.5.3.2.1 No Action/No Project Alternative

There would be no changes, and biological resources at both the dredging sites and the placement sites would be unaffected. Therefore, no impacts are expected under the No Action/No Project Alternative.

#### 4.5.3.2.2 Alternative A-1 (Channel deepening to -32 feet MLLW, placement at Cullinan)

Although there would be impacts to biological resources at RWC and SBS Channels that would result from the dredging, the impacts would be less than significant after mitigation. If the jet sled method of construction is use, the impacts from the pipeline relocation work at SBS Channel would be expected to have significant and unavoidable impacts due to the substantially higher turbidity and the impacts on aquatic species during the construction period. After construction is complete, no long-term impacts are expected. The construction of the offloader and pipeline at Cullinan would have localized and short term impacts that would be less than significant and the site would be expected to return to pre-project conditions after construction is complete.

#### 4.5.3.2.3 Alternative A-2 (Channel deepening to -32 feet MLLW, placement at SF-Montezuma)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same as for Alternative A-1. There could be a significant an unavoidable impact from relocation of the pipeline, due to the turbidity created during construction. The delivery of dredged sediments to Montezuma would have a less than significant impact on biological resources.

#### 4.5.3.2.4 Alternative A-3 (Channel deepening to -32 feet MLLW, placement at SF-DODS)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same as for all “A” alternatives. The delivery of dredged sediments to Montezuma would have a less than significant on biological resources. At SF-DODS however, there would be localized and short term impacts, which would return to pre-project conditions after the disposal is complete.

#### 4.5.3.2.5 Alternatives A-4 and A-5 (Channel deepening to -32 feet MLLW, placement at Eden and Alviso, respectively)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same as for all “A” alternatives. The delivery of dredged sediments at Montezuma would have a less than significant on biological resources. At the Eden Landing and Alviso placement sites, construction of the offloader and pipeline would have localized and short term impacts, which would return to pre-project conditions after the construction is complete.

#### 4.5.3.2.6 Alternative B-1 (Channel deepening to -34 feet MLLW, placement at Cullinan & Montezuma)

For all the “B” alternatives, the larger sediment volume (3.96 mcy) dredged from the channels compared to the “A” alternatives would increase the duration of the disruption to biological resources in the area around the Project. Although there would be impacts to biological resources at RWC and SBS channels that would result from the dredging options, the impacts would be less than significant after mitigation. As for the “A” alternatives, the impacts from the pipeline relocation work at SBS Channel could have significant and unavoidable impacts due to the substantially higher turbidity levels and the impacts on aquatic species during the construction period if the jet sled method of construction is used. After construction is complete, no long-term impacts are expected. There would be a less than significant impact to Montezuma from the delivery of the dredged sediment. The construction of the offloader and pipeline at Cullinan would have localized and short term impacts that would be less than significant and would be expected to return to pre-project conditions after construction is complete.

##### 4.5.3.2.7 Alternative B-2 (Channel deepening to -34 feet MLLW, placement at SF-DODS)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same for Alternative B-2 as for Alternative B-1. After construction is complete, no long term impacts are expected. The delivery of dredged sediments to Montezuma would have a less than significant impact on biological resources. At SF-DODS, there would be localized and short term impacts, which would return to pre-project conditions after the disposal is complete.

##### 4.5.3.2.8 Alternatives B-3 (Channel deepening to -34 feet MLLW, placement at Cullinan)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same as for all “B” alternatives. The construction of the offloader and pipeline at Cullinan would have localized impacts that would be less than significant and conditions at the site would be expected to return to pre-project conditions after construction is complete. At SF-DODS, there would be localized impacts, which would return to pre-project conditions after the disposal is complete.

##### 4.5.3.2.9 Alternative B-4 (Channel deepening to -34 feet MLLW, placement at Montezuma)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same as for all “B” alternatives. The delivery of dredged sediments to Montezuma would have a less than significant impact on biological resources.

##### 4.5.3.2.10 Alternatives B-5 and B-6 (Channel deepening to -34 feet MLLW, placement at Eden and Alviso, respectively)

Impacts from dredging of RWC and SBS Channels and relocation of the pipeline at SBS Channel would be the same as for all “B” alternatives. The delivery of dredged sediments to Montezuma would have a less than significant impact on biological resources. At Eden Landing and Alviso Pond A2W, construction of the offloader and pipeline would have localized impacts, which would return to pre-project conditions after the construction is complete.

##### 4.5.3.2.11 Alternatives C-1 through C-6 (Channel deepening to -37 feet MLLW, all placement sites)

For all the “C” alternatives, the larger sediment volume (7.7 mcy) dredged from the channels compared to the “A” and “B” alternatives would increase the duration of the biological resources impacts in the area around the dredging and pipeline relocation area. After construction is complete the sites are expected to return to pre-project conditions. All impacts to the placement sites are the same as for the “B” alternatives.

### 4.5.3.3 *Cultural Resources*

The impacts of each Project alternative are compared in ***Table 4-8***. With the exception of the No Action/No Project Alternative, the impacts of pipeline placement and dredging would be considered a potentially significant effect on shipwrecks and unknown submerged cultural resources, human remains, and paleontological resources. With the implementation of mitigation measure as described in ***Appendix A*** the impact would be less than significant.

#### 4.5.3.3.1 No Action/No Project Alternative

Under the No Action/No Project Alternative there would be no impacts to cultural resources. Maintenance dredging would continue, but no dredging that would deepen or widen the shipping channels would occur. No impacts to cultural resources would result as dredged material transport would not involve sediment disturbance, and would not be expected to result in a disturbance of archaeological or paleontological resources. The dredged material would be placed at existing placement sites on previously placed dredged material. Therefore, placement activities would not result in impacts to unique archaeological resources, because the underlying native deposits would not be disturbed. Environmental review would be required if the USACE used placement sites that have not been previously evaluated (USACE 2014b).

#### 4.5.3.3.1 Project Alternatives

The impacts of all of the alternatives on cultural resources are expected to be similar. Alternatives involving Dredging Option A would entail less removal of sediment, and would therefore pose a somewhat lower risk of encountering unknown cultural resources, human remains, and paleontological resources. With implementation of mitigation as described in ***Appendix A***, all action alternatives would result in less than significant impacts to cultural resources.

### 4.5.3.4 *Geology, Soils, and Seismology*

#### 4.5.3.4.1 No Action/No Project Alternative

The No Action/No Project Alternative would avoid construction impacts associated with the dredging alternatives, including temporary impacts on soil erosion resulting from dredging, relocation of the pipelines, and construction of offloading facilities at Cullinan, Eden Landing, and Alviso.

Regular maintenance dredging of RWC and SBS Channels would continue. Because of the study area’s proximity to the San Andreas and Hayward faults, the area could experience strong seismic ground shaking resulting in slope failure of the channel side slopes under the No Action/No Project Alternative. Proximity to the faults and soil conditions could result in liquefaction at the maintenance dredging and placement sites during seismic events. Strong ground shaking, liquefaction, ground settlement, subsidence, and lateral spreading could occur as part of the No Action/No Project Alternative. During maintenance dredging, workers would be exposed to these risks. However, because no new structures would be built, and maintenance dredging volumes would remain the same, the No Action/No Project Alternative poses the lowest risk of seismic-related incidents.

#### 4.5.3.4.2 Alternatives A-1 through A-5

Impacts related to geology, soils, and seismicity would be similar for these five alternatives. Although the alternatives may result in minimal erosion of the channel sides from sloughing after the channels are dredged (due to the disturbance of sediments), historic patterns of erosion and sediment accumulation would not be expected to change. Seismic hazards such as ground shaking and liquefaction, and the potential for slope failure of the channel banks would be similar to those for the No Action/No Project Alternative above. The potential for erosion impacts due to placement activities would be minimal and temporary at Cullinan, Eden Landing, and Alviso. Offloading facilities could also be subject to severe shaking. Workers at the Project site would be exposed to these risks; however, proper design of the offloading facilities would reduce potential seismic-related risk to less than significant levels. Because no offloading facilities would be constructed at Montezuma and SF-DODS, the alternatives using only these two placement sites would have slightly lower impacts to seismicity and soils than the alternatives involving Cullinan, Eden Landing, or Alviso.

#### 4.5.3.4.3 Alternatives B-1 through B-6

Impacts related to geology, soils, and seismicity would be similar to Alternatives A-1 through A-5 except that twice as much sediment would be dredged from the channels and delivered to placement sites. The potential for slope failure would be slightly greater for these alternatives due to the deeper dredging at the channels, and the greater duration of construction activities would result in in a corresponding, very minor, increase in potential for seismic events affecting the offloading locations. As for Alternatives A-1 through A-5, because no offloading facilities would be constructed at Montezuma and SF-DODS, the alternatives using only these two placement sites would have slightly lower impacts to seismicity and soils than the alternatives involving Cullinan, Eden Landing, or Alviso.

#### 4.5.3.4.4 Alternatives C-1 through C-6

Impacts related to geology, soils, and seismicity would be same as Alternatives B-1 through B-6 except nearly twice as much sediment would be dredged and delivered to placement sites. The potential for slope failure would be the greatest with these alternatives because these alternatives would result in the greatest channel depths. There would be a minor increase in potential for seismic events affecting the offloading locations due to the extended duration of project activities. The Montezuma and SF-DODS placement sites would not require construction of any offloading facilities, therefore the alternatives using only these two placement sites would have slightly lower impacts to seismicity and soils than the alternatives involving Cullinan, Eden Landing, or Alviso.

### 4.5.3.5 *Hazards and Hazardous Materials*

#### 4.5.3.5.1 No Action/No Project Alternative

Use and management of hazardous materials would remain the same as they currently occur within the Port. Maintenance dredging, including dredging of any contaminated sediments would continue in accordance with the USACE's maintenance dredging program. Relocation of the existing fuel lines below SBS Channel would not be required.

#### 4.5.3.5.2 Alternatives A-1 – A-5

All three dredging options would require relocating the fuel pipelines. Because Dredging Option A would require the least amount of dredging, it would have the lowest fuel use and shortest construction duration. Use of hazardous materials could be reduced further by using an electrically-powered dredge and operating the Cullinan offloader using electric power. There would be no offloader operations at SF-DODS, and impacts associated with offloader operations at Montezuma would be the responsibility of the site owner. Due to their remote locations, it is unlikely that the offloading facilities at Eden Landing and Alviso could be electrically-powered; however, it is possible that sediment could be delivered to these sites directly via cutterhead dredge, thus reducing potential risks due to fueling of offloading equipment. The shorter dredging and placement duration would also result in the least risk of a navigational incident.

The quantity of contaminated sediment in RWC Channel has not been fully defined, and therefore it is not possible to determine whether a greater volume of contaminated sediment would have to be dredged for Dredging Options B and C than for Dredging Option A.

#### 4.5.3.5.3 Alternatives B-1 – B-6

Dredging Option B would require approximately twice as much dredging as Dredging Option A, and would therefore have greater fuel use and a slightly greater risk of an adverse event from a fuel spill or navigational incident. Similarly, the duration of use for the placement sites would be approximately double that compared to Alternatives A-1 through A-5. If offloading facilities are electrically-powered, there would be no difference in potential offloading-related hazards materials incidents between alternatives including Dredging Option A and alternatives including Dredging Option B.

The quantity of contaminated sediment in RWC Channel has not been fully defined, and therefore it is not possible to determine whether a greater volume of contaminated sediment would have to be dredged for Dredging Options B and C than for Dredging Option A.

#### 4.5.3.5.4 Alternatives C-1 – C-6

Dredging Option C would require approximately four times as much dredging as Dredging Option A, and would therefore pose the greatest potential risk associated with hazardous materials and navigational incidents. As for Alternatives B-1 through B-6, if offloading facilities are powered by electricity, the potential for hazardous materials incidents associated with offloading would the same regardless of the volume of material placed.

The quantity of contaminated sediment in RWC Channel has not been fully defined, and therefore it is not possible to determine whether a greater volume of contaminated sediment would have to be dredged for Dredging Options B and C than for Dredging Option A.

### 4.5.3.6 ***Land Use and Planning***

#### 4.5.3.6.1 No Action/No Project Alternative

Land uses would remain the same as they currently exist at both the dredging site and the placement sites. Therefore, no impacts are expected under the No Action/No Project Alternative.

#### 4.5.3.6.2 Project Alternatives

The impact from all dredging options would be the same and the construction of a temporary staging area to support the dredging activities would not be significant impact. All placement sites, including SF-DODS, have either been specifically permitted to accept dredged sediment, or would be specifically permitted to receive dredged sediment prior to use as a placement site. Less than significant impacts to land use could occur from the presence of dredging, construction, and/or off-loading equipment in areas used for commercial navigation and recreational boating.

### 4.5.3.7 ***Noise***

#### 4.5.3.7.1 No Action/No Project Alternative

Under the No Action/No Project Alternative, there would be no use of the placement sites, and no change in the noise environment. Noise sources within the Port would remain the same; however, noise levels may increase slightly over time as cargo volume and therefore use of Port facilities increases over time. Noise at the Port has high legal thresholds, due to its industrial use. Existing land and water-based traffic and activities in the Project area contribute to the existing noise environment, sometimes incurring adverse impacts, which require mitigation by the parties involved.

#### 4.5.3.7.2 Alternative A-1

Noise would occur from dredging activities, pile driving for fuel line relocation if the new fuel pipeline segments are tied in *in situ*, construction of the offloader (including limited pile driving) and offloader operations. The duration of dredging and offloading activities would be shorter for alternatives involving Option A than for the other dredging options. The most intense noise impacts in the project area would be from pile driving, and any pile driving would be short term, localized, and would not be significant after mitigation. Operation of tugboats and offloader pumps during dredged material delivery may temporarily increase noise levels at nearby wildlife receptors. However, the closest habitat is low quality and this impact is not considered significant. Tugboats towing scows to and from the offloader would be idling after positioning the scow at the offloader. Noise from the tugboats would be intermittent and short, occurring roughly four to six times per day.

#### 4.5.3.7.3 Alternative A-2, B-4, and C-4

The most intense noise impacts in the Project Area (pile driving at SBS Channel during pipeline relocation) would be short term, localized, and would not be significant after mitigation. Though Alternative B-4 would have longer dredging durations and would result in more scow trips to delivery sites, the overall noise impacts are comparable. The reuse of dredged sediments at Montezuma would have very low impact from a noise perspective, since only minimal noise from tugboats towing scows to the offloader would be produced. The noise from this activity would be less than ambient levels. There is potential for less than significant noise impacts to recreational boaters, but this would be short-lived and the affected area is easily avoided by boaters, especially since notices to mariners will be issued through the USCG.

#### 4.5.3.7.4 Alternative A-3, B-2, and C-2

The most intense noise impacts in the Project Area (pile driving at SBS Channel during pipeline removal) would be short term, localized, and would not be significant after mitigation. Though Alternatives B-2 and C-2 would have longer dredging durations and would result in more scow trips to delivery sites, the overall noise impacts are comparable. Use of SF-DODS for sediment disposal has relatively low noise impacts. There would be less than significant noise impacts to wildlife from tugboats towing scows past wildlife areas en route to SF-DODS. The reuse of dredged sediments at Montezuma has very low impact from a noise perspective, as described above.

#### 4.5.3.7.5 Alternatives A-4, B-5, and C-5

The most intense noise impacts in the project area (pile driving at SBS and during Eden Landing offloader construction) would be short term, localized, and would not be significant after mitigation. Though Alternatives B-5 and C-5 would have longer dredging durations and would result in more scow trips to the offloader sites or an increased duration of pumping from the cutterhead, the overall noise impacts are comparable. Maximum use of Eden Landing for dredged material placement would be the best option from a noise impact perspective, since there would be no adverse noise impacts, other than effects to wildlife from pile driving for the offloader, from use of Eden Landing. The reuse of the wetland foundation sediments at Montezuma has very low impact from a noise perspective, as described above.

#### 4.5.3.7.6 Alternative A-5, B-6, and C-6

The most intense noise impacts in the project area (pile driving at SBS Channel and during offloader construction at Alviso) would be short term, localized, and would not be significant after mitigation. Though Alternatives B-6 and C-6 would have longer dredging durations and would result in more scow trips to the placement sites or an increased duration of pumping from the cutterhead, the overall noise impacts are comparable. The offloading of dredged sediments at the Alviso offloader would have relatively low impacts due to the high existing noise environment from nearby highways and railroads and the attenuation of noise with distance. Noise impacts from the booster pump at the sediment delivery location would be similar to those anticipated at Cullinan. The reuse of the wetland foundation sediments at Montezuma has very low impact from a noise perspective, as described above.

##### 4.5.3.7.7 Alternative B-1 and C-1

The most intense noise impacts in the project area (pile driving at SBS Channel and during offloader construction at Cullinan) would be short term, localized, and would not be significant after mitigation. Although Alternative C-1 would have longer dredging durations and would result in more scow trips to placement sites, the overall noise impacts are comparable. The reuse of the wetland foundation sediments at Montezuma has very low impact from a noise perspective, as described above. The reuse of dredged sediments at Cullinan would have localized and short term impacts on noise due to the construction of the offloader and during offloader operations. Operation of tugboats and offloader pumps during dredged material delivery may temporarily increase noise levels at wildlife receptors nearby. However, the closest habitat is low quality and this impact is not considered significant. Noise from the tugboats would be intermittent and short, occurring roughly four to six times per day.

##### 4.5.3.7.8 Alternatives B-3 and C-3

The most intense noise impacts in the project area (pile driving at SBS Channel and during offloader construction at Cullinan) would be short term, localized, and would not be significant after mitigation. Though Alternative C-3 would have a longer dredging durations and would result in more scow trips to placement sites, the overall noise impacts are comparable. The reuse of dredged sediments at Cullinan would result in localized and short term noise impacts as described above. Use of SF-DODS for sediment disposal has relatively low noise impacts. There would be less than significant noise impact to wildlife from tugboats towing scows past wildlife areas near en route to SF-DODS.

#### 4.5.3.8 *Recreation*

##### 4.5.3.8.1 No Action/No Project Alternative

Recreation features would continue to function as they do currently at both the dredging sites and the placement sites. The No Action/No Project Alternative would avoid any short-term impacts associated with dredging, pipeline relocation and offloading elements of the project alternatives. The existing recreational features would not be affected. Over time, increased cargo throughput through the Port could have *de minimis* effects on recreational boat use in RWC Channel, and through indirect (noise) effects on nearby recreational resources.

##### 4.5.3.8.2 Alternatives A-1, A-5, B-1, B-3, and B-6

These alternatives would require construction of an offloader and pipeline for placement of dredged sediment. Work may be required in a slough and the presence of construction equipment could interfere with boating access. During construction, the USACE would coordinate with USFWS on signs to safeguard recreationists and maintain access to unaffected areas. Continued access would be provided, and the duration required for construction in the sloughs would only be a matter of days. Therefore impacts to recreational activities would be short-term and considered less than significant. Alternatives B-1 and B-6 include use of the Montezuma placement site, and Alternative B-3 would include use of SF-DODS, both of which would have negligible impacts to recreational activities.

##### 4.5.3.8.3 Alternatives A-2, A-3, B-2, and B-4

No construction is required for the Montezuma and SF-DODS placement sites. Barges would deliver sediment to the offloader already in place at Montezuma and sediment would be bottom-dumped at SF-DODS. SF-DODS is located in open waters where minimal recreational activities take place. Alternative B-4 would not require use of SF-DODS.

##### 4.5.3.8.4 Alternatives A-4 and B-5

These alternatives would require construction of an offloader and pipeline for placement of dredged sediment. Work would occur in an open water area, therefore impacts to recreational activities would be short-term and less than significant. Both alternatives include use of the Montezuma placement site, which would have negligible impacts to recreational activities.

##### 4.5.3.8.5 Alternatives C-1 through C-6

The recreational impacts of Alternatives C-1, C-2, C-3, C-4, C-5 and C-6 would be the very similar to B-1, B-2, B-3, B-4, B-5, and B-6, respectively. The amount of sediment delivered to each site would nearly be doubled. Impacts to recreation would have the greatest duration under these alternatives, however, impacts would still be considered less than significant.

Alternatives A-2 and A-3 are the most-preferred alternatives and C-1, C-3, and C-6 are the least-preferred alternatives with regard to impacts to recreation.

#### 4.5.3.9 *Socioeconomics*

##### 4.5.3.9.1 No Action/No Project Alternative

There would be no use of the placement site under the No Action/No Project Alternative and consequently no effect on socioeconomics. Cargo throughput at the Port is forecast to grow at an average annual rate of 2.8 percent whether or not the proposed Project is implemented. Therefore regional job growth associated with increased Port operations would occur under this alternative; however, there would be no economic benefit to the construction industry in the region.

##### 4.5.3.9.2 All Project Alternatives

All dredging options would have a slight beneficial effect due to increased efficiency in use of the Port for importing and exporting construction materials. A very minor short-term benefit would also accrue from the creation of up to 40 to 45 construction jobs lasting between 11 and 67 months. No adverse impacts are expected since positive impacts to the economy would not be disproportionately distributed. Similarly, adverse impacts would not be disproportionately distributed to low income communities and/or communities of color.

### 4.5.3.10 ***Transportation/Navigation***

#### 4.5.3.10.1 No Action/No Project Alternative

Transportation and navigation would remain the same as they currently exist at both the dredging sites and the placement sites.  Since dredge sites are currently depth-limited and the proposed Project would reduce navigation constraints, the existing inefficiencies would continue under the No Action/No Project Alternative and likely worsen over time due to increasing demand for construction commodities in the South Bay and the tendency for ships to get bigger over time.  However, as described previously, cargo growth is driven by regional demand, and is expected to continue at an average annual rate of 2.8 percent, resulting in reaching the 2.5 million ton forecast cargo tonnage in 2025.

#### 4.5.3.10.2 All Project Alternatives

The post-construction effect on navigation would be beneficial, as the added depths would decrease delays, improve navigation efficiency, and decrease the overall number of scow trips in the project area.  During construction, the impact from all dredging options would be the same and the construction of temporary staging areas to support the dredging activities would not be a significant impact.  All placement sites scenarios would involve some additional vessel transits in the Project Area; however only two to three scows per day would be taken to the placement sites, and impacts from this limited number of scow trips would be less than significant.  A notice to mariners would be posted so that both commercial and recreational users in the project area are aware of the location and schedule for construction. Contractors would be required to comply with all rules for vessel navigation.

Truck traffic from the Port would increase in response to cargo growth, as described above. This increase in truck traffic would occur whether or not the proposed Project is constructed.

### 4.5.3.11 ***Utilities and Service Systems***

#### 4.5.3.11.1 No Action/No Project Alternative

Under the No Action/No Project Alternative there would be no demand for electricity or other utilities to support dredging to deepen RWC channel or pump dredged sediment to the Eden Landing or Alviso placement sites.  There would be no construction at and no use of any of the placement sites, and no need to supply electrical power to any of the site.  Use of utilities at the Port would increase commensurate with growth in cargo throughput.

The existing fuel pipelines are at considerably shallower elevations than dictated by their permits.  It is unknown whether the pipeline owners would be required to relocate the pipelines if the proposed Project is not constructed.

#### 4.5.3.11.2 Project Alternatives

All action alternatives would require relocation of the fuel pipelines crossing under SBS Channel.  Only minor use of non-electrical utilities, if any, would be required by the alternatives (i.e., to provide sanitary facilities to the small number of workers associated with the proposed

Project). If the Project decides to employ an electrically-powered dredge for work in RWC Channel, an existing substation would be used; however, power demand would increase substantially while the Project-related dredging is occurring.

#### 4.5.3.11.3 Alternatives A-2, A-3, B-2, B-4, C-2, and C-4

These alternatives would use only Montezuma and/or SF-DODS as placement sites and would have no other utility requirements.

#### 4.5.3.11.4 All Other Alternatives

All other alternatives could have minor utility use associated with the small crew operating the offloaders; however, with the exception of electrical power at Cullinan, no utility construction is anticipated for any of the alternatives.

### 4.5.3.12 *Water Quality and Hydrology*

#### 4.5.3.12.1 No Action/No Project Alternative

Water quality would remain the same as it currently is at both the dredging sites and the placement sites. Surface water quality would be controlled through the Port of Redwood City's existing stormwater management program and in compliance with the state of California's general permit for stormwater.

#### 4.5.3.12.2 Alternative A-1

Water quality impacts on the water column from this alternative would localized and would not be significant after mitigation. The reuse of dredged sediments at Cullinan would have localized and short term impacts on the water column due to the construction of the offloader and pipeline, which would return to ambient conditions after construction is complete.

#### 4.5.3.12.3 Alternative A-2

Water quality impacts on the water column from this alternative would be localized and would not be significant after mitigation. The reuse of dredged sediments at Montezuma would have no impact on water quality.

#### 4.5.3.12.4 Alternative A-3

Water quality impacts on the water column from this alternative would localized and would not be significant after mitigation. The reuse of dredged sediments at Montezuma would have no impact on water quality. At SF-DODS, there would be localized and short term impacts on the water column, which would return to ambient conditions after the disposal is complete.

#### 4.5.3.12.5 Alternatives A-4 and A-5

Water quality impacts on the water column from these alternatives would localized and would not be significant after mitigation. The reuse of dredged sediments at Montezuma would have no impact on water quality. At the Eden Landing and Alviso placement sites, construction of the offloader and pipeline would have localized and short term impacts on the water column, which would return to ambient conditions after the construction is complete.

#### 4.5.3.12.6 Alternative B-1
For all the "B" alternatives, the larger sediment volume (3.96 mcy) dredged from the channels compared to the "A" alternatives would increase the duration of the water quality disruption in the water column in the area immediately around the dredge. The reuse of dredged sediments at Montezuma would have no impact to water quality. The reuse of dredged sediments at Cullinan would have localized and short term impacts on the water column due to the construction of the offloader and pipeline, which would return to ambient conditions after construction is complete.

#### 4.5.3.12.7 Alternative B-2
For all the "B" alternatives, the larger sediment volume (3.96 mcy) dredged from the channels compared to the "A" alternatives would increase the duration of the water quality disruption in the water column in the area immediately around the dredge. The reuse of dredged sediments at Montezuma would have no impact on water quality. At SF-DODS, it would have localized and short term impacts on the water column, which would return to ambient conditions after the disposal is complete.

#### 4.5.3.12.8 Alternatives B-3
For all the "B" alternatives, the larger sediment volume (3.96 mcy) dredged from the channels compared to the "A" alternatives would increase the duration of the water quality disruption in the water column in the area immediately around the dredge. The reuse of dredged sediments at Cullinan would have localized and short term impacts on the water column due to the construction of the offloader and pipeline, which would return to ambient conditions after construction is complete. At SF-DODS, it would have localized and short term impacts on the water column, which would return to ambient conditions after the disposal is complete.

#### 4.5.3.12.9 Alternative B-4
For all the "B" alternatives, the larger sediment volume (3.96 mcy) dredged from the channels compared to the "A" alternatives would increase the duration of the water quality disruption in the water column in the area immediately around the dredge. The reuse of dredged sediments at Montezuma would have no impact on water quality.

#### 4.5.3.12.10 Alternatives B-5 and B-6
For all the "B" alternatives, the larger sediment volume (3.96 mcy) dredged from the channels compared to the "A" alternatives would increase the duration of the water quality disruption in the water column in the area immediately around the dredge. The reuse of dredged sediments at Montezuma would have no impact on water quality. At Eden Landing and Alviso, construction of the offloader and pipeline would have localized and short term impacts on the water column, which would return to ambient conditions after the construction is complete.

#### 4.5.3.12.11 Alternatives C-1 through C-6
For all the "C" alternatives, the larger sediment volume (7.7 mcy) dredged from the channels compared to the "A" and "B" alternatives would increase the duration of the water quality

disruption in the water column in the area immediately around the dredge. All impacts to the action alternatives are the same as the "B" alternatives.

# 5 NEPA/CEQA Considerations and Other Required Analyses

This chapter addresses other topics required by NEPA and CEQA in this Integrated Document. The following sections address environmental justice (NEPA, Executive Order 12898, 59 CFR 7629), provide a summary of cumulative impacts (NEPA and CEQA; details for each resource are presented in ***Chapter 4 and Appendix A***), growth-inducing impacts (CEQA), and other required analyses. The other required analyses include unavoidable adverse impacts (CEQA), irreversible and irretrievable commitments of resources (NEPA and CEQA), the relationship of short-term uses and long-term productivity (NEPA), energy resources (CEQA) and the identification of the environmentally superior alternative (CEQA).

## 5.1 Unavoidable Adverse Impacts/Unavoidable Significant Impacts

This EIS/EIR identified a number of potentially significant impacts. All of these impacts can be reduced to a less than significant level by application of the mitigation measures identified in this document, with the exception of potential impacts to air quality and turbidity effects to biota if the jet sled method of construction is used. The following impacts would still be considered potentially significant after application of available mitigation:

- Impact AQ-1: <u>Construction Air Emissions</u>

Although construction of the proposed Project would be scheduled so that emissions of criteria air pollutants remain below the conformity threshold, average daily emissions of NOx, ROG, and $PM_{2.5}$ would exceed the BAAQMD thresholds of significance for construction emissions. Specific measures, including use of an electric offloader at Cullinan, reducing the dredge horsepower, and limiting the horsepower of tugs used in-Bay, have already been incorporated into the proposed Project; nonetheless, BAAQMD thresholds of significance for construction emissions would be exceeded. Two other measures are currently under evaluation to determine their feasibility for the proposed Project: powering the dredge in RWC Channel using electrical power, and requiring use of Tier 3 engines for all transport tugs. Depending on the selected alternative and the specific constituent, emissions could be reduced from 13% to 56% if the additional measures are feasible.

- Impact Bio-1: <u>A substantial adverse effect through substantial population decline, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFWS or USFWS.</u>

Use of the jet sled method of construction could require between 50 and 100 months for pipeline replacement at SBS channel (depending on depth). Turbidity effects would occur primarily in SBS Channel, an area that currently experiences some disturbance from deep draft vessel traffic. Due to the long duration of the dredging activities in a localized area, effects from increased turbidity associated with jet sled would be considered significant. Use of a silt curtain or other barrier device would be infeasible due to the use of the channel by deep draft vessels. Turbidity impacts to special status species and other fish species would be minimized though compliance with LTMS and permitting requirements and implementation of WQ-M1 (***Appendix A, Section A.15.4***); however, the residual impact would remain significant. Use of the jet sled method of construction would result in a significant and unavoidable impact from increased turbidity. After construction is complete the site would quickly be expected to return to near pre-project conditions and the impacts would be expected to be less than significant.

- Impact WQ-1: Creation of or Increase in Contamination, Pollution or a Nuisance, or Violation of a Regulatory Standard

There is little information regarding the turbidity impacts from a jet sled or pipeline jetting operation; however, total suspended solids (TSS) levels would be expected to be substantially higher in the lower water column than TSS from dredging operations. The plume would extend from the pipeline replacement site for a variable distance which would be influenced by tides and currents. The duration of the pipeline excavation would be substantially longer than the other two pipeline replacement methods. Although the TSS levels would be expected to be high during the jet sled construction period, after completion, the plume would be expected to settle quickly, particularly due to the expected higher sand content of the sediment in the SBS Channel area, and no long term turbidity effects are expected.

The dredging operations at SBS would be done in conjunction with the pipeline replacements to minimize mobilization of equipment which would extend the duration of elevated turbidity and TSS levels at the site. Dredging of the trench would add up to 3 weeks to the total dredging duration. If the clamshell or directional drilling pipeline replacement methods are used the impact would be expected to be less than significant impact with the implementation of Mitigation Measure WQ-M1 (***Appendix A, Section A.15.4***). If the jet sled pipeline excavation method is used, the impact would be expected to be significant and unavoidable due to the longer duration of high turbidity and TSS levels and the lack of feasible mitigation measure (i.e. use of a silt curtain or other barrier device).

## 5.2 Issues of Known Controversy

One issue of known controversy has been identified. As documented in USEPA's comment letter received during the scoping period, resource and regulatory agencies are targeting 100 percent beneficial reuse for deepening projects (the USEPA letter is provided in ***Appendix K***). USACE's policy for determining the NED Plan requires that national economic development benefits be maximized, which in turn requires use of the lowest cost placement site. For this project, the lowest cost placement option is disposal at SF-DODS. An NED Plan relying primarily on SF-DODS for dredged sediment placement would be controversial.

Should the Eden Landing or possibly Alviso ponds become available as a dredged sediment placement site by the time the proposed Project is ready to go to construction, they may be a less expensive location for dredged sediment placement than SF-DODS.

## 5.3 Relationship of Short-Term Uses and Maintenance/Enhancement of Long-Term Productivity

The Council on Environmental Quality (CEQ) Guidelines that implement the NEPA regulations (40 CFR 1500 et seq.) require that an EIS discuss issues related to environmental sustainability. The discussion relates to environmental consequences, including consideration of "the relationship between local short-term uses of [our] environment and the maintenance and enhancement of long-term productivity" [42 USC 4332(C)(iv)].

The proposed Project has USACE objectives and non-federal sponsor objectives. The USACE objective is to contribute to NED while remaining consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning requirements.

The non-federal sponsor's objectives are to enhance the economic and environmental sustainability at the Port of Redwood City by allowing use of the Port by more heavily-laden vessels, while ensuring protection of near-by sensitive habitats, and supporting the LTMS policies, including beneficial reuse of dredged material.

The Project would result in deepening of RWC and SBS Channels to a depth between -32 feet MLLW and -37 feet MLLW plus overdepth, and placement of the dredged sediment at one or more of five placement sites. None of the action alternatives are anticipated to generate growth in cargo throughput (***Section 5.5***).

As described in Chapter 3, deepening the channels would support the USACE's NED objective and the non-federal sponsor's economic sustainability objective by supporting economic development through an increase in transportation efficiency. All action alternatives would protect adjacent habitats through proper channel design, and most alternatives would contribute to enhancement of the environment through beneficial reuse of dredged sediment. As shown in Chapter 4, none of the action alternatives would result in long-term adverse effects on environmental sustainability. However, an environmental effects trade-off exists between the goal of minimizing turbidity at the dredge location by avoiding barge overflow, and the number of tug trips required to transport the dredged sediment to the placement sites. Eliminating barge overflow effectively reduces the sediment load of each scow by 33 percent, resulting in a 50 percent increase in the number of tug trips required to transport the dredged sediment to the placement site(s). There would be a substantial increase in fuel use, criteria air pollutant emissions, and GHG emissions if barge overflow is eliminated.

During operations, increasing transportation efficiency would reduce criteria air pollutant emissions and GHG emissions relative to the No Action/No Project condition (see Section 4.5.2) without inducing growth in cargo throughput.

## 5.4 Irreversible and Irretrievable Commitments of Resources

Section 15126(c) of the CEQA Guidelines requires an EIR to address any significant irreversible environmental changes and irretrievable commitment of resources that may occur as a result of implementation of the proposed Project or alternatives. Resources that are irreversibly or irretrievably committed to a project are those that are typically used on a long-term or permanent basis; however, some are considered short-term resources that cannot be recovered and are thus considered irretrievable. This includes use of nonrenewable resources (e.g., fuel, wood, or other natural or cultural resources), the commitment of future generations to similar uses, and irreversible damage, which can result from environmental accidents associated with the Project. Irreversible changes associated with all of the alternatives include the use of building materials, nonrenewable energy sources, and labor required to operate trucks, machinery, and other equipment. The unavoidable destruction of natural resources which limit the range of potential uses of that particular environment would also be considered an irreversible or irretrievable commitment of resources.

Implementation of any Project alternatives would result in both short- and long-term impacts. During dredging and placement of dredged sediment there would be an increase in air pollution emissions and noise in the immediate vicinity of the dredging and placement site(s) and there could be adversely affected special status fish and marine mammals. Noise effects and impacts to special status fish and marine mammals would be temporary and less than significant after mitigation. The air quality impacts during construction would be significant and unavoidable and would last for the duration of construction, up to 16 dredging seasons. If scow overflow is allowed, the total Project duration and tug trips would decrease by 33 percent. The transport and placement of the dredged material at one or more of the proposed placement sites would increase maritime traffic for the duration of the dredging period. Depending on the selected placement sites, there could be up to 400 scow trips per year if the existing permitted reuse sites are used, or a total of up to 4,800 scow trips during the dredging period. The SF-DODS disposal site would require the most trips. This level of additional traffic would have only minimal effects on shipping lanes in the San Francisco, San Pablo, and Suisun Bays relative to existing traffic, and any impacts would be short term. If Eden Landing or Alviso are used, there could be up to 1,000 tug trips per year, but the effect of up to 6 round trip tug trips per day would be also be less than significant, and the total number of tug trips to these placement sites would be 4,300 or less. All action alternatives could also result in the damage or destruction of unknown archeological and paleontological resources, and human remains.

The proposed Project would constitute an irreversible or irretrievable commitment of nonrenewable or depletable resources for the materials, time, money, and energy expended during activities implementing the proposed Project. Under all alternatives except the No Action/No Project Alternative, there would be irreversible and irretrievable commitments of resources. The following paragraphs summarize the irreversible and/or irretrievable impacts of the proposed Project.

- Project construction and long-term maintenance of the study area would require consumption of fossil fuels and energy. Fossil fuels (gasoline and diesel fuel) would be used to power dredging and offloading equipment, support vessels, worker and ancillary supply vehicles, and other support equipment. The energy consumed for project construction represents a permanent and nonrenewable commitment of these resources.
- All of the materials used for construction of the proposed offloading facilities would come from off-site sources. This would constitute a long-term, nonrenewable investment by the Federal and non-federal sponsors. Dredging and dredged sediment placement activities are considered a long-term nonrenewable investment of these resources.
- The capital and labor required for construction would be an irreversible and irretrievable commitment of financial resources.

These commitments of resources could have been applied to projects other than the proposed Project. No natural resources would be permanently destroyed, and acceleration of habitat restoration, if some or all of the dredged sediment is placed at a beneficial reuse site, would be considered beneficial to the region.

## 5.5 Growth-Inducing Impacts

CEQA requirements for evaluation of growth-inducing impacts are set forth in Section 15126.2 (d) of the CEQA Guidelines (California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000-15387). CEQA requires that both direct and indirect impacts of all phases of a proposed project be considered. Growth-inducement is typically considered to be a direct or indirect effect of an action that either directly fosters growth or removes an obstacle to economic or population growth, or the construction of new housing. The CEQA Guidelines also require evaluation of new infrastructure and service facilities needed to serve growth induced by a project. The Guidelines note that "it must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment." Therefore, the nature of the effects of any induced growth also must be considered to determine if the impacts of that growth are potentially significant.

Some projects may be considered growth inducing while others may be growth accommodating (i.e. they are intended to accommodate planned growth, but do not induce that growth). The proposed Project would be growth accommodating. The distinction is primarily whether or not a project removes an obstacle to growth. The purpose of the proposed Project is to improve the efficiency of deep draft navigation at the Redwood City Harbor and San Bruno Shoal Channels (see ***Section 2.6***)

The proposed Project would not induce growth in cargo throughout through the Port; cargo growth is driven by regional economic growth, and would occur regardless of whether the channels are deepened. The Port's throughput capacity is determined by its land-side infrastructure. The Port has implemented Phase 1 of the Wharves 1 and 2 Reconstruction

Project, which upgraded the infrastructure at the Port to increase cargo throughput capacity. The Wharves 1 and 2 Reconstruction Project is proceeding, and Phase 2 would be implemented whether or not the channel is deepened.

Analyses of various harbors, which have included consideration of commodity forecasts, competing ports, Port capacities, and land side costs to hinterland origins and destinations proved to a reasonable degree that deepening of a particular harbor would have little to no effect on the total amount of cargo shipped through that port. Many factors affect harbor growth and competitiveness (***Section 2.2***). They include land side development and infrastructure, location of distribution centers for imports, source locations for exports, population and income growth and location, port logistics and fees, business climate and taxes, carrier preferences, labor stability or volatility, and business relationships. Harbor depth is just one of the many factors involved. Overall growth in cargo is limited by the throughput capacity of the Port, which is controlled by the land-side infrastructure. As described in ***Section 4***, the permitted maximum throughput capacity of the Port with Phase 2 of the Wharves 1 and 2 Reconstruction Project completed is 2.5 million tons of sand and aggregate, 300,000 tons of gypsum, 850,000 tons of cement, and export of up to 450,000 tons of scrap metal. There are no plans to increase the Port's throughput capacity beyond these levels, and the proposed Project would have no effect on the maximum throughput capacity at the Port.

The Project would be growth-accommodating, in that it would reduce the challenges that shippers face when using the Port. As stated in Section 1.1, Purpose and Need for Project, the purpose of the project is to provide for more efficient movement of commodities and provide for related economic benefits. In so doing, the Project would have a minor beneficial effect on regional air quality because the total number of vessel calls, delays entering the Port, and the need for lightering cargo into scows would all be reduced relative to the No Action/No Project Alternative.

## 5.6 Environmental Justice

### 5.6.1 Affected Environment

#### 5.6.1.1 *Regulatory Setting and Study Methodology*

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was issued on February 11, 1994. The order requires Federal agencies to identify and address disproportionately high and adverse human health and environmental effects of Federal programs, policies, and activities on minority and low-income populations. As the Federal sponsor of the proposed Project, USACE must consider how the project might affect these target populations.

Potential environmental justice populations were identified primarily using 2010 U.S. Census information. Because the Census Bureau's current population reports (Consumer Income Reports P60) do not provide detailed information about the study area, they were considered but not used for analysis.

Much of the study area, including all permitted and potential placement sites, is open, undeveloped land. The following sites that are part of the Project Area are far (1.5 miles or more) from the closest residential areas and therefore were not evaluated to determine whether the closest community would be classified as an environmental justice community:

- SBS Channel (1.5 miles or more from the closest residential area)
- The Eden Landing offloading location (2.3 miles from the closest residential area)
- Eden Landing sediment delivery location (3 miles from the closest residential area)
- Alviso offloading location (1.5 miles or more from the closest residential area)
- Alviso sediment delivery locations (both 2.9 miles from the closest residential areas to the two locations)
- Alviso intermediate booster pump location (2.9 miles from the closest residential locations)
- SF-DODS (50 miles offshore)

Both the Montezuma (Collinsville, Census Tract 2535, no block level information) and Cullinan (Vallejo, Census Tract 2517.02, Block 1101) placement sites are located in an open space area; however, there are residential areas within approximately 0.3 to 0.35 miles of both locations. For these areas, the census tract data applicable to those nearby residential areas were used as a basis for evaluation. Finally, there are two residential communities in the vicinity of RWC Channel: The houseboats at Docktown Marina, and mobile home parks along East Bayshore Road. The closest houseboat is about 0.7 miles from the southern-most dredging location; the closest mobile home is about 1.2 miles from the southernmost dredging location. These two communities are in the same Census tract (6103.02), but in separate Census blocks (1053 and 1037, respectively). The applicable Census block for the Cullinan site contains only 26 people; therefore the entire census tract was used as basis for comparison. No Census block-level data are available for Collinsville.

#### 5.6.1.2 *Minority Populations*

According to the CEQ guidelines for environmental justice analyses (CEQ 1997):

> Minority populations should be identified where either (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the majority population percentage in the general population or other appropriate unit of geographic analysis. A minority population also exists if there is more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds.

This study uses criterion (a) to identify minority communities. For the purpose of this study, a *minority* is a person who is Black, Asian, American Indian or Alaskan Native, or Native Hawaiian or other Pacific Islander or is of Hispanic or Latino origin. People of Hispanic or Latino origin may be of any race and of more than one race.

***Table 5-1*** summarizes the racial and ethnic population distribution of cities in the study area. Minority populations in the cities and counties in and around the study area range from 50.4 percent to 73.9 percent, compared to the 54.2 percent for the nine-County Bay Area as a whole, and 60.3 percent for the State as a whole. For the specific census tracts and blocks discussed above, the minority populations are as follows:

- Redwood City, Docktown Marina – Census tract 6103.02, Block 1053: 61.9 percent
- Redwood City, Mobile Home Park Area – Census tract 6103.02, Block 1037: 59.9 percent
- City of Vallejo, Lighthouse Drive Area – Census tract 2517.2, Block 1101: 57.7 percent
- Solano County, Collinsville/Rio Vista Area – Census tract 2535 (no block-level data): 30.0 percent

***Table 5-1. Socioeconomic Data by Jurisdiction and Project Site, Redwood City Harbor Navigation Improvement Project***

| Site | Jurisdiction | Population 2013 estimates | Median household income (in 2013 dollars), 2009-2013 | Persons in poverty (%)** | Bachelor's degree or higher, % of persons 25 years +, 2009-2013 | White alone (%), 2013 | Hispanic or Latino (%), 2013 | Asian alone, (%), 2013 | Black or African American alone (%), 2013 | American Indian & Alaska Native alone (%), 2013 | Total Minority Population (%), 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Redwood City Harbor Channel | Redwood City | 80,872 | $79,419 | 9.0 | 40.2 | 60.2 (2010) | 38.8 (2010) | **10.7** (2010) | 2.4 (2010) | 0.7 (2010) | 52.6 (2010) |
| Redwood City Harbor Channel / San Bruno Shoal | San Mateo County | 747,373 | $88,202 | 8.4 | 44.4 | **63.3** | 25.4 | 26.9 | 3 | 0.9 | 52.6 |
| San Bruno Shoal | City of South S.F. | 66,174 | $76,785 | **7.1** | 29.8 | 37.3 (2010) | 34 (2010) | **36.6** (2010) | 2.6 (2010) | 0.6 (2010) | 73.8 (2010) |
| | City of Brisbane* | **4,443** | $73,630 (2012) | 14.1 (2009) | 48.0 | 46.4 | 25.6 | 23.3 | **0.2** | **0.2** | 52.6 |
| Eden Landing Ecological Reserve | Alameda County | 1,578,891 | $72,112 | 13.1 | 41.8 | 52.0 | 22.7 | 28.2 | 12.4 | 1.2 | 64.5 |
| | City of Hayward | 151,574 | $62,013 | 14.4 | **24.2** | 18.6 (2010) | **40.7** (2010) | 21.6 (2010) | 11.3 (2010) | 0.3 (2010) | 73.9 (2010) |
| Montezuma | Solano County | 424,788 | $67,177 | 14.2 | 24.3 | 60.7 | 25.2 | 15.4 | **14.9** | 1.3 | 52.6 |
| Cullinan Ranch | Vallejo | 118,837 | **$53,046** | **17.5** | 23.3 | **32.8** | 22.6 | 24.9 | 22.1 | 0.7 | 70.3 |
| Alviso Pond Complex | Santa Clara County | **1,862,041** | $91,702 | 10.8 | 46.5 | 57.2 | 26.8 | 34.1 | 2.9 | **1.4** | 65.2 |
| | City of Mountain View | 77,846 | **$97,338** | 8.1 | **62.6** | 56 (2010) | **21.7** (2010) | 26 (2010) | 2.2 (2010) | 0.5 (2010) | 50.4 (2010) |
| | City of San Jose | 998,537 | $81,829 | 12.2 | 37.4 | 42.8 (2010) | 33.2 (2010) | 32 (2010) | 3.2 (2010) | 0.9 (2010) | 69.3 (2010) |
| Compare With: | San Francisco | 7,150,739 (2010) | $75,989 (2006-2010) | 9.7 (2006- | 41.5 (2006-2010) | 52.5 (2010) | 23.5 (2010) | 23.3 (2010) | 6.7 (2010) | 0.7 (2010) | 54.3 (2010) |

| Site | Jurisdiction | Population 2013 estimates | Median household income (in 2013 dollars), 2009-2013 | Persons in poverty (%)** | Bachelor's degree or higher, % of persons 25 years +, 2009-2013 | White alone (%), 2013 | Hispanic or Latino (%), 2013 | Asian alone, (%), 2013 | Black or African American alone (%), 2013 | American Indian & Alaska Native alone (%), 2013 | Total Minority Population (%), 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bay Area*** | | | 2010) | | | | | | | |
| | State of California | 38,802,500 (2014) | $61,094 | 16.8 | 30.7 | 73.5 | 38.4 | 14.1 | 6.6 | 1.7 | 60.8 |
| | United States | 316,128,839 (2014) | $53,046 | 14.5 | 28.8 | 77.7 | 17.1 | 5.3 | 13.2 | 1.2 | 36.8 |

All data is sourced from the United States Census Bureau, unless otherwise noted. Statistics of note (e.g., maxima or minima) are **bolded.**
*Brisbane is a small city, less than 5,000 people, and was not addressed separately in the national census. Census data for Brisbane is taken from city-data.com.
**No date was provided for this item, but data are likely from 2009-2013.
***San Francisco Bay Area data are taken from Bay Area Census (2010) and aggregates data from the following nine Counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.

#### 5.6.1.3 *Low Income Population*

To identify low-income populations, the CEQ's environmental justice guidance states the following (CEQ 1997):

> *Low-income populations in an affected area should be identified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. In identifying low-income populations, agencies may consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect.*

However, the Census Bureau's current P-60 population report provides only general information about income trends nationwide and does not provide detailed information about the study area (US Census Bureau 2014). Because of this, the 2010 Census data are used to obtain more detailed information on income and poverty in the Census tracts listed above.

For the purpose of this study, a low-income population is persons who have a median income below the poverty thresholds defined by the U.S. Department of Health and Human Services. To identify low-income populations in the study area, this study identifies areas having a substantially higher percentage of people and households in poverty than:

1) For cities: the counties in which they are located
2) For counties: the nine-county Bay Area average

***Table 5-1*** summarized the median income and poverty status of people living in cities and counties in the study area. Table 5.1 showed that, in general, people living in the Bay Area have a much higher median income than the residents of California as whole, and with the exception of Vallejo, all cities in the study area have higher incomes than the State average. To some degree, the higher incomes associated with each city reflect a higher cost of living in the Bay Area and are more meaningful when compared to the county incomes (and to each other) rather than to the State statistic. Poverty levels at the three locations of interest and the comparable rates at the city or county level are provided below.

- Redwood City, Docktown Marina and Mobil Home Park Area – Census tract 6103.02: 10.7 percent poverty rate; Redwood City Poverty Rate: 9.0 percent
- City of Vallejo, Lighthouse Drive Area – Census tract 2517.2: 45.1 percent poverty rate; City of Vallejo Poverty Rate: 17.5 percent
- Solano County, Collinsville/Rio Vista Area – Census tract 2535: 10.5 percent poverty rate; Solano County poverty rate: 14.2 percent

#### 5.6.1.4 *Summary*

In summary, the 2010 Census information shows that the population of Redwood City near the Port of Redwood City and the City of Vallejo near the Cullinan Ranch site support a minority population. The census data also indicate that the same areas are lower income, although given the error range for the estimate of persons living in poverty, it is uncertain whether the poverty rate for the Redwood City tract is actually lower than that of Redwood City as a whole. The community of Collinsville meets neither the minority percentage nor the income disparity criteria for an environmental justice community. The discussion of potential effects on environmental justice populations assumes that Redwood City near the Port and Vallejo near the Cullinan site represent environmental justice populations in the study area.

### 5.6.2 Potential Effects on Environmental Justice Populations

#### 5.6.2.1 *Methodology for Determining Effects*

Pursuant to Executive Order 12898, this section considers whether the project alternatives would:

- Cause disproportionately high adverse effects (such as noise, air quality, and access effects) on the identified population(s) during construction
- Cause disproportionately high adverse effects on the identified population(s) during operation and maintenance of the deepened channels

As defined in the 1997 CEQ guidance, the factors below are used to measure environmental justice effects.

##### 5.6.2.1.1 Human Health Effects

For human health effects, agencies are to consider the following factors to the extent practicable:

- Whether the health effects, which may be measured in risks and rates, are significant (as the term is used by the NEPA), or above generally accepted norms. Adverse health effects may include bodily impairment, infirmity, illness, or death;
- Whether the risk or rate of hazard exposure by a minority population, low-income population, or Indian tribe to an environmental hazard is significant (as the term is used by the NEPA) and appreciably exceeds or is likely to appreciably exceed the risk or rate to the general population or other appropriate comparison group; and
- Whether health effects occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

##### 5.6.2.1.2 Environmental Effects

For environmental effects, agencies are to consider the following:

- Whether there is or will be an impact on the natural or physical environment that significantly (as the term is used by the NEPA) and adversely affects a minority population, low-income population, or Indian tribe. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities, low-income communities, or Indian tribes when those impacts are interrelated to impacts on the natural or physical environment;

- Whether environmental effects are significant (as the term is used by the NEPA) and are or may be having an adverse impact on minority populations, low-income populations, or Indian tribes that appreciably exceeds or is likely to appreciably exceed those on the general population or other appropriate comparison group; and
- Whether the environmental effects occur or would occur in a minority population, low-income population, or Indian tribe affected by cumulative or multiple adverse exposures from environmental hazards.

The communities identified as environmental justice communities in the vicinity of the Port and the Cullinan project are located adjacent to major highways (Highway 101 and Highway 37, respectively). The Docktown Marina area is also located in the immediate vicinity of an industrial area that is located south of the dredging area and north of Highway 101. This analysis does not evaluate how the existing land uses have affected the community in the past. The following discussion focuses on how the RWC Project might affect these environmental justice communities.

#### 5.6.2.2 *Evaluation of Project Components*

In general, the proposed Project is expected to have a negligible effect on regional economic conditions; cargo growth at the Port would be driven by local economic conditions. The Project may have a slight indirect regional effect on the construction industry through reduced cost of materials, which in turn could result in slight increases in construction employment. These minor positive effects would apply to all populations in the study area. The following paragraphs examine the potential environmental justice population effects associated with deepening RWC Channel, and delivering sediment to the Cullinan placement site. As discussed above, the remaining Project areas are sufficiently far from residential areas that no effects to residents would be expected.

##### 5.6.2.2.1 Redwood City Harbor

Activities at this location would consist of dredging to deepen the channel and berths. While the maximum dredging duration for the entire RWC Channel could last up to approximately 48 months over eight dredging seasons, the dredge would be moving at a minimum estimated rate of 15 feet per day, so that after one dredging season the dredge would be a minimum of 1.2 miles from the closest residential area.

There would be no access or transportation effects on the nearby community as all deliveries would occur by water, and dredging crews would be small (estimated at 16 to 18 workers). Dredging activities could result in noise effects and air emissions. Due to the distance between the closest residential areas and the dredging area, noise effects were determined to be less than significant.

#### 5.6.2.2.2 Cullinan Placement Site

Activities at this site would include construction of the offloader and sediment transfer pipeline, and offloading operations. Construction of the offloading facilities would require several months, and would require 1 to 2 days of pile driving. All work related to the offloading facilities would be north of Highway 37. Once the facilities are constructed, two to three scows per day would call at the offloader; offloading would be expected to take several hours per scow, during which time the tug would be idling. Offloading activities could occur for a total of up to 26 months over four to five dredging seasons. There would be no access or transportation effects on the nearby community as all deliveries would occur by water. Construction of the offloading facilities and use of the offloader could result in noise effects and air emissions. With the possible exception of the one to two days of pile driving, noise associated with delivering scows and pumping the dredged sediment would not be audible over the background noise from Highway 37.

## 5.7 Energy Resources

Per Public Resources Code Section 21100(b)(3), in order to ensure that energy implications are considered in project decisions, CEQA requires that an EIR include a discussion of the potential energy impacts of the proposed project, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy. Potentially significant energy implications of a project are to be considered in the EIR to the extent relevant and applicable to the project.

Appendix F of the State CEQA Guidelines outlines issues related to energy conservation and includes potential project description considerations, types of impacts applicable to energy use, and potential mitigation measures to reduce wasteful, inefficient, and unnecessary consumption of energy. Energy conservation is defined as wise and efficient use of energy that may be achieved by:

(1) decreasing overall per capita energy consumption,

(2) decreasing reliance on fossil fuels such as coal, natural gas and oil, and

(3) increasing reliance on renewable energy sources.

Energy used during project construction, operation, and maintenance would be expended in the form of electricity, gasoline, and diesel fuel, which would be used primarily by dredges, offloaders, booster pumps, and other construction equipment (i.e., for the pipeline relocation).

Appendix F of the CEQA Guidelines encourages reductions in energy expended in transportation. For the purposes of the proposed Project, transport of dredged sediment to placement sites in San Francisco Bay would be accomplished with lower horsepower tugs than transport to SF-DODS, and these sites would also be closer to the dredging locations. However, the in-Bay dredging sites would require either an offloader or direct pumping to the dredged sediment location through a hydraulic cutterhead. Offloading facilities would not be required at SF-DODS. As discussed in ***Section 4.5.3.1.2***, total construction emissions are directly related to the volume dredged and transport distance. Alternatives involving Dredging Option A (to -32 feet MLLW) result in reduced air emissions compared to the other alternatives because less dredging would occur, and reducing the transport distance would reduce transport-related fuel consumption. Alternative A-1, which would use Cullinan as the placement site, would have the lowest fuel consumption of the action alternatives.

In addition to the selection of the placement site, there are several factors related to the construction process that have a substantial effect on the energy consumed to construct the Project. As discussed in ***Section 5.3***, if barge overflow is not allowed, there would be a substantial reduction in the net volume of sediment that would be transported by each scow. The total number of tug trips as well as the project duration would increase by 50 percent due to 33 percent reduction in effective scow capacity. Therefore, there would be an approximately 50 percent increase in fuel use and transport-related air emissions, as well as a substantial increase in dredging-related air emissions as some equipment on the dredge would be in continuous operation, even if the dredge is idle. A further important construction decision pertains to the size of the scows used. The current air emission estimate assumes that 4,000 cy scows would be used. If 5,000 cy scows are used, the volume of dredged sediment that could be hauled during each trip would increase by 25 percent, and the number of tug trips required would decrease by 20 percent.[17] This would also be expected to reduce the overall Project duration and associated dredge stand-by fuel use and other miscellaneous fuel use.

The energy intensiveness of the proposed Project could be reduced if the dredge and/or offloaders and booster pumps are electrically-powered and a portion or all of the electrical power used is from renewable sources. Currently, power provided by Pacific Gas and Electric (PG&E) contains an estimated 33 percent renewables content. In some locations, power can be purchased from other providers that provide up to 100 percent renewables content. The evaluation of energy conservation benefits of using electrically-powered equipment must consider ancillary energy costs (such as setting power poles and stringing line, and transmission losses), and compare these to the complete energy cost of fueling the construction equipment with conventional fuel (diesel). The latter energy costs would include the energy associated with delivering the fuel and transferring it to the equipment, any equipment and staff required for fueling operations, and stand-by time during fueling activities.

If the Eden Landing and/or Alviso placement sites become available in time for construction of the Project, and are chosen as the reuse sites, a more substantial portion of the dredging and

[17] This reduction may be partially offset by the use of larger horsepower tugs, if larger tugs are needed to haul the larger barges, or by a greater operating factor (harder working engine) on the same size tug. Nonetheless some reductions in fuel use and corresponding air emissions would be anticipated.

placement activities could be accomplished using electrical power because all sediment from RWC channel could be dredged and placed using a hydraulic cutterhead powered by electricity.

While the primary energy consumption during construction results from dredging, transport, and offloading of sediment and passenger vehicle use would be minimal, workers would nonetheless be encouraged to carpool or seek alternative forms of transportation. Following construction, the project would have a beneficial effect on energy resources as a result of transportation efficiencies. A deeper channel would allow vessels to enter with a deeper draft, thereby reducing the number of vessel and barge calls associated with a given volume of commodities. Depending on the amount of deepening conducted, total vessel calls from sand and aggregate deliveries could be reduced by between 7 percent and 24 percent relative to the No Action/No Project Alternative.

## 5.8 Cumulative Impacts

Cumulative impacts include the direct and indirect impacts of a project together with the impacts of all other anticipated past, present, and reasonably foreseeable future actions in the area, including those proposed or implemented by others. The analysis of cumulative impacts concentrates on whether the Project impacts would be cumulatively considerable.

### 5.8.1 Assessment Methodology and Thresholds

The cumulative impacts assessment reviews the effects of recent past, present, and reasonably foreseeable future actions along with the direct and indirect effects of the RWC Harbor Deepening Project. ***Table 5-2*** shows the potential cumulative projects. Cumulative impacts are discussed for those resources that could be affected by the project, even if such impacts are less than significant. The geographic area for the evaluation of cumulative effects varies by resource. For most resources, evaluation on a study area basis is appropriate; however, for certain resources, the natural environment provides a more appropriate analysis context. For example, air quality is addressed on an air basin basis.

The timeframe considered for the cumulative impacts analyses is 2014 through 2025. The timeframe selected allows for analysis considering the best available information regarding reasonably foreseeable cumulative effects to regional resources that may be affected by the Project. To consider the time period after about 2025 would be speculative given historical variability in cargo volumes.

It is also not necessary to consider the period before 2014. Both RWC and SBS Channels have been maintained at their current depths since 1962. Maintenance dredging at SBS Channel is infrequent (occurring typically every 10 years) and generates relatively low quantities of material (3,000 cy per year, or 30,000 cy per episode); maintenance dredging in RWC Channel was initiated in 2014, and is scheduled to be completed in 2015. Two of the placement sites, SF-DODS and Montezuma, have been in active use for more than 10 years and are expected to continue to be in active use for many more years. The Cullinan site was used in 2014 for a small quantity of dredged material placement (100,000 cy) using a different offloading process at the proposed sediment delivery location; the offloader and pipeline that would be used for this Project have not been constructed. While Phase I activities for the SBSP Restoration Project are underway or completed, Phase II activities, which could include placement of dredged sediment at the Eden Landing and Alviso ponds as described in this document, are currently in the planning stage.

***Table 5-2. Cumulative Impacts – Current and Reasonably Foreseeable Future Projects***

| Project Number | Project Name/ Location | Status/ Anticipated | Project Summary | Cumulative Resources | Source |
|---|---|---|---|---|---|
| 1 | Federal Maintenance Dredging in San Francisco Bay | Ongoing | The USACE conducts maintenance dredging at 11 locations in San Francisco Bay and its environs (Napa River Channel, Oakland Harbor, Petaluma River Channel, Redwood City Harbor, Richmond Harbor, San Francisco Harbor, San Leandro Marina, San Pablo Bay/Mare Island Strait, San Rafael Creek, Suisun Bay Channel, and Suisun Slough Channel). Maintenance dredging is expected to occur at all or portions of these locations during the project planning period. Up to 1.4 mcy are dredged annually during the maintenance dredging window extending from June 1 through November 30 of each year. Maintenance dredging sediment is typically disposed of at a combination of locations including SF-8, SF-9, SF-10, SF-11, SF-16, SF-17, SF-DODS, and other sites (including beneficial reuse sites) that are permitted and may be economically viable. SF-9, SF1-0, SF-11, and SF-16 are in-Bay placement sites; SF-DODS, SF-8, and SF-17 are ocean placement sites. | All resources except cultural resources | |
| 2 | Nonfederal Maintenance Dredging in San Francisco Bay | Ongoing | More than 100 marinas, ports, and berthing slips are maintenance dredged in the San Francisco Bay/Estuary. Most of the nonfederal maintenance projects are along the shorelines and in the tributaries of the Estuary. | All resources except cultural resources | |
| 3 | San Francisco Bay and Delta Sand Mining Project | 10-year leases to continue mining sand (until 2022) | The California State Lands Commission action is a 10-year General Lease through December 31, 2022. Hanson Marine Operations proposed new 10-year mineral extraction leases to enable the continuation of dredge mining of construction-grade sand from certain delineated areas of Central San Francisco Bay, Suisun Bay, and the western Sacramento-San Joaquin River Delta area. | All | CSLC 2012, CEQAnet 2013, C. Boudreau pers. comm. 2015 |

| Project Number | Project Name/ Location | Status/ Anticipated | Project Summary | Cumulative Resources | Source |
|---|---|---|---|---|---|
| 4 | South San Francisco Shoreline Study | Planning phase; construction could begin in 2017 | Congressionally authorized study by USACE together with the Santa Clara Valley Water District and the CSCC to identify and recommend flood risk management and ecosystem restoration projects along South San Francisco Bay for federal funding. | Air Quality, Biology, Cultural Resources, Hazards/Hazardous Materials, Noise, Recreation, Transportation and Navigation, Water Quality and Hydrology | USACE 2013 |
| 5 | South Bay Salt Pond Restoration, Phase II | Planning Phase | The CSCC, the California Department of Fish and Wildlife, and the United States Fish and Wildlife Service are the project sponsors for this tidal wetland restoration project that, when complete, will restore approximately 15,000 acres of industrial salt ponds to tidal wetlands, mudflats, and other wetland habitats. | Air Quality, Biology, Hazards/Hazardous Materials, Noise, Recreation, Transportation and Navigation, Water Quality and Hydrology | CSCC 2015 |
| 6 | San Francisco Bay to Port of Stockton John F. Baldwin Ship Channel Phase III Navigation Improvement Project | Planning phase of first segment of John F. Baldwin Ship Channel | The San Francisco Bay to Stockton project is divided into two components, the Western Reach and the Eastern Reach, now entitled Project I and Project II. The dividing boundary of the two reaches is located at Avon (just east of the Carquinez Bridge). The Western Reach (also known as the John F. Baldwin Ship Channel) includes the West Richmond Channel, Pinole Shoal Channel, and the Bulls Head Reach portion of the Suisun Bay Channel. The Eastern Reach includes the remaining portions of the Suisun Bay Channel (i.e., Suisun Bay Channel east of Avon and New York Slough) and Stockton Deepwater Ship Channel. The proposed deepening of Project I is currently being evaluated while the Eastern Reach, Project II, is on hold pending completion of the Project I Director's GRR Report. | All | |

| Project Number | Project Name/ Location | Status/ Anticipated | Project Summary | Cumulative Resources | Source |
|---|---|---|---|---|---|
| 7 | Suisun Marsh Restoration Plan | Planning phase | The United States Department of the Interior is the project sponsor for tidal restoration targets of 5,000 to 7,000 acres and 44,000 to 46,000 acres of managed wetlands during the 30-year implementation period. | Air Quality, Biology, Hazards and Hazardous Materials, Noise, Recreation, Transportation and Navigation, Water Quality and Hydrology | U.S. Department of the Interior, USFWS, and CDFW, 2011 |
| 8 | WETA Central Bay Operations and Maintenance Facility Project | Construction activities as early as 2016 | The Central Bay Operations and Maintenance Facility project is being developed by WETA to provide a central San Francisco Bay base for WETA's ferry fleet. The project site is near Pier 3 of Alameda Point. The facility will also include a system of floating docks and gangways that would provide daytime and overnight berthing capacity for up to 11 vessels. CEQA review has been completed and permitting is in progress. | All | WETA 2015 |
| 9 | Oyster Shell Mining, South San Francisco Bay | On-going, permits through 2017; beginning renewal process | A private entity holds a State Lands Commission permit to mine oyster shells in the eastern portion South Francisco Bay just north of the San Mateo Bridge. Mining operations are based on demand and typically mine on average 6,000 cy of shell per month for a yearly average of approximately 70,000 cy. Mining occurs only when demand exists. | All | C. Boudreau personal communication 2015 |
| 10 | Coast Guard Island Berth Deepening | Design phase; construction planned for 2016 | Deepen existing berths at Coast Guard Island (Alameda) to allow vessels with deeper draft to use the berths. | All | |

Note: No planned or recent fuel pipeline relocation projects in the Bay were identified.

### 5.8.2 Summary of All Cumulative Impacts for Each Resource

This section summarizes the potential cumulative effects of the action alternatives.

#### 5.8.2.1 *Air Quality and Greenhouse Gases*

The cumulative air quality impacts include a net increase of any criteria pollutant for which the Project region is in nonattainment under an applicable Federal or state ambient air quality standard. Based on BAAQMD guidance, if a Project exceeds the identified significance thresholds, its emissions are cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions.

The reasonably foreseeable actions in ***Table 5-2*** include activities that would produce construction and/or operational emissions that could overlap with dredging activities and contribute to cumulative air quality impacts in the study area. Under any of the alternatives, emissions from dredging, transport, and placement activities would cause emission increases above the BAAQMD significance thresholds, and the proposed Project's contribution to cumulative air impacts would be cumulatively significant.

#### 5.8.2.2 *Biological Resources*

Cumulative effects to biological resources would only occur if another project were located in close proximity to the RWC Project because the effects from the RWC Project to biological resources are localized. Cumulative effects to biological resources from turbidity, entrainment, habitat disturbance, habitat modification, noise, interference with the movement of marine mammals and fish, and suspension of contaminated sediment have the potential to occur if dredging at RWC Channel were to occur at the same time as the nonfederal maintenance dredging at the marina adjacent to the Port of Redwood City. Existing water quality regulations and the required permits would ensure that the cumulative impact on water quality from the Project in combination with marina maintenance dredging would remain less than significant. The additional impacts from maintenance dredging at the marinas is expected to be small and in conjunction with this Project impacts would not rise to the standard of being cumulatively significant.

Cumulative effects to biological resources from turbidity, entrainment, habitat disturbance, habitat modification, noise, interference with the movement of marine mammals and fish, and suspension of contaminated sediment have the potential to occur at SBS Channel if dredging and pipeline replacement were to occur at the same time as a nearby project. Pile driving could have an impact to wildlife species due to underwater noise. Due to the short duration of pile driving activities associated with SBS pipeline replacement, the distance from other projects in ***Table 5-2,*** and unlikely concurrent construction schedule, a cumulative biological noise impact is not expected***.*** The use of the jet sled method to trench for the pipeline replacement has the potential to be a significant and unavoidable impact. The impacts from these effects including turbidity from the jet sled are localized and there are no current or future projects within 0.25

miles of SBS Channel; therefore the Project impacts would be would not rise to the standard of being cumulatively significant.

Cumulative impacts at the placement sites would be specific to the time and location of the Project activities. No cumulative impacts are expected at SF-DODS, Cullinan and Montezuma. Oyster shell mining in South San Francisco Bay would have the potential to create a cumulative impact, if it were located in close proximity to the Eden Landing or Alviso offloader during the construction period and if the mining operations are continuous. However oyster shell mining operations occur only when demand exists, and are therefore episodic. Construction of the offloader would occur more than 3 miles from the areas designated for oyster shell mining, and would comply with all permits and regulations. The impacts associated with construction of the offloader and sediment transfer pipeline would be temporary and therefore there would not be a significant cumulative impact.

The South San Francisco Shoreline Study itself would not result in a cumulative impact. If it were determined that construction of the levees both at Eden Landing and Alviso were required for flood protection, that work could have a cumulative effect if it occurred at the same time as construction of the sediment transfer pipeline and in the vicinity of the pipeline location. However, it is highly unlikely that the levee work would occur in the same location and at the same time as the sediment delivery process, because the sediment delivery process would block a portion of the levee and would interfere with the levee construction. It is much more likely that either the sediment delivery or levee work would be completed first. Furthermore, the impact from the installation of the pipeline on the levee would be minor, short term, and temporary in comparison to reconstructing the levee for flood control. Therefore there would not be a significant cumulative impact. The cumulative impacts to biological resources from pile driving are described in the Noise analysis in ***Section 5.8.2.7***.

#### 5.8.2.3 *Cultural Resources*

The proposed Project or alternatives would not result in any individual effects to historical resources and would, therefore, not contribute to cumulative impacts to historical resources. Dredging and pipeline placement could result in the inadvertent discovery of buried archaeological resources, submerged shipwrecks or other objects of historical significance, human remains, and paleontological resources. With implementation of mitigation as described in ***Appendix A***, the impact would be less than significant and would not result in a cumulatively significant effect on archaeological resources, submerged shipwrecks or other objects of historical significance, human remains, and paleontological resources.

#### 5.8.2.4 *Geology Soils, and Seismicity*

No cumulative impacts are expected. Impacts associated with this resource area would be specific to the time and location of the Project activities, and none of the cumulative projects would occur at the same in the same footprint as the Project at the same time as the Project, or, in the case of the Eden Landing and Alviso placement sites, would occur before or after Project activities have been completed.

#### 5.8.2.5 *Hazards and Hazardous Materials*

The impacts from navigation hazards, potential spills, and/or use or management of hazardous materials at any specific site would be small, and potential impacts from the Project would not rise to the standard of being cumulatively significant. Existing laws, regulations, and programs pertaining to navigation, contaminated sediment, and use and management of hazardous substances would ensure that the cumulative impact on hazards and hazardous materials from the Project in combination with future dredging and placement of dredged sediment would remain less than significant.

#### 5.8.2.6 *Land Use*

There would be no cumulative impact to Land Use. Land use at the dredging sites and placement sites would remain consistent with applicable plans and policies, and this would also be true of the reasonably foreseeable cumulative projects listed in ***Table 5-2***.

#### 5.8.2.7 *Noise*

Cumulative impacts to noise could occur if several noise generating activities would have the potential to affect the same noise sensitive receptors. This would most commonly occur if activities are occurring in the same or nearby locations at the same time. All projects listed in ***Table 5-2*** would either occur at a different location or at a different time than the proposed Project. Therefore there would be no cumulative effects to land-based sensitive receptors. The Project's contribution to cumulative noise impacts would be less than significant.

#### 5.8.2.8 *Recreation*

Cumulative impacts to recreation could occur if several projects were to be undertaken in the same area or would have the potential to affect the same recreational use over an extended area. This would occur if the project activities are occurring in the same or nearby locations at the same time. The projects listed in ***Table 5-2*** are either far away from the activities associated with the RWC Project, or would primarily occur before or after RWC Project activities. There would be no cumulative effects to recreation in and near RWC and SBS Channels. Although maintenance dredging of the RWC Channel could occur during the channel deepening if the channel deepening activities occur over more than 2 or 3 dredging seasons. The presence of an additional dredge in the channel area would not result in a cumulatively significant effect on recreation because ample space for boating would remain. Other projects in ***Table 5-2*** could cause localized effects on recreational boating; however, due to the large area available for recreational boating in San Francisco Bay, the contribution of the Project to effects on recreational boating would not be cumulatively significant.

#### 5.8.2.9 *Socioeconomics*

There would be no cumulative impact to socioeconomics, population, and housing. While all projects listed in ***Table 5-2*** would provide for a minor increase in jobs, the effects of the proposed Project to housing needs or other effects driven by increases in population growth in combination with all other reasonably foreseeable cumulative projects would remain less than significant. Socioeconomic benefits would be geographically distributed, and would not economically disadvantage any community.

#### 5.8.2.10 *Transportation and Navigation*

During construction, the proposed Project could result in localized, less than significant impacts to navigation due to the presence of the dredging, construction, and offloading facilities. Following construction, the proposed Project would initially contribute to a small reduction in the number of vessel calls at the Port of Redwood City relative to the 2014 baseline, and a sustained reduction in the number of vessel calls relative to the No Action/No Project Alternative. This would be a benefit of the Project. By 2025, when cargo tonnage moving through the Port is expected to reach 2.5 million tons, deep draft vessel traffic could increase as much as 45 percent relative to the 2014, which would represent an increase of less than 1 deep draft vessel call per week. The need for lightering would be reduced relative to the No Action/No Project Alternative.

Cumulative effects could occur if construction equipment or vessel traffic could significantly increase the potential for navigation delays or incidents. Maintenance dredging in RWC Channel may be required if the dredging duration extends more than 2 to 3 years. Channel deepening and channel maintenance activities would be coordinated to minimize effects on Port operations. The other projects listed in ***Table 5-2*** are either located in areas that are far from the Project Area, or would occur before or after Project-related construction activities. There would be no cumulative effect to navigation.

Cumulative effects to land-based traffic during construction could occur if the projects in ***Table 5-2*** in combination with Project-related traffic would contribute to an adverse effect on freeway volume or capacity, or if the projects in ***Table 5-2*** would contribute traffic to the same intersections as the RWC Project. There would be no overlapping construction activities from the projects in ***Table 5-2*** affecting the same intersections as the RWC construction activities with the possible exception of maintenance dredging occurring during channel deepening. However, RWC Project's potential construction-related traffic is limited to a small number of worker vehicle trips, and the same would be true for maintenance dredging activities. Similarly, effects on local freeway would be minimal because the various projects in ***Table 5-2*** would either occur in a location affecting other portions of the Bay Area road network, or, in the case of maintenance dredging in RWC Channel, would occur before or after the Project construction activities. The Project would not contribute cargo growth (i.e., truck trips) during operation of the Project; cargo growth is driven by regional economic conditions and Port land-side infrastructure; the environmental documentation for the Port's most recent infrastructure improvements addressed traffic effects associated with improvements to Wharves 1 and 2, and provided mitigation for these resulting increases in truck trips (Port of Redwood City 2010). The

Project's effect on transportation would generate only a very small number of daily vehicle trips.

#### 5.8.2.11 *Utilities and Service Systems*

The impacts on utilities and service systems associated with any specific Project would be small, and potential impacts from the Project would not rise to the standard of being cumulatively significant. The need for any increased utility service would be geographically distributed, and would not cause a large effect in any specific location. The cumulative impact on utilities and service systems from the Project in combination with the projects listed in ***Table 5-2*** would be less than significant.

#### 5.8.2.12 *Water Quality and Hydrology*

Cumulative effects to water quality and hydrology would only occur if another project were located in close proximity to the RWC Project because the water quality effects from the RWC Project are localized. There are no impacts to hydrology from the Project. Cumulative effects to water quality from turbidity or suspension of contaminated sediment would occur if dredging at RWC Channel were to occur at the same time as the federal channel maintenance dredging in RWC Channel or non-federal maintenance dredging at the marina adjacent to the Port of Redwood City. The additional impacts from maintenance dredging at the marinas would be expected to be small and in conjunction with this Project impacts would be would not rise to the standard of being cumulatively significant. Channel maintenance dredging could occur in areas away from the channel deepening activities (more than 0.25 miles from the deepening area).

Cumulative effects could potentially occur due to jet sled construction suspension of contaminated sediment at SBS Channel, if dredging and pipeline replacement were to occur at the same time as a nearby project. The use of the jet sled to trench for the pipeline replacement has the potential to be a significant and unavoidable impact. The impacts from these effects including turbidity from the jet sled are localized and there are no current or future projects within 0.25 miles of SBS channel; therefore the Project impacts would be would not rise to the standard of being cumulatively significant.

No cumulative impacts to water quality at any of the placements sites are expected. Impacts at the placement sites would be specific to the time and location of the Project activities. Existing water quality regulations and the required permits would ensure that the cumulative impact on water quality from the Project in combination with marina maintenance dredging would remain less than significant.

### 5.8.3 Contextual Relationship between Alternatives and Cumulative Impacts

The potential extent of cumulative impacts is primarily affected by the dredging option selected. Increased deepening would require substantially greater dredging, which in turn would extend the construction duration by a corresponding amount. Greater deepening may also require a longer construction duration for the relocation of the fuel pipelines because the pipelines would have to be relocated to a deeper depth (there would be little or no effect if directional drilling or clamshell trenching are the selected construction method). Both of these factors would result in greater impacts during construction.

For most resources, changes in duration of construction activities would not alter the level of impacts to that resource. For these resources, a change in construction duration and the resulting environmental effects would not lead to a change in the Project's contribution to cumulative effects. For resources with cumulatively significant effects (including air quality/greenhouse gases and cultural resources) alternatives requiring less dredging and placement would not reduce the potential impacts to a less than significant level, and the Project's effects on these resources would remain cumulatively significant.

Following construction, increased deepening would increase transportation efficiency by allowing more heavily loaded vessels to enter RWC Harbor. This in turn would reduce air emissions associated with cargo movement relative to the No Action/No Project Alternative, and is considered a beneficial effect of the proposed Project. The deeper the channels, the greater the increase in cargo per vessel, and the corresponding reduction in air emissions. In addition, providing dredged sediment is delivered to a beneficial reuse placement site, increased dredging would result in greater benefits to these sites by increasing the volume of sediment available to raise site elevations and accelerate habitat formation in advance of substantial sea level rise.

## 5.9 Environmentally Superior/Environmentally Preferable Alternative

NEPA requires that the ROD identify an environmentally preferable or alternative or alternatives. According to the CEQ, the environmentally preferable alternative is the alternative that

> …will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.

The Council recognizes that the identification of the environmentally preferable alternative may involve difficult judgments, particularly when one environmental value must be balanced against another. The public and other agencies reviewing a Draft EIS can assist the lead agency in developing and determining environmentally preferable alternatives by providing their views in comments on the Draft EIS. Through the identification of the environmentally preferable alternative, the decision maker is clearly faced with a choice between that alternative and others, and must consider whether the decision accords with the Congressionally-declared policies of the Act.

CEQA requires identification of the environmentally superior alternative. CEQA Guidelines (Section 15126.6(a) and (e)(2)) require that an EIR's analysis of alternatives identify the "environmentally superior alternative" among all of those considered. If the No Project Alternative is identified as environmentally superior, then the EIR also must identify the environmentally superior alternative among the project alternatives. CEQA's goal in identifying the environmentally superior alternative is to assist decision makers in the Project approval process. CEQA does not require an agency to select the environmentally superior alternative, nor to consider the feasibility of environmentally superior project alternative identified in the EIR, if mitigation measures included in the EIR would reduce environmental impacts of the approved project to less than significant levels (*Laurel Heights Improvement Association of San Francisco v. Regents of the University of California*, 47 Cal.3d 376, 400-3 (1988*); Laurel Hills Homeowners Association v. City Council* 83 Cal. App. 3d 515 (1978), CEQA Guidelines Sections 15042–15043). All applicable mitigation measures must be incorporated into the Project.

For the purposes of this Project, the environmentally superior/preferable alternative is the No Action/No Project Alternative. The No Action/No Project Alternative would not result in any impacts during construction, and would avoid the significant and unavoidable air quality impacts associated with dredging and placement of dredged material. It would result in somewhat higher air and greenhouse gas emissions during operations, as vessels continue to experience delays entering the Harbor, the vessel fleet calling at the Port continues to contain more smaller vessels, and more lightering would be needed (relative to Project alternatives) to bring the required volume of cargo into the Port.

The environmentally superior/environmentally preferable alternative Project alternative is Alternative A-1, which consists of deepening RWC and SBS Channels to -32 feet MLLW and reusing the dredged sediment at Cullinan Ranch. While this alternative has construction air emissions which are avoided by the No Action/No Project Alternative, Alternative A-1 would reduce air emissions following construction by allowing more heavily loaded vessels to enter the Port. In addition, the sediment dredged from deepening the channels would be reused beneficially to accelerate tidal marsh habitat formation at Cullinan. Relative to the No Action/No Project Alternative, post-construction Alternative A-1 would result in an 11% percent reduction in vessel calls. Accelerating tidal marsh formation in advance of sea level rise, particularly within the next 15 years, is a key goal of the Bay Area regulatory and resource agencies, and environmental community.

To further minimize potential impacts from Project construction, the jet sled method of pipeline relocation should be avoided. Either directional drilling or clamshell excavation would prevent significant and unavoidable impacts to biological resources and water quality, and are the environmentally-preferred construction process for pipeline relocation.

If either the Eden Landing or the Alviso placement sites are permitted by the time the proposed Project is ready to be constructed, it is anticipated that use of either of these sites would be considered environmentally preferable/superior to using Cullinan. Although there is currently insufficient information to quantify transportation emissions from these locations, the transportation distance between the dredging locations and these placement sites is much shorter than to the Cullinan site. Because Eden Landing is approximately 4 miles closer to RWC Channel, and ten miles closer to SBS Channel than Alviso, it would likely be the preferred placement location. Either of these two South Bay placement sites would also provide the benefit of accelerating habitat restoration. Other potential environmental impacts, including biological resources and cultural resources impacts would be similar to Alternative A-1.

# 6 Identification of the Tentatively Selected Plan

## 6.1 Final Array of Alternative Plans

Seventeen preliminary action alternatives and the No-Action alternative were developed as documented in ***Chapter 3***, and summarized in ***Table 3-5***. The next steps in the study were to further refine the selection of the retained placement sites for the dredged materials and to identify the optimum channel depth. It was decided at this time that the alternatives array could be further reduced due to limited information and the uncertainties associated with the availability of the two sites that are still under study, Eden Landing and Alviso Pond Complex.

### 6.1.1 Final Evaluation of Placement Sites

A more rigorous and detailed analysis of the viability of the retained placement sites was conducted. The results of the analyses are detailed in ***Chapters 4 and 5***. The proposed beneficial reuse sites at the SBSP Restoration Project had uncertain time frames for when they would be permitted and available for use. Also, critical details were not available for development of cost estimates and identification of impacts of transporting dredged material to the sites. To address these uncertainties, a workshop was conducted in January 2015 with the Project Delivery Team (PDT) and site owners. The viability of using the two retained South Bay Salt Pond sites (Eden Landing and Alviso Pond Complex) was discussed and assumptions for probable construction methods were developed.

It is envisioned by the SBSP Restoration Project site owners that a third party (potentially a public/private partnership) would design, finance, construct, and operate facilities for deepwater offloading dredged material, piping the material to the site, and decanting the material at the site. A tipping fee would be charged for use of these facilities. Adequate information is not available for development of the estimated tipping fee that would be charged.

The evaluation of potential placement sites focused on site availability, capacity, and the permit status. Although highly desirable due to their proximity to the dredging sites, both Eden Landing and Alviso Pond Complex sites are still in the early development phase. The EIRs for the sites have not been completed. Even though the site owners indicate that the sites could be ready by 2018, it is not certain that permitting would be complete and the facilities for transporting the dredged material would be constructed and operational by that time. Additionally, there is no proponent that has come forward at this time to finance the operations required to offload and transport the dredged material to the sites. Therefore, both the Alviso Pond Complex and Eden Landing sites are not being considered further at this time. As a result, Alternatives A-4, A-5, B-5, B-6, C-5 and C-6 are not being carried forward for evaluation at this time. However, if either Alviso Pond Complex or Eden Landing sites were to be permitted and available by 2018 and found to be cost effective, then use of these sites would be reconsidered.

The two upland beneficial reuse sites, Cullinan Ranch Tidal Restoration Project and Montezuma Wetlands Restoration Project (***Figure 6-1***), are already available and permitted, as is the ocean disposal site SF-DODS, so these were retained for use in the final array of alternatives. However preliminary cost numbers on using the combination of Cullinan and Montezuma as placement sites was not cost effective. It is less expensive to use one or the other. As a result, Alternatives B-1 and C-1 were also not carried forward for further evaluation. Descriptions of the remaining nine alternatives are provided in ***Section 6.2***.


***Figure 6-1***. Sites Retained in the Final Alternatives

## 6.2 Descriptions of the Nine Final Alternative Plans

**Alternative A-1: 32 foot Depth with Placement at Cullinan**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -32 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. One hundred percent of the wetland dredged material acceptable as wetland cover, will be placed at Cullinan Ranch Tidal Restoration Project. Cullinan does accept wetland non-cover material which is assumed to be about 5 percent of the total volume dredged from the RWC Channel.

**Alternative A-2: 32 foot Depth with Placement at Montezuma.** Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -32 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. One hundred percent of the dredged material suitable for wetland cover will be placed at Montezuma Wetlands Restoration Project. Montezuma does accept wetland non-cover material which is assumed to be about 5 percent of the total volume of dredged material from RWC Channel.

**Alternative A-3: 32 foot Depth with Placement at SF-DODS.** Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -32 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. All dredged material shall be transported in bottom dump scows to SF-DODS except for approximately 46,000 cy which is suitable for wetland non-cover material placement at Montezuma Wetlands Restoration Project.

**Alternative B-2: 34 foot Depth with Placement at SF-DODS**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -34 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. All dredged material shall be transported in bottom dump barges to SF-DODS except for approximately 81,000 cy which is suitable for wetland non-cover material placement at Montezuma Wetlands Restoration Project.

**Alternative B-3: 34 foot Depth with Maximum Placement at Cullinan**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -34 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. Dredged material shall be taken to Cullinan and the site's capacity will be maximized at approximately 3 mcy. Wetland non-cover quality dredged material will be placed at Cullinan. The remaining 710,000 cy shall be transported in bottom dump barges to SF-DODS.

**Alternative B-4: 34 foot Depth with Placement at Montezuma Only**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -34 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. All dredged material (wetland cover and non-cover quality) shall be placed at Montezuma Wetlands Restoration Project.

**Alternative C-2: 37 foot Depth with Placement at SF-DODS**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -37 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. All dredged material shall be transported in bottom dump barges to SF-DODS except for approximately 138,000 cy which is wetland non-cover quality material to be placed at Montezuma Wetlands Restoration Project.

**Alternative C-3: 37 foot Depth with Placement at Cullinan and Montezuma**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -37 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. One hundred percent of the dredged material placement is to be placed at a combination of Cullinan Ranch Tidal Restoration Project and Montezuma Wetlands. This placement combination assumes that dredged material is placed at Cullinan until it reaches its 3 mcy capacity and the remaining 4,080,000 cy is to be placed at Montezuma. This constitutes one hundred percent beneficial reuse for placement.

**Alternative C-4: 37 foot Depth with Placement at SF-DODS**. Deepen the channels at Redwood City Harbor and San Bruno Shoal to a depth of -37 feet MLLW, with a slight realignment at the channel entrance at Redwood City Harbor towards the east to avoid adverse impacts to Bair Island Restoration Project, bottom-cut the channel between Reaches 3-5 so that the existing side slopes and Port facilities will remain undisturbed. All dredged material shall be placed at Montezuma Wetlands Restoration Project.

**No Action Alternative:** The No Action Plan (or the future without-project condition) is described in ***Section 2.3***. It constitutes the benchmark against which plans are evaluated. Forecasts of future without-project conditions consider all other actions, plans and programs that would be implemented in the future to address the problems and opportunities in the study area in the absence of a USACE project.

## 6.3 Evaluation Criteria

In accordance with USACE guidance for planning documents (ER 1105-2-100), four accounts and four planning criteria were used to evaluate the focused array of alternative plans and determine the single TSP.

The four accounts are specified in the USACE Planning Guidance Notebook (ER 1105-2-100). They were established via the Flood Control Act of 1970. The accounts are used to facilitate evaluation and display of effects of alternative plans. The accounts address: the National Economic Development (NED), Environmental Quality (EQ), Other Social Effects (OSE), and Regional Economic Development (RED).

- ***National Economic Development (NED)***. The first account displays changes in the economic value of the national output of goods and services. ER 1105-2-100 requires identification of the plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective. This plan is to be identified as the NED plan. In accordance with the Federal objective, the NED plan will be recommended unless the non-federal sponsor proposes a locally preferred plan (LPP) that, if acceptable to the Federal government, may be recommended if the non-federal sponsor is willing to increase their monetary contribution if necessary to make up for the shortfall with the NED plan benefits.
- ***Environmental Quality (EQ).*** The EQ account addresses the anticipated environmental impacts associated with implementation of the alternative plans. The environmental impacts of the alternative plans are fully documented in ***Chapter 4*** in compliance with the requirements of NEPA and CEQA.
- ***Other Social Effects (OSE***). The OSE account relates to navigational and public safety. San Francisco Bar Pilots have confirmed that there is no safety concern related to navigating ships for the proposed alternatives.
- ***Regional Economic Development (RED).*** This account is based on regional jobs created as a result of project construction.

Additionally there are four planning criteria used by the USACE to compare plans. These are Completeness, Efficiency, Effectiveness and Acceptability. Descriptions of how these criteria were applied to this study are described below.

- ***Completeness:*** The extent to which the alternative plans provide and account for all necessary investments or actions by all involved parties to ensure the planning objectives are realized. In this study, alternatives that don't have viable placement sites were eliminated from consideration.
- ***Effectiveness:*** The extent to which the alternative plans contribute to meeting the planning objective. The objective of this project is to improve navigation efficiency. All of the final alternatives contributed to improved navigation efficiency.

- ***Efficiency:*** The extent to which the alternative plan is the most cost effective means of achieving the project goal and objectives. Efficiency is based on the net NED benefits of the alternative.
- ***Acceptability:*** The extent to which the alternative plans are acceptable in terms of applicable Federal and State laws, regulations and public policies.

### 6.3.1 NED Analysis

HarborSym is a discrete event Monte-Carlo simulation model developed by the Institute for Water Resources (IWR), a USACE laboratory. It is designed to facilitate economic analyses of proposed navigation improvement projects in coastal harbors. HarborSym was used to evaluate the benefits of deepening the channels to -32, -34, and -37 feet MLLW.

Cost estimates were prepared for the screened alternative plans to include the costs of dredging and hauling the material to placement sites, mobilization and demobilization, planning engineering and design, construction management, contingency, operations, maintenance repairs rehabilitation, and relocations.

The costs and benefits were analyzed together to determine annual project costs, annual NED benefits, annual net NED benefits, and benefit to cost ratios. ***Table 6-1*** provides the results of the economic evaluation of the focused array of alternative plans and provides the basis for identification of the NED plan, which is highlighted in green. Alternatives with positive annual net benefits (i.e., average annual NED benefits greater than average annual costs) were carried forward for more detailed comparisons.

The NED plan is identified as Alternative A-3: Channel Deepening to -32 feet MLLW with placement of dredged material at SF-DODS. This plan reasonably maximizes net national economic development benefits consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable Executive Orders, and other Federal planning requirements. It has the greatest net benefit and operations, which will realize greater efficiencies and transportation cost savings.

***Table 6-1. Economic Analysis of Alternative Plans***

| Placement Site | Alternative | Depth (ft) | Total Project Cost ($1,000) | Annual Benefits ($) | Annual Project Costs ($) | Annual Net Benefits ($) | Benefit to Cost Ratio | Result |
|---|---|---|---|---|---|---|---|---|
| Montezuma | A-2 | 32 | 75,950 | 3,950,000 | 3,600,000 | 350,000 | 1.1 | Retain |
| | B-4 | 34 | 161,680 | 7,540,000 | 7,653,000 | -113,000 | 1.0 (rounded) | Not carried forward |
| | C-4 | 37 | 315,150 | 8,110,000 | 14,769,000 | -6,659,000 | 0.5 | Not carried forward |
| Cullinan | A-1 | 32 | 73,588 | 3,950,000 | 3,501,500 | 448,500 | 1.1 | Retain |
| | B-3 | 34 | 148,070 | 7,540,000 | 7,085,500 | 454,500 | 1.1 | Retain |
| | C-3 | 37 | 300,450 | 8,110,000 | 14,156,000 | -6,046,000 | 0.6 | Not carried forward |
| SF-DODS | **A-3** | **32** | **73,150** | **3,950,000** | **3,483,000** | **466,800** | **1.1** (1.134 rounded) | **Retain (NED Plan)** |
| | B-2 | 34 | 151,050 | 7,540,000 | 7,209,750 | 330,250 | 1.1 (1.0458 rounded) | Retain |
| | C-2 | 37 | 292,950 | 8,110,000 | 13,843,500 | -5,733,500 | 0.6 | Not carried forward |

### 6.3.2 Four Accounts Evaluation

The four alternatives that had average annual benefits that were less than the average annual costs (B-4, C-4, C-3, and C-2) were not carried forward for additional evaluation (***Table 6-1***). The remaining five alternatives including the NED plan were further evaluated against the accounts of Environmental Quality (EQ), Regional Economic Development (RED), and Other Social Effects (OSE). The results are described below and are summarized in ***Table 6-2***.

- ✓ Environmental Quality (EQ) addresses the anticipated environmental impacts associated with implementation of the alternative plans. Placement of material at Cullinan Ranch or Montezuma Wetlands is considered beneficial reuse and would contribute to the goals of the LTMS. The results of detailed assessment of environmental impacts of the alternative plans is presented in ***Table 4-5***. In general, all the alternatives would have less than significant impacts or less than significant impacts with mitigation. However, if the jet sled construction method is used to relocate the pipelines at SBS Channel, there could be significant and unavoidable impacts. Use of a clamshell dredge or directional drilling for pipeline relocation would result in a less than significant impact.

- ✓ Regional Economic Development (RED) is based on regional jobs created as a result of project construction. This is estimated to be the same across all alternatives.
- ✓ Other Social Effects (OSE) relates to navigational, public safety, and environmental justice issues. San Francisco Bar Pilots have stated that there is no safety concern related to navigating ships for the proposed alternatives. This will be confirmed during Preconstruction Engineering and Design (PED) when the ship simulation studies are conducted. Environmental justice impacts were evaluated in ***Section 5.6*** and found to be less than significant for all alternatives.

***Table 6-2*. Evaluation Results Using Four Planning Accounts**

| | Montezuma | Cullinan | | SF-DODS | |
|---|---|---|---|---|---|
| **Depth** | **32 (A-2)** | **32 (A-1)** | **34 (B-3)** | **32 (A-3)** | **34 (B-2)** |
| **2.** NED: Annual Net Benefits | $350.0k | $448.5k | $454.5 | $466.8k | $330.3 |
| 2. EQ: Environmental Impacts | Low | Low | Low | Medium | Medium |
| 3. RED: Regional Job Creation | Low | Low | Low | Low | Low |
| 4. OSE: Navigational Safety/Environmental Justice (EJ) | Safe/No EJ impact | Safe/No EJ impact | Safe/No EJ impact | Safe/No EJ impact | Safe/No EJ impact |

### 6.3.3 Planning Criteria Evaluation

***Table 6-3*** provides a final summary of the Completeness, Effectiveness, and Efficiency of the alternatives. Plans that are incomplete (i.e., those that don't have viable placement sites) and/or plans that are ineffective at reducing transportation costs, were already eliminated from the final array of alternatives. Therefore, all the remaining five alternatives evaluated are complete and effective. Efficiency was evaluated based on the net benefits of the plans. Plan A-3: Channel Deepening to 32 feet with dredged material placed at SF-DODS, maximized net Annual NED benefits at $1.5M.

***Table 6-3. Planning Criteria Evaluation***

| Placement Sites | Montezuma | Cullinan | | SF-DODS | |
|---|---|---|---|---|---|
| **Channel Depths** | **32 (A-2)** | **32 (A-1)** | **34 (B-3)** | **32 (A-3)** | **34 (B-2)** |
| Completeness: *Actions of others required* | Complete Available Capacity Permitted | Complete Available Capacity Permitted | Complete Available Capacity Permitted | Complete Available Capacity Permitted | Complete Available Capacity Permitted |
| Effectiveness: *Transportation Cost Savings* | Meets objective | Meets objective | Meets objective | Meets objective | Meets objective |
| Efficiency: *Net Benefits* | $350,000 | $448,500 | $454,500 | $466,800 | $330,250 |
| Compliance with Fed Law | Meets objective | Meets objective | Meets objective | Meets objective | Meets objective |
| **Result** | **Drop** | **Drop** | **Drop** | **TSP** | **Drop** |

## 6.4 Identification of the Tentatively Selected Plan (TSP)

Results of alternative plan evaluations are summarized based on the four accounts (***Table 6-2***) and the four planning criteria (***Table 6-3***). Based on this evaluation the TSP is the NED plan, highlighted in green in ***Table 6-3***. This plan calls for a deepening of the existing federal project to a depth of -32 feet MLLW with slight adjustments in alignment in order to avoid adverse environmental impacts to Bair and Greco Islands and Port infrastructure. Results of the evaluation as they pertain to the TSP and, where appropriate, the future without project are discussed below:

### 6.4.1 Four Accounts Evaluation of the TSP

- ✓ **NED**: The selected plan is the NED plan which maximizes net NED benefits. Implementation will provide annual net benefits of $1,502,066 to the nation.
- ✓ **EQ**: The selected plan generally results in less than significant impacts on the affected environment. The exception is that there is a potential for unavoidable significant impacts to cultural resources and significant but mitigatable impacts on noise. Placement of dredged material at a beneficial reuse site is not included in the recommended plan because currently available sites are not cost effective. However, if Eden Landing (or Alviso Pond Complex) is successfully permitted in time to receive RWC dredged material and the mechanisms for transporting dredged material to the sites are

in place, consideration will be given to placing the dredged material at the beneficial reuse site.

- ✓ **RED**: The selected plan will not significantly impact the regional economic conditions, although jobs will be created during the construction period.
- ✓ **OSE**: San Francisco Bar Pilots have stated that there is no safety concern related to navigating ships for the selected plan. This will be confirmed during PED when the ship simulation studies are conducted. Environmental justice impacts were evaluated in ***Section 5.6*** and found to be less than significant for all alternatives.

### 6.4.2 Planning Criteria Evaluation of the TSP

- ✓ Completeness: The selected plan is complete, the placement sites for the dredged material (SF-DODS and Montezuma) are currently permitted and have adequate capacity to accept all the dredged material.
- ✓ Effectiveness: The selected plan will meet the primary objective of reducing costs and inefficiencies associated with the current federal navigation project. The selected plan reduces the need for light loading, lightering, topping off, and awaiting favorable tide conditions, thereby significantly improving navigation efficiency.
- ✓ Efficiency: The selected plan is the most efficient of all the alternative plans proposed and this is reflected in having the highest amount of net annual benefits over costs.
- ✓ Acceptability: The selected plan is in conformity with all necessary state and federal laws and regulations. The plan and all supporting documentation will have been vetted with all appropriate stakeholders, resource agencies and general public. This document represents the draft EIS/EIR and is being subjected to a public and agency review. All comments will be addressed and the final report will be made available for a final public and agency review.

# 7 Public Involvement, Review, and Coordination

The goal of public involvement and coordination is to open and maintain channels of communication with the public in order to give full consideration to public views and information in the planning process. The objectives of public involvement are: 1) to provide information about project activities to the public; 2) to make the public's desires, needs, and concerns known to decision-makers; 3) to provide for consultation with the public before decisions are reached; and, 4) to consider the public's views in reaching decisions.

Public involvement and agency coordination activities required by USACE planning policies and procedures have been conducted in conjunction with the requirements of NEPA and CEQA. Public and agency correspondence related to this project is contained in ***Appendix K***. This appendix will be updated through the remaining coordination and review process.

## 7.1 Public Involvement

### 7.1.1 Scoping Meeting

On 10 December 2014, the San Francisco District, USACE and the Port of Redwood City conducted a scoping meeting in compliance with NEPA and CEQA. The purpose of the scoping meeting was to obtain public and agency input on the issues that should be considered in decision making for the Redwood City Harbor Navigation Feasibility Study and EIS/EIR study process. A summary of the meeting is provided in ***Appendix K***.

The meeting presentation described the purpose of the study, how the NEPA and CEQA processes were being integrated with the planning process, the initial alternatives, the evaluation criteria that will be used to compare the alternatives, opportunities for public input, and the schedule for completion of the study. Comments received during the meeting were generally supportive of channel deepening.

Two letters were received during the scoping process: one from the SLC and another from USEPA. The SLC letter identified resources that should be evaluated during the study process. The USEPA letter identified topics that should be addressed in the EIS/EIR. It also recommended that the Montezuma Wetland Restoration Project, the Cullinan Ranch Tidal Restoration Project, and the Dumbarton Bridge Passive Sediment Transport Sites be considered for placement of the dredged material for beneficial reuse. These sites were evaluated in this document.

## 7.2 Institutional Involvement

### 7.2.1 Interagency Meeting

An interagency meeting attended by federal and state resource agencies was conducted May 19, 2015. The purpose of the meeting was to describe the study, summarize the findings to date, and to obtain feedback regarding potential issues or areas of concern. The TSP was identified and a description was provided of the planning process and the rational for the preliminary recommendation. Comments received during the meeting are addressed in this report.

## 7.3 Report Circulation

The draft integrated feasibility report and EIS/EIR will be circulated for concurrent public and agency review for a 45 day period. All comments will be addressed and the final integrated report will be circulated for a final 30-day public review.

## 7.4 Public Views and Responses

A public meeting will be conducted during the review period for the draft integrated report to provide an additional opportunity for public input. All written and oral comments received during this period will be addressed in the final report. An appendix will be included in the final report providing responses to each comment and the draft integrated report will be revised as appropriate.

# 8 List of Preparers

***Table 8-1. List of Preparers***

| Name | Title/Organization | Yrs. Experience |
|---|---|---|
| **Main Report** | | |
| Eric Jolliffe | Environmental Manager/USACE | 20 |
| Jaime O'Halloran | Water Resources Planner/USACE | 7 |
| Paula Gagnon | Natural Resources Specialist/HydroPlan LLC | 13 |
| Susa Gates | Senior Scientist/GAIA Consulting, Inc. | 33 |
| Martin Gonzalez | Senior Water Resources Planner/HydroPLan LLC | 31 |
| Lewis Hornung | Project Manager/HydroPlan LLC | 37 |
| Sage Jensen | Biologist/Sage Environmental Services, LLC/HydroPlan LLC | 17 |
| Daria Mazey | Senior Water Resources Planner/HydroPlan LLC | 9 |
| Melba Policicchio | Scientist III/GAIA Consulting, Inc. | 15 |
| Leann Taagepera | Cultural Resources Specialist/HydroPlan LLC | 20 |
| Susanne von Rosenberg | NEPA/CEQA Specialist/GAIA Consulting, Inc. | 31 |
| **Appendix A: Affected Environment Resource Assessment** | | |
| Paula Gagnon | Natural Resources Specialist/HydroPlan LLC | 13 |
| Susa Gates | Senior Scientist/GAIA Consulting, Inc. | 33 |
| Daria Mazey | Senior Water Resources Planner/HydroPlan LLC | 9 |
| Melba Policicchio | Scientist III/GAIA Consulting, Inc. | 15 |
| Leann Taagepera | Cultural Resources Specialist/HydroPlan LLC | 20 |
| Susanne von Rosenberg | NEPA/CEQA Specialist/GAIA Consulting, Inc. | 31 |
| **Appendix B: Civil Design** | | |
| Frank Sun | Civil Engineer/USACE | 13 |
| Dave Doak | Navigation Technical Manager/USACE | 33 |
| **Appendix C: Cost Engineering** | | |
| Sherman Fong | Cost Engineer/USACE | 31 |
| **Appendix D: Geotechnical Engineering** | | |
| Michael G. Stevens, P.G. | Geotechnical Engineer/USACE | 33 |
| **Appendix E: Water Resources Engineering** | | |
| Patrick Sing | Hydraulic Engineer/USACE | 7 |
| **Appendix E: Water Resources Engineering** | | |
| Bonievee Delepaz | Real Estate Specialist | |
| **Appendix G: Regulatory Setting** | | |
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# 9 Compliance with Applicable Laws, Policies, and Plans

Implementation of the TSP requires compliance with applicable federal, state and local statutes and policies pertaining to dredging and dredged material placement activities, and protection of aquatic and terrestrial resources. Some of these laws require the USACE to obtain permits, certifications, or approvals from other agencies before taking action. The following section describes the key federal and state laws applicable to the TSP and for which permits or certifications are required. This section also discusses the status of coordination with the issuing agencies and progress made toward compliance with the relevant laws and regulations. Other laws pertaining to the protection of environmental resources are presented by applicable resource areas in ***Appendix G***, Regulatory Setting.

## 9.1 Federal Laws

### 9.1.1 National Environmental Policy Act (NEPA)

Under NEPA, federal agencies must consider the environmental consequences of proposed major federal actions. The spirit and intent of NEPA is to protect and enhance the environment through well-informed federal decisions, based on sound science. NEPA is premised on the assumption that providing timely information to the decision maker and the public about the potential environmental consequences of proposed actions would improve the quality of federal decisions. Thus, the NEPA process includes the systematic evaluation of potential environmental consequences expected to result from implementing a proposed action. The CEQ sets forth regulations implementing NEPA.

**Status**: This document is intended to fulfill the requirements of NEPA, the CEQ regulations (40 C.F.R. pt. 1500-1508), and USACE Procedures for Implementing NEPA (Engineer Regulation 200-2-2). Full compliance with NEPA will be achieved when the final EIS/EIR and Record of Decision are filed with the USEPA.

### 9.1.2 Clean Water Act (CWA), Section 401 Water Quality Certification

The Clean Water Act (CWA) is the primary Federal law governing water pollution. It established the basic structure for regulating discharges of pollutants into waters of the U.S. and gives the USEPA the authority to implement pollution control programs, such as setting wastewater standards for industries. In some states, such as California, the USEPA has delegated authority to regulate the CWA to state agencies. The Porter-Cologne Water Quality Control Act of 1969 (Porter-Cologne Act), and associated regulations found in California Code of Regulations Title 23, establish a comprehensive program for the protection of water quality and the beneficial uses of waters of the state. It addresses both point and nonpoint source discharges, to both surface and ground waters and provides for the adoption of water quality control plans to designate beneficial uses of water, set water quality objectives to protect beneficial uses, and provide for a program to achieve those objectives. The San Francisco Bay RWQCB administers Section 401 of the CWA, and either issues or denies Water Quality Certifications (WQCs) based on an assessment of whether the proposed action would comply with Federal water quality standards and the Basin Plan, and the RWQCB's master water quality control planning document. WQCs typically include project-specific requirements established by the RWQCB to ensure attainment of water quality standards.

**Status**: The USACE will request a 401 WQC pertaining to the proposed action concurrent with the Draft EIS/EIR. With issuance of a WQC from the RWQCB, the USACE would be in full compliance with this Act.

### 9.1.3 Clean Water Act (CWA), Section 404

The goal of Section 404(b)(1) Guidelines of the CWA (Guidelines) is "to restore and maintain, the chemical, physical, and biological integrity of waters of the United States (waters of the US) through the control of discharges of dredged or fill material." The regulations set forth in 40 CFR Section 230 are the substantive criteria issued by the USEPA, used in evaluating discharges of dredged of fill material in to waters of the US. The 404(b)(1) guidelines provide regulations outlining measures to avoid, minimize and compensate for impacts. They also specify that "no discharge of dredged or fill material shall be permitted if there is a practical alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 C.F.R. § 230.10[a]).

Section 404 of the CWA requires that a permit be obtained from the USACE when an action will result in the discharge of dredged or fill material into wetlands and waters of the U.S. Under Section 404, the USACE regulates such discharges and issues individual and/or general permits for these activities. Before the USACE can issue a permit under Section 404, it must determine that the project is in compliance with the CWA Section 404(b)(1) guidelines.

**Status**: When conducting its own civil works projects, the USACE does not issue permits to itself. Rather, the USACE complies with the guidelines and substantive requirements of the CWA, including Section 404. The RWC Project would require discharge of fill material into waters of the U.S., therefore a Section 404(b)(1) analysis will be conducted on the TSP, and will be appended to this document. The USEPA will review the analysis along with the Draft EIS/EIR to ensure that discharge of fill material would comply with the 404(b)(1) guidelines.

### 9.1.4 Endangered Species Act

Under the federal ESA (16 U.S.C. §§ 1531-1544), all federal agencies shall, in consultation with the Secretary of the Interior or Secretary of Commerce, use their authorities to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of habitat determined under the ESA to be critical.

The ESA provides a program for conserving threatened and endangered plants and animals, and the habitats in which they are found. It is designed to protect critically imperiled species from extinction. The ESA is administered by USFWS and NMFS. In general, NMFS is responsible for protection of ESA-listed marine species and anadromous fishes, while other species are under USFWS jurisdiction.

Section 7 of the ESA prohibits Federal agencies from authorizing, funding, or carrying out activities that are likely to jeopardize the continued existence of a listed species or destroy or adversely modify its critical habitat. By consulting with USFWS and NMFS before initiating projects, agencies review their actions to determine if those actions could adversely affect listed species or their habitat. Through consultation, USFWS and NMFS work with Federal agencies to help design their programs and projects to conserve listed and proposed species. The agencies then prepare a Biological Opinion, which often includes conditions, reasonable and prudent alternatives, and protection/mitigation measures that must be completed if the project is implemented.

**Status**: The USACE has been coordinating with USFWS and NMFS through informal meetings and discussions. An ESA Section 7 Biological Assessment will be prepared and appended to this integrated feasibility report and EIS/EIR. The biological assessment will include the USACE's determination of the listed species that may be adversely affected by the proposed project. Formal Section 7 Consultation will be initiated following the release of the Draft EIS/EIR. The USFWS is expected to complete a Biological Opinion in regard to the TSP to complete the consultation requirements. With issuance of a Biological Opinion from the USFWS, the USACE would be in full compliance with this Act.

### 9.1.5 **Fish and Wildlife Coordination Act (FWCA)**

The FWCA ensures that fish and wildlife receive consideration equal to that of other project features from projects that are constructed, licensed, or permitted by Federal agencies. The FWCA requires federal agencies that construct water resource development projects to consult with USFWS, NMFS, and the applicable state fish and wildlife agency (CDFW) regarding the project's impacts on fish and wildlife and measures to mitigate those impacts.

**Status**: The USFWS and CDFW have participated in evaluating the proposed project and USACE is considering all recommendations proposed by the agencies. A Coordination Act Report (CAR) will be requested. When complete, it will be appended to this integrated feasibility report and EIS/EIR. With issuance of a final CAR from USFWS and CDFW, the USACE would be in full compliance with this Act.

### 9.1.6 **Magnusun-Stevens Fishery Conservation and Management Act**

Sections 305(b)(1)(D) and 305(b)(2-4) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) establishes a management system for national marine and estuarine fishery resources. This legislation mandates the identification, conservation, and enhancement of Essential Fish Habitat (EFH), which is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity," for all managed species. Federal agencies consult with NMFS on proposed actions that may adversely affect EFH. The main purpose of the EFH provisions of the Act is to avoid loss of fisheries due to disturbance and degradation of the fisheries habitat.

**Status**: An EFH Assessment will be prepared and appended to this integrated feasibility report and EIS/EIR. The NMFS is expected to issue EFH Conservation Recommendations to avoid, minimize, mitigate, or otherwise offset any identified adverse effects of the project prior to the issuance of the ROD. The RWC project will be in full compliance with this Act once a response is provided to the EFH conservation recommendations.

### 9.1.7 Coastal Zone Management Act (CZMA)

The CZMA, established in 1972 and administered by the NOAA's Office of Ocean and Coastal Resource Management, provides for management of the nation's coastal resources through a state and federal partnership. Under the federal consistency provisions of the CZMA, federal projects need to be consistent with the state's coastal zone management program and policies to the maximum extent practicable (16 U.S.C. § 1456); this determination is made by the lead federal agency, and concurrence is requested from the state or local agency responsible for implementing the CZMA.

Pursuant to the McAteer-Petris Act, the San Francisco Bay Conservation and Development Commission (BCDC) is the state's coastal zone management agency responsible for issuing consistency determinations under the CZMA for San Francisco Bay. The San Francisco Bay Plan is BCDC's policy document specifying goals, objectives, and policies for BCDC jurisdictional areas.

**Status**: The USACE will prepare a draft CZMA federal consistency determination and submit documentation of compliance with applicable chapters of the CZMA to BCDC after release of the draft EIS/EIR. The USACE will be in full compliance with the CZMA when the BCDC issues a consistency determination.

### 9.1.8 Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 *et seq.*) requires authorization from the USACE for the construction of any structure in, or over any navigable water of the U.S., including the excavation/dredging or deposition of material in these water or any obstruction or alteration in a "navigable water."

**Status:** The USACE does not issue itself Section 10 permits, however, it may issue a Section 10 permit to the non-federal sponsor, if required. The USACE will ensure compliance with Section 10 before completion of the NEPA process.

### 9.1.9 Clean Air Act (CAA)

The USEPA, in conjunction with the U.S. Department of Transportation (DOT), established the General Conformity Rule on 30 November 1993. The rule implements the Clean Air Act (CAA) conformity provision, which requires federal agencies to identify, analyze, and quantify emission impacts of an action and mandates that the federal government not engage, support, or provide financial assistance for licensing or permitting, or approve any activity not conforming to an approved CAA implementation plan.

**Status**: A General Conformity Applicability Analysis pertaining to the proposed action is included in this document (***Section 4.4.2***). This consists of calculation of the foreseeable indirect emissions for each alternative. Foreseeable indirect emissions include operational emissions as well as the incremental increase in emissions from recurring O&M dredging. The direct emissions for each alternative plus the indirect emissions are compared to the Federal deminimis levels. If the emissions from the project (including mitigation measures) fall below Federal de minimis levels then no Conformity Determination will be needed. If emissions exceed deminimis levels, a General Conformity Analysis will be prepared. When the EPA issues a Conformity Determination the USACE will be in compliance with the CAA.

## 9.2 State Laws

### 9.2.1 California Environmental Policy Act (CEQA)

The CEQA was closely modeled on NEPA and requires public agencies to consider and disclose to the public the environmental implications of proposed actions. CEQA applies to all discretionary activities that are proposed or approved by California public agencies, including state, regional, county, and local agencies, unless an exemption applies. Unlike NEPA, CEQA imposes an obligation to implement measures or project alternatives to avoid or mitigate significant adverse environmental effects, when feasible. When avoiding or mitigating significant environmental impacts of a proposed project is not feasible, CEQA requires that agencies either disapprove of the project, or prepare a written statement of the overriding considerations with approval of such project. Under the direction of CEQA, the California Natural Resources Agency has adopted regulations, known as the Guidelines for Implementation of the CEQA (CEQA Guidelines, California Code of Regulations Title 14, Section 15000 et seq.), which provide detailed procedures that agencies must follow to implement the law.

**Status**: This EIS is intended to fulfill the requirements of CEQA and the CEQA Guidelines, although as a federal agency, the USACE is not required to comply with CEQA.

### 9.2.2 California Endangered Species Act (CESA)

The CESA (California Fish and Game Code 2050-2116) operates in a similar fashion to the federal ESA, but is administered by CDFW. Certain species that are federally listed may not be listed on the CESA or vice-versa, or may have a different listing status. Similar to the federal ESA, CESA and the Native Plant Protection Act authorize CDFW to designate, protect, and regulate the taking of protected species in the State of California. Section 2080 of the California Fish and Game Code prohibits the taking of state listed plants and animals. CEQA lead agencies considering the approval of proposed projects that may adversely impact state-listed threatened or endangered species must consult with CDFW as a trustee agency. There has been no clear and explicit waiver of federal sovereignty with respect to CESA. Accordingly, as a federal agency, USACE does not seek incidental take authorization or other authorization under CESA. In issuing a WQC, however, the RWQCB must comply with CESA. The RWQCB's environmental review must give consideration to rare and endangered species, as protected by the Basin Plan in the beneficial uses protecting Preservation of Rare and Endangered Species, and Fish Migration. Similarly, in the NEPA significance criteria, USACE must consider special-status species and whether the action threatens violation of federal, state, or local law or requirements imposed for the protection of the environment (40 C.F.R. § 1508.27[b][9-10]).

**Status**: This document analyzes impacts to species listed under CESA to facilitate issuance of a WQC.

# 10 Recommended Plan

This chapter discusses the details of the recommended plan, which was determined by plan formulation process described in ***Chapters 3 and 6***. Impacts of the plan are detailed in ***Chapters 4 and 5.*** The details of the recommended plan discussed in this chapter include material quantities and classifications, O&M, dredged material placement, costs and benefits, and risk and uncertainty. A locally preferred plan (LPP) has not been identified. Therefore, the recommended plan is the NED Plan, identified generally as the **32 foot depth deepening at both Redwood City Harbor and SBS Channels with a slight realignment at Redwood City Harbor only to avoid sensitive environmental features of Bair Island and Greco Island including the peripheral mudflats.**

## 10.1 Plan Components

- Both channels will be deepened from -30 feet to -32 feet MLLW. The side slopes of both channels will be maintained at 3H:1V. An additional one foot of paid overdepth will be allowed; an additional one foot of overdepth will be allowed but not paid.
- The channel at Redwood City Harbor would range from 350 feet wide near the entrance to 288 feet throughout the rest of the channel. The channel alignment at the turn into Redwood City Harbor will retain the existing width but will be slightly modified. The intent of these modification is to avoid impacts to not only Bair and Greco Island but also Port facilities as well:
    - From Station 80+00 to Station 122+ 00 the channel will be realigned 6 feet to the east away from Bair Island
    - From Station 127+00 to Station 140+00 the channel will be realigned 6 feet towards the west to avoid impacts to adjacent Greco Island mudflats
    - From Station 140+00 to Station 155+00 the channel will be shifted 6 feet away from Bair Island.
    - From Station 155+00 to Station 162+00 the channel will be reduced in width by 12 feet so as to avoid impacts to the RWC port facilities
    - From Station 162+00 to the end of the turning basin, the channel width was reduced by six feet on the Bair Island side only so as to avoid adverse impact to Bair Island.
- The SBS Channel will remain approximately 500 feet wide and 29,850 feet (5.65 miles) long and will not be realigned. Some extension may be required to ensure a smooth transition to the existing channel bottom.
- At approximately Station 38+00 on SBS Channel, 10 inch and 12 inch petroleum pipelines that will be adversely impacted due to their location relative to the new

deepened channel will be lowered (relocated) to accommodate the increased channel depth. These two pipelines are owned by Kinder Morgan.
- At approximately station 148+70 on the SBS Channel, a ten inch petroleum pipeline owned by the Shell Oil Company that will also be impacted by the deepened channel will be lowered (relocated) to accommodate the increased channel depth.

Details pertaining to both the recommended plan, and placement of the dredged material are presented in the following sections.

## 10.2 Dredging Considerations

### 10.2.1 Dredging Volumes

The recommended plan would dredge a total of approximately 1,400,000 cy of in-place material. Adding a 20 percent bulking factor and a two-foot overdepth (***Table 4-1***) means that a placement capacity for 1,680,000 cy will be required. The material from RWC Channel will consist of greater than 80 percent fines and will be mostly young bay mud. Between 60 percent and 70 percent of the material dredged from SBS Channel will be fines and the remainder mostly sands. All of the material meets the requirements for ocean disposal at SF-DODS.

The allowed 2 feet overdepth accounts for the inherent variability and inaccuracy of dredging equipment (normally ± two feet). Also, the dredge operator may practice overcutting. An "overcut" along the sides of the channel) where substrates are unconsolidated materials, like sand and silts) may be employed in anticipation of movement of material down the sides of the channel. Overcut throughout the channel bottom may be the result of furrowing or pitting by the dredging equipment (such as the hopper dredge's drag arms, or the clamshell dredge's bucket). ***Figures 10-1 and 10-2*** illustrate these concepts.

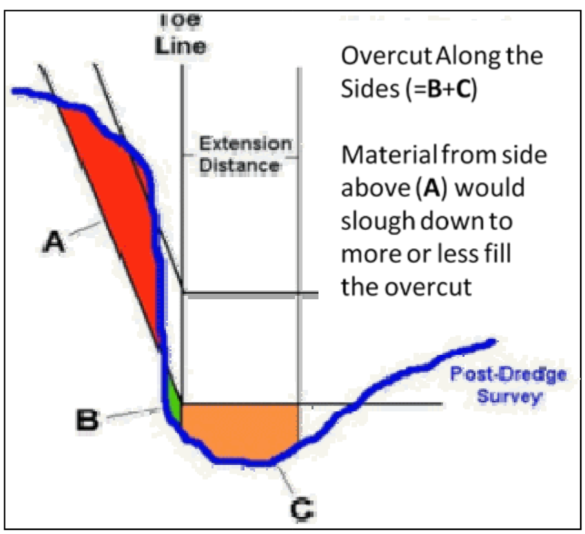


***Figure 10-1. Conceptual Depiction of Overcut Dredging***

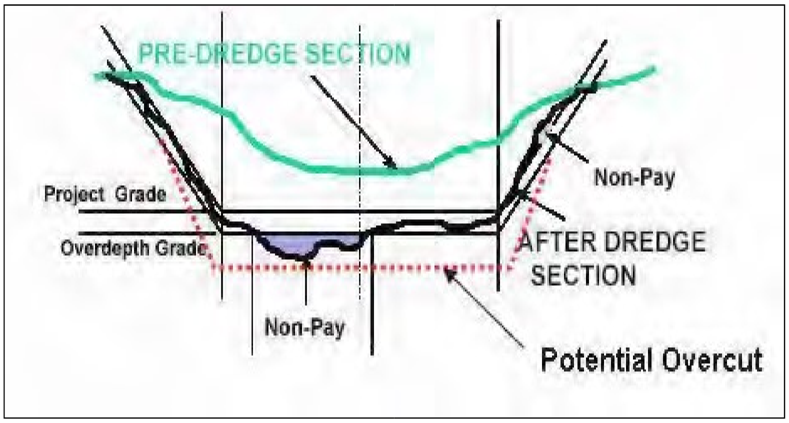


*Figure 10-2. Conceptual Depiction of Overdepth Grade Dredging*

### 10.2.2 Disposal of Dredged Material at SF-DODS

All the dredged material is to be disposed of at SF-DODS which is located in the Pacific Ocean west of San Francisco approximately 75 nautical miles from the SBS dredging site and 85 nautical miles from the RWC dredging site. It is the farthest and deepest of the dredged material disposal sites and:

- Is approximately eight square miles of open ocean area with a 600 meter circular center disposal location,
- Is considered non-dispersive (sediments tend to stay in place) and is unconfined,
- Is fully permitted and managed by the EPA, and
- Can accommodate a maximum of 4.8 mcy of dredged material annually.

## 10.3 Equipment and Construction Considerations

In general, the USACE does not specify types of equipment and construction methods within its specifications due to the requirements of Federal acquisition regulations compliance with the Competition in Contracting Act. The act requires Federal agencies to limit how specifications are written to prevent limiting competition among contractors. The contractor selected by USACE will determine the most efficient construction methodology of the project, in their professional opinion, and submit that as part of a proposal to USACE. USACE can, and does, specify the intended results of construction, safety measures, environmental compliance requirements, etc. through detailed plans and specifications. Generic information regarding common construction techniques is discussed below.

### 10.3.1 Equipment

#### 10.3.1.1 *RWC Channel*

Since this channel is somewhat confined, it will be dredged mechanically likely using a clamshell dredge with a bucket suitable for use with mud. A clamshell dredge is able to work in more confined areas and is less sensitive to wave conditions. However, they do have low capacity and are unable to dig into very firm or consolidated material such as rock. The RWC channel is bordered by either the environmentally sensitive mudflats of both Bair and Greco Islands or very expensive Port infrastructure. The clamshell dredging operation cycle is to lower the mud bucket in open position to the bottom surface, then close the bucket, thereby penetrating the bottom surface material due to its significant weight. A 21 cy clamshell dredge is assumed to be used. Dredging depth is controlled by length of wire used to drop the bucket. Production rate will vary depending on the size of the bucket used, the type of material being dredged, and the distance barges must be towed to the disposal site. Tugboats will be needed to move the dredge to its various locations.

Potential environmental impacts from clamshell dredging in the unconsolidated sediments of RWC Channel include possible re-suspension of sediments when the bucket hits the bottom and as material washes from the bucket as it rises through the water column. These impacts can be mitigated by controlling the speed of the bucket as it drops and rises, as well as the use of a closed bucket system. Environmental effects are further discussed in ***Chapter 4***.

#### 10.3.1.2 *SBS Channel*

This channel is in open water within the approximate center of San Francisco Bay. While a Hopper Dredge or a Cutterhead Dredge could be used, it is assumed that a 21 cy clamshell dredge similar to that used in the RWC channel and with similar bottom dump barges will be used for transport to SF-DODS.

#### 10.3.1.3 *Finishing Techniques*

Since dredging equipment does not typically result in a perfectly smooth and even channel bottom, a drag bar, chain or other item may be drug along the channel bottom to smooth down high spots and fill in low spots. This finishing technique also reduces the need for additional dredging to remove any high spots that may have been missed by the dredging equipment. It may be more cost-effective to use a drag bar or other leveling device than to conduct additional dredging.

#### 10.3.1.4 *Transport to SF-DODS*

Barges used to transport the dredged material to SF-DODS will likely be “bottom dump” type with a 5,000 cy capacity. These barges typically have an 18 foot draft and are filled to a maximum of 80 percent of their capacity when used for travel to open ocean disposal sites such as SF-DODS. A bottom dump barge has doors on the bottom of the hopper which open at the disposal site to allow the dredged material to fall to the bottom of the ocean. This type of barge has slower disposal than the split hull type dump barges. As a result the dropped material disperses over a greater area. The split hull type barges have two hulls connected with hinges at the front and back which allow them to swing apart. This results in a faster descent through the water column reducing the re-suspension of sediments. Either type is acceptable for use at SF-DODS.

#### 10.3.1.5 *Navigation Aids*

The USCG is typically responsible for providing and maintaining navigation aids. While the realignment being recommended is slight (six feet), a small cost will be added to the project for miscellaneous administrative coordination with the USCG during and post construction. Typically, the necessary relocation of aids for this small of a realignment is considered minor and incidental by the USCG and there is no charge for the actual physical relocation. The Bar Pilots shall be consulted and their recommendations incorporated as to placement of all navigation aids.

### 10.3.2 Construction Considerations

#### 10.3.2.1 *Dredging Window*

Dredging would occur only during the established window established by the California Bay Area regulatory and resource agencies to protect sensitive species that may be present at other times. The dredging window extends from June 1 through November 30. Dredging work will occur 24 hours a day and 7 days a week during this dredging window. Typically crews are expected to work 12 hour shifts.

Over the last few years, the LTMS agencies have worked closely with the National Marine Fisheries Service (NMFS) to develop a proposed update to the LTMS programmatic biological opinion (BO). That process is near completion.

The proposed update summarizes the accomplishments of the LTMS program over the years in reducing impacts to salmonids and green sturgeon, as well as other fish species, and outlines a proposed simplification of the existing environmental work windows for salmonids. In this proposal, no additional work windows would be created for green sturgeon. In addition, the proposal includes the opportunity for certain projects to work outside the salmonid work window without further consultation with NMFS, so long as the dredged material is beneficially reused to benefit fish habitat (such as at a tidal wetland restoration site) (Bay Planning Coalition 2015).

#### 10.3.2.2 *Construction Phasing*

Construction phasing is based on USACE estimates for dredging durations and element costs and provides the plan for contract phases per fiscal year. The number of contracts required to complete this project is a function of the funding stream, the contractor’s proposal, construction methods, equipment availability, compliance with air quality requirements, and construction window compliance. These factors may require multiple contracts and since most of this data is currently unavailable, the precise number and timing of contracts cannot be predicted at this time. A single continuing contract is assumed for this construction project. This will allow the contractor to group like items, meet the Port implementation schedules, have some flexibility with component construction due to weather or environmental conditions, and reduce mobilization and demobilization costs.

## 10.4 Real Estate Requirements

The non-federal sponsor will acquire the minimum interests in real estate required to support the construction and subsequent operation and maintenance of the Project. At this time, all project construction activities will occur within the channel where Navigational Servitude applies. Should any mudflats be negatively impacted resulting in a Real Estate "taking" then appropriate mitigation measures will be taken. Transport and disposal of dredged material will also occur in submerged lands where Navigational Servitude applies. Navigational Servitude may be exercised under statutory rights and powers without obligation for compensation to the riparian landowners.

Staging and work areas will be within the lands below the designated MHW line or on Port of Redwood City property. These lands will be certified by the non-federal sponsor.

Although there are no real estate acquisition requirements for disposal of dredged material, the project has the opportunity to support the LTMS by evaluating the feasibility of placing dredged material from the Redwood City Navigation Improvement Project at beneficial reuse sites. The goal of LTMS is to manage dredging and disposal activities in the Bay Area to maximize beneficial reuse of dredged material and minimize disposal in the Bay and at SF-DODS.

Use of the Eden Landing Ecological Reserve or the Alviso Pond Complex for beneficial reuse of dredged material from the RWC Project has been carefully considered in this study. Use of either of these placement sites potentially offer cost savings and environmental benefits. However, due to uncertainty in when the sites will be permitted and available and the methods that would be used to transport dredged material to the sites, they were considered to be potentially not implementable. Evaluations of the environmental impacts of using Eden Landing and Alviso Pond placement sites are documented in ***Chapter 4*** of this document. If either of these sites become available in time for Project construction and they are found to be cost effective, the Project implementation plan can be modified accordingly.

While there are no Public Law 91-646 Relocations required in connection with the project there are pipelines that have been identified and need to be relocated. They are owned by Kinder Morgan and Shell. The former Shell dock at San Francisco Airport is a convenient staging area for the relocations. All costs associated with the relocations are borne by the non-federal sponsor.

There are no real estate costs for this construction project other than the administrative costs during preconstruction, engineering and design (PED), which are required for coordination purposes. These costs are administrative and are not for lands and damages. Per USACE regulations, they are included in the cost sharing analysis.

## 10.5 Pipeline Relocations

There are two pipelines owned by Kinder Morgan and one owned by Shell (currently inactive) that will need to be relocated as they cross the SBS Channel (***Figure 2-1***). The pipeline relocation was estimated at $15 million for three jet-fuel pipelines located underneath the channel at San Bruno Shoal. All three pipelines will need to be lowered in order to accommodate the deepened SBS channel. Each pipeline will have a section of 2,500 linear feet removed and replaced at lower elevations that will allow for a 6 foot cover. Trenches will be dug and each pipeline replacement will have armoring over the 500 foot length that traverses SBS. Details for the equipment needed and construction to be performed can be found in ***Section 4.2.3***.

### 10.6 Local Betterments

In order to take advantage of the deeper channel and thereby realize the projected benefits, the five existing berths at the Port have to be deepened by a corresponding amount of two feet. Typically, berths should be a minimum of 4 feet deeper than the channel depth. Currently all five berths are at -34 feet MLLW; since the new deepened channel will be at -32 feet MLLW, the berths will be deepened to -36 feet MLLW.

The non-federal sponsor will be responsible for both funding and constructing these improvements. In order to deepen the berths, the attached wharves must remain structurally sound with the greater berth depths. The Port has recently completed upgrades to Wharves 1 and 2 that will maintain structural integrity of the wharves at a berthing depth as low as -40 feet MLLW. The Port is currently evaluating wharves 3 through 4 to determine whether any improvements would be required. Wharf 5 is not of concern. It is not currently being dredged and all cargo tonnage over the past 20 years has gone to Wharves 1 thru 4. Although not anticipated, if strengthening of the wharves were to be necessary, one of the following measures could be taken by the Port:

- Improve the existing fender systems
- Drive additional piling
- Install a cutoff wall to reinforce the slope beneath the wharves

Because wharves 3 through 5 will require no additional structural modifications to support the two foot deepening, it has been assumed that no wharf improvements will be required to meet geotechnical stability criteria. The Port will be responsible for deepening the berths. It is estimated that 17,000 cy of material will need to be removed.

### 10.7 Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)

Maintenance dredging is an ongoing program currently performed by the USACE at the existing RWC and SBS Channels. The current scheduled maintenance at RWC Channel is once every one to two years as long as funding is available. The current scheduled maintenance at SBS Channel is once every 10 years. There will be an increase in the overall volume to be dredged post project completion (approximately 13 percent) but also an increase in the rate of sediment deposition due to the increased depths. Despite this, both channels are expected to retain their current dredging maintenance schedule. Disposal will continue to be at the historic in-Bay disposal site (SF-11) unless other more cost effective and/or environmentally beneficial sites come on line. Use of a clamshell dredge is the most likely method of future maintenance dredging. There should be no change in the anticipated material characteristics for both the RWC and SBS channels.

### 10.8 Cost Apportionment

Federal and non-federal cost apportionment for project implementation is described in ***Table 10-1***. The pipeline removal/relocation financial costs are incurred by the pipeline owners per navigational servitude, which is a non-Federal implementation cost item. It's treated as an associated economic cost and included in the economic analysis, but is not considered a project financial cost that is cost shared between USACE and the Port.

***Table 10-1. Redwood City Navigation Improvement Project Cost Apportionment***

| TSP (NED Plan) Project First Cost | Project Implementation Cost | Federal Cost | Non-Federal Cost |
|---|---|---|---|
| General Navigation Features (GNF) (75% Federal / 25% Non-Federal)[1] | $52,982,000 | $39,737,000 | $13,246,000 |
| Environmental Mitigation (75% Federal / 25% Non-Federal) | $200,000 | $150,000 | $50,000 |
| LERRs (100% Non-Federal) | $218,000 | $0 | $218,000 |
| **Subtotal Project First Cost** | **$53,400,000** | **$39,887,000** | **$13,514,000** |
| | | | |
| **Additional Project Implementation Requirements and Cost Adjustments** | | | |
| 10% Cash (GNF minus LERR - Paid Over Period NTE 30 years | | ($5,122,000) | $5,122,000 |
| Local Service Facilities (100% Non-Federal) | $505,000 | $0 | $505,000 |
| Aids to Navigation (100% Federal-US Coast Guard) | $100,000 | $100,000 | $0 |
| Pipeline Relocation - Navigation Servitude (100% Pipeline Owner) | $18,750,000 | $0 | $18,750,000 |
| **Subtotal Additional Project Implementation Requirements and Cost Adjustments** | **$19,355,000** | **($5,022,000)** | **$24,377,000** |
| | | | |
| **TOTAL** | **$72,755,000** | **$34,865,000** | **$37,891,000** |
| | | | |
| **Incremental Increase in Annual O&M (100% Federal)** | **$435,000** | **$435,000** | **$0** |

[1]Includes Mob/Demob, PED, & S&A.

# 11 Recommendations

I concur with the findings presented in this report. The recommended plan developed is technically sound, economically justified, and socially and environmentally acceptable.

The work proposed is within the existing authority. I recommend that the plan selected herein, deepening the existing Federal channels at Redwood City and San Bruno Shoal an additional two feet to a depth of -32 feet MLLW with only a slight realignment of six feet and some minor narrowing of the RWC Channel near the Port facilities, be authorized by Congress for implementation. These minor adjustments to the existing Federal channel were necessary to reduce the possibility of any "taking" of mudflats at either Bair Island or Greco Island. Should these adverse environmental impacts to existing resources be noted during PED, then appropriate mitigation will be taken. Costly impacts to Port facilities are being avoided. As such, at this time no mitigation compensation for environmental resources are anticipated. Relocation, establishment, and disestablishment of aids to navigation are to be funded by the United States Coast Guard.

- The total estimated cost of the project is $73,150,000, with a Federal share of $34,865,000 and a non-federal share of $37,891,000.
- The average annual costs were determined to be $3,483,000 and average annual benefits were $466,800, with a benefit to cost ratio of 1.1 to 1. Average annual net benefits are $1,512,486.

The recommended plan conforms to the essential elements of the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and complies with other Administration and legislative policies and guidelines on project development. If the project were to receive funds for Federal implementation, it would be implemented subject to the cost sharing, financing, and other applicable requirements of Federal law and policy for navigation projects including WRDA 1986, as amended; and would be implemented with such modifications, as the Chief of Engineers deems advisable within his discretionary authority. Aids to navigation are to be funded by the U.S. Coast Guard. Federal implementation is contingent upon the non-federal sponsor agreeing to comply with applicable Federal laws and policies. Prior to implementation, the non-federal sponsor shall agree to:

a. Provide, during the periods of design and construction, funds necessary to make its total contribution for commercial navigation equal to:
   - 25 percent of the cost of design and construction of the General Navigation Features (GNFs).

b. Provide all lands, easement, and rights-of-way (LERR), including those necessary for the borrowing of material and placement of dredged or excavated material, and perform or assure performance of all relocations, including utility relocations, all as determined by the government to be necessary for the construction or operation and maintenance of the GNFs;

c. Pay with interest, over a period not to exceed 30 years following completion of the period of construction of the GNFs an additional amount equal to 10 percent of the total cost of construction of GNFs less the amount of credit afforded by the Government for the value of the LER and relocations, including utility relocations, provided by the non-Federal sponsor for the GNFs. If the amount of credit afforded by the Government for the value of LER, and relocations, including utility relocations, provided by the non-federal sponsor equals or exceeds 10 percent of the total cost of construction of the GNFs, the non-federal sponsor shall not be required to make any contribution under this paragraph, nor shall it be entitled to an refund for the value of LER and relocations, including utility relocations in excess of 10 percent of the total costs of construction of the GNFs;
d. Provide, operate, and maintain, at no cost to the Government, the local service facilities in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Government;
e. In the case of project features greater than 32 foot depth, provide 50 percent of the excess cost of operation and maintenance of the project over that cost which the Government determines would be incurred for operation and maintenance if the project had a depth of 32 feet;
f. Give the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating and maintaining the GNFs;
g. Hold and save the United States free from all damages arising from the construction or operation and maintenance of the project, any betterments, and the local service facilities, except for damages due to the fault or negligence of the United States or its contractors;
h. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of three years after completion of the accounting for which such books, records, documents, and other evidence is required, to the extent and in such detail as will properly reflect total cost of the project, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and local governments at 32 CFR, Section 33.20;
i. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 USC 9601– 9675, that may exist in, on, or under LER that the Federal Government determines to be necessary for the construction

or operation and maintenance of the GNFs. However, for lands, easements, or rights-of-way that the Federal Government determines to be subject to the Navigation Servitude, only the Federal Government shall perform such investigation unless the Federal Government provides the non-federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

j. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsor, for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under LER that the Federal Government determines to be necessary for the construction or operation and maintenance of the project;

k. To the maximum extent practicable, perform its obligations in a manner that will not cause liability to arise under CERCLA;

l. Comply with Section 221 of PL 91-611, Flood Control Act of 1970, as amended, (42 U.S.C. 1962d-5b) and Section 101(e) of the WRDA 86, Public Law 99-662, as amended, (33 U.S.C. 2211(e)) which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

m. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended, (42 U.S.C. 4601-4655) and the Uniform Regulations contained in 49 CFR 24, in acquiring lands, easements, and rights-of-way, necessary for construction, operation and maintenance of the project including those necessary for relocations, the borrowing of material, or the placement of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act;

n. Comply with all applicable Federal and State laws and regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, PL 88-352 (42 USC 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled “Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army”; and all applicable Federal labor standards requirements including but not limited to, 40 U.S.C. 3141-3148 and 40 U.S.C. 3701-3708 (revising, codifying and enacting without substantive changes the provision of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c);

o. Provide the non-federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation that are in excess of 1 percent of the total amount authorized to be appropriated for the project; and

p. Not use funds from other Federal programs, including any non-federal contribution required as a matching share therefore, to meet any of the non-federal sponsor's obligations for the project costs unless the Federal agency providing the Federal portion of such funds verifies in writing that such funds are authorized to be used to carry out the project.
q. Accomplish all removals determined necessary by the Federal Government other than those removals specifically assigned to the Federal Government.
r. Mitigation monitoring during construction and post construction shall be cost shared between the Federal government and non-federal sponsor, 75 percent and 25 percent, respectively.

The information contained herein reflects the information available at this time and current departmental policies concerning formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works program or the perspective of higher review levels within the executive branch. Consequently the recommendations may be modified before it is submitted to the Congress as a proposal for authorization and implementation funding. However, prior to submittal to the Congress, the State of California, the Port of Redwood City (the non-federal sponsor), interested Federal agencies and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

____________________ ___________________________

Date

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Lieutenant Colonel, U.S. Army

District Commander

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**Personal Communications**

Christine Boudreau. 2015. Personal Communication with Susa Gates.

R. Lowgren. 2015a. Personal Communication with Susanne von Rosenberg.

R. Lowgren. 2015b. Personal Communication with Susanne von Rosenberg.

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