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

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

Affected Environment Resource Assessment

Appendix A

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Contents

A. Affected Environment Resource Assessment 1
A.1 Resource Areas Not Evaluated in Detail 1
A.1.1 Aesthetics 1
A.1.2 Mineral Resources 2
A.1.3 Public Services 2
A.2 Air Quality and Green House Gases 3
A.2.1 Affected Environment 4
A.2.2 Significance Thresholds 11
A.2.3 Environmental Consequences 13
A.2.2 Mitigation Measures 26
A.3 Biological Resources Overview 26
A.3.1 Affected Environment 27
A.3.2 Significance Thresholds 39
A.3.3 Habitat Conservation Plan, Natural Community Conservation Plan, or other Approved Local, Regional, or State Habitat Conservation Plans 41
A.3.4 Special Status Species 41
A.4 Biological Resources – Fish and Aquatic Resources 42
A.4.1 Environmental Consequences 42
A.4.2 Mitigation Measures 71
A.5 Biological Resources – Terrestrial Resources 72
A.5.1 Environmental Consequences 72
A.5.2 Mitigation Measures 85
A.6 Cultural Resources 86
A.6.1 Affected Environment 86
A.6.2 Significance Thresholds 95
A.6.3 Environmental Consequences 97
A.6.4 Mitigation Measures 104
A.7 Geology/Soils/Seismicity 106
A.7.1 Affected Environment 106
A.7.2 Significance Thresholds 117

A.7.3 Environmental Consequences ... 117
A.7.4 Mitigation Measures ... 121
A.8 Hazards and Hazardous Material ... 122
A.8.1 Affected Environment ... 122
A.8.2 Significance Thresholds ... 130
A.8.3 Environmental Consequences ... 130
A.8.4 Mitigation Measures ... 137
A.9 Land Use and Planning ... 137
A.9.1 Affected Environment ... 137
A.9.2 Significance Thresholds ... 140
A.9.3 Environmental Consequences ... 140
A.9.4 Mitigation Measures ... 146
A.10 Noise and Vibration ... 146
A.10.1 Affected Environment ... 148
A.10.2 Significance Thresholds ... 153
A.10.3 Environmental Consequences ... 154
A.10.4 Mitigation Measures ... 171
A.11 Recreation ... 172
A.11.1 Affected Environment ... 172
A.11.2 Significance Thresholds ... 179
A.11.3 Environmental Consequences ... 179
A.11.4 Mitigation Measures ... 183
A.12 Socioeconomics/Population/Housing ... 183
A.12.1 Affected Environment ... 184
A.12.2 Significance Thresholds ... 188
A.12.3 Environmental Consequences and Mitigation ... 189
A.12.4 Mitigation Measures ... 190
A.13 Transportation/Navigation/Traffic ... 190
A.13.1 Affected Environment ... 190
A.13.2 Regulatory Setting ... 199
A.13.3 Significance Thresholds ... 200

A.13.4 Environmental Consequences 201
A.13.5 Mitigation Measures 206
A.14 Utilities/Service Systems 206
A.14.1 Affected Environment 206
A.14.2 Significance Thresholds 208
A.14.3 Environmental Consequences 208
A.14.4 Mitigation Measures 211
A.15 Water Quality and Hydrology 211
A.15.1 Affected Environment 211
A.15.2 Significance Thresholds 222
A.15.3 Environmental Consequences 222
A.15.4 Mitigation Measures 237
A.16 References 238

Tables

Table A-1. National and California Ambient Air Standards, Bay Area Attainment Status 7
Table A-2. CEQA BAAQMD Threshold Values for Construction and Operation Emissions 12
Table A-3. General Conformity de Minimis Thresholds for Construction Emissions 13
Table A-4. Calculated Dredging and Transportation Emissions Based on CEDEP Estimate 18
Table A-5. Dredging Options – Estimated Dredging and Transport Emissions 21
Table A-6. CEQA BAAQMD Threshold Comparison for Construction Emissions 22
Table A-7. General Conformity Threshold Comparison for Construction Emissions 24
Table A-8. Current and Forecast Vessel Calls at Port of Redwood City 26
Table A-9. Response of Marine Species to Certain Concentration Levels of Total Suspended Sediments (Anchor 2003) 49
Table A-10. Shipwreck Data 94
Table A-11. Sound Levels and Relative Loudness of Typical Noises in Indoor and Outdoor Environments 147
Table A-12. Estimated Equipment Noise Levels at Dredging Sites 155
Table A-13. Estimated Noise Levels at Dredging Sites Compared to Ambient Conditions 156
Table A-14. Estimated Equipment Noise Levels by Placement Site 161
Table A-15. Predicted Noise Levels at Placement Sites Compared to Ambient Levels 163
Table A-16. Socioeconomic Data by Jurisdiction and Project Site, Redwood City Harbor Navigation Improvement Project 186
Table A-17. Main Industries in Project Area for RWC Navigation Improvement Project 187
Table A-18. Commercial Traffic and Commodity Volumes, Port of Redwood City 194

Figures

Figure A-1. Montezuma Wetland Restoration and Cullinan Ranch Restoration Sites 4
Figure A-2. Map of BAAQMD Air Quality Monitoring Sites (Source: BAAQMD 2015b) 10
Figure A-3. South Bay Salt Pond Restoration Project 37
Figure A-4. Alviso Pond Complex 63
Figure A-5. Eden Landing Ponds.. 68
Figure A-6. Alquist-Priolo Earthquake Fault Zones 109
Figure A-7. Earthquake Liquefaction Susceptibility 112
Figure A-8. Study Area including SF-DODS.. 139
Figure A-9. Existing and Planned Ferry Routes in San Francisco Bay 193
Figure A-10. Transit Route to and from SF-DODS 196
Figure A-11. Sub-bays of San Francisco Bay.. 212

A. Affected Environment Resource Assessment

This appendix supplements ***Chapter 4***, *Affected Environment, Environmental Consequences, and Mitigation Measures* of the *Redwood City Harbor Navigation Improvement Integrated Feasibility Report and EIS/EIR*. In this document, each individual resource area is assessed to establish the baseline conditions, potential impacts that would result from the alternatives being considered are evaluated, and when appropriate, mitigation measures are identified.

This document refers to the *Redwood City Harbor Navigation Improvement Integrated Feasibility Report and EIS/EIR* (without appendices) as the Main Integrated Report.

A.1 Resource Areas Not Evaluated in Detail

For some resource areas, it was not necessary to perform detailed analyses to determine that there would be no significant impacts caused by the Project Alternatives. These rational for concluding there would be no significant impacts to these resource areas are provided in the following sub-sections.

Aesthetics

Although aesthetic evaluations are inherently subjective, certain views are widely held to be scenic. Such vistas typically comprise or partially encompass natural landscapes and notable landmarks of the built environment. In the Project area, the important natural scenic resources and scenic features of the built environment include the Redwood City Harbor and Bair Island areas; San Francisco Bay and skyline near San Bruno Shoals and Alcatraz; South San Francisco Bay shoreline (including Eden Landing, Alviso and Ravenswood South Bay Salt Pond restoration sites and Dumbarton restoration area); and open ocean areas west of San Francisco.

To some observers, aesthetic resources may be considered slightly degraded during dredging and placement activities from the presence of dredge equipment, floating pipelines and turbidity produced during dredging and placement activities. These impacts would be temporary and would occur in locations where dredging and placement activities have occurred regularly in the past. Also, the temporary impacts (3-6 moths) to the visual landscape would be offset by the long-term aesthetic improvements provided by the restoration project. In addition, the waters of San Francisco Bay already include similar uses and equipment, such as ferry terminals, ports, scows, and industrial and commercial shipping operations that are part of the existing visual landscape. In this context, impacts to aesthetics and visual resources from the project alternatives would be negligible. The USACE would not use the placement sites until appropriate environmental review is completed, including evaluation of impacts on visual resources and aesthetics.

Therefore, the project alternatives would not adversely impact aesthetics and visual resources, and this resource is not evaluated further in this EIS/EIR.

Mineral Resources

The proposed Project would not require quarrying, mining, dredging, or extraction of locally important mineral resources within the Project Area, nor would it deplete any nonrenewable natural resource. Sand is mined from the San Francisco Bay for industrial and agricultural uses. Geographically, mining activity occurs in three areas: the Central Bay west of Angel Island; at Middle Ground Shoal just east of Port Chicago; and in the eastern portion of Suisun Channel (USACE 2012). No sand mining areas are located in the vicinity of the dredging sites, or the Eden Landing or Alviso ponds.

To reach the SF-DODS, Cullinan, and Montezuma placement sites Project-related vessel traffic may transit near some of the sand mining locations; however, Project-related vessel traffic would be a small fraction of the more than 130,000 annual vessel movements in San Francisco Bay. Dredging of the RWC and SBS Channels, and placement of dredged materials at any of the placement sites under the proposed alternatives would not adversely impact sand mining. The Project would not occur near and would not affect any land-based mineral resources. The proposed Project would not result in adverse impacts on mineral resources and therefore does not warrant further discussion in this EIR.

Public Services

Evaluating impacts to public services requires determining whether the proposed Project would affect the level of service and the need for expansion of fire protection, police, schools, public parks and libraries, and/or if the Project would impair emergency response capability. Workers for the project would be sourced from the existing labor pool and this Project is not expected to increase the service population for the Project Area. No new public facilities would need to be built or expanded as a result of the Project, since it is not projected to affect population, nor demand for services.

Emergency response capability could be reduced if the Project caused reduced access to locations requiring emergency response. The vast majority of the activities associated with this Project would occur on the water. All dredging would occur in-Bay at RWC Channel and SBS Channel and all of the placement sites would be accessed by water. Any upland activities to place and manage sediment delivered by the RWC Project are analyzed separately through each site's permitting process.

Offloaders and pipelines constructed by the Project would be placed so as to not obstruct navigation, and would be appropriately marked to avoid potential vessel incidents. Transport of sediment would require up to 75 round-trip scow trips per month for 6 months per year;[1] this is a small fraction of the total vessel traffic in San Francisco Bay. Vessels would be in contact with the US Coast Guard's Vessel Traffic Service, San Francisco (VTS). There would be

[1] Tug trips to Eden Landing and Alviso could be considerably higher because these sites are much closer; up to 175 tug trips per month could occur.

neither a need for additional emergency response nor a requirement for new or expanded public facilities as a result of Project construction.

The RWC Channel is approximately 21,000 feet (roughly four miles) in length and currently experiences low frequency large vessel traffic. In 2014 the Port had a total of 107 vessel calls. If averaged out per month, this equates nine vessel calls per month to the Port. The proposed Project would not cause cargo growth, and due to the efficiencies of the deeper channel (vessels can be loaded more heavily), the total number of vessel calls would be reduced compared to the No Project/No Action alternative. Thus, following deepening, emergency access would be the same or better for RWC and SBS Channels. Dredging RWC Channel and transporting dredged material from the dredge site to placement sites would not adversely affect the over-water public service activities performed by police, fire and any other emergency service in the South Bay due to the existing low traffic conditions and adequate width of the channel.

SBS channel experiences higher marine traffic than RWC channel, however there is ample maneuvering width for most vessels to either side of the channel. The deepening and subsequent maintenance of SBS channel would improve the safe navigability of the channel, again providing a beneficial impact to on-water public services.

Implementation of the Project would have no adverse impacts on public services and this resource is not evaluated further in this EIS/EIR.

A.2 Air Quality and Green House Gases

This section (***A.2***) discusses the relevance of both air quality and greenhouse gas (GHG) emissions to the study areas and Project activities. For this Project, air emissions result from engines of the vessels and equipment used for dredging, transport of the dredged material, and placement of the material. The Project is composed of a construction phase and an operational phase. For purposes of the air quality/GHG analysis:

- The construction phase would involve dredging up to 7,715,000 cy of sediment combined from RWC and SBS Channels and Berths 1 through 4 at the Port of Redwood City. As explained further in the Methodology Section (***Section A.2.2***), construction emission estimates were developed based on equipment estimates. The equipment estimates were taken from preliminary cost estimates prepared assuming 904,700 cy of material are dredged and placed into one of three placement sites: SF-DODS; Montezuma, or Cullinan (***Figure A- 1***). The air quality/GHG impacts of sediment delivery to the Eden Landing and Alviso Ponds are not evaluated because there is insufficient information regarding the likely operating parameters for sediment delivery to these sites.

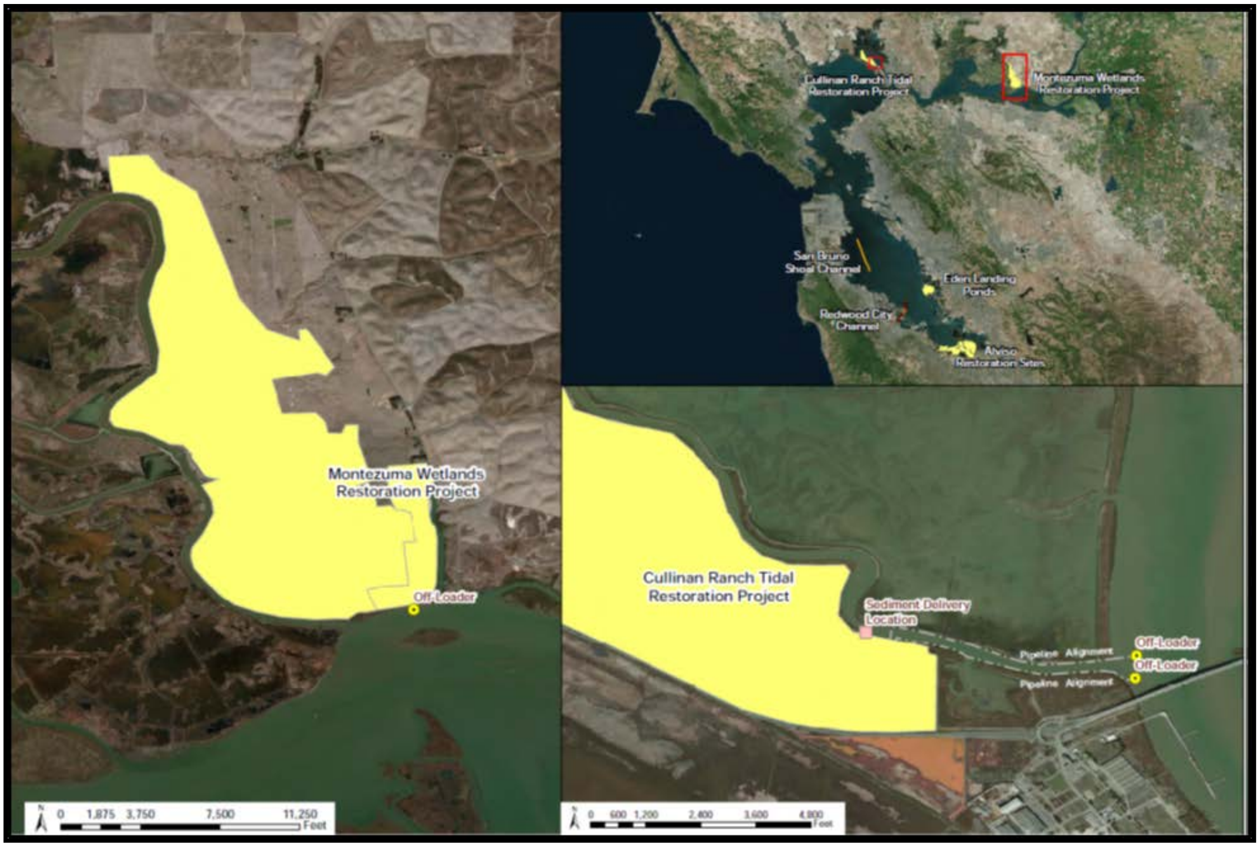

Figure A-1. Montezuma Wetland Restoration and Cullinan Ranch Restoration Sites

- The operational phase involves only the two channel locations, and how the deeper channels would affect vessel traffic patterns and the resulting air emissions over the short- and long-term.

Existing air quality and GHG emissions in the study areas, the proposed Project's significance thresholds, and the short-term and long-term environmental consequences of deepening the RWC and SBS Channels and Port berths, compared to the No Action Alternative (no deepening) are discussed within this sub-section. The applicable regulations related to air quality and GHG emissions that construction and operational activities must consider are described in more detail in ***Appendix G***, Regulatory Setting. Calculations used to develop final emission estimates are found in ***Attachment 1*** to this appendix, Air Quality and Greenhouse Gas Emission Calculations.

A.2.1 Affected Environment

The Project site is located in the San Francisco Bay Area Air Basin (Basin). The Basin includes nine-county regions including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin and Napa counties, and the southern portions of Solano and Sonoma counties. The Bay Area consists of mountains, valleys, and bays, which result in specific wind flow patterns. Wind patterns vary from season to season. Wind tends to move from areas of high-pressure to low-pressure. In warm months, air currents move on-shore from the ocean to inland areas. Pacific Ocean air receives emissions from numerous anthropogenic and biogenic sources as it comes onshore. During the summer northwest winds enter the Bay Area through the Golden Gate Bridge and the lower portions of the Peninsula. This jet flow sweeps eastward, through the Golden Gate Bridge, creating southwest winds at Berkeley and northwest winds at San Jose. During the winter, the Pacific high pressure cell weakens and shifts southward. During winter rainy periods, inversions are weak or nonexistent, winds can be moderate to strong and air pollution potential decreases. Winter dry periods that can last over a week increase the potential for carbon monoxide (CO) and particulate pollution occurrences.

A.2.1.1 Air Quality

Air quality can be quantified by the concentration of various pollutants in the atmosphere. Air quality is affected by the rate, amount and location of air pollutants, and by the environmental conditions of the area that influence pollutant dispersal. Units of concentration are in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The importance of a pollutant is determined by comparing its concentration to an appropriate Federal, state, and/or regional ambient air quality standard. These threshold values represent allowable maximum concentrations into the air to maintain an appropriate and safe air quality. Specific pollutants are described below and Federal, state and regional thresholds are described in ***Section A.2.2***.

The Federal Clean Air Act (CAA) requires USEPA to set National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] Part 50) for six pollutants considered harmful to public health and the environment. These standards are the maximum allowable atmospheric concentrations that may occur while protecting public health and welfare with a reasonable margin of safety. They include short-term (1-, 3-, 8-, and 24-hour periods) and long-term standards (quarterly and annual averages). USEPA has defined “primary” and “secondary” ambient thresholds for each of six criteria pollutants. Primary thresholds protect human health, particularly sensitive receptors such as children, the elderly, and sick. Secondary standards protect the natural environment.

USEPA calls these pollutants criteria air pollutants because it regulates them by developing science-based guidelines and permissible levels. The six criteria air pollutants are:

- **Ozone.** Ozone (O_3) is found in two regions of the Earth’s atmosphere – at ground level and within the upper atmosphere regions. Ground-level ozone, or smog, is an air pollutant. Ozone is formed by chemical reactions between nitrogen oxides (NO_X) and volatile organic compounds (VOCs). Ozone is likely to reach unhealthy levels on hot sunny days in urban environments and can be transported long distances by wind. Emissions from industrial facilities and electric utilities, engine exhaust, gasoline vapors, and chemical solvents are some of the major sources of NO_X and VOCs.

- **Particulate matter (PM).** PM refers to a range of particles in the atmosphere including dust, aerosols and metallic oxides, and organic chemicals (USEPA 2015). Some PMs, such as pollen, are naturally occurring. Whether natural or anthropogenic, PMs can cause health problems, reduced visibility (or haze), and adverse environmental impacts (acidification of waterbodies). The size of particles is directly linked to their potential for causing health and environmental problems. The USEPA is concerned about particles that are 10 micrometers in diameter or smaller because these particles can pass through the throat and nose and enter the lungs or travel long distances in the wind. Two categories of PM have been defined: PM_{10} and $PM_{2.5}$, particles less than 10 and 2.5 micrometers in diameter, respectively.

PM may also be classified as primary or secondary depending on the compounds and processes involved during its formation. Primary particles are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires. Secondary particles form in complicated reactions in the atmosphere of chemicals such as sulfur dioxides and NOx that are emitted from power plants, industries, and automobiles. Secondary particles make up most of the fine particle pollution in the country.

- **Carbon monoxide (CO).** CO is a colorless, odorless gas emitted from combustion processes, largely originating from mobile sources. Exposure to CO can reduce the oxygen-carrying capacity of the blood.
- **Nitrogen Dioxide (NO_2).** NO_2, a reactive oxide of nitrogen, is one component of NOx. Other nitrogen oxides include nitrous acid and nitric acid. While USEPA's NAAQS covers the entire group of NO_X, NO_2 is of greatest interest and the indicator for the larger group of nitrogen oxides. NO_2 forms quickly from emissions from cars, trucks and buses, power plants, and off-road equipment. In addition to contributing to the formation of ground-level ozone, and fine particle pollution, NO_2 is linked with a number of adverse effects on the respiratory system.
- **Sulfur dioxide (SO_2).** SO_2 is an oxide of sulfur. The largest sources of SO_2 emissions are from fossil fuel combustion at power plants (73%) and other industrial facilities (20%) (USEPA 2015). Smaller sources of SO_2 emissions include industrial processes such as extracting metal from ore, and the burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment. SO_2 is linked with a number of adverse effects on the respiratory system.
- **Lead.** In the past, sources of lead emissions have been from fuels from motor vehicles and industry. Regulations have decreased emissions from transportation sources, and today the major sources of lead emissions are ore and metals processing and piston-engine aircraft operating on leaded aviation gasoline (USEPA 2015). Lead can affect the nervous system, kidney function, immune system, reproductive and developmental systems, and the cardiovascular system.

USEPA has classified air basins as "attainment" or "nonattainment" for each criteria pollutant, based on whether or not the national standards have been achieved (40 CFR Part 81, Subpart C, Section 107). The CAA requires each state to develop a State Implementation Plan (SIP) that is its primary mechanism for ensuring that the NAAQS are achieved and maintained within that state. The California Clean Air Act (CCAA), patterned after the Federal CAA, also designates areas as "attainment" or "nonattainment".

Individual states may also establish their own air quality standards. The California Health and Safety Code, Section 39606, authorizes the California Air Resources Board (CARB) to set ambient air pollution standards for public health, safety, and welfare. CARB makes area designations for 10 pollutants: O_3, suspended particulate matter (PM_{10} and $PM_{2.5}$), CO, NO_2, SO_2, sulfates, lead, hydrogen sulfide (H_2S), and visibility reducing particles.

- Regional air districts also develop local air quality/pollutant regulations and prepare air quality plans that set goals and measures for achieving attainment with NAAQS and CAAQS. The districts develop emission inventories, collect air monitoring data, and perform and perform analyses.

Table A-1 shows the NAAQS and CAAQS and the Bay Area's attainment status for each standard.

Table A-1. National and California Ambient Air Standards, Bay Area Attainment Status

		California Standards		National Standards	
Pollutant	**Averaging Time**	**Concentration**	**Attainment Status**	**Concentration**	**Attainment Status**
Ozone	8 Hour	0.070 ppm (137 µg/m^3)	Nonattainment	0.075 ppm	Nonattainment
	1 Hour	0.09 ppm (180 µg/m^3)	Nonattainment		
Carbon Monoxide	8 Hour	9.0 ppm (10 mg/m^3)	Attainment	9 ppm (10 mg/m^3)	Attainment
	1 Hour	20 ppm (23 mg/m^3)	Attainment	35 ppm (40 mg/m^3)	Attainment
Nitrogen Dioxide	1 Hour	0.18 ppm (339 µg/m^3)	Attainment	0.100 ppm	Unclassified
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Attainment
Sulfur Dioxide	24 Hour	0.04 ppm (105 µg/m^3)	Attainment	0.14 ppm (365 µg/m^3)	Attainment
	1 Hour	0.25 ppm (655 µg/m^3)	Attainment	0.075 ppm (196 µg/m^3)	Attainment
	Annual Arithmetic Mean			0.030 ppm (80 µg/m^3)	Attainment
Particulate Matter	Annual Arithmetic Mean	20 µg/m^3	Nonattainment		

Pollutant	Averaging Time	California Standards Concentration	California Standards Attainment Status	National Standards Concentration	National Standards Attainment Status
(PM_{10})	24 Hour	50 µg/m³	Nonattainment	150 µg/m³	Unclassified
Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m³	Nonattainment	15 µg/m³	Attainment
	24 Hour			35 µg/m³	Nonattainment
Sulfates	24 Hour	25 µg/m³	Attainment		
Lead	30 Day Average	1.5 µg/m³			Attainment
	Calendar Quarter	-		1.5 µg/m³	Attainment
	Rolling 3 Month Average	-		0.15µg/m³	
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m³)	Unclassified	No Federal Standards	
Vinyl Chloride (chloroethene)	24 Hour	0.010 ppm (26 µg/m³)	No information available		
Visibility Reducing Particles	8 Hour (10:00 to 18:00)		Unclassified		

mg/m³ = milligrams per cubic meter
ppm = parts per million
µg/m³ = micrograms per cubic meter
Source: (BAAQMD 2015a)

A.2.1.1.1 **Toxic Air Contaminants (TACs)**

The California Health and Safety Code defines TACs (also known as hazardous air pollutants or HAPs) as air pollutants that may cause/contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. TACs are less pervasive in the urban atmosphere than criteria air pollutants, but are linked to acute or chronic and/or carcinogenic adverse health effects (USEPA 2015). USEPA is working with state, local, and tribal governments to reduce air toxics releases of 187 pollutants to the environment. Examples of toxic air pollutants include benzene, found in gasoline; perchloroethylene, emitted from some dry cleaning facilities; and methylene chloride, used as a solvent and paint stripper. Most air toxics originate from human-made sources, including mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Some air toxics are also released from natural sources such as volcanic eruptions and forest fires. Diesel particulate matter (DPM) has also been identified as a TAC by CARB (CARB 1998). DPM is not a single substance, but rather a mixture of many substances. Research by the Bay Area Air Quality Management District (BAAQMD) indicates that DPM emitted by diesel engines, accounts for more than 85 percent of the total inventoried cancer risk from TACs in the Bay Area, and is one of the TACs of greatest concern statewide (BAAQMD 2014).

A.2.1.1.2 **Sensitive Receptors**

Sensitive receptors are those segments of the population most susceptible to poor air quality: children, the elderly, and those with pre-existing serious health problems affected by air quality (e.g. people at residences, schools and school yards, parks and playgrounds, daycare centers, nursing homes, and medical facilities). Most USACE Federal navigation channels and existing placement sites are not located near sensitive receptors.

A.2.1.1.3 **Air Quality in the Project Area**

BAAQMD maintains a database of air quality data collected at ambient air monitoring locations throughout the region (***Figure A-2***). Monitored pollutants include O_3, NOx, CO, SO_2, H_2S, PM_{10} and $PM_{2.5}$, hydrocarbons, elemental and organic carbon, and various hazardous air pollutant compounds. Not all constituents at monitored at each location. The Bay Area is currently classified as non-attainment for the:

- National and California eight-hour ozone standard;
- California PM_{10} standard;
- California $PM_{2.5}$ annual arithmetic mean standard; and,
- The National $PM_{2.5}$ 24 hour standard (BAAQMD 2015a).

Over the past three years (2011 through 2013), the following specific exceedances were observed at monitoring stations located near RWC and SBS Channels (BAAQMD 2015b):

- Redwood City (closest monitoring station to RWC Channel):
  - No exceedances of the national 8-hour ozone standard, NO_2 or CO.
  - Three exceedances of the national 24-hour $PM_{2.5}$ standard.
- San Francisco (closest monitoring stations to SBS Channel)
  - No exceedances of the national standards for O_3, PM_{10}, or CO.
  - Three exceedances of the national 24-hour $PM_{2.5}$ standard.
  - One exceedance of the national 1-hour NO_2 standard.

Similarly for the proposed placement sites, the following exceedences were observed at nearby monitoring stations over the past three years (BAAQMD 2015b):

- Vallejo (monitoring station closest to the Cullinan Ranch Tidal Restoration Project):
  - No exceedances of the national standards for O_3, NO_2, SO_2, or CO

- Eight exceedances of the national 24-hour $PM_{2.5}$ standard.

- Martinez (monitoring station to the Montezuma Wetlands Restoration Project)
  - SO_2 concentrations did not exceed the national 1-hour 75-ppb standard.

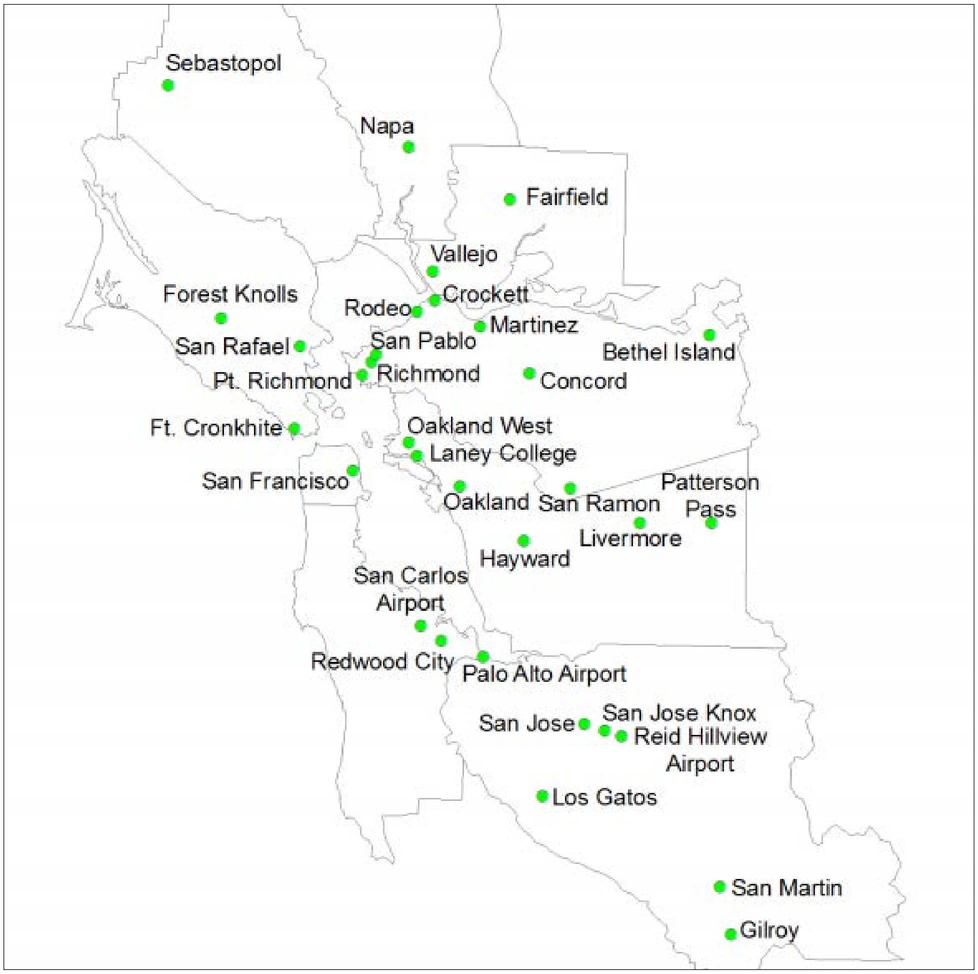

Figure A-2. Map of BAAQMD Air Quality Monitoring Sites (Source: BAAQMD 2015b)

A.2.1.2 A.2.2 Greenhouse Gases and Climate Change

Climate is governed by incoming solar radiation and the greenhouse effect. The "greenhouse effect" is the result of certain naturally occurring, atmospheric gases absorbing long-wave radiation emitted from the Earth. Absorption of this long-wave radiation in the atmosphere, as opposed to being transmitted into space, warms the Earth. Gases that trap heat in the atmosphere are called greenhouse gases (GHGs). GHGs emissions adversely affect the environment by contributing to global climate change. In order of importance to the greenhouse effect, GHGs include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and O_3. While some gases, such as CH_4 nitrous oxide (N_2O), are more effective at trapping heat than others, such as CO_2 and water vapor, the latter are present in much greater quantities in the atmosphere, and thus have a much higher contribution to the greenhouse effect.

Natural factors, which include solar variation and volcanic activity, contribute to climate change. However, strong scientific evidence suggests that these factors alone do not fully explain the observed accelerated global warming of the past few decades. Human (anthropogenic) activities such as the burning of fossil fuels (adding more GHGs to the atmosphere) and clearing of forests (removing a natural sink for carbon dioxide), have intensified the natural greenhouse effect. Carbon dioxide emissions from the burning of fossil fuels are the most substantial source of anthropogenic GHG emissions. The primary human activity affecting the amount and rate of climate change is GHG emissions from the burning of fossil fuels. The most important GHGs directly emitted by human activities include CO_2, CH_4, N_2O, and fluorinated gases such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. In 2013, CO_2 accounted for 82% of all US greenhouse gases according to the USEPA (2015).

The USEPA issued a "Mandatory Reporting of Greenhouse Gases Rule" on October 30, 2009. The rule, referred to as 40 CFR Part 98 or Part 98, is referred to as the Greenhouse Gas Reporting Program. GHGs covered under the Greenhouse Gas Reporting Program are CO_2, methane, N_2O, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. Each GHG is assigned a global warming potential (GWP), which is then standardized to CO_2 (with CO_2 having a value of 1). The GWP is a measure of the ability of a gas or aerosol to trap heat in the atmosphere. GHG emissions in ***Section A.2.3*** are shown as CO_2 equivalents or CO_{2eq}. Emissions of CO_2, CH_4, and N_2O are typically converted into CO_{2eq} by multiplying their emissions by their respective GWP.

The state government has declared that California is particularly vulnerable to the impacts of climate change. Specifically, increased temperatures are believed to have potential to greatly reduce the Sierra snowpack, an important source of water for the state. In addition, rising temperatures are believed to threaten the state's air quality problems and adversely impact human health. Rising sea levels also threaten the state's coastal real estate and natural habitats. The California Global Warming Solutions Act of 2006 directs the State to reduce GHG emissions to 1990 levels by the year 2020.

A.2.2 Significance Thresholds

The Project area is subject to air quality regulations developed and implemented at the Federal, state, and regional levels. At the Federal level, the USEPA is responsible for implementation of the CAA. Some portions of the CAA (e.g., certain mobile-source and other requirements) are implemented directly by USEPA. Other portions of the CAA (e.g., stationary-source requirements) are implemented by state and local agencies. Responsibility for attaining and maintaining air quality in California is divided between CARB and the regional air quality districts.

BAAQMD prepares plans to attain ambient air quality standards in the San Francisco Bay Area Air Basin as required by the CAA and the CCAA (BAAQMD 2012). BAAQMD also developed project-level thresholds and guidance for use during the CEQA evaluation process. These threshold values for a Project's individual air emissions, if exceeded, would result in significant adverse air quality impacts to the region's existing air quality conditions. This includes ozone precursors, VOCs or NO_X, the $PM_{2.5}$ precursor SO_2, $PM_{2.5}$, or CO. ***Table A-2***[2] summarizes the air quality thresholds applied to this Project for both construction-related activities and long-term operations-related activities. BAAQMD's *CEQA Air Quality Guidelines* (May 2012) specify that a project generating more than 54 pounds per day of ROG, NOx or $PM_{2.5}$, or more than 82 pounds per day of PM_{10}, will have a significant impact on the Bay Area's regional air quality. BAAQMD does not provide significance thresholds for GHGs for construction activities.

Table A-2. CEQA BAAQMD Threshold Values for Construction and Operation Emissions

Pollutant	Construction Related Emissions	Operational-Related Emissions	
Criteria Air Pollutants and Precursors (Regional)	**Average Daily Emissions (lb./day)**	**Average Daily Emissions (lb./day)**	**Maximum Annual Emissions (ton/year)**
ROG	54	54	10
NO_X	54	54	10
PM_{10} (exhaust)	82	82	15
$PM_{2.5}$ (exhaust)	54	54	10
Local CO	None	9.0 ppm (8-hour average) 20.0 ppm (1-hour average)	
CO_{2eq}	N/A		1,210[1]

[1] 1,100MT = 1,210 short tons
Lbs. = pound
Source: (BAAQMD 2012)

The USEPA enacted the Federal General Conformity regulation (40 CFR Parts 5, 51, and 93) in 1993. General Conformity prohibits any Federal action that does not conform to the applicable air quality attainment plan, or SIP, and applies to areas designated as nonattainment or maintenance for NAAQS. This is meant to ensure Federal activities do not interfere with the emission budgets in the SIP. A Project is exempt from the conformity rule if the total net project-related emissions (construction and operation) are less than the *de minimis* thresholds

[2] Analysis of air quality impacts relies on CEQA Thresholds of Significance from BAAQMD's May 2011 Guidelines. While the Alameda Superior Court ordered BAAQMD to set aside these Thresholds until a CEQA review is conducted, the Court did not rule that the Thresholds lacked substantial evidence to support them or that they were flawed or scientifically unsound. The Court held that BAAQMD is required to conduct further environmental review of the Thresholds before it can readopt them.

established by the conformity rule. A project that produces any of the 10 emissions that exceed conformity thresholds shown in ***Table A-3*** is required to mitigate or offset these impacts.

Table A-3. General Conformity de Minimis Thresholds for Construction Emissions

Pollutant	*De Minimis* Thresholds (tons/year)	Notes
O_3 (ROG, VOC or NO_X)	100	Included because BAAQMD is an O_3 maintenance area.
NO_2	100	Included as a potential precursor for $PM_{2.5}$ formation.
SO_2	100	Included as a potential precursor for $PM_{2.5}$ formation.
$PM_{2.5}$	100	Included because BAAQMD is a $PM_{2.5}$ maintenance area.
PM_{10}	100	Included because BAAQMD is a PM_{10} maintenance area.

Source: (40 CFR 93.153)

In December of 2014, CEQ released final guidance on the ways Federal agencies can improve their consideration of the effects of GHG emissions under NEPA. 79 FR 77802 states that if a proposed action would cause direct emissions of greater than 25,000 tons of CO_{2eq} GHG emissions on an annual basis, agencies should consider this an indication that a quantitative and qualitative assessment may be meaningful to decision makers and the public. For long-term actions that have annual direct emissions of less than 25,000 metric tons of CO_{2eq}, the CEQ encourages Federal agencies to consider whether the action's long-term emissions should receive similar analysis.

Based on the identified thresholds, impacts would be significant if the Project would:

- Violate any air quality standard or plan;
- Generate a cumulative net increase of a criteria pollutant for which the project region is in nonattainment under an applicable Federal or state standard;
- Generate GHG emissions that may have a significant impact on the environment.

A.2.3 Environmental Consequences

The following subsections first describe the methodology used to calculate both construction and operational air emissions and GHGs and then discuss the results and incorporated mitigation measures.

A.2.3.1 Construction Emissions Methodology

This section summarizes the methodologies used to assess air quality impacts, including GHGs, under CEQA and NEPA. The NAAQS criteria air pollutant emissions, including GHG emissions (comprised of CO_2, N_2O, and CH_4), were estimated for construction and operation of the proposed Project dredging options and placement sites. To determine their significance, the proposed Project emissions were compared to the significance thresholds for construction and operational-related emissions discussed in ***Section A.2.2***.

The emission estimates presented in this document were calculated using the latest available data, assumptions, and emission factors at the time this document was prepared. Project construction activities would involve the use of in-water equipment such as clamshell dredges, tow boats, scows, derrick barges, work tugs, crew boats, and Offloader. The information needed to calculate emissions, including dredging quantities, equipment utilization, engine sizes, travel speeds and times, and other construction-related information, was provided by USACE and Port of Redwood City staff. Proposed dredging options and placement sites are combined into a focused array of alternatives in ***Section 3.6 of the Main Integrated Report***, and are analyzed in ***Section 4.5 of the Main Integrated Report***.

Construction activities associated with channel deepening and sediment placement would occur for a period of about 6 months per year, during the in-water regulatory work window for the San Francisco Bay Area of June 1 through November 30. The main sources of construction-related emissions are combustion products from dredging and dredged material placement equipment. One clamshell dredge would be used for excavation during dredging activities. Dredged material would then be placed into one of three scows and transported to the placement site with the assistance of two tug boats (one tug boat per scow). All major motorized dredging equipment would be diesel-powered.

Dredged sediment quantities used in the emissions calculations were calculated by the USACE based on a recent hydrographic survey. USACE Dredge Estimating Program (CEDEP) output data provided by the San Francisco District was used to estimate emissions from dredging and sediment transport activities. These data included equipment types and quantities, engine specifications (including assumed model year), as well as operating times, and travel distances.

Emissions calculated for construction followed the methods described in the CARB Emissions Methodology for Commercial Harbor Craft Operating in California, Appendix B (CARB 2007a) and Appendix C (CARB 2010). Tugboat main and auxiliary engine sizes and age were determined from tugboat owner data. Load factors, fuel correction factors, and emissions factors were derived based on data tables provided in the CARB Harbor Craft document (CARB 2011a), not including those for GHGs or SO_2/SO_X. GHG emission factors and deterioration factors used were obtained from the Port of Los Angeles' "Inventory of Air Emissions – 2013" (Starcrest 2014). Emission factors for SO_2 were calculated according to CARB methodology using the brake specific fuel consumption (BSFC) rate and assuming 15 ppm ultra-low sulfur diesel (ULSD). For the purposes of these calculations, work tugs and crew boats were considered "work boats" as defined in Appendix B (CARB 2007a) while derrick barges were considered "cranes" and scows were considered "pumps" as defined in Appendix C (CARB 2010). The clamshell dredge was considered a "dredger." The emissions factors for the derrick barge, scows, and clamshell dredge were derived based on the CARB California Barge and Dredge Emissions Inventory Database (CARB 2011b).

The fuel sulfur content used for calculating emissions for all harbor craft and other construction equipment was 15 ppm in accordance with the September 1, 2006 CARB diesel fuel regulation for harbor craft.

For each of the dredging options and the three placement sites, physical boundaries were established for purposes of the emissions calculations. Two of the three placement sites, Cullinan and Montezuma, lie entirely within the jurisdictional boundaries of the BAAQMD air basin. Therefore, emission calculations for those two sites include emissions due to transit along the entirety of the Redwood City-to-Cullinan route and the Redwood City-to-Montezuma route, respectively. For the SF-DODS placement site, however, due to the fact that SF-DODS is roughly 50 miles west of the Golden Gate emissions calculations only include emissions due to transit to the outer ring of sea buoys roughly 17 miles west of the Golden Gate. This boundary is consistent with the water side boundary for all of the Bay Area seaport emission inventories and lies outside the jurisdictional boundaries of the air basin.

Based on the CEDEP estimates, deepening RWC Channel to -32 feet MLLW would require dredging 603,700 cy of material while the deepening the SBS Channel to the same depth would require dredging 284,000 cy of material. These quantities were used as the basis for estimating construction emissions for dredging and transport. The emission calculations also include emissions due to deepening the Redwood City vessel berths to a depth of -36 feet MLLW as well as the emissions due to relocating three petroleum pipelines beneath SBS Channel to a minimum of 6 feet below the bottom of the channel. The emissions for the Cullinan alternative also include operation of an electric offloader at the Cullinan placement site and associated supporting diesel equipment. The Cullinan and Montezuma placement site emission estimates do not include any landside equipment used in placing the dredge material. All landside equipment emissions at these two sites were included in their respective EIS/EIRs and would occur whether or not the RWC Project delivers sediment to these sites.

The CEDEP-based emission estimates were then used to calculate estimated unit emissions per 10,000 cy of sediment dredged and transported to a specific location. The estimated emissions associated with the CEDEP estimate for deepening to -32 feet MLLW, and for each dredging option were calculated, along with the equipment operating hours for construction and emissions for dredging and transporting the corresponding amount of sediment to one of the three placement sites. The emission calculation tables are provided in ***Attachment 1*** to this appendix, Air Quality and Greenhouse Gas Emission Calculations.

A.2.3.2 Operational Emissions Methodology

Operational emissions sources include bulk carriers and tugboats. Since these sources use diesel fuel they would generate emissions of diesel exhaust. Future year emission estimates were calculated for the years 2018 and 2025, respectively, to determine how the project may impact future air quality and GHG emissions. The methodology for calculating baseline and future operational emissions is discussed below. Information regarding vessel activity and operating characteristics was provided by Port of Redwood City staff.

Existing, or baseline, Port of Redwood City maritime operations in San Francisco Bay and landward of the outer ring of sea buoys were estimated to understand the implications of the proposed Project on operations over the long-term. In 2014 emissions due to operations at the Port of Redwood City were calculated in accordance with California Air Resources Board Appendix D, Emissions Estimation Methodology for Ocean-Going Vessels.

Similar to construction emission calculations, load factors, fuel correction factors, and emissions factors were derived based on data tables provided in the CARB Ocean-Going Vessels document, not including those for greenhouse gases. Greenhouse gas emission factors and deterioration factors used were obtained from the Port of Los Angeles' "Inventory of Air Emissions – 2013."

Vessel call information used in the baseline emissions calculations for 2014 was extracted from VTS data for the San Francisco Bay Area provided by the U.S. Coast Guard (USCG 2015). The VTS data contained vessel arrival and departure date and times, arrival and departure ports (including anchorage), as well as the name of each vessel. Vessel engine power, auxiliary engine power, vessel and engine age, and design speed for each ship were obtained from Clarkson's World Fleet Register (Clarkson's 2015).

Vessel and barge call information for the Port of Redwood City for 2014 was provided by the Port of Redwood City. This information included vessel names, arrival date and time, departure date and time; whether vessel was loaded or discharged, and commodity of load or discharge and tonnage. These data were cross-referenced with the VTS data to determine vessel travel routes after entering the Bay.

For purposes of the proposed Project the transit times and distances to and from Redwood City were broken down into segments at different speeds. It was assumed that vessels would travel at 14.5 knots (cruise speed) from the outer ring of sea buoys west of the Golden Gate to the pilot boarding station. Vessels would then slow to 8 knots for roughly 12 minutes to allow the pilot to board or disembark the vessel. Within San Francisco Bay, vessel speed would be 12 knots except within SBS Channel and approaching the RWC Channel where vessel speed is assumed to be 7 knots. Within RWC Channel, vessel speed would be 5 knots. The travel durations for each segment of the vessel route were calculated by dividing the length of each segment, measured on NOAA nautical charts, by the assumed speed. Maneuvering time, both inbound and outbound, was assumed to 30 minutes (Don Snaman, pers. comm.).

For all vessel calls at the Port of Redwood City, the average hoteling time is about 62 hours (CARB 2011a). When vessels stop at an anchorage prior to or after leaving the Port of Redwood City, the average anchorage time is about 25 hours (CARB 2011a). In cases when vessels are at anchorage at any time on the way to or from the Port of Redwood City, emissions from transit north of the anchorage location are included if appropriate based on the overall route of the vessel. For inbound trips to Redwood City, if a vessel originated from the pilot board station prior to stopping at anchorage, the emissions due to the PBS-to-anchorage segment are included. However, if a vessel originated from another Bay Area port prior to stopping at anchorage, the emissions due to transit from the other port to anchorage were not included. The same concept applied to outbound trips from the Port of Redwood City.

Vessel fuel was assumed to be in compliance with CARB Emissions Estimation Methodology for Ocean-Going Vessels, Appendix D (CARB 2011a). Vessels manufactured prior to 2000 are assumed to burn a 0.5% sulfur diesel fuel. Vessels manufactured after 2000 are assumed to burn a 0.1% sulfur diesel fuel in compliance with the North American Emissions Control Area (ECA) designated in 2010. Ships in ECAs must operate in accordance with the most stringent tier of emission standards contained in the amended International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI. This most stringent requires that by 2015 sulfur content for vessel fuel must not exceed 1000 ppm or 0.1%.

Tugs and towboats, or harbor craft, included in the baseline and future emissions estimates are those used to assist larger vessels entering and leaving the Port of Redwood City as well as those used to push barges to and from the Port. The barges arriving and departing generally contain bulk cement, scrap metal, rock and sand, and dry bulk cargo (Port of Redwood City 2015). For each ocean-going vessel call it is assumed, per communication with Redwood City staff, that there are two assist tugs for both inbound and outbound trips. Assist tugs are utilized by ocean-going vessels roughly between the Port of San Francisco's Pier 94 and the Port of Redwood City, an approximately 22-mile transit length. The emissions methodology for tugs, towboats and harbor craft used in Port operations is identical to that used for emissions calculations for tugs used in construction.

A.2.3.3 Impact AQ – 1: Construction Air Emissions

Estimated construction emissions are summarized in ***Tables A-4 through A-7***. ***Table A-4*** provides the estimated emissions for each dredging option and placement site based on the dredging volumes used on the CEDEP estimates. These estimates were then converted to unit emissions as described in ***Section A.2.3.1***, and applied to the maximum potential volume for each dredging option (see ***Table 4-1 of the Main Integrated Report***); the maximum estimated emissions are shown in ***Table A-5***.

The emission estimates for dredging include emissions due to relocation of the three petroleum pipelines beneath SBS Channel, channel deepening, and berth deepening. The estimated emissions reflect the measures taken to minimize potential construction air emissions, including use of an electric offloader at Cullinan, reducing the horsepower of the dredge, and limiting the horsepower of the tugs used for transport of sediment to in-Bay placement sites. Two other potential measures are currently being evaluated to determine their institutional and financial feasibility. It may be possible to require transport tugs to be equipped with Tier 3 engines (several tugs in the Bay area have recently been equipped with these engines, and/or to electrify the dredge working in RWC Channel. Electrifying the dredge working in SBS Channel would not be feasible due to the distance from shore and the length of the channel. Electrifying the dredge working in RWC Channel, if feasible, would also reduce GHG emissions. The tables show estimated emissions with and without the potentially available additional measures.

As shown in ***Table A-6***, the Project would meet BAAQMD thresholds for PM_{10} daily emissions, but would exceed BAAQMD thresholds for NOx, ROG, and $PM_{2.5}$. Even if the additional air emission reduction measures are feasible and implemented, emissions of NOx and ROG would continue to exceed BAAQMD thresholds. Therefore, this impact is significant and unavoidable.

Table A-7 shows the total tons of select construction emissions for the Project compared to general conformity thresholds. With the exception of NO_X, emissions of criteria air pollutants would meet general conformity thresholds. The estimated emissions would occur over 2 to 12 dredging seasons if the expected dredging rate reflected in the CEDEP is attained. As can been seen from the tables, the combined dredging and transport emissions for any combination of dredging option and placement site at any depth would exceed the Federal General Conformity Thresholds for NO_X if dredging is conducted at the rate assumed by the CEDEP.

Annual construction emissions would be controlled to remain below the conformity thresholds, as specified in the air quality management plan (see ***Section 4.2.3.2.1 of the Main Integrated Document***). This would be a requirement of the construction contract. Annual emissions would be controlled by reducing the amount of dredging and associated transport each year. This would extend the total construction duration to between 3 and 16 dredging seasons, depending on the combination of dredging option and placement sites.

Table A-4. Calculated Dredging and Transportation Emissions Based on CEDEP Estimate

SF-DODS	**Emissions (tons) Based on CEDEP Estimate**						
Dredging Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\,eq}$**
RWC Channel	55.3748	3.1400	3.0458	5.4912	22.0418	0.0192	1997.6410
SBS Channel	38.1656	2.2031	2.1370	3.8343	15.2311	0.0130	1350.7421
Berth Deepening	1.7698	0.1004	0.0974	0.1755	0.7045	0.0006	63.8377
Pipeline Relocation d	0.8030	0.0445	0.0431	0.0783	0.3186	0.0003	29.6874
RWC Channel – With Potential Measures	1.6223	0.0968	0.0938	0.1956	0.6588	0.0006	58.0878
SBS Channel -- With Potential Measures	38.1656	2.2031	2.1370	3.8343	15.2311	0.0130	1350.7421
Berth Deepening -- With Potential Measures	0.0517	0.0031	0.0030	0.0062	0.0210	0.0000	1.8512
Pipeline Relocation -- With Potential Measures	0.8030	0.0445	0.0431	0.0783	0.3186	0.0003	29.6874
Total Dredging -- Project	**96.1132**	**5.4880**	**5.3233**	**9.5794**	**38.2959**	**0.0331**	**3441.9082**

Total Dredging -- With Potential Measures	**40.6426**	**2.3474**	**2.2770**	**4.1144**	**16.2295**	**0.0139**	**1440.3684**

Transport Emissions	NOx	PM_{10}	$PM_{2.5}$	ROG	CO	SOx	$CO_{2\ eq}$
SF-DODS -- Project	93.4042	3.2895	3.1908	9.5941	67.5713	0.0911	8554.4929
SF-DODS -- With Potential Measures	93.4042	3.2895	3.1908	9.5941	67.5713	0.0911	8554.4929
TOTAL EMISSIONS							
Project	**189.5174**	**8.7774**	**8.5141**	**19.1734**	**105.8673**	**0.1242**	**11996.40**
Project With Potential Measures	**134.0468**	**5.6369**	**5.4678**	**13.7084**	**83.8008**	**0.1050**	**9994.86**

MONTEZUMA	Emissions (tons) Based on CEDEP Estimate						
Dredging Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
RWC Channel	51.4856	2.9287	2.8409	5.1176	20.5031	0.0178	1851.1491
SBS Channel	36.0025	2.0835	2.0210	3.6238	14.3732	0.0122	1270.7248
Berth Deepening	1.5323	0.0872	0.0846	0.1523	0.6102	0.0005	55.0937
Pipeline Relocation	0.8030	0.0445	0.0431	0.0783	0.3186	0.0003	29.6874
RWC Channel -- With Potential Measures	1.6121	0.0961	0.0933	0.1943	0.6547	0.0006	57.7230
SBS Channel -- With Potential Measures	36.0025	2.0835	2.0210	3.6238	14.3732	0.0122	1270.7248
Berth Deepening -- With Potential Measures	0.0480	0.0029	0.0028	0.0058	0.0195	0.0000	1.7179
Pipeline Relocation -- With Potential Measures	0.8030	0.0445	0.0431	0.0783	0.3186	0.0003	29.6874
Total Dredging -- Project	**89.8235**	**5.1438**	**4.9895**	**8.9720**	**35.8051**	**0.0308**	**3206.6550**
Total Dredging -- With Potential Measures	**38.4657**	**2.2269**	**2.1601**	**3.9022**	**15.3659**	**0.0131**	**1359.8531**
Transport Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
Montezuma	65.3829	2.2883	2.2197	6.7182	47.4212	0.0642	6020.5051
Montezuma -- With Potential Measures	65.3829	2.2883	2.2197	6.7182	47.4212	0.0642	6020.5051
TOTAL PROJECT EMISSIONS							
Project	**155.2064**	**7.4321**	**7.2092**	**15.6902**	**83.2263**	**0.0950**	**9227.16**
With Potential Measures	**103.8486**	**4.5152**	**4.3798**	**10.6204**	**62.7871**	**0.0773**	**7380.36**

Table A-4. Calculated Dredging and Transportation Emissions Based on CEDEP Estimate (continued)

CULLINAN	**Emissions (tons) Based on CEDEP Estimate**						
Dredging Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
RWC Channel	45.9941	2.6319	2.5529	4.5915	18.3320	0.0158	1643.3131
SBS Channel	35.7937	2.0728	2.0106	3.6046	14.2912	0.0121	1262.4288
Berth Deepening	1.3689	0.0783	0.0760	0.1367	0.5456	0.0005	48.9081
Pipeline Relocation	0.8030	0.0445	0.0431	0.0783	0.3186	0.0003	29.6874
RWC Channel -- With Potential Measures	1.5979	0.0953	0.0924	0.1926	0.6489	0.0006	57.2152
SBS Channel -- With Potential Measures	35.7937	2.0728	2.0106	3.6046	14.2912	0.0121	1262.4288
Berth Deepening -- With Potential Measures	0.0476	0.0028	0.0028	0.0057	0.0193	0.0000	1.7028
Pipeline Relocation -- With Potential Measures	0.8030	0.0445	0.0431	0.0783	0.3186	0.0003	29.6874
Total Dredging -- Unmitigated	**83.9597**	**4.8274**	**4.6826**	**8.4110**	**33.4873**	**0.0287**	**2984.3375**
Total Dredging -- With Potential Measures	**38.2422**	**2.2154**	**2.1489**	**3.8812**	**15.2780**	**0.0130**	**1351.0343**
Transport Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
Cullinan	47.2478	1.6527	1.6031	4.8578	34.2743	0.0464	4351.6869
Cullinan -- With Potential Measures	47.2478	1.6527	1.6031	4.8578	34.2743	0.0464	4351.6869
	Emissions (tons) Based on CEDEP Estimate						
Offloader Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
Cullinan	1.4202	0.0801	0.0777	0.1605	0.5453	0.0005	49.9333
Cullinan -- With Potential Measures	1.4202	0.0801	0.0777	0.1605	0.5453	0.0005	49.9333
TOTAL PROJECT EMISSIONS							
Project	**132.6277**	**6.5603**	**6.3635**	**13.4293**	**68.3069**	**0.0756**	**7385.9576**
With Potential Measures	**86.9102**	**3.9482**	**3.8298**	**8.8995**	**50.0975**	**0.0599**	**5752.6544**

Table A-5. Dredging Options – Estimated Dredging and Transport Emissions

Dredging Option A (-32 feet MLLW) Estimated Dredging and Transport Emissions (tons) Based on EIS/EIR Volume							
Total Dredging Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
Cullinan Ranch	162.23	9.33	9.05	16.26	64.71	0.06	5764.29
Montezuma	173.67	9.95	9.65	17.35	69.23	0.06	6198.02
SF-DODS	185.94	10.62	10.30	18.54	74.09	0.06	6656.98
Cullinan Ranch -- With Potential Measures	73.04	4.24	4.11	7.42	29.18	0.02	2577.85
Montezuma -- With Potential Measures	73.48	4.26	4.13	7.46	29.36	0.03	2595.05
SF-DODS -- With Potential Measures	77.72	4.49	4.36	7.87	31.04	0.03	2752.13
Total Transport Emissions							
Cullinan Ranch	90.86	3.18	3.08	9.34	65.91	0.09	8369.12
Montezuma	126.24	4.42	4.29	12.97	91.56	0.12	11624.85
SF-DODS	180.91	6.37	6.18	18.58	130.87	0.18	16568.47
Cullinan Ranch -- With Potential Measures	68.82	1.46	1.42	9.34	65.91	0.09	8369.12
Montezuma -- With Potential Measures	95.54	2.03	1.97	12.97	91.56	0.12	11624.85
SF-DODS -- With Potential Measures	136.79	2.94	2.85	18.58	130.87	0.18	16568.47
Total Offloading Emissions							
Cullinan Ranch	2.77	0.16	0.15	0.31	1.06	0.00	97.42
Cullinan Ranch -- With Potential Measures	2.77	0.16	0.15	0.31	1.06	0.00	97.42
Dredging Option B (-34 feet MLLW) Estimated Dredging and Transport Emissions (tons) Based on EIS/EIR Volume							
Total Dredging Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\ eq}$**
Cullinan Ranch	364.08	20.94	20.31	36.48	145.22	0.12	12936.19
Montezuma	389.75	22.33	21.66	38.94	155.37	0.13	13909.55
SF-DODS	417.29	23.83	23.12	41.60	166.27	0.14	14939.55
Cullinan Ranch -- With Potential Measures	163.92	9.50	9.22	16.65	65.50	0.06	5785.18
Montezuma -- With Potential Measures	164.90	9.56	9.27	16.74	65.88	0.06	5823.79
SF-DODS -- With Potential Measures	174.43	10.08	9.78	17.67	69.66	0.06	6176.31
Total Transport Emissions							
Cullinan Ranch	203.90	7.13	6.92	20.96	147.92	0.20	18781.91
Montezuma	283.30	9.91	9.62	29.11	205.48	0.28	26088.41
SF-DODS	405.99	14.30	13.87	41.70	293.70	0.40	37182.84
Cullinan Ranch -- With Potential Measures	154.45	3.29	3.19	20.96	147.92	0.20	18781.91
Montezuma -- With Potential Measures	214.40	4.55	4.42	29.11	205.48	0.28	26088.41
SF-DODS -- With Potential Measures	306..99	6.59	6.39	41.70	293.70	0.40	37182.84

Total Offloading Emissions							
Cullinan Ranch	6.22	0.35	0.34	0.70	2.39	0.00	218.62
Cullinan Ranch -- With Potential Measures	6.22	0.35	0.34	0.70	2.39	0.00	218.62
Dredging Option C (-37 feet MLLW) Estimated Dredging and Transport Emissions (tons) Based on EIS/EIR Volume							
Total Dredging Emissions	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**CO**	**SOx**	**$CO_{2\,eq}$**
Cullinan Ranch	709.13	40.79	39.56	71.06	282.85	0.24	25196.34
Montezuma	759.14	43.49	42.18	75.84	302.62	0.26	27092.19
SF-DODS	812.78	46.42	45.03	81.02	323.86	0.28	29098.36
Cullinan Ranch -- With Potential Measures	319.27	18.51	17.96	32.43	127.57	0.11	11268.03
Montezuma -- With Potential Measures	321.18	18.61	18.05	32.61	128.32	0.11	11343.24
SF-DODS -- With Potential Measures	339.74	19.64	19.05	34.42	135.68	0.12	12029.85
Total Transport Emissions							
Cullinan Ranch	397.15	13.89	13.47	40.83	288.11	0.39	36582.29
Montezuma	551.80	19.31	18.73	56.70	400.23	0.54	50813.46
SF-DODS	790.76	27.85	27.01	81.22	572.06	0.77	72422.52
Cullinan Ranch -- With Potential Measures	300.83	6.40	6.21	40.83	288.11	0.39	36582.29
Montezuma -- With Potential Measures	417.60	8.87	8.60	56.70	400.23	0.54	50813.46
SF-DODS -- With Potential Measures	597.94	12.84	12.45	81.22	572.06	0.77	72422.52
Total Offloading Emissions							
Cullinan Ranch	12.11	0.68	0.66	1.37	4.65	0.00	425.82
Cullinan Ranch -- With Potential Measures	12.11	0.68	0.66	1.37	4.65	0.00	425.82

Table A-6. CEQA BAAQMD Threshold Comparison for Construction Emissions

Dredging Option A (-32 feet MLLW) Pollutant	**BAAQMD Threshold**	**SF-DODS**	**Montezuma**	**Cullinan**
Regional Criteria Air Pollutants and Precursors	**Unmitigated Average Daily Emissions (lbs./day)**			
ROG	54	***154***	***145***	***151***
NO_X	54	***1,523***	***1,430***	***1,488***
PM_{10} (exhaust)	82	71	68	74
$PM_{2.5}$ (exhaust)	54	***68***	***66***	***71***
Local CO	None	-	-	-
Regional Criteria Air Pollutants and Precursors	**Mitigated Average Daily Emissions (lbs./day)**			
ROG	54	***110***	***97***	***99***
NO_X	54	***1,074***	***952***	***969***
PM_{10} (exhaust)	82	45	41	44
$PM_{2.5}$ (exhaust)	54	44	40	43
Local CO	None	-	-	-

Table A-6. CEQA BAAQMD Threshold Comparison for Construction Emissions (continued)

Dredging Option B (-34 feet MLLW) Pollutant	BAAQMD Threshold	SF-DODS	Montezuma	Cullinan
Regional Criteria Air Pollutants and Precursors	**Unmitigated Average Daily Emissions (lbs./day)**			
ROG	54	***158***	***148***	***163***
NO_X	54	***1557***	***1462***	***1610***
PM_{10} (exhaust)	82	72	70	80
$PM_{2.5}$ (exhaust)	54	***70***	***68***	***77***
Local CO	None	-	-	-
Regional Criteria Air Pollutants and Precursors	**Mitigated Average Daily Emissions (lbs./day)**			
ROG	54	**112**	**100**	**107**
NO_X	54	**1098**	**973**	***1048***
PM_{10} (exhaust)	82	46	42	48
$PM_{2.5}$ (exhaust)	54	45	41	46
Local CO	None	-	-	-

Dredging Option C (-37 feet MLLW) Pollutant	BAAQMD Threshold	SF-DODS	Montezuma	Cullinan
Regional Criteria Air Pollutants and Precursors	**Unmitigated Average Daily Emissions (lbs./day)**			
ROG	54	***159***	***149***	***132***
NO_X	54	***1574***	***1478***	***1299***
PM_{10} (exhaust)	82	73	71	64
$PM_{2.5}$ (exhaust)	54	***71***	***69***	***62***
Local CO	None	-	-	-
Regional Criteria Air Pollutants and Precursors	**Mitigated Average Daily Emissions (lbs./day)**			
ROG	54	***113***	***101***	***87***
NO_X	54	***1110***	***985***	***846***
PM_{10} (exhaust)	82	47	43	38
$PM_{2.5}$ (exhaust)	54	45	41	37
Local CO	None	-	-	-

Daily dredging emissions are included in the average daily emissions.

Table A-7. General Conformity Threshold Comparison for Construction Emissions

Pollutant	Conformity Threshold	SF-DODS	Montezuma	Cullinan
Dredging Option A (-32 feet MLLW)	**Emissions (tons/year)**	**Unmitigated Emissions (tons/year)**		
O_3 (ROG)	100	9.28	10.11	8.64
NO_x	100	91.71	99.97	85.29
SO_2	100	0.06	0.06	0.05
$PM_{2.5}$	100	4.12	4.65	4.10
PM_{10}	100	4.25	4.79	4.22
		Mitigated Emissions (tons/year)		
O_3 (ROG)	100	8.82	10.22	8.54
NO_x	100	86.21	99.86	83.33
SO_2	100	0.07	0.07	0.06
$PM_{2.5}$	100	3.51	4.21	3.67
PM_{10}	100	3.62	4.34	3.78
Pollutant	**Conformity Threshold**	**SF-DODS**	**Montezuma**	**Cullinan**
Dredging Option B (-34 feet MLLW)	**Emissions (tons/year)**	**Unmitigated Emissions (tons/year)**		
O_3 (ROG)	100	9.26	9.72	9.69
NO_x	100	91.48	96.15	95.70
SO_2	100	0.06	0.06	0.05
$PM_{2.5}$	100	4.11	4.47	4.60
PM_{10}	100	4.24	4.61	4.74
		Mitigated Emissions (tons/year)		
O_3 (ROG)	100	9.90	9.17	9.58
NO_x	100	96.74	89.64	93.51
SO_2	100	0.08	0.07	0.06
$PM_{2.5}$	100	3.94	3.78	4.12
PM_{10}	100	4.06	3.89	4.25
Pollutant	**Conformity Threshold**	**SF-DODS**	**Montezuma**	**Cullinan**
Dredging Option C (-37 feet MLLW)	**Emissions (tons/year)**	**Unmitigated Emissions (tons/year)**		
O_3 (ROG)	100	9.54	9.47	9.44
NO_x	100	94.33	93.64	93.20
SO_2	100	0.06	0.06	0.05
$PM_{2.5}$	100	4.24	4.35	4.48
PM_{10}	100	4.37	4.49	4.61
		Mitigated Emissions (tons/year)		
O_3 (ROG)	100	9.64	9.92	9.33
NO_x	100	94.21	97.00	91.07
SO_2	100	0.07	0.07	0.06
$PM_{2.5}$	100	3.84	4.09	4.01
PM_{10}	100	3.96	4.21	4.14

In summary, the proposed Project would meet Federal general conformity thresholds by extending the construction duration to 2 to 3 dredging seasons for Dredging Option A (-32-foot MLLW), 5 to 8 dredging seasons for Dredging Option B (-34-foot MLLW), and 12 to 17 dredging seasons for Dredging Option C (-37-foot MLLW). If dredged sediment quantities are consistent with the estimates used in the CEDEP (i.e., only approximately 1 foot total of overdepth would be dredged), the dredging durations could be reduced to 1 to 2 dredging seasons for Dredging Option A, 3 to 4 dredging seasons for Dredging Option B, and to 5 to 8 dredging seasons with Dredging Option C.

While Federal general conformity thresholds would be met, there would be a significant and unavoidable impact due to the exceedance of BAAQMD's average daily thresholds of ROG and NOx.

A.2.3.4 Impact AQ – 2: Long-term (Future) Operational Emissions

Operational air emissions consist of transport emissions and offloading emissions. Changes in future operational air emissions are primarily associated with growth in cargo throughput, and are not attributable to the proposed Project. As discussed in Chapter 4 of the Main Integrated Report, growth in cargo throughput at the Port is driven by local economic conditions rather than harbor depth. Potential emission increases associated with increased throughput capacity were analyzed as part of the Wharves 1 and 2 Reconstruction Project (Port of Redwood City 2010).

The only potential effect on future operations from the proposed Project is beneficial. Emissions associated with off-loading would be very similar for all potential channel depths, because they would be determined largely by the cargo throughput at the Port. Minor reductions in offloading emissions may result from the reduced need to lighter into barges with the deeper channels. Offloading from barges is less efficient than offloading from a large vessel.

Operational transport emissions would be reduced with the proposed Project because the number of vessel calls would decrease. While a more heavily loaded vessel would have a deeper draft, the total increase in fuel use would be small compared to the fuel required to bring a vessel into Port. By the Year 2025, total vessel calls with the proposed Project would be reduced between 11% (Dredging Option A, -32 feet MLLW) and 24% (Dredging Option C, -37 feet MLLW) compared to the no dredging scenario. Operational transport emissions would be expected to decrease by a similar percentage relative to the no dredging scenario. The forecasted vessel calls (for the Port of Redwood City are shown in ***Table A-8***. Beyond the year 2025, USACE indicated that vessel call numbers are expected to remain constant. As discussed in the Main Integrated Report, and as shown in ***Table A-8***, the total number of vessel calls for future years is highest at the existing channel depth of – 30 feet MLLW, and decreases with increasing channel depth.

Table A-8. Current and Forecast Vessel Calls at Port of Redwood City

Vessel Calls: -30-foot MLLW (Baseline)		
Year	**Ocean-Going Vessels**	**Tugs/Towboats for Barges Only**
2014	**66**	**46**
2018	**82**	**46**
2025	**104**	**46**

Vessel Calls: -32-foot		
Year	**Ocean-Going Vessels**	**Tugs/Towboats for Barges Only**
2014	**66**	**46**
2018	**76**	**46**
2025	**93**	**46**

Vessel Calls: -34-foot		
Year	**Ocean-Going Vessels**	**Tugs/Towboats for Barges Only**
2014	**66**	**46**
2018	**70**	**46**
2025	**88**	**46**

Vessel Calls: -37-foot		
Year	**Ocean-Going Vessels**	**Tugs/Towboats for Barges Only**
2014	**66**	**46**
2018	**62**	**46**
2025	**79**	**46**

Mitigation Measures
All feasible emissions reduction measures have been incorporated into the proposed Project.

A.3 Biological Resources Overview

This section addresses potential effects of the Project on biological resources. This overview presents information on the regional habitat types, the more specific dredge and placement site environmental settings, regulations pertaining to biological resources, and significance thresholds that are applicable to all or most biological resources topics. Existing Project Area characteristics, such as habitat types and plant and animal species present, are described based on site-specific information developed for the Project and published relevant information, especially environmental impact reports prepared for other San Francisco Bay Area waterfront projects, and technical articles and agency reports as indicated in source citations.

Due to the large number of potentially affected special status species and diversity of potentially affected habitats in the dredged sites and placement sites, the discussion of the impacts to biological resources has been divided into two subsections following this overview. The two subsections are: Biological Resources - Fish and Aquatic Resources (***Section A.4***) and Terrestrial Resources (***Section A.5***). Aquatic biological resources as defined in this document include habitats and species that are primarily dependent on aquatic resources for survival such as fish, marine mammals, and some invertebrates. Terrestrial biological species as defined in this document include birds, mammals, plants and other species that may use aquatic resources but that spend significant time on dry land. All birds are grouped with the terrestrial species.

Affected Environment

The San Francisco Bay-Delta is the second largest estuary in the United States and supports numerous aquatic habitats and biological communities. It encompasses 479 square miles, including shallow mudflats. San Francisco Bay is divided into four main basins: South Bay, Central Bay, San Pablo or North Bay, and Suisun Bay.

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 and CDFW 2007). 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 listed in ***Appendix H***. Aquatic special status species with a potential to occur at dredging sites and at placement sites are identified in ***Tables H-1a and H-1b***, respectively.[3] Terrestrial special status species with a potential to occur at the dredging sites and placement sites are identified in ***Tables H-2a and H-2b***, respectively. The Project Area does not include all the habitat types that occur in San Francisco Bay. The primary habitats within the Project Area include: open water; tidal flats; tidal salt marsh; diked, non-tidal salt marsh; and associated levees that fringe the Bay. SF-DODS is located in open ocean habitat approximately 50 miles outside the Bay. All of San Francisco Bay and SF-DODS are essential fish habitat (EFH). These habitat types are described below.

a. Habitat Types Within the Study Area

There are seven habitat types within the Project Area: open water, tidal salt marshes, tidal brackish marsh, non-tidal salt marsh, tidal flat (mud flat), upland levee, and ocean water habitat.

Open Water Habitat

San Francisco Bay (Bay) has both deep open water habitat (deeper than -18 feet MLLW) and shallow open water habitat (shallower than -18 feet MLLW) (Goals Project 1999). Open water

[3] Due to a greater similarity of species and habitat considerations, SF-DODS was grouped with the dredging sites.

includes a variety of habitat types including subtidal Bay waters, tidal sloughs, shipping channels, and areas of standing ponded water. Deep open water habitat exhibits depths between -18 and -100 feet MLLW - this includes the deepest portions of San Francisco Bay and the largest tidal channels. The shallow open water (also referred to as shallow Bay) habitats include the vast majority of San Francisco Bay (USACE and RWQCB 2014). San Francisco Bay currently contains almost 172,000 acres of shallow Bay/channel habitat, and more than 82,000 acres of deep Bay/channel habitat (Goals Project 1999).

RWC and SBS Channel are located in deep water habitat within the Bay. The proposed alignment of RWC Channel would require dredging into portions of adjacent subtidal habitat. All dredging and pipeline relocation work at SBS would occur in deep open water habitat. The RWC Project work at Cullinan within Dutchman Slough, Napa River, and on the southern levee of Dutchman Slough would occur in shallow and deep water habitat. The Montezuma site is located in at the far eastern edge of Suisun Bay, in the immediate vicinity of the confluence of the Sacramento and San Joaquin Rivers, a combination of shallow and deep water habitat. The offloaders for Eden Landing ponds and Alviso ponds would be located in deep water, whereas pipelines from the offloaders to the dredged sediment delivery location would traverse primarily shallow water and mudflat habitat. If a cutterhead dredge is used to delivery sediment directly to the Eden Landing or Alviso ponds, it would traverse deep water habitat, shallow water habitat, and mudflat. Booster pumps for Eden Landing and Alviso would be located on the levee at the dredged sediment delivery location, and an intermediate booster pump that would be required to deliver dredged sediment to Alviso Pond A9 would be located in shallow open water.

Some of the species that use deep water habitat include the following:

- Fish such as brown rockfish (*Sebastes auriculatus*), halibut (*Paralichthys californicus*), sturgeon (*Asipenser* sp.), Delta smelt *(Hypomesus transpacificus)* in the North Bay, and longfin smelt throughout the entire Bay area.
- Waterbirds, such as surf scoter (*Melanitta perspicillata*), scaups (*Aythya* spp.), brown pelican, and terns (*Sterna* spp.),
- Marine mammals, such as Pacific harbor seal (*Phoca vitulina richardsi*), harbor porpoises *(Phoeocna phoeocna*) and California sea lion (*Zalophus californianus*).

Anadromous fish, such as Chinook salmon and steelhead, use deep water migratory pathways to and from upstream spawning areas (USACE and RWQCB 2014).

Shallow water habitat serves as feeding and foraging habitat for a variety of fish and birds species, including:

- A feeding area for the Pacific herring, northern anchovy (*Engraulis mordax*), and jacksmelt (*Atherinopsis californiensis*), as well as many other aquatic species.

- A nursery area for juvenile halibut and sanddabs (*Citharichthys stigmaeus*), shiner perch (*Cymatogaster aggregata*), herring, and other fishes.
- Migratory pathways for anadromous fish use to and from upstream spawning areas.
- Important avian foraging habitat for diving birds
- Foraging areas for marine mammals such as Pacific harbor seals (USACE and RWQCB 2014).

Shallow Bay habitat can also include eelgrass (*Zostera marina*) beds in various areas of the Bay; eel grass is San Francisco Bay's only rooted seagrass. Eelgrass is an Essential Fish Habitat area of particular concern (USACE and RWQCB 2014) and is habitat to a wide range of fish and invertebrates (USACE and RWQCB 2014). Pacific herring spawn on hard substrates (including anthropogenic structures such as pilings) and eelgrass (*Zostrea marina*) along the shallow margins of the Central Bay and can extend into portions of the South Bay. Two small eelgrass beds are found near the Eden Landing ponds.

Tidal Salt Marshes

Tidal salt marshes are interspersed along portions of the Bay edge and have historically been much more extensive. Current tidal marshes throughout the Bay comprise less than 25% of their former extent but they still support a high density and diversity of wildlife species. The loss of habitat has resulted in decreases in many species associated with tidal marshes, and endangered species listing of two species dependent on tidal marshes: salt marsh harvest mouse and Ridgway's rail.

In general, plant species diversity in tidal marshes is lower in South San Francisco Bay than in North San Francisco Bay (USFWS and CDFW 2007). The vegetative cover in tidal salt marshes is largely controlled by the salinity of both the water and substrate. Tidal marshes provide a variety of habitat for birds and other terrestrial wildlife, including resting, nesting, escape cover during high tides, and foraging habitat. In addition to other habitat types, tidal marshes are important for migratory birds, providing foraging habitat and roosting sites. Within the Project Area, tidal salt marshes are found at Bair Island and Greco Island adjacent to RWC Channel, and in small bands at the outboard sides of the Cullinan, Eden Landing, and Alviso levees at the potential dredged sediment delivery locations.[4]

Most salt marshes in the Bay are generally dominated by relatively few native plant species, such as pickleweed (*Salicornia pacifica*), native cordgrass (*Spartina foliosa*), saltgrass (*Distichlis spicata*), spearscale (*Atriplex triangularis*), fleshy jaumea (*Jaumea carnosa*), alkali heath (*Frankenia salina*),and sometimes large summer "blooms" of parasitic salt marsh dodder mats (*Cuscuta salina*). Marsh gumplant (*Grindelia hirsutula*; syn. *G. stricta* var. *angustifolia*, *G.* x *paludosa*) vegetation is widespread along marsh banks of tidal sloughs. Non-native plant species, many of which are highly invasive, have become established in salt marsh vegetation,

[4] The dredged sediment delivery locations were chosen in part to minimize the amount of tidal salt marsh that would be disturbed by sediment pipeline construction and operation.

including hybrid cordgrass (*Spartina alterniflora* x *foliosa*), perennial pepperweed *(Lepidium latifolium)*, and Mediterranean saltwort (*Salsola soda*). Marshes in San Pablo and Suisun Bays have remained relatively free of hybrid cordgrass (CSCC 2010).

Special-status birds and mammals that use tidal marshes include the State- and federally-listed Ridgway's rail (formerly California clapper rail (*Rallus obsoletus obsoletus*)), State-listed black rail (*Laterallus jamaicensis*), and State- and federally-listed salt marsh harvest mouse (*Reithrodontomys raviventris)* (USACE and RWQCB 2014), and salt marsh wandering shrew (*Sorex vagrans haliocoetes*), only occur within this habitat type.

Songbirds that forage and nest in the tidal marshes include song sparrow (*Melospiza melodia*), red-winged blackbird (*Agelaius phaeniceus*), and salt marsh common yellowthroat (*Geothlypis trichas sinuosa*), among others. Raptors that forage and breed in tidal marshes include Peregrine falcon (*Falco peregrinus*) and northern harrier (*Circus cyaneus*) (City of Redwood City 2010a). There are also a wide variety of shorebirds and waterfowl such as ruddy duck, northern pintail (*Anas acuta*), red knot (*Calidris canutus*), western sandpiper, American avocet, black-necked stilt, long-billed dowitcher, and marbled godwit that use tidal marshes.

Aquatic species that utilize tidal marsh for breeding and/or foraging include a large number of invertebrates and fish such as chinook salmon, three-spine stickleback, longjaw mudsucker (*Gillichthys mirabilis*), rock crab, opossum shrimp, and California bay shrimp (*Crangon franciscorum*) (City of Redwood City 2010a). The composition of the invertebrate community is primarily influenced by salinity, the frequency and duration of tidal inundation, and the type and density of emergent vegetation.

Tidal Brackish Marsh

In San Francisco Bay the brackish marsh occurs predominantly where freshwater inflows from the Delta mix with the tidal waters from the ocean near Suisun Bay. In Suisun Bay, tidal brackish marsh maybe characterized by tule and cattails. Brackish tidal marsh also occurs at the mouths of several South Bay streams where bulrushes, spearscale, and cordgrass are present (Goals Project 1999). Within the Project Area, some tidal brackish marsh occurs in a narrow band along levees at Cullinan and Alviso. Salinities in brackish marsh may significantly vary by season and from year to year depending on rainfall. This mixing zone where the fresh and salt water meet can be several miles wide in Suisun Bay and is one of the Bay's most productive zones. Delta smelt, young striped bass, Pacific herring and salmon feed in this area (Goals Project 1999).

Tidal Flat Habitat

Tidal flat habitat includes mudflats, sandflats, and shell flats. This habitat occurs from below MLLW to Mean Tide Level (MTL) and supports less than 10 percent cover of vascular vegetation, with the exception of eel grass. The vegetative cover typically includes areas of colonization by cordgrass and annual pickleweed but the vegetative cover is too sparse to be distinct salt marsh habitat (USFWS and CDFW 2007). Mudflats often occur along the edges of the tidal sloughs and channels, and on the outboard side of some levees. Mudflats comprise the largest area of tidal flat habitat in the Bay and occur adjacent to RWC Channel (outboard of Greco and Bair Islands), Cullinan, Alviso ponds, and Eden Landing ponds. More than one-half of the San Francisco Bay's tidal flat habitat is in the southern half of the San Francisco Bay (City of Redwood City 2010a). In the Lower South Bay, south of Dumbarton Bridge, the average water depth is only 3 feet and 75% of the Bay's surface area consists of mudflats.

Mudflats are a key reason for the importance of the San Francisco Bay Area to West Coast shorebird populations, with an average of 67 percent of all the shorebirds on the West Coast using San Francisco Bay wetlands (USFWS and CDFW 2007). Although the largest numbers of shorebirds forage on the broad flats along the edge of the Bay at low tide, some shorebirds, gulls, Ridgway's rail, and large waders (e.g., herons and egrets) feed on the exposed flats along sloughs and channels, and the smaller channels in the brackish and salt marshes (USFWS and CDFW 2007). Mudflats can be dynamic depositional features, changing in extent and location depending on the nature of erosion and deposition of sediments (USFWS and CDFW 2007).

Tidal flats provide aquatic habitat for invertebrate organisms and fish. The mudflats support an extensive community of aquatic organisms including diatoms, worms, and shellfish, as well as algal flora. Crustaceans, polychaete worms, gastropod and bivalve mollusks, and other invertebrates live on or just below the surface of the mud. Inundated mudflats provide foraging and/or breeding habitat for many species of fishes such as Pacific staghorn sculpin (*Leptocottus armatus armatus*), Pacific herring (*Clupea pallasi*) and starry flounder (*Platichthys stellatus*) among others (City of Redwood City 2010a). During the daily high tides, fish move over the mudflats to feed on these invertebrates. As the tide recedes and exposes the mudflats, the fish retreat to subtidal areas.

The mudflats support a large number of birds and other terrestrial species. Birds, primarily shorebirds, leave their high-tide roosts and feed on the mudflats. Shorebirds, gulls, terns, American white pelicans, and ducks often use exposed mudflats as roosting or loafing areas when available. The mudflats provide foraging habitat for a variety of migratory shorebirds such as long-billed curlew (*Numenius americanus*), western sandpiper (*Calidris mauri*), American avocet (*Recurvirostra americana*), black-necked stilt (*Himantopus mexicanus*), marbled godwit (*Limosa fidoa*), and long-billed dowitcher (*Limnodromus scolopaceus*).

When the tides rise, most of these birds return to roosting areas in salt marshes, salt ponds and associated levees, or other alternate habitats. Pacific harbor seals (*Phoca vitulina richardsi*) haul out on tidal flats and the seals move to open waters when the tides rise. Because benthic invertebrates recede deeper into the mud as the tidal elevation drops, especially large concentrations of foraging birds usually occur along the edge of the receding or rising tide line (USFWS and CDFW 2007).

Non-Tidal Salt Marsh

Diked, non-tidal salt marshes adjacent to tidal waters (separated by dikes) are generally jurisdictional (State- and federally regulated) wetlands. Diked non-tidal salt marshes ordinarily support simple vegetation with low plant species diversity. They are usually dominated by pickleweed, or simple mixtures of pickleweed and saltgrass. Such diked non-tidal salt marshes often decline in salinity over time, and admit various non-native weeds such as broadleaf pepperweed (CSCC 2010). Within the Project Area, non-tidal salt marsh is located on the inboard side of some of the levees at Eden Landing ponds and Alviso ponds.

Levee-Upland Habitat

Levees are earthen structures that separate open water tidal areas from salt ponds, marsh or upland areas in the Project Area. The levees in the South Bay salt pond complexes (Eden Landing and Alviso ponds) as well as the Cullinan levees were typically constructed from soils excavated from borrow ditches in former salt marshes (USFWS and CDFW 2007; USFWS 2010). In the South Bay the levee substrate is typically silty-clay in texture and saline; levees at Cullinan are constructed from Bay Mud. Some levees may be reinforced with riprap or concrete debris.

The levees in the South Bay salt pond complexes support peripheral halophytes (plants adapted to living in a saline environment) along the banks and tops of levees separating tidal areas from salt ponds (USFWS and CDFW 2007). Peripheral halophytes in the South Bay typically include nonnative, ruderal (disturbance loving, weedy) species such as iceplant (*Mesembryanthemum nodiflorum*), New Zealand spinach (*Tetragonia tetragonioides*), Russian thistle (*Salsola soda)*, and Australian saltbush (*Atriplex semibaccata*) (USFWS and CDFW 2007).

South Bay levees are used by nesting by birds such as California gulls, black-necked stilts, and American avocets. Large numbers of shorebirds use salt pond levees for roosting, particularly when intertidal foraging habitats, including mudflats and tidal salt marsh, are inundated during high tide. Some species, particularly western snowy plovers, black-necked stilts, and least sandpipers, also forage frequently along the margins of levees. Gulls, Forster's and Caspian terns, cormorants, pelicans, and other waterbirds also frequently roost on levees. The California least tern uses levees in the South Bay as post-breeding roosting sites. Mammals use levees for dispersal and to obtain access to foraging areas. Levees with rip-rap or concrete debris provide some cover for other small mammals such as the Norway rat (*Rattus norvegicus*), roof rat (*Rattus rattus*), and feral cat (*Felis catus*), while peripheral halophytes along the lower edges of the levee provide high-tide refugia for species such as the salt marsh harvest mouse, Ridgway's rail, and California black rail (USFWS and CDFW 2007).

The inboard levee slopes and the tops of the levees at Cullinan support upland habitat. The outboard side of the levee is characterized by remnant tidal salt marsh species transitioning to ruderal upland habitat consisting predominantly of nonnative vegetation. The native scrub plant coyote brush also occurs in the ruderal upland habitat. These levees provide habitat for raptors, owls, sparrows, and mammals including raccoons, rabbits, ground squirrels, mice, and rats. The levee tops adjacent to tidal marshes provide important refuge for marsh species during extreme high tide events.

Ocean Water Habitat

SF-DODS is located in the open ocean on the lower continental slope, approximately 50 miles west of San Francisco. It is the only part of the Project Area that is located in ocean water habitat. Water depths at the site range between approximately 2,500 meters and 3,000 meters (USACE and RWQCB 2014). Biological resources at SF-DODS can be separated into three basic communities: the shallow pelagic community, the deep water pelagic community, and the continental slope benthic community. The shallow pelagic community includes various sea birds, marine mammals, migratory fish, and pelagic invertebrates. Seventeen species of cetaceans (whales, dolphins, and porpoises) are frequently observed near SF-DODS (USACE and RWQCB 2014). Of these, Dall's porpoise (*Phocoenoides dalli*), harbor porpoise *(Phoeocna phoeocna*), and Pacific white-sided dolphin are considered common resident species. The deep water pelagic community includes fish and invertebrates such as squid that are adapted to deep water conditions and marine mammals that dive to great depths while foraging. The continental slope benthic community is sparsely populated by fish and invertebrates that are adapted to the harsh conditions of the deep sea (USACE and RWQCB 2014).

b. Dredge and Placement Site Description

Redwood City Harbor

The RWC Channel consists of a deep open water habitat and shallow open water habitat on portions of the channel side slopes. The Project includes the proposed alignment of the dredged channel, and deepening of Berths 1 through 4. The current -30-foot MLLW deep open water habitat is regularly disturbed by maintenance dredging to remove up to 6 to 8 feet of sediment along the channel bottom. On either side of the existing channel are the shallow water habitat and tidal mudflats surrounding the tidal marshes at Bair and Greco Islands. These islands are preserved for their natural resources and are managed by the USFWS as part of the Don Edwards San Francisco Bay National Wildlife Refuge. Areas frequently used by harbor seals are near Greco and Bair Islands. Both Bair Island and Greco Island are known habitat for Ridgway's rail and double breasted cormorant as well as other avian species. Although not in the Project Area, in addition to the mudflats other habitat that occurs adjacent to the RWC Channel at both Greco Island and Bair Island includes tidal salt marsh and shallow open water habitat (HT Harvey 2005).

The proposed RWC Channel would slope from the maximum -39 feet MLLW bottom of the proposed channel to shallow water (i.e., from a maximum of -37 feet MLLW and 2 feet of overdepth). Tidal mudflats would be avoided by ensuring that the channel daylights[5] in shallow open water habitat. Up to 14.3 acres of shallow water habitat would be converted to deep

[5] Intersects the natural Bay bottom

water habitat as a result of widening the top width of the channel by up to 42 feet. The majority of the subtidal habitat would be removed along the southern side of the channel adjacent to Greco Island.

The deep water habitat in the channel is likely to support a variety of fish and marine mammals, which would use the area for foraging and migration between habitats.

Benthic invertebrates which live in the bottom substrate have been periodically disturbed by the maintenance dredging. This Project would not increase the frequency of the maintenance dredging events but would increase the volume of sediment to be dredged by an estimated 13% - 51% per episode, depending on the extent of channel deepening. This would increase the duration of the maintenance dredging but not the extent of the disturbance, as maintenance dredging would continue to occur within the footprint of the RWC channel.

San Bruno Shoal Channel

SBS Channel 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 channel and the immediate vicinity, including possible widening and lengthening areas, and pipeline relocation areas, are entirely deep water habitat (minimum depth of approximately -26 feet MLLW) with no nearby intertidal or wetland habitat. Further east of the channel and associated widening area is the main San Bruno Shoal, with water depths ranging from -2 feet MLLW to -10 feet MLLW (NOAA 2013b). Similar to RWC Channel, SBS Channel is periodically disturbed by maintenance dredging which would affect benthic organisms. However, SBS Channel is dredged at a much lower frequency (approximately every 10 years) than RWC Channel. The site likely provides foraging habitat and migration areas for a variety of fish, marine mammals, and invertebrates.

Cullinan Ranch Tidal Restoration Project

Shallow salt/brackish water habitat occurs in Napa River near the proposed offloader locations and in Dutchman Slough along the pipeline location. Shallow-water habitat provides foraging and roosting habitat for numerous species of wildlife, including mallard, cinnamon teal, great blue heron, snowy egret, and American coot. Steelhead, striped bass, green sturgeon, yellowfin goby, Delta smelt, longfin smelt and other fish occupy the Napa River and possibly Dutchman Slough (Jones and Stokes 2004).

Shallow water habitat and mudflats occur along the tidally-influenced Dutchman Slough. Benthic organisms such as worms and clams typically occur in the soft muddy bottom of subtidal habitats. Fish species, waterfowl and diving ducks are also typical users of subtidal aquatic habitat for foraging. Mudflats adjacent to the levees provide important foraging and roosting areas for resident and migrant shorebirds, wading birds, and gulls. The outboard side of the levee adjacent to Dutchman Slough supports remnant tidal marsh vegetation, characterized by pickleweed and gumplant vegetation. Spartina foliosa (native cordgrass) would be expected in the vicinity of the site.

The tops of the levees and the inboard levee slopes at Cullinan provide upland habitat. Vegetation is characterized by nonnative species including mustard, wild fennel, poison hemlock and annual grasses. The native scrub plant coyote brush also occurs on the levees (USFWS 2008b). In general, the tops of the levees and the inboard levee slopes provide habitat for raptors, owls, sparrows, and mammals including raccoons, rabbits, ground squirrels, mice, and rats. The upland habitat may also provide foraging, roosting and nesting habitat for short eared owls, northern harriers, and white-tailed kites. In addition, levee tops and high vegetation on levee slopes adjacent to the tidal marshes can provide refuge for marsh species during extreme high tide events.

Montezuma Wetlands Restoration Project

Montezuma is located at the eastern margin of Suisun Marsh, near the confluence of Suisun Bay and the Sacramento-San Joaquin River Delta. The facility has a permitted offloader; the pump for the offloader is permitted to operate only between August 1 and December 15 to protect larval stage Delta and longfin smelt and would use groundwater from June 1 through July 31. The offloader site is located in brackish open water habitat and as such would support split tail, Chinook salmon, and the endangered delta smelt and longfin smelt. Critical habitat for Delta smelt, green sturgeon, Central Valley steelhead, Central Valley Spring-run Chinook, and Central Valley Winter-run Chinook is located in the Sacramento River at Montezuma. Longfin smelt spawn at Montezuma. The Montezuma site is used by a variety of waterfowl and foraging shorebirds. The area potentially affected by RWC Project activities does not include any mudflat, upland or wetland habitat.

SF-DODS

SF-DODS is located 50 miles west of the Golden Gate Bridge and is approximately 2.5 nautical miles wide by 4.5 nautical miles long (6.5 square nautical miles). The water depth at the site is 2,500 to 3,000 meters. To reach SF-DODS scows must be towed through the protected Gulf of Farrallones National Marine Sanctuary. To avoid environmental impacts due to the potentially rough ocean conditions scows transporting material to SF-DODS are monitored and there are limitations on transit routes, allowable weather and wave conditions, maximum scow load and scow performance (no spill or leakage) (USEPA 2014). This ocean water habitat supports pelagic communities of seabirds such as gulls, albatross and Northern Fulmars, marine mammals, and fish and benthic communities. The site is fully permitted as a bottom dumping disposal site. Monitoring of SF-DODS has concluded that benthic organisms rapidly recolonize the site after dumping of dredge sediments (USEPA 2010b).

Alviso Pond Complex

The portion of the Alviso Pond complex within the Project Area includes open water, brackish marsh, tidal salt marsh and adjacent levee habitats. For the RWC Project, the sediment would be taken by scow to an offloader from where it would then be pumped through a floating and submerged pipeline to a sediment delivery location either on the top of the levee adjacent to Pond A2W or Pond A9. The offloader would be located in deep water habit to allow fully loaded scows to transit during low tide. Floating and/or submerged pipelines would cross through deep to shallow water habitat, mudflats and small areas of tidal marsh to the pond levees. Sediment dredged from RWC Channel could also be pumped directly to the sediment delivery locations; multiple booster pumps would be required to pump the required distance (up to 13 miles to the dredged sediment delivery location at Pond A9). The pipeline from the cutterhead would be longer, but would cross the same habitat types as the pipeline from the offloader.

Pond A2W is bordered on the north by the Bay and on the south by Mountain View Park. Pond A2W is bordered on the west by Mountain View Slough and then Pond A1 and on the east by Stevens Creek (***Figure A-3*).** The outboard areas of the pond levee and the lower reaches of the surrounding sloughs are characterized by upland and tidal salt marsh. The levee tops support salt tolerant plants including peripheral halophytes. Open water habitat exists along the Mountain View Slough and Stevens Creek (HT Harvey 2005).

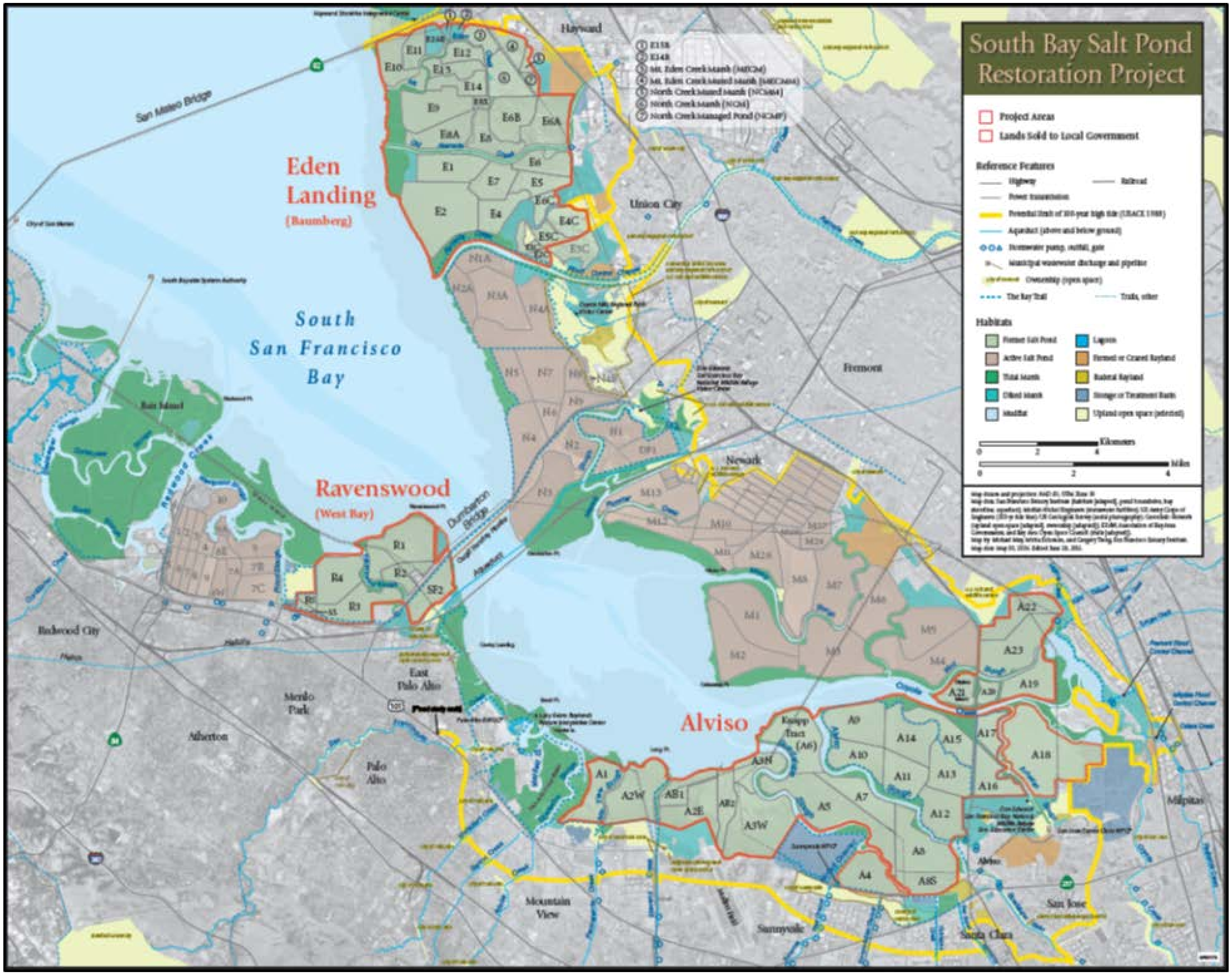

Figure A-3. South Bay Salt Pond Restoration Project

Pond A9 (365 acres) is bordered by Coyote Creek to the north and on the South by ponds A10 and A11. It is bordered on the west by Alviso Creek and to the east by Pond A14 (***Figure A-3***). The sediment would be delivered to the top of the Pond A9 pond levee along its northern edge adjacent to Alviso Slough. The habitat on the outboard side of the levee along Alviso Slough consists primarily of mudflat and open water habitat, and also includes small areas of tidal salt marsh habitat intermixed with brackish marsh. A large mudflat island is located at the mouth of Alviso Creek adjacent to Pond A9 (USACE 2014a).

Fish that may occur in the open water habitat of the South Bay include the northern anchovy, shiner perch, longfin smelt, white croaker, Pacific staghorn sculpin, bay goby midshipman, English sole, cheekspot goby, American shad, Pacific staghorn sculpin, three-spined stickleback and Pacific herring (USACE 2014a). Mudflats provide important habitat for resident and migratory bird populations in the South Bay as well as foraging habitat for estuarine fishes and invertebrates. A variety of shorebirds, gulls, terns, American white pelicans, and ducks use the mudflats.

Salt marsh habitat occurs on the outboard levees along the western and eastern extent of the Alviso complex. Salt marsh dominated by cordgrass occurs on the lower elevations of the marsh that border mudflat areas. Pickleweed-dominated salt marsh occurs at higher elevations, just above the cordgrass-dominated fringes of the salt marshes. The pickleweed salt marsh communities extend upstream into Mountain View Slough, Stevens Creek and Alviso Slough. Cordgrass borders occur along Mountain View Slough and Alviso Slough (HT Harvey 2005). Tidal marsh is also present along the north side of the mouth of Coyote Creek. Upstream in these sloughs, the brackish marsh initially contains patches of pickleweed salt marsh and cordgrass as it transitions from salt marsh to brackish marsh.

Levees separate many of the individual ponds in the Alviso complex and the ponds from San Francisco Bay. Along the outboard side of the levees, the pickleweed and cordgrass salt marsh habitats are separated by elevation. Cordgrass typically occurs below the MHW mark and pickleweed occurs above this mark and often extends up the levee banks. The fill soils associated with levees provide an artificial ecotone habitat that is marginally suitable for special status plants of relatively dry, alkaline areas. Peripheral halophytes occur along the banks and tops of levees separating tidal areas from salt ponds, and occasionally along levees separating salt ponds from each other. The extent of peripheral halophytic vegetation is primarily determined by the salinity of the levee soils, and how recently the levee soils were excavated from borrow pits in adjacent salt ponds. Peripheral halophytes typically include non-native, ruderal species such as iceplant (*Mesembryanthemum nodiflorum*), New Zealand spinach (*Tetragonia tetragonioides*), Russian thistle (*Salsola soda*), and Australian saltbush (*Atriplex semibaccata*). Native high marsh species also occasionally form peripheral halophytic habitat along levee banks. These species include marsh gumplant, alkali heath, spearscale, and saltgrass. In addition, pickleweed may also occur on levee banks along with these species.

Peripheral halophytic vegetation provides important refugial habitat to salt marsh wildlife species during high tides (HT Harvey 2005).

Eden Landing Ponds

The Eden Landing ponds within the Project Area includes open water, mudflats, tidal salt marsh, and levee-upland habitat. Two eelgrass beds are located nearby. For the RWC Project the sediment would be taken by scow to an offloader from which it would then be pumped through a floating and/or submerged pipeline to a sediment delivery location at the top of the Pond E2 Bay-front levee (***Figure A-5***). The offloader would be located in deep water habit to allow fully loaded scows reach the offloader during low tide. The floating and/or submerged pipeline would cross through the deep to shallow water habitats, mudflats and tidal marsh to the pond levee.

Alternatively, sediment could be delivered directly via a pipeline from a hydraulic cutterhead dredge. No offloader would be required; the pipeline would terminate in the same location as a pipeline from an offloader. The location of the cutterhead pipeline in San Francisco Bay would vary depending upon the location of the dredge. The cutterhead pipe would cross the same types of habitats as the pipeline from the offloader, but could be as long as 16 miles to reach the north end of SBS Channel.

The Eden Landing ponds include salt marsh, brackish marsh, freshwater marsh and peripheral halophyte marsh habitat (HT Harvey 2005). Large areas of pickleweed salt marsh lie to the west of the Eden Landing complex at the mouths of Old Alameda Creek (i.e., the Flood Control Channel) adjacent to Pond E1 (north of Pond E2). Pickleweed salt marsh dominates the lower reach of the Alameda Creek Flood Control Channel adjacent to Pond E2, however tidal marsh habitat is largely absent in the vicinity of the proposed dredged sediment delivery location. Large expanses of mudflat extend to the west of the Eden Landing complex. Open water habitat exists in the Bay west of the mudflats and in Old Alameda Creek (HT Harvey 2005). In addition, a small oystershell beach ridge is located on the north end of the outboard marsh of Pond E2 Two patches of eelgrass are located a short distance north of the proposed dredged sediment delivery location. The smaller patch is located approximately 4,500 feet northwest of the proposed dredged sediment delivery location, approximately 4,000 feet offshore. The larger patch is located approximately 1,200 feet off-shore, and is approximately 4,400 feet north-northwest of the proposed dredged sediment delivery location. The levees support peripheral halophytes with similar vegetation that is represented at the Alviso ponds.

Significance Thresholds

Establishing thresholds of significance, determining the significance of impacts, and establishing mitigation for biological resources require consideration of several inherent external and dynamic factors which would affect biological conditions even if the Project were not constructed. In particular, for many potential species it is difficult to identify a quantitative threshold of significance. Many plant and animal populations may vary considerably from one year to the next (interannual variability). For example shorebird numbers require many years of bird surveys to establish a quantitative baseline, and available data on many birds may not accurately describe existing conditions for NEPA/CEQA baseline purposes. For example, the interannual variability in shorebird numbers in the South Bay could result in numbers that, in some years, would drop below a given threshold, even without the Project (USFWS and CDFW 2007). Furthermore, quantitative data are lacking for many, if not most, species at most locations that comprise the Project Area. In addition, many factors affecting species viability are out of the control of the RWC Project. These include factors such as climate change and habitat modification in other parts of the world (for migratory species). Many species are mobile, and variations in the number of individuals present at any given location in any given year reflects factors such as prey availability, presence of predators, weather, and availability of other habitat that may be more desirable. Consequently, significance criteria for biological resources focus on qualitative assessment of potential effects.

The effects of the proposed Project or alternative on biology are considered to be significant if the proposed Project or alternatives would result in any of the following:

- 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.
- 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. This would include causing:
  - the loss or substantial reduction in area or distribution of a unique or rare plant community;
  - A major increase in the distribution, rate of spread, abundance, or impact of an invasive non-native species; or
  - A major, long-term reduction in diversity of native species and communities (that are not special status species).
- A substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption or other means.
- Substantial interference 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.
- A conflict with any local policies or ordinances protecting biological resources.
- A conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

The term “substantial adverse effect on habitat or natural communities” and “substantial interference with movement or wildlife migration corridors” has not been quantitatively defined in CEQA. What is considered “substantial” varies with each species and with the particular circumstances pertinent to a particular geographic area.

Habitat Conservation Plan, Natural Community Conservation Plan, or other Approved Local, Regional, or State Habitat Conservation Plans

This CEQA significance threshold was included for completeness but none of the cities or counties in the Project Area have adopted habitat conservation plans or natural community plans that are applicable to the Project Area except Solano County. Solano County has an adopted habitat conservation plan (HCP) that is applicable to the Project Area. The reuse of the sediments to enhance marsh habit at Cullinan is consistent with that HCP (Solano County Water Agency 2012). As part of the Dredge Material Management Office (DMMO) sediment evaluation and permitting process, the Project would be permitted in compliance with the SFRWQCB Basin Plan and permitting requirements; BCDC Bay Plan and permitting requirements; LTMS policies; and other local and regional agency plans and regulatory requirements. The Project would also comply with the requirements of the USFWS Section 7 consultation, CESA requirements, and the NMFS Section 7 and Essential Fish Habitat consultation. The LTMS policies support the beneficial reuse of dredged material from deepening and maintenance projects. The Project would not conflict with adopted conservation plans and therefore there would be no impact related to this significance criterion at any of the dredging or placement sites.

Special Status Species

In evaluating impacts to special status plant and wildlife species within the Project Area, the analysis was based on relevant literature. Special status species tables were developed from special-status plant and wildlife species listed on the USGS 7.5 minute Quadrangles that encompass the various locations that comprise the Project Area and then the list was refined to include only those species for which there is appropriate habitat within the Project Area. Species lists generated from the USFWS quadrangle search and CNDDB quadrangle search were combined.

Special status aquatic and terrestrial species are listed in ***Appendix H*** on ***Tables H-1a through H-2b*** and include those species listed as endangered, threatened, proposed for listing as threatened or endangered, or species of concern, or are designated as Fully Protected species under one or more of the following regulatory statues: Federal Endangered Species Act, as amended; Marine Mammal Protection Act of 1972, as amended; California Endangered Species Act; California Fish and Game Code; and California Native Plant Protection Act of 1977. Special status species also include locally rare species defined by the California Environmental Quality Act (CEQA) guidelines 15125(c) and 15380, which may include species that are designated as sensitive, declining, rare, locally endemic or as having limited or restricted distribution by various federal, state and local agencies, organizations and watch lists. Their status is based on their rarity and endangerment throughout all or portions of their range.

Impacts to aquatic species that occur in the Project Area are described below in ***Section A.4.*** Aquatic biological resources are wildlife that the majority of their life is dependent on aquatic habitat e.g. fish. Impacts to terrestrial species that occur in the Project Area are described in ***Section A.5*****.**

A.4 Biological Resources – Fish and Aquatic Resources

Environmental Consequences

- **Dredging Options**

The three dredging options consist of deepening RWC and SBS Channels to -32 feet MLLW, -34 feet MLLW, or -37 feet MLLW. All three options include relocating the fuel pipelines crossing SBS Channel to a minimum of 6 feet below the maximum depth of the channel (i.e., including overdepth). Potential effects of all three dredging options to biological resources are very similar; consequently the three dredging options are analyzed together. ***Table H-1a (Appendix H)*** shows the special status aquatic species that could occur at the dredge sites. Special status aquatic species that may be present at the dredge sites include Chinook salmon, steelhead, green sturgeon, and longfin smelt. No eelgrass or special status invertebrates occur at the dredge sites. The proposed Project would widen the existing dredged channels by up to 12 feet for the -32-foot depth, 24 feet for the -34-foot depth and 42 feet for the -37-foot depth.

RWC Channel is and would continue to be located immediately adjacent to the mudflats at Bair Island and Greco Island. Removal of any mudflats outboard of Bair Island and Greco Island would be avoided through channel design. The channel side slopes would be constructed with a 3:1 slope to minimize the potential for sloughing. As discussed in the Geotechnical Engineering Appendix (***Appendix D***), the final design of RWC Channel, including the exact RWC Channel alignment and the channel side slopes, may be affected by several factors such as the underlying sediment type, bar pilot navigational requirements, and further engineering analysis to be performed during the design phase.

Deepening and widening of SBS Channel is less constrained. The current 500-foot bottom width would be retained along the entire channel, regardless of the amount of deepening. All channel side slopes would remain at a 3:1 slope. Relocating the three fuel pipelines crossing SBS Channel would be accomplished using one of the three methods described in ***Section 4.2.3.4 of the Main Integrated Report***. Up to 2,500 feet of each of the three existing pipeline would be removed and replaced at greater depth. The habitat that would be disturbed at SBS Channel is deep water habitat. No disturbance of shallow water habitat is expected.

Impact 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.

For the aquatic biological environment it is not expected that there would be a significant population decline of aquatic species including special status aquatic species except potentially through entrainment of listed species. The dredging would occur within all relevant work windows, which are June 1 through November 30, follow BMPs, Programmatic EFH conservation measures, and permit requirements. Under certain circumstances work windows could be modified through additional consultation process with the appropriate agencies. A summary of the key potential impacts follows.

Entrainment

Dredging could occur with a clamshell or a hydraulic cutterhead. The Project would comply with LTMS work windows where applicable and other permitting measures to minimize entrainment and its effects on species. During t the biological consultation for the Project, the Corps would consult with USFWS and NMFS regarding entrainment. The avoidance and minimization measures identified as part of that consultation would be implemented as needed.

Entrainment associated with clamshell dredging would be minimal. If a hydraulic cutterhead is used, special status species, non-listed fish species and other organisms could be incidentally entrained in significant numbers during the dredging operation as the dredge suctions water and material from the channels into the pipe. There is a higher potential for entrainment for fish that live and feed on and near the bottom of the water column. Although some of these non-listed fish species (e.g. Pacific staghorn sculpin, Pacific sanddabs) may be entrained, this would not have significant effect on their population numbers or species survival. Entrainment would be of particular concern for longfin smelt due to the significant long term population decline (more than 25 years) in San Francisco Bay. (Due to the salinity of the water at the dredging locations, Delta smelt would not be present.) Population decline is attributed principally to reductions in freshwater inflows and introductions of exotic invasive clam species (USERDC 2014).

Entrainment is also of concern for green sturgeon which are benthic feeders, and may be present year round in the Project area. Due to their year round occurrence there is no work window for the species that would avoid entrainment although further research into a work window is proposed. San Francisco Bay is designated critical habitat for green sturgeon. Adult and sub-adult sturgeon are found in both deep and shallow water (Stanford et al 2009). Entrainment impacts would be greater with cutterhead dredging but would also occur at a low level from clamshell dredging. Based on current knowledge the entrainment rates for Green Sturgeon appear to be generally low (Stanford et al 2009).

Salmonids may also be present in the dredging area. Salmonids may pass through the proposed dredging area en route to spawning habitat further south. Redwood Creek does not have a salmon run (Port of Redwood City 2010), but salmon may stray into RWC Channel. After hatching, young-of-the-year (i.e., first-year juvenile) green sturgeon move into the Delta and San Francisco Bay where they may remain for 2 to 3 years before migrating to the ocean (USACE and RWQCB 2014). Sub-adult and nonspawning adult green sturgeon use both ocean and estuarine environments for rearing, foraging, and feeding on benthic invertebrates, crustaceans, and fish (Moyle 2002). Although juvenile and adult green sturgeon have the potential to be present in the Project area during dredging, it is generally believed they would be motile enough to avoid entrainment.

In addition there is the potential for fish species to be entrained in vessel propeller wash or struck by vessel propellers. Fish species may be struck by propellers or entrained in propeller wash (propwash) from tugs and other vessels during dredging operations. In a study of entrainment in propwash and propeller strikes on the Mississippi River, large-body species such as sturgeon showed a higher probability of being struck by a vessel propeller. Sturgeon are known to experience direct injury and mortality due to propeller strikes and entrainment in propwash. In a study by the Engineer Research and Development Center (ERDC) on the Mississippi River to assess impacts of propeller strikes on Atlantic sturgeon (Acipenser oxyrinchus), 2% of all fish entrained behind a large tugboat were found to have been injured by propeller strikes. The study also noted that entrainment of sturgeon in propwash of deep draft vessels produced mortality rates substantially exceeding those associated with dredging entrainment (USACE and Port of Sacramento 2011).

Following construction, the potential for green sturgeon to be struck by vessel propellers or entrained in vessel propwash would increase with additional vessels call at the Port of Redwood City. As discussed in Section 4.2, there could be up to a 45% increase in vessel calls, although the total number of vessel calls would be less than under the No Action/No Project condition. The impacts to green sturgeon from vessel strikes and entrainment in vessel propwash would be less than significant.

Longfin smelt may occur throughout San Francisco Bay at all times of year. They are not powerful swimmers and sometimes occur near the bottom of the water column where entrainment by the draghead of a hydraulic dredge can occur. There is no specified work window for longfin smelt. Modeling has indicated that smelt may continue to decline over the next 30 years due to a small degree from Bay-wide maintenance and deepening dredging, but largely due to significant other factors which contribute to their decline. The LTMS Draft Programmatic Work Window Consultation (BCDC et al. 2014) for conservation measures for salmonids, green sturgeon and smelt and have been incorporated into the Project. In addition, the following measures determined through coordination with CDFW may be implemented as required to protect longfin smelt (these measures generally benefit other fish species as well):

1. Dredging may proceed anywhere when water temperature exceeds 22.0 degrees Celsius.
2. The USACE would implement a worker education program for longfin smelt, and other listed terrestrial and aquatic species.
3. Draghead pumps would only be turned on when the dragheads are on the seafloor or within 3 feet of the seafloor when priming pumps.
4. USACE will coordinate with the dragtender to monitor the dragheads so that they maintain positive contact with the seafloor during suction dredging.
5. If the Project undertakes work requiring only a partial dredging window to complete (i.e., following work during a full dredging window of operations in the prior year), USACE would dredge later (October-November) during the dredging window, if feasible, to reduce entrainment risk.

Little is known regarding entrainment of species associated with use of the jet sled trenching process that may be used for pipeline replacement at SBS Channel. It is assumed that there would be some level of entrainment from the pipeline that takes in water to pump into the sediment to move the sediment off the pipe and create the trench for pipeline replacement. Entrainment is not expected to occur with the clam shell trenching method or directional drilling.

Entrainment impacts to special status species and other fish species would be minimized though compliance with LTMS programmatic measures, and permitting requirements and implementation of BIO-M1, BIO-M2, and BIO-M3 (***Section A.4.2***).

<u>Noise</u>

All dredging activities would take place in the federal navigation channels, which receive regular boat traffic, and therefore have high background levels of underwater noise. Large shipping vessels have continuous noise in the range of 180 to 189 dB (USACE and RWQCB 2015). Mechanical and hydraulic dredges both produce repetitive sounds that may be intense enough to cause adverse effects on fish and marine mammals. Clamshell dredges can have a repetitive sequence of sounds generated by the winches, bucket impact with the substrate, closing and opening the bucket, and sounds associated with dumping the dredged material into the scow. The highest sound impacts are produced during the bucket's impact with the substrate, which can result in peak sound pressure levels (SPL) of 124 decibels (dB) measured 150 meters from the bucket strike location (USACE and RWQCB 2014). Underwater noise is generated by hydraulic dredging equipment, including rotating cutterheads, pumps, propellers, suction pipes, and the cutterhead contact with the substrate. The noise from a hydraulic cutterhead dredge will vary by size and sediment, it can produce continuous noise in the range of 150 to 170 dB when measured 10 meters from the cutterhead, with noise levels varying with dredge size and sediment type (USACE and RWQCB 2014). All three dredging options may require short term pile driving to isolate the tie-in locations for the relocated fuel pipelines at the SBS Channel.

Currently, there are approximately two to four weekly deep draft vessel that transits through SBS Channel and RWC Channel, as well as an unknown amount of other commercial vessel traffic. Maintenance dredging occurs on average every 19 months; i.e., approximately 2 out of every 3 years. Maintenance dredging occurs during the six-month dredging window (i.e., between June 1 and November 30), and the typical duration is 2 to 4 months. The deepening dredging noise would also occur during the 6-month dredging window, and would be nearly continuous over this period up to 6 months; however, it would occur annually over multiple years ranging from 2 up to 12 years.

Marine mammals are occasionally found within the proposed dredging areas. Levels of harassment for marine mammals are defined by the MMPA. Level A harassment is defined as "[A]ny act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is defined as "[A]ny act of pursuit, torment, or annoyance which has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding or sheltering." Any activities that may result in harassment of marine mammals under these guidelines would require an Incidental Harassment Authorization (IHA) from the NMFS. For impact pile-driving, NMFS defines noise level exposure above 190 dB RMS (root mean squared) as Level A harassment for seals and sea lions (which could occur in the area) and indicates that noise levels above 180 dB RMS (can cause injury to cetaceans (whales, dolphins, and porpoises). Level B harassment for impact pile-driving is defined as sound levels between 160 dB and 190 dB. For continuous noise, such as vibratory pile-driving the Level B criterion is 120 dB (SLC 2012; USACE and RWQCB 2014). The dredging and pile driving could produce underwater noise that qualifies as harassment for marine mammals and is comparable to the noise produced by commercial shipping vessels currently occurring in the project area, as well as dredging activities during maintenance dredging. Level A harassment is unlikely to occur; however, Level B harassment could occur in the immediate vicinity of the dredge. At these levels behavioral effects could include changes in feeding behavior, fleeing, and startle response. More serious injury, such as rupture of swim bladder from peak noise, is not expected to occur.

For fish the effects of dredge-generated noise and sound waves are still largely unknown, with the amount of scientific knowledge varying by species. Effects may include behavioral changes, neurological stress, and temporary shifts in hearing thresholds (USACE and RWQCB 2015). Generally noise-related studies have been on the effects of pile driving and the Fisheries Hydroacoustic Working Group (FHWG), whose members include California departments of transportation, CDFW, and other agencies determined that noise at or above peak noise levels greater than 206 dB are considered to be injurious (SLC 2012, USACE and RWQCB 2015). Accumulated SPLs of 187 dB for fishes that are greater than 2 grams, and 183 dB for larval fishes below that weight, are considered to cause temporary shifts in hearing, resulting in temporarily decreased fitness and detrimental behavioral changes (USACE and RWQCB 2015).

Periodic maintenance dredging in the channels has not produced injuries to fish and deepening would also not be expected to injure fish. Effects to fish behavior (avoidance, fleeing, changes in feeding behavior, etc.) may occur at lower dB ranges. NMFS uses 150 dB as the threshold for adverse fish behavioral effects (USACE and RWQCB 2014). Injury to fish from peak noise (e.g., rupture of swim bladder) is not expected to occur. The noise levels from Project dredging activities would be expected to cause special status as well as non-listed species fish and marine mammals to temporarily avoid the area where the dredge operates and/or temporarily affect behavior such as feeding; however, these adverse impacts would be expected to be short term. Fish species are expected to return after dredging stops; therefore no long term impacts are expected.

At SBS, several methods are proposed to remove the pipelines and construct the trench. Jet sled use is not expected to produce noise levels that could affect fish or marine mammal populations (Williams 2013). The noise levels from using a clamshell dredge to construct the trench would be similar to noise from dredging operation. Noise from directional drilling is expected to be minimal and short term. Relocation of the pipeline would also require installation of cofferdams, which would be constructed of sheetpiles. Pile driving would be conducted adjacent to SBS Channel as part of the pipeline removal process. A sound assessment of underwater noise from pile driving was completed in 2012 (Illingworth and Rodkin 2012). This assessment determined that underwater sound would exceed levels that have the potential to disturb or temporarily decrease fitness of fish with a prolonged exposure to the underwater sound. Such effects could potentially impact fish over areas of up to 328 feet from pile driving (USACE and RWQCB 2015). However, the assessment also determined that the use of bubble curtains reduced noise impacts to levels that would not cause injury to fish. As described in ***Section 4.2.3.2.2 of the Main Integrated Report***, pile driving for this Project would use vibratory pile drivers, wherever possible. If substrates are too dense for vibratory hammers, an impact hammer would be used and noise would be attenuated with a bubble curtain. A “soft start” technique would also be employed for both types of hammers to give wildlife time to exit the area during pile driving.

Marine mammals are highly mobile and likely to avoid areas of noise while dredging operations are underway (USACE and RWQCB 2014). Impacts may therefore include temporary displacement of marine species; however, the affected area would be limited to the immediate dredging area and would not substantially limit habitat or movement of wildlife and therefore the impact is expected to be less than significant. Pile driving activities would produce underwater sound that has the potential to harass marine mammals (Level B harassment, which includes non-injury behavioral effects). Vibratory driving would produce lower levels of sound than impact pile driving, but would still exceed Level B harassment thresholds. Level A harassment, which includes potential injury, is not expected to occur as a result of the project activities (USACE and RWQCB 2014).

Noise impacts to special status species, including marine mammals, and other fish species would be minimized though the compliance with permitting requirements and implementation of BIO-M4 (***Section A.4.2***).

Turbidity, Total Suspended Solids, and Contaminants

Increased Turbidity
Proposed dredging and pipeline relocation activities would introduce suspended sediments into the water column which would result in an increase in turbidity in the vicinity of the dredge. Hydraulic dredging would minimize turbidity at the site whereas clamshell dredging would result in a higher level of turbidity. Although dredging would be continuous, increases in turbidity would be expected to be localized, with the most concentrated portion of the turbidity plume located along the bottom of the water column and decreasing in concentration toward the surface (USACE and Port of Oakland 1998). The plume would extend downcurrent of the dredging site for a variable distance which would be influenced by tides and creek flows. After completion of dredging activities, the plume would be expected to settle quickly with no long term effects. The dredge would move 23 to more than 100 feet per day. Turbidity plumes would dissipate as the dredge moves. Studies have indicated that turbidity can naturally range as high as 1000 mg/l. Total suspended solids (TSS) levels in the Bay vary greatly, ranging from 10 mg/l to over 100 mg/l depending on season, tidal stage, and depth (USACE and RWQCB 2014).

The removal of the SBS Channel pipeline would substantially increase turbidity if the jet sled method of construction is chosen. There is little information on the impacts from a jet sled operation; however, the TSS levels would be expected to be higher in the lower portion of the water column than for trenching operations and for a long duration. The plume would extend downcurrent of the jetting site for a variable distance which would be influenced by tides and currents. Although the TSS levels would be expected to be high locally during the jetting activity, after completion, the plume would be expected to settle quickly particularly due to the expected higher sand content of the sediment in the area, and with no long term effects are anticipated. If pipelines are tied in above water, the pipelines on both sides of the channel would be jetted out of the sediment, and similar effects to using the jet sled method of construction would occur. Turbidity from use of a clamshell dredge to construct the trench would be similar to dredging the channel and duration would be less than 20 days per pipeline segment. Turbidity from directional drilling is expected to be minimal and short term.

Increased turbidity levels associated with the dredging and pipeline relocation activities could result in biological impacts to organisms. Higher turbidity levels during a dredging event can result in a slight reduction in light penetration (measured as transmissivity) in the water column immediately adjacent to the dredging operations. Transmissivity is important to phytoplankton because phytoplankton require sufficient light to photosynthesize. The increased turbidity would not be expected to significantly affect phytoplankton productivity because phytoplankton production typically occurs in the upper portion of the water column where the decrease in transmissivity is expected to be minimal. Filter feeding organisms (e.g., mussels) both in the bottom substrate and those organisms attached to the pilings along the berths could be affected by increased turbidity due to clogged gills and feeding apparatus.

High levels of turbidity may affect fish by disrupting normal feeding behavior, reducing growth rates, increasing stress levels, and reducing respiratory functions (Anchor 2003). Review of the literature regarding the effects of turbidity associated with construction in the aquatic environment on anadromous salmonids indicates turbidity may interfere with visual foraging, increase susceptibility to predation, and interfere with migratory behavior. Turbidity also reduces the avoidance response of juvenile chinook salmon to bird and fish predator models (Anchor 2003) and induces a surfacing response in juvenile coho salmon, which potentially increases their vulnerability to predation (Anchor 2003).

There is little direct information available to assess the effects of turbidity in San Francisco Bay on juvenile or adult green sturgeon. The green sturgeon forages in bottom sediments and thus is well adapted to living in estuaries with fine sediment substrate and is tolerant of elevated levels of turbidity. Listed species in San Francisco Bay commonly encounter areas of increased turbidity due to storm flow runoff events, wind and wave action, and benthic foraging activities of other aquatic organisms. Fish generally react by avoiding areas of high turbidity and return when concentrations of suspended solids are lower.

Many laboratory studies have attempted to determine the levels of suspended sediments that cause impacts on the physiology of marine organisms. A study found that most of the fish and invertebrates studied could withstand levels of resuspended sediments of up to 250 to 400 mg/l for a period of about 9 to 10 days without effect (Anchor 2003). ***Table A-9*** presents total suspended sediments (TSS) concentrations at which effects are noted from typical studies (Anchor 2003).

Table A-9. Response of Marine Species to Certain Concentration Levels of Total Suspended Sediments (Anchor 2003)

Species	Concentration (mg/l)	Response
Rainbow Smelt *Osmerus Mordax*	10	Increased swimming behavior
Most fish and invertebrate	250-400	No effect
American Shad larvae	500	32% mortality after 4 days of exposure
White Perch	650	Elevated hematocrit levels after 5 days of exposure.
Striped Bass	1,500	Elevated hematocrit levels after 14 days of exposure
Fish	4,000	Exhibits of erosion at gill filament tips
Shiner Perch	6,000	50% mortality
Chinook Salmon smolts	11,000	50% mortality after 96 hours of exposure

Observed biological impacts from the studied TSS concentrations ranged from no effect to lethal impacts. Marine organisms' response to resuspended sediments is a function of the resuspended sediment concentration, the duration of exposure, and the type and level of development of organisms. Study results indicate that significant adverse impacts likely do not occur during typical dredging projects, though biological effects can occur at higher resuspended sediment concentrations. Typical concentrations of suspended sediments generated by dredge projects are less than the sub-lethal and lethal levels observed in the laboratory studies (C. Boudreau per comm. 2015). Further, elevated resuspended sediment concentrations in typical dredging projects are generally confined to the immediate vicinity of the dredge or discharge point and dissipate rapidly at the completion of the operation. Resuspended sediment concentrations caused by natural phenomenon such as floods, storms, large tides and winds are often higher and of longer duration than those caused by dredging.

Marine organisms in the Bay are adapted to the fluctuating turbidity levels. Fish are expected to avoid areas of higher than normal turbidity and filter feeders would recover in a short time. The effects of dredging on turbidity would be short term and localized during dredging with implementation of mitigation measures WQ-M1 this impact would be less than significant.

During pipeline relocation, turbidity in the lower portions of the water column could be relatively high if the jet sled method of construction is used or the pipeline is jetted out of the sediment as part of the tie-in process. Use of the jet sled method of construction could require approximately 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. Mitigation measure WQ-M1 would be implemented; 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. 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 (***Section A.15.4***); however, the impact if jet sled construction were used for the SBS pipeline relocation would be significant and unavoidable.

Increased Suspension of Toxics and Organics

The sediments from the deepening of the channels would primarily be made up of find grained sediment including some contaminated sediment at RWC Channel and a combination of 30% sands and 70% fine grained sediment at SBS Channel. Available sediment sampling data from recent maintenance dredging episodes indicates that most of the sediment to be dredged, with the exception of the Inner Turning Basin in RWC Channel, is likely to be suitable for unconfined aquatic disposal. Past maintenance dredging characterizations for the Port of Redwood City indicated that generally sediment chemical concentrations were similar to ambient levels in the Bay. Testing in 2008 and 2010 indicated a lack of toxicity in elutriate and solid phase biological tests which would support the conclusion that contaminant concentrations are not available in the water fraction (Pacific EcoRisk 2008 and 2010).

A small percentage of sediment could be unsuitable for unconfined aquatic disposal, and may have to be placed at a reuse site capable of accept wetland foundation dredged sediment. The spatial extent of contaminated sediments that could be resuspended would be limited in extent and suspended sediments would quickly settle out of the water column. Organic compounds are generally less soluble than metals. Consequently, direct toxicity via organic compounds dissolved in the water column is often less likely. However, organic compounds tend to bioaccumulate in organisms. This can occur both through dissolved phase exposure through the water column and from organic compounds adsorbed to particulate matter.

Organic compounds such as PCBs are usually sequestered on particulate matter and can be released to surrounding water when sediments are dredged resulting in suspending the particles. The exposure from this sediment is expected to be short term in the area of the Inner Turning Basin, and toxicity testing of the sediments has shown that toxicity associated with these sediments is generally comparable to the reference sediment from SF-DODS and SF-11 (Kinnetic and Atkins 2015). Due to the relatively short exposure duration, the limited concentration, and minimal solubility of contaminants at the site, toxic effects are expected to be insignificant. The impact would be less than significant.

Beneficial Impacts from Resuspended Sediments

While resuspended sediments are typically associated with negative impacts, an increase in the amount of resuspended sediments can also have beneficial impacts to the aquatic environment. For example, a study indicated that suspended bottom material serves as an additional food source for the blue mussel *Mytilus edulis*, and that this organism depended on suspended bottom material to exploit fully its feeding potential, and to reach the maximum growth rates observed in nature (Anchor 2003). Other studies also suggested that suspended sediments could cause the release of nutrients to marine plants that can stimulate algal growth (Anchor 2003). It also has been found that several species actively prefer turbid over clear water conditions to facilitate feeding and avoidance behaviors (Anchor 2003). Turbid conditions may also enhance the visual contrast of prey items and thus increase overall feeding rates, as was demonstrated for larval pacific herring *Clupea pallasi* (Anchor 2003). Alternatively, increased turbidity may reduce the risk of predation while foraging and result in increased foraging rates, as was observed for juvenile chinook salmon (Anchor 2003).

<u>Habitat Disturbance</u>

Potential dredging pipeline replacement impacts to the existing benthic community in the channels would occur due to removal of the existing benthic communities in the deeper subtidal areas. No special status benthic species are likely to occur within RWC and SBS channels. The existing benthic deeper subtidal habitat in the Port's RWC channel is frequently disturbed, both by maintenance dredging that occurs every one to two years, and by propwash associated with ship movements. SBS Channel experiences a much lower maintenance dredging frequency; however, it would also be subject to disturbance of bottom sediments due to frequent vessel transits. The location where the pipeline would be removed and replaced (1000 feet on either side of SBS channel) has not been disturbed for many years. Although the Project would cause benthic productivity to be reduced temporarily in the dredged channels and pipeline trench, it would be expected that recolonization of the dredged areas and pipeline replacement area with species similar to the existing benthic community would start soon after dredging/replacement is complete especially in areas with silty sediments (USACE and Port of Oakland 1998). Because the existing benthic community at RWC channel is frequently disturbed, and recolonization would occur within a relatively short time, dredging impacts in the channel are considered to be less than significant. The area of SBS Channel dredged under Dredging Options B and C would be substantially larger than under Option A, which would disturb more bottom substrate and benthic habitat. Dredging and pipeline replacement at SBS Channel is less frequent and the bottom substrate is expected to contain higher sand content which could lengthen the period that it would be required for benthic species to recolonize; however, it would be expected that benthic organisms would recolonize over time and wildlife species would utilize the extensive nearby deepwater habitat for foraging during the construction period; and therefore the impacts would be less than significant.

<u>Habitat Modification</u>

Deepening of RWC Channel would include conversion of some shallow open water habitat to deep open water habitat. All of the dredging locations are EFH (USACE and RWQCB 2015). An estimated5.6 to 14.3 acres of shallow water habitat would be removed, depending on the channel depth. No habitat conversion would occur at SBS Channel; all proposed work areas are at depths below –18 feet MLLW. Extensive shallow water habitat is present near RWC Channel in the open waters of the Bay. Nonetheless, the shallow water habitat is considered essential fish habitat and is managed under federal management plans (FMPs)for Pacific groundfish and Pacific coast salmon, and conversion of the habitat would therefore be considered a significant impact. With implementation of Mitigation Measure BIO-M6, this impact would be less than significant.

<u>Impact 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.</u>

Potential impacts associated with habitat alteration would consist of the physical removal of soft bottom substrates in the subtidal deep water habitat and shallow water habitat in the existing channels and berths during dredging. Marine organisms immediately adjacent to the dredge operations may also be lost due to smothering of existing habitats during resettlement of suspended sediment. The species would be expected to recolonize the area relatively quickly. No special status benthic epifauna or infauna species would occur in these areas (USACE and RWQCB 2015). The shallow water soft bottom habitat is EFH for Pacific groundfish and Pacific salmon and as described above conversion would be a significant impact.

The widening of the channels would create more deep water habitat in the RWC and SBS Channels vicinity. The reduction in shallow water habitat would be expected to have a minimal effect on species that inhabit shallow water habitat except EFH species that use shallow water habitat. The Project is engineered to avoid dredging the mudflats. The Project would be in compliance with any measures required in the Section 7 consultation, CESA requirements, EFH consultation, and the permits. The proposed dredging is not expected to have substantial adverse effect on sensitive natural communities and no special status specie area located in the affected habitat. The loss of shallow water habitat would be mitigated with implementation of Mitigation Measure BIO-M6, this impact would be less than significant.

The dredging operations would not be expected to spread invasive species beyond the SBS and RWC Channels into adjacent habitat and therefore the impact is less than significant.

<u>Impact 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.</u>

The dredging of RWC and SBS channels would not adversely affect protected wetlands because the Project is located in existing channels and adjacent subtidal deep and shallow water habitat. The dredging would deepen the existing channel alignment and would remove subtidal habitat to stabilize the channel slope but would not remove, fill, or cause a hydrological interruption of wetlands. There would be no impact.

<u>Impact 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.</u>

Fish and marine mammal movement and migration could be affected by the Project due to the species' avoidance of the dredging area when the dredge is operating. Physical disturbances such as underwater noise and increased turbidity may cause fish and marine mammals to temporarily avoid areas with high levels of turbidity or noise. These impacts would be expected to be localized and the fish and/or marine mammals would return following the completion of dredging. All work would occur during the work window. The Project would be in compliance with any measures required in the Section 7 consultation, CESA requirements, EFH consultation, and the permits including the BMPs described in ***Section 4.2 of the Main Integrated Report***. This is a short term impact that is considered to be less than significant.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

The project would have short term temporary impacts to biological communities but would not be expected to have long term impacts consistent with the cities of Redwood City and Brisbane's policies (***Appendix G***). The City of Redwood City has policy to protect tidal flats. The Project is engineered to avoid dredging the mudflats. Therefore the impact is less than significant.

Placement Sites

Cullinan Ranch Tidal Restoration Project

Impact 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.

Cullinan has SLC and BCDC permits to construct an offloader and piping to discharge slurried sediment to the diked upland portion of the site. This portion of the site is being restored to intertidal elevation for rapid vegetation to tidal marsh. It is expected that the RWC Project, if it constructs the offloader and pipeline, would obtain similar permits for the site that would also allow one or both of the two offloader locations and pipeline alignments included in the Cullinan permits. The impacts from the construction of the offloader and related pipeline were previously evaluated in the *Addendum to the Final Environmental Impact Report for the Cullinan Ranch Restoration Project Solano and Napa Counties* (SLC 2012).

Activities associated with use of this placement site would be the transport of dredged material to this site by scow, construction and operation of the dredged sediment offloader and pipeline, and delivery of dredged sediment to the top of the levee where it would be discharged into the inboard side of the levee (***Figure A-1***). The offloader locations are proposed to be in the Napa River in deep water, approximately 1 mile east of the levee where the sediment would be delivered. The offloader and work area around the offloader would be approximately 200 feet by 400 feet. The offloader platform would be held in place by two spuds. The sediment would be slurried by pumping water from the Napa River through a fish screen in compliance with NOAA Fisheries Service (NOAA Fisheries), USFWS and California Department Fish and Wildlife (CDFW) guidance. The sediment would be pumped to Cullinan Ranch through a sediment placement pipeline which would float on the surface of the water along the edge of Dutchman Slough and be anchored with small dead weight anchors. If the sediment placement pipeline crosses a navigable area, weights would be used to hold down and anchor the pipeline to the bottom of the channel. Management of the sediment once it reaches the top of the levee would be part of the Cullinan Ranch Tidal Restoration Project and has been evaluated under separate environmental reviews.

Shading

The offloader once constructed may be in place for up to ten years. The platform for the offloader is expected to be approximately 6,000 square feet and would cast shade over the water which can impact phytoplankton production, affect invertebrate and vertebrate communities, affect fish foraging, alter fish species composition and alter normal predator prey relationships when compared to open water conditions. No eelgrass or bottom growing algae occur in the area of the offloader construction. Marine species in the Napa River are adapted to relatively high TSS levels as sediment constantly resuspended due to daily tidal currents, waves and water flow. The daily tidal currents and water flow would also limit the duration that species would be subject to shading. While fish species composition could be somewhat different beneath structures than in open-water conditions, the change due to the Project related to overwater structures is not substantial and the potential effect of shading on sensitive species is not expected to constitute an adverse effect.

The reduction in light resulting from overwater structures can affect behavior, and has the potential to deflect or delay fish migration, reduce prey resource production and availability, and alter predator-prey relationships. Many predatory fish, such as striped bass, are associated with structures and could occur near the offloader. This could result in a slight increase in predation on larval and young fish in the local Project Area. Larger predatory fish may move into shallow water to feed during high tide. However, larval or young fish would most likely avoid areas that are shaded by the floating platform (SLC 2012) and it is unlikely that significant increases in predation would occur. The potential impact from Project due to shading is expected to be less than significant.

Noise

The impacts from pile driving are similar to the pile driving at the SBS pipeline replacement. FHWG determined that noise at or above peak noise levels greater than 206 dB can cause barotrauma to auditory tissues, the swim bladder, or other sensitive organs in fish. Accumulated sound energy levels (SEL) above 187 dB for large fish and 183 dB for larval fish (less than 2 grams body weight) have been determined to be potentially detrimental to fish (SLC 2012). Pile driving would occur over a very short period and in accordance with the best management practices outlined in ***Section 4.2 of the Main Integrated Report***. This would include use of vibratory pile driving were feasible, soft starts for pile driving, and bubble curtains if needed to attenuate pile driving noise (if vibratory pile driving is not feasible). Peak sound pressures of 206 dB are not anticipated to occur with the vibratory hammer installation of the mooring piles. It is estimated that every pile would be driven approximately 10 minutes (600 seconds). There would be about 1,800 seconds of operation if all three piles were driven in one day. A conservative assessment assumes all piles strikes are at the same distance to the receiver (i.e., a fish) and all pile strikes produce the maximum SEL. The distance over which the 187 dB accumulated SEL level would be exceeded is about 105 feet for a hollow steel pile. If wooden piles are installed, the 187 dB accumulated SEL level would not be exceeded (SLC 2012).

For marine mammals, if impact pile driving is used it would not be expected to produce sound levels above the Level A Harassment threshold (190 dB) defined by NMFS. The Level B harassment for impact pile driving would be 260dB and 190dB and could be exceeded over a distance of up to one mile for steel piles. If wooden piles are installed, the threshold could be exceeded over a distance of 600 feet (SLC 2012).

As discussed previously, pile driving activities produce would produce underwater sound that has the potential to harass marine mammals, producing Level B non-injury behavioral effects. Vibratory driving would produce lower levels of sound than impact pile driving, but could still exceed Level B harassment thresholds (USACE and RWQCB 2014). However, background underwater sound levels in the lower Napa River are expected to be greater than 120 dB due to regular boat traffic, which may produce sound levels of 150 dB or more. Given the short duration of pile-driving (1,800 seconds total) and the distribution of marine mammals (no haul outs or other regular use areas are located on the Napa River) it is unlikely that any marine mammals would experience harassment (SLC 2012). Avoidance of the area by marine mammals and fish would be temporary and is expected to occur only while the hammers are in use.

The noise levels could cause temporary hearing loss or behavioral changes to special status and other species of fish. As described in ***Section 4.2.3.2.2 of the Main Integrated Report***, pile driving for this Project would use vibratory pile drivers, wherever possible. If substrates are too dense for vibratory hammers, an impact hammer would be used and noise would be attenuated with a bubble curtain. A “soft start” technique would also be employed for both types of hammers to give wildlife time to exit the area during pile driving. With the implementation of the Mitigation Measure BIO-M4 to ensure that pile driving occurs when special status fish species are not present the impact would be less than significant.

Smothering

There is potential for smothering of benthic organisms in the immediate area of the pile driving and the placement of the sediment conveyance pipeline. When driving the piles and/or placing the spuds, benthic organisms, primarily clams, worms and other invertebrates, would likely be killed at the pile or spud location. In addition, there is potential for non-mobile organisms to be smothered by the pipeline in Dutchman Slough, if the pipeline is laid on the bottom or moves up and down with the tides. The impacts to marine organisms would be temporary and these relatively small areas would be expected to recover quickly once the offloader, piles and pipeline are removed; therefore the impact is less than significant.

Impact 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.

The Cullinan offloader would be located in the deep water habitat and the pipeline would traverse mudflats, a small fringe of salt marsh, and upland habitat on the levee. There would be minimal temporary physical removal of habitat during construction and operation of the offloader which would be expected to return to the previous habitat after the offloader and piping are removed. These small habitat areas would not be permanently modified and no substantial adverse effect on sensitive natural communities would be expected; therefore the impact is less than significant. Greatly accelerated creation of tidal wetland habitat from the reuse of the dredged sediment is expected to have a beneficial impact on sensitive natural communities.

Construction equipment would comply with permits and regulations intended to minimize the spread of invasive nonnative species by vessels. The placement site operator would be responsible for managing the placement of dredged materials at the placement sites in accordance with conditions of their permits and other regulatory approval, which include measures to minimize the spread of invasive nonnative species. Therefore, project activities would not be expected to substantially increase the spread of invasive nonnative species. Potential impacts from Project due to the spread of invasive species are expected to be less than significant.

Impact 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 or other means.

The Project would construct the offloader with minimal disturbance to underlying subtidal habitat. Construction of the offloading pipeline could lead to removal or damage to a very small area of fringe tidal marsh outboard of the sediment delivery location; an area of up to 1,000 square feet may be affected. This area is expected to revegetate rapidly once the pipeline is removed, or could serve as a breach location once the Cullinan site is filled to intertidal elevation. The main portion of the pipeline would be located away from any tidal marsh vegetation. The impact to wetlands would be less than significant.

Impact 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.

As discussed above shading from the offloader and pile driving from the construction of the offloader could potentially affect fish and other marine organism behavior including migratory behavior. The offloader and/or piping would not be expected to affect the movement or migratory corridor for special status fish or non-listed fish species in Napa River and Dutchman

Slough. The platform would be approximately 6,000 square feet, which is a relatively small area when compared to the extensive open water habitat in the vicinity of the Project. Potential impacts from the Project due on fish and marine organism migration or migratory corridors is expected to be less than significant.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

The Project would be consistent with Solano County's policies (***Appendix G***). Solano County has policy to protect the County's natural habitats and diverse plant and animal communities, particularly occurrences of special-status species, wetlands, sensitive natural communities, and habitat connections. The Project would have short term impacts during construction as described in Impact BIO-1 that would be mitigated by mitigation measures BIO-M4 as well as BIO-M5. Long term impacts from operation of the offloader are expected to be minimal. The accelerated creation or enhancement of marsh habitat by the beneficial reuse of the sediment is a beneficial impact from the Project. The Project is not expected to conflict with local policies or ordinances and therefore the impact is less than significant.

Montezuma Wetland Restoration Project

Impact 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.

For the RWC Project, only the impacts associated with transporting dredged material by scow to this offloading facility are attributable to the RWC Project. Dredged sediment offloading, management of the offloading facility, sediment placement, and Montezuma site management are services provided by the Montezuma project and have been evaluated under separate environmental reviews and would occur independently of the RWC Project. Potential noise exposures to wildlife would be limited to underwater noise from tug engines. Potential underwater noise associated with tugs would be below the thresholds set by NMFS as causing adverse impacts to fish and marine mammals. This impact is less than significant.

Impact 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.

The Project would tie up to the Montezuma offloader that is located in the deep water habitat of the Sacramento River. No substantial adverse effect on sensitive natural communities would be expected; therefore the impact is less than significant. Creation of tidal wetland habitat from the reuse of the dredged sediment is expected to have a beneficial impact on sensitive natural communities.

Construction equipment, including tugs and scows, would comply with permits and regulations intended to minimize the spread of invasive nonnative species by vessels. The placement site operator would be responsible for managing the placement of dredged materials at the placement sites in accordance with conditions of their permits and other regulatory approvals, which would include measures to minimize the spread of invasive nonnative species. Therefore, Project activities would not be expected to substantially increase the spread of invasive nonnative species. The potential impact from the Project due to the spread of invasive species is expected to be less than significant.

<u>Impact 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 or other means.</u>

The Project would deliver sediment to the offloader with minimal disturbance to underlying subtidal habitat and would not remove, fill, or cause a hydrological interruption of wetlands and therefore there would be no impact.

<u>Impact 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.</u>

The effect of the Project would be due to tying up the scows at the offloader. No impacts would be expected to fish and marine organism migration or migratory corridors

<u>Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.</u>

The Project would not be expected to have any long term adverse impacts. Solano County has policy to protect the County's natural habitats and diverse plant and animal communities, particularly occurrences of special-status species, wetlands, sensitive natural communities, and habitat connections (***Appendix G*****).** The Project is not expected to conflict with local policies or ordinances and therefore there is no impact.

SF-DODS

<u>Impact 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.</u>

The disposal of dredged material in ocean waters is regulated under the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA). The MPRSA prohibits disposal activities that would unreasonably degrade or endanger human health or the marine environment. Under the Act, the USEPA and the USACE have joint authority for regulating ocean disposal of dredged material and for managing ocean disposal sites. Permits for the transportation and disposal of dredged material into ocean waters are authorized under MPRSA §103(e) after USEPA concurs that environmental criteria and conditions established by USEPA are applied. Management of SF-DODS consists of:

- regulating the quantities, types of material, times, rates, and methods of disposing of dredged material at an SF-DODS through a Site Management and Monitoring Plan (SMMP);
- developing and maintaining an effective monitoring program for the site; and
- enforcing permit conditions for approved dredging projects.

The location of SF-DODS was selected to avoid important fishery areas and geographically unique or otherwise sensitive habitats and it is one of the most intensively monitored sites in the nation. To date, 15 years of monitoring data have been collected for the SF-DODS and the data has been reviewed to determine the impacts of dredge disposal at SF-DODS (USEPA 2010b). The USEPA study concluded that:

- Measured chemical concentrations in the sediment have generally not exceeded those background values found either at the site prior to disposal or at the SF-DODS reference area; the few chemical compounds whose concentrations have exceeded background values have still been well below any value to cause any potential concern for biological effects.
- No suspended sediment plumes have resulted in substantial or increased uptake of contaminants by water column organisms outside the SF-DODS boundary or within the Gulf of Farallones National Marine Sanctuary.
- There have been no adverse impacts to marine birds, marine mammals or pelagic fish from disposal activities; the only effect observed was small and limited to the immediate vicinity of the disposal zone in the heaviest disposal years.
- Detailed analysis of 120 benthic samples revealed that stations within the SF-DODS boundary that are affected by large volumes of dredged material have recolonized rapidly and by the same taxa that are normally found in the adjacent ambient sediments.
- The distribution, abundance, and physiological condition of krill, fish larvae, and juvenile fishes do not appear to be negatively affected by any of the dredged material disposal activities at SF-DODS.

The only noise source associated with placement of sediment at SF-DODS would be tugs towing the scows. Tugs would follow the designated lanes across the Gulf of the Farallones Marine Sanctuary. Tugs would be in transit, and would only be in the area for a short period of time. Wildlife has ample opportunity to avoid the noise source.

The RWC Project would be required to obtain permits for and meet all regulatory requirements for acceptable sediment for disposal at SF-DODS. Monitoring has concluded that the special status marine mammals that occur in the area have had no adverse effect. Monitoring of SF-DODS has concluded that the disposal of permitted dredge material has been temporary disturbance and that the site returns to pre-disposal conditions within a short period. The impacts from the Project would be less than significant.

<u>Impact 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.</u>

As described under Impact BIO-1, long term monitoring of the disposal of sediment at the site have concluded that there are no significant adverse effects from use of the site for sediment disposal. The sediments from the Project would be tested and permitted prior to disposal and would comply with all regulatory requirements. The impact from the Project would be less than significant.

Barges and equipment would comply with permits and regulations intended to minimize the spread of invasive nonnative species by vessels. The Project would be in compliance with conditions of the permits and other regulatory approvals. Therefore, project activities would not be expected to substantially increase the spread of invasive nonnative species. Potential impacts from Project due to the spread of invasive species are expected to be less than significant.

<u>Impact 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 or other means.</u>

The SF-DODS site does not include wetland habitat and therefore there would be no impact to wetlands.

<u>Impact 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.</u>

Marine birds, marine mammals and many species of pelagic fish are far-ranging in seasonal migration patterns and/or occur over large areas within the region. The effects on these species, including their movement, was studied at the site and took into account regional influences. These factors included regional climate variations, natural variations in regional ocean circulation patterns, variations of biological populations, and human-induced effects such as adverse impacts of fishing gear, point and non-point sources of pollution, and marine debris. The study concluded that there was no relationship between marine mammal or bird density and distance from SF-DODS, nor between mammal density and disposal activities, indicating that variation in marine mammal densities were not related to disposal site activities at SF-DODS. There were also no data to indicate any adverse effect of disposal at SF-DODS on abundance of juvenile fish or plankton. The impact from the Project would be less than significant.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

There are no local policies or ordinances relevant to SF-DODS and therefore there are no impacts from the Project.

Alviso Ponds

Impact 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.

Activities associated with use of this placement site would be the transport of dredged material to this site by scow, construction and operation of the dredged sediment offloader, pipeline, and booster pump(s), and delivery of dredged sediment to the top of the levee where it would be discharged into the inboard side of the levee (***Figure A-4***). The offloader location is proposed to be in the South Bay in deep water, approximately 4 miles to 6 miles north of the levees where the sediment would be delivered. The offloader and work area around the offloader would be approximately 200 feet by 400 feet. The offloader platform would be held in place by piles, and mooring dolphins would be provided for the scows. Delivery of sediment to the Pond A9 dredged sediment delivery location would require another booster pump between the offloader and the levee. The platform for the booster pump would be considerably smaller than the offloader platform, and would be constructed in the same manner as the offloader platform.

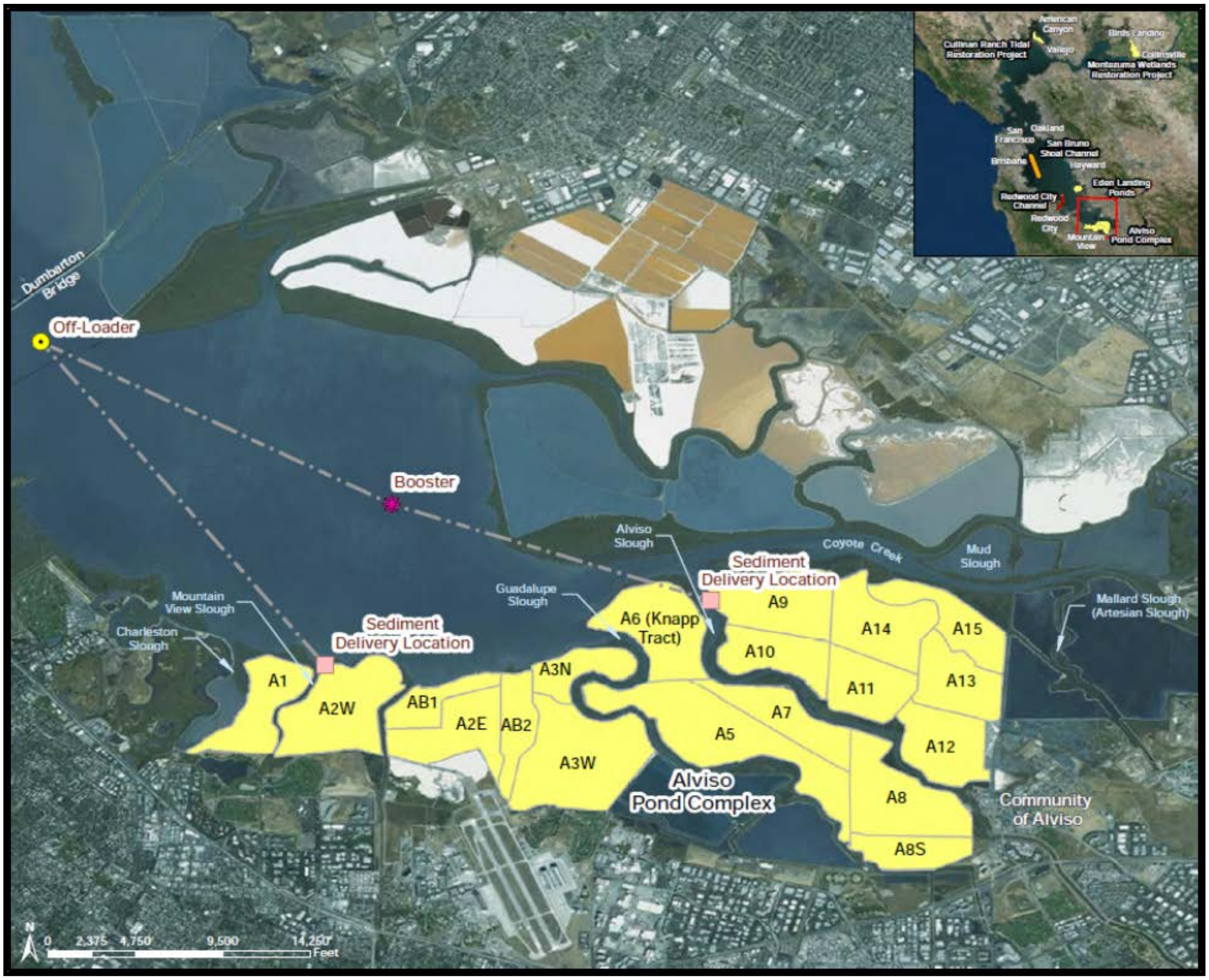

Figure A-4. Alviso Pond Complex

The sediment would be slurried by adding water pumped to the offloader through a fish screen in compliance with NOAA Fisheries, USFWS and CDFW guidance. The slurried sediment would be pumped to the Alviso Ponds through a sediment placement pipeline which would float on the surface of the water or lay on the Bay bottom and be anchored with small dead weight anchors. If the sediment placement pipeline crosses a navigable area, weights would be used to hold down and anchor the pipeline to the bottom of the channel. The pipeline would be laid through deep water, shallow water, and mudflat habitat, and may be laid through a narrow band of fringe marsh outboard of the levee. Management of the sediment once it reaches the top of the levee would be part of the Alviso Pond Project and evaluated under separate environmental reviews.

Sediment from RWC Channel could also be pumped directly from a cutterhead dredge. If a cutterhead dredge is used, the pipeline would most likely be laid into the natural deep water channel and then cross shallow water and mudflat habitat, and may be laid through a narrow band of fringe marsh outboard of the levee.

Shading

The offloader and possible booster pump station once constructed could be in place for up to four years. The platform for the offloader is expected to be approximately 6,000 square feet and would cast shade over the water which can impact phytoplankton production, affect invertebrate and vertebrate communities and affect fish foraging, alter fish species composition and normal predator prey relationships when compared to open water conditions. No eelgrass or bottom growing algae occur in the area of the offloader or booster pump construction. The platform for the booster pump has been conservatively estimated to require 3,000 square feet, and shading from the booster pump platform would have the same effects as shading from the offloader. Daily tidal currents and wave and water flow would limit the duration that species would be subject to shading. While fish species composition could be somewhat different beneath structures than in open-water conditions, the change due to the Project in overwater structures in the area is not substantial and the potential effect of shading on sensitive species is not expected to constitute a significant adverse effect.

The reduction in light resulting from overwater structures can affect behavior and has the potential to deflect or delay fish migration, reduce prey resource production and availability, and alter predator-prey relationships. Many predatory fish, such as striped bass, are associated with structures and could occur near the offloader. This could result in a slight increase in predation on larval and young fish in the local Project Area. Larger predatory fish may move into shallow water to feed during high tide. However, larval or young fish would most likely avoid areas that are shaded by the floating platform (SLC 2012) and it is unlikely that significant increases in predation would occur. The potential impact from Project due to shading is expected to be less than significant.

Noise

The only noise level generated at the Alviso placement site that has the potential to impact sensitive aquatic wildlife receptors is from the pile driving activities during construction of the offloader and/or intermediate booster pump location if sediment is delivered to Pond A9. The pile driving activities would be expected to be very similar to those described for Cullinan. Up to 3 mooring dolphins could be installed over a span of several days at both locations. FHWG determined that noise at or above peak noise levels greater than 206 dB can cause barotrauma to auditory tissues, the swim bladder, or other sensitive organs in fish. Accumulated sound energy levels (SEL) above 187 dB for large fish and 183 dB for larval fish (less than 2 grams body weight) have been determined to be potentially detrimental to fish (SLC 2012). Pile driving would occur over a very short period and in accordance with the best management practices outlined in ***Section 4.2 of the Main Integrated Report***. This would include use of vibratory pile driving were feasible, soft starts for pile driving, and bubble curtains if needed to attenuate pile driving noise (if vibratory pile driving is not feasible). Peak sound pressures of 206 dB are not anticipated to occur with the vibratory hammer installation of the piles. It is estimated that the duration of pile driving would be short. A conservative assessment assumes all piles strikes are at the same distance to the receiver (i.e., a fish) and all pile strikes produce the maximum SEL. The distance over which the 187 dB accumulated SEL level would be exceeded is about 105 feet for a hollow steel pile. If wooden piles are installed, the 187 dB accumulated SEL level would not be exceeded (SLC 2012).

For marine mammals, if impact pile driving is used it would not be expected to produce sound levels above the Level A Harassment threshold (190 dB) defined by NMFS. The Level B harassment for impact pile driving would be 260dB and 190dB and could be exceeded over a distance of up to one mile for steel piles. If wooden piles are installed, the threshold could be exceeded over a distance of 600 feet (SLC 2012).

As discussed previously, pile driving activities produce would produce underwater sound that has the potential to harass marine mammals, producing Level B non-injury behavioral effects. Vibratory driving would produce lower levels of sound than impact pile driving, but could still exceed Level B harassment thresholds (USACE and RWQCB 2014). The background underwater noise level at the offloader and intermediate booster pump locations is unknown; however, recreational boat traffic is present in the area and would result in some underwater noise. Given the short duration of pile-driving (up to 90 minutes total over several days) and the distribution of marine mammals (no haul outs would occur in the deep water habitat) it is unlikely that any marine mammals would experience harassment. Avoidance of the area by marine mammals and fish would be temporary and is expected to occur only while the hammers are in use (USACE and RWQCB 2014).

Best management practices as discussed in ***Section 4.2 of the Main Integrated Report***, including pile driving windows, would be utilized to minimize the risk of conducting this activity when sensitive wildlife is present, and vibratory hammers would be used when feasible. A "soft start" would also be performed to give marine life the chance to leave the area before the full and sustained noise of pile driving commences. Underwater sound levels from pile driving could also exceed levels that have the potential to disturb or temporarily decrease fitness of fish with a prolonged exposure to the underwater sound. If necessary, as described in the BMPs, a bubble curtain would be implemented to minimize effects to nearby aquatic wildlife. Vibratory impact pile driving would increase noise levels over background; however, the noise levels would be temporary and of short duration (approximately 90 minutes total over several days) and would not be expected to result in noise levels that would be injurious to fish or marine mammals. With the implementation of the mitigation measure BIO-M4 to ensure that pile driving occurs when special status fish species are not present the impact would be less than significant.

Because the pipeline (whether from the offloader or the cutterhead dredge) would be laid on the bottom of the Bay, non-mobile benthic organisms located immediately beneath the footprint of the pipe could be smothered. However, the footprint of the pipe would be small (the maximum pipeline diameter would be no more than 36 inches and is likely to be between 18 and 24 inches), there are not special status species in the benthic community, and the benthic community is expected to reestablish rapidly once the pipeline is removed, this impact would be less than significant.

Impact 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.

The Alviso offloader and possible booster pump station would be located in the deep water habitat and the pipeline would traverse deep water, shallow water, and mudflat habitats. It may also across a small fringe of tidal marsh outboard of the upland habitat on the pond levees. There could be minimal physical removal of habitat during construction and operation of the offloader which would be expected to return to the previous habitat after the offloader and piping is removed. These small habitat areas would not be permanently modified and no substantial adverse effect on sensitive natural communities would be expected; therefore the impact is less than significant. Creation of tidal wetland habitat from the reuse of the dredged sediment is expected to have a beneficial impact on sensitive natural communities.

Construction equipment would comply with permits and regulations intended to minimize the spread of invasive nonnative species by vessels. The placement site operator would be responsible for managing the placement of dredged materials at the placement sites in accordance with conditions of their permits and other regulatory approvals, which would include measures to minimize the spread of invasive nonnative species. Therefore, project activities would not be expected to substantially increase the spread of invasive nonnative species. Potential impacts from Project due to the spread of invasive species are expected to be less than significant.

Impact 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 or other means.

The Project would construct the offloader and possible booster pump station with minimal disturbance to underlying subtidal habitat and construction of these facilities would not remove, fill, or cause hydrological interruption of wetlands. Construction of the pipeline may require removal of a small area (up to 1,000 square feet) of outboard fringe marsh; alternatively the pipeline could be laid on wooden mats placed onto the vegetation. The vegetation would be expected to reestablish rapidly once the pipeline is removed. The impact to wetlands would be less than significant.

Impact 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.

As discussed above, shading from the offloader and possible booster pump station, and pile driving from the construction of the offloader could potentially affect fish and other marine organism behavior including migratory behavior. The offloader and/or piping would not be expected to affect the movement or migratory corridor for special status fish or non-listed fish species in the vicinity of the offloader. The offloader platform would be approximately 6,000 square feet which is a relatively small area when compared to the open water habitat in the vicinity of the Project, and the booster pump platform would be smaller. Potential impacts from the Project to fish and marine organism migration or migratory corridors are expected to be less than significant.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

The Project would have temporary impacts to biological communities but would not be expected to have long term impacts upon Project completion and is consistent with Santa Clara County's, the City of Mountain View's and the City of San Jose's policies (***Appendix G***). The Project would have short term impacts during construction as described in Impact BIO-1 that would be mitigated by mitigation measures BIO-M4 as well as BIO-M5. The Project is not expected to conflict with local policies or ordinances and therefore the impact is less than significant.

Eden Landing Ponds

Impact 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.

Activities associated with use of this placement site would be the transport of dredged material to this site by scow, construction and operation of the dredged sediment offloader and pipeline, and delivery of dredged sediment to the top of the levee where it would be discharged into the inboard side of the levee (***Figure A-5***). Sediment could also be pumped directly from a cutterhead dredge. The cutterhead pipeline location would change as the dredge moves, but would generally follow the same route across the mudflats as the pipeline from the offloader. In other areas, the pipeline from the cutterhead dredge would be located in shallow or deep open water.

Figure A-5. Eden Landing Ponds

The offloader location is proposed to be in the South Bay in deep water, approximately 3.5 miles west of the levee where the sediment would be delivered. The offloader would be constructed and operated in the same way as the Alviso offloader. The pipeline would be laid through deep water, shallow water, and mudflat habitat, and may be laid through a narrow band of fringe marsh outboard of the levee. If the sediment placement pipeline crosses a navigable area, weights would be used to hold down and anchor the pipeline to the bottom of the channel. If sediment is pumped directly from a cutterhead, the pipeline could extend up to 16 miles from the north end of SBS Channel to the sediment delivery location at Pond E2. Management of the sediment once it reaches the top of the levee would be part of the Eden Landing project and evaluated under separate environmental reviews.

<u>Shading</u>

The offloader once constructed could be in place for up to four years. The configuration of the offloader and the shading effects from the offloader would be the same as described for the Alviso site.

<u>Noise</u>

The noise levels associated with offloader construction and operation would be the same as for the Alviso site. The only noise that has the potential to impact sensitive fish and mammal receptors is from the pile driving activities. Marine mammals and fish maybe impacted by the temporary pile driving activities associated with construction of the offloader. With implementation of the best management practices included in ***Section 4.2 of the Main Integrated Report***, potential noise effects from pile driving would not be expected to be injurious to fish or marine mammals. The noise levels could cause temporary hearing loss to special status and other species of fish. With the implementation of the mitigation measure BIO-M4 to ensure that pile driving occurs when special status fish species are not present the impact would be less than significant.

<u>Impact 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.</u>

The Eden Landing offloader would be located in the deep water habitat and the pipeline would traverse deep water, shallow water, mudflats and possibly pass in the vicinity of nearby eelgrass beds before reaching the fringe of tidal marsh and upland habitat on the Pond levees. There would be minimal temporary physical removal of habitat during construction and operation of the offloader and piping. This habitat, including any removal of mudflat and fringe tidal marsh, would be expected to return to the previous habitat after the offloader and piping are removed. With the exception of adjacent eelgrass beds, these small habitat areas would not be permanently modified and no substantial adverse effect on sensitive natural communities would be expected. Eelgrass beds is an EFH and could be affected be the suspension of sediment during construction of the pipeline and possibly the offloader depending on the proximity of the offloader to the eelgrass beds. Distribution of eelgrass in San Francisco Bay is limited by sediment in the water (turbidity) and the depth to which light can penetrate at levels high enough to sustain eelgrass growth. In San Francisco Bay, eelgrass is limited to depths of about 10 feet or less depending on localized turbidity conditions. Sediment would not be expected to resuspend during operation of the offloader. Pre-dredge surveys of the eelgrass beds would be required; however, the limited quantity of resuspended sediment from the laying the pipeline and potentially offloader construction in compliance with regulatory permits is not likely to have a significant impact to eelgrass beds. Accelerating tidal marsh habitat creation through the reuse of the dredged sediment is expected to have a beneficial impact on sensitive natural communities.

Construction equipment would comply with permits and regulations intended to minimize the spread of invasive nonnative species by vessels. The placement site operator would be responsible for managing the placement of dredged materials at the placement sites in accordance with conditions of their permits and other regulatory approval, which include measures to minimize the spread of invasive nonnative species. Therefore, project activities would not be expected to substantially increase the spread of invasive nonnative species. Potential impacts from Project due to the spread of invasive species are expected to be less than significant.

Impact 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.

The Project would construct the offloader with minimal disturbance to underlying subtidal habitat and construction of these facilities would not remove, fill, or cause hydrological interruption of wetlands. Construction of the pipeline may require removal of a small area (up to 1,000 square feet) of outboard fringe marsh; alternatively the pipeline could be laid on wooden mats placed onto the vegetation. The vegetation would be expected to reestablish rapidly once the pipeline is removed. The impact to wetlands would be less than significant.

Impact 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.

As discussed above for the Alviso ponds, shading from the offloader and pile driving from the construction of the offloader could potentially affect fish and other marine organism behavior including migratory behavior. The offloader and/or piping would not be expected to affect the movement or migratory corridors for special status fish or non-listed fish species in the vicinity of the offloader. The platform would be approximately 6,000 square feet which is a small area when compared to the open water habitat in the vicinity of the offloader. Potential impacts from the Project to fish and marine organism migration or migratory corridors are expected to be less than significant.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

The Project would have short term impacts to biological communities but would not be expected to have long term impacts upon project completion consistent with the Alameda County's and the City of Hayward's policies (***Appendix G***). The Project would have short term impacts during construction as described in Impact BIO-1 that would be mitigated by mitigation measures M4 as well as BIO-M5. Long term impacts from operation of the offloader are expected to be minimal. The Project is not expected to conflict with local policies or ordinances and therefore the impact is less than significant.

Post-Construction Operation

Under existing ballast water regulation, ships exchange ballast water in the ocean before entering San Francisco Bay . This requirement ensures that future ships entering the Bay for calls at the Port would have deballasted and reballasted prior to entering the Bay and thereby minimized the potential spread of invasive species. It is expected that there would be less deballasting/reballasting on the transit to the RWC Channel with the deeper channels. The reduced need for deballasting and reballasting in South San Francisco Bay to safely transit under the San Mateo Bridge would be reduced following channel deepening. This would slightly reduce the potential for spread of invasive species following deepening of the channel.

Mitigation Measures

The following mitigation measures were identified to minimize Project effects on aquatic wildlife. With implementation of these measures as described above, potential impacts to aquatic biological resources from the proposed Project would be less than significant for all components except the potential for extended duration elevated TSS resulting from fuel pipeline relocation using the jet sled method.

Mitigation Measure BIO-M1: Minimize Species Entrainment

In addition to the LTMS measures described in ***Section 1.6.1 of the Main Integrated Report***, dredging activities shall be scheduled to take into account seasonal longfin smelt migrations that are affected by hydrologic conditions.

Mitigation Measure BIO-M2: Conduct Entrainment Monitoring

If hydraulic dredging is used, conduct entrainment monitoring on a percentage of sediment dredged from the channels. Adaptively manage construction such that hydraulic dredging ceases should entrainment of listed species reach the number of individuals set in any incidental take statement/permit. The percentage of dredged material that must be monitored and the amount of take allowed shall be determined during the formal state and federal ESA consultation processes.

Mitigation Measure BIO-M3: Minimize Entrainment during SBS Channel Pipeline Replacement

A fish screen or other agency approved method would be required on the water intake(s) for the jet sled unless it is determined that entrainment of listed species would not reach the number of individuals set in any incidental take statement/permit. The amount of take allowed shall be determined during the formal state and federal ESA consultation processes.

Mitigation Measure BIO-M4: Avoid Construction that Could Affect Tidal Aquatic Habitats when Salmonid Species and Other Special Status Fish Species are known to Occur.

Construction activities that could affect special status species would occur during the applicable species windows. If construction activities must occur during periods when special status species could be present, USWFS, in consultation with NMFS and CDFW, shall determine what, if any, additional mitigation measures may be required. In the event that the Project is undertaking exceptionally noisy construction activities such as driving piles during periods when endangered species are present and the best management practices described in ***Section 4.2 of the Main Integrated Report*** are inadequate to control pile driving noise, additional sound attenuation techniques shall be implemented as required in the applicable permits and other regulatory approvals.

Mitigation Measure BIO-M5: Limit Speeds for Construction Vessels

Limit speeds for construction vessels (i.e., dredges, tugs, and scow/tug combinations, and other large vessels) to 2 knots or less when approaching or operating in the dredging locations. Smaller support vessels carrying personnel and/or supplies to the dredging location would be limited to 5 knots or less. Limiting vessel speeds in the dredging location would minimize the likelihood of propeller strikes and other vessel collisions, as well as propwash entrainment of fish that may be in the study area.

Mitigation Measure BIO-M6: Habitat Mitigation

Shallow water habitat loss from channel deepening shall be compensated for through the creation of new shallow water habitat (e.g., construction of channels in wetland restoration projects), or through purchasing mitigation credits from an approved mitigation bank. The mitigation ratio and specific mitigation opportunities shall be determined during the EFH consultation for the Project.

A.5 Biological Resources – Terrestrial Resources

Environmental Consequences

The impacts to terrestrial species (defined as those species for whom the majority of their life is spent on land), are described in this section. Special-status wildlife and plants species that occur in or near the Project Area are listed ***Appendix H*** in ***Tables H-3 and H-4.*** Species that were listed on the applicable quads, but for whom no suitable habitat is present in the Project Area are not included in the tables.

Terrestrial habitat in the Project area is limited, and consists primarily of levee habitat and tidal marsh. All potential effects to bird species are evaluated in this section, and therefore effects to aquatic areas used for foraging and roosting are also evaluated.

Dredging Options

Potential effects of all three dredging options are very similar; consequently the three dredging options are analyzed together. ***Table H-3 in Appendix H*** shows the special status terrestrial species that could occur at the dredging sites. Both RWC and SBS Channel are entirely aquatic sites and there is no upland habitat. The only terrestrial species potentially associated with the two dredge sites would be bird species that use the channel for feeding or forage on the mudflats. The open water of the channels provides roosting and "loafing" habitat for birds such as surf scoter (*Melanitta perspicillata*), lesser scaup (*Aythya affinis*), Northern shoveler (*Anas clypeata*), and brown pelican. During low tide, mud flats provide crucial foraging and roosting areas shorebirds including western sandpiper (*Calidris mauri*), least sandpiper (*Calidris minutilla*), dunlin (*Calidris alpina*), long- and short-billed dowitcher (*Limnodromus griseus*, and *L. scolopaceus*, respectively), long-billed curlews (*Numenius americanus*), whimbrels (*Numenius phaeopus*), and American avocet (*Recurvirostra americana*).

The Project would be located immediately adjacent to the mudflats at Bair Island and Greco Island and would avoid dredging in the mudflats. To avoid impacts to the mudflats, the Project located the channel alignments as far as possible from the mudflats and adjusted the bottom width of the channel where needed to maintain the required 3:1 slope of the channel banks. The exact location of the channel and the slope would be determined during design, and may be affected by several factors including the sediment type, bar pilot navigational requirements, and final slope stability analysis (USACE 2015).

Potential impacts to birds in the Project Area could result primarily from loss of foraging opportunities due to increased turbidity and disturbance from operation of the dredging equipment (primarily noise and light effects) and loss of prey. Through the DMMO process and consultation provided by resource agencies, all proposed dredging, transport, and placement of dredged material would be reviewed. This review includes a review of sediment testing results. Sediments with elevated concentrations of chemical contaminants could have adverse effects to the food chain if released.

The Project would implement BMPs and comply with RWQCB permit conditions, the BCDC consistency determination, CESA requirements, and measures specified in the Section 7 and NMFS EFH consultations. The USACE would also implement sediment bioaccumulation testing in accordance with the LTMS Programmatic EFH agreement. Adherence to these measures and BMPs would minimize the potential for impacts from dredging disturbance, including disturbance due to increased turbidity, noise, night lighting, habitat disturbance and bioaccumulation of contaminants in the food chain.

<u>Impact 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.</u>

The presence of tugs, scows, dredges, and tender vessels could result in disturbances to birds due to elevated noise levels and night-time lights. The lights from dredging at night may create a disturbance that could result in birds avoiding the immediate vicinity of the dredging vessels. Special status birds that are likely to use the dredge site for foraging or be present in the mudflats and tidal marshes adjacent to the Project Area are: Peregrine falcon, American white pelican, black skimmer, Western Snowy plover, least tern, Forster's tern, and Ridgway's rail. All of these species potentially forage in the vicinity of the channels but are not expected to nest in the main channel area. The California least tern and Western Snowy plover have been known to historically nest at Bair Island but no recent occurrences are known in the past several decades.

Noise and Night Lighting

Birds are likely to avoid the immediately vicinity of dredging operations due to noise and night lighting. Birds located in or near the channels are likely to be accustomed to ongoing ship traffic and human activity such as recreational boating use associated with the marinas. Bird species have also been exposed to similar noise and night light disturbances during maintenance dredging. Ambient noise levels in the natural areas near the Port where the wildlife sensitive receptors are located are assumed to be 55 dBA. During the dredging period, the dredging operations may disturb foraging and resting behaviors, decrease time available for foraging, and increase energetic costs as a result of increased flight times and startling responses. The maximum predicted noise levels of 54.6 dB in the marsh bordering the dredging areas do not exceed ambient noise in the wildlife area as described in Table A-14 in Section ***A.10 Noise and Vibration.*** Birds in this area are likely to temporarily flee to avoid the dredging operations but are expected to return after dredging is completed and therefore the impact is less than significant.

Certain special status bird species such as Ridgway's rail and California black rail may be sensitive to loud noise during the nesting season if the noise intensity is unusually high. For this reason, the USFWS Biological Opinion for the LTMS Program specifies that dredging shall not occur within 250 feet of potential habitat for this species from February 1 through August 31. The USFWS considers all potential habitat to actually be occupied by this species unless surveys that year document its absence. The marsh habitat adjacent to the RWC channel has the potential to be occupied by Ridgway's rail and California black rail. Noise impacts from both construction and dredging operations to these species during the nesting season are potentially significant. With the implementation of Mitigation Measure BIO-M7 through BIO-M9 the impact to noise sensitive species and other special status species would be less than significant.

Turbidity and Contaminants

Turbidity

An increase in turbidity in the dredging areas could reduce visibility in the immediate vicinity of dredging operations, thereby reducing foraging success due to the decrease in the visibility of the prey. However, because it is anticipated that fish would also avoid the dredge area, bird avoidance of the immediate area would not result in a significant decrease in foraging success. Due to their mobility, the birds would likely follow the fish and forage in the readily available nearby areas. Bird species have been exposed to similar disturbances during maintenance dredging. The area that would be avoided is limited to the immediate vicinity of the dredge site, which is a small fraction of the total foraging area for the birds. Once dredging in a specific area is complete, fish and birds would return to the area. Impacts on food availability and foraging success as a result of increased turbidity in the water column would be short term and localized and are expected to result in a minimal reduction in short-term food availability for birds. The impact is less than significant.

Contaminants

Any toxic metals and organics, pathogens, and viruses, absorbed or adsorbed to fine-grained particulates in the sediment may become biologically available to organisms as a result of sediment resuspension during dredging -- either in the water column or through food chain processes. Most available studies suggest that there is no significant transfer of metal concentrations into the dissolved phase during dredging, even though release of total metals associated with the suspended matter may be large (USACE and RWQCB 2014). Organic contaminants such as pesticides, polychlorinated biphenyls (PCBs), and polyaromatic hydrocarbons (PAHs) are generally not very soluble in water, and direct toxicity by exposure to dissolved concentrations in the water column is not very likely (USACE and RWQCB 2014). Sediments testing results would be reviewed by DMMO, and DMMO review would include an evaluation of the potential for impact to aquatic organisms that would potentially be a food source for bird species. The Project would also undertake sediment bioaccumulation testing in compliance with the *Agreement on Programmatic EFH Conservation Measures for Maintenance Dredging Conducted under the LTMS Program* (USACE and USEPA, 2011). These studies would assess the potential for dredging to increase contaminant concentrations in the environment above baseline conditions; however, based on exiting studies significant bioaccumulation above background in bird species is not expected and therefore the impact is less than significant.

Vessel Wakes

Wake wash is generally of concern where wetlands, other sensitive habitats, and marinas are close to vessel routes. In general, if vessel wake-generated waves have significantly greater wave heights or energy at the shoreline than natural wind waves, wake wash can lead to resuspension of shoreline sediments and hence shoreline erosion or damage. Higher waves could also lead to periodic swamping of marsh vegetation.

In 2004, the Port of Redwood City conducted a study to evaluate vessel wake effects in RWC Channel (URS 2004). At RWC Channel, waves in the entrance channel area and within Redwood Creek are generated by daily winds in the Central and South Bay. Westerly to west by northwesterly winds typically build during the day. The strongest winds occur in the late afternoon. Because the entrance to Redwood Creek is located towards the southern end of the Bay it experiences waves that result from wind acting over a long fetch. Large waves can be experienced in the Bay offshore of the channel entrance during afternoons with strong winds. The inner portion of the channel in redwood Creek is relatively protected. Measured and calculated wave heights in the channel near Westpoint and Corkscrew Sloughs showed that this inner channel quiescent compared to the outer channel.

The 2004 study addressed "barges"; because barges are towed by tugs, the information contained in the 2004 study is relevant to tug/scow combinations that would be used to haul dredged sediment. Provided the tugs move slowly in RWC Channel as barges do, and as required by the BMPs, wakes are expected to be similar to the barge wakes in the study, which were evaluated extensively. The wake height from barges has been observed to be small as barges tend to travel at slow speeds. Barges were found to have low wake energy, with approximately 1,200 J/m in a 10-wave wake train measured at 100 feet from the vessel. Maximum wave heights are between 0.08 and 0.12 m (0.26 and 0.4 feet). The study noted that during times when wind waves were present, it was not possible to distinguish between wind waves and barge wake.

The study also evaluated the energy in the largest wave in the barge wake compared to the energy in ferry wakes, as ferry wakes are known to be of potential concern. The study concluded that the energy in the energy in the largest wave in the wake from existing high-speed ferries measured 100 feet from the vessel would be about 117,000 J/m, or over 90 times as great as the barge wakes. The wave records indicate that barges produce small, low energy, wakes.

The study calculated the energy from two barge calls per month (assuming the wake energy from an empty barge would be the same as for a loaded barge) and compared it to the monthly wind average wind wave energy (excluding storm events). The study determined that it is equivalent to 19,200 J/m per month, or 0.2 percent of the monthly average wind wave energy (excluding storm events). During construction up to five single tug trips per day could occur in RWC Channel (i.e., two complete round trips and a partial trip). This would increase the vessel wake energy by a factor of approximately 40 compared to the energy generated by the barge calls, to approximately 8% of the average wind wave energy. This level of wave energy is not expected to cause adverse effects to mudflat or swamping of habitat. This impact is less than significant.

<u>Other Habitat Disturbance</u>

Another potential impact of concern would be the loss of prey species and altered benthic habitat due to the dredging of the deep and shallow water habitat. This would reduce the abundance of prey species and invertebrates for diving ducks (e.g. scaups and scoter) and grebes of various species. Although the dredging would represent a permanent loss of shallow water habitat, due to the abundance of foraging habitat within the vicinity of the Project Area, the impact is less than significant.

Impact 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.

No terrestrial habitat is located in the dredge channels. The Project would not affect any unique plant communities or substantially affect the diversity of non-listed species. The Project would not affect any terrestrial habitat, and therefore the Project would not spread any terrestrial invasive species. There is no impact.

Impact 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 or other means.

The dredging of RWC and SBS Channels would not adversely affect protected wetlands because the Project is located in existing channels and is not located in wetlands. As discussed above, vessel wakes would be low energy and are not expected to affect wetland habitat. There is no impact from the Project.

Impact 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.

No terrestrial habitat is located in the dredge channels and vessel wakes are not expected to cause adverse effects to tidal marsh. Therefore there is no impact from the Project. Effects to aquatic species have been discussed in ***Section A.4.1***.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

No terrestrial habitat is located in the dredge channels and therefore there is no impact from the Project. Effects to aquatic species have been discussed in ***Section A.4.1***.

Placement Sites

Cullinan Ranch Tidal Restoration Project

Impact 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.

At Cullinan, Project activities would include the construction and operation of the offloader and sediment transfer pipeline within Napa River and Dutchman Slough. The sediment transfer pipeline would have a short section that may cross a band of salt marsh and then ruderal upland levee habitat before it reaches the discharge point. The size of the pipeline is small, approximately 24 to 36 inches in diameter. Construction of the pipeline may require a work area up to 1,000 square feet. Once construction is complete, tidal marsh habitat would be expected to reestablish rapidly, or the location would serve as the site of a levee breach to bring tidal action into the dredged sediment placement area.

Noise sensitive species, including Ridgway's rail and California black rail may be present in the marsh habitat near the offloader locations. Noise impacts from both construction of the offloader to these species during the nesting season are potentially significant. While estimated noise levels from offloader operations (see ***Table 4-15 in the Main Integrated Report***) at these sensitive receptor locations exceed the typical noise levels in open space areas, they are below the ambient levels due to the presence of Highway 37 immediately south of the southern offloader location, and are therefore considered to be less than significant. With the implementation of mitigation measures BIO-M7 through BIO-M9 the impact to noise sensitive species and other special status species would be less than significant.

<u>Impact 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.</u>

A very short section of the sediment transfer pipeline would be placed on upland levee habitat. This short section of pipeline would not be expected to have a significant effect on any unique plant communities or substantially affect the diversity of native plant or wildlife species. Construction equipment would comply with regulations intended to minimize the spread of invasive nonnative species and the placement of the short section of pipeline on the levee would not be expected to spread terrestrial invasive species. Any invasive species within the construction work area would be removed from the site. The impact would be expected to be less than significant.

<u>Impact 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 or other means.</u>

A short section of the 24- to 36-inch pipeline would cross a small band of salt marsh and ruderal upland levee habitat to the discharge point at the top of the levee. The band of salt marsh habitat can be intermittent in the area and the Project would be designed to avoid or minimize the construction in salt marsh habitat. If the pipeline cannot avoid a marsh area, it is expected that vegetation at that location would readily recolonize after the pipeline and any wooden mats are removed, and there would be no long term impacts. The potential impact from the pipeline alignment in the narrow band of salt marsh habitat is small when compared to the extensive nearby marsh habitat in the vicinity of the Project. The impact would be expected to be less than significant.

Impact 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.

The Project would block movement of some terrestrial wildlife along the levee; however, the individual animals could use other parts of the site to maneuver around the pipe, if necessary. The construction period would be short, and therefore the impact is expected to be less than significant.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

Solano County has a policy to protect the County's natural habitats and diverse plant and animal communities, particularly occurrences of special-status species, wetlands, sensitive natural communities, and habitat connections (***Appendix G***). The Project would accelerate habitat restoration at the Cullinan site and is therefore not expected to conflict with local policies or ordinances. There is no impact from the Project.

Montezuma Wetland Restoration Project

Impact 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.

For the RWC Project, only impacts associated with transporting dredged material by scow to this offloading facility are attributable to the RWC Project. Dredged sediment offloading, management of the offloading facility, sediment placement, and Montezuma site management are services provided by the Montezuma project and have been evaluated under separate environmental reviews and would occur independently of the RWC Project. There is no terrestrial wildlife habitat at the Montezuma offloader and therefore there would be no adverse impact to special status species from the Project.

Impact 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.

The Project would tie up to the Montezuma offloader that is located in the deep water habitat of the Sacramento River. No terrestrial habitat is associated with the offloader within the Project Area. The Project would not affect the distribution of invasive species. No substantial adverse effect on sensitive natural terrestrial communities would be expected; therefore there is no impact from the Project. Creation of tidal wetland habitat from the reuse of the dredged sediment is expected to have a beneficial impact on sensitive natural communities.

Impact 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 or other means.

There is no wetland habitat at the Montezuma offloader and therefore there would be no impact from the Project.

Impact 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.

There is no terrestrial habitat at the Montezuma offloader associated with the Project and therefore there would be no adverse impact to special status species from the Project.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

Solano County has a policy to protect the County's natural habitats and diverse plant and animal communities, particularly occurrences of special-status species, wetlands, sensitive natural communities, and habitat connections (***Appendix G***). The Project would promote formation of tidal marsh habitat, and is not expected to conflict with local policies or ordinances; therefore there is no impact from the Project.

SF-DODS

Impact 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.

Birds use the area for foraging habitat and are likely to avoid the site during sediment disposal operations and move to nearby extensive ocean habitat to forage. However, it would be expected that the birds would return to the area after the completion of the sediment disposal. Each scow would require only 10 to 15 minutes to complete disposal of the sediment in the scow, and there would be 2 to 3 scows per day. The disposal at SF-DODS would not have a substantial adverse effect on special status or other bird species and therefore there is no impact from the Project.

Impact 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.

There is no terrestrial habitat at SF-DODS and therefore there would be no impact from the Project.

Impact 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 or other means.

There is no wetland habitat at SF-DODS and therefore there would be no impact from the Project.

Impact 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.

There are no terrestrial species at SF-DODS that would use the site in any of the ways identified and therefore there would be no impact from the Project.

Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.

The Project is consistent with the permitted use of the site, and is not expected to conflict with local policies or ordinances; therefore there is no impact from the Project.

Alviso Ponds

Impact 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.

The Project activities associated with this placement site would consist of the construction and operation of the offloader and sediment transfer pipeline within South San Francisco Bay, including a section of the pipeline that would cross mudflats, a narrow band of tidal marsh and then upland habitat on the levee before it reaches the discharge point at the top of the levee. A booster pump would most likely be located at the top of the levee. If the Pond A9 sediment delivery location is selected, another booster pump would be required mid-way between the offloader and the levee. This booster pump would most likely be located in shallow water habitat. Construction of the entire pipeline may require several months, and operations would occur for period of up to 24 months spread over 4 dredging windows.

The construction of the offloader and pipeline could temporarily disturb special status and other bird species using the mudflats and tidal marsh for foraging and upland habitat as refuge. However the effects during construction would be short term and the construction areas are adjacent to extensive mudflat, tidal marsh and upland refuge habitat that is available to wildlife during this period. The extent of the pipeline alignment and work area at the levee is small relative to the extent of mudflat and tidal marsh habitat in the vicinity. After construction is complete, the bird species are expected to return to the most of the area, although some noise sensitive species may avoid the immediate vicinity of the offloader, booster pump(s) and sediment delivery location while sediment delivery is in progress. The pipeline would be removed after the Project is complete.

Wildlife in Pond SF-2 located west of the offloader location and in the SFBNWR to the east of the offloader location is also located between Highway 84 and the railroad, and therefore is exposed to high ambient noise levels. Predicted noise levels at Pond SF-2 from pile driving for the Alviso offloader would be 62 dBA without controls, and 56 dBA with controls, compared to the estimated ambient noise level of 70 to 74 dBA (refer to ***Table A-16*** i***)***. Predicted noise levels from pile driving at the SFBNWR lands to the east of the offloader construction would range from 63 to 69 dBA, compared to the estimated ambient level of 70 to 74 dBA (refer to ***Table A-16)***. Noise sensitive species, including Ridgway's rail and California black rail may be present in these two habitat areas near the offloader location. If these species are present in these areas, they would be expected to be accustomed to high levels of ambient noise.

Noise sensitive species may also be present in the SFBNWR south of the railroad. The ambient noise in this area is expected to be considerably lower, although still higher than in open space areas that are further away from transportation corridors. The maximum pile driving noise with controls at these receptors would be 63 dBA, compared to estimated ambient levels of 64 to 68 dBA (see ***Table A-15***). This noise level would occur for only a short duration, and actual construction activities would be more than 2,000 feet from this area. Noise impacts from both construction and operation of the offloader equipment to these species during the nesting season are potentially significant. With the implementation of Mitigation Measure BIO-M7 through BIO-M9 the impact to noise sensitive species and other special status species would be less than significant.

<u>Impact 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.</u>

Parts of the sediment transfer pipeline would be placed on mudflats, tidal marsh and upland levee habitat. The pipeline would have a short term impact to these habitats as described in Impact BIO-1 but would not be expected to have a significant effect on any unique plant communities or substantially affect the diversity of any native species. Construction equipment would comply with regulations intended to minimize the spread of invasive nonnative species and the placement of the pipeline on the levee would not be expected to spread terrestrial invasive species. The impact would be less than significant.

<u>Impact 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, or introduction or substantial spread of invasive nonnative plants or wildlife, or other means.</u>

The Project activities at this placement site would consist of the construction of the offloader, booster pumps, and sediment transfer pipeline crossing South San Francisco Bay. The approximately 24- to 36-inch pipeline would cross mudflat, tidal marsh and subsequently upland levee habitat to the discharge point at the top of the levee. Construction of the pipeline may require a work area up to 1,000 square feet. The Project would be designed to avoid or minimize placement of the pipeline in tidal marsh habitat. If the pipeline cannot avoid the marsh area, it is expected that the vegetation in the area would readily recolonize after the pipeline is removed and there would be no long term impacts. The potential impact from the pipeline alignment in the tidal marsh habitat is small when compared to the nearby habitat in the vicinity of the Alviso sediment delivery locations. The temporary disturbance to the tidal marsh habitat is expected to be minimal.

<u>Impact 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.</u>

The Project would block movement of some terrestrial wildlife along the levee; however, the individual animals could use other parts of the site to maneuver around the pipe, if necessary. In addition, the construction period would be short. Therefore the impact is expected to be less than significant.

<u>Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.</u>

Santa Clara County, the City of Mountain View and the City of San Jose have policies to protect natural habitats and plant and wildlife communities (***Appendix G***). The Project is not expected to conflict with local policies or ordinances and therefore there is no impact from the Project.

Eden Landing Ponds

<u>Impact 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.</u>

The Project activities associated with this placement site would consist of the construction and operation of the offloader and sediment transfer pipeline within South San Francisco Bay, including a section of the pipeline that would cross mudflats, a narrow band of tidal marsh and then upland habitat on the levee before it reaches the discharge point. Alternatively, a pipeline could be laid from the cutterhead dredge directly to the top of the levee. In both cases, a booster pump would most likely be located at the top of the levee. If the cutterhead dredge is used for SBS Channel as well, intermediate booster pump locations would most likely be required, similar to what would be constructed for the Alviso Pond A9 delivery location. Estimated noise levels at the closest sensitive receptors are shown in ***Table A-15***.

Construction of the offloader or cutterhead pipeline may require several months. The construction of the pipeline could temporarily disturb special status and other bird species using the mudflats and tidal marsh for foraging and upland habitat as refuge. However the effects during construction would be short term and the site is adjacent to extensive mudflat, tidal marsh and upland refuge habitat. The footprint of the the pipeline alignment and associated construction work area is small relative to the mudflat and tidal marsh habitat in the vicinity. After construction is complete the bird species are expected to return to the area in the vicinity of the pipeline, booster pump, and offloader. All offloading facilities would be removed after the Project is complete. Pile driving for the offloader would occur over several days; as discussed previously, the total pile driving time is estimated to comprise 30 minutes or less over this period.

At Eden Landing, noise sensitive species, including Ridgway's rail and California black rail may be present in the marsh outboard of Pond E1. These potential sensitive receptors are far enough away that noise levels due to pile driving at the offloader location would attenuate to less than 55 dBA. The potential intermediate booster pump locations would be further from sensitive habitat areas, and noise effects from pile driving would therefore be less than significant.

The offloader and booster pumps would operate for up to 24 months over 4 years (i.e., during 4 dredging windows). Potential noise levels at the closest sensitive wildlife receptors would be less than 45 dBA. This impact would be less than significant.

<u>Impact 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.</u>

The sediment transfer pipeline would be placed on mudlflats, tidal marsh and upland levee habitat. The pipeline would have a short term impact to this habitat as described in Impact BIO-1 but would not be expected to have a significant effect on any unique plant communities or substantially affect the diversity of a native species. Construction equipment would comply with regulations intended to minimize the spread of invasive nonnative species and the placement of the pipeline on the levee would not be expected to spread terrestrial invasive species. The impact would be less than significant.

<u>Impact 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, or introduction or substantial spread of invasive nonnative plants or wildlife, or other means.</u>

The Project activities at this placement site would consist of the construction of the offloader, booster pumps, and sediment transfer pipeline crossing South San Francisco Bay. The approximately 24- to 36-inch pipeline would cross mudflat, tidal marsh and subsequently upland levee habitat to the discharge point at the top of the levee. Construction of the pipeline may require a work area up to 1,000 square feet. The Project would be designed to avoid or minimize placement of the pipeline in tidal marsh habitat. If the pipeline cannot avoid the marsh area, it is expected that the vegetation in the area would readily recolonize after the pipeline is removed and there would be no long term impacts. The potential impact from the pipeline alignment in the tidal marsh habitat is small when compared to the nearby habitat in the vicinity of the Eden Landing sediment delivery location. The temporary disturbance to the tidal marsh habitat is expected to be minimal.

<u>Impact 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.</u>

The Project would block movement of some terrestrial wildlife along the levee; however, the individual animals could use other parts of the site to maneuver around the pipe, if necessary. In addition, the construction period would be short. Therefore the impact is expected to be less than significant.

<u>Impact BIO-5: Conflict with any local policies or ordinances protecting biological resources.</u>

Alameda County and the City of Hayward have policies to protect natural habitats and plant and wildlife communities (***Appendix G***). The Project is not expected to conflict with local policies or ordinances and therefore there is no impact from the Project.

Mitigation Measures

Mitigation Measure BIO-M7: Construction Schedule and Sequencing

To the extent possible schedule and sequence construction so that construction of offloading facilities occurs outside the breeding season for bird species that may occur within the Project area and that are protected by the ESA or MBTA. If construction activities are scheduled to occur during the breeding season, within 14 days prior to construction, a qualified, USFWS-approved biologist shall complete a survey of all potential nesting habitat within 500 feet of the proposed dredged sediment pipeline alignment, and any other portion of the placement site(s) required for dredged sediment delivery.

The same nesting survey requirements shall apply when dredging is scheduled to occur within 500 feet of potential nesting habitat for these sensitive bird species. If active nests are found during pre-construction surveys, consultation with USFWS shall occur to determine potential project impacts (including noise impacts) and the appropriate course of action. This could potentially include establishing buffer zones, relocating individuals and nests, temporal restrictions (i.e., rescheduling construction activities), and/or restrictions on placement of the dredged sediment delivery pipeline.

Mitigation Measure BI0-M8: Rail Surveys and Noise Windows

If noise levels from construction or operations at any of the placement sites and/or dredging could exceed ambient levels at tidal marsh habitat in the vicinity of the placement sites, a qualified biologist shall determine if the habitat is known or suitable Ridgway's rail or California black rail habitat. If the habitat is known Ridgway's rail or black rail habitat, no noise generating activities that could exceed ambient levels ("excess noise") shall occur during the breeding season (February 15 through August 31) for these species.

If suitable habitat is present, but it is unknown whether these species are present, either excess noise shall be avoided during the breeding season, or protocol level surveys shall be conducted during the appropriate period prior to the scheduled construction or sediment delivery effort. If the surveys determine that no rails are present, then work may proceed without restrictions. If rails are determined to be present, the habitat is then considered known rail habitat.

Excess noise may be avoided through scheduling work outside of the breeding season, or implementing noise controls as determined by the regulatory agencies such as shielding the pumps, installing mufflers, and enclosing pumps.

Mitigation Measure BIO-M9: Pre-Construction Special Status Wildlife Surveys

Special status wildlife surveys shall be completed by a qualified, USFWS-approved biologist within 14 days prior to construction of both dredged material offloading and delivery facilities. The survey areas shall include all portions of the placement sites within 500 feet of any construction areas. The survey shall include a survey for all special status species (e.g., salt marsh wandering shrew, salt marsh harvest mouse), nests and other breeding habitats (e.g., rodent burrows) as well as unique habitat features required by special status species potentially occurring within the construction areas. If special status species, nests, or unique habitat features are encountered, avoidance and/or relocation measures shall be established and implemented; the measures shall be defined through consultation with USFWS. Measures may include establishing exclusion and buffer zones within the construction area, trapping and relocating individuals, or temporal restrictions (i.e., avoiding construction during the breeding season).

Alternatively, special status species may be assumed to be present, and avoidance measures implemented to avoid take of special status species. This may include hand-clearing areas of pickleweed marsh, installation of exclusion fencing, and/or other measures as appropriate.

A.6 Cultural Resources

Affected Environment

This section identifies and evaluates issues related to cultural and paleontological resources. The "Affected Environment" discussion below describes the current setting of the action area. The purpose of this information is to establish the existing environmental context, or background, against which the reader can understand the environmental changes caused by the action. The environmental setting information is intended to be directly or indirectly relevant to the subsequent discussion of impacts. For example, the setting summarizes the pre-history and history of the Bay's shoreline and in-water areas because the action could affect cultural and historical resources in those areas.

The proposed Project would not affect any existing structures either directly or through new elements (such as new construction) that could affect the setting of the built environment. Therefore, only the potential effects of the proposed Project to archaeological and paleontological resources are evaluated. The proposed Project is proposing the deepening of the berthing areas - not widening.

The Project boundary for the analysis in this document is from the dredging location at the Redwood City Harbor and San Bruno Shoal Channels to the top of the levees at the placement sites. No offshore areas would be affected by the Project, with the exception of specific areas of disturbance at the dredging and placement sites as described below. The study area includes the San Francisco Deep Ocean Disposal Site (SF-DODS), as well as the waters that would be used by vessels traveling to the disposal sites and pipelines that could be used to transport dredged materials to the Eden Landing or Alviso disposal sites. All of the areas on the land where dredged material would be placed and associated areas of disturbance are not part of the study area and have been evaluated for environmental impacts already by previous CEQA/NEPA documents (USFWS & CDFW 2007, USACE & SCVWD 2014). 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 (USACE & RWQCB 2014).

Areas of Disturbance at Placement Sites

1. Montezuma Wetlands Restoration Site: No analysis regarding cultural resources is required for this existing placement site. A CEQA/NEPA document was already prepared for this site (USACE & RWQCB 2014).

2. Cullinan Ranch Tidal Restoration Site: No cultural resources analysis is required for this site on the land where dredged material would be placed, as it is not part of the study area and was already analyzed in previous CEQA/NEPA documents (USFWS 2009, SLC 2012, USACE and RWQCB 2014). The Project may install the off-loader and pipeline leading from the off-loader to the disposal location. Potential disturbance areas would, therefore, include the off-loader locations (there are two options) and pipeline alignments (also two options). The Project may be required to electrify the southern off-loader.

3. Eden Landing: No analysis regarding cultural resources is required for this site on the land where dredged material would be placed, as it is not part of the study area and was analyzed in previous environmental documents (USFWS and CDFW 2007, USACE 2014a). The Project would use one of two options for dredged sediment delivery:

a. Option 1: The Project would construct an off-loader, which would be located in approximately eighteen feet of water, including a scow tie up location, and a pipeline from the off-loader to the levee. The work would require limited pile driving and possibly limited excavation to lay pipe through outboard mudflats/marsh. It is not known if the pipeline would be submerged or floating, or a combination of the two. In addition, booster pumps would also be required and could be located at the off-loader or on-shore (on the levee); or.

b. Option 2: The Project would use a hydraulic dredge and pump material directly from RWC and/or SBS Channels to Eden Landing, through a (most likely) submerged pipeline. Booster pumps would also be required and be located at the dredge location and on the levee. If material is pumped from SBS Channel, intermediate booster pumps would also be required.

4. Alviso: No analysis regarding cultural resources is required for this site on the land where dredged material would be placed, as it is not part of the study area and was analyzed in previous environmental documents (USFWS and CDFW 2007, USACE 2014a). The two options described above for Eden Landing would also apply to this location, although the Alviso site is too far from SBS Channel to allow direct pumping from that dredging site. There would be two locations where sediment delivery could occur: at Ponds A1/A2W, and at Pond A9.

The Eden Landing and Alviso disposal sites were previously analyzed for impacts to cultural resources caused by the South Bay Salt Pond Restoration Project in that Project's EIS/EIR and in earlier analyses described in that report (USFWS and CDFW 2007). In addition, the Alviso disposal site was analyzed for impacts to cultural resources in the Draft Interim Feasibility Report and EIS/EIR for the South San Francisco Bay Shoreline Phase I Study (USACE 2014a).

Terminology

The following definitions are common terms used to discuss the regulatory requirements and treatment of cultural resources:

Cultural resources is the term used to describe several different types of properties: prehistoric and historical archaeological sites; architectural properties such as buildings, bridges, and infrastructure; and resources of importance to Native Americans or other groups of people.

Historic properties is a term defined by the National Historic Preservation Act (NHPA) as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on, the National Register of Historic Places (NRHP), including artifacts, records, and material remains related to such a property.

Historical resources as described in the California Environmental Quality Act (CEQA) include buildings, sites, structures, objects, or districts, each of which may have historical, prehistoric, architectural, archaeological, cultural, or scientific importance, and is eligible for listing or is listed in the California Register of Historical Resources (CRHR) or a local register of historical resources. The CRHR includes resources listed in or formally determined eligible for listing in the NRHP, as well as some California State Landmarks and Points of Historical Interest.

Paleontological resources are defined as including fossilized remains of vertebrate and invertebrate organisms, fossil tracks and trackways, and plant fossils. A unique paleontological site would include a known area of fossil-bearing rock strata.

Physical Setting

This section summarizes the ethnographic and historic settings of the general area and discusses in more detail the prehistoric and historic resources relevant to the Project area. Due to the long-term history of navigation on San Francisco Bay, and the navigational challenges posed by San Francisco Bay, there are numerous shipwrecks in the Bay. This section analyzes effects to archaeological sites and sunken vessels.

The analysis for this Project consisted of reviews of historical research and archaeological surveys conducted by the USACE and USFWS in recent years and reviews of information on shipwrecks produced by the California State Lands Commission (SLC), National Parks Service (NPS), and the National Oceanic and Atmosphere Administration (NOAA). The environmental documents reviewed include the following:

- Draft South San Francisco Bay Shoreline Phase I Study EIS/EIR, (USACE 2014a)
- South Bay Salt Pond Restoration Project Final EIS/EIR, (USFWS and CDFW 2007b)
- Draft EA/EIR, Maintenance Dredging of the Federal Navigation Channels in San Francisco Bay, Fiscal Years 2015-2024 (USACE and RWQCB 2014)

As stated in USACE & RWQCB 2014:

> *The USACE has established policy and procedures for conducting underwater surveys for maintenance dredging and disposal activities (USACE 1989). The USACE is directed to make a reasonable and good faith effort to identify submerged cultural resources that may be affected by project implementation. Typically, the review of project documents and research of historical records and other sources is sufficient to determine what the potential is for submerged sites to be present and whether there would be an effect. The policy states that underwater surveys to identify archaeological sites are not required within the boundaries of previously dredged channels or previously used disposal areas unless USACE determines that there is a good reason to believe that such resources exist, and that they would be altered or destroyed as a result of project implementation.*

Prehistoric Setting

San Francisco Bay San Pablo Bay, and surrounding marshlands and uplands were used extensively by humans during prehistoric and historic times. Before circa A.D. 1770, at the time of the first major European contact, the San Francisco Bay region was occupied by Coast Miwok, Patwin, Bay Miwok, and Costanoan/Ohlone Native American people. The Costanoan/Ohlone population in 1770 has been estimated at 7,000. Archaeological remains related to the prehistoric occupation of the area are evidenced by hundreds of shellmounds and occupation sites that lined the shores of the San Francisco, San Pablo, and Suisun Bays. Native people were known to produce and use the naturally-occurring salt that exists along the bay. The locations of these shellmounds approximately follow the current shoreline, but also line major tributaries feeding into the Bay (Moratto 1984).

During the last major ice age, the Bay was well above sea level and was the site of converging river valleys that drained through the Golden Gate and towards the continental shelf. The most recent filling of San Francisco Bay occurred during the past 10,000 years. Glacial melt began approximately 15,000 years ago and the Bay began filling around 10,000 to 11,000 years before present (B.P.). By 8,000 years ago, marine waters had begun to enter San Francisco Bay. Sea levels rose rapidly until approximately 6,000 B.P. and have continued to rise more slowly since then. Rising Bay levels may account for submerged archaeological sites (Moratto 1984).

Shellmounds are mounds or deposits containing shells, animal bones, and potentially human remains and other evidence of pre-historic settlement of an area. Many of the shellmounds known to be located around the Bay have been found in close relationship with marshy areas. A number of known shellmounds stand partially below current sea level, indicating that their accumulations began during lower water level occurrences in the past. Given the long duration both of the Bay water rise and human occupation of the shore zone, it is likely that earlier use and occupation sites, such as shellmounds, are present below current sea levels (Moratto 1984).

The configuration of the Bay shoreline has also changed in the last one hundred and fifty years or so due to the deposition of gold mining sediments flowing downstream from hydraulic mining locations, agriculture, the narrowing of river channels through levee construction, construction of salt ponds, development of "man-made land," and more modern construction and fill near the shore. It is estimated that 875 million cubic meters of sediment were deposited in the Bay from 1850 to 1914, as a result of mining in the Sierra Nevada foothills (Moratto 1984).

Historic Setting

Spanish Time Period

Spanish explorers are said to have first visited the entrance to the Bay in 1769. Travel from the sea into the Bay first occurred in 1775. Spanish exploration in the late 1700s and in the 1800s led to the establishment of permanent settlements along the coast of California, mostly in the form of missions. No buildings or structures directly related to the Spanish explorers remain in the Redwood City area, however. Spanish explorers came into increasing contact with Native Americans in the first half of the 1770s as expeditions were led through the region. In 1776, construction of the San Francisco Presidio and the mission of Our Seraphic Father San Francisco de Asís were begun in Yalamu territory near the northern end of the San Francisco peninsula. Later that year, the mission of Our Seraphic Mother Santa Clara began construction in Tamien territory to the south, and a small civilian settlement was begun near Mission Santa Clara, which was established in 1777 (USFWS 2008b, City of Redwood City 2010b, USACE 2014e).

Mexican Time Period

Mexico gained independence from Spain in 1821 and California changed from Spanish to Mexican control. Due to the relaxation of trade restrictions, merchant ships, occasional whalers, and warships from the United States and from Europe began freely entering the Bay. The change to Mexican independence brought new laws, administrators and a shift of power from missionaries to secular governors and ranching families. The decline of the missions allowed for the rise of extensive ranching along the California coast as well as the Sacramento Valley area. What was Native American land became more than 500 land grants (Ranchos) distributed to prominent California families. Then followed a time period of skirmishes and battles between the Mexican army and Native Americans. This and parceling of the land into Ranchos, along with epidemics of small pox and malaria that spread through Native populations resulted in the further decimation of the Native population and culture (Paddison 2015, Sturtevant 1978, USACE 2014e).

American Time Period

California became a part of the United States as a result of the Mexican-American war that ended in 1848. During the Gold Rush (lasting from 1849 to approximately 1855), there was a large population increase of immigrants and gold seekers to California. Redwood City developed into an important shipping point during this time. Lumbermen and merchants realized that the "Redwood Embarcadero," as it was then known, would be a good shipping point for their goods. Industrial growth continued along the tidelands, along with residential and commercial building. Redwood City was incorporated in 1868 and a modern deep water port was ultimately created in 1937. The Gold Rush resulted in a large increase in ships traveling into the Bay and San Francisco became a major city and port. Commercial fishing began with whaling and salmon fishing in the 1850s with the fishing and shrimping growing into major industries. Ferries became popular ways to travel throughout the Bay Area until the construction of train and car bridges, which caused people to switch modes of travel (City of Redwood City 2010a, USACE 2014e).

<u>Placement Sites</u>

The wetland areas in the Bay were originally open marshes used by Native people and wildlife. The tidelands around San Francisco and San Pablo Bays remained undeveloped until the 1850s-1860s, but were transformed in the 1870s with the reclamation of much of the tideland under the 1868 Green Act. By the early 20th century, levees enclosed nearly all of the marshes around the Bay. New land uses included salt production, ranching and farming, duck hunting, and urban infrastructure including roads. Many former agricultural and salt pond areas around the Bay and associated waterways are now being converted back to tidal marshes and wetlands using dredged material from other projects in the Bay Area (USACE 2005, San Francisco Estuary Institute 2015, Save the Bay 2015, Ducks Unlimited 2015.)

Shipwrecks in San Francisco Bay

Since its exploration by Spanish navigators in 1769, the Bay has been the site of numerous shipwrecks. SLC has created a database of more than 1,500 shipwrecks off the coast of California and within bays and waterways. The sailing conditions off of the Golden Gate are known to be difficult and for many ships, the waters of the Bay became a final resting place. Many ships were lost due to explosions, collisions, and sabotage. Others lost in the Bay were grounded or sunk intentionally (Office of Coast Survey 2015, SLC 2015, Sonoma State University 2015.) The ship wrecks in the SLC database occurred between 1540 and about 1990; the database includes the approximate latitude and longitude and other available information for each one. In addition, the NOAA Automated Wreck and Obstruction Information Center includes over 13,000 listed shipwrecks and obstructions. Also, the National Park Service maintains a list of shipwrecks that are on the NRHP.

Paleontological Setting

Paleontological resources provide indirect evidence of the form and activity of ancient organisms. Such locations and specimens are important nonrenewable resources. A search of the University of California Museum of Paleontology paleontological database did not identify any previously identified paleontological resources in the study area. Within San Mateo County the search revealed 905 identified paleontological localities. Specimens could be buried in Bay sediments as the Bay region contains a diverse record of geologic history. There may be a potential for the inadvertent discovery of unique paleontological resources during dredging activities (University of California Berkeley 2015, USACE 2014e).

Previous Studies

A draft Environmental Assessment (EA) prepared by the USACE in August 2014 analyzed the routine maintenance of dredging in the Redwood City Harbor federal channels. That Project entailed dredging to previously-dredged depths and concluded that routine maintenance dredging was not expected to affect cultural resources. No known cultural resources were identified in the channels or the maneuvering areas. That study stated “should dredging activity reveal any artifact of archeological or historical interest, work in the vicinity of the archeological or historical interest will cease. A qualified USACE archaeologist will evaluate the significance of the find and carry out the appropriate actions in accordance with federal laws and Regulations. Work in the area in question will not be allowed until the archeologist has given clearance to proceed” (USACE 2014b).

A draft EA/EIR was prepared by the USACE and the and the RWQCB in December 2014, which analyzed maintenance dredging of the federal navigation channels in and around the Bay, for fiscal years 2015-2024. That Project also proposed dredging at previously-dredged depths and found that because “no known paleontological, archaeological, or historical resources within the federal navigation channels or existing placement sites, no impacts are expected to result from the project alternatives" (USACE and RWQCB 2014).

Results of Shipwreck Search

There are three primary sources of information on shipwrecks – the SLC database, the NOAA Information Center, and NPS's list of shipwrecks on the NRHP. The SLC database contains more than 1,500 records and provides a list of shipwrecks by county. It is based primarily on historical accounts of the ships, such as name of ship, year sunk, reason for sinking, and approximate locations. The data describe potential resource locations, as exact locations may not be known (SLC 2015). NOAA's Automated Wreck and Obstruction Information Center includes over 13,000 listed shipwrecks and obstructions.

All three databases were searched for any known shipwrecks located in the areas that would be affected by the RWC Project. No shipwrecks on the NPS NRHP list are located in the area that would be affected by the Project; the NOAA database identified two locations. SLC staff searched the database and their records for shipwrecks. Three locations were identified in the SLC database. Some shipwrecks have been salvaged through time and the SLC database does not indicate if such salvaging took place. It is possible that shipwrecks identified were salvaged or even demolished to reduce risks to ship traffic. Dredging has taken place in the federal shipping channels and this dredging could have removed evidence of shipwrecks in that area (Office of Coast Survey 2010, NPS 2015). Two shipwrecks were located as existing at the eastern Alviso sediment delivery area, on the eastern shore of Alviso Slough, north of the area where a sediment delivery pipeline would terminate (Office of Coast Survey 2010.) The Project would be constructed south of this area; however, thereby avoiding the two shipwrecks. The pipeline route from the cutterhead dredge to either the Alviso or Eden Landing placement sites has not been defined. However, the pipeline would be routed to avoid any shipwrecks through implementation of the cultural resources protection plan (see ***Section 4.2.3.2.1 of the Main Integrated Report***).

The five shipwrecks that could potentially be affected by the Project as shown in ***Table A-10.***

Table A-10. Shipwreck Data

Channel/Placement/ Pipeline Site	Ship Name/Reason for Sinking	Year Sunk	County	Latitude	Longitude	Source
Redwood City Harbor/Docks	City of Glendale (Fishing Schooner) – Possible Arson	1921 [1]	San Mateo	37deg 31'00"N (DecLat = 37.5167)	122deg 12'20"W (DecLong = -122.206)	SLC database
Redwood City Harbor where it meets the Bay/San Francisco Bay	Morgan Shell (Tugboat) – Burned[2]	1951	San Mateo	37deg 31'53"N (DecLat = 37.5314)	122deg 11'29"W (DecLong = -122.191)	SLC database (likely taken from NOAA database)
Redwood City Harbor where it meets the Bay/San Francisco Bay	Manana – Exploded[3]	1969	San Mateo	37deg 32'00"N	122deg 11'27"W	NOAA database
San Bruno Shoal Area/Between Redwood City and San Francisco	Echo (Sloop or Schooner) – Foundered[4]	1879	San Mateo	37deg 37'30"N (DecLat = 37.625	122deg 17'30"W (DecLong= -122.292)	SLC database
South of the San Mateo Bridge/San Francisco Bay (Potential Pipe Location for Alviso Disposal Site)	USS Thompson (DD 305) – Sunk as Target[5]	1944	San Mateo	37deg 33' 10"N (DecLat=37.55299	122deg 9'27.882"W (DecLong=-122.157745	NOAA database

[1]The ship may not have sunk, as a 1921 magazine account of the incident stated that it had "slight damage." (Wise 1921) Also described as having been "Burned at dockside at Redwood City, a victim of arson." (Marshall 1978)

[2]SLC Database notes that "Wreck salvaged except for engine block. Vessel reported silting up, and that engine would be below mudline by 1995" (California State Lands Commission 2015).

[3]NOAA Database notes that "vessel exploded and sank in 1969…no portion of the hull or cabin are intact…wreck should be appropriately charted as wreckage" (Office of Coast Survey 2010).

[4]The ship is said to have "Foundered and sank between Redwood City and San Francisco" (Marshall 1978). SLC database location radius for the shipwreck site is 8,000 square feet, a large and imprecise location.

[5]The ship was a Clemson-class destroyer of the U.S. Navy named in honor of Richard W. Thompson. It was sunk for military target practice and is now known as the "South Bay Wreck" (Wikipedia 2015, Navsource Naval History, 2015).

Significance Thresholds

The NRHP is the nation's master inventory of historic places deemed worthy of preservation. The NRHP is administered by the NPS and includes listings of buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the national, state, or local level. Structures, sites, buildings, districts, and objects over 50 years of age can be listed in the NRHP as significant historic resources. However, properties under 50 years of age that are of exceptional importance or are contributors to a district can also be included in the NRHP.

National Register criteria applied to evaluate the significance of cultural resources are defined in 36 Code of Federal Regulations (CFR) 60.4 as follows:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and
>
> 1. that are associated with events that have made a significant contribution to the broad patterns of history;
> 2. that are associated with the lives of persons significant in our past;
> 3. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> 4. that have yielded or may likely yield information important in prehistory or history.

Integrity refers to a property's ability to convey its historical significance. There are seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. The importance and applicability of these qualities depend on the historical significance of the resource and the nature of its character-defining features (NPS 1997).

Under federal regulations (36 CFR 800.5), an adverse effect occurs when a project alters directly or indirectly, any of the characteristics of a historic property that qualifies that project for inclusion on the NRHP in a way that diminishes the integrity of the property. Adverse effects on historic properties include, but are not limited to, the following (36 CFR 800.5):

- physical destruction of all or part of the property;
- alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, and hazardous material remediation, that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties;
- removal of the property from its historic location;
- change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; or

- introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

Significance Thresholds under CEQA

State historic preservation regulations affecting this Project include the statutes and guidelines contained in CEQA, under PRC Sections 20183.2 and 21084.1 and Section 15064.5 of the CEQA Guidelines. Per CEQA, public agencies must consider the effects of their actions on both "historical resources" and "unique archaeological resources." Pursuant to PRC Section 21084.1, a "project that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant effect on the environment."

"Historical resource" is a term with a defined statutory meaning (PRC, Section 21084.1; determining significant impacts to historical and archaeological resources is described in the State CEQA Guidelines, Section 15064.5 [a], [b]). Under State CEQA Guidelines Section 15064.5(a), historical resources include the following:

1) A resource listed in, or determined to be eligible by the State Historical Resources Commission, for listing in the CRHR (PRC, Section 5024.1).
2) A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the PRC or identified as significant in a historical resource survey meeting the requirements of Section 5024.1(g) of the PRC, will be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3) Any object, building, structure, site, area, place, record, or manuscript which a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource will be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing in the CRHR (PRC, Section 5024.1), including the following:
    a. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
    b. is associated with the lives of persons important in our past; or
    c. embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or may be likely to yield, information important in prehistory or history.
4) The fact that a resource is not listed in, or determined to be eligible for listing in the CRHR, not included in a local register of historical resources (pursuant to Section 5020.1(k) of the PRC), or identified in a historical resources survey (meeting the criteria

in Section 5024.1(g) of the PRC) does not preclude a lead agency from determining that the resource may be an historical resource as defined in PRC Section 5020.1(j) or 5024.1.

As noted above, CEQA also requires lead agencies to consider whether projects will impact "unique archaeological resources." Public Resources Code Section 21083.2, subdivision (g), states that " 'unique archaeological resource' means an archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1) contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
2) has a special and particular quality such as being the oldest of its type or the best available example of its type; or
3) is directly associated with a scientifically recognized important prehistoric or historic event or person."

Following Public Resource Code Sections 21083.2 and 21084.1, and Section 15064.5 and Appendix G of the State CEQA Guidelines, cultural resource impacts are considered to be significant if implementation of the project considered would result in any of the following:

1) Cause a substantial adverse change in the significance of a historical resource as defined in PRC section 21084.1 and CEQA Guidelines section 15064.5, respectively;
2) Cause a substantial adverse change in the significance of an archaeological resource as defined in Public Resources Code section 21083.2, 21084.1, and CEQA Guidelines section 15064.5, respectively;
3) Directly or indirectly destroy a unique paleontological resource or site or unique geological feature; or
4) Disturb any human remains, including those interred outside of formal cemeteries.

For purposes of CEQA (and NEPA), to determine whether cultural resources could be significantly affected, the historical significance of the resource itself must first be determined. Section 15065 of the CEQA Guidelines mandates a finding of significance if a project would eliminate important examples of major periods of California history or prehistory. CEQA Guidelines Section 15064(b), defines a significant impact to historical and cultural resources as the following: "[S]ubstantial adverse change in the significance of a historical resource means physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of the resource would be materially impaired."

Environmental Consequences

This section identifies environmental effects associated with deepening the channels and use of each of the placement sites, describes how they would occur, and prescribes mitigation measures to reduce significant impacts.

Methods and Assumptions for the Effect Analysis

The study area was reviewed for the existence of cultural resources through the review of CEQA/NEPA documents that already evaluated impacts to cultural resources, including the following:

- Draft South San Francisco Bay Shoreline Phase I Study EIS/EIR (USACE 2014a) http://www.valleywater.org/SSFBS-DEIR.aspx
- South Bay Salt Pond Restoration Project Final EIS/EIR (USFWS and CDFW 2007) http://www.southbayrestoration.org/EIR/downloads.html)
- Draft EA/EIR, Maintenance Dredging of the Federal Navigation Channels in San Francisco Bay, Fiscal Years 2015-2024 (USACE and RWQCB 2014) http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/dredging/Fed%20Nav%20Channels_DEAEIR_Dec2014.pdf)

In addition, the three shipwreck databases were searched for any known shipwrecks located in the areas that would be affected by the Project. Since the Project's actions do not propose demolition of existing structures or the introduction of features that would be incompatible with the historic setting of the built environment, and the effects on the land-ward side of levees is not part of the study area and, only the effects of the Project on submerged archaeological and paleontological resources were evaluated. The significance of effects was determined based on the historical significance of the resource affected and the type of potential impact.

Dredging Options

The proposed dredging options would result in deepening of the RWC and SBS Channels. Impacts to cultural resources would be similar under all three dredging alternatives, and all three dredging options are therefore addressed as a group.

Impact CUL-1: Cause a substantial adverse change in the significance of a historical resource.

The proposed dredging options would not result in the demolition of existing structures or the introduction of features that would be incompatible with the historic setting of the built environment. Therefore, no effects to historical resources would occur.

Impact CUL-2: Cause a substantial adverse change in the significance of an archaeological resource

Shipwrecks

Dredging Guidance Letter No. 89-01, USACE, March 13, 1989, established policy and procedures for conducting underwater surveys for maintenance dredging and disposal activities. The Letter indicates that the USACE is to make a reasonable and good faith effort to identify submerged cultural resources that may be affected by a USACE project. The policy states that underwater surveys to identify archaeological sites are not required within the boundaries of previously dredged channels or previously used disposal areas unless the USACE finds that there is a good reason to believe that such resources exist, and that they would be altered or destroyed as a result of project implementation (USACE 2104b). The proposed action evaluated in this document entails deepening and widening in some areas, as well as pipeline construction (relocation) outside of the existing channel footprint at SBS Channel in addition to dredging within the existing footprint of the channel.

No known shipwrecks are located within the federal navigation channels (USACE 2104b). However, five shipwrecks were identified as potentially existing near or within the dredging and pipeline construction areas: the City of Glendale, Morgan Shell, Manana, Echo, and USS Thompson (DD 305).

The City of Glendale was a fishing schooner, said to have been sunk in 1921. However, research indicates that it may have survived the arson incident and may not have sunk (Wise 1921). This ship was said to have been located at dockside (Marshall 1978) and its GPS coordinates place it along the south side of the channel at the land's edge. The proposed action would be located entirely in the water area of the RWC channel; therefore, it does not appear that the proposed Project would affect the ship, if it still exists in that location.

The Morgan Shell is a tugboat that that burned and sunk in 1951. It is located east of Bair Island in the Bay near to the mouth of RWC Channel. The SLC database notes that "wreck salvaged except for engine block. Vessel reported silting up, and that engine would be below mudline by 1995" (SLC 2015). The Manana exploded and sunk in 1969 and is located near the Morgan Shell. The NOAA database notes that "vessel exploded and sank in 1969…no portion of the hull or cabin are intact…wreck should be appropriately charted as wreckage." It also states that "Wood and metal debris protruding 1ft out of the mud uncovers 2 ft at [mean lower low water] within a 5m radius of the surveyed position of lat 37-32-09. 9n, long 122-11-17.9w." Due to the poor condition of the two shipwrecks and that either or both were salvaged, they would appear to not qualify as historic under the NRHP or CEQA, due to a lack of integrity of materials. In addition, even if the ships were more intact, they do not appear to be eligible for the NRHP or the CRHR on any of the four criteria. However, more detailed analyses would need to be completed to evaluate the historical significance of the two shipwrecks, and potentially further environmental review, if it is determined that they would be affected by the proposed Project.

The Echo is known as either a sloop or schooner in SLC records. It foundered and sank in 1879 between Redwood City and San Francisco in the San Bruno Shoals area. The SLC database location radius for the shipwreck site is very large, at 8,000 square feet, indicating an imprecise location. Research in historical newspapers has failed to reveal other information regarding the shipwreck or a more precise location. However, from reviewing the location as described in SLC records, it would appear to exist east of the proposed Project area in and near the San Bruno Shoals. Due to the lack of information about this shipwreck, a determination of historical significance is not possible without further research. If it is determined that the proposed

Project would affect this shipwreck, an evaluation of historical significance would be required to be completed, and potentially further environmental review.

The USS Thompson (DD-305) is a U.S. Navy Clemson-class destroyer named in honor of Richard W. Thompson. The keel of the USS *Thompson* was laid down on 25 September 1918, at San Francisco, by the Bethlehem Steel Corporation. The ship was launched on 15 January 1919, was commissioned at the Mare Island Naval Shipyard in Vallejo on 16 August 1920. It was decommissioned in April, 1930 and sold for scrap in June of the same year. The ship was bought by a private party and turned into a floating restaurant in lower San Francisco Bay during the 1930s. In 1944, the Navy purchased the ship from the new owner, is said to have salvaged features of it, and intentionally sunk it in a mudflat in the Bay, where Army and Navy aircraft used it for practice bombing runs with dummy bombs. The ship is now commonly known as the "South Bay Wreck." It is located within San Mateo County south of the San Mateo Bridge and is a popular location for recreational kayakers to visit. The shipwreck is potentially within the location where a pipeline could be placed to transport the dredged material to the Alviso disposal site. (Wikipedia 2015, Navsource Naval History 2015)

The USS Thompson may be considered to be eligible for the NRHP as a shipwreck, although it is not intact, presumably due to salvaging activities and use for military bombing practice. Its shape and form are still discernable, however. The term "shipwreck" is defined by the NPS in National Register Bulletin 20 as "A submerged or buried vessel that has foundered, stranded, or wrecked. This includes vessels that exist as intact or scattered components on or in the sea bed, lake bed, or river bed, mud flats, beaches, or other shorelines, excepting hulks." A "hulk" is defined as a "substantially intact vessel that [is] not afloat…"

The USS Thompson shipwreck may be considered eligible for the NRHP under criterion A - it is associated with "events that have made a significant contribution to the broad patterns of our history." Under Criterion A, a shipwreck may qualify for listing in the NRHP through her association with the historic theme of the military and naval warships (United States National Parks Service 1992). In addition, it may be considered to be a "submerged historic resource," per PRC 6313. More research would need to be completed to determine if the shipwreck would be considered historically significant under federal and/or state guidelines; however, the shipwreck appears to be eligible for the NRHP, and therefore, the CRHR. In addition, the effects on the USS Thompson are further regulated by the SMCA, which states that the Navy's sunken military craft remain property of the U.S. regardless of their location or the passage of time and may not be disturbed without permission from the U.S. Navy.

Impacts of pipeline relocation adjacent to SBS Channel would be considered a potentially significant effect on the shipwrecks. Mitigation measures CUL-M1, CUL-M2, and CUL-M3 listed at the end of this section under ***A.6.4 Mitigation Measures*** would mitigate for the potentially substantial adverse change in the significance of archaeological resources and the impacts would be less than significant.

Other Archaeological Sites

The proposed action evaluated in this document entails deepening and widening in some areas, in addition to dredging and the potential relocation of fuel pipelines within the Bay. The exact location of the areas of disturbance is not fully known at this time. Previously dredged areas, such as shipping lanes and maneuvering areas have already altered the Bay floor, so that any submerged cultural resources in those areas would have been severely damaged or destroyed. In sediments not previously disturbed, it is possible that archaeological resources would be disturbed by the proposed Project.

The inadvertent discovery of archaeological materials would be considered a potential significant impact. However, the following measures are incorporated to mitigate any potential impacts to Native American and historical archaeological resources (including shipwrecks), in the event that unanticipated archaeological remains were encountered during construction and dredging activities.

Mitigation Measure CUL-M4 is listed at the end of this section under A.6.4 Mitigation Measures and would mitigate for the potentially substantial adverse change in the significance of other archaeological resources. Under all dredging options, the inadvertent discovery of archaeological materials during Project activities represents a potential impact; however, implementation of Mitigation Measures CUL-1through CUL-4 would reduce the potential to result in impacts to archaeological resources to a less-than-significant level.

<u>Impact CUL-3: Directly or indirectly destroy a unique paleontological resource or site or unique geological feature</u>

The likelihood of the proposed Project affecting any significant paleontological resources is minimal due to the nature of the sediment to be dredged. The sediment would be Bay Mud, which would have accumulated in the past 6,000-7,000 years. However, the disturbance of paleontological resources would be considered a potentially significant impact. Therefore, a mitigation measure has been added to reduce the level of impact, in the event that paleontological resources were encountered during the construction of the proposed Project.

Under all dredging options, the inadvertent discovery of paleontological resources during Project activities represents a potential impact; however, implementation of Mitigation Measure CUL-M5 (see ***Section A.6.4***) would reduce the potential to result in impacts to paleontological resources to a less than significant level.

<u>Impact CUL-4: Disturb any human remains, including those interred outside of formal cemeteries</u>

No evidence of human remains is known to exist for the study area. However, it is possible that human remains could be inadvertently uncovered with proposed Project implementation. Such disturbance of unidentified human remains would be a significant adverse impact.

If human remains of Native American origin are discovered during dredging or pipeline construction, it would be necessary to comply with state laws relating to the disposition of Native American burials, which fall under the jurisdiction of the Native American Heritage Commission (NAHC) (PRC Section 5097). In addition, pursuant to State law (CEQA Guidelines Section 15064.5, PRC 5097.87, and the Health and Safety Code Section 7050.5) Mitigation Measure CUL-M6, be implemented if any human remains are discovered (see ***Section A.6.4***).

Under all dredging options, the inadvertent disturbance of human remains during project activities represents a potential impact; however, implementation of Mitigation Measure CUL-6 would reduce the potential to result in impacts to human remains to a less than significant level.

A.6.1.1 Placement Sites

As stated above for the placement sites, all of the areas on land where dredged material would be placed and associated areas of disturbance are not part of the study area and have been evaluated for environmental impacts already by previous CEQA/NEPA documents (USFWS and CDFW 2007, USACE & SCVWD 2014). Existing placement sites (Montezuma and Cullinan) were also 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 (USACE & RWQCB 2014). No impact from the proposed Project is expected at the Montezuma site because the proposed Project would only deliver material to the offloader; there would be no disturbance of the Bay bottom or shore. Similarly, there would be no disturbance of any structures or intrusion into the seafloor at SF-DODS, and no impacts would be expected at SF-DODS.

Cullinan Ranch Restoration Project

As part of the previous CEQA evaluation, *Addendum to the Final EIR for the Cullinan Ranch Restoration Project* (SLC 2012), for the offloader and related piping at Cullinan the following mitigation measure was required:

> MM CR-3.1. Stop work if subsurface cultural deposits are encountered during Construction Activities. If previously unknown subsurface historic or archaeological artifacts are encountered during deep earth-moving construction activities, work shall halt and the San Pablo Bay National Wildlife Refuge manager shall be immediately notified. A regional archaeologist or similarly qualified individual (under the approval of the USFWS) shall assess the deposits before work resumes in the discovery area.

The proposed Project also proposes the construction of an offloader(s) and related piping with the potential to affect subsurface unknown historic, paleontological and archaeological resources.

<u>Impact CUL-1: Cause a substantial adverse change in the significance of a historical resource</u>

The proposed Project would not result in the demolition of existing structures or the introduction of features that would be incompatible with the historic setting of the built environment. Therefore, no effects to historical resources would occur.

Impact CUL-2: Cause a substantial adverse change in the significance of an archaeological resource

The proposed Project also proposes the construction of an offloader and related piping with the potential to affect archaeological resources. With the implementation of mitigation measures CUL-M4 the impact would be less than significant.

Impact CUL-3: Directly or indirectly destroy a unique paleontological resource or site or unique geological feature

The proposed Project also proposes the construction of an offloader and related piping with the potential to affect unique paleontological resource or site or unique geological feature. With the implementation of Mitigation Measures CUL-M5 the impact would be less than significant.

Impact CUL-4: Disturb any human remains, including those interred outside of formal cemeteries

The proposed Project also proposes the construction of an offloader and related piping with the potential to affect undiscovered human remains. With the implementation of Mitigation Measures CUL-M6 the impact would be less than significant.

Alviso Pond Complex and Eden Landing Ponds

Impact CUL-1: Cause a substantial adverse change in the significance of a historical resource.

The proposed Project would not result in the demolition of existing structures or the introduction of features that would be incompatible with the historic setting of the built environment. Therefore, no effects to historical resources would occur.

Impact CUL-2: Cause a substantial adverse change in the significance of an archaeological resource

For Alviso and Eden Landing, the Project also proposes the construction of an offloader and related pumps and piping, or use of a pipeline from the cutterhead dredge to deliver sediment directly to these placement sites. Both delivery options have the potential to affect unknown archeological resources. No archaeological resources have been identified in the vicinity of the proposed offloader locations. Potential pipeline alignments would be evaluated in the cultural resources protection plan (see ***Section 4.2.3.2.1 of the Main Integrated Report***) to ensure that they avoid any known archaeological resources. Nonetheless, there could be an inadvertent discovery of archeological resources during construction of the offloader and/or pipeline. The inadvertent discovery of archaeological materials during project activities represents a potentially significant impact; however, implementation of Mitigation Measure CUL-4 (see

Section A.6.4) would reduce the potential impacts to archaeological resources to a less than significant level.

<u>Impact CUL-3: Directly or indirectly destroy a unique paleontological resource or site or unique geological feature</u>

For Alviso and Eden Landing, the inadvertent discovery of paleontological resources during Project activities represents a potential impact; however, implementation of the cultural resources protection plan (see ***Section 4.2.3.2.1 of the Main Integrated Report***) and Mitigation Measure CUL-M5 (see ***Section A.6.4***) would reduce the potential to result in impacts to paleontological resources to a less than significant level.

<u>Impact CUL-4: Disturb any human remains, including those interred outside of formal cemeteries</u>

Mitigation Measures

For Alviso and Eden Landing, the inadvertent disturbance of human remains during project activities represents a potential impact; however implementation of Mitigation Measure CUL-M6 (see ***Section A.6.4***) would reduce the potential to result in impacts to human remains to a less than significant level. Mitigation Measures

The following mitigation measures were identified to minimize the proposed Project's effects on cultural resources. With implementation of these measures as described above, potential impacts to cultural resources from the proposed Project would be less than significant.

Mitigation Measure CUL-M1:

To avoid effects of the potential pipeline that could be utilized to transport material to the Alviso site, the site of the USS Thompson shall be avoided by all pipeline construction and laying activities and no part of the site shall be disturbed. The pipeline activities and pipeline location itself shall take place outside of all remains of the shipwreck.

Mitigation Measure CUL-2:

The USACE shall attempt to avoid all known shipwrecks that could be affected by all activities of the implementation of the project, including dredging and pipeline placement. 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. If the activities are proposed to take place in an area that would affect the shipwreck, the USACE shall not complete that part of the proposed action until the shipwreck is evaluated for historical significance and appropriate environmental review is completed.

Mitigation Measure CUL-3:

After the location of the dredging and widening activities is further defined, 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 appropriate environmental review is completed. If the shipwrecks are to be affected by the project and are not found to be historically significant, that conclusion shall be documented using State of California Department of Recreation 523 forms.

Mitigation Measure CUL-4*:*

The USACE or designated person shall inform all personnel connected with construction of the Project of the possibility of finding archaeological resources. These potential cultural and historic resources include fragments of bone, stone tools, structural remains, ship remnants, or historic refuse. If such resources are encountered during project activities, the USACE shall immediately halt all soil-disturbing activities within the area of the find, as appropriate. (If hydraulic dredging and pipeline transportation of dredged materials is utilized, it is recognized that it would be possible for construction personnel to not notice the inadvertent discovery of archaeological remains until the materials arrived at a disposal site.) The USACE archaeologist or other qualified archaeologist who shall then ascertain the nature of the discovery, the significance of the find, and provide proper management recommendations.

Project personnel shall not collect cultural resources found at any time. Prehistoric cultural material includes, but is not limited to, chert or obsidian flakes, projectile points, mortars, and pestles, dark friable soil containing shell and bone dietary debris, heat-affected rock, human burials, shell midden deposits, hearth remains, and stone and/or shell artifacts. Historic material, including but not limited to, ship remains, maritime-related structures and remains with square nails, whole or fragmentary ceramic, glass or metal objects, wood, nails, brick, anchors, barge remnants, dumpsites, or other materials may occur within the project area. Any identified cultural resources shall be recorded on DPR 523 historic resource recordation forms by a qualified archaeologist.

If an archaeological resource cannot be avoided by project activities, the Project 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. The archaeologist shall then conduct an evaluation consistent with the USACE-approved AEP. The methods and findings of the evaluation shall be present in an Archaeological Evaluation and Effects Report, which shall be submitted to USACE for review upon completion.

Mitigation Measure CUL-5:

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. Project personnel shall not collect paleontological resources found. The paleontologist shall consult USACE to determine the procedure that would be followed before work is allowed to resume at the location of the find. If USACE determines that avoidance is not feasible, the paleontologist shall prepare a salvage plan in accordance with the Society of Vertebrate Paleontologist's guidance documents and CEQA Guidelines. The plan shall be submitted to the USACE for review and approval prior to implementation.

Mitigation Measure CUL-6

If human remains are found during project construction activities, the activities shall cease and USACE's project representative shall immediately contact the Coroner of the County in which the remains were found to evaluate the remains, and follow the procedures set forth in CEQA Guidelines Section 15064.5(e)(1). (As discussed earlier, due to the nature of the project, it may not be possible for project personnel to notice the inadvertent discovery of human remains.) If the Coroner determines that the finds are of Native American origin, and therefore not subject to his/her authority, s/he shall notify the NAHC within 24 hours. The NAHC shall identify the most liked descended (MLD) person or a person who may make a recommendation for the means of treating the human remains and any associated grave goods. Per PRC 5097.98, the USACE shall ensure that, according to generally accepted cultural or archaeological standards or practices, the immediate vicinity of where the Native American human remains are located, is not damaged or disturbed by further activity until the USACE has discussed and conferred, with the most likely descendants regarding their recommendations, if applicable, taking into account the possibility of multiple human remains. 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.

A.7 Geology/Soils/Seismicity

Affected Environment

This section describes the environmental setting for geology, soil, and seismicity for the Project. It also includes a brief description of the physical characteristics of sediment in the Project Area. Chemical characteristics of the sediment are discussed in Section 4.4.9, Hazards/Hazardous, Toxic, and Radioactive Waste.

A.7.1.1 Regional Geological Setting

The San Francisco Bay Area is located in the Coast Ranges geomorphic province which is characterized by northwest-southeast trending valleys and ridges. These are controlled bed folds and faults that resulted from collision of the Pacific and North American plates and subsequent strike-slip faulting along the San Andreas fault zone. The Bay Area experienced uplift and faulting in several episodes during late Tertiary time (about 25 to 2 million years ago) that produced a series of northwest-trending valleys and mountain ranges, including the Berkeley Hills, the San Francisco Peninsula, and intervening San Francisco Bay. The Coast

Ranges can be further divided into the northern and southern ranges, which are separated by the San Francisco Bay.

San Francisco Bay lies within a broad depression created from an east-west expansion between the San Andreas and the Hayward Fault systems. The Bay Area is underlain largely by sedimentary rocks of the Franciscan Assemblage (50 to 200 million years old) and Great Valley Sequence (65 to 150 million years old). Much younger rocks and alluvium (less than about 15 million years old) typically overlie these rocks. The thickness of the various historic sediment formations varies throughout San Francisco Bay, but they can be several hundred feet thick overall.

About 10,000 to 11,000 years ago, the rising sea re-entered the bay, and the sediments accumulated rapidly in the emerging San Francisco Bay and the surrounding floodplains. The sediments that now cover the bottom of the bay or blanket the adjacent flatlands are, for the most part, less than 5,000 years old. The upper several feet of the sediment profile in most locations consists of more recently deposited marine and riverine sediments. Being geologically very young, the surface deposits tend to be weaker and more compressible than deeper more well-consolidated alluvium that predates the last sea level rise.

Sediments in the Bay fall into three broad categories: sandy bottoms in the channels; shell debris over a wide expanse of the South Bay (derived from remnants of oyster beds); and soft deposits (known as Bay Mud) underlying the vast expanses of shallow water (USACE & RWQCB 2014). Some of the former tidal flats are covered with artificial fill.[6] Regions of the bay where currents are strong, including the deep channels of the bay and the central channels of the major rivers in the Delta, generally have coarser sediments (i.e., fine sand, sand, or gravel). Areas where current velocities are lower, such as the shallow fringes of each sub-region of San Francisco Bay (Suisun Bay, San Pablo Bay, Central San Francisco Bay, and South San Francisco Bay), are covered with Bay Mud (BCDC et al. 1998). The shallow subsurface sediments (Bay Mud) of San Francisco Bay (shallower than -100 feet NAVD88) can be divided into three units, Young Bay Mud, Bay Deposits, and Old Bay Mud.

Young Bay Mud

Young Bay Mud generally consists of gray to grayish-green fine sand, silts, and silty-clays. These are more recent marine sediments that are exposed at the mudline throughout the Project Area in the RWC Channel and the SBS Channel. Thicknesses can range up to 120 feet under the Bay, thinning to less than 1 foot around the original margins of the bay. Shell fragments are sometimes found in the Young Bay Mud. With increasing depth, there is some consolidation in the Young Bay Mud clay, although it is typically not as stiff as the Old Bay Mud.

Bay Deposits

[6] United States Geological Survey (USGS), 1983, Geologic Map of San Mateo County, California, Map I-1257-A.

Between the Young Bay Mud and the Old Bay Mud there appears to be a horizontally variable sand unit that consists of fine sand. This sand unit varies in composition between silty sand and sandy clay. The unit does not consistently appear throughout the Bay Area, but it has been observed in the San Bruno Shoal area.

Old Bay Mud

Underlying the Young Bay Mud is a firm, stiff, dark greenish-gray silty clay that is typically a very stiff, over consolidated clay. It is markedly different from overlying Young Bay Mud. It has a greater compressive strength, includes thin sand and gravel lenses, and lacks shell fragments in the clay. The Old Bay Mud is thicker than 50 feet beneath the central part of the Bay, with a maximum thickness of more than 100 feet just east of Yerba Buena Island.

A.7.1.2 Dredging Efficiency of Existing Sedimentary Units

The three recognized sedimentary units in the southwestern San Francisco Bay area are important with regard to dredging projects. Typically, "mud-bucket" clamshells are sufficient to dredge the clay, silt, and sands of the Young Bay Mud and Bay Deposits. However, such dredges are inefficient when they encounter the previously undisturbed, much stiffer Old Bay Mud, which would instead require more powerful scow-mounted heavy excavators or heavy clamshell buckets, in order to deepen the existing channel bottom below the existing project depth.

A.7.1.3 Seismicity of the Region

The San Francisco Bay Area lies along an active system of right-lateral strike-slip faults forming the tectonic boundary between the North American and Pacific Plates. Tectonic disturbances create seismic waves which travel through the Earth generating ground shaking or earthquakes. The size of an earthquake can be described by its magnitude or intensity. Earthquakes in the Bay Area have their origin in the release of strain energy by the sudden movement of a fault. Strain energy is constantly accumulating in the crustal rocks of the region because of the relative movement of the Pacific Plate relative to the North American Plate. Locally, the tectonic plate boundary is referred to as the San Andreas Fault Zone (SAFZ), which includes the San Andreas Fault, and numerous other active faults.

Regional Faults

The SAFZ includes faults found by the California Geological Survey under the Alquist-Priolo Earthquake Fault Zoning Act (APEFZA) to be "active" (i.e., to have evidence of fault rupture in the past 11,000 years). Some of the major regional active faults within the SAFZ include the San Andreas, Hayward-Rodgers Creek, San Gregorio-Seal Cove, West Napa, Concord-Green Valley, Marsh Creek-Greenville, and Calaveras faults. The most significant to the Project include the San Andreas, Hayward-Rodgers Creek, and Calaveras faults. These faults have caused severe ground shaking in the past and have the potential to do so in the future. Regional active faults are shown on ***Figure A-6***.

Figure A-6. Alquist-Priolo Earthquake Fault Zones

According to the most recent fault activity map (Jennings et al 2010), the State Mining and Geology Board defines an "active fault" as one which has "had surface displacement within Holocene time" (about the last 11,000 years). A "potentially active fault" is considered to be any fault that "showed evidence of surface displacement during Quaternary time" (last 1.6 million years). Because of the large number of potentially active faults in California, the State Geologist adopted additional definitions and criteria in an effort to limit zoning to only those faults with a relatively "high" potential for surface rupture. Thus, the term "sufficiently active" was defined as a fault for which there was evidence of Holocene surface displacement. This term was used in conjunction with the term "well-defined," which relates to the ability to locate a Holocene fault as a surface or near-surface feature (Bryant and Hart 2007).

The Project Area could be subject to damage from movement on any one of the active San Francisco Bay Area earthquake faults. According to the UCERF3[7], the latest earthquake probability model, the probability of one or more earthquakes of magnitude 6.7 or higher occurring in the San Francisco Bay Area within the next 30 years (starting in 2014) is 72% (Field et al. 2015). The likelihood of a magnitude 6.7 or greater earthquake occurring along individual faults is 14.3 percent for the Hayward-Rodgers Creek Fault, 6.4 percent for the Northern San Andreas Fault, and 7.4 percent for the Calaveras Fault.

Faults are less likely to rupture (less ready) when and where there has been a recent earthquake, and are more likely to rupture (more ready) where tectonic forces have built up during many years without an earthquake. The comparably low value for the Northern San Andreas fault (6.4%) is partly because of the relatively recent 1906 earthquake on that fault. Probabilities on two other Bay Area faults, the Hayward–Rodgers Creek and the Calaveras, currently exceed those on the Northern San Andreas, in part because they are both relatively ready (Field 2015). The last damaging earthquake on the Hayward Fault was in 1868.

The Alquist-Priolo Special Studies Zones Act of 1972, administered by the California Division of Mines and Geology, is designed to mitigate the hazard of fault rupture by prohibiting the location of most structures for human occupancy across the traces of active faults. Development projects are regulated if they fall into one of these zones. Neither the RWC and the SBS Channels nor the dredge placement sites lie within or near an Alquist-Priolo Earthquake zone and no active faults are mapped at any of these locations.

A.7.1.4 Subsidence

Young Bay Mud is a very soft, highly compressible material that can cause settlement and ground subsidence. Bay Mud is encountered at the dredging sites as well as the placement

[7] Scientists have developed a new earthquake forecast model for California, referred to as the third Uniform California Earthquake Rupture Forecast, or "UCERF3." The new model provides authoritative estimates of the magnitude, location, and likelihood of earthquake fault rupture throughout the state. UCERF3 represents the latest model from the Working Group on California Earthquake Probabilities (WGCEP) (WGCEP 2014), which also released forecasts in 1988, 1990, 1995, 2003, and 2007.

sites. The potential for settlement is correlated to thickness of the Bay Mud that underlies a given location. Therefore, a new earthen or structural load constructed in an area that contains a significant thickness of Bay Mud can cause consolidation of Bay Mud, which would cause ground settlement resulting in lower ground surface elevations. The RWC Project is not proposing to construct substantial new structures and would not impose any substantial earthen loads on any portion of the Project Area.

A.7.1.5 Earthquake-Related Effects

Surface Fault Rupture

Seismically-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude and nature of fault rupture can vary for different faults or even along different strands of the same fault. Ground rupture is considered more likely along active faults. Neither the dredging sites nor the placement sites are within an Alquist-Priolo Fault Rupture Hazard Zone, and no mapped active faults traverse the immediate Project Area. Because there are no faults on the project site or on adjacent properties, there is no known risk of surface rupture during an earthquake.

Ground Shaking

Ground shaking is a general term referring to all aspects of motion of the earth's surface resulting from an earthquake, and is normally the major cause of damage in seismic events. The extent of ground shaking is controlled by the magnitude and intensity of the earthquake, distance from the epicenter, and local geologic conditions. Ground shaking intensity during an earthquake can vary depending on the overall magnitude, distance to the fault, focus of earthquake energy, and type of geologic material. Intensity is a subjective measure of the perceptible effects of seismic energy at a given point and varies with distance from the epicenter and local geologic conditions. Areas underlain by bedrock tend to experience less ground shaking than those underlain by unconsolidated sediments such as artificial fill.

The San Andreas Fault is considered capable of generating a magnitude 7.9 (M_W) earthquake, similar to the 1906 San Francisco earthquake. A 7.2 (M_W) magnitude event on the Peninsula portion of the San Andreas Fault or a 7.9 (M_W) event on the entire San Andreas Fault could be capable of generating very strong (MMI VIII) to violent (MMI IX) seismic shaking in the project area. To the east, the Hayward fault could produce a 6.5 (M_W) event that could result in moderate to strong (MMI VI-VIII) seismic shaking in the project area.

Liquefaction and Lateral Spreading

Liquefaction is the sudden temporary loss of shear strength in saturated, loose to medium-density granular sediments subjected to ground shaking. When this occurs, it can cause foundation failure of buildings and other facilities, such as levees. The potential for liquefaction depends on a number of factors including the duration and intensity of earthquake shaking, particle size distribution of the soil, density of the soil, and elevation of the groundwater. In general, more compressible soils, such as plastic silts or clays, do not generate excess pore pressure as quickly or to as great an extent as less compressible soils, such as sands. Soils with large amounts of clay such as Bay Muds, therefore, tend to be less susceptible than sandy soils to liquefaction-type behavior. According to the ABAG Liquefaction Susceptibility Map, the land-based portions of the Project have a moderate risk of liquefaction with a very high risk along the Port of Redwood City and portions of Bair Island (***Figure A-7***).

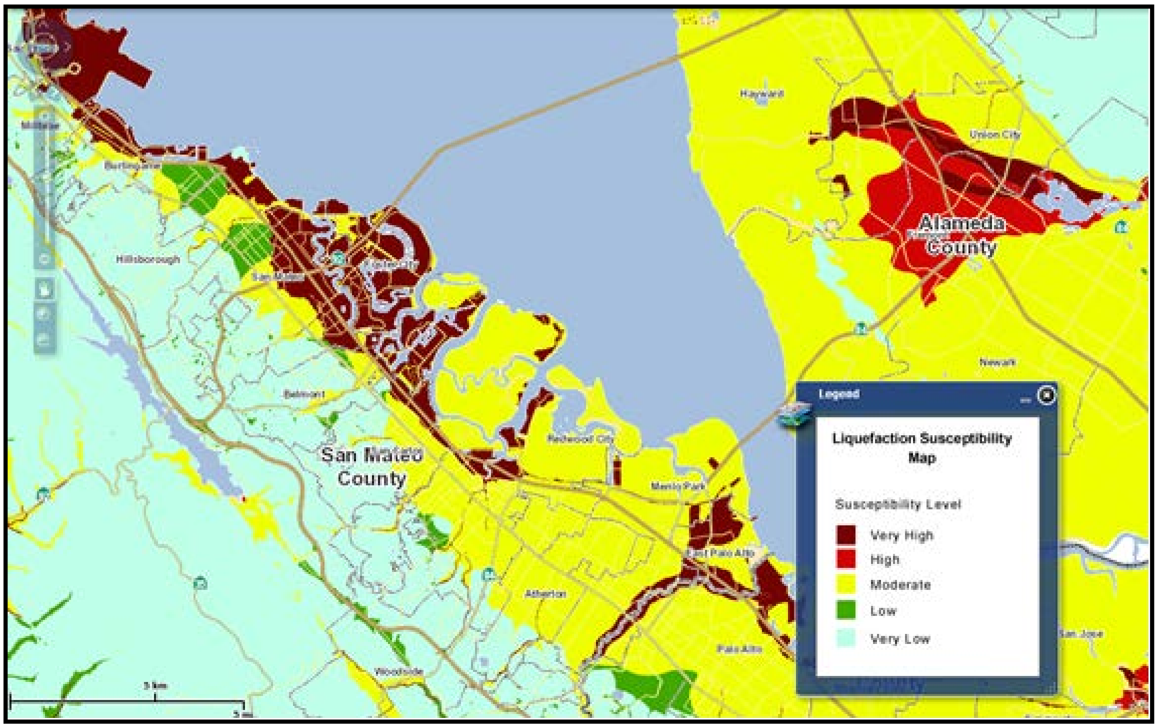

Figure A-7. Earthquake Liquefaction Susceptibility [8]

Lateral spreading is a form of horizontal displacement of soil toward an open channel or other "free" face, such as an excavation boundary. Lateral spreading can result from either the slump of low cohesion and unconsolidated material or more commonly by liquefaction of either the soil layer or a subsurface layer underlying soil material on a slope, resulting in gravitationally-driven movement. Earthquake shaking leading to liquefaction of saturated soil can result in lateral spreading where the soil undergoes a temporary loss of strength. Portions of the Project area are highly susceptible to liquefaction hazards, indicating that lateral movement to an open face, i.e., somewhere along one of the channel banks, is possible.

Tsunamis and Seiches

Large earthquakes can generate seismic sea waves, or tsunamis, which can cause damage along the coastline. Due to the narrowness of the Golden Gate, tsunamis pose relatively little risk

[8] Source: ABAG, "Earthquake and Hazards Information, Earthquake Liquefaction Susceptibility," developed based on USGS open file report 00-444 and 2006-1037. http://gis.abag.ca.gov/website/liquefactionsusceptibility/. Accessed 15 March 2015.

inside the Bay. Redwood City is located about 10 miles east of the Pacific Ocean shoreline, and is not within the County of San Mateo Tsunami Evacuation Planning area. Therefore tsunamis are not considered further in this document.

In addition to tsunamis, earthquakes also have the potential to generate a seiche. A seiche is a standing wave oscillation in an enclosed waterbody (such as a bay) that continues after the cessation of the originating force. Seiches may also be triggered by atmospheric conditions. Although the Bay Area is located in the seismically active region of California, historically, it has not been adversely affected by seiches. Therefore seiches are not considered further in this document.

Slope Stability

Slope instability can be manifested as landslides—including mudflows ("mudslides") or by more subtle processes such as soil creep. Slope instability is a complex phenomenon that can occur at many scales and for many reasons. Examples of triggering mechanisms include earthquakes, grading/excavation, and erosion.

A.7.1.6 Dredging Sites

RWC Channel

RWC Channel is located in Redwood Creek, and extends from the mouth of Redwood Creek to deep water in the San Francisco Bay. RWC Channel is approximately 5 miles east of the San Andreas fault. The channel is surrounded by extensive areas of marshlands and associated Bay Mud deposits. The entire channel is underlain by Holocene Bay Mud (Helley and LaJoie 1979). Soils in the current and former tidal flat areas are classified as the Novato and Reyes Series soils. They consist of very deep, nearly level poorly drained and somewhat poorly drained soils on tidal flats[9].

Sediment chemical quality is discussed in detail in ***Section A.8***, Hazards and Hazardous Materials. This section addresses sediment physical characteristics. The sediment quality of RWC Channel has been characterized several times in recent years in conjunction with maintenance dredging. The most recent data are included in ***Appendix I of the Main Integrated Report*** and are summarized in ***Section A.8***, Hazards and Hazardous Materials.

Sediment in RWC Channel is predominantly silt and clay, with 2 percent or less sand and gravel (USACE and RWQCB. 2014). The channel maintenance dredging sediment data collected between 2008 and 2014 indicate that the fines (silts and clays) in the samples typically exceed 96% with silt ranging from 29 to 65 percent and clay ranging from 35 to 69 percent.

According to test borings and Cone Penetration Tests (CPTs) that were drilled in 2012 along the shoreline of the Port's Wharves 1 and 2 and below the wharf area, compressible Bay Mud is present below on-shore fill and below the mudline off-shore. The thickness of the Bay Mud

[9] USDA, 1991, *Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California*,

ranged from 3 to 10 feet off-shore and 24 to 35 feet on-shore. A layer of medium dense to very dense granular material was encountered beneath the on-shore Bay Mud. This material consisted of silty/clayey sand and gravel with varying amounts of silt and clay. However, this granular layer was not encountered in any of the off-shore borings or CPTs. Granular material may have the potential to liquefy during an earthquake. In general, the majority of the potentially liquefiable layers are relatively thin and appear to be discontinuous (Treadwell and Rollo 2011).

Sediment samples were collected in RWC Channel in 2001, 2005, 2008, 2011 and 2014 prior to maintenance dredging. With the exception of the berth areas at Wharves 1 and 2 and the Inner Turning Basin, maintenance dredging sediment samples have not been collected below -32.5 feet MLLW. In addition, there are no sediment data for the channel side slopes. For the purposes of this project, it is assumed that the sediment physical characteristics are the same for the material between -32.5 feet MLLW and -39 feet MLLW (i.e., -37 +2 feet MLLW) as well as the sediment on the side slopes of the channel.

Geotechnical field exploration was performed in RWC Channel in 2012 by Fugro West. Eleven overwater borings were drilled to approximately -49 to -55 feet MLLW. All but two borings encountered a layer of Young Bay Mud. Where encountered, Young Bay Mud extended to depths of about -24 to -54 feet MLLW. The bottom of the Young Bay Mud was generally deeper toward the north, in the Bay (to approximately -54 feet MLLW) and shallower toward the south within the inner shipping channel (to approximately -24 feet MLLW) (Fugro 2012). The soil encountered below the Young Bay Mud generally consisted of soft to stiff gray to olive brown to light brown lean clay (CL) with varying amounts of sand, with lesser amounts of fat clay with sand, sand, and clayey sand, and extended to the maximum depths explored. This soil can be characterized as alluvial deposits and generally has a lower water content and lower plasticity than the Young Bay Mud (Fugro 2012).

In 2010, a marine geophysical sub-bottom profiler survey of RWC and SBS Channels was performed by SeaVision. Eleven vibacore samples were collected from RWC Channel at depths ranging from -32 and -53 feet NAVD 1988, with the majority of the depths between -33 and -36 feet NAVD 1988. In general, these cores indicated the presence of a gray, very soft clayey silt layer overlying a gray to greenish-gray soft to medium silty clay that exhibited increasing stiffness with depth. The survey effort indicated that Old Bay Mud is well below the -35 foot NAVD 88 elevation in RWC Channel.

San Bruno Shoal Channel

Only limited data are available regarding the geological conditions at SBS Channel. In 2010, twenty-four vibracore samples were collected from SBS Channel with bottom-of-hole elevations ranging between -30 and -43 feet NAVD 1988. These cores were generally similar to the samples collected in the RWC Channel in that they indicated the presence of a gray, very soft clayey silt layer overlying a gray to greenish-gray soft to medium silty clay that exhibited increasing stiffness with depth. A well-sorted fine brown silty sand was encountered at several locations. This sand is consistent with descriptions of the sandy Bay Deposits described in the work of Goldman (1969) as the sand unit that overlies the Old Bay Mud in San Francisco Bay. Based on the sub-bottom profiling survey Old Bay Mud may occur above -35 feet NAVD 1988 in SBS Channel (Seavision 2011). Material dredged in the San Bruno Shoal is assumed to be 70% mud and silt and 30% loose sand (USACE 2014d). A review of test data back to and including 1993 indicated that no data have been collected at SBS Channel during the past 22 years.

As described in ***Section 4.2 of the Main Integrated Report***, three fuel pipelines are located underneath the SBS and will have to be relocated for this Project. The pipelines would be lowered to a depth of between -40 and -45 feet MLLW to provide a minimum 6-foot separation between the top of the pipeline and the bottom of the channel, while allowing for overdepth of up to 2 feet. The replacement pipeline sections would be covered with three feet of sand and two feet of armor rock, and the remainder of the trench would be allowed to silt in naturally over the rock.

A.7.1.7 Placement Sites

Cullinan Ranch

Cullinan Ranch is underlain by varying thicknesses of Bay Mud. Holocene age intertidal deposits (Qi) underlie the Cullinan Ranch site. These deposits are composed of soft mud and peat deposits in marshes, swamps, and adjacent waterways (California Division of Mines and Geology 1982). The Cullinan Ranch site has moderate liquefaction susceptibility (ABAG 2015d)

Cullinan Ranch soils are all of the Reyes series. These soils are silty clays deposited primarily by sediment-laden bay waters, but also by tributary freshwater streams. Slopes in the area range from 0 to 2%, but most are less than 1%. The erosion hazard of these soils is considered to be low.

The closest active fault to the Cullinan Ranch site is the West Napa Fault, located approximately 3 miles northwest of the site. The Concord-Green Valley fault is located approximately 5 miles east of the site, and the Hayward-Rodgers Creek fault is located roughly 5 miles southwest of the site. The possibly active Franklin Fault (Quaternary fault) runs along the Napa River, west of Cullinan Ranch. No active faults traverse the site. In 2014, the South Napa magnitude 6 earthquake caused the strongest shaking in the San Francisco Bay area since the 1989 Loma Prieta earthquake. According to the USGS, the earthquake occurred near the West Napa Fault and the Carneros-Franklin Faults. Although there are several faults in the region, only the West Napa Fault is known to have displaced Holocene-age sediments, which is positive evidence of surface fault rupture in the last 11,000 years (Shakal 2014).

Montezuma Wetlands Restoration

The Montezuma Wetlands site is located in recent alluvium and Bay Muds in the floodplain of the Sacramento River and the Montezuma Hills. The site is located 12.5 miles east of the active

Concord-Green Valley fault (***Figure A-6***). The Vaca/Kirby Hill fault runs north-south along the west side of the Montezuma Slough. This Quaternary fault is considered a potentially active fault (showing evidence of surface displacement sometime during the last 1.6 million years). There are no known active faults within the site.

SF-DODS

The continental shelf offshore of the Golden Gate is a broad, relatively flat plain, with water depths up to 180 m (500 feet). SF-DODS is located beyond the continental shelf, on the continental slope, in water depths of 2,500 to 3,000 meters. This relatively narrow (about 35 km wide) segment of the continental slope has rugged topographic relief and an average slope of six degrees or more (BCDC et al. 1998). The location of SF-DODS was specifically selected to avoid geographically unique or otherwise sensitive habitats (Germano & Associates 2010).

SF-DODS is close to the foot of the continental slope in an area characterized by slow deposition and by very little mass movement of sediment. The site is in an area that is atypically sandy relative to other continental slopes (Karl 2001). The mean grain size decreases with increasing depth on the slope, from dominance by silty and clayey sands in Pioneer Canyon (approximately 35km outside the site boundary), to primarily silt and clay closer to the disposal site itself (Karl 2001).

Sediment samples have been collected from SF-DODS and the surrounding areas and analyzed for sediment chemistry each year to monitor the effects of dredged material disposal on the chemical and physical characteristics of bottom sediments within and adjacent to the SF-DODS.

The San Andreas Fault runs offshore approximately 50 mile east of the SF-DODS site.

Alviso Ponds

In general, the Alviso area is mapped as Bay Mud. The Bay Mud is relatively thin (< 5 feet) along the existing urban/salt pond boundary and becomes deeper (35 to 40 feet thick) along the outer pond levees adjacent to the Bay. Bay Mud is underlain by alluvial flood plain deposits that range in grain size from coarse to fine and are generally medium dense to dense/stiff in consistency. The Alviso Pond complex has moderate liquefaction susceptibility (HDR 2014). The existing outboard levees are most likely constructed of Bay Mud borrow excavated from adjacent ponds and sloughs (HDR 2014).

Soils in the Alviso pond complex are generally not categorized, but labeled as tidal marsh or salt concentration ponds. Some soils are categorized Alviso Clays and Mocho fine sandy loam over basin clays (EDAW 2007), which are generally poorly drained.

Alviso Pond A9 is approximately five miles east of the Hayward Fault and 12 miles west of the San Andreas Fault. Pond A2W is roughly 8.5 miles west of the Hayward Fault and 8 miles east from the San Andreas fault. The San Jose Fault, a concealed potentially active Quaternary fault[10], traverses the southwest portion of Pond A2W continuing northwest through Pond A1 and Charleston Slough to the Dumbarton Bridge. No active faults cross the Alviso Pond complex. The 1989 Loma Prieta Earthquake, which was a 7.1M, strong shaking effects in San Jose.

Eden Landing Ponds

Within the Eden Landing pond complex the thickness of Bay Mud varies from about 0 to 28 feet (USFWS AND CDFW 2007). An outcropping of the Franciscan Unit rock type exists within the pond complex. Eden Landing is approximately 3 miles west of the trace of the Hayward Fault and 12 miles east of the San Andreas Fault. Potential for settlement within the pond complex is strongly correlated to Bay Mud thickness. The ponds along the Bay side of the Eden Landing pond complex have a moderate liquefaction susceptibility.

Soils in the Eden Landing pond complex are primarily Reyes-Urban Land soils (USFWS AND CDFW 2007). These soils consist of very poorly drained clays located on tidal flats or urban land, and are also known as Bay Muds.

Significance Thresholds

The effects of a project or alternative on geology and soils are considered to be significant if the proposed Project or alternatives would:

- 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, or
- Result in substantial soil erosion at the dredging and/or placement sites, creating substantial risks to life, property, waterways, or resulting in damage to sensitive habitat

Environmental Consequences

This section evaluates the potential impacts on geology, seismicity and soils that would result from implementation of the Project. While none of the dredging or placement sites are located in an Alquist-Priolo earthquake hazard zone, the proposed Project could potentially be affected by large earthquakes that could occur anywhere in the greater Bay Area and/or tsunamis resulting from a large offshore earthquake. Other geology- and soil-related impacts that could occur to the Project site, such as erosion, subsidence or slope failure, would be more site-specific and confined to the immediate vicinity of the dredging sites.

Geological impacts were evaluated in two ways: (1) impacts of the Project on the local geologic environment; and (2) impacts of geohazards on Project components that may result in substantial damage to structures or infrastructure or expose people to substantial risk of injury.

[10] Showing evidence of displacement sometime during the past 1.8 million years.

Impacts are considered significant if the Project meets either of the significance criteria identified above.

Dredging Options

The proposed dredging would result in deepening of the RWC and SBS Channels. Impacts to geology, soil and seismicity would be similar under all three dredging alternatives, and all three dredging options are therefore addressed as a group.

<u>Impact 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</u>

As discussed previously, the San Francisco Bay Area is considered to be seismically-active region. The dredging sites are have the potential to be subject to significant ground shaking resulting from an earthquake along any of the active faults located in the region including the San Andreas, the closest active fault to the dredging sites. No active faults or faults that fall under the Alquist-Priolo Special Studies Zone Act of 1972 have been mapped at either dredging site, and there would not be any construction of new structures.

During and immediately after a strong seismic event, saturated loose granular soils may lose strength (liquefy), and may experience relatively rapid volumetric change, resulting in subsidence or lateral spreading at the dredging sites. Generally thicker deposits will accumulate more volumetric change than thinner deposits. The dredge sites are underlain by Bay Mud, and portions of the channels and the RWC berths are underlain by a thin layer of sand; however, the sand layer is not consistent throughout the Project Area. Sandy soils are potentially liquefiable, and liquification of the sandy soils could result in related ground failures including lateral spreading, subsidence or slope failure. Deepening of the channels and berths could increase the risk of slope failures of the channel banks if the constructed slopes are inadequate. The channel banks could become unstable under seismic or static conditions depending on the nature of the underlying soil and geometry (height and steepness) of the slopes.

Because there are no structures in or adjacent to SBS Channel, collapse of a portion of the channel banks as a result of an earthquake would not result in any damage to structures and would not expose people to potential harm. Deepening of RWC Channel and berths could increase the risk of slope failures of the channel banks if the constructed slopes are inadequate. The channel and berth banks could become unstable under seismic or static conditions depending on the nature of the underlying soil and geometry (height and steepness) of the slopes. Collapse of the channel and/or berth banks in RWC Channel could also lead to failure of adjacent structures (wharves).

Additional data on sediment properties would be collected as needed during the design phase. The existing slopes would be analyzed and the future slopes designed, and constructed in accordance with EM 1110-2-1902 (USACE 2003). Adherence to applicable design specifications and standards would ensure that the risk of slope failure would be reduced to an acceptable level. To address potential concerns with RWC Channel deepening adjacent to existing structures, the current footprint of the channel would not be widened near existing structures. This impact is less than significant.

<u>Impact GEO-2: Significant Soil Erosion Creating Risks to Life, Property, or Waterways, or Damage to Sensitive Habitat</u>

Erosion of the channel banks and habitat adjacent to the channel banks could occur as a result of sediment sloughing from the channel banks and/or vessel wakes and propeller wash. The proposed RWC Channel footprint has been designed to minimize impacts to existing sensitive habitat (mudflat) adjacent to the channel. The design of the channels is intended to minimize sloughing of the channel sides and thus sloughing-related erosion effects to mudflats adjacent to RWC Channel.

There would be no expected impact to Bair Island, as the channel daylight would be the same as for the current channel. The channel daylight would move between 6 and 42 feet closer to Greco Island, and could potentially contribute to erosion of the mudflats adjacent to Greco Island. This impact is potentially significant. With implementation of Mitigation Measure GEO-M1, this impact would be reduced to less than significant.

Vessel wakes and prop wash during dredging and post-construction could contribute to erosion of the mudflats. As described in ***Section A.5.1***, passing vessels, including tugs and deep draft vessels, could generate vessel wakes that exceed the naturally-occurring sustained wind-wave heights in RWC Channel. The increased vessel traffic during and following construction could therefore lead to an increase in erosion of mudflats adjacent to the channel. Annual deep draft vessel calls could increase from 64 up to 93 during the life of the project; this would result in approximately 1 to 2 additional vessel transits per week. Potential impacts due to increases in erosion from increased deep draft vessel transits would be less than significant.

During construction, there would be increased tug traffic of up to five to six one-way tug trips per day. In addition, there would be several crew and tender boat trips per day. Crew and tender boats are small vessels, and their vessel wakes would be similar to those of the recreational boats currently using RWC Channel. The potential effects on mudflat erosion due to crew and tender boats would be less than significant.

Tugs have powerful engines and increased use of tugs could potentially contribute to increased erosion of adjacent mudflats. With implementation of Mitigation Measure BIO-M10, this impact would be less than significant.

Placement Sites
Cullinan

Impact 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

The offloader and pipeline would be designed to the appropriate seismic safety standards. The design of the pipeline would consider appropriate slopes and support on the outboard embankment to avoid damage to the embankment. Additional data would be collected as needed during the design phase. This impact is less than significant.

As discussed above for the dredging options, the risk of tsunamis and seiches in San Francisco Bay is low. The risk is further reduced by the location of Cullinan north of Mare Island Strait; Mare Island Strait is narrow and would further attenuate the effects of any tsunami. Potential impacts of tsunamis and seiches on delivery of sediment, including construction of the offloader and pipeline, would be less than significant.

Impact GEO-2: Significant Soil Erosion Creating Risks to Life, Property, or Waterways, or Damage to Sensitive Habitat

Offloader construction would be designed to minimize effects on near-by habitat. Minor disturbance of marsh, mudflat and/or subtidal habitat could occur as a result of pipeline installation. However, the effect would be limited in extent and duration, and would be designed to avoid causing significant erosion. The potential for increases in erosion of nearby mudflats and marsh habitat due to vessel wake from tugs would be low because tugs would be moving slowly as they are delivering scows to the offloader, and because there would only be a small number of tugs trips each day. This impact is less than significant.

Montezuma

Potential impacts to geological resources and seismic effects associated with placement of sediment at the Montezuma site are all addressed by the Montezuma site. Delivering sediment to be off-loaded would have no impacts on geological resources or seismic effects.

SF-DODS

Impact 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

Seismic-induced settling of sediments disposed of at SF-DODS would consolidate the material, and is not expected to cause movement of the material outside of the SF-DODS boundaries (USACE and Port of Oakland 1998). Therefore, there would be no impact related to seismic hazards associated with use of the SF-DODS.

Impact GEO-2: Significant Soil Erosion Creating Risks to Life, Property, or Waterways, or Damage to Sensitive Habitat

This offshore placement site is considered non-dispersive, meaning that sediment stays within the placement boundaries (BCDC et al. 1998). Nonetheless, some migration of the sediment outside the disposal area is known to occur, and migration is generally consistent with modeling (Germano & Associates 2010). According to the USEPA (2010b) monitoring report, the apparent accumulated thickness of dredged material outside the site boundary is less than 10 cm. Freshly deposited particles are constantly being reworked into the underlying sediments by infaunal burrowing and feeding activity. Therefore, impacts related to soil erosion would be insignificant for this site.

Alviso and Eden Landing Ponds

Impact 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

The offloader, booster pump(s) and pipeline at these two placement sites would be designed to the appropriate seismic safety standards. The design of the pipeline would consider appropriate slopes and support on the outboard embankment to avoid damage to the embankment. Pipeline design and effects of seismic events on the pipelines would be similar for a pipeline from the offloader to the dredged sediment delivery location and for a pipeline from a cutterhead dredge to the dredged sediment delivery location. Additional data would be collected as needed during the design phase. This impact is less than significant.

As discussed above for the dredging options, the risk of tsunamis and seiches in San Francisco Bay is low. Furthermore, the facilities to be constructed to enable use of these two placement sites would be resistant to the effects of tsunamis and seiches because they are placed in the Bay. Potential impacts of tsunamis and seiches on delivery of sediment, including construction and use of an offloader and pipelines, would be less than significant.

Impact GEO-2: Significant Soil Erosion Creating Risks to Life, Property, or Waterways, or Damage to Sensitive Habitat

If offloaders are constructed to support sediment delivery to these two sites, the offloaders would be placed in deep water, and construction would be designed to minimize effects on the Bay and any near-by habitat. Minor disturbance of marsh, mudflat and/or subtidal habitat could occur as a result of pipeline installation, whether the pipeline is originating at a cutterhead dredge or an offloader. However, the effect would be limited in extent and duration, and would be designed to avoid causing significant erosion. This impact is less than significant.

Mitigation Measures

Mitigation Measure GEO-M1: Conduct Supplemental Hydrodynamic Surveys and Monitor for Erosion

There is insufficient information to determine whether and to what degree the channel daylight for the RWC Channel could intersect mudflats adjacent to Greco Island. To avoid inadvertent loss of mudflat and/or an increase in erosion of mudflat, the Corps shall conduct supplemental hydrodynamic surveys of the east side of Redwood Creek in the vicinity of Greco Island. If the channel daylight line may intersect with the outboard mudflats at Greco Island, the Corps shall evaluate the potential for alternative alignments in this area, including potentially tapering the channel sides (narrowing the footprint of the channel) and/or steepening the channel side slopes (if feasible without adversely affecting the stability of the channel banks). In addition, wherever the new channel daylight line comes into close proximity with the mudflats, the Corps shall conduct erosion monitoring (e.g., through use of erosion pins) to establish whether loss of mudflat is occurring, and shall mitigate for loss of habitat through purchase of mitigation credits or other means as approved through biological consultation.

A.8 Hazards and Hazardous Material

Affected Environment

This section address potential hazards posed by the proposed Project, including hazards to navigation, hazardous materials, and contaminated sediment. The proposed Project would not affect potential flood hazards. Deepening RWC Channel and SBS Channel would not affect the likelihood of flooding in the vicinity of the channels. Similarly, construction of offloading facilities at some of the potential placement sites would not cause a substantial obstruction to flood flows and would not affect flooding. Potential effects to flooding from placing sediment into the placement sites has been, or would be, addressed by the separate environmental documents prepared by the placement site owners.

A.8.1.1 Hazards to Navigation

Hazards to navigation can be divided into five categories: (1) shoals and islands, (2) bridges and other structures, (3) fog and inclement weather, (4) vessel traffic, and (5) tides and currents. Hazards to navigation may result in collisions, groundings, and allisions.[11]

Islands and the shallow areas around such islands as Alcatraz, Angel Island, Treasure Island, and Yerba Buena Island as well as shallow areas such as San Bruno Shoal are hazards to navigation and, when combined with other elements including fog, traffic, or malfunctioning radar equipment, can present an extreme hazard. Bridges and other structures pose a similar hazard that is frequently coupled with restricted maneuvering room. These hazards are identified on navigation charts and by lighting and other aids to navigation.

Summer fog and winter storms contribute to navigation difficulties in the Bay. Some types of commercial vessels, including tankers carrying hazardous materials such as fuel oil, have been restricted from transiting the Bay during periods of low visibility.

[11] An allision is defined as a vessel striking a fixed object as, for example, when the Cosco Busan struck the Bay Bridge.

The greatest hazard to vessel navigation is other vessel traffic. Large commercial and naval vessels are required by US Coast Guard (USCG) regulations to use designated traffic lanes when traveling in inland waterways. Smaller commercial vessels (i.e., tugboats, ferryboats, and private vessels) often do not navigate within specific traffic lanes, but rather travel the most direct route. Private (recreational) vessel users also travel freely across the Bay. Recreational boaters may be unaware of navigation rules, and/or underestimate the danger posed by large vessels. These private vessels can pose hazards to navigation, particularly if other circumstances such as fog are present. Private vessel traffic is heaviest during weekend days. Commercial vessels are required to coordinate with the USCG's Vessel Traffic Service San Francisco, which monitors and guides vessel traffic in San Francisco Bay in the same way that air traffic control monitors and guides local air traffic.

Grounding is a collision between a vessel and the seafloor or edge of a channel. Groundings can result in damage to vessels as well as serious environmental consequences. A ship aground in a channel can block the transit of other vessels or create new shoaling, and may cause serious delays to commerce. Maneuvering deep-draft ships in narrow channels with minimal underkeel clearance poses high navigational risks, given the complexities of tides, currents, and weather conditions in the Bay (HSC 2014).

Tidal action causes extremely strong currents throughout the Bay during periods of maximum ebb and maximum flood tides. Strong currents (above 2 knots) are potentially hazardous if not properly "corrected for" during slow speed maneuvering. The greatest currents occur at the Golden Gate with the average maximum flood current being 3.3 knots[12] and the maximum ebb current being 4.5 knots. Even as far south as Hunter's Point, there are currents of 2.2 knots at maximum ebb (USACE and Port of Oakland 1998).

The VTS collects detailed reports of every vessel incident in the Bay. The categories of incidents include collisions, near-misses, vessel grounding, noncompliance (not listening to the VTS or acting contrary to their instructions), non-participation (turning the vessel radio off), hindering navigation (e.g., a sail boat passing in front of a commercial vessel confined to narrow channels or fairways), and loose scows (the tow line between the tug and the scow breaks and the scow is set adrift, or the tugboat loses power). There have only been a few incidents involving commercial vessels in the past 5 years. These include a ferry colliding with Pier 41, a party boat colliding with underwater rocks near Alcatraz, a small speedboat striking a ferry, and a tanker side-swiping Bay Bridge Tower E (CNT Group 2015).

A.8.1.2 Hazardous Material

Hazardous materials are present in the Project area in the fuel pipelines crossing under SBS Channel (jet fuel), and fuel in vessels transiting the channels. Some vessels may carry cargoes that are considered hazardous materials. Transport of hazardous materials on water is governed by 46 CFR 15 Part 146 *et seq.* (Dangerous Cargo). The Port Tariff (Port of Redwood

[12] One knot is equal to 1 nautical mile per hour, or 1.15 statute miles/hour.

City 2014) includes various requirements applicable to dangerous cargoes, as well as requirements pertaining to the proper management of oily wastes and fuels.

A.8.1.3 Contaminated Sediments

Sediments in San Francisco Bay have been impacted by wastes originating from industrial and commercial activities around the Bay. These activities have released inorganic and organic chemical constituents to San Francisco Bay. The constituents present and their concentrations vary around the Bay depending on the types of sources upstream of the sediment being tested and the proximity of these sources to the sediment.

The San Francisco Estuary Institute (SFEI) conducts the Regional Monitoring Program (RMP) that tracks contaminant distribution and trends throughout the Bay. In some locations some chemical constituent concentrations exceed or approach thresholds set to protect human health and/or the environment. In general, chemical concentrations in San Francisco Bay have been declining over the past 20 years, reflecting improved waste management practices. However, some new chemicals (e.g., certain types of flame retardants) have been introduced (SFEI 2015).

Because sediment is San Francisco Bay frequently contains legacy anthropogenic chemicals, testing is required prior to channel deepening and maintenance dredging. Sediment chemical data are reviewed by the Dredged Material Management Office (DMMO), and compared to ambient and reference concentrations to determine the suitability of the dredged sediment for various types of placement sites.

Dredged Material Management Office

The DMMO was created in 1996 to establish a comprehensive and consolidated approach to permitting placement of dredged material to eliminate redundancy and delays in the dredged material placement permitting process. The DMMO reviews and approves sampling and analysis plans (SAPs), reviews the resulting sampling and analysis reports (SARs), and approves sediment chemical classifications proposed in the SARs. The sediment classifications in turn determine the allowable dredged placement locations. The DMMO determines the suitability for placement of dredged material at a given location, based on sediment testing results and LTMS program goals. The DMMO is a joint program composed of USACE, USEPA, BCDC, RWQCB, and the State Lands Commission. Participating agencies include CDFW, NMFS, and USFWS.

Regional Monitoring Program

The RMP compiles sediment, water, and tissue samples from a variety of monitoring stations around the Bay. Not all stations are analyzed for all constituents of interest. Although there is considerable variation among locations, a review of the data shows that in general, sediments are less contaminated in San Pablo and Suisun Bays than in Central and South San Francisco

Bays (SFEI 2015). Data from the RMP are frequently used as reference data for evaluating contamination levels in dredged sediment.

Testing Requirements for Placement and Beneficial Reuse of Dredged Material

Material proposed to be dredged and placed at ocean, inland aquatic, or upland/beneficial reuse sites requires sediment characterization to predict the environmental impacts associated with dredging and dredged material placement activities. The objective of the sediment testing requirements is to determine whether placement of dredged material at designated sites can occur without causing unacceptable effects to the surrounding environment.

Generally, sediments are tested for physical and chemical attributes and/or the potential for biological toxicity. The extent of sediment characterization necessary to ensure compliance with applicable environmental laws and regulations is site-specific. The type and extent of testing depends on the physical characteristics of the sediment, as well as the characteristics of the dredged material placement site.

The entire potential dredge prism, which includes 2 feet of overdepth, is characterized. Recently, testing of the so-called “Z-layer” has also been required to document the sediment quality of the sediment that would be exposed at the new post-dredging surface following the dredging episode.

For ocean disposal to take place, the material must be acceptable for deep-ocean placement, as regulated by the MPRSA. The standards under CWA and MPRSA for determining the need for testing differ. The requirement for testing under the CWA is based on reason to believe that contaminants are present in the proposed discharge and have the potential to result in unacceptable adverse impact (40 CFR § 230.60).

Testing under the MPRSA is required when the material does not meet the exclusionary criteria in 40 CFR § 227.13(b). Once it is determined that testing is required, the physical, chemical, and biological tests relied on for evaluating the material are similar for in-Bay and ocean placement sites.

For placement of dredged material in inland waters, including San Francisco Bay, Section 404 of the CWA, including the Section 404 (b)(1) Guidelines, and the regulations at 40 CFR Part 230 define the testing requirements. Current guidance for implementing inland aquatic disposal is provided in Evaluation of Dredged Material Proposed for Disposal in Waters of the US – Testing Manual for Discharge in Inland and Near Coastal Water (USACE and USEPA 1998), referred to as the Inland Testing Manual. The regulations allow some temporary effects to the environment, and these effects are based on water quality criteria and Limiting Permissible Concentrations (LPCs). Concentrations of chemicals of concern present in dredged material must be lower than concentrations that cause significant impacts to certain species.

In late 1997, NMFS published regulations requiring consultation for projects or programs that may adversely affect Essential Fish Habitat (EFH). Consequently, in 2004, the LTMS agencies and NMFS began preparing a programmatic EFH consultation for the LTMS program. The programmatic EFH agreement was completed in 2011 (USACE and USEPA 2011), and updated in 2012 to address mercury contamination considerations (USACE and USEPA 2012). The EFH agreement includes a number of Conservation Measures that enhance the environmental protectiveness of the LTMS program. The conservation measures in the Programmatic EFH also tie the sediment testing program to San Francisco Bay's existing Total Maximum Daily Loads (TMDLs) for mercury and polychlorinated biphenyls (PCBs), as well as to the RMP. This ensures that dredging and dredged material placement will be managed in a manner that directly complements other key pollution-reduction programs for San Francisco Bay. A proposed update to the programmatic EFH was issued by the LTMS agencies in October 2014, and is currently in review by NMFS. The update addresses protection of salmonids and green sturgeon, and is based on the results of the LTMS 12-Year Review, and proposed measures were incorporated into this EIS/R.

In the San Francisco Bay Area, placement of dredged material at upland sites or for beneficial reuse is regulated under the Porter-Cologne Act and the McAteer-Petris Act. Screening guidance is provided in the RWQCB's May 2000 staff draft summary report, *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (RWQCB 2000). There are two levels of screening guidelines for beneficial reuse of sediments for wetland restoration: guidelines for wetland surface material (also referred to as wetland cover material) and for wetland foundation material (also referred to as wetland non-cover material).

Surface (also referred to as "cover") material is a class of material that is not expected to pose a threat to water quality or the aquatic environment, even in places where the material is in direct contact with surface waters or aquatic organisms and is suitable for unconfined aquatic disposal. Wetland foundation (also referred to as "non-cover") material is not of a quality that constitutes a hazardous or listed waste but has a potential for biological effects if directly exposed to organisms. Wetland foundation material is not expected to be a threat to water quality when an adequate amount of cover material is used to reduce the risk of foundation material coming into contact with the aquatic environment. The amount of cover material needed to adequately reduce this risk depends on site-specific characteristics.

A.8.1.4 Dredging Sites

Redwood City Harbor

Navigation Hazards

In calendar year 2014, the Port received 107 vessel calls, consisting of 64 ships and 43 barges. Panamax vessels, the largest vessels calling on the Port are 110 feet in width; the channel has a width ranging from 300 to 900 feet. Approximately 60% of the ship calls were Panamax vessels. Standard scows used to transport aggregate to the Port are 76 feet wide. Navigation in RWC

Channel is constrained by the deep draft channel and the widths of the turning basins. Private and public marinas are located south and east of the channel, contributing recreational boat traffic to the channel. There have been no incidents pertaining to large vessels in RWC Channel in the past five years.

Hazardous Materials

The presence of hazardous materials in RWC Channel is primarily associated with vessels in transit. No fixed locations containing hazardous materials are located within the proposed dredging area. None of the sediment to be dredged would be classified as a hazardous material.

Contaminated Sediment

Sediment testing has been conducted in RWC Channel in support of maintenance dredging. The most recent sediment data collected were collected in 2014. Sediment chemistry data for 2008 through 2014 are provided in ***Appendix I***. Sediment was collected to a maximum depth of -32.5 feet MLLW. In general, sediment samples collected from RWC Channel have met the criteria for open water disposal (SUAD) and wetland surface material. The most recent testing, however, indicated that total PCB congener concentrations in some sediment cores in the Inner Turning Basin exceeded the wetland foundation criteria of 180 µg/kg. Biological testing conducted indicated that species effects for most test species were statistically similar to reference sediments from SF-DODS (Kinnetic and Atkins 2015). Additional testing is in progress to characterize depths below -32.5 feet MLLW.

San Bruno Shoal Channel

Navigation Hazards

Navigation in SBS Channel is slightly constrained by the deep draft channel; however, many vessels other than deep draft vessels would be able to transit the area without using the channel. Other vessel traffic in the area consists of recreational vessel use and minor commercial traffic. There have been no incidents pertaining to large vessels in SBS Channel in the past five years.

Hazardous Materials

The presence of hazardous materials in SBS Channel is primarily associated with vessels in transit. The three fuel pipelines underlying the channel also contain hazardous materials. None of the sediment to be dredged would be classified as a hazardous material.

Contaminated Sediment

There are no available data regarding contaminated sediment in SBS Channel. SBS Channel is not near any point source locations, and sediment chemical concentrations are expected to be representative of ambient conditions. Because sediment in SBS Channel is sandier than at RWC

Channel, chemical concentrations in SBS Channel are also likely to be lower than at RWC Channel.

A.8.1.5 Placement Sites

None of the placement sites, including proposed offloader, pipeline, and booster pump locations are known to contain hazardous materials. Similarly, all offloading locations would be in deep water at the edge of existing channels or natural deep water areas. No larger vessel incidents (i.e., involving tugs and scows) have been recorded in the vicinity of any of the proposed off-loading locations in the past five years.

Cullinan Ranch Restoration Project

There is extensive recreational boat traffic on the Napa River and periodic recreational boat traffic on Dutchman Slough. The proposed offloader locations are situated on the western edge of the deep water channel in Napa Rover and the proposed pipeline alignments are located in shallow water adjacent to the levees along Dutchman Slough. No contaminated sediment is known to be present at the proposed offloader locations at Cullinan, or within the proposed pipeline alignments. There are no regional monitoring program sites near the Cullinan site. The closest sites are near the south side of Mare Island Strait (SFEI 2015) and likely reflect influences from industrial and military activities along Mare Island Strait. These data are not considered relevant to the Cullinan site. The site is permitted to receive wetland foundation sediment.

Montezuma Wetlands Project

There is recreational boat traffic in the vicinity of the offloading location, however, there are no nearby marinas or other sources of recreational vessel traffic. The offloading location is very close to the northern shore, north of Chain Island. No construction is proposed at this placement site.

SF-DODS

There may be occasional recreational or larger vessel traffic in the vicinity of the offloading location, however, there are no nearby sources of recreational vessel traffic. This site is located in deep water in the open ocean, and no disturbance of the existing bottom sediment is expected. Existing bottom sediments collected in the vicinity of the site provide reference concentrations for allowable chemical and biological characteristics in sediment to be disposed of at this site.

Eden Landing Restoration Project

The proposed offloader location is on the eastern edge of the natural deep water channel in San Francisco Bay. The proposed pipeline alignment is located in deep to shallow water and would cross shallow water and mudflats prior to terminating at the top of the levee at Pond E2.

Recreational boating occurs in the South Bay, and the pipeline alignment is designed to avoid interfering with recreational vessel traffic.

One sediment sampling station included in the RMP is located near the proposed offloader location; no sediment sampling stations are located in the vicinity of the sediment delivery location. The designated sampling station generally has relatively low concentrations of contaminants; with the exception of dioxins and methyl mercury, most concentrations at this station are below the mean for San Francisco Bay (SFEI 2015).

Alviso Ponds Restoration Area

The proposed offloader location is on the eastern edge of the natural deep water channel in San Francisco Bay, between the Dumbarton Bridge and the railroad bridge. Although the natural deep water channel extends south of the railroad bridge, the offloader location was selected to avoid potential congestion associated with the need to pass the railroad bridge. The proposed pipeline alignments are located in deep to shallow water and would cross shallow water and mudflats prior to terminating at the top of the levees at either Pond A2W or A9. Booster pumps would be located on top of the levee at the sediment delivery location. Recreational boating occurs in the far South Bay and the pipeline alignments are designed to avoid interfering with recreational vessel traffic. The additional booster pump required to deliver sediment to the Pond A9 located would be in relatively shallow water east of the natural deep water channel.

The geography and history of the San Francisco Bay affects the distribution of mercury-contaminated sediments within and surrounding the South Bay Salt Ponds area. South San Francisco Bay has been subjected to discharges of mercury contaminated sediments originating from the historic New Almaden mining district. The mining activities causing these discharges date back to the late 1800s and early 1900s; the discharges persist as a legacy source in the Guadalupe River watershed. The land area around the New Almaden mines has been cleaned up and restored to beneficial use, and downstream remediation and stewardship is underway in the watershed.

However, a legacy of mercury contamination persists in the form of a north-south mercury concentration gradient in sediments. The average concentration of mercury in Bay sediments is 0.4 ppm, and the median concentration of mercury in suspended sediments is 0.3 ppm. This gradually increases to 0.5 - 0.8 ppm in the South Bay, and then sharply increases to 1 – 2 ppm in Alviso Slough, especially just after high-flow events (Tetra Tech Inc. 2005, 2006). Other contaminant concentrations also tend to be elevated relative to the San Francisco Bay mean, with most sample locations in the Lower South Bay exhibiting contaminant concentration in the 3rd or 4th quartiles (SFEI 2015).

Significance Thresholds
Hazards and hazardous materials impacts would be considered significant if the dredging, pipeline relocation, and/or sediment transport activities would cause or create:

- An increase in navigation incidents or other substantial navigational safety risks, including risks to recreational boats;
- A substantial hazard to the public or the environment through dredging or routine transport, use, or disposal of contaminated sediment or hazardous materials or wastes; or
- A substantial hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

Environmental Consequences
Potential hazards to navigation were assessed by evaluating the available navigation area, intensity of vessel use, and ability to divert around potential obstacles. Potential hazards associated with hazardous materials present in the Project area and/or used as part of the Project were evaluated by assessing the likelihood of releases or other incidents associated with these hazardous materials. There would be the storage of small amounts of hazardous material in staging areas at RWC and possibly at the former Shell dock for the pipeline work at SBS. Because there would be little or no use or storage of hazardous materials on land, the analysis focused on potential hazardous materials incidents on the water. The potential for spreading contaminated sediment through spills and/or dredging practices was evaluated by considering the degree of contamination in the sediments and the measures in place to minimize or avoid spills. Potential risks to biota from contaminated sediment are addressed in ***Sections A.4 and A.5***.

A.8.1.6 Dredging Options
Potential hazards associated with the three dredging options are very similar. The primary difference is the duration of the dredging effort and therefore the duration for which the hazard could exist.

Impact HAZ-1: Increase in Navigation Incidents or Other Substantial Navigational Safety Risks

All equipment used to conduct the dredging and relocate the fuel pipelines would be highly visible and well-marked in accordance with USCG regulations. Any floating or submerged dredged material pipelines would also be marked, and any portions of submerged pipelines located in the channel would be laid in the bottom of the channel.

Navigation in RWC Channel is constrained by the deep draft channel. Dredging equipment and any associated pipelines would be present for a period of 6 months per year for up to 2 years. Although the equipment may restrict certain portions of the channel, it would be highly visible and well-marked. Best management practices for safe navigation would be implemented as described in ***Section A-14***. These include notices to mariners, coordinating work with the Port and San Francisco Bar Pilots, and having the dredge operator remain in communication with VTS and monitor Channel 16.

The San Francisco Bar Pilots, who board all commercial vessels before they enter San Francisco Bay and would guide the vessel through SBS Channel and into RWC 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. Notification of the nearby marinas regarding the proposed work and schedule would ensure that recreational vessel users are also aware of the need for safe navigation around the dredge.

SBS Channel is less constrained. Many vessels other than commercial deep draft could safely navigate outside the channel to avoid the dredge, if necessary. Passages of vessels near the dredge would be coordinated and the dredge would be moved if necessary. The same would be true for equipment used to relocate the fuel pipelines.

Following construction, portions of the RWC Channel would be slightly narrower at the bottom than currently. The channel alignment and configuration would be verified through a ship simulation study performed during the design phase, and the changes to the channel are also being reviewed with the bar pilots. Operating guidelines for the channel would take into consideration any measures required to continue to operate safely in RWC Channel. Navigational safety in SBS Channel would not be affected, as the bottom of the channel would remain at its current width of 500 feet.

The pipeline relocation activities in SBS Channel could temporarily block a portion of the channel. The directional drilling process could be conducted entirely from outside the channel boundaries, and therefore would not pose any hazards to navigation within the channel. The dredged trench construction process would require up to three weeks of work in the channel; however, dredge movements would be coordinated with vessel transits as they would be for all of the dredging activities. The jetsled method of construction would require at a minimum 50-100 months to complete the work in the channel. However, work would occur only 10 hours per day, and the ship used to deploy the jetsled could relocate when the jetsled is not in service. Also, because the channel is 500 feet wide, vessels would be able to transit past the jetsled equipment when it is operating near the margins of the channel. This impact is less than significant.

Impact HAZ-2: Substantial Hazard to the Public or the Environment from Routine Use, Transport, or Disposal of Contaminated Sediment or Hazardous Materials

Small quantities of hazardous materials may be stored at the staging area, and may be used on the dredge for routine maintenance. As discussed in ***Section 4.2 of the Main Integrated Report***, dredges, tugs, scows and all other vessel would be operated in compliance with all applicable regulations related to the prevention of water pollution by fuel, harmful substances, and garbage, as well as from accidental discharges. Therefore, the potential for the release of hazardous substances from vessel operations during dredging would be minimal.

The primary routine use of hazardous materials for the proposed project would be related to equipment fueling during construction. Diesel fuel would be used to fuel all or part of the construction equipment. As described in ***Section 4.2 of the Main Integrated Report***, all fueling operations would be subject to USCG, OSPR, and SLC requirements. If dredges are diesel-fueled they would typically be fueled at the dock; dredges are capable of holding up to 3 – 4 weeks of fuel. 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 to the dredge using a fuel scow. Pipeline construction equipment could also be fueled at the dock or via a fuel scow, subject to the same best management practices. All smaller vessels, including tugs and work boats would be fueled at the dock. An Oil Transfer Plan would be developed to address potential concerns with fueling operations and ensure that appropriate preventative measures and practices are in place. This would include clear assignment of roles and responsibilities during fuel transfer, as well as communication protocols during the fueling process.

Although some of the sediment is contaminated with anthropogenic compounds, and some of these compounds exceed the median San Francisco Bay concentrations of these constituents, none of the sediment to be dredged would be classified as a hazardous material, and current data suggest that the majority of the sediment would be suitable for unconfined aquatic disposal. The small portion of sediment that is potentially not suitable for unconfined aquatic disposal would be reused at an appropriate beneficial reuse site. After construction is completed, vessels would continue to transit SBS Channel and use the Port subject to the same restrictions and requirements as vessels currently engaged in transporting cargo to the Port. If necessary based on more refined testing to be completed during the design phase, implementation of WQ-M1, including an environmental bucket and/or silt curtains, would be used to minimize the spread of any sediment containing elevated levels of anthropogenic chemical constituents. No overflow would be allowed from any scow at the dredge site, and scows would be filled only to the acceptable capacity. The Project would be consistent with BMPs as discussed in ***Section 4.2 of the Main Integrated Report*** and DMMO permit requirements. With implementation of WQ-M1, this impact is less than significant.

Impact HAZ-3: Substantial Hazard to the Public or the Environment through Reasonably Foreseeable Accident or Upset Conditions Involving Hazardous Materials

As stated above, all vessels would be operated in compliance with all applicable regulations related to fueling and management of hazardous substances. During transport, the dredged material would be secured, with precautions in place to minimize any risk of spills. If dredges are diesel-fueled, best management practices would require development of a safety plan and a spill prevention and response plan. None of the sediment to be dredged would be classified as a hazardous material.

Relocation of the fuel pipelines would involve cutting into existing fuel pipelines. As described in ***Section 4.2 of the Main Integrated Report***, the pipelines would first be emptied and inerted (purged of explosive gases), if necessary. All work directly involving the existing fuel pipelines would be conducted with workers who have specialized safety and response training, and are familiar with the specialized requirements for working around fuel pipelines. Because the Shell pipeline is inactive or abandoned, it poses minimal risk of a hazardous materials release. Work on the Kinder-Morgan pipelines would be more challenging because the two pipelines are located only 5 feet apart, and at least one of the pipes would continue to be in active service while the other pipeline is being worked on. Incidents could occur if the active pipeline is accidentally damaged by the excavation and/or tie-in process.

The Fuel Pipeline Relocation and Response Plan to be developed for the construction phase would address specific training requirements, safety requirements, emergency response requirements, and any other specific requirements imposed by the pipeline owners to ensure that work around the pipes occurs in a safe manner and the environment is protected. There would be little risk of a hazardous materials incident if the directional drilling method is chosen as the preferred option for relocating the pipelines. The borehole would be at a sufficient depth to avoid any risks to the pipelines, and both Kinder-Morgan pipelines would remain in active service until the new pipeline segments are ready to be tied into the existing pipeline. The jet sled method of pipeline trench construction would pose less potential risk to nearby pipelines than the clamshell dredged trench construction process because only a water jet is used to remove soil, so there is little risk of damaging an existing pipeline. The dredged trench method would result in a greater potential hazard, as there is little room for error when working near the pipelines, and dredge buckets are relatively large and precise control of the dredge bucket's movement through the water can be challenging. Proper excavation techniques and specific safety requirements for trench excavation would be incorporated into the Fuel Pipeline Relocation and Response Plan, if necessary. The three pipeline relocation methods would be evaluated in more detail during the design phase, and the preferred method would be selected in part based on the potential hazards associated with that method.

The other activity that has the potential to result in an accidental hazardous materials release is tying in the new pipeline segments into the existing pipeline. This step would require cutting the existing pipeline, and if the existing pipelines have not be properly emptied and inerted, an accident could result. However, because the tie would occur either on a barge (above water) or within a dewatered area protected by a cofferdam, any potential spills could be readily contained and cleaned up and would not enter the aquatic environment. Implementation of the Fuel Pipeline Relocation and Response Plan would ensure that pipelines are properly prepared prior to cutting. This impact is less than significant.

A.8.1.7 Placement Sites

Cullinan Ranch Restoration Project

Impact HAZ-1: Increase in Navigation Incidents or Other Substantial Navigational Safety Risks

Use of the Cullinan site may require construction of an offloader and dredged sediment delivery pipeline. Construction of the offloading facilities, the presence of the offloading facilities, and the mooring of scows at the offloader could pose minor hazards to navigation in the vicinity of the construction activities and offloading facilities. The offloading facilities would be would be present for no more than ten years. Actual offloading activities would only occur for a total of approximately 58 months during the work window. As described in ***Section 4.2 of the Main Integrated Report***, a notice to mariners would be issued to make other boaters in the vicinity aware of the proposed work and location of the temporary pipeline and offloader. Any Project-related vessels or equipment would be equipped with the necessary lights. This impact is less than significant.

Impact HAZ-2: Substantial Hazard to the Public or the Environment from Routine Use, Transport, or Disposal of Contaminated Sediment or Hazardous Materials

Small quantities of hazardous materials may be used on the equipment used to construct the offloader and pipeline. These materials may also be used as part of routine maintenance during operation of the offloader. Any material used in an aquatic setting would be approved for use in that setting. Fueling of tugs would occur at a permitted location, and fuel for a diesel-powered offloader would be delivered by fuel scow, following the same requirements as fueling dredges over water. As discussed in ***Section 4.2 of the Main Integrated Report***, all hazardous materials used by the Project would be managed and transported in accordance with all applicable regulations, and fueling would occur in accordance with applicable laws and regulations. None of the sediment to be delivered to Cullinan would be classified as a hazardous material. This impact is less than significant.

Impact HAZ-3: Substantial Hazard to the Public or the Environment through Reasonably Foreseeable Accident or Upset Conditions Involving Hazardous Materials

Small spills of hazardous materials, as well as spills of diesel during fueling could occur if the materials are improperly handled or transferred. As described in ***Section 4.2 of the Main Integrated Report***, the contractor would be required to comply with all applicable laws and regulations regarding over-water fuel transfers and management of hazardous substances. This would include preparing a spill prevention and response plan, maintaining adequate spill response materials at the dredge and/or work site, and training all workers in proper spill response. This impact is less than significant.

Montezuma Wetlands Project

Impact HAZ-1: Increase in Navigation Incidents or Other Substantial Navigational Safety Risks

Mooring of scows at the offloader could pose a very minor hazard to navigation in the vicinity of the offloader. However, there is adequate room near the offloader for smaller vessels to pass any scows and tugs. This impact is less than significant.

Impact HAZ-2: Substantial Hazard to the Public or the Environment from Routine Use, Transport, or Disposal of Contaminated Sediment or Hazardous Materials

Small quantities of hazardous materials may be used on the tug and scows used to haul sediment to Montezuma. Any material used in an aquatic setting would be approved for use in that setting. As discussed in ***Section 4.2 of the Main Integrated Report***, all hazardous materials used by the Project would be managed and transported in accordance with all applicable regulations. None of the sediment to be delivered to Montezuma would be classified as a hazardous material. This impact is less than significant.

Impact HAZ-3: Substantial Hazard to the Public or the Environment through Reasonably Foreseeable Accident or Upset Conditions Involving Hazardous Materials

Small spills of hazardous materials could occur if the materials are improperly handled on the tug or scow delivering sediment to Montezuma. As described in ***Section 4.2 of the Main Integrated Report***, the contractor would be required to comply with all applicable laws and regulations regarding management of hazardous substances. This would include preparing a spill prevention and response plan, maintaining adequate spill response materials at the dredge and/or work site, and training all workers in proper spill response. This impact is less than significant.

SF-DODS

Impact HAZ-1: Increase in Navigation Incidents or Other Substantial Navigational Safety Risks

The presence of scows at, or in transit to SF-DODS would not pose a new or unusual hazard to navigation. The tugs would use established navigation lanes and be in contact with VTS, and would observe weather-related travel restrictions. There would be no impact.

Impact HAZ-2: Substantial Hazard to the Public or the Environment from Routine Use, Transport, or Disposal of Contaminated Sediment or Hazardous Materials

Small quantities of hazardous materials may be used on tugs and scows used to haul sediment to SF-DODS. All hazardous materials used by the Project would be managed and transported in accordance with all applicable regulations. None of the sediment to be delivered to SF-DODS would be classified as a hazardous material. This impact is less than significant.

Impact HAZ-3: Substantial Hazard to the Public or the Environment through Reasonably Foreseeable Accident or Upset Conditions Involving Hazardous Materials

Small spills of hazardous materials could occur if hazardous materials on the tug or scow are improperly handled. As described in ***Section 4.2 of the Main Integrated Report***, the contractor would be required to comply with all applicable laws and regulations regarding management of hazardous substances. This would include preparing a spill prevention and response plan, maintaining adequate spill response materials at the dredge and/or work site, and training all workers in proper spill response. This impact is less than significant.

Eden Landing Restoration Project and Alviso Pond Complex

Impact HAZ-1: Increase in Navigation Incidents or Other Substantial Navigational Safety Risks

Use of the Eden Landing and Alviso sites may require construction of an offloader, and a dredged sediment delivery pipeline from the offloader or a cutterhead dredge to the sediment delivery location. Construction of the offloading facilities, the presence of the offloading facilities, and the mooring of scows at the offloader could pose minor hazards to navigation in the vicinity of the construction activities and offloading facilities. The offloading facilities would be temporary. As described in ***Section 4.2 of the Main Integrated Report***, a notice to mariners would be issued to make other boaters in the vicinity aware of the proposed work and location of the temporary pipeline and/or offloader. Any Project-related vessels or equipment would be equipped with the necessary lights. This impact is less than significant.

Impact HAZ-2: Substantial Hazard to the Public or the Environment from Routine Use, Transport, or Disposal of Contaminated Sediment or Hazardous Materials

Small quantities of hazardous materials may be used on the equipment used to construct the offloader and pipeline. These materials may also be used as part of routine maintenance during operation of the offloader. Any material used in an aquatic setting would be approved for use in that setting. Fuel for a diesel-powered offloader would be delivered by fuel scow, following the same requirements as fueling dredges over water. As discussed in ***Section 4.2 of the Main Integrated Report***, all hazardous materials used by the Project would be managed and transported in accordance with all applicable regulations, and fueling would occur in accordance with applicable laws and regulations. None of the sediment to be delivered to these placement sites would be classified as a hazardous material.

Construction of the pipeline to Alviso and Eden Landing my require small amounts of excavation near the levee, where the pipeline passes through mudflats and possibly thin bands of tidal marsh outboard of the levee. At Alviso, the local sediment may contain levels of mercury and other constituents at concentrations exceeding San Francisco Bay average ambient levels. Although these concentrations are elevated, they are well below the threshold for a hazardous waste (20 mg/kg mercury). This impact is less than significant.

Impact HAZ-3: Substantial Hazard to the Public or the Environment through Reasonably Foreseeable Accident or Upset Conditions Involving Hazardous Materials

Small spills of hazardous materials, as well as spills of diesel during fueling could occur if the materials are improperly handled or transferred. As described in ***Section 4.2 of the Main Integrated Report***, the contractor would be required to comply with all applicable laws and regulations regarding over-water fuel transfers and management of hazardous substances. This would include preparing a spill prevention and response plan, maintaining adequate spill response materials at the dredge and/or work site, and training all workers in proper spill response. This impact is less than significant.

Mitigation Measures
There are no significant impacts from the Project associated with hazards and hazardous materials; no mitigation is required.

A.9 Land Use and Planning

Affected Environment

A.9.1.1 Redwood City Harbor Land Uses

Redwood City Harbor (RWC) Channel is located in the eastern part of Redwood City in San Mateo County, California. The adjoining land use in this region consists of primarily urban areas comprised of industrial, commercial, residential, recreational, open space, salt ponds, restored wetland, and Port-related areas. Almost half of Redwood City's jurisdictional (land) area is under water, in San Francisco Bay (City of Redwood City 2010a). RWC Channel is approximately 21,000 feet in length. Land uses immediately adjacent to the channel area include open space, marinas, commercial, industrial, wetlands and the Port. These areas are described below.

Land Use North and Northwest of RWC Channel

Bair Island is located to the north and northwest of the channel. It is composed of three islands totaling approximately 3,000 acres that were a complex of former salt ponds. Large portions of Bair Island have been restored to tidal salt marshes. Approximately 1,985 acres are part of the Bair Island Ecological Reserve owned by CDFW and the remainder of the island is part of the USFWS Don Edwards NWR (CDFW 2015a). The part of Bair Island that borders the RWC Channel is within the USFWS Don Edwards National Wildlife Refuge and runs parallel to RWC Channel along the north and northwest.

South and Southwest End of Channel

The land uses located at the south and southwest end of RWC Channel are primarily industrial and commercial. The facilities in the area include the Port, offices, commercial space, heavy industrial facilities, marinas, UP railroad tracks, Seaport Boulevard, parking lots, public access, and vacant lots. The Port of Redwood City is approximately 108 acres. The Port area includes five wharves, two marinas, offices and other commercial space, the Seaport Conference Center, restaurants, and industrial/recycling (i.e. Cemex Cement, Cemex Aggregates, PABCO Gypsum, Sims Metal Management, etc.) facilities. East and south of the Port is the Redwood City Saltworks complex owned by Cargill, Inc., an approximately 1,400-acre salt pond area still considered to be in active use.

Southeast End of Redwood Channel

The southeast portion of RWC Channel is adjacent Greco Island, part of the Don Edwards San Francisco Bay NWR. Greco Island is an approximately 817-acre restored island marsh.

San Bruno Shoal Channel

San Bruno Shoal (SBS) Channel is located in San Francisco Bay, approximately 0.75 mile east of the City of San Bruno shoreline in San Mateo County and approximately 2 miles south of the City of San Francisco. The SBS Channel is approximately 30,000 feet in length and is part of and surrounded by San Francisco Bay. There are no land uses within the Project Area for SBS Channel.

Placement Sites

The dredged material placement sites consist of four beneficial reuse sites and SF-DODS. The Placement sites include Cullinan Ranch Tidal Restoration Project, Montezuma Wetlands Restoration Project, Alviso ponds (Ponds A1 and A2W; A5, A7, A8, and A8S; and Ponds A9 through A15), and Eden Landing ponds (Ponds E1 and E2, E4 and E7; Ponds E5, E6, and E6C; and Ponds E1C, E2C, E4C, and E5C). The land uses for each of these sites are described below.

Cullinan Ranch Tidal Restoration Project

Cullinan is located in Solano County and is an approximately 1,575-acre wetland restoration project. Approximately 290 acres of Cullinan were diked off to receive dredged sediment to create an elevation suitable for mid-marsh establishment. The area affected by the RWC Project only includes the two potential offloader sites, the pipeline alignments along Dutchman Slough leading from the offloader sites to the delivery point, and a small portion of the levee where the sediment delivery pipeline would enter the site and delivery of sediment from the pipeline would occur (***Figure 1-1***). The only land uses immediately adjacent to the offloader and the levee are restored wetlands, open water, and tidal channels.

Montezuma Wetlands Restoration Project

Montezuma is located in Solano County and is an approximately 2,000-acre wetland restoration project. The area affected by the RWC Project only consists of the offloader location (***Figure A-8***). The only land uses adjacent to the offloader are restored wetland, outboard marsh, and open water.

Figure A-8. Study Area including SF-DODS

SF-DODS

SF-DODS is approximately 50 miles west of the Golden Gate and is managed by USEPA Region IX. There are no adjacent land uses except open ocean water.

Alviso Pond Complex

The Alviso Pond Complex consists of multiple historic salt and other ponds in the South Bay Area within Santa Clara County. The Alviso Pond Complex is part of the SBSP Restoration Project. The RWC dredged sediment could be delivered to the Bay side of levees bordering the Alviso Pond Complex at several potential locations and distributed by the SBSP Restoration Project for further delivery of the sediments into the appropriate pond(s). These levee locations border the following ponds:

- Ponds A2W for delivery to Ponds A1 and A2W (Mountain View Ponds); and
- Pond A9 for delivery to Ponds A5, A7, A8 and A8S; and Ponds A9 through A15.

The surrounding land uses for all the ponds are salt ponds or wetland, tidal channels, and open water.

Eden Landing Ecological Reserve

Eden Landing Ecological Reserve is an approximately 5,500-acre area in the South Bay Area in the City of Hayward (ACFCWCD 2015). This area is part of the SBSP Restoration Project. The RWC dredged sediment would be delivered to a levee located on the Bay side of Eden Landing near Pond E2 and distributed by the SBSP Restoration Project into the appropriate pond(s). The surrounding land uses are wetland, tidal channels, and open water.

Significance Thresholds

The effects of the Project or alternative on land uses are considered to be significant if the proposed Project or alternatives would result in any of the following land use impacts (Impact LU) that would:

1. Result in a conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Project (including, but not limited to a general plan, specific plan, local coastal program, or zoning ordinance);
2. Introduce land uses or activities incompatible with existing or adjacent land uses;
3. Physically divide existing communities; or
4. Conflict with any applicable habitat conservation plan or natural community conservation plan.

Environmental Consequences

Impacts to land use were assessed by determining whether the project activities would 1) alter an existing land use, 2) comparing any changes in land use with allowable land uses at the site, and with adjacent land uses, and 3) evaluating whether construction activities would be incompatible with adjacent land uses.

Dredging Options

Potential land use impacts associated with all three dredging options are similar; therefore the three dredging options are discussed together.

Impact LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project

Dredging in RWC Channel would be consistent with local land use plans. Dredging in RWC and SBS Channels and pipeline installation activities at SBS Channel are not expected to have any significant long-term impacts to land uses. Temporary staging areas to support the dredging activities during construction would be within existing Port industrial areas or other industrial areas (e.g., near San Francisco Airport, if needed for the pipeline work). This impact is less than significant.

Impact LU-2: Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses

As stated above, staging areas to support the dredging activities would be temporary and within existing Port or other industrial areas. There would be no other construction on land adjacent to the RWC Channel, or associated with dredging work or pipeline installation at SBS Channel. This impact is less than significant.

Impact LU-3: Physical Division of Existing Communities

Staging areas to support the dredging during the project would be temporary and within existing Port or other industrial areas. The project would not divide existing communities. There is no impact from the Project.

Impact LU-4: Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan

There is no habitat conservation plan or natural community conservation plan for the City of Redwood City. The City of Brisbane does not have a habitat conservation plan or natural community conservation plan for this area. There is no impact from the project.

Placement Sites

Cullinan Ranch Tidal Restoration Project

Impact LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project

Potential activities associated with use of the Cullinan site include construction of an offloader and up to 1 mile of floating pipeline, and offloading of scows at the offloader. Off-loading at the Cullinan site could occur for up to a total of 19 months if the entire 3 MCY capacity of the site is used by the RWC Project. Construction of the offloader and pipeline could require up to up to three months. The Project is consistent with the local land use plans to protect and restore wetlands at Cullinan Ranch. Regulatory agencies permits and a lease from the State Lands Commission (SLC) have been obtained for a past sediment reuse project in 2014. These documents specify the requirements for construction and operation of the offloader and the RWC Project would have similar permits and would comply with all permit requirements. This impact is less than significant.

<u>Impact LU-2: Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses</u>

The construction activity adjacent to and on the Cullinan site would be temporary. Construction and operation of the offloader and related piping would be in and adjacent to Dutchman Slough and piping would also be constructed on the outboard levee at Cullinan or Napa Sonoma Marsh Wildlife Area Pond 3. The adjacent land uses are wetlands and are designated as Marsh in the Land Use Element of the Solano County General Plan. The Project would not conflict with adjacent land uses and over the long term would support the restoration of the Cullinan to tidal marsh. This impact is less than significant.

<u>Impact LU-3: Physical Division of Existing Communities</u>

The construction and operation of the offloader would occur adjacent to Dutchman Slough, and pipeline would be in Dutchman Slough. There is no impact from the Project.

<u>Impact LU-4: Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan</u>

There is a Solano Habitat Conservation Plan (HCP) for parts of Solano and Yolo counties. This plan covers the portion of Cullinan Ranch Tidal Restoration Project within Solano County. The site is owned and managed by USFWS and therefore the habitat is protected. The placement of dredged material within Cullinan is a beneficial reuse of the dredged sediment to restore the wetlands. This work is consistent with the HCP. There is no impact from the Project.

Montezuma Wetland Restoration Project

<u>Impact LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project</u>

Potential activities associated with use of the Montezuma site consist of offloading sediment from the scows at the dedicated offloader (all potential impacts associated with operation of the offloader and placement and management of the sediment are addressed by the Montezuma project). Off-loading at the Montezuma placement site could occur for up to a total of approximately 58 months (spread over 10 dredging windows) if 7.7 MCY of

Montezuma's capacity is used by the RWC Project. The Project is consistent with the local land use plans and the Marsh land use designation with a Resource Conservation Overlay in the Solano County General Plan. The impact is less than significant.

<u>Impact LU-2: Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses</u>

The RWC Project would not introduce activities incompatible with existing or adjacent land uses. The adjacent land uses are wetlands and are designated as Marsh or Water body and courses in the Land Use Element of the General Plan. The offloading of dredge sediment from this project would comply with all existing permits. The Project would not conflict with adjacent land uses and over the long term would support the restoration of the Montezuma project. There is no impact from the Project.

<u>Impact LU-3: Physical Division of Existing Communities</u>

The delivery of the sediment to the offloader would be in eastern Suisun Bay. There is no impact from the Project.

<u>Impact LU-4: Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan</u>

The Solano County HCP includes Montezuma. The placement of dredged material at the Montezuma site is a beneficial reuse of the dredged sediment to restore the wetland. This work is consistent with the HCP. There is no impact from the Project.

SF-DODS

<u>Impact LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project</u>

The potential activity associated with the use of the SF-DODS is bottom dumping of dredged material at the site. The site is located approximately 50 miles west of the Golden Gate Bridge. Use of this site for dredge material placement is consistent with all permits and plans. There is no impact from the Project.

<u>Impact LU-2: Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses</u>

The site is located approximately 50 miles offshore and there are no activities incompatible with existing or adjacent land uses. There is no impact from the Project.

<u>Impact LU-3: Physical Division of Existing Communities</u>

There are no communities near SF-DODS and therefore there is no impact from the Project.

Impact LU-4: Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan

There is no applicable habitat conservation plan or natural community conservation plan for SF-DODS and therefore there is no impact from the Project.

Alviso Ponds

Impact LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project

Potential activities associated with use of the Alviso placement site would include construction of an offloader and 4 - 6 miles of floating or submerged pipeline, and offloading of scows at the offloader. Dredged sediment delivery to Alviso could occur for up to a total of 24 months (spread over 4 years) if all sediment generated under Dredge Option C is delivered to this placement site. Sediment delivery to the Pond A9 levee would require a floating or submerged pipeline in Alviso Slough.

Both Santa Clara County's and the City of San Jose's land use policies promote the protection and restoration of the wetlands. The construction and operation of the offloader and pipeline would be consistent with these land use policies. The Alviso restoration work would be analyzed as part of the South Bay Restoration Project and the enhancement of the habitat through beneficial reuse of dredge sediment is consistent with the SBSP Restoration plans. The construction of the offloader would require permits and approvals from regulatory agencies and SLC as described for the Eden Landing ponds and the RWC Project would comply with all requirements contained in these approvals and permits. This is impact is less than significant.

Impact LU-2: Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses

The Project would not introduce activities incompatible with existing or adjacent land uses. The site is surrounded by salt ponds and marsh owned by USFWS. The offloading of dredge sediment from this Project would comply with all existing permits. The Project would not conflict with adjacent land uses and over the long term would support the restoration of the Alviso wetlands. There is no impact from the Project.

Impact LU-3: Physical Division of Existing Communities

The offloader and pipelines would be located in San Francisco Bay. There is no impact from the Project.

Impact LU-4: Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan

Although Santa Clara County has a Habitat Conservation Plan, it does not apply to the baylands including the Alviso site. There is no impact from the Project.

Eden Landing Ponds

Impact LU-1: Conflict with Applicable Land Use Plan, Policy, or Regulation of an Agency with Jurisdiction over the Project

Potential activities associated with use of the Eden Landing placement site would include three options for transport of the dredged sediment to this placement site. One option would require the construction of an offloader and approximately 3.5 miles of floating or submerged pipeline, and offloading of scows at the offloader. Offloading at Eden Landing could occur for up to a total of up to 24 months (spread over 4 years) if all sediment generated under Dredge Option C is delivered to this placement site. Construction of the offloader and pipeline would require approximately three months.

The second option would involve the use of a cutterhead dredge at RWC and SBS Channels that would pump sediment directly from the dredging location to the sediment delivery location at the top of the levee on Pond E2.

The third option would be a combination of Options 1 and 2. The contractor may determine that it is most cost-effective to mobilize a clamshell for portions of the work, and a cutterhead for the other portion.

Both the County's and the City's land use policies promote the protection and restoration of the wetlands. The construction and operation of the offloader and pipeline or pipeline from the hydraulic cutterhead dredge would be consistent with these land use policies. The Eden Landing Ponds restoration work would be analyzed as part of the South Bay Restoration Project and the enhancement of the habitat through beneficial reuse of dredge sediment is consistent with the SBSP Restoration plans. The construction of the offloader and pipelines would require permits and approvals from regulatory agencies (including BCDC, RWQCB, CDFW, USFWS, and NOAA-Fisheries) and approval from the SLC and the RWC Project would comply with all requirements contained in the permits and approvals. This is impact is less than significant.

Impact LU-2: Introduction of Land Uses or Activities Incompatible with Existing or Adjacent Land Uses

The Project would not introduce activities incompatible with existing or adjacent land uses. The site is surrounded by salt ponds and marsh owned by CDFW. The offloading of dredged sediment from this Project would comply with all applicable permits and approvals. The Project would not conflict with adjacent land uses and over the long term would support the restoration of the Eden Landing wetlands. There is no impact from the Project.

Impact LU-3: Physical Division of Existing Communities

The offloader and pipelines would be located in San Francisco Bay. There is no impact from the Project.

<u>Impact LU-4: Conflict with Applicable Habitat Conservation Plan or Natural Community Conservation Plan</u>

There is no applicable habitat conservation plan or natural community conservation plan for the Eden Landing ponds. There is no impact from the Project.

Mitigation Measures

There are no significant impacts to land uses due to the dredging or placement options; no mitigation is required.

A.10 Noise and Vibration

This chapter discusses noise and its relevance to the study areas. It describes existing noise conditions and noise regulations applicable to the study areas, and evaluates potential effects on noise-sensitive uses. Noise sensitive uses (noise sensitive receptors) include uses such as residential areas, hospitals, schools, and child-care centers. Effects of noise on nearby wildlife populations are addressed in Biological Resource ***Sections A.4 and A.5*** on Fish and Aquatic Resources and Terrestrial Resources, respectively; however, the calculations supporting the impact assessment for noise effects on wildlife are presented in this section.

The traditional definition of noise is "unwanted or disturbing sound." Sound becomes unwanted when it either interferes with normal activities such as sleeping and conversation, or disrupts or diminishes one's quality of life. Persistent and escalating sources of sound also have the potential to affect one's health. Problems related to noise include stress-related illnesses, high blood pressure, speech interference, hearing loss, sleep disruption, and lost productivity (USEPA 2012).

The decibel (dB) is a unit used to express the intensity of a sound wave, and is used to measure noise levels and set noise regulations. The unit of measurement is generally adjusted to the A scale (dBA) to better approximate the human ear's range of sensitivity to sounds of different frequencies (USACE 2009). A noise level of 0 dBA is considered the threshold of human hearing, and a noise level of 140 dBA is considered the threshold of pain. ***Table A-11*** shows noise levels for a range of activities.

Table A-11. Sound Levels and Relative Loudness of Typical Noises in Indoor and Outdoor Environments

Activity (Distance from Noise Source)	Sound Level (dBA)	Subjective Impression	Relative Loudness
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50-hp siren (100 feet)	130		32 times as loud
Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Riveting machine	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal or food blender (50 feet)	80	Moderately loud	Reference loudness
Vacuum cleaner (10 feet) or passenger car at 65 mph (25 feet)	70		1/2 as loud
Large store air-conditioning unit (20 feet)	60		1/4 as loud
Light auto traffic (100 feet)	50	Quiet	1/8 as loud
Bedroom/living room or bird calls	40		1/16 as loud
Library, soft whisper (15 feet)	30	Very quiet	
Broadcasting studio	20		
	10	Just audible	
	0	Threshold of hearing	

There are several methods by which noise levels are expressed. One method, called the Equivalent Sound Level (Leq), is the average acoustic energy content of a noise over a given period of time. The Leq of a time period with varying noise levels and that of a steady noise are the same if they deliver the same acoustic energy to the ear during the period of exposure. Another noise measurement is the “Day-Night Average Sound Level” (Ldn). Ldn is the time average of noise levels for a 24-hour period with 10 dB added to noises occurring between 10:00 p.m. and 7:00 am (night-time “penalty”). This adjustment accounts for the increased sensitivity of people to nighttime noise. The “Community Noise Equivalent Level” (CNEL) is similar to the Ldn, except the CNEL also adds 5 dB to evening noise levels (7:00 p.m. to 10:00 p.m.). Ldn and CNEL noise measurement values are generally similar (USACE 2009).

Vibration

Vibration is another potential noise-related impact and is defined as the following.

> "Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. There are several different methods that are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe vibration impacts to buildings. The root mean square (RMS) amplitude is most frequently used to describe the effect of vibration on the human body. The RMS amplitude is defined as the average of the squared amplitude of the signal. Decibel notation (VdB) is commonly used to measure RMS. The decibel notation acts to compress the range of numbers required to describe vibration (Port of Redwood City 2010)."

Groundborne vibrations can be caused by natural phenomena—such as earthquakes, landslides, and sea waves—or by humans, in the case of machinery, traffic, explosions, trains, and construction equipment. Construction vibrations can be transient, random, or continuous. Transient construction vibrations are generated by blasting, pile-driving, and wrecking balls. Continuous vibrations result from vibratory pile-drivers, large pumps, horizontal directional drilling, and compressors (USFWS AND CDFW 2007).

Although pile driving, directional drilling, and use of large pumps are all activities associated with this Project, they will primarily occur in-Bay and are not expected to cause on-land vibration impacts. Booster pumps potentially located on levees are far from most land-based receptors are not expected to cause vibration impacts. Impacts to sensitive wildlife receptors from underwater noise generated by pile driving are of special concern. Underwater noise impacts from pile driving are assessed using noise thresholds set by resource agencies. Potential vibration impacts are inherent in this particular assessment. Vibration effects to structures and human receptors are not a concern for this Project and are not analyzed further.

Affected Environment

The following sections discuss existing noise conditions at locations within and adjacent to the study areas. The noise environment for the dredging and placement sites varies considerably, with the placement sites generally being located in quieter, more noise-sensitive natural areas. Noise regulations and standards promulgated by all applicable jurisdictions have been reviewed. These include Alameda County, San Mateo County, Santa Clara County, and Solano County, as well as the Cities of Brisbane, Hayward, Redwood City, San Jose, South San Francisco, and Mountain View. The Project is composed of a construction phase involving the two channel locations and the five placement sites, and an operational phase that would primarily affect the two channel locations. The regulatory setting information provided in the following section focuses on construction activities, and allowable operational noise levels at the two channel locations.

A.10.1.1 Dredging Sites
Redwood City Harbor Channel

RWC Channel is an industrial area. It is bounded to the southeast by the Port of Redwood City's and related industrial facilities, as well as Greco Island. While the industrial areas are not considered to be noise sensitive, Greco Island is a sensitive natural (wetland) area. To the northwest is Bair Island, which is also a sensitive wetland area. Recreational, residential, and industrial uses are present to the southwest of the proposed dredging area within and around the marinas. Some data are available regarding the background noise levels at the Port of Redwood City and nearby marinas west of the Port and are described below. The Redwood City General Plan provides ambient noise data from the "undeveloped lands" surrounding the Redwood Creek area, which this analysis assumes to be equivalent or comparable to Bair and Greco Islands.

The main contributors to the noise environment surrounding the RWC Channel are existing Port activities and vehicles traveling on Seaport Boulevard, the main street used to access the Port and nearby facilities. Seaport Boulevard lies less than half a mile inland from the channel's edge. Long-term noise measurements were taken for the Redwood City General Plan Noise and Vibration Background Report at the parking lot of the Seaport Center on July 16, 2008 through July 18, 2008. According to these measurements, the CNEL at this location was approximately 62 dBA. The primary noise source identified at the Seaport Center was noise from Seaport Boulevard (City of Redwood City 2008). Since noise travels over water, the reported noise level is assumed to be representative of the ambient noise level along the RWC Channel adjacent to the Seaport Center.

An Existing Noise Contours map contained in the 2010 Redwood City General Plan (ESA 2010) shows an average noise level of less than 55 dBA on the undeveloped land surrounding the RWC Channel study area. Intermittent noise would also be expected from ship traffic and aircraft en route to nearby San Francisco International Airport, which is located approximately 17 miles northwest of the Port along the shoreline. San Francisco Airport's Fly Quiet Program seeks to reduce noise impacts to nearby communities by preferring incoming and outgoing flights to approach and depart over water, when possible (SFO 2015).

The nearest residential receptors include residents that inhabit houseboats in the marinas at Redwood Landing and Docktown. The nearest of these receptors would be residents at Redwood Landing, approximately 0.5 miles south of the project site. Additionally, there is a mobile home community located approximately 1.5 miles southeast of the Port. Other residential areas near the project site include the downtown (about 2.2 miles southwest of the Port), and nearby neighborhoods of Middlefield, Ampex, and Friendly Acres (Port of Redwood City 2010). Kaiser Permanente Redwood City Medical Center is located approximately 2 miles southeast of the Port and the surrounding industrial areas. The highly trafficked Highway 101 lies between the proposed dredging location and the medical center and residential areas of downtown, Middlefield, Ampex and Friendly Acres.

San Bruno Shoal Channel

SBS Channel is located in deep water in South San Francisco Bay, within several miles of San Francisco International Airport to the west, and Metropolitan Oakland International Airport to the east. Other noise sources in the area consist of the full array of vessel traffic commonly found in San Francisco Bay.

Potential receptors include recreational users on the Bay and perhaps at the Tony Lema Golf Course, Oyster Bay Regional Shoreline, Marina Park, and the Hayward Regional Shoreline, several miles away along the East Bay shoreline. These recreation sites are all south of Oakland Airport and several miles east of the proposed dredging areas. Part of the Tony Lema Golf Course lies within the 65 dB noise contour for Oakland Airport (HMMH 2014). Some recreational use also exists on the western shoreline; the closest are Coyote Point Recreation Area and Poplar Creek Golf Course, both of which lie adjacent to and between Highway 101 and the Bay. Proposed dredging would occur several miles (roughly 3 miles at nearest point) east of these recreation areas.

SBS Channel lies within the jurisdiction of the City of South San Francisco, among others. The South San Francisco General Plan establishes average noise levels and projects how those would change by 2010. Due to the proximity to San Francisco International Airport (SFO), much of the noise discussion focuses on aircraft noise. With no change in SFO's runway configuration, aircraft noise contours were projected to shift gradually eastward by 2010. As a result, areas east of the current flight path were expected to experience an increase in average noise levels. At the same time, the 70 dB CNEL contour was expected to shrink, no longer impacting South San Francisco (City of South San Francisco 2015). However, the Fly Quiet Program at SFO has since sought to maximize over-water approaches and takeoffs in order to minimize noise to nearby communities. No noise contours for over bay areas were located, but this approach has likely shifted some of the higher noise levels in excess of 65 dB to the vicinity of the SBS area.

A.10.1.2 Placement Sites

Cullinan Ranch Tidal Restoration Site

The Cullinan Ranch Tidal Restoration Site is located immediately adjacent to State Highway 37. The southern offloader location is within 200 feet of the Highway 37 Mare Island Bridge over the Napa River; the northern offloader location is approximately 750 feet north of the Mare Island Bridge. The northern offloader is located approximately 500 feet east of the outboard marsh at the NSMWA's Pond 3 (restored to tidal action in 2006). The dredged sediment delivery location on the north Cullinan levee is within 2,000 feet of Highway 37, and approximately 300 feet south of Pond 3. Dutchman Slough and Pond 3 would be considered noise sensitive locations. The southern offloader is less than 100 feet from low quality habitat that was formerly used as an informal construction and storage site. This habitat is the same distance from Highway 37 as the southern offloader and can be expected to have the same ambient noise levels as the southern offloader site. Although no noise monitoring data are available for Cullinan, noise from Highway 37 carries across the open expanse between the highway and the north side of Cullinan including the area around the sediment delivery location. Highway traffic noise levels typically range from 70 to 80 dBA at a distance of 50 ft. from the highway (USDOT 2003).

Montezuma Wetlands Restoration Project

The Project would deliver sediment to the Montezuma offloader; the Montezuma Wetlands Restoration Site is responsible for all environmental impacts associated with off-loading, placing, and managing the dredged sediment. The offloader is located approximately 100 feet off-shore of the southeastern levee of the Montezuma site, approximately 0.5 mile east of the mouth of Montezuma Slough and 0.2 mile north of Chain Island. The hamlet of Collinsville, which contains several residences, is located approximately 1,900 feet east of the offloader location. Recreational boaters are likely to pass by this site, and the DWR Collinsville Day-Use area is about 2 miles northwest of the offloader location.

SF-DODS

SF-DODS is located in the Pacific Ocean just west of the continental shelf. Some ship traffic is likely in the area; however, the predominant sounds are of natural origin.

Alviso Pond Complex

The Alviso ponds are located on the south shore of San Francisco Bay, bayward of the Cities of Fremont, San Jose, Sunnyvale, and unincorporated Santa Clara County. The two potential dredged sediment delivery locations are adjacent to other ponds within the Alviso Pond Complex. Pond A9 is surrounded by open water and other ponds. The most likely delivery location at Pond A9 is approximately 3 miles north of the closest residential area and 2.5 miles north of the closest industrial area. Recreational uses, including a golf-course, trails, and local parks are adjacent to Ponds A1 and A2W, and a trail runs around the perimeter of Pond A9.Intermittent noises can be heard in the vicinity of recreational facilities.

The primary local noise sources in the area include transportation systems and airports. US 101 and State Route 237 are to the south of the pond complex, and generate vehicular traffic noise. According to the City of Mountain View General Plan, 1990 noise levels on US 101 and SR 237 ranged from 72 to 76 dB (Ldn) and 65 to 74 dB (Ldn), respectively. These noise levels were expected to be similar in 2015 (City of Mountain View 2012).

Airport operations, including flights to and from the Palo Alto Municipal Airport (less than 1.5 miles west of the pond complex) and the Moffett Federal Airfield (immediately south of Pond

AB2) also contribute to local noise levels at the pond complex (USFWS and CDFW 2007). A 2010 Environmental Noise Assessment report (Illingworth & Rodkin, Inc. 2010) produced for the Envision San Jose 2040 General Plan found that in the area of the city closest to the study area (named Alviso Planning Area in the report), the main sources of noise include State Route 237 and Interstate 880, train operations along the Union Pacific Railroad, and aircraft.

A noise measurement conducted along State Route 237 determined the Day-Night Average noise level to be 74 dBA DNL, which is consistent with the noise levels reported by the City of Mountain View. Other significant noise-generating roadways include North First Street, Gold Street, Los Esteros Road, and Zanker Road. Currently, there are no major noise sources within the pond complex, with the exception of the railroad that crosses the pond complex east of A12, A13, and A15 (USFWS and CDFW 2007). The rail line is approximately 2.5 miles east of the proposed sediment delivery location.

The only sensitive receptor within the Alviso pond complex are trail users at Pond A9, and wildlife that may be present in the strip marshes in the vicinity of the dredged sediment delivery locations at Ponds A2W and A9. Most of the Alviso ponds are surrounded by commercial and industrial uses, the Bay, and active Cargill, Inc. (Cargill) ponds. The nearest residential receptors are to the west of Highway 101 (more than 1.5 miles from the proposed sediment delivery location at Pond A2W), and in the community of Alviso, 3 miles southeast of the proposed sediment delivery location at Pond A9. Most of the residents of Alviso are separated from the Alviso pond complex by railroad tracks near the western edge of the town.

For the purposes of the RWC Project, the Alviso pond complex placement site also includes the offloader location serving the Alviso ponds, and the intermediate booster pump location required if sediment is delivered to Pond A9. The offloader would be located between Highway 84 and the railroad to the south of the highway; this is a high-noise location. The closest sensitive receptors to the offloader location are habitat areas (wildlife receptors) approximately 0.3 – 0.5 miles to the east and southeast in the SFBNWR, and approximately 0.6 miles to west-southwest at Pond SF-2. Pond SF-2 is immediately adjacent to Highway 84, and the SFBNWR areas to the southeast are located between Highway 84 and the railroad, and immediately south of the railroad. The closest residential receptors are in East Palo Alto, approximately 1.7 miles to the southwest, and the closest recreational receptors would be at the Bay Trail location 1.5 miles to the southwest of the offloader location. The potential intermediate booster pump location for the Pond A9 dredged sediment delivery location is farther away from all sensitive receptors than the offloader and Pond A9 sediment delivery location, and therefore the impact assessment does not address this location separately.

Eden Landing Ponds

The Eden Landing ponds are located along the east shore of South San Francisco Bay, between Alameda Creek (Alameda Flood Control Channel) and Old Alameda Creek. The Eden Landing pond complex is in the City of Hayward, in Alameda County. The City of Union City is to the east and the City of Fremont abuts the pond complex to the south. The ponds are surrounded by other wetlands, including managed ponds and tidal marsh to the north, east, and south. Residential areas are located approximately 3 miles east of the Pond E2 exterior embankment (i.e., the sediment off-loading location). The offloader that may be installed to pump sediment into this site is anticipated to be located approximately 3.5 miles west (off-shore) from the Pond E2 levee (in deeper water).

Recreational use (Bay Trail spur) occurs to the south of Pond E2 on the trails along the ACFCC, and hunting is permitted off-shore in navigable waters in season. With the exception of the trails along the ACFCC, the southern portion of Eden Landing ponds are closed to the public. Other recreational uses occur in the northern portion of the ELER, which would not receive sediment from of the Project. Intermittent noises can be heard in the vicinity of the recreational areas (USFWS and CDFW, et al. 2007).

Noise levels in this area are primarily influenced by vehicular traffic on SR 92 (approximately 3 miles north of the proposed sediment delivery location), and I-880, approximately 3 miles to the east of the E2 outboard levee. The Hayward General Plan identifies noise contours for major roadways within its jurisdiction. Noise levels within 50 feet (15 meters [m]) of SR 92 range from 75 to 79 Ldn (USFWS and CDFW 2007). Other local noise sources are associated with passing trains and airplanes flying overhead. The Union Pacific Railroad is located about 3.5 miles east of the sediment delivery location. The Hayward Executive Airport is located approximately 6 miles to the north of the proposed sediment delivery location. Currently, no major noise sources occur within the Eden Landing pond complex since salt production operations ceased when CDFW acquired the property.

According to the South Bay Salt Pond Restoration Project environmental analysis, open space and commercial and industrial uses surround the pond complex to the north, east and south, and San Francisco Bay is to the west. The nearest sensitive receptors are residences within the Eden Shores development (off Eden Shores Drive in the City of Hayward) approximately 300 feet north of Pond E6A, and 3 miles east of the proposed sediment delivery location. Residences are also located approximately 1,000 feet east of Pond E4C (off Carmel Way in Union City) (USFWS and CDFW 2007); these residences are located approximately 3.2 miles east of the proposed sediment delivery location.

Residential areas are also located approximately 2.5 miles to the west of the offloader locations. Sensitive wildlife may be present in the marsh areas located approximately 0.5 miles to the north and 0.6 miles to the south of the proposed dredged sediment delivery location.

Significance Thresholds

The effects of a project or alternative on noise are considered to be significant if the proposed Project or alternatives would:

1. Increase existing noise levels at sensitive receptor locations by more than 5 dBA, or

2. Expose sensitive receptors or other identified land uses to noise levels in excess of regulatory thresholds

Environmental Consequences

This section addresses potential effects to sensitive human receptors. Potential noise effects to wildlife species are primarily addressed in Biological Resources ***Sections A.4 and A.5***, Biological Resources. Calculations of the predicted noise levels for wildlife receptors are included in tables A-13, A-14, A-15, and A-16 below for completeness. Potential noise effects were evaluated by comparing calculated noise levels at the receptor location with existing (ambient) and permissible noise levels.

Dredging Options

<u>Impact N-1: Noise Level Increase of More than 5 dBA at Sensitive Receptor Locations</u>

Construction Phase Noise for Dredging

Potential noise effects from the three dredging options would be similar for all three options; the primary difference would be the duration of the construction activities. Consequently, all three dredging options are addressed as a group. Dredging could potentially occur a maximum of 24 hours a day, 7 days a week during the 180-day dredging window (June 1 through November 30). While noise can be generated from a variety of equipment used for dredging, the primary sources of equipment noise would include the dredge (with its associated pumps and generators) and tugboats, which would be used to position the dredges and scows. Other equipment, such as the work skiffs (crew boat) and tender tug, would be used for the dredge at the dredge site and would not contribute substantially to the noise associated with dredging activities.

Assuming dredging occurs using a clamshell, up to four pieces of equipment could be active simultaneously: the dredge, a tug boat attending a scow, a work skiff (crew boat), and a tender tug for the clamshell. The expected noise level at 50 feet if these four pieces of equipment are working simultaneously is captured in the clamshell dredge noise estimate that is presented in ***Table A-12***. The data presented show the expected noise levels at the nearest sensitive receptor location when dredging activities are closest to the sensitive receptor location. If a hydraulic cutterhead dredge is used, supporting equipment would include a booster pump(s) located at the dredge, a derrick barge, a work skiff, and two tender tugs. The noise expected from these pieces of equipment are combined into one noise measurement for the cutterhead dredge, also shown in ***Table A-12***. ***Table A-13*** provides a comparison of the predicted noise levels compared to ambient levels. As shown in Table A-13, the highest predicted noise level at the closest sensitive receptor is below 55dBA (cutterhead dredge plant), which is below the ambient levels at the nearest residential and sensitive habitat areas. Motorized boat users are not considered sensitive receptors. Non-motorized boat users may temporarily avoid the area where dredging is occurring; however, the dredging location is relatively far from shore, in or immediately adjacent to the active ship channel, and limited to the small area of active dredging. Also, non-motorized boat users have ample opportunities for recreational activities in areas away from the dredging location. Potential noise impacts from dredging work in RWC and SBS Channels are less than significant.

Table A-12. Estimated Equipment Noise Levels at Dredging Sites

Project Site	Noise Source(s)	Reference Noise Levels (dBA)	Location of Noise Source	Distance to Closest Sensitive Receptor from Noise Location	Predicted Noise Levels (dBA) at Closest Receptor[1]
RWC Channel	Clamshell Dredge	67 @ 250 ft.	Dredging Channel	0.5 miles (residents - houseboats)	46.5
	Cutterhead Dredge	79 @ 160 ft. (L_{eq})			54.6
	Tugboat	82 @ 50 ft. (L_{eq})			47.5
SBS Channel	Clamshell Dredge	67 @ 250 ft.	Dredging Channel	3.0 miles (residents-Brisbane)	31
	Cutterhead Dredge	79 @ 160 ft. (L_{eq})			39
	Tugboat	82 @ 50 ft. (L_{eq})			32
	Pile driver (pipeline removal)	101 w/o controls; 95 w/ controls @ 50 ft. (L_{max})			50.9 w/o controls; 45 with controls
	Derrick scow (pipeline removal)	88 @ 50 ft.			38

Table A-13. Estimated Noise Levels at Dredging Sites Compared to Ambient Conditions

Project Site	Noise Source(s)	Location of Noise Source	Distance to Closest Sensitive Receptor from Noise Location	Ambient Noise at Sensitive Receptor Location	Predicted Noise Levels (dBA)[1]
RWC Channel	Clamshell Dredge	Dredging Channel	0.5 miles (residents - houseboats)	62; 55 in open areas	46.5
	Cutterhead Dredge				54.6
	Tugboat Tugboat				47.56 47.5
SBS Channel	Clamshell Dredge	Dredging Channel	3.0 miles (residents-Brisbane)	60-65	31
	Cutterhead Dredge				39
	Tugboat				32
	Pile driver (pipeline removal)				50.9 w/o controls; 45 with controls
	Derrick scow (pipeline removal)				38

[1] Predicted noise levels have been adjusted for distance to the receptor.

Pipeline Relocation

Pipeline relocation could be performed using three methods: trenching using clamshell, directional drilling, or a jet sled. Maximum noise effects from all three methods were considered. Trench construction using clamshell construction would be completed in one to two weeks per trench; jet sled construction options would require 50-100 months, depending on the depth of the trench. Once the trench is constructed, clamshell dredge would be used to place 3 feet of sand over the pipe, and two feet of armor rock over the sand.

The directional drilling method would not require trenching, but would involve drilling of a pilot hole, possibly widening the pilot hole (pre-reaming), and pipeline drawback. Given the size of the pipelines, it may be possible to drill the borehole in one pass.

Equipment required to install the replacement pipe would depend on the process chosen. All methods would include one or more work barges and one or more barges to deliver the pipe. Clamshell excavation would use the same equipment described above for dredging. Directional drilling may require one or more barges to serve as working platform for the drill rig, a derrick barge to place the pipe, and support equipment (tender tug, crew boat, etc.).

The 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 (it is towed by the pipeline laying barge). 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.

As discussed in ***Section 4.2.3.4 of the Main Text***, the new pipeline segments could be tied into the existing pipelines in situ or above the water. For in situ tie-in, cofferdams (mostly likely steel sheetpile) would be driven to isolate the work area at the tie-in locations. The work area on each end of the pipeline segment would be approximately 10 feet wide by 100 feet long. A clamshell would then be used to excavate the area around the existing pipe. Alternatively, a portion of the existing pipeline could jetted out of the sediment on either side of the channel, and lifted onto a barge. Up to 1,000 feet of pipeline may have be to be jetted out of the sediment to allow a small portion of it be lifted onto a barge.

The noisiest equipment that would be used for this work are pile drivers to drive the sheet piles for the cofferdams. The pile driving would be short term work (up to four piles can be driven per day). The second noisiest piece of equipment is the derrick barge. Sound is not a concern in use of the jet sled since the sled would be pulled along the bottom by the barge already in place, which itself is held on a precise heading (Williams 2013).

The closest sensitive receptors to the SBS area, where this work would take place, are residents in the City of Brisbane (near the Shell pipeline) and recreational boaters and land-based recreational users (near the Kinder-Morgan pipeline), both roughly three miles from the construction activities. The residential areas in San Bruno are west of Highway 101, and Coyote Point Recreation Area is in the immediate vicinity of SFO. Surrounding areas have relatively high ambient noise levels, due to their proximity to SFO and Metropolitan Oakland International Airport, and their associated flyover traffic, as well as the the presence of Highway 101. Motorized boat users are not considered noise-sensitive receptors.

Noise from pipeline relocation activities would not be audible to land-based sensitive receptors. With noise attenuating at 6 dBA per doubling distance, the noise levels from even the loudest of these activities would be no more than 51 dBA at the sensitive receptor locations, which is below the ambient noise at the land-based receptors. The maximum noise from the second loudest activity, use of the derrick barge would be at least no more than 38 dBA at the nearest land-based sensitive receptors. Predicted noise levels are presented in ***Table A-15*.**

The area comprises deep water habitat, however the work area where pile driving would occur is small enough such that marine mammals and other sensitive receptors could avoid the area during the temporary and periodic noise from pile driving and other pipeline removal activities. Potential noise impacts from pipeline removal work in SBS Channel are less than significant.

Berth Deepening at Port

Berth deepening work would be performed at the Port in conjunction with channel deepening. This work would be temporary. The Redwood City General Plan defines the normally acceptable noise threshold for the Port as less than 75 dBA, and the conditionally acceptable threshold as greater than 75 dBA. No threshold is given for an unacceptable noise level. The Redwood City Municipal Code allows construction noise of up to 110 dBA in residential areas and does not provide a threshold for industrial areas. No construction noise that permeates into residential is allowed during evening hours. Though no data are currently available regarding construction equipment and durations (i.e., a quantitative analysis cannot be performed), ambient noise and allowable noise levels at the Port are both high, such that no noise impact would be expected.

<u>Impact N-2: Exceedance of Applicable Noise Thresholds</u>

As discussed above, the Redwood City General Plan defines the normally acceptable noise threshold for the Port as less than 75 dBA, and the conditionally acceptable threshold as greater than 75 dBA. No threshold is given for an unacceptable noise level. The Redwood City Municipal Code allows construction noise of up to 110 dBA in residential areas and does not provide a threshold for industrial areas. No construction noise that exceeds local ambient noise is permitted to permeate into residential areas between 8 p.m. and 7 a.m.

There are high levels of background noise in and east of RWC Channel, due to the industrial activities within the Port. Noise levels would vary throughout the day and the week as vessels are unloaded or loaded, and industrial operations vary in their level of activity. The typical general ambient noise (as measured from Seaport Center parking lot about 0.9 miles, or 4,750 feet, from the Port of Redwood City) is about 62 dBA. The noise level at the actual Port is most likely higher than 62 dBA. Noise levels would typically be lower at night due to reduced industrial activity.

Dredging operations could occur as close as half a mile from the closest sensitive receptors (houseboats docked at Docktown Marina). Noise from construction equipment generally attenuates (decreases) at a rate of 6.0 to 7.5 dBA per doubling of distance (Port of Redwood City 2010). Using the more conservative value of 6 dBA per doubling of distance, the maximum attenuated noise levels at the closest residential receptors (level of noise once it reaches the sensitive receptors half a mile away) would be 54.65 dBA, well below both ambient and legal thresholds. Furthermore, the channel dredging would progress at 23 feet or more per day, and the distance between the closest residential receptors and the dredge would be 1.5 miles or more after one dredging season.

Trail users at Bair Island on the west side of RWC Channel and non-motorized boat users at Bair Island and Greco Island would also be considered sensitive receptors. Dredging activities could occur close to trail users and non-motorized boat users. There are no construction noise thresholds set by the City for open areas. The noise levels would not violate construction noise level restrictions for residential area set forth by the City—no noise above 110 dB at 25 feet and no noise above ambient at night. Elevated noise levels would be temporary in nature. Impacts would be less than significant.

The maximum predicted noise from Project activities in the SBS Channel area at the nearest land-based sensitive receptor is 50.9 dBA from pile driving activities during pipeline relocation. After that, dredging noise would be very low (imperceptible) at the nearest land-based sensitive receptor locations—39 dBA. This is well below ambient noise levels. Neither San Mateo County, nor the City of Brisbane, nor the City of South San Francisco set specific noise thresholds.

SBS Channel is very wide and non-motorized recreational boaters can avoid the dredging noise by taking a wider path around it. If boaters stay at least one fifth of a mile (roughly 750 feet) away from the loudest potential dredge (cutterhead), then the noise produced by the dredge would remain within the ambient range.

Placement Sites

There are three primary sources of noise associated with use of the placement sites: 1) tug boats towing scows to the placement site; 2) construction of pipelines and offloaders at placement sites, and 3) operation of the offloader and booster pump(s) during sediment offloading and transfer (pumping) of sediment to the sediment delivery location. Estimated noise levels associated with the equipment used to construct offloading facilities and to off-load and deliver sediment are provided below for each of the placement site (see ***Table A-14***). The noisiest activity associated with construction of an offloading facility would be pile driving for the mooring dolphins and any piles required to anchor the offloader barge. Estimated pump noise from the offloading and/or booster pump operating closest to sensitive receptors for each site is also provided in ***Table A-14***.

Mooring piles may be driven to accommodate sediment-delivery scows at the offloader sites for Eden Landing, Alviso Ponds, and possibly Cullinan Ranch. Up to 26 steel pipe piles would need to be installed for the offloader mooring dolphins at each site. Typically crews can drive up to four piles per day (approximately two hours per pile installation). Use of the pile driving hammer is not constant during installation, since the two-hour estimate includes the time it takes to pile the rig, loft the pile, set it in place, align the pile for driving and set the leads and hammer in position. Thus actual pile driving would likely last between 1.25 and 1.5 hours per pile, with four piles being driven in a day for a duration of 6.5 days per site. Another 3.5 days per site would be needed to secure the mooring barges and offloader. This would not require more pile driving, but would generate noise from other equipment, such as the tugboat and work skiff.

While pile driving noise would be short term, noise from the offloader and booster pumps could potentially be generated for up to 24 months under a -37 foot MLLW channel deepening option when all the material is taken to Eden Landing or Alviso ponds. The Cullinan site has a smaller capacity but a slower dredge sediment placement rate, and would be filled up within approximately 19 months.

Table A-14. Estimated Equipment Noise Levels by Placement Site

Project Site	Noise Source(s)	Reference Noise Levels (dBA)	Location of Noise Source	Distance to Closest Sensitive Receptor from Noise Location	Predicted Noise Levels (dBA)[1]
Cullinan	Tugboat	82 @ 50 ft. (L_{eq}	Offloader (north)	300 ft (sensitive wildlife)	66.4
			Offloader (south)	100 ft (low quality habitat)	75.9
	Pile driver for offloader	101 w/o controls; 95 w/ controls @ 50 ft. (Lmax)	Offloader (north)	300 ft (sensitive wildlife)	81 w/o controls; 75 with controls
			Offloader (south)	100 ft (low quality habitat)	94.9 w/o controls; 88.9 with controls
	Offloader pump	76 dBA @ 50 ft	Offloader (north)	300 ft (sensitive wildlife)	60.4
			Offloader (south)	100 ft (low quality habitat)	69.9
Montezuma	Tugboat	82 @ 50 ft. (L_{eq})	Offloader	1,900 ft (residents)	50.4
Alviso	Tugboat	82 @ 50 ft. (L_{eq})	Offloader	1.5 miles (residents - East Palo Alto)	38
				0.375 miles (sensitive wildlife)	50
				1.0 mile (recreation - trail/open space)	41.5
	Pile driver for offloader	101 w/o controls; 95 w/ controls @ 50 ft. (Lmax)	Offloader	1.5 miles (residents - East Palo Alto)	57 w/o controls; 51 w/ controls
				0.375 miles (sensitive wildlife)	69 w/o controls; 63 w controls
				1.0 mile (recreation - trail/open space)	60.5 w/o controls; 54.5 w/ controls
	Offloader pump	76 dBA @ 50 ft	Offloader	1.5 miles (residents - East Palo Alto)	32

Project Site	Noise Source(s)	Reference Noise Levels (dBA)	Location of Noise Source	Distance to Closest Sensitive Receptor from Noise Location	Predicted Noise Levels (dBA)[1]
				0.375 miles (sensitive wildlife)	44
				1.0 miles (recreation-trail user)	35.5
	Booster pump at Pond A2W	80 – 85 dB @ 20 ft	Pond A2W levee	2 miles (residents)	30.5
				0.15 miles (sensitive wildlife)	53
				0.9 mile (recreation-trail user)	37.5
	Booster pump at Pond A9	80 – 85 dB @ 20 ft	Pond A9 levee	3 miles (residents)	27.5
				0.15 mile (sensitive wildlife)	53
				400 ft (recreation-trail user)	59
Eden Landing	Tugboat	82 @ 50 ft. (L_{eq})	Proposed Offloader	2.5 miles (residents)	33.5
	Pile driver for offloader	101 w/o controls; 95 w/ controls @ 50 ft. (L_{max})		2.5 miles (residents)	52.5 w/o controls; 46.5 with controls
	Offloader pump	76 dBA @ 50 ft		2.5 miles (residents)	27.5
	Booster Pump	80 – 85 dB @ 20 ft	Pond E2	3.0 miles (residents)	27.5
				3,100 ft (recreation - trail user)	41.1
				2,600 ft (sensitive wildlife [outboard marsh at Pond E1])	42.7

[1] Predicted noise levels have been adjusted for distance to the receptor.

Predicted noise levels at sensitive receptor locations were compared to the ambient noise levels at those locations in order to assess noise increases and the potential for objectionable levels of noise. The comparison is presented in ***Table A-15.***

Table A-15. Predicted Noise Levels at Placement Sites Compared to Ambient Levels

Project Site	Noise Source(s)	Location of Noise Source	Distance to Closest Sensitive Receptor from Noise Location	Ambient Noise at Sensitive Receptor location (dBA	Predicted Noise Levels (dBA)[1]
Cullinan	Tugboat	Offloader (north)	300 ft (sensitive wildlife)	46.5 - 56.5	66.4
		Offloader (south)	100 ft (low quality habitat)	58-68	75.9
	Pile driver for offloader	Offloader (north)	300 ft (sensitive wildlife)	46.5 - 56.5	81 w/o controls; 75 with controls
		Offloader (south)	100 ft (low quality habitat)	58-68	94.9 w/o controls; 88.9 with controls
	Offloader pump	Offloader (north)	300 ft (sensitive wildlife)	46.5 - 56.5	60.4
		Offloader (south)	100 ft (low quality habitat)	58-68	69.9
Montezuma	Tugboat	Offloader	1,900 ft (residents)	No data, assume 55	50.4
Alviso	Tugboat	Offloader	1.5 miles (residents - East Palo Alto)	70-74	38
			0.375 miles (sensitive wildlife)		50
			1.0 mile (recreation - trail/open space)		41.5
	Pile driver for offloader	Offloader	1.5 miles (residents- East Palo Alto)	70-74 at Pond SF-2; 64 – 68 at eastern sensitive wildlife location; ___ in East Palo Alto; 55 at trail (no data)	57 w/o controls; 51 w/ controls
			0.375 miles (sensitive wildlife)		69 w/o, 63 w controls
			1.0 mile (recreation - trail/open space)		60.5 w/o controls; 54.5 w/ controls

	Offloader pump	Offloader	1.5 miles (residents- East Palo Alto)	70-74 at Pond SF-2; 64 – 68 at eastern sensitive wildlife location; ___ in East Palo Alto; 55 at trail (no data)	32
			0.375 miles (sensitive wildlife)		44
			1.0 mile (recreation - trail/open space)		35.5
	Booster pump at Pond A2W	Pond A2W levee	2 miles (residents)	No data, assume 55	30.5
			0.15 miles (sensitive wildlife)	No data, assume 55	53
			0.9 mile (recreation-trail user)	No data, assume 55	37.5
	Booster pump at Pond A9	Pond A9 levee	3 miles (residents)	No data, assume 55	27.5
			0.15 mile (sensitive wildlife)	No data, assume 55	53
			400 ft (recreation-trail)	No data, assume 55	59
Eden Landing	Tugboat	Proposed Offloader	2.5 miles (residents)	No data, assume 55	33.5
	Pile driver for offloader		2.5 miles (residents)	No data, assume 55	52.5 w/o controls; 46.5 with controls
	Offloader pump		2.5 miles (residents)	No data, assume 55	27.5
	Booster Pump	Pond E2	3.0 miles (residents)	No data, assume 55	27.5
			3,100 ft (recreation- trail)	No data, assume 55	42.9
			2,600 ft (sensitive wildlife [outboard marsh at Pond E1])	No data, assume 55	43.9

[1] Predicted noise levels have been adjusted for distance to the receptor.

Cullinan

Impact N-1: Noise Increase of 5 dBA or More at Sensitive Receptor Locations

Cullinan is the only site at which a noise increase of 5 dBA or more over ambient may occur at sensitive receptor locations. At Cullinan, ambient noise levels are roughly 58 to 68 dBA at the southern offloader location and between 46.5 and 56.5 dBA at the northern offloader location. Ambient noise was estimated by calculating the attenuated noise from the State Highway 37, which is 750 feet away from the northern offloader and 200 feet away from the southern offloader. The levee delivery location is approximately 2,000 feet from the Highway and has an estimated ambient noise level of roughly 48 dBA.

Pile driving activities at Cullinan Ranch would increase ambient noise more than 5 dB with or without use of noise controls. At the proposed southern offloader location, noise levels would increase from 58 to 68 dB to somewhere between 76 (for tugboat peak noise) and 95 dBA (maximum possible pile driving noise). However, this increase would be temporary, lasting only 6.5 days for the pile driving and would only occur in short spurts for the tugboat while it is delivering and positioning a full scow. The pile driving would last for 1.25 to 1.5 hours, up to four times per day during the 6.5 day period; it would not be constant.

During offloading activities, a tug would pull up, the scow would tie up, and the tug would either leave or go on idle, significantly decreasing noise from the tugboat. Cullinan could accept up to 5,300 cy of material per day, which would mean between two and three deliveries per day. Since tug operators try to use as little fuel as possible, they are likely to idle once they have arrived thereby reducing noise levels. Though the predicted noise from tugboat is given at 100% of its motor operation, it is likely that the tugboat would generally operate at 80% or less when loaded, and less than 50% when empty, and at around five percent when idling. This would significantly decrease the noise effects from the tugboats operating at the offloader locations. Tugboat noise when operating at 100% is expected to range from 62 and 76 dBA at sensitive receptor locations. The maximum possible noise from tugs, although 8 to 14 dB louder than the ambient noise at the various possible delivery sites, would last for just enough time for the tug to pull up and position the scow to be tied up (approximately 5-20 minutes) up to three times per day. The noise impact from tugs delivering scows is considered less than significant.

Pile driving noise at sensitive receptor locations would range from 75 dBA with controls to 95 dBA without controls. This ranges from moderately loud to very loud. Wildlife comprises the main sensitive receptor group near Cullinan Ranch, and is discussed in ***Sections 4.3 through 4.5***. There is the possibility of recreational boaters in this area, however boaters would likely choose to avoid this site during construction. Since there are alternative recreational boating locations nearby and noise impacts are not expected to exceed 10 days during offloader construction and would be minimal (periodic tugboat traffic while towing scows to offloader), the impact to potential recreational users is less than significant.

Noise from the offloader pump at the southern site would increase noise levels by approximately 2 dB over ambient; this is not considered a significant increase. At the southern offloader site, the pump would generate noise at roughly 60 dB at the sensitive receptor location. For the upper ranges of the estimated ambient noise, this is not a significant increase (3.9 dB), but for the quieter part of the range, it represents an increase of 13.9 dB. Under the worst case scenario (material from the proposed Project filling up Cullinan), the offloader would be operating for up to 19 months over a 4 year dredging window period (June 1 through November 30).

Since wildlife is the main sensitive receptor group in this area, the impact of the noise from the offloader, tugboats, and pile driving is further discussed in the Biology Resources – Wildlife, ***Section 4.4.6***. The closest residences are located south of Highway 37, and approximately 0.5 miles southeast of the southern offloader, and noise level from the offloader pump would be less than 55 dBA. Motorized boat users are not considered sensitive receptors. Non-motorized boat users may temporarily avoid the area where the offloader is operating. Non-motorized boat users have ample opportunities for recreational activities in areas away from the offloading location. Impacts to other sensitive receptors would less than significant.

<u>Impact N-2: Exceedance of Applicable Noise Thresholds</u>

As discussed for Impact N-1, noise effects from the Project at Cullinan are the only location expected to (temporarily) increase ambient noise at sensitive receptor locations by more than 5 dBA. Cullinan is in Solano County, which has thresholds for unacceptable noise ranging from 65 to 80 dBA, depending on the receptors. Solano County, however, does not set legal noise thresholds for wildlife receptors or open space. For outdoor activity areas, which is the closest applicable land use type that the County discusses, the County recommends "practical use of best-available noise reduction measures." Solano County requires use of sound mitigation measures if construction noise will be louder than the thresholds set for various land uses. Where noise could potentially impact wildlife receptors, mitigation measures are used. Noise thresholds set by resource agencies by which to judge impacts to wildlife are discussed in ***Sections A.4 and A.5***, Biological Resources. Noise levels from offloading operations at the closest residences would be less than 55 dBA, and would not be perceptible over the noise from Highway 37. Pile driving noise at the nearest residential receptor would range from 57 to 63 dBA, which is within in the acceptable range. This level of noise would only be generated for a very short period of time, as discussed above. The potential for exceedances of applicable noise thresholds set by Solano County is less than significant.

Montezuma

Impact N-1: Noise Increase of 5 dBA or More at Sensitive Receptor Locations

For the Montezuma placement site, the only potential noise source associated with the RWC Project would be tugs delivering scows of sediment. All other potential impacts associated with use of this site are the responsibility of the site owner. Since no noise measurements were found for Montezuma, the ambient noise level was assumed to be on par with other natural areas nearby, such as Bair Island, which is 55 dBA. The maximum predicted noise at the nearest sensitive receptor location to Montezuma is 50.4 dBA. There would be no impact.

Impact N-2: Exceedance of Applicable Noise Thresholds

Montezuma is also part of Solano County; for this site there are residential receptors located approximately 1,900 feet from the placement site. Solano County sets the following thresholds for residential low density, single family, duplex or mobile homes— less than 60 dB is normally acceptable, 55 to 70 dB is conditionally acceptable, 70 to 75 is normally unacceptable, and greater than 75 dB is clearly unacceptable. The maximum predicted noise at the nearest sensitive receptor location to Montezuma is 50.4 dBA, which is well below the threshold for normally acceptable levels for residential use. There would be no impact to residential uses.

Boating and related recreational uses may occur in the vicinity of the Montezuma offloader location. Solano County noise standards indicate that where it is not possible to reduce noise levels in outdoor activity areas to 60 dB or less using practical application of the best-available noise reduction measures, an exterior noise level of up to 65 dB may be allowed, provided that all available exterior noise level reduction measures have been implemented. While the noise level in the immediate vicinity of the tug (within approximately 400 feet) may periodically exceed the applicable noise threshold, the presence of tugs at the offloader would be episodic, as described for the Cullinan placement site above, and of limited duration. In addition, there is extensive availability of alternative recreation locations. The impact to outdoor uses is less than significant.

SF-DODS

Impact N-1: Noise Increase of 5 dBA or More at Sensitive Receptor Locations

Although wildlife may be present at SF-DODS, there would be no human receptors. There would be no impact.

Impact N-2: Exceedance of Applicable Noise Thresholds

SF-DODS is located in the deep Pacific Ocean and no legal noise thresholds are identified there. There would be no impact.

Alviso

Impact N-1: Noise Increase of 5 dBA or More at Sensitive Receptor Locations

For the Alviso ponds, the offloader location is between 4 and 6 miles north of the two possible sediment delivery locations. Consequently, the primary offloader construction noise effects (i.e., pile driving) would occur far from the sediment delivery locations. However, both the offloader and the sediment delivery locations would experience effects from pumps used to transport the sediment from the offloader to the delivery location. In addition to the pump at the offloader, each sediment delivery location would have a booster pump. The Pond A9 dredged sediment delivery location would require a second booster pump equidistant between the offloader and the sediment delivery location. As discussed earlier, the intermediate booster pump location is further away from sensitive receptor locations than other equipment that would be used, and is therefore not evaluated separately.[13] Noise effects were evaluated for the booster pumps at Ponds A9 and A2W and the offloader construction and offloader pumps. The information is presented in ***Table A-14 and Table A-15*****.**

Offloader and Intermediate Booster Pump Construction Noise

Residential areas in East Palo Alto are located approximately 1.5 miles southwest of the proposed Alviso offloader location. Industrial users are located 2.5 miles away. A portion of the Bay Trail and the Ravenswood Open Space Preserve are located within 1 mile southwest. Pond SF-2, which is a closely monitored restoration site, is within 0.6 miles (3,168 feet) to the west, and a portion the SFBNWR containing tidal marsh and open water ponds is located approximately 0.3 to 0.4 miles to the east. The closest residential receptors to the east are located approximately 3.8 miles away.

Ambient noise in the vicinity of the proposed offloader location would be relatively high (70 – 74 dB) because it is located between State Highway 84 and a railroad bridge. The final location of the Alviso offloader has not been determined, however, it is likely that it would be within 0.5 miles of Highway 84. The highest predicted noise level at the residential sensitive receptor

[13] The closest residential receptors to the proposed intermediate booster pump location that would be required for delivery to Pond A9 are approximately three miles to the west, on the west side of Palo Alto's municipal airport. Residential receptors are also located approximately 3.7 miles to the northeast. The closest recreational area is San Francisquito Creek Trail approximately 1.9 miles to the west.

location resulting from offloader construction is 57 dB from the use of the pile driver. The highest predicted noise level at the trail would also be due to the pile driver would be 54.5 dB with controls, and 60 dB without controls. The noise levels would be within 5dBA of ambient conditions.

Pile driving noise associated with the installation of the intermediate booster pump, if needed, would be lower at all sensitive receptor locations than noise from the offloader construction, because all sensitive receptors are farther from the potential pile driving activities. However, ambient noise levels at the recreational locations would be lower than for the sensitive receptors closest to the offloader location. Ambient noise levels at the closest recreational receptor locations are estimated to be 55 dBA (open space). Pile driving noise with controls would not exceed 60 dBA at any of these locations, and would be of short duration. This impact is less than significant.

Offloader Operations/Dredged Sediment Delivery

The same receptors that would be exposed to pile driving noise from the construction of the offloader would be exposed to operating noise (i.e., pump noise) while the offloaderis in operation. Pump noise would be considerably lower, but much more sustained, than pile driving. If the maximum amount of RWC sediment is placed at the Alviso ponds, the offloader would be expected to operate for 24 months total, comprised of four six-month dredging window periods. The noise from continual offloader operationwould be well below the existing ambient noise levels at the closest residential and recreational receptor locations.

Residential receptors closest to Ponds A2W and A9 would be exposed to maximum noise levels of 27.5 to 30.5 dBA, which much less than the ambient level of 55 dBA. Recreational receptors on the south side of Pond A2W could be exposed to noise levels of up to 37.5 dBA from the dredged sediment delivery pump, compared to expected ambient noise levels of 55 dBA in this area. The loudest predicted noise levels resulting from sediment delivery would come from the booster pump at Ponds A2W and A9 being approximately 0.15 miles from potential wildlife receptors. Even here, noise would only be 53 dBA, which is below ambient levels. Potential recreation receptors (Alviso Slough Trail) may come within 400 feet of the booster pump at Pond A9 (the area around the pump would be secured to ensure the safety of the public and construction operations). The predicted noise level associated with the booster pump would be 59dBA at 400 feet. Although the predicted level would be above ambient, it less than an increase of 5dBA. The potential impact would be less than significant.

<u>Impact N-2: Exceedance of Applicable Noise Thresholds</u>

Alviso Ponds are part of three different jurisdictions, Santa Clara County, City of San José, and the City of Mountain View. In Santa Clara County, permissible noise levels range from 45 to 75 dBA for residential uses during the night (10 pm to 7 am) to heavy industrial uses anytime during the day, respectively. Residential public space is limited to 55 dBA during the daytime hours (7 am to 10 pm). Higher noise levels are permitted for construction and demolition activities. The maximum noise levels for repetitively scheduled and relatively long-term operation stationary equipment ranges from 60 to 70 dBA between the hours of 7 am to 7 pm, depending on the land use. Noise levels for nonscheduled, intermittent short-term operation increases by 15 dBA above the stationary source. Variances to noise provisions may be authorized by the Director, assuming that permitted conditions included by the Director are protective.

The maximum noise effect of the project is from pile driving, which would measure at 57 dBA at the nearest residential receptor location without use of noise controls. With the exception of pile driving, no other noise source would exceed 45 dBA at the closest residential receptor. Since pile driving activities would be limited to day time hours and are a short term construction activity, the noise from this activity does not exceed legal thresholds. No other equipment would exceed 55 dBA at the closest residential receptor, and

The Envision San José 2040 General Plan (City of San Jose 2011) states that the city's acceptable noise level objective is 60 dBA DNL or less for residential and most institutional land uses. Section 20.100.450 of the San Jose Municipal Code (City of San Jose 2012) prohibits construction activity on a site located within 500 feet of a residential unit before 7:00 a.m. or after 7:00 p.m. Monday through Friday, or at any time on weekends. None of the proposed project activities would exceed these legal thresholds.

Mountain View sets noise standards for new single and multi-family developments at 65 dBA Ldn for exterior noise in private outdoor active use areas, as well as community outdoor recreation use areas. Noise standards do not apply to private decks and balconies in multi-family residential developments. None of the proposed activities would exceed these legal thresholds. This impact is less than significant.

Eden Landing

<u>Impact N-1: Noise Increase of 5 dBA or More at Sensitive Receptor Locations</u>

The closest sensitive residential receptors at Eden Landing are residents located 2.5 miles east of the offloader location in the community of Redwood Shores and three miles east of the Pond E2 Bayfront levee potential booster pump location. Some recreational users may be present along the Bay Trail approximately 0.6 miles to the south of Pond E2.

Offloader Construction Noise

The pile driving activities at Eden Landing are far enough away from the nearest sensitive receptors that they would attenuate to a maximum of 52.5 dBA at the nearest sensitive receptor location; this is below the assumed ambient noise level of 55 dBA. Furthermore, the pile driving activities would be temporary, only lasting 6.5 days and would not occur at night. There is no impact.

Offloader Operations/Dredged Sediment Delivery

Noise levels associated with offloader operations and sediment delivery activities at Eden Landing would be well below expected ambient levels. There is no impact.

Impact N-2: Exceedance of Applicable Noise Thresholds

There are no data for ambient noise, but it can reasonably be assumed that ambient noise at the Eden Landing ponds is comparable to other natural Bay-front areas nearby; thus a value of 55 dBA was chosen as the baseline. All noise sources would result in noise levels below at the closest sensitive receptor. These are below ambient noise levels. As discussed above, these noise levels would be below applicable legal thresholds for the City of Redwood City.

Eden Landing is located in the City of Hayward in Alameda County. The City of Hayward defines unacceptable noise levels between 65 to 80 dBA, depending on type of land use nearby. Chapter 4, Article 1, Section 4-1.03.4 of Hayward's Municipal Code allows construction activities to operate an individual device or piece of equipment with noise levels up to 83 dBA at a distance of 25 feet from the source and activities that do not produce a noise level exceeding 86 dBA at any point outside of the property plane. The Countywide Noise Element of the Alameda General Plan established interior and exterior noise average noise levels (Ldn) of 45 dBA and 55 dBA respectively for residential land uses based on Federal noise level standards. The Noise Element also references noise compatibility standards developed by the Association of Bay Area Governments, which identified an exterior noise level of 65 dBA CNEL or less as a basis for finding little noise impact on residential land uses, 65 to 70 dBA as a moderate impact, and any level above 70 dBA as a significant impact. There is a 5 dBA evening "penalty" from 10 PM to 7 AM. None of the Project activities would exceed these thresholds. No impact from exceeding noise thresholds would occur at Eden Landing. There would be no impact.

Mitigation Measures
There are no significant impacts from noise due to the dredging or placement options; no mitigation is required.

A.11 Recreation

This section summarizes the existing recreational conditions within the Project area; describes the recreational resource regulations applicable to the proposed Project; identifies the significance thresholds; and discusses the potential impacts that the Project and alternatives may have on recreational resources.

Affected Environment

The southern portion of the San Francisco Bay region is an urbanized area primarily comprised of residential communities and industrial and commercial areas, with recreational resources such as trails, parks, open space (land based), and marinas comprising the remaining areas. South San Francisco Bay itself is fronted by extensive wetland areas in various stages of restoration.

RWC and the SBS Channels are located in San Mateo County. The dredged sediment placement sites are located in Alameda, Santa Clara, and Solano Counties. Recreational resources, including trails, parks, land-based open space, and marinas, in the vicinity of the dredging location and placement sites offer a wide variety of recreational opportunities such as motorized and non-motorized boating, fishing, hunting, bird watching, walking, hiking, bicycling and photography. By law, all navigable waters are open to hunting during the appropriate seasons. The following sections describe recreation areas in or near the Project Area, as well as the dredging and placement sites.

A.11.1.1 San Francisco Bay Trail

The San Francisco Bay Trail (Bay Trail) is a shoreline trail and recreational corridor that, when complete, will encircle San Francisco and San Pablo Bays with a continuous 500-mile network of bicycling and hiking trails. It will link all nine Bay area counties and 47 cities (ABAG 2015c). Currently, approximately 338 miles of the planned alignment have been completed. The Bay Trail offers access to points of historic, natural and cultural interest; recreational areas such as beaches, recreational marinas, fishing piers, boat launches, and over 130 parks and wildlife preserves totaling 57,000 acres of open space; residential areas; and commercial and industrial areas.

It passes through highly urbanized areas like downtown San Francisco as well as remote natural areas like the Don Edwards San Francisco Bay National Wildlife Refuge. The Bay Trail's policies specifically seek to protect sensitive natural habitats. Bay Trail segments may consist of paved multi-use paths, dirt trails, bike lanes, sidewalks or city streets signed as bike routes. The Bay Trail also connects to trails that lead inland and with the Ridge Trail, another regional trail network (located primarily along the ridges of the Bay Area's hills).

A.11.1.2 Don Edwards San Francisco Bay National Wildlife Refuge

Don Edwards San Francisco Bay National Wildlife Refuge (SFBNWR) is located in San Mateo, Alameda and Santa Clara counties in San Francisco Bay. It is the first urban National Wildlife Refuge established in the United States, and provides opportunities for wildlife-oriented recreation and nature study for the surrounding communities (USFWS 2012). USFWS currently maintains approximately 30,000 acres of the SFBNWR and intends to acquire an additional 13,000 acres in the vicinity of the SFBNWR (USFWS 2012). SFBNWR includes trails and other public facilities such as an educational center. Bair Island and Greco Island are part of the SFBNWR.

A.11.1.3 San Pablo Bay National Wildlife Refuge

San Pablo Bay National Wildlife Refuge (SPBNWR) is located in Solano and Sonoma Counties. SPBNWR includes open bay/tidal marsh, mud flats, and seasonal and managed wetland habitats. SPBNWR provides numerous recreation opportunities that include wildlife viewing, wildlife photography, hiking, boating, and hunting.

A.11.1.4 Eden Landing Ecological Reserve

Eden Landing Ecological Reserve (ELER) comprises approximately 6,400 acres of restored salt ponds, adjacent diked marshes, and transitional areas to uplands that are managed for resident and migratory waterbirds and tidal marsh habitats and species. The reserve, located in Alameda County, is owned and managed by CDFW and provides recreational opportunities that include wildlife viewing, photography, hiking, and waterfowl hunting. The 835-acre portion of ELER north of Old Alameda Creek (former Ponds 1B–6B, 7C, and 8B–17B) was restored as part of the Phase 1 South Bay Salt Pond Restoration Project. In this document, the southern portion of ELER is referred to as the Eden Landing ponds. The Eden Landing ponds serve as potential placement site for the RWC Project.

A.11.1.5 Napa Sonoma Marshes Wildlife Area

The Napa-Sonoma Marshes Wildlife Area (NSMWA) is an area of baylands, tidal sloughs and wetland habitat that provide habitat for sensitive species as well as extensive recreation opportunities. The NSMWA is managed by CDFW and is regularly used by hunters and fisherman, as well as bird watchers, photographers, bicyclists, and hikers. NSMWA lands are located north and west of Cullinan.

A.11.1.6 Dredging Sites

Redwood City Harbor Channel

RWC Channel is bordered by Bair Island to the west and north, and commercial and industrial properties to the south and east. Further north along the channel, Greco Island lies to the east, and San Francisco Bay lies to the north and east of the channel.

Trails

There are three trails near RWC Channel. They consist of the Bay Trail (portions are located to the east and west of the channel), and trails on Bair Island. The portion of Bay Trail that is adjacent to RWC Channel is located along the eastern side of the Port (ABAG 2015b). This segment of the Bay Trail is a landscaped, wide concrete sidewalk that begins at the intersection of Blomquist and Seaport Boulevard and runs north along Seaport Boulevard to the Pacific Shores Center (PSC) business park (Horii 2007). The Bay Trail then runs around the perimeter of

PSC and leads to a park along Westpoint Slough. A segment of the trail off Seaport Boulevard (approximately 0.7 miles from the start of the trail) leads to a small waterfront park and to the Redwood City (Municipal) Recreational marina.

Another portion of the Bay Trail near the RWC Channel runs along the western edge of Inner Bair Island. This trail is located approximately 0.7 miles southwest of the southernmost portion of the RWC Channel to be dredged. A pedestrian bridge was constructed in April 2013. The accessible trail is a 1-mile loop trail around the southeastern portion of Inner Bair Island (USFWS 2015b). The remaining portion of the Inner Bair Island trail located north of Area D is currently closed until restoration construction is complete (USFWS 2015c).

Parks and Open Space

According to the EIR in support of Redwood City's New General Plan, there are approximately 226 acres of active developed parkland in the City (City of Redwood City 2010b). None of Redwood City's active parklands are in or adjacent to RWC Channel. The closest neighborhood park is located off of Whipple Avenue south of Highway 101, approximately 1.5 miles southwest of the southern portion of RWC Channel.

One land-based recreational facility is located near the RWC Channel: a 4.6-acre sports field complex that is part of the PSC development located at the end of Seaport Boulevard, approximately 1,000 feet east of RWC Channel. The sports fields and courts were originally constructed for tenants of PSC, and are available to Redwood City for city-sponsored sports activities on a limited basis.

In addition to the developed parkland discussed above, Redwood City has approximately 700 acres of designated open space that can be used for passive recreation (walking, boating, exploring, etc.) (City of Redwood City 2010). The majority of Redwood City's open space is on bayfront lands including Bair, Bird, and Greco Islands; Redwood Shores Lagoon; the San Francisco Water Department Right of Way; and Edgewood County Park.

Recreational activities that currently take place at Bair Island include fishing, jogging, wildlife viewing, hiking/walking, bicycling, boating and hunting, (hunting is only allowed by boat at portions of Middle and Outer Bair Islands). Greco Island is the largest contiguous tidal marsh on the western side of the Bay and is relatively protected from human disturbance. Greco Island is only accessible by water, primarily through the use of non-motorized boats, and is available for passive recreation such as fishing and wildlife viewing. Hunting is allowed in season (USFWS 2015c).

Marinas

The Redwood City Marina (a public marina) and four private marinas are adjacent to the RWC Channel and use the federal channel for recreational boat access in and out of San Francisco Bay (USACE and RWQCB. 2014). These marinas provide a total of approximately 1,100 berths for recreational boats. Channel deepening would occur north of all the marinas. Fishing in Redwood Creek and surrounding area provides a variety of fish including largemouth bass, bluegill and smallmouth bass.

The Port operates a 190-berth municipal recreational marina known as the Redwood City Marina (Port of Redwood City 2015) located south of RWC Channel and at the southern end of the Port Sequoia Yacht Club, which offers sailing and navigational classes, has its headquarters, clubhouse, and recreational boating club at the Marina.

The Redwood City Marina provides a launch ramp, electricity and water to all boats, and restrooms, showers, and laundry facilities for all recreational marina users. It has the only public boat launching facility with access to San Francisco Bay south of Coyote Point. Motorized as well as non-motorized watercraft such as kayaks and canoes use this public boat launch ramp. Crew boat races, Hawaiian Outrigger canoe races, and sailing regattas are regularly held on the Port's waterfront. Fishing is allowed from the public fishing pier.

Private marinas located adjacent to the federal channel include Redwood Landing Marina, Westpoint Harbor Marina, and Docktown Marina. Redwood Landing Marina, located south of Redwood Creek Channel at the southern end of the Port of Redwood City, is a small private recreational marina of over 40 boat slips. Westpoint Harbor Marina is boat accessible through Westpoint Slough, and is located east of the Port of Redwood City. It has over 270 slips.

No commercial fishing marinas/harbors are located in, or adjacent to RWC Channel.

San Bruno Shoal Channel

SBS Channel is located in the middle of San Francisco Bay. There are no land-based recreational facilities near SBS Channel. The only land-based activities associated with SBS CHannel may be the use of a staging area (e.g., at the old Shell Oil dock) to support pipeline relocation construction).

Aquatic recreational activities in the vicinity of SBS Channel and the pipeline installation areas could include motorized and non-motorized boat use, hunting in season, and fishing. A variety of fish including sturgeon, striped bass, and channel catfish have been caught in the vicinity of SBS Channel.

A.11.1.7 Dredged Material Placement Sites

Cullinan Ranch Restoration Project

Cullinan Ranch Tidal Restoration Project is part of SPBNWR and managed by USFWS. Cullinan is being restored to tidal marsh. A goal of the restoration project is to provide a key public access point for the SPBNWR. The majority of the site was restored to tidal action in January 2015. Adjacent to Cullinan is Guadalcanal Village, which was restored to tidal action by Caltrans as mitigation for their Highway 37 improvement project. Guadalcanal Village is in the process of being transferred to USFWS.

Trails

A levee-top walking trail, approximately 1.5 miles long, runs from the southwest corner of Cullinan to the northwest corner along the western levee. Visitors can park in a parking lot at the foot of the trail off Highway 37 (CDFW 2015b). The nearest Bay Trail segment is located east of Cullinan (across the Napa River Bridge) in Vallejo along Sacramento Street and Wilson Street (ABAG 2015a). No trails are located on the eastern portion of Cullinan Ranch that is slated to receive dredged sediment. Once the transfer of Guadalcanal Village to USFWS is complete, USFWS will install a new trail along the perimeter of Guadalcanal Village.

Parks and Open Space

The Cullinan site is primarily an open water area that is expected to accrete to intertidal (marsh) elevation within 60 to 100 years. NSMWA Pond 1 is located on the western boundary of the Cullinan Ranch Site and Dutchman and South Sloughs border Cullinan Ranch on its northern edge. Guadalcanal Village is located directly adjacent to the eastern boundary of Cullinan. Ponds 2, 2A, and 3 are located further north of Cullinan across Dutchman Slough.

An accessible kayak launch and a fishing pier are located in the southwestern portion of the Cullinan site, near the parking lot. Cullinan is currently closed to all hunting (Cullinan 2015). Hunting is allowed on SPBNWR lands south of Highway 37 and in the NSMWA Area at Ponds 1 and 3. Waterfowl hunting is only allowed by boat on open bay and navigable sloughs. Boating and fishing occurs in the tidal sloughs adjacent to Cullinan, as well as within Cullinan. The closest motorized boat launch ramps are in Vallejo at Brinkman's Marina, on Hudeman Slough in Sonoma County, on Skaggs Island, and on Cuttings Wharf Road in Napa County.

Marinas

There are no marinas within the Cullinan. Vallejo Municipal Marina is approximately 2 miles south of the proposed sediment delivery location, and 1 mile south of the proposed off-loader locations.

Montezuma Wetlands Restoration Project

Montezuma is located on the eastern edge of Suisun Marsh in Solano County east of Montezuma Slough. The site is bounded by the San Joaquin River-Sacramento River and Delta to the south. The offloader location is more than 2 miles east of Montezuma Slough in open water.

Parks and Open Space

The Department of Water Resources (DWR) Collinsville Day-Use Area is on the eastern shore of Montezuma Slough with access off of Collinsville Road and within the Montezuma site. The day use area is located more than 8,000 feet northwest of the offloader location.

Approximately 2 miles to the east, the Suisun Marsh's large open space areas provide extensive wildlife viewing, hiking, canoeing, hunting, and fishing opportunities. Duck hunting is the major recreational activity in the marsh occurring from late October until January. Approximately 150 private duck clubs are located in the marsh (DWR 2015). Fishing accounts for nearly as much recreational use in the marsh as duck hunting (Solano County 2008). At various times of the year several species of game fish may be caught in Suisun Marsh. They include striped bass, brown bullhead, white catfish, white sturgeon, black crappie and the occasional largemouth bass, Chinook salmon and steelhead (CDFW 2015b).

Boating and fishing occur on the open waters of the Delta and Sacramento and San Joaquin Rivers in the vicinity of Montezuma, as well as in Suisun Marsh. The open water areas in the vicinity of the Montezuma site provide a variety of recreational opportunities including fishing, hunting, boating, and viewing nature.

Marinas

There are no marinas near or at the Montezuma site.

SF-DODS

The SF-DODS placement site is located approximately 50 miles east of San Francisco in the Pacific Ocean. There are no trails, parks, land-based open space, recreational or commercial fishing marinas at this location. Deep-sea fishing and whale watching may occur from both private and commercial boats.

Alviso Ponds

A dredged sediment pipeline may deliver material to either the top of the levee at Pond A2W or Pond A9. The discussion below therefore focuses on recreational resources in the vicinity of the outboard levees at these ponds. Uses of open water areas near the proposed offloader location would be similar to those described for SBS Channel.

Trails

Segments of the Bay Trail in and around the Alviso ponds include:

Alviso Slough Trail (along the levees of Ponds A9 - A15),
A trail south of Alviso Ponds A1 and A2W, and
Stevens Creek Trail, located between Ponds A2W, A2E and AB1

An unimproved, on-street portion of the Bay Trail (no bike lanes or sidewalks) leads from the Alviso Marina and Historic District (adjacent to Alviso Ponds A8 and A12) south toward San Jose and Highway 237. In 2014, a smartphone audio tour of a 4.5-mile Alviso section of the Bay Trail launched.

The SFBNWR trails adjacent to the Alviso Ponds are the New Chicago Marsh Trail, Mallard Slough Trail, Butterfly Garden Trail, and the Marsh View Trail. All are located north of the town of Alviso within the Refuge's Alviso Unit Trails Unit.

Parks and Open Space

Several parks are located within 2 to 3 miles of Ponds A1/A2W. These include Palo Alto Baylands Park, Shoreline at Mountain View, and Stevens Creek Shoreline Nature Study Area. The closest public park to Pond A9 is Alviso Marina County Park, located approximately 3 miles south of the proposed sediment delivery location at Pond A9.

Various ponds within the Alviso Pond Complex are open to waterfowl hunting. At Ponds A5 and A7 and the northern portion of Pond A8N, waterfowl hunting is available from existing blinds. Ponds are accessed using electric or non-motorized boats. Generally, the waterfowl hunting season extends from approximately mid-October to mid-January.

Fishing is not allowed on any ponds within the Alviso Ponds Complex (including salt evaporation ponds or marshes). Visitors are allowed to fish from boats in the Bay and sloughs. Mallard Slough (east of Pond A17, also known as Artesian Slough) is closed to boats from March 1 through August 31 to protect sensitive wildlife species (USFWS and CDFW 2007).

Marinas

Alviso Marina County Park, south of Pond A12, has a launch ramp for boat access that provides one of the few clear routes in the San Jose area through the South Bay Salt Ponds out to the open waters of the San Francisco Bay (County of Santa Clara 2015). Shark and striped bass commonly occur at this recreational fishing site. A small commercial fishing vessel (the Dorothy Anne) works out of Alviso (USACE and RWQCB. 2014).

Eden Landing Ponds

The Eden Landing ponds, including the area that includes the potential sediment delivery location at Pond E2, are currently closed to the public; however, controlled access is permitted on specific hunt dates for hunters selected by a public lottery. A dredged sediment pipeline may deliver sediment to the top of the outboard levee at Pond E2. The discussion below therefore focuses on recreational resources in the vicinity of the Pond E2 outboard. Uses of open water areas near the proposed offloader location for this site would be similar to those described for SBS Channel.

Trails

Segments of the Bay Trail in Alameda County are located south of the Eden Landing ponds. The trail, known as the Alameda Creek Regional Trail runs along the north and south sides of the Alameda Creek Flood Control Channel (ACFCC, also known as Alameda Creek and Coyote Hills

Slough). This portion of the trail is considered a spur trail, and the closest point is located approximately 0.75 miles south of the proposed sediment delivery location at Pond E2.

As part of the restoration, CDFW, in partnership with EBRPD, completed construction on a new 3.8-mile segment of the Bay Trail Spine, north of Old Alameda Creek (SBSP 2015). The closest portion of this trail is more than 2.5 miles north of the proposed offloader location at Pond E2.

Parks and Open Space

Waterfowl hunting in the Eden Landing ponds occurs on lands deemed appropriate by CDFW; areas typically open to waterfowl hunting include marsh areas and ponds with sufficient water. Access for waterfowl hunting typically occurs on approximately six dates comprised of Saturdays and selected weekdays during the hunting season (late October through January) (CDFW 2015b).

Hayward Regional Shoreline Park, a 1,682-acre park owned and managed by EBRPD, is adjacent to the north side of ELER and stretches from San Lorenzo Creek to Highway 92. This park is approximately 2 miles north of the Eden Landing ponds.

Marinas

There are no marinas located in or adjacent to the Eden Landing ponds.

Significance Thresholds

The effects of the Project or alternatives on recreation and recreational facilities are considered to be significant if the proposed Project or alternatives would:

- Substantial reduce or restrict the availability or quality of existing recreation opportunities in the Project vicinity.

Environmental Consequences

Environmental effects to recreational resources were assessed by evaluating the potential for direct interference (e.g., blocking access to a marina entrance) with recreational activities, reduced access to recreational facilities and areas (e.g., through the presence of new equipment in waterways), and noise effects on sensitive recreational uses (e.g., trails in natural areas).

Dredging Options

Dredging Options

All three dredging options would have similar effects on recreation. The only difference is the duration during which these effects would occur. Therefore, all three dredging options are evaluated jointly.

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Dredging in RWC Channel would last between a total of 11 months and 30 months, depending on the depth of the channel over two to five years (dredging windows). Dredging activities in RWC Channel may occasionally delay or temporarily impede recreational boating activities. These impacts would be temporary and considered a minor diminishment of quality of recreational resources. Notes to mariners and navigational warning markers would be used as needed to prevent navigational hazards. While the southernmost portion of RWC Channel is being dredged, the entrance of the Redwood City Municipal Marina may temporarily be obstructed by scows in the turning basin. Scows would generally be located so as to minimize obstructions. Any such obstruction would be of short durations (days). During construction, signs would be posted informing the public of any temporary marina closures. Dredging in SBS Channel would require between and 4 and 39 months over one to 7 years and installation of the replacement fuel pipelines would require between 50-100 months of jet sled operation; other methods would require 3 months or less. Relocation of the fuel pipelines would be performed before channel deepening SBS Channel. Dredging of SBS Channel and installation of the replacement pipelines may limit boating access in the immediate vicinity of the dredge or construction equipment; however, there would be sufficient room for recreational vessels to maneuver around dredge equipment and there would be ample other areas for boating in the vicinity.

Dredging and fuel pipeline installation activities are not expected to have any impacts to land-based activities. Staging areas to support the construction activities would not be located on or block existing recreational facility, and pipeline termination points would be within existing industrial areas. Noise impacts to recreational receptors are addressed in Section 4.5.10. This impact is less than significant.

Placement Sites

Cullinan

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Potential activities associated with use of the Cullinan site include construction of an offloader and up to 1 mile of floating pipeline, and offloading of scows at the offloader. Off-loading at the Cullinan placement site could occur for up to a maximum of 58 months between June 1 and November 30 (10 dredging periods) if the entire 3 MCY capacity of the site is used by the RWC Project. Construction of the offloader and pipeline could require up to 2 months. During construction of the offloader and pipeline, access to Dutchman Slough may be impeded occasionally and access to the immediate construction area would be prohibited for safety reasons; however, recreational boaters could easily navigate around the construction equipment under most circumstances. Access to the offloader and the sediment delivery location would also be prohibited throughout the offloading period. Offloading activities would not create an obstacle to recreational boating, as the Napa River is wide enough to provide ample space for recreational boat users to pass the offloader and any scows and tugs tied up at the offloader. Fishing, hunting, and wildlife viewing opportunities would also be largely unaffected; if any obstructions in Dutchman Slough occur, there are many alternative locations in the immediate vicinity of this placement site. This impact is less than significant.

Montezuma

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Potential activities associated with use of the Montezuma site consist solely of offloading of scows at the existing offloader (all potential impacts associated with operation of the offloader and placement and management of the sediment are addressed by the Montezuma project). Because the RWC Project would only use the off-loader, and the site owner is responsible for all environmental impacts associated with delivery of sediment from the off-loader to the site and placement and management of sediment within the site, this analysis focuses on potential impacts that could occur as a result of transport to, and tying up at the off-loader at Montezuma. Land-based recreation is not evaluated.

Offloading at Montezuma could occur for up to 58 months over a period of 10 years if all sediment generated under Dredge Option C is delivered to this placement site. Offloading activities would not create an obstacle to recreational boating, as the waterway in the vicinity of the site north of Chain Island is more than 800 feet wide and provide ample space for recreational boat users to pass the offloader and any scows and tugs tied up at the offloader. Vessels could also pass south of Chain Island and avoid the offloading facilities completely. Fishing and hunting opportunities would also be largely unaffected. This is impact is less than significant.

SF-DODS

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Potential activities associated with use of the SF-DODS placement site consist solely of offloading of scows by bottom dumping. Barges would require an estimated 15 minutes per load to dump their cargo. Dumping could occur anywhere within the 600-meter-radius circle (0.44 square miles area) at the center of SF-DODS. Recreational boating, commercial boating charters, and limited recreational fishing may occur in the vicinity of SF-DODS. Due to the large expanse of open water available for recreational activities at and around the site, the potential impact is less than significant.

Alviso

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Potential activities associated with use of the Alviso placement site would include construction of an offloader and approximately 5 miles of floating or submerged pipeline, and offloading of scows at the offloader. Alternatively, activities associated with Alviso would require construction of a pipeline from the hydraulic offloader to the site. Offloading and dredged sediment delivery activities at Alviso could occur for up to a total of 24 months (spread over 4 years) if all sediment generated under Dredge Option C is delivered to this placement location. Construction of the offloader and pipeline would require up to 4months. During construction of the offloader and pipeline, access to the immediate construction area would be prohibited for safety reasons; however, recreational boaters would easily be able to navigate around the construction equipment. Access to the off-loader and the sediment delivery location would also be prohibited throughout the offloading period.

The pipeline would be submerged as needed to prevent obstacles to boating. Offloading activities would not create an obstacle to recreational boating, as there is ample space in the Bay for recreational boat users to pass the offloader and any scows and tugs tied up at the offloader. Fishing, hunting, and wildlife viewing opportunities would also be largely unaffected. Only the immediate area around the offloader would be blocked.

Alviso County Park, located near the south end Alviso Slough, is the only boat launching facility in the San Jose area that provides clear access to the San Francisco Bay. Sediment delivery to the Pond A9 embankment would require a floating or submerged pipeline in Alviso Slough. The pipeline would be located so as to minimize obstruction of the slough. A short term blockage of the slough may occur during construction of the pipeline. Signage would be posted in the vicinity to inform all boaters of any short term obstructions. This impact is less than significant.

Use of the Alviso placement site may also involve use of a cutterhead dredge that would pump material directly from the RWC Channel dredging location to the sediment delivery location at the top of the levee. This dredged sediment delivery mechanism could be used for sediment dredged from RWC Channel only. The cutterhead would deliver a maximum of 3.3 MCY, over a period of 8 - 9 months. The pipe from the cutterhead would be submerged to allow continued vessel traffic in RWC Channel. Thus offloading activities would not affect recreational boating, or other water-dependent recreation. This is impact is less than significant.

A segment of the Alviso Slough Trail at Pond A9 would have to be blocked off during the sediment delivery period. The Alviso Slough Trail, a 9 mile loop trail, runs along the perimeter of Ponds A9 through A15. The loop follows Alviso Slough to its junction with Coyote Creek and the Bay. A portion of this trail also runs along the perimeter of Pond A15 for a 3.6 mile loop. The Mallard Slough Trail, a 3.3 mile loop trail and the 0.5 mile in-and-out New Chicago Marsh Trail are located east of the Alviso Slough Trail. Of these three trails, the Alviso Slough Trail sees the least amount of usage (HDR 2014). Since recreational users would continue to have access to the remaining sections of the Alviso Slough Trail (as well as the Mallard Slough Trail and the New Chicago Marsh Trail and this impact is less than significant.

Eden Landing

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Potential activities associated with use of the Eden Landing placement site would include construction of an offloader and approximately 3.5 miles of floating or submerged pipeline, and offloading of scows at the offloader. Alternatively, activities associated with Eden Landing would require construction of a pipeline from the hydraulic offloader to the site. The construction process would be the same as for the Alviso placement site; the construction duration would be slightly less because the pipeline would be shorter. Offloading activities would not create an obstacle to recreational boating, as there is ample space in the Bay for recreational boat users to pass the offloader and any scows and tugs tied up at the offloader. Fishing, hunting, and wildlife viewing opportunities would also be largely unaffected. Only the immediate area around the off-loader would be blocked, and there are many alternative locations in the immediate vicinity of this placement site.

Use of the Eden Landing placement site may also involve use of a cutterhead dredge that would pump material directly from the dredging location to the sediment delivery location at the top of the levee on Pond E2. This dredged sediment delivery mechanism could be used for sediment dredged from both RWC and SBS Channel. The cutterhead would deliver a maximum of 7.7 MCY, over a maximum of 17-21 months. The pipeline from the cutterhead would be submerged to allow continued vessel traffic in RWC Channel. Thus offloading activities would not affect recreational boating, or other water-dependent recreation. This is impact is less than significant.

Operational Effects

Impact REC-1: Restricted or Reduced Availability or Quality of Existing Recreation Opportunities

Following deepening, the total number of vessel calls would initially decrease as less lightering of cargo into scows would be required. Long-term, vessel calls may increase at an average of approximately 3 calls per year until 2025, when the maximum cargo throughput capacity at the Port is expected to be reached. This increase is de minimis and would not have a measurable effect on recreational opportunities in RWC Channel or in SBS Channel. This impact is less than significant.

Mitigation Measures

The potential impacts to recreation associated with the dredging and placement options, and post-construction operations are all less than significant; no mitigation is required.

A.12 Socioeconomics/Population/Housing

This section addresses the socioeconomics of the Project Area, identifying the main industries and how they may be affected by the proposed Project. The information presented includes statistics on the income and racial make-ups of the communities in the Project Area, as well as information about the labor force and jobs. Contrasts with the larger surrounding areas were described where feasible.

Affected Environment
There are four counties and six cities with jurisdiction over portions of the Project Area. For the purposes of this section, socioeconomic information is presented for each of these jurisdictions, except SF-DODS, which is 50 miles offshore from the Golden Gate. Since labor for various industries in the Project Area could potentially be sourced from anywhere within a commutable distance, this evaluation assumes that some effects on the economy could extend beyond the particular jurisdiction being discussed.

Table A-16 presents socioeconomic data for the Project Area, indicating which dredging and placement sites are located in which jurisdictions. Often, two jurisdictions apply to a specific site, and county jurisdictions may apply to multiple sites. For example, RWC Channel is located in Redwood City and San Mateo County. SBS Channel is also located in San Mateo County, but one part of the channel is also located in the City of South San Francisco, while the other part is located in the City of Brisbane. Population data for each jurisdiction are provided to give a sense of size. The following economic factors are shown in ***Table A-16***: median household income, the percent of persons in poverty, and racial distribution data. The percentage of persons 25 years or older with a bachelor's degree or higher is also provided, since this usually correlates with socioeconomic prosperity. To establish a context for the local data, national, state, and Bay Area averages are also provided. The "white alone" category also includes white Hispanics, which is why percentages add up to more than 100%.

All data in ***Table A-16*** are sourced from the United States Census Bureau, unless otherwise noted. Statistics of note (maxima or minima, etc.) are bolded. It should be noted that Brisbane is a small city of less than 5,000 people and is not in the national census. Census data for Brisbane were taken from city-data.com. The San Francisco Bay Area data are taken from the Bay Area Census (2010) and aggregated from the following nine Counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma.

A.12.1.1 Dredging Sites

Redwood City Harbor Channel

RWC Channel is located in the eastern part of Redwood City in San Mateo County, California. It is an affluent area, with median income above both the local Bay Area average, as well as state and national averages. Poverty rates range from 8.4% countywide to 9% within Redwood City, both well below the national average of 14.5% and state poverty rate of 16.8%. These rates are also lower than the 9.7% poverty rate for the San Francisco Bay Area.

The Redwood City Harbor area is more white in racial composition than the greater Bay Area, though it is more diverse than the state and national averages. The second largest racial group after "white alone" (60.2%) is Hispanic or Latino, which comprises 38.8% of the residents. The

Hispanic/Latino percentage is similar to the State as a whole, well above the national average, and slightly above the overall Bay Area percentage. The next largest racial group is Asian (10.7%), which is less than both the Bay Area and State averages, but higher than the national average. Statistical data on socioeconomics is provided by location in ***Table A-16*** and the main industries for the Redwood City Harbor Channel area are presented in ***Table A-17***.

San Bruno Shoal Channel

SBS Channel is located in San Francisco Bay, approximately 0.75 mile east of the City of San Bruno shoreline in San Mateo County and approximately 2 miles south of the City of San Francisco. Parts of the channel lie within the City of Brisbane as well. The area around SBS is relatively affluent, with median incomes on par with or higher than the Bay Area average, which are already higher than both the state and national averages for median income. The City of Brisbane, however, has a relatively high poverty rate of 14.1%, which is considerably higher than the Bay Area rate of 9.7%, although still lower than state and national poverty rates.

The racial compositions of communities around SBS vary quite a bit from each other and also from the regional, state, and national levels. The City of South San Francisco has the highest percentage of Asian residents of any jurisdiction within the Project Area, at 36.6%. This is more than double the state levels and well above the Bay Area levels as well.

A.12.1.2 Placement Sites

Cullinan Ranch and Montezuma

Cullinan and Montezuma are both located in Solano County. The socioeconomics for Solano County are presented in ***Table A-17*** and the main industries are presented in ***Table A-17***. Solano County is one of the poorest jurisdictions in the Project Area. Its poverty rate exceeds the Bay Area average, although its rate is still lower than the state and national averages. Residents of Solano County are about 50% less likely to have a bachelor's degree or higher than the average Bay Area resident. Median income for Solano County is higher than the state and national averages, though it falls well short of the Bay Area average. Solano County has the highest proportion of both white and black residents of any jurisdiction in the project area.

SF-DODS

SF-DODS is approximately 50 miles west of San Francisco and is managed by USEPA Region IX. It has no adjacent land uses except open ocean water and thus is not analyzed for socioeconomics.

Table A-16. 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
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)
	San Mateo County	747,373	**$88,202**	8.4	**44.4**	63.3	25.4	26.9	3	0.9
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)
	City of Brisbane*	4,443	$73,630 (2012 $)	**14.1** (2009)	**48.0**	46.4	25.6	23.3	0.2	0.2
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
	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)
Cullinan Ranch Montezuma	Solano County	424,788	$67,177	**14.2**	24.3	**60.7**	25.2	15.4	**14.9**	1.3
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**
	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)
	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)
Compare With:	San Francisco Bay Area***	7,150,739 (2010)	$75,989 (2006-2010)	9.7 (2006-2010)	41.5 (2006-2010)	52.5 (2010)	23.5 (2010)	23.3 (2010)	6.7 (2010)	0.7 (2010)
	State of California	38,802,500 (2014)	$61,094	16.8	30.7	73.5	38.4	14.1	6.6	1.7
	United States	316,128,839 (2014)	$53,046	14.5	28.8	77.7	17.1	5.3	13.2	1.2

Table A-17. Main Industries in Project Area for RWC Navigation Improvement Project

Site	Jurisdictions	Main Industries
Redwood City Harbor Channel	Redwood City	Information Technology, Professional, Scientific, and Technical Services, Healthcare, Retail Trade, Construction (City of Redwood City 2010a))
	San Mateo County	Agriculture, Government, Services, Retail Trade, Mining and construction, Manufacturing, Transportation and public utilities, Wholesale trade, and Finance, insurance and real estate (County of San Mateo 2004)
San Bruno Shoal	City of South S.F.	Limited data. Industries generally described as agriculture and retail, with large employers HQ'd in S. S.F. for food wholesale, biotech and research and development, and some manufacturing (Wikipedia 2015)
	City of Brisbane	Construction, Professional, scientific, and technical services, Transportation and warehousing, Health care and social assistance, Manufacturing, Retail trade, Educational services, Public administration; Wholesale trade (City-data.com 2015)
Eden Landing Ecological Reserve	Alameda County	Advanced manufacturing, Bio science, Construction, Energy, Engineering, Healthcare, Information Communication Technology, and Transportation logistics (Alameda Social Services 2014)
	City of Hayward	Manufacturing, warehousing and distribution, technology and biotechnology, and food manufacturing (City of Hayward 2014)
Cullinan Ranch Tidal Restoration Project	Solano County	Government, education and health services, retail trade, leisure and hospitality, professional and business services, construction, agriculture, and wholesale trade (Solano County and Solano Economic Development Corporation 2015)
Montezuma Wetlands		
Alviso Pond Complex	Santa Clara County	Professional, scientific, management, administrative, and waste management services, Educational, health and social services, and Manufacturing (City-data.com 2015)
	City of Mountain View	Professional, scientific, and technical services, Computer and electronic products, Educational services, Accommodation and food services, Construction (City-data.com 2015)
	City of San Jose	Computer and electronic products, Professional, scientific, and technical services, Construction, Administrative and support and waste management services, Accommodation and food services; Healthcare, Educational services, Social assistance (City-data.com 2015)

Alviso

The Alviso Pond Complex is located in Santa Clara County and the Cities of San Jose, and Mountain View. All have jurisdiction over a portion of the ponds. The area around Alviso Pond Complex contains the first, second, and fourth most affluent jurisdictions in the Project Area, based on median income. The most affluent city, Mountain View, also has the highest percentage of individuals with Bachelor degrees or higher, an impressive 62.6%. The percentages of people in poverty for San Jose and Santa Clara County are lower than state and national averages, but are slightly higher than the regional average in the Bay Area. Santa Clara County has the second highest proportion of Asian (34.1%) residents—well above the regional, state, and national percentages—and the highest proportion of American Indians (1.4%) in the project area, though this number is still lower than the national average. There are comparatively very few African Americans in this area. The proportion of white only residents ranges from roughly 43% to 57% of the population for the jurisdictions around the Alviso ponds.

Eden Landing

The Eden Landing ponds are located in southern Alameda County. Though the median income for Alameda County is relatively high ($72,112) and well over the state and national median incomes, it is still below the Bay Area average ($75,989). Poverty is higher in Hayward than in any other jurisdiction in the Project Area; Hayward has 14.4% of the population living in poverty. This is just barely below the U.S. average, over two points below the State average and almost 50% higher than the average Bay Area poverty rate. Alameda County‘s poverty rate is also higher than the Bay Area average poverty rate.

The racial compositions of communities around Eden Landing vary greatly—white only percentages range from 18.6% in Hayward to 52% in Alameda County as whole. There are more Hispanics in Hayward (40.7%) than any other jurisdiction in the Project Area and Hispanics represent the racial majority in this city, with the second biggest racial group being Asians (21.6%) and the third being whites (18.6%).

Significance Thresholds

NEPA does not provide specific thresholds of significance for socioeconomic impact assessment. Significance is understood to vary depending on the setting of the proposed action (40 CFR 1508.27[a]). Similarly, CEQA Guidelines do not discuss significance criteria for economic impacts since they are not considered effects on the environment under CEQA.

For the purposes of the RWC Project, the effects of the Project or alternative on socioeconomics are considered to be significant if the proposed Project or alternatives would result in any of the following socioeconomic impacts:

1. Result in a measurable and prolonged decrease in local job supply or decrease in revenue from leading industries.
2. Disproportionately benefit high-income, white communities and/or disproportionately harm low-income communities and/or communities of color.

Environmental Consequences and Mitigation

The Project itself is not expected to yield any increase in Port cargo throughput. As discussed in Chapter 2, throughput is driven by local economic conditions. The Project and alternatives are intended to result in more efficient Port operations. Because the socioeconomic effects would be similar for all dredging and placement options, the analysis was conducted for all sites collectively.

<u>Impact SE-1: Measurable and Prolonged Decrease in Local Job Supply or Decrease in Revenue from Leading Industries</u>

The potential socioeconomic effects of the project are associated with short term job creation during construction. A small number of temporary jobs would be created during construction of the project; the duration of these temporary jobs would be no more than 12 years (the maximum duration of the project) for approximately 6 months per year. The majority of these jobs would be associated with the dredging and pipeline replacement activities; a few temporary jobs would also be created at the sediment delivery location if a beneficial reuse site is used.

The Project may result in some beneficial effects. Because the Port of Redwood City imports bulk construction and building materials, there may be a beneficial effect from this project on the regional construction industry, including the construction activities in some of the jurisdictions that would be affected by the Project. Beneficial effects could include minor reductions in cost and increased supply reliability. The proposed Project is not expected to generate any increases in construction activity, as construction activity is driven by local economic conditions.

Industries that are expanding rapidly and therefore constructing new facilities may experience indirect benefits from the proposed Project. Expanding industries in this region include information technology, professional, scientific and technical services, retail trade, biotech and research and development, computer and electronic products, and construction, among others (Alameda Social Services 2014; City of Hayward 2014).

The cargo handling facilities at the Port of Redwood City are not equipped to process other types of commodities, such as food and technology exports that would make it possible for the project to positively impact industries other than construction. There are no current plans to expand the Port's facilities (adding cranes or other equipment) to accommodate commodities other than construction materials; therefore the Project is not expected to impact any other industries directly. The Project would have a slight beneficial effect; no adverse impacts are expected.

No mitigation is required because there would be no Project-related adverse impacts to socioeconomics.

Impact SE-2: Disproportionate Benefit to High-Income, White Communities and/or Disproportionate Harm to Low-Income Communities and/or Communities of Color.

Redwood City, San Mateo County, Brisbane, Alameda County, the City of Mountain View, City of South San Francisco, City of Hayward and San Jose may see local economic benefits to the construction industry. The communities that would benefit span a range of poverty levels and racial percentages. Therefore, from an economic standpoint, neither positive nor adverse effects are disproportionately distributed.

The two communities that have the lowest proportion of white residents, the City of Hayward (18.6%) and City of South San Francisco (37.3%) are not communities where construction is a leading industry. However, they are close enough to communities that have a strong construction industry so that labor could be reasonably sourced from them. Therefore, positive impacts to the economy through a beneficial on regional construction and growing Bay Area industries are not expected to be disproportionately distributed. There would be no impact.

Mitigation Measures
No mitigation is required because there would be no Project-related adverse impacts to socioeconomics.

A.13 Transportation/Navigation/Traffic

This section describes the water-based transportation and navigation setting for the Project, detailing the regulated navigation areas and “rules of the road” for vessels navigating the waters in and around the project locations. Regulations pertaining to navigation are also discussed. Land based traffic is briefly discussed, but since all the vast majority ofProject-related work would take place on-water, the analysis focuses on water-based transportation.

Affected Environment

A.13.1.1 Vessel Traffic in the Study Area

Vessel traffic in San Francisco Bay and outside the Golden Gate includes tugs, government vessels, passenger ferry ships, commercial shipping vessels, motorized and non-motorized recreational boats including large sail boats, commercial and sport fishing boats, and personal watercraft (jet skis).

The Vessel Traffic Service (VTS) San Francisco area extends from the Ports of Sacramento, Stockton and Redwood City to the offshore ocean approaches within a 38 nautical mile radius of Mount Tamalpais (Boone pers. comm. 2015) (more discussion of VTS and its role is provided in Section 4.5.13.2, below. Large vessels entering and maneuvering in San Francisco Bay are required to be on contact with VTS and use designated traffic lanes set by VTS for inbound and outbound vessel traffic, and follow rules governing vessels entering and leaving ports. San Francisco Bay is a tricky complicated waterway from mariner's perspective.

Piloting in and out of the Bay and adjacent waterways is compulsory for all vessels of foreign registry and U.S. vessels under enrollment not having a federally licensed pilot on board. San Francisco Bar Pilots provide these services for vessel movements to and from all terminals in the Bay and tributaries to the Bay, including the Carquinez Strait.

Ship traffic density in San Francisco Bay has increased from approximately 124,987 movements in 2009 to an estimated 131,391 in 2014, with intermittent dips and increases in between (Boone pers. comm. 2015). This includes all types of commercial vessels including ferries, tugs and scows, container vessels, cruise ships, tour boats, etc.

Approach into San Francisco Bay

Approach lanes to the entrance of San Francisco Bay have been established from the north, west, and south. The approach lanes begin in Gulf of the Farallones. The northern and western approach lanes are composed of a 1 mile wide inbound traffic lane and a 1 mile wide outbound traffic lane with a 1 mile wide separation zone between the traffic lanes. The southern approach lane is composed of a 1 mile wide inbound traffic lane and a 1 mile wide outbound traffic lane with a 2 mile wide separation zone between the traffic lanes. Outside these lanes, the US Navy has designated areas for submarine operations within which scow operations are precluded.

The approach lanes lead to an offshore light station with a rotating beacon that marks the beginning of the main channel to the Golden Gate Bridge. The beacon, which is located 10 miles west of Point Bonita, is in the center of a precautionary area where all ships leaving and entering port converge and is called Light Buoy “SF” or referred to as the “San Francisco Sea Buoy.” This is the area where many ships take on or discharge San Francisco Bar Pilots.

Navigation to Port of Redwood City

Ships bound for the Port of Redwood City proceed in an easterly direction toward the Golden Gate Bridge through a narrow channel, which consists of inbound and outbound traffic lanes with a separation zone between them. These traffic lanes are 600 yards wide with a separation zone of approximately 150 yards. The water is usually more than 90 feet deep throughout this area, with the exception of shoal areas. A navigation channel through the shoal is maintained at a depth of 55 feet. Shoal waters less than 30 feet deep exist on either side of this narrow channel. Standard aids to navigation such as horns, bells, and lights are provided at appropriate locations near submerged rocks and points of land. Ships then proceed inbound either through the East Bound Traffic Lane (south of Alcatraz Island) or through the Deep Water Traffic Lane north of Harding Rock Buoy. They will typically transit under the Bay Bridge through the A-B Span or the D-E span. The B-C and C-D spans are options but the width between the bridge towers is much narrower than the D-E and A-B spans. Once the vessels are clear of the Bay Bridge, they will transit south through SBS Channel and through the fixed navigation span of the San Mateo Bridge. The entrance to the RWC Channel is approximately 3.7 miles south of the San Mateo Bridge.

Vessels in transit through Central and South San Francisco Bay typically maintain speeds between 10 and 12 knots. Dead slow speed for vessels entering RWC Channel is approximately 7 knots; typical speeds within RWC Channel are approximately 9 knots. Vessels entering RWC are escorted by one or more tugs.

As noted in Chapter 3, approximately 70% of vessels entering the Port have drafts that exceed the allowable draft under current conditions. Three options exist for vessels that exceed the allowable draft. Vessels may:

- Wait for higher tides.
- Partially offload cargo onto scows before entering the Port (this practice is called lightering). Both the lightered vessel and the scows are offloaded at the Port.
- Deballast in order to transit San Bruno Shoal channel, then reballast to transit under the San Mateo Bridge, and then deballast again to enter the RWC Channel.

Vessels that are waiting for higher tides as well as vessels that are being lightered anchor at Anchorage 9 (Marine Safety and Security Information Bulletin (MSSIB) 10-06 and 33 CFR 156.118).

Other Vessel Traffic

Ferries comprise more than 50% of the vessel transits in San Francisco Bay. Ferries operate on regular schedules and routes, and have maximum speeds of up to 40 knots. Existing and planned ferry routes are shown in ***Figure A-9***. It is important to note that the planned ferry route for Redwood City shown in ***Figure A-9*** would not begin construction until 2024 or later, well after the proposed RWC Project's construction phase is over.

Figure A-9. Existing and Planned Ferry Routes in San Francisco Bay

Regionally, the Marine Highway Initiative is an effort to establish a “container on scow” service stretching from West Sacramento to Oakland, with stops in Stockton, to provide a viable marine highway that facilitates short sea shipping service between regional ports to improve goods movement throughout Northern California. In addition, this initiative is expected to help decrease congestion on major roadways, and reduce the truck emissions associated with the current distribution system. Service started in July 2013 between the Port of Stockton and the Port of Oakland (recordnet.com 2013).

A.13.1.2 Dredging Sites

Redwood City Harbor

The existing Federal navigation channel and turning basins at Redwood City Harbor have an authorized depth of -30 feet MLLW, and are maintained on a one- to two-year dredging cycle. The Federal channel extends from the mouth of Redwood Creek to deep water in San Francisco Bay. It was partially dredged in 2014 and will be fully dredged to its authorized depth of -30 feet MLLW in 2015. The latest Port statistics show that 1.8M tons of commodities passed through in FY 14 (Jul 12 – June 13). Over the past 15 years, the Port's tonnage has increased at an average annual growth rate of 2.8%. Based on this growth rate, total tonnage is expected to reach the Port's maximum throughput capacity of 2.5 million tons in about 2025. The Port has no plans for future infrastructure improvements, and commodity throughput is expected to remain level after 2025. ***Table A-18*** shows the vessel calls from 2002 to 2014 and the associated commodity volumes.

Table A-18. Commercial Traffic and Commodity Volumes, Port of Redwood City

Port of Redwood City Commercial Traffic					
Fiscal Year	Cargo Metric Tons	Vessel Calls			Percent Barges
		Barges	Ships	Total	
2014	1,784,659	25	64	89	28%
2013	1,493,190	19	51	70	27%
2012	1,319,198	26	48	74	35%
2011	871,940	11	36	47	23%
2010	842,727	16	33	49	33%
2009	986,727	11	37	48	23%
2008	1,487,064	65	50	115	57%
2007	1,436,626	94	46	140	67%
2006	1,833,022	91	60	151	60%
2005	1,908,172	96	60	156	62%
2004	1,484,720	88	54	142	62%
2003	1,111,000	58	42	100	58%
2002	899,652	65	30	95	68%
Note: July/June is the fiscal year.					
Source: Port of Redwood City					

In addition to commercial vessel traffic, the Redwood City public marina and several private marinas are located adjacent to RWC Channel and use the federal channel for recreational boat access in and out of San Francisco Bay (Port of Redwood City 2010). These marinas have approximately over five hundred berths for recreational boats between them (see ***Section A.11,*** Recreation).

Popular routes of travel and locations for nonmotorized small boat recreation, nature observation and environmental education include the area around Bair Island Ecological Reserve and Corkscrew Slough.

San Bruno Shoal Channel

SBS Channel also has an authorized depth of and is maintained at -30 feet MLLW. There are no port or other facilities in the immediate vicinity of SBS Channel. The channel is underlain by three fuel pipelines at 3 to 6 feet below the bottom of the channel. Commercial vessel traffic in SBS Channel consists primarily of vessels en route to the Port of Redwood City. Recreational use of the Bay occurs throughout the South and Central Bays, including in the vicinity of SBS Channel.

A.13.1.3 Placement Sites

Cullinan Ranch Restoration Project

The Cullinan offloading site would be located in Napa River, and the sediment delivery site would be located on a levee adjacent to Dutchman Slough. To reach the Cullinan offloading site, scows would have to transit the through South and Central San Francisco Bays and San Pablo Bay into Mare Island Strait, which is the entrance to the Napa River. Barges would use the existing navigation channels where necessary. Mare Island Strait is a federally authorized channel, with an authorized depth of -30 feet MLLW. It currently has depths between -24 and -38 feet MLLW (NOAA 2006). Napa River has a federally-authorized ship channel nominally maintained at -15 feet MLLW; however, no maintenance dredging has been conducted in the past 10 years (Keith Caldwell, pers. comm. 2015). In the vicinity of the proposed offloading location, Napa River has depths of approximately 20 to 21 feet. Dutchman Slough has depths between 8 and 13 feet MLLW in the vicinity of the offloading and the dredged material delivery area (NOAA 2006).

Mare Island Strait is used by some commercial vessels and is on an active ferry route (Vallejo-San Francisco). The Vallejo Marina is located north of the ferry terminal, and there is extensive recreational motorized and non-motorized boat traffic in Mare Island Strait and Napa River north of Mare Island Strait. Vessel traffic in Dutchman Slough is exclusively recreational except during periods of levee maintenance and the recent restoration activities at Cullinan Ranch.

Montezuma Wetlands Project

The Montezuma offloader location is in open water near the confluence of the Sacramento and San Joaquin Rivers. Scows in transit to the Montezuma placement site would use would have to transit through South and Central San Francisco Bays, San Pablo Bay, and Suisun Bay. The scows would use the existing navigation channels where necessary. Just west of the entrance to the Sacramento Deep Water Channel, scows would head in a northerly heading around the north side of Chain Island to the Montezuma offloader.

In addition to supporting commercial traffic, Suisun Bay and the Delta are used extensively by recreational boaters. Commercial traffic in the immediate vicinity of the offloader would consist primarily of vessels bound for the offloader, and periodic maintenance vessels headed for the DWR gates in Montezuma Slough.

SF-DODS

SF-DODS is located in the deep ocean east of the Golden Gate Bridge. Scows en route to SF-DODS would have to transit through South and Central San Francisco Bays, under the Golden Gate Bridge and then through the western San Francisco Bay RNA and the Golden Gate Precautionary Area (see Appendix N, RNA Figures), using designated shipping lanes. San Francisco Bay between San Francisco and Oakland, near the San Mateo Bridge, and around the entrance to the Bay at the Golden Gate Bridge are all trafficked by ferries, as well as commercial vessels heading to the Ports of Oakland, San Francisco, and those heading north towards San Pablo Bay and the Port of Stockton. Once out on the open ocean, ***Figure A-10*** shows the typical route that a disposal vessel would take to reach SF-DODS. As noted in the figure, the vessel remains within established shipping lanes in the vicinity of the Farallon Islands, as required (USEPA 2015) to minimize effects to the Monterey Bay and Gulf of the Farallones National Marine Sanctuaries, and avoid the Farallon Islands exclusion zone. .

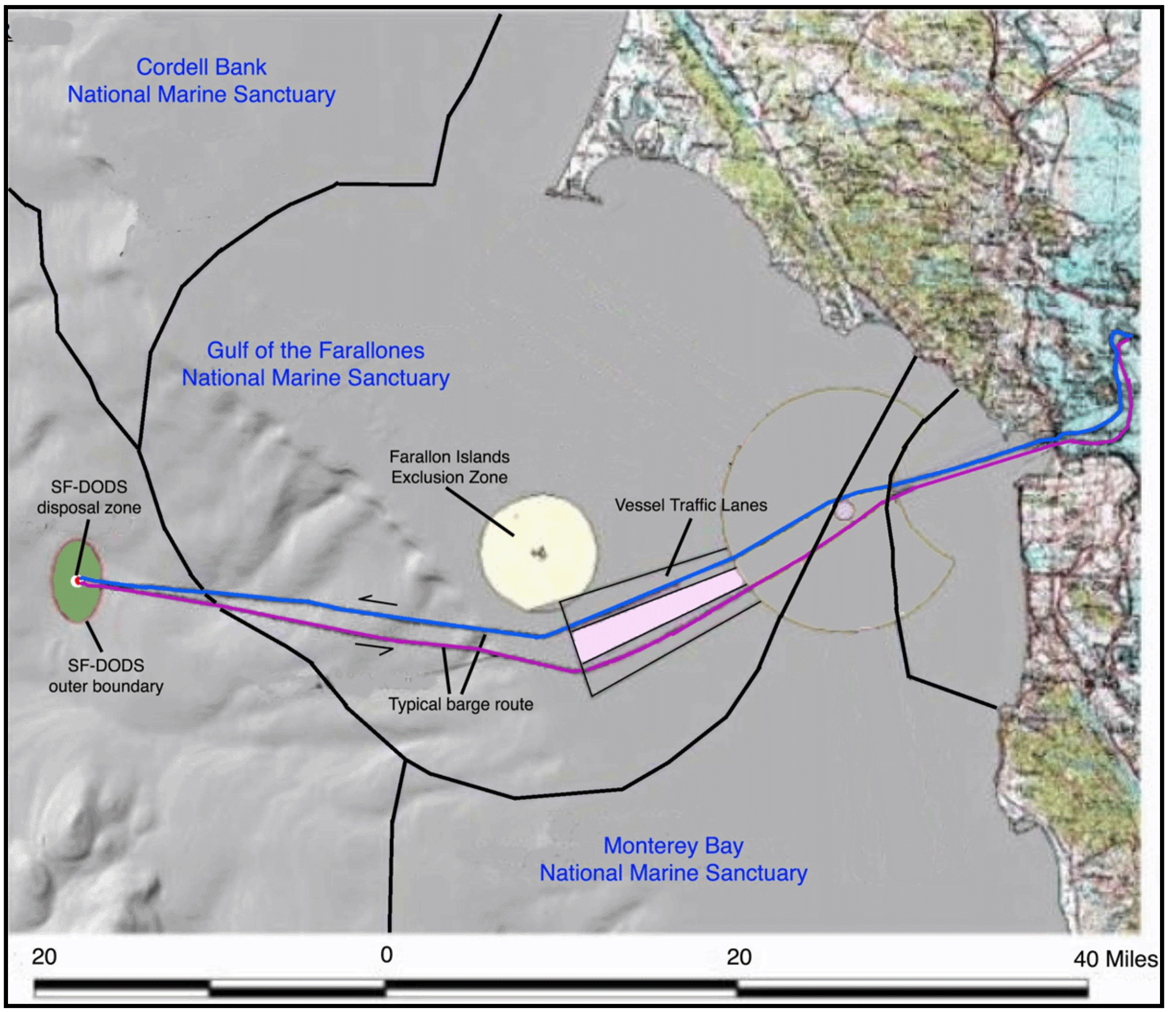

Figure A-10. Transit Route to and from SF-DODS

Sea conditions in the open Pacific Ocean off central California can be extreme, therefore there are strict limitations on the transit route and allowable weather and wave conditions for accessing SF-DODS that project contractors must comply with.

Eden Landing Restoration Project

Eden Landing is located on the east side of the South Bay, opposite Redwood Creek/RWC Channel. Alameda Creek (sometimes called Coyote Hills Slough) runs along the south edge of Ponds E2 and E4. The proposed offloader location is just east of the entrance to the RWC Channel on the east side of the natural deepwater channel (***Figure A-8***).

Compared to the Central Bay and areas closer to San Francisco and Oakland, this area has limited boat traffic, though there is some commercial ship traffic nearby, heading to the Port and there are several public and private marinas in the vicinity of the Port.

Alviso Ponds Restoration Area

Alviso Pond Complex is located in the South Bay. Coyote Creek runs along the northern edge of the pond complex. Guadalupe Slough and Alviso Slough run through the Pond Complex, with the sediment delivery location at Pond A9 located just within the entrance to Alviso Slough, and the sediment delivery location at Pond A2W just inside Mountain View Slough. If the Pond A9 sediment delivery location is used, another booster pump would be located in open water midway between the delivery location and the offloader (***Figure A-8***).

The sloughs and open waters around the Alviso Pond Complex are used recreationally. There is little or no commercial traffic, except during levee maintenance activities for the nearby community of Alviso and commercial fishing boats that fish in the Bay. Alviso Marina County Park is located on the banks of Alviso Slough and provides a public boat launch ramp for motorized and non-motorized boats. The South Bay Yacht Club (SBYC) is located along the bank of Alviso Slough. The Blue Whale Sailing School is also located along the levee of Alviso Slough, adjacent to and downstream of SBYC.

A.13.1.4 Land Based Traffic

Effects to land-based traffic from construction-related activities would be *de minimis* for this Project. Most, if not all, of the heavy equipment (dredges, scows, tugboats, etc.) would transit to the site over water. If heavy equipment would need to use local roadways to access the Project areas during construction, a Traffic Control Plan would be completed and implemented to avoid and minimize impacts to local traffic.

Construction crew travel effects would also be minimal. Construction workers for the dredge sites would consists of a 16 or 18 member crew, depending on the type of dredge (16 for clamshell and 18 for a cutterhead), working 12-hour shifts. These workers would most likely drive to the Port and park there before taking a skiff to the dredge.

There would also be a five person crew staffing an offloader at Eden Landing, Alviso, or Cullinan, if any of these sites are used to place dredged material. Offloader crews would likely drive and park at a marina near the placement sites and take a boat to the offloader for their 12-hour shift. If the maximum amount of material went to each of these sites, it would mean five offloader workers traveling to and from the site (two crews per 24-hour period) for up 24 months out of a 4 year period at Eden Landing and Alviso, and 58 months out of a 10-year period at Cullinan, which has a slower placement rate. This effect on land based traffic would be *de minimis*.

In a regional context, both dredge sites are located in San Mateo County, where roughly three quarters of a million people live. Eden Landing and Alviso Ponds are close to one another, but span two counties—Alameda and Santa Clara County. Together these counties have well over three million residents, while Cullinan Ranch is part of Solano County, which has just under half a million residents.

The south portion of the San Francisco Bay region, the broader location of RWC and SBS Channels as well as both Eden Landing and Alviso Ponds, is an urbanized area. Due to the large scale of existing land based traffic in these populated urban areas, adding five to 18 daily commuters for up to 6 months out of the year during of construction is unlikely to have a noticeable impact. Primary access to the Port of Redwood City would be via Highway 101. In 2011 US-101 had an annual average daily traffic (AADT) maximum of 209,000 vehicles in the portion near Redwood City (Caltrans 2013). Thirty-six vehicles per day (72 total trips) compared to the daily traffic is less than 0.001%. Near Alviso, the Highway 101 AADT was similarly high at 197,000 AADT (max) (Caltrans 2013). Twenty total vehicle trips would not contribute to any noticeable traffic effects. Eden Landing would be accessed via Interstate 880 or Highway 92. Both of these roads are also major transportation arteries, and adding a small number of daily commute trips would not affect overall traffic on these roads. Any impact from construction workers commuting to work would also be *de minimis*.

Traffic effects during operation would be largely limited to effects from trucks exiting the Port. There would be no effects associated with public transportation, or bicycle and pedestrian access; small increases in the local workforce could also occur. However, the growth in cargo projected for the Port (up to a 38% increase in cargo throughput) would not be attributable to the Project. As discussed in Section 4.2, growth would occur with or without the Project. Increases in truck traffic would be due to projects that result in increases in Port throughput capacity. The most recent project completed at the Port, the improvement of Wharves 1 and 2, was projected to add to the baseline cargo throughput, and provided traffic mitigation for that increase (Port of Redwood City 2010). Based on the information provided above, land based traffic is not analyzed in further detail. However, waterborne transportation effects are assessed.

Regulatory Setting

This section discusses the regulatory setting for navigation in the Project Area, including which laws and agencies governing navigation in the area.

A.13.1.5 Federal, State, and Regional Laws, Regulations, Policies and Agencies

Under Federal law, the USCG regulates marine traffic and sets "rules of the road" for navigation. The USCG's Vessel Traffic Service (VTS) for San Francisco Bay, which is located on Yerba Buena Island, controls marine traffic throughout the Bay Area. (VTS performs a function similar to air-traffic control for airports.) Although some small and private vessels are not required to coordinate their movements by contacting the VTS, the Coast Guard monitors all commercial, Naval, and private marine traffic within San Francisco Bay and local coastal waters.

The California Department of Boating and Waterways (Cal Boating) establishes and enforces recreational boating operation and equipment regulations in conformity with federal navigation rules promulgated by the Coast Guard.

The San Francisco Bay Water Emergency Transportation Authority (WETA) is a regional agency authorized by the State of California (SB 976) with control of all public transportation ferries in the Bay Area region, except those owned and operated by the Golden Gate Bridge District. WETA was created in 2007 from the San Francisco Water Transit Authority (WTA). WTA adopted an Implementation and Operations Plan which describes the current ferry system within the Bay. WETA later adopted the Final Transition Plan, which describes the expansion of the existing ferry service within the Bay.

A.13.1.6 Regulated Navigation Areas

Within San Francisco Bay, the USCG has established RNAs (Regulated Navigation Areas) as depicted in Appendix N. The RNAs increase navigational safety by organizing traffic flow patterns; reducing meeting, crossing, and overtaking situations between large vessels in constricted channels; and limiting vessel speed.

RNAs apply to "large vessels" (defined as power-driven vessels of 1,600 or more gross tons, or tugs with a tow of 1,600 or more gross tons). When navigating within the RNAs, large vessels follow specific guidelines. They must have their engines ready for immediate maneuver, must operate their engines in a control mode and on fuel that allows for an immediate response to any engine order, and must not exceed a speed of 15 knots through the water.

San Francisco Bay RNA

The first RNA encountered by inbound ships is the San Francisco Bay RNA, which extends from the precautionary zone east of the Golden Gate Bridge to Alcatraz Island (see Appendix N for RNA maps). Because of the large number of vessels entering and departing San Francisco Bay, traffic lanes were established under the Golden Gate Bridge and in the Central Bay to separate opposing traffic and reduce vessel congestion. Use of these lanes and adherence to the indicated direction of travel is required for large vessels and recommended for all other vessels.

Due to the presence of shoals and rocks in the Central Bay, the Central Bay Two-Way Deep Water Traffic Lane (DWTL), located north of Harding Rock, provides the best water depth safety margin for inbound vessels with a draft of 45 feet or greater, and for outbound vessels with a draft of 28 feet or greater. These deep draft vessels are required to use the DWTL.

North Ship Channel RNA and San Pablo Straight Channel RNA

The North Ship Channel and San Pablo Strait Channel RNAs consist of the existing charted channels and delineate the only areas where the depths of water are sufficient to allow the safe transit of large vessels. The strong tidal currents in these channels severely restrict the ability of large vessels to safely maneuver to avoid smaller vessels.

Pinole Shoal Channel RNA

The Pinole Shoal Channel RNA is a constricted waterway, the use of which is currently restricted to vessels with of 1600 gross tons or greater or tugs with tows of 1600 gross tons or greater (as per regulation 33CFR165.1181).

Benicia Martinez Railroad Drawbridge RNA

The Benicia Martinez Railroad Drawbridge RNA consists of a small circular area, 200 yards in radius, centered on the middle of the channel under the Benicia Martinez Railroad Drawbridge. The limited horizontal clearance results in a greater chance of vessel collisions with the bridge. This risk of collision is significantly increased when there is poor visibility. The regulation precludes large vessels from transiting the Benicia Martinez Railroad Drawbridge RNA when visibility is less than a half nautical mile.

A.13.1.7 Critical Maneuvering Areas

Critical Maneuvering Areas (CMAs) are areas within the Bay where additional standards of care are required due to the restrictive nature of the channel, proximity of hazards, or the prevalence of adverse currents. CMAs were established by the Harbor Safety Committee as best practices in response to the Cosco Busan bridge allision. While they are best practices,the VTS can enforce compliance under the National VTS Regulations (per MSIB 15-05 dated 13 February 2015). Tugs with tows are advised not to transit through CMAs when visibility is less than 0.25 nautical mile. Locations in the Bay identified as CMAs pertinent to this project are Redwood Creek, San Mateo-Hayward Bridge, Oakland Bar Channel, the east span of Richmond-San Rafael Bridge, and Union Pacific Railroad Bridge (HSC 2014).

Significance Thresholds

Because this transportation evaluation focuses on marine navigation, many of the California Environmental Quality Act (CEQA) Appendix G thresholds for transportation/traffic, as written, do not apply to the project alternatives because they are focused on land-based or air transportation. Therefore, the following project-specific thresholds were established to evaluate the potential for navigation impacts under NEPA and CEQA. Navigational safety risks are discussed in **Section A.8**, Hazards and Hazardous Materials.

Waterborne transportation impacts would be considered significant if the Project vessel traffic or vessel traffic generated by the Project alternatives would cause or create:

- Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade.
- Substantially interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area.

Potential navigational safety risks are addressed in the Hazards and Hazardous Materials discussion (***Section A.8***).

Environmental Consequences

Dredging Options

Redwood City Harbor Channel

Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade

Dredging and Construction Phase

RWC Channel does not currently experience congestion problems and is a relatively low-traffic area, with an average of roughly 9 vessel calls per month in 2014. The channel is 300 to 900 feet wide and the largest vessels that call on it (Panamax vessels) are 110 feet wide. Dredging operations in the channel would be planned and impermanent, lasting a maximum of 67 months (-37 ft alternative with 2 feet of overdepth and the minimum dredge rate per day at RWC Channel with placement at SF-DODS). This would occur during the 180-day dredging windows only and would therefore span about twelve dredging windows. While dredging operations would result in a small number of additional vessels and scows using RWC Channel during the construction phase, the Port and marinas along the channel would still be accessible. There could be up to approximately seven pieces of equipment in use during for dredging. In addition to the dredge itself, accompanying equipment for a clamshell dredge would include scows, tugboats to position the dredge and scows, a crew boat, and a tender tug. For a cutterhead dredge, there would be a booster pump(s) at the dredge, a derrick barge, a crew boat and two tender tugs. Slight delays are possible as a result of the dredging, but these would not be unreasonable. A notice to mariners would be publically posted so that recreational users and commercial vessels are aware of dredging locations and schedules. This impact is less than significant.

Post-Construction

By 2025, the total tonnage throughput at the Port is expected to reach 2.5 million, up from roughly 1.8 million tons in 2014. This growth would occur as a result of regional economic activity rather than the proposed Project. Vessel traffic would be expected to increase slightly over time. Vessel traffic with the Project would be expected to decline slightly relative to the No Action/No Project condition. Since dredging a deeper channel would reduce the need for light-loading and lightering, deep draft ships would be able to carry more cargo to Port, resulting in less lightering into barges and potentially fewer deep draft vessel calls as well.

Under the current conditions, roughly two per month are used at RWC Channel for lightering. Under the -32 foot MLLW dredging option, this would decrease to about one per month. Thus, the long-term effect of the deepening would be about a 33% decrease in barge calls, as well as a 10 to 24% reduction in deep draft vessel calls. The Proposed Project would also reduce the wait times for vessels wishing to enter the Port. The Project would have a beneficial effect on navigation in the post-construction phase.

<u>Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area</u>

The existing RWC Channel capacity is expected to handle the temporary increase in vessel movement during construction, without substantially interfering with navigation. Though the number of large vessel movements in RWC Channel would noticeably increase, this increase would not substantially impede other vessel movement and would be temporary. This impact is less than significant.

San Bruno Shoals Channel

<u>Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade</u>

Dredging and Construction Phase

SBS Channel is located in a wide part of the Bay. Though deep draft vessels must use the deep draft channel, all other vessels, such as barges, ferries, and recreational vessels, have adequate water depth and ample room to move in the shallower parts surrounding the channel. A notice to mariners would be posted with dredging and pipeline removal maps and schedules to help guide mariners away from the construction area.

Pipeline relocation activities could block portions of the channel while the pipeline segments crossing the channel are relocated (lowered). The preferred method for the relocation effort would be selected during the Project design phase. If directional drilling is used, there would be no blockage of the channel, as all work could be completed from outside the channel boundaries. If clamshell construction is chosen, the work duration in the channel would require up to 3 weeks; however, work would be done by a dredge, and dredging activities would be coordinated with vessel calls to the degree feasible. Furthermore, the channel is 500 feet wide, and vessels are likely to be able to transit past the dredge during the majority of the work period in the channel. If the jet sled method is chosen, construction in the channel could require from 50-100 months, working 10 hours per day. Because the jetsled is deployed from a vessel, the vessel could be moved out of the channel when there is no construction activity, and thus allow vessels to transit the channel. The potential obstruction of vessel traffic during construction and dredging in SBS Channel is less than significant.

Post-Construction

The current SBS Channel is slightly depth constricted and this Project would add needed depth to the deep draft channel. The Project would have a beneficial effect on navigation in the post-construction phase.

Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area

SBS Channel dredging or pipeline relocation would not result in substantial interference with vessel navigation, nor a substantial increase in vessel volume. No impact is expected.

Placement Sites

Cullinan Ranch Tidal Restoration Project

Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade

The proposed offloader locations on the western edge of the deep water channel in the Napa River and the proposed pipeline alignments in the shallow water adjacent to the levees along Dutchman Slough were chosen in part to minimize impact on vessel traffic in the area. Scow delivering sediment are not expected to cause delays to commercial vessels in the Federal channel, and there is ample room for smaller vessels to divert around the scows. There would be no impact.

Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area

This area is relatively well-trafficked already, with many recreational boaters on the Napa River, periodic recreational boat traffic on Dutchman Slough, and an existing Federal Navigation Channel in the area and in Mare Island Strait. The maximum traffic added from use of Cullinan Ranch would be two to three scows delivering sediment to the offloader per day. This would not substantially interfere with vessel navigation or substantially increase vessel volume. The impact is less than significant.

Montezuma Wetland Restoration Project

Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade

The waters near Montezuma experience some commercial traffic on the way to the Sacramento River, and there is recreational boat traffic near the offloader, as well. There are no marinas or other sources of recreational vessel traffic near the site, however. The offloader is located close to the northern shore, north of Chain Island; there would be no commercial vessel traffic other than that bound for the offloader north of Chain Island. Recreational vessel traffic can either pass by the tug and scow north of Chain Island, or could divert to the south of Chain Island. No construction is proposed at this site. Delays to commercial vessels would not be expected to result from placing material at Montezuma. There is no impact.

Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area

With only two to three scow arrivals per day, and no construction proposed at this site, the potential impact to navigation is less than significant.

SF-DODS

Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade

The scow trip to SF-DODS involves navigating through the busier parts of the San Francisco Bay. The Bay experienced over 130,000 vessel movements in 2014. Contractors transporting materials would follow all rules for vessel navigation. A maximum of two to three scows transiting to SF-DODS per day would not be expected to cause any delays to commercial vessels. This impact is less than significant.

Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area

Contractors transporting material to SF-DODS would follow all rules for vessel navigation, including use of the transit route around sensitive habitat areas and adhering to any weather restrictions, should they arise. With a maximum of two to three scow deliveries per day, no interference is expected with vessel navigation and this would not be considered a substantial increase in vessel movement volume in the study area. Any impact would be less than significant.

Alviso Ponds

Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade

The Alviso offloader location, on the eastern edge of the natural deep water channel in the Bay, between the Dumbarton Bridge and the railroad bridge was chosen specifically to avoid delays and hazards to scows transiting the railroad bridge. Boat traffic in the South Bay is mostly recreational. There would be no unreasonable delays to commercial vessels.

Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area

Offloader construction and operation would not substantially increase the volume of vessel movements in area, and would not create any substantial interference with recreational vessel traffic. With no more than two to three scows offloading at Alviso per day, this would not cause substantial interference with vessel navigation, nor would it substantially increase the volume of vessel movements. There would be ample room for recreational vessels to divert around the offloader and construction activities associated with the offloader and dredged sediment pipeline. The proposed pipeline alignments are also designed to avoid interfering with recreational vessel traffic. They would be located in deep to shallow water, crossing mudflats and shallow water prior to terminating at the top of the levees at either Pond A2W or A9. Booster pumps would be located on top of the levee at the sediment delivery location. The additional booster pump required to deliver sediment to Pond A9 would be in relatively shallow water east of the natural deep water channel. There would be no impact.

Eden Landing Ponds

Impact NAV-1: Unreasonable (unplanned, regularly occurring) delays to commercial vessels plying their trade

The proposed offloader location for Eden Landing is the closest to the dredging areas of any of the proposed placement sites, adjacent to the eastern edge of the deep water channel near the entrance to RWC Channel. Mariners would expect to encounter larger vessels in this area. Delays to commercial vessels resulting from scows transiting to the offloader would be unlikely and on-going communications between the vessels would prevent vessel interference. Any delays would be minor, as the tug crossing the channel would typically require less than 1 minute to complete the transit. This delay would not be unreasonable, and there would be no impact. The pipeline from the cutterhead to the dredged sediment delivery location may cross RWC Channel. It would be submerged and placed on the bottom of the channel to avoid impacts to vessel navigation. The pipeline from the offloader to the dredged sediment delivery location would be well marked, and would be partially located on the Bay bottom to allow continued transit of various types of smaller commercial and recreational vessels. The impact would be less than significant.

Impact NAV-2: Substantial interference with vessel navigation, and/or substantially increased the volume of vessel movement in the study area

As discussed previously, dredging activities would result in 2 to 3 scows being delivered to the offloader each day. Vessel movement in the study area would not increase substantially. The transits of the channel would be of short duration, and there is ample space for shallower draft vessels to divert around the offloader area during construction and operation. Construction of the dredged sediment delivery pipeline across the channel could result in a temporary blockage to vessel traffic in RWC Channel, and would be coordinated with vessel movements to avoid interference. For the reasons described above, the dredged sediment delivery pipeline would not pose a substantial obstacle to navigation. The impact would be less than significant.

Mitigation Measures

There are no significant impacts, and no mitigation is required.

A.14 Utilities/Service Systems

Affected Environment

This section addresses potential effects to public services, utilities, and related infrastructure that could be affected by Project activities. The focus is on the potential for damage to these types of facilities, the need to possibly relocate or otherwise protect the facilities, and the potential for disruption in these services/utilities during dredging or placement activities. The analysis does not address the proposed Project's effect on supply and demand for these public services, since these would not be substantively affected by the proposed Project. Potential hazards associated with relocation of the fuel pipeline are addressed in ***Section A.8***.

A.14.1.1 Dredging Sites

Redwood City Harbor

There are no underground utilities in/across the channel in the vicinity of the Port. Above ground high tension electrical power lines cross RWC Channel east of the mouths of Corkscrew and Westpoint Sloughs, about 0.5 miles north of the Port. Power towers are located on the mudflats adjacent to the channel. These power lines are not the controlling height for the channel deepening. The controlling height is the San Mateo Bridge and would continue to be so after the deepening is completed. All of the utility mains serving the wharf areas are located in upland areas. The utilities serving the wharves include electrical, water, sanitary sewer, and storm sewer fuel lines. Potable water is received from Redwood City; sanitary waste is treated at the Silicon Valley Clean Water Treatment Plant in Redwood Shores. There are no active fuel lines in the Port area, and all abandoned fuel lines have been cleaned up in accordance with California EPA Department of Toxic Substances Control and USCG requirements.

San Bruno Shoal Channel

As described in ***Section 4.2 of the Main Integrated Report*****,** three fuel pipelines are known to exist below SBS Channel. A single southern pipe is owned by Shell; two northern pipelines located in one trench are owned by Kinder-Morgan. The Shell pipeline is reported to be inactive. The Kinder-Morgan pipelines provide fuel to San Francisco International Airport and Metropolitan Oakland International Airport. No other utilities are known to be present in the immediate vicinity of SBS Channel.

A utility survey was conducted to locate the pipelines. The Shell pipeline is 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 -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 can be assumed that the pipelines would have been laid into the bottom of the trench, the report indicates that 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 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).

A.14.1.2 Placement Sites

None of the placement sites would require the use of any service systems such as waste water treatment or potable water treatment. Therefore, this section focuses on only utilities that may be present in the Project Area.

Cullinan Ranch Restoration Project

There are no known above ground or buried utilities in the immediate vicinity of the Cullinan offloading locations, nor are there any utilities along the proposed pipeline locations. Electrical power could be provided from Mare Island to the southern offloader location.

Montezuma Wetlands Project

There are no known utilities in the immediate vicinity of the Montezuma site. Electrical power to the Montezuma offloader is provided from the shore.

SF-DODS

There are no known utilities in the vicinity of SF-DODS.

Eden Landing Restoration Project

There are no known above-ground or buried utilities in the immediate vicinity of the Eden Landing dredged sediment delivery location. The nearest utility is an electrical distribution line along Old Alameda Creek that powers a pump at Pond E1 (J. Krause pers. comm. 2015). There are also no known above ground or buried utilities near the proposed offloader location.

Alviso Ponds Restoration Area

There are no known underground utilities in the immediate vicinity of the Alviso dredged sediment delivery sites. High tension power lines are located north of the Dumbarton Bridge. Underground cables and potable water lines are present between the Dumbarton and railroad bridge in the vicinity of the proposed offloader location for the Alviso ponds. High tension power lines cross Pond A2W near the entrance to Mountain View Slough. A power tower is located in the vicinity of the proposed dredged sediment delivery location at Ponds A2W. High tension power lines also cross Coyote Creek near the mouth of Alviso Slough.

Significance Thresholds
Impacts associated with utilities and service systems would be considered significant if the dredging and/or sediment delivery activities would:

- Potentially damage services or utilities
- Interfere with the operation of fuel pipelines such that customers served by these pipelines would lack adequate access to fuel supplies for their day-to-day operations or cause other disruptions to utilities or service systems, or
- Require or result in the need to relocate or otherwise protect or replace services or utilities where those activities are not already incorporated into the proposed Project

Environmental Consequences
Environmental effects on service systems and utilities were evaluated by assessing the location of utilities relative to project activities, and the need to take any utilities out of service during construction.

A.14.1.3 Dredging Options
Potential effects on utilities and service systems are the same for all three dredging options. There would be no impacts to service systems, as there would be no activities near any existing service systems, and no need for increased capacity at any existing service systems. Thus, the discussion below focuses on utilities.

<u>Impact UTIL-1: Potential Damage to Utilities or Service Systems</u>

There are no utilities underneath the channel in RWC Channel or the adjacent berths. Should deepening of the berths require any work on the wharves, affected utilities would be modified as needed to provide safe and reliable service to the upgraded wharf. Existing utilities at wharves would be appropriately protected to avoid any damage to utilities that are scheduled to be retained.

Relocation of the fuel lines would be subject to the plans and specifications prepared by the USACE, the pipeline owners or another qualified party, and conducted in accordance with all applicable safety standards and the best management practices outlined in Section 4.2. The fuel lines would be lowered to a depth of 6 feet below the maximum depth of the future channel (design channel depth plus two feet of overdepth). Lowering the fuel lines would reduce the potential for any damage to the fuel lines following construction. Given that the current cover over the fuel lines is less than 3 feet in some locations, the post-construction conditions would be an improvement over current conditions. This impact is less than significant.

Impact UTIL-2: Interfere with Operations of or Cause Other Disruptions to Utilities or Service Systems

Relocation of the fuel lines could cause a temporary disruption in service of the fuel lines while the replacement lines are being tied into the existing lines, and potentially due to unplanned incidents during construction. This disruption would be limited to the time required to cut the existing fuel lines and connect the existing fuel lines with the relocated (deeper) segments. This activity is expected to require up to 14 days at each tie-in location.

The Shell fuel line is reportedly inactive. Therefore, taking this fuel line out of service for an estimated 14 days would not cause an unacceptable disruption to fuel supplies. The tie-in of the replacement pipeline could be accomplished at both ends simultaneously or sequentially at each end.

One Kinder-Morgan pipelines would be tied in at a time, allowing one line to remain in service to provide fuel as needed. These fuel lines supply the Kinder Morgan Terminal in Brisbane, which in turn provides fuel to San Francisco International Airport. It is anticipated that to expedite the return of these pipelines to service that both end of the replacement pipeline would be tied in simultaneously. As part of the Fuel Pipeline Relocation and Response Plan, the contractor would be required to coordinate with the pipeline owners regarding fuel supply and contingency plans for unintended interruptions in the fuel supply. The plan would address storage capacity, include provisions for a continued fuel supply if disruptions occur or the available conveyance capacity of the single Kinder-Morgan pipeline is inadequate, and create an agreed-upon ranked menu of choices. Every effort would be made to avoid interference with airport operations or any other critical commercial or industrial function.

The electrical lines crossing above RWC Channel would be above the maximum height of the dredge equipment, and safety awareness training conducted as part of routine construction operations would ensure that the dredge operator and other employees would be aware of the potential hazard. This impact is less than significant.

Impact UTIL-3: Need to Relocate or Otherwise Protect or Replace Utilities or Service Systems

As discussed above, as part of the Project the three fuel pipelines underneath SBS Channel would be relocated to a deeper depth. Also, should deepening of the berths require any work on the wharves, affected utilities would be modified as needed to provide safe and reliable service to the upgraded wharf. The potential changes to utilities at the wharves would be minor, and are a normal part of construction activities. Finally, if the dredge working in RWC Channel is electrically powered, electrical service would have to be provided near the wharf.

This would most likely entail connecting to the existing substation at Wharves 1 and 2, and running a cable to a small substation on the dredge to step down the current to a voltage usable by the dredge. No other utilities would be required, nor would any other utilities require relocation or replacement. This impact is less than significant.

A.14.1.4 Placement Sites

Cullinan Ranch Restoration Project

Impact UTIL-1: Potential Damage to Utilities or Service Systems

There are no existing utilities or service systems located at or near the Cullinan site; therefore there is no potential for damage to occur. There would be no impact.

Impact UTIL-2: Interfere with Operations of or Cause Other Disruptions to Utilities or Service Systems

There are no existing utilities or service systems located at or near the Cullinan site; therefore there is no potential for interference or disruptions. There would be no impact.

Impact UTIL-3: Need to Relocate or Otherwise Protect or Replace Utilities or Service Systems

The contractor may choose to operate the Cullinan offloader using electrical power. Electrical power would be provided from Mare Island. A small substation would most likely be constructed at the offloader to step down the current to one usable by the offloader and support equipment. Several power poles would most likely have to be installed on Mare Island to lay the electrical cable to the offloader location. It is anticipated that an ample power supply is available at Mare Island (R. Lowgren, pers. comm. 2015). No other utilities would be required, nor would any other utilities require relocation or replacement. This impact is less than significant.

Montezuma Wetlands Project

All utilities at the Montezuma site are at the offloader or closer to shore. There would be no impacts from transporting sediment to the offloader location.

SF-DODS

There are no utilities at SF-DODS, and there would be no impacts.

Alviso Pond Complex

Impact UTIL-1: Potential Damage to Utilities or Service Systems

The electrical lines crossing above Coyote Creek and Mountain View Slough would be above the maximum height of the construction equipment used to lay the pipeline, and safety awareness training conducted as part of routine construction operations would ensure that the equipment operators and other workers would be aware of the potential hazard.

The precise locations of the existing water lines and cables between the Dumbarton and railroad bridges would be determined during design, and the offloader would be located at a safe distance from these existing lines and cables. This impact is less than significant.

Impact UTIL-2: Interfere with Operations of or Cause Other Disruptions to Utilities or Service Systems

The Alviso offloader and dredged sediment delivery pipeline would not use any utilities. The offloader and booster pumps would be diesel-fueled. Therefore, the only potential disruptions and interference that could occur would be as a result of damage. As described above, the design and construction process would avoid damage to utilities. This impact is less than significant.

Impact UTIL-3: Need to Relocate or Otherwise Protect or Replace Utilities or Service Systems

The proposed Project would avoid all existing utilities in the vicinity of the offloader and dredged sediment delivery locations. No utilities would be required, nor would any utilities require relocation or replacement. This impact is less than significant.

Eden Landing Restoration Project

There are no existing utilities or service systems located at or near the proposed Eden Landing offloader and sediment delivery locations and no utilities are proposed; therefore, there would be no impacts. The offloader and booster pumps would be diesel-fueled.

Mitigation Measures

There are no significant impacts from the Project associated with utilities and service systems; no mitigation is required.

A.15 Water Quality and Hydrology

Affected Environment

A.15.1.1 Hydrology and Salinity in San Francisco Bay

San Francisco Bay extends from the confluence of the Sacramento and San Joaquin Rivers to the Golden Gate Bridge and south to the shoreline of Santa Clara County. The Sacramento and San Joaquin Rivers collectively contribute roughly 90 percent of the total freshwater input to the estuary; the other ten percent is provided by creeks, streams and water treatment plants outfalls that drain directly into the Bay (CSCC 2010). The Bay's hydrology determines the salinity in different portions of the estuary and controls the circulation of water through the channels and bays. Freshwater inflows, tidal currents, and their interactions largely determine variations in the hydrology of the Bay. The Bay is a "mixed semi-diurnal" tidal system of two high tides and two low tides of unequal magnitude each day. This tidal exchange determines water surface levels, direction, volume of flow and salinity and influences the biological, chemical, and physical conditions of the Bay (CSCC 2010).

The North Bay of San Francisco Bay (comprising Suisun Bay, Carquinez Strait, and San Pablo Bay) is geographically and hydrologically distinct from the Central and South bays (see ***Figure A-11***). The North Bay is dominated by seasonally varying river inflow and tidal influence through the Golden Gate. The timing and magnitude of the seasonal river freshwater and the ocean tides influences the estuarine circulation. The tidal amplitude increases in the North Bay from the Golden Gate to the eastern shores of San Pablo Bay, where it is the highest. The tides are then attenuated when passing through the Carquinez Strait so that the tidal range is diminished in Suisun Bay (CSCC 2010). In the North Bay the Sacramento/San Joaquin Delta freshwater inflow into the Bay results in significant seasonal salinity variation. The salinity in the North Bay fluctuates relative to the Central Bay with salinities also influenced by local stream and river inflows in addition to the Sacramento/San Joaquin Delta freshwater inflow. Residence times of water in the North Bay can be as low as days during periods of high river discharge, or months in drier periods (CSCC 2010).

Figure A-11. Sub-bays of San Francisco Bay

Suisun Bay is hydrologically complex with the Sacramento and San Joaquin Rivers entering the eastern end of Suisun Bay (in the immediate vicinity of the Montezuma site) and the variation in salinity can vary greatly on Delta outflow. As a result, the salinity gradient in Suisun Bay is the greatest found in the San Francisco Bay (CSCC 2010). The western end of Suisun Marsh is more strongly influenced by the tides and tidal influence dissipates further upstream in the Delta.

In the Central Bay, tides and currents are a stronger influence than the North Bay, especially during the dryer months of the year. The Sacramento and San Joaquin rivers freshwater inflows can extend through the Central Bay and into the South Bay during wet winters. The Central Bay is characterized by Pacific waters that are cold, saline, and low in total suspended sediment (TSS) (USACE and RWQCB 2014). The Central Bay is most similar to ocean salinity levels (32 parts per thousand).

The South Bay receives only minor amounts of freshwater inflow from the surrounding watersheds and limited influence from the Sacramento and San Joaquin rivers during wet years; it is often considered in effect a tidal lagoon (USACE and RWQCB 2014). The South Bay receives less than 10 percent of the freshwater budget of San Francisco Bay. It also receives the largest direct freshwater inflows of treated wastewater in the Bay. The greatest tidal range in San Francisco Bay is found in the South Bay, where the spring tidal range (mean lower low water [MLLW] to mean higher high water [MHHW]) is approximately nine feet. This compares to the spring range of approximately six feet at the Golden Gate (Central Bay) (CSCC 2010).

South Bay circulation is limited and water residence times are much longer than in the North Bay. Water residence times in the South Bay during the summer months can be on the order of several months; in the winter, the residence time can be less than a month. South Bay salinity fluctuates with exchange with the Central Bay, freshwater inflows from creeks and local municipal wastewater treatment plants, and evaporation. Typical salinities within the South Bay as a whole are near oceanic levels, whereas the lower South Bay (south of Dumbarton Bridge) is brackish year-around due to the freshwater inflows from the watershed and wastewater treatment (CSCC 2010).

A.15.1.2 Offshore Environment

To the west of San Francisco Bay, the Project Area includes increasingly deep water as the scows transit to SF-DODS. SF-DODS is in the open ocean on the lower continental slope approximately 50 miles west of the California coastline and water depth at the site ranges between approximately 2,500 meters and 3,000 meters (USACE and RWQCB 2014). The ocean is influenced by currents and counter currents as well as tides, which account for 35 to 60% of the current variability on the continental shelf. Tidal currents can affect the resuspension of material deposited on the seabed and dispersion of material suspended in the water column; however, USEPA studies of SF-DODS have shown it is depositional. In addition, currents in the vicinity of SF-DODS are generally slow, which helps to minimize the extent of sediment plumes within the water column during and immediately after sediment placement events (USACE and RWQCB 2014).

A.15.1.3 Water Quality in San Francisco Bay

The primary water quality parameters of concern in the Bay are salinity (as discussed above), dissolved oxygen (DO), chemical contaminants, and TSS/turbidity.

Dissolved Oxygen

Dissolved oxygen is required for the survival of aquatic life. DO concentrations are affected by many variables including water temperature, circulation, wind (which contributes to local water mixing), biological and chemical oxygen demand, and activity of algae. Waters in San Francisco Bay are generally well oxygenated with typical concentrations of dissolved oxygen ranging from 9 to 10 mg/l during high periods of river flow, 7 to 9 mg/l during moderate river flow, and 6 to 9 mg/l during the late summer months when flows are lowest.

In areas with anoxic sediments, disruption of the sediments can decrease DO levels. The minimum DO threshold typically set by the RWQCB in its permits is 5.0 mg/lLow DO levels are more common in the South Bay due to the higher residence time of water in the South Bay, and during warmer times of year.

Contaminants

The Regional Monitoring Program (RMP) is a program operated by the San Francisco Estuary Institute (SFEI). The RMP publishes a summary report of water quality data that includes monitoring results of major chemical contaminants that are of greatest concern in San Francisco Bay and/or are included on the Clean Water Act's Section 303(d) List. These chemical pollutants are of concern because they bioaccumulate (accumulate to high concentrations) and can have negative effects on wildlife and humans. The RMP also evaluates long term trends and spatial patterns of contamination. The following information from the 2013 Pulse of the Estuary and 2014 RMP Update summarize the status and trends of these contaminants (SFEI 2013 and SFEI 2014).

Mercury

Mercury is transported to the Bay in runoff of both contaminated sediment and contaminated surface water. The yearly mercury load in the San Francisco Bay estuary depends on hydrologic conditions, with higher loads associated with increased runoff. Mercury contamination is one of the top water quality concerns and mercury is included on the Clean Water Act's Section 303(d) List. The SFRWQCB has established a Total Maximum Daily Load (TMDL) target for Baywide suspended sediment mercury concentration of 0.2 mg/kg dry sediment to achieve the human health and wildlife, fish tissue, and bird egg targets and to attain water quality standards (RWQCB 2015). Mercury is a problem because it accumulates to high concentrations and poses direct risks to some fish and wildlife species as well as health risks to humans and the wildlife that consume fish (SFEI 2014).

Inorganic mercury is converted to the bioavailable form of methylmercury by bacteria. Because concentrations of methylmercury are driven primarily by biological activity rather than total mercury concentration, the total mercury concentration is not a good predictor of methylmercury concentrations. Methylmercury production can vary tremendously over small distances and over short time periods (SFEI 2014). Methylmercury typically represents only about 1% of the total of all forms of mercury in water or sediment, but it is the form that is readily accumulated in the food web and poses the greatest toxicological threat.

Water from Lower South Bay had the highest average concentration of methylmercury (0.109 ng/L) of any Bay segment from 2006 to 2013. The South Bay had the next highest average (0.054 ng/L). No regulatory guideline exists for methylmercury in water. The Bay-wide average in 2013 was 0.023 ng/L. The Bay-wide average between 2002 and 2011 was 0.042 ng/L. The Bay-wide averages for the period from 2008 to 2011 were lower than those observed in 2006 and 2007 (SFEI 2014).

San Pablo Bay had the highest average concentrations of total mercury in sediment between 2002 and 2011 (0.27 ppm). The average concentrations were slightly lower in Lower South Bay and Central Bay (both 0.26 ppm) and South Bay (0.22 ppm), and lowest in Suisun Bay (0.17 ppm) (SFEI 2014). During the same time period, however, methylmercury concentrations were highest in sediment from Lower South Bay and South Bay (average concentration of 0.68 and 0.72 parts per billion (ppb), respectively) and lower in San Pablo Bay (0.27ppb) and Suisun Bay (0.20ppb) (SFEI 2014). Concentrations of methylmercury in sediment south of the Bay Bridge have been consistently higher than those in northern San Francisco Bay.

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are included on the Clean Water Act's Section 303(d) List for several Bay locations. Concentrations are often higher near the Bay margins, due to proximity to anthropogenic sources. Contributing sources are historic industrial activity as well as combustion products (including motor vehicle exhaust), waste oil, and road run-off. Increasing population and motor vehicle use in the Bay Area suggests that PAH concentrations could increase over the next 20 years, due to deposition of combustion products from the air directly into the Bay and from the air to roadway runoff and into the Bay via stormwater (SFEI 2013).

Average dry season PAH concentrations in sediment have been highest along the southwestern shoreline of the Central Bay. The Central Bay has had the highest average dry season concentration (4.1 ppm) with the South Bay having the next highest average concentration (2.6 ppm), followed by Lower South Bay (2.1 ppm), San Pablo Bay (1.1 ppm), and Suisun Bay (0.6 ppm). The Bay-wide average in 2012 (wet season) was 1.7 ppm; the second lowest annual average observed over the period of record (SFEI 2014).

Polybrominated Diphenyl Ethers (PBDEs)

PBDEs, bromine-containing flame retardants, increased rapidly in San Francisco Bay through the 1990s. The production of PBDEs began to be phased out in 2004 and the material is no longer manufactured in the U.S. The California Legislature has banned the use of three types of PBDE mixtures: Penta-BDE (represented by BDE-47), Octa-BDE, and Deca-BDE (represented by BDE -209) (SFEI 2013).

Concentrations of BDE-47 in sediment, consistent with the data for water and biota, appear to be on the decline. The Bay-wide average for 2012 (0.26 ppb, a wet season value) was the lowest observed during the period of record, and 50% lower than the average observed in 2002. Long-term average dry season concentrations of BDE-47 in sediment have been highest, by far, in Lower South Bay (0.65 ppb). Average concentrations in the other segments ranged from 0.35 ppb in South Bay to 0.46 ppb in Central Bay (SFEI 2014).

BDE-209 (also known as decabromodiphenyl ether) represents the last PBDE mixture to be phased out of production in the US. In contrast to BDE-47, Bay-wide average concentrations of BDE-209 in sediment do not appear to be declining. The average concentration in the wet season sampling of 2012 (1.8 ppb) was equal to the long-term dry season average. Similar to BDE-47 in sediment, long-term average dry season concentrations of BDE-209 from 2004-2009 were highest in Lower South Bay (5.2 ppb), followed by San Pablo Bay (2.1 ppb), Central Bay (1.9 ppb), South Bay (1.7 ppb), and Suisun Bay (0.8 ppb) (SFEI 2014).

Polychlorinated Diphenyls (PCBs)

PCB contamination remains a significant water quality concern in San Francisco Bay, and PCB cleanup is a primary focus of the SFRWQCB. PCBs are a problem because they accumulate to high concentrations in some Bay fish and pose health risks to consumers of those fish (SFEI 2013). The SFRWQCB has established TMDL target for PCBs concentrations in fish tissue of 10 ug/kg for San Francisco Bay (SFRWQCB 2015). PCBs enter the Bay primarily through small tributaries and storm water and are associated with older urban and industrial land uses. Long-term average dry season PCB concentrations in Bay sediment have been highest in the South Bay with concentrations in the Lower South Bay at 14.2 ppb. Concentrations in the Central Bay are also elevated (12.9 ppb), while concentrations are considerably lower in San Pablo Bay (6.2 ppb) and Suisun Bay (4.5 ppb). The Bay-wide average for the wet season sampling in 2012 was 7.1 ppb which was the lowest annual average observed over the period of record(2003-2013 excluding 2004-2006 due to data problems). Models suggest that sediment PCB concentrations must decline to about 1 ppb for concentrations in sport fish to fall below the threshold of concern. Suisun Bay has been closest to this level, with a minimum annual average of 2.0 ppb in 2011 (SFEI 2014).

Selenium

Selenium contamination is a concern in San Francisco Bay due to bioaccumulation in wildlife. Selenium accumulates in diving ducks to concentrations that pose a potential health risk to human consumers (SFEI 2013). Selenium concentrations in water are below the water quality objective established by the California Toxics Rule (5 ppb), but there are still concerns regarding wildlife exposure including early life-stages of fish. The highest concentration observed in water at random stations from 2002 to 2013 was 0.63 ppb (in Central Bay in 2002), much lower than the Toxics Rule objective. The Lower South Bay had a higher average concentration over this period (0.25 ppb) than the other Bay segments, which had very consistent average concentrations (all other averages were between 0.13 and 0.15 ppb)(SFEI 2014).

Turbidity and Suspended Sediment

Suspended sediment is a key component of an estuarine system. The terms turbidity and suspended sediment are often used interchangeably. Turbidity refers to a number of different suspended particulates including biological materials (plankton) and mineral particles (sediment). Suspended sediment refers to the actual sediment component in the water column and is measured as TSS. Most near-shore environments, and estuaries in particular, tend to have higher levels of turbidity or suspended sediment loads due to discharges from rivers, drainages and the relative shallow nature of the environment. Suspended sediment concentrations in San Francisco Bay tend to be extremely variable and strongly correlated to season and water depth

Sediment quality in the Bay varies with the physical and chemical characteristics of the sediments and is discussed in ***Section A.8***, Hazards and Hazardous Materials. The deposition and resuspension rate of sediment in the Bay changes with location, season, bathymetry, general estuarine circulation patterns, direct input from rivers and surface runoff, wind-driven re-suspension of sediment by waves, tidal currents, mining and dredging activities, and disturbance by vessels.

Suspended sediment has the potential to affect aquatic organisms in three ways: (1) physical impacts related to the physical properties of suspended sediments (e.g., reduced light transmission that can decrease phytoplankton photosynthesis, increased turbidity that can clog gills); (2) chemical impacts, related to the chemicals associated with suspended solids (including effects on phytoplankton and fish); and (3) resettling effects that can smother aquatic benthic habitats and organisms. Finer-grained sediments (clay and silt) are more readily suspended than sandy material and remain suspended in the water column longer. Suspended sediments can influence the behavior, distribution and growth of listed species. Disturbance of sediments during the construction activities is likely to result in temporarily increased levels of suspended sediments/turbidity and potential release of contaminants from sediments.

TSS levels in the Estuary vary greatly, ranging from 10 mg/l to over 1000 mg/l (USACE and RWQCB 2014). Existing deposits of typical fine-grained surface sediments in the shallow areas of the Bay and natural processes such as wind-driven wave action and tidal currents, are the primary source of TSS and turbidity throughout the Bay (USACE and RWQCB 2014). In addition to the sediment that is carried into the Bay by the inflow from the Delta, sediments are carried by the Napa, Sonoma, Petaluma Rivers and a variety of smaller streams and watersheds and other drainages (including storm drains and flood control channels) throughout the Bay. Small tributaries adjacent to San Francisco Bay supply 61 percent of the new suspended sediment to San Francisco Bay (USACE and RWQCB 2014). The Central Bay generally has the lowest TSS concentrations but the levels vary depending on wind-driven wave action, run off, tidal currents, dredged material placement and sand mining operations (USACE and RWQCB 2014).

A.15.1.4 Dredging Sites
Redwood City Harbor

The RWC Channel is subject to tidal and wind effects. The water velocity in the channel is generally less than 0.45 m/sec throughout the water column (USACE and Weston 2005). A study of ambient turbidity in found the turbidity in the channel was consistently between 8 to 22 NTU. In this study, plumes generated from knocking down sediment high spots in the channel had TSS levels as high as 600 mg/l which decayed to 100 mg/l within 7-9 minutes. The plumes remained in the lower half of the water column. Residual plumes of 50-100 mg/l range persisted for 13 minutes or longer (USACE and Weston 2005). Higher fluctuations occurred in the measured turbidity and may be influenced by the ebb flows from the two intersecting sloughs, Steinberger and Westpoint sloughs, as well as higher outflows during a storm event.

Pollutant sources discharging into RWC Channel include both point and nonpoint discharges. Point sources in the Project Area include discharges through pipelines and open drainage swales that drain from the Port into RWC Channel. The Port of Redwood City has five storm water discharge points/outfalls and other surrounding industrial and urban areas also have storm water discharge points draining into RWC Channel.

Dredged material in RWC Channel is expected to consist primarily of Young Bay Mud, a predominantly fine-grained material. Dredged material from Redwood City Harbor has typically been more than 80 percent fines and suitable for suitable for unconfined aquatic disposal (SUAD). Maintenance dredging in RWC Channel typically occurs every 1 to 2 years. Berth 1 through 4 maintenance dredging is planned for late 2015 as well as the Port's Fiscal Year 2017.

Construction of the Project would require dredging between approximately 920,000 cy and 2.8 MCY of sediment from RWC Channel. Berth deepening would also be required. The estimated volume for berth deepening for the four actively-used berths combined is 17,000 cy for deepening commensurate with a -32 feet 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. Dredging of the berth area would most likely occur at the same time as dredging of the RWC channel.

A temporary staging area would be located onshore in the Port area during construction operations. The temporary staging area would be located on an impervious surface and located away from areas that could make it susceptible to damaging waves. Materials, fuels, and other potentially hazardous material may be stored in the staging areas. The staging area would comply with the Port's storm water discharge permit and BMPs. Any liquids or other materials on the site that could spill or runoff during storm events would be located in a bermed area or an area with other secondary containment.

The Port lies in the San Mateo Plain sub basin of Santa Clara Valley groundwater basin in the San Francisco Bay Hydrologic Region (Port of Redwood City 2010). Historically, water was supplied from the groundwater basin but potable water is now supplied by the San Francisco Public Utilities District (SFPUD). There are no drinking wells in or immediately adjacent to the Project Area (City of Redwood City 2010a). There are wells on the Port's Cemex leased property at confluence of Redwood City Harbor and Westpoint Slough and also other wells nearby in Redwood City that are used for irrigation/dust control (Snaman, pers. comm.). The proposed Project would not require the extraction of any groundwater and there would be no potable water supplied to the Project.

San Bruno Shoal Channel

San Bruno Shoal Channel 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 channel is located in the northern most part of the South Bay, and is west of the main portion of the shoal. Water depths in the vicinity of the channel range from -25 feet to -34 feet MLLW; further to east, in the main portion of the shoal, water depths range from as low as -2 feet to around -15 feet MLLW (NOAA 2013b). Between SBS Channel and the entrance to RWC Channel is a natural deepwater channel extending the length of the South Bay with a channel depth of -33 feet to -50 feet MLLW. At the SBS Channel/San Bruno Shoal area the Bay widens and gets shallower (USACE 2014a). Dredged sediment at SBS Channel is expected to contain up to 30% sand with the remaining sediment consisting of fine-grained materials (USACE 2014d).

Construction of the Project would require dredging between approximately 480,000 cy and 3.1 MCY of sediment from SBS Channel. In addition, relocation of the three fuel pipelines underneath SBS Channel could require removal of between 8,000 cy and 12,000 cy of sediment. The three fuel pipelines crossing SBS Channel would be removed and replaced with three new sections of the pipeline at deeper depths (between -40 and -45 feet MLLW, depending on the selected channel depth). The three possible construction methods for pipeline relocation are described in ***Section 4.2.3.4 of the Main Integrated Report***. Relocation of the fuel pipelines would include removal of sediment above the existing pipeline in the area of the replacement pipeline section, if the chosen construction method uses clamshell excavation or the jet sled process.

In addition, there would be a temporary onshore staging area for staging of equipment and materials either at the former Shell dock at San Francisco Airport or at the Brisbane Marina. The temporary staging area would be located on an impervious surface and located away from areas that could make it susceptible to damaging waves. Materials, fuels, and other potentially hazardous material may be stored in the staging areas. The staging area would comply with the Port's storm water discharge permit and BMPs. Any liquids or other materials on the site that could spill or runoff during storm events would be located in a bermed area, or an area that has other acceptable forms of secondary containment.

A.15.1.5 Placement Sites

The dredged material placement sites consist of four beneficial reuse sites and SF-DODS. The hydrology and water quality for each of these sites is described below. Groundwater is not addressed because there would be no Project-related activities that could affect groundwater at the placement sites.

Cullinan Ranch Tidal Restoration Project

The area affected by the RWC Project at the Cullinan placement site would include the construction of a temporary offloader in Napa River and pipeline extending along a portion of Dutchman Slough or alternately just tying up the loaded scow to an existing permitted offloader (that would have been constructed by the Cullinan Project) at the same location in Napa River (***Figure A-8***). The construction of the offloader would require driving 2 spuds and up to 3 mooring piles to allow scows to tie up alongside. The pipeline would be floating with anchors to hold it in placed along Dutchman Sough. It would be expected that the offloader would be in place for 2-5 years, depending on the volume of sediment delivered to the site. An offloader and pipeline were permitted for the Cullinan Project for the placement of sediments into Cullinan in 2013 (BCDC 2013) and similar regulatory requirements would be expected if the Project constructs the offloader and pipeline.

Montezuma Wetlands Restoration Project

Montezuma Project is located at the eastern margin of Suisun Marsh, near the confluence of Suisun Bay and the Sacramento-San Joaquin River Delta. The permanently installed offloading facility is located immediately offshore in a deep water channel (***Figure A-8***). The Montezuma Project portion within the RWC Project is located at the offloading facility in the Suisun Bay/Sacramento River. For the RWC Project, impacts associated with transporting dredged material by scow to this offloading facility are attributable to the RWC Project but impacts associated with dredged sediment offloading, management of the offloading facility, placement, and Montezuma site management have been evaluated under separate environmental reviews/permits and would occur independently of the RWC Project.

Dredged sediments are transported to Montezuma in scows escorted by tugboats and the scows would be tied up to the offloader. At the point where the scow docks at the offloader the Montezuma Wetlands Restoration Project would take over the operations required to slurry and offload the sediment to the Montezuma site. Accidental spill of slurried sediment that might occur as part of the slurring process are covered under the existing Montezuma Wetlands LLC permits.

SF-DODS

SF-DODS is located 50 miles to the west of the Golden Gate Bridge and is approximately 2.5 nautical miles wide by 4.5 nautical miles long (6.5 square nautical miles). The water depth at the site ranges between approximately 2,500 meters and 3,000 meters. The impacts from the

RWC Project would be from accidental spills during transit to the site. The site is permitted to bottom dump suitable dredge sediment. To avoid environmental impacts due to the potentially rough ocean conditions scows transporting material to SF-DODS are monitored and there are limitations on transit routes, allowable weather and wave conditions, maximum scow load and scow performance (no spills or leakage) (USEPA 2014). Extensive monitoring at SF-DODS has confirmed that no significant impacts to ocean resources (including EFH) have occurred (USEPA 2010b).

Alviso Pond Complex

The Alviso Ponds are located in the South Bay. The width of the South Bay ranges from less than 1.2 miles near the Dumbarton Bridge (the Dumbarton Narrows) to more than 12 miles north of the San Mateo Bridge. The mean (average) depth of the South Bay is less than 13 feet, with a channel depth of 33 to 50 feet. The hydrology of the area adjacent to the Alviso ponds is influenced by the Coyote Creek and Guadalupe river watersheds and San Francisco Bay.

For the RWC Project the sediment would be taken by scow to an offloader where it would then be pumped through a floating and submerged pipeline and booster pump(s) to a sediment delivery location either on the top of the levee adjacent to Pond A2W or Pond A9. The offloader would be located in deep open water habit to allow fully loaded scows to transit during low tide. Floating and/or submerged pipelines would cross from the offloader through the open water habitat, mudflats and intertidal marsh to the pond levees. In addition to booster pumps at the offloader and on the levee, an intermediate booster pump would be required to transfer sediment from the offloader to the dredged sediment delivery location Pond A9. It would located on a barge of platform in shallow water approximately mid-way between the offloader and the levee.

Sediment from RWC Channel dredging could also be delivered using a hydraulic cutterhead dredge. The sediment would be pumped from the dredge head through a floating and submerged pipeline directly to the sediment delivery location at either Pond A2W or Pond A9. Several booster pumps would likely be required; at the dredge, at one or more intermediate locations, and on the levee at the dredged sediment delivery location.

Eden Landing Ponds

The Eden Landing ponds are located in the South Bay. The portion of the Eden Landing Ecological Reserve within the Project Area includes open water, mudflats, tidal salt marsh and adjacent levee habitats. For the RWC Project the sediment would be taken by scow to an offloader where it would then be pumped through a floating and/or submerged pipeline and booster pump to a sediment delivery location on the top of the levee adjacent to Pond E2. The offloader would be located in deep open water habit to allow fully loaded scows to reach the offloader during low tide. Alternatively, sediment could be delivered using a hydraulic cutterhead dredge. The sediment would be pumped from the dredge head through a floating and submerged pipeline directly to the sediment delivery location at Pond E2. Two booster pumps would likely be required for material dredged in RWC Channel; one at the dredge and one at the Pond E2 levee. Due to the much longer pumping distance, multiple booster pumps would be required to support delivery from SBS Channel to the Pond E2 levee.

Significance Thresholds
The effects of a project or alternative on surface water or groundwater are considered to be significant if the proposed project or alternatives would result in any of the following:

1. Discharges that create contamination, pollution or a nuisance as defined by the California Water Code, the Clean Water Act, or that would cause regulatory standards to be violated.
2. An increase in vessel wake force that would increase turbidity as a result of an accelerated rate of shoreline erosion, especially at Bair Island or Greco Island.
3. Acceleration of the natural processes of sedimentation resulting in substantial sediment deposition that could not be contained or controlled onsite and that would have a permanent significant effect on receiving water quality or aquatic habitat
4. Substantial adverse effect on state- or federal-protected wetlands (as defined by Section 404 of the Clean Water Act) through direct removal, filling, hydrological interruption, or other means.
5. A significant increase in salinity in public or private wells from salt water intrusion as a result of dredging, which reduces the ability of a user to continue to use the groundwater from the wells for their present uses.

Environmental Consequences
Potential effects to water quality and hydrology were evaluated by determining whether the project activities had the potential to generate or release suspended solids or contaminants into the water column, and comparing the potential for these effects with applicable standards. The potential for project activities to result in erosional or other sediment transport effects that could have an effect on sensitive habitat was also examined. Finally, the evaluation considered the potential for dredging operations to adversely affect groundwater resources through creating new pathways for salt water intrusion into existing groundwater supplies.

A.15.1.6 Dredging Options
Potential effects of all three dredging options are very similar; consequently the three dredging options are analyzed together.

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

Dredging and pipeline relocation operations would occur in compliance with all permit requirements and best management practices. Dredging of fine grained sediments would be done in a way to minimize sediment loss and turbidity during the dredging cycle, including possibly slower cycling times and the use of environmental buckets.[14] 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. Scows would be filled to 80% (for scows to SF-DODS) or 90% of their rated capacity (for scows bound for in-Bay placement sites), and no overflow would be permitted.

Relocating the three fuel pipelines crossing SBS Channel could be accomplished using conventional clamshell excavation, the "jet sled" method of construction, or directional drilling from a water-based staging area in San Francisco Bay as described in ***Section 4.2.3.4 of the Main Integrated Report***. Up to 2,500 feet of each of the three existing pipelines would be removed and replaced at greater depths. The clamshell construction method would take approximately 2-3 months per pipeline segment; however the bottom sediment disturbance would be less than 20 days. The directional drilling construction pipeline construction method would be expected to take approximately one month. The jet sled construction method is expected to take up to 50-100 months for all pipeline segments.

Water quality could be affected by dredging and pipeline relocation operations. Impacts on water quality could result from the suspension of sediments and/or the introduction of contaminants to the water column. Sediment suspension could also result in the short term release of contaminants into the water column by desorption (separation) from suspended particles. The potential water quality effects from berth and channel dredging from the proposed Project construction could include:

- Increased turbidity (reduced water clarity and light transmittance),
- Increased sediment suspension (increased suspended solids),
- Increased dissolved or particulate contaminants,
- Reduced dissolved oxygen (from suspension of sediments with low oxygen),
- Reduced pH,
- Plankton blooms (from suspension of nutrient-laden sediments), and
- Potential construction-related accidental spills.

The biological effects on marine biota from potential water quality impacts are discussed in ***Section A.4,*** Biological Resources – Fish and Aquatic Resources.

Sediment Suspension and Turbidity at the Dredging Site/SBS Fuel Pipeline Relocation Site

Sediment resuspension caused by a dredging operation is defined as those sediment particles suspended into the water column during the dredging operation that do not rapidly settle out of the water column following disturbance of the sediment (Anchor 2003). For the purposes of this EIS/R, the same definition is used for sediment suspension following pipeline removal

[14] . 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.

and/or placement at the pipeline relocation site. Sediment suspension occurs every time materials are dredged or otherwise disturbed, regardless of the dredge type or precautions taken during dredging operations.

Different types of dredge/pipeline excavation equipment release different percentages of the dredged sediment into the water column. However, the degree of resuspension of sediments from dredging and disposal depends on several variables (Anchor 2003) such as:

- Dredge site characteristics
- Physical characteristics the material. Sandy material released to the water column settles out more quickly than silty fine grained sediment. Fine grained sediments can remain in suspension for an extended period of time while being subjected to the processes of diffusion, settling and transport
- Nature of the dredging operation (dredge type and size, discharge-cutter configuration, discharge rate, production rate, etc.)
- Characteristics of the water quality and hydrologic regime in the vicinity of the operation, including salinity and hydrodynamic forces (waves, current, etc.)

Characteristics of Dredged Material

Field and laboratory analyses examining the dispersion of dredged material indicate that sediment suspended during dredging either remains suspended in the upper water column at relatively low concentrations or forms high concentration suspensions that cover the bottom (Anchor 2003). Very fine material such as clay and silt has a tendency to readily go into suspension during the dredging process. Because the settling velocity of such fine particles is very slow, these particles remain in suspension for a longer time compared with coarse-grained particles such as sand that settle fairly quickly. The degree of turbidity or the degree of suspended sediment, therefore, largely depends on the size of the sediment particles (Anchor 2003).

Sediments at RWC Channel are predominantly (greater than 80%) fine-grained and could create a larger plume. Dredging sediments and/or excavation of the fuel pipeline trench at SBS Channel would likely generate a smaller turbidity plume due to the higher sand content.

Sediment Resuspension by Hydraulic Dredges (with Sediment Transfer Pipeline)

The majority of sediment resuspension occurs near the point of sediment removal at the cutterhead (Anchor 2003). With this method sediments cannot directly enter the middle and upper water column since they are directly suctioned into the dredge head and transported via the pipeline to the placement site.

Sediment Resuspension by Mechanical Dredges

Sediment resuspension that occurs during the operation of a clamshell dredge is primarily due to four major sources (Anchor 2003):

- Sediment resuspension occurring when the bucket impacts the sediment bed, closes, and is pulled off the bottom;
- Sediment losses from the bucket as the bucket is pulled up through the water column (or lowered down into the water column);
- Further loss of sediment when the bucket breaks the water surface; and/or
- Turbid water leaking through the openings between the jaws of the bucket during hoisting and swinging from water to the haul scow

Sediment Resuspension During Pipeline Relocation

The removal and replacement of the fuel pipeline segments may significantly increase turbidity due to excavation of the trench by clamshell dredging or, the jet sled process. Directional drilling would have a minor increase in turbidity only at the point where the drill enters and exits the Bay bottom. A small amount of sediment may be trailed through the water column as the pipeline is lifted onto a barge, however, this would be a one-time, very short duration event. The clamshell excavation would increase turbidity over the short term but the duration of this excavation method is expected to be less than 3 months per pipeline segment and, similar to the channel dredging, the turbidity plume would be expected to settle out within a short distance of the work given the high sand content at the SBS site.

There is no information specifically regarding the turbidity generated by the jet sled process or from jetting out pipelines. However, due to the greater level of disturbance to the sediments and the duration of the jet sled work, it would be expected that the turbidity plume would be more dispersed than sediments disturbed by the channel dredging and have a more significant impact. The jet sled method uses high pressure water jets to remove material on top of the existing pipelines, to create the trench, and/or to lift the pipeline out of the water. This method could result in considerable turbidity in the vicinity of the active construction area, as the process uses water to slurry sediment in place and then uses pumps to pumps the material out of the trench and deposit it on both sides of the trench. Pipeline tie-in above water would also require "jetting" out up to 2,000 feet of pipeline. Water would be jetted under and around the pipeline to loosen if and allow it to be lifted out of the sediment. Up to 1,000 feet of pipeline would have to be loosed to allow sufficient slack to lift the center portion of that section of pipeline onto a barge.

Sediment resuspension from use of the jet sled would be expected to occur predominantly near the bottom, as there would be no vertical movement of the jet sled and discharge of the slurried sediment would be horizontally to areas adjacent to the trench. Similarly, jetting of the pipeline would also predominantly generate turbidity near the bottom of the water column.

TSS Generated During Dredging Operations

Many studies have attempted to quantify loss of sediment during dredging as either TSS concentrations or resuspension rates. Turbidity levels at various dredging project sites were not compared because there is such a high degree of variability in turbidity values even within the same site.

During dredging operations, elevated turbidity would occur in the immediate vicinity of the dredge. Concentrations of TSS vary with the material being dredged and the type of dredge employed. The majority of suspended sediments settle within a short period after dredging. Transport of suspended particles by tidal currents and other means would result in some redistribution of sediment and any associated contaminants and the presence of a turbidity plume. The amount of contaminants redistributed in this manner would be small and localized in the channel adjacent to the work area.

Monitoring studies at other dredge sites have documented that a dredging-related turbidity plume dissipates rapidly with distance from dredging operations (USACE and RWQCB 2014). Within areas of sediment resuspension, DO could be slightly reduced. Reductions in DO concentrations, however, would be brief and are not expected to persist or cause detrimental effects to biological resources. Contaminants, including metals and organics, could be released into the water column during the dredging. Any increase in contaminant levels in the water is expected to be localized and of short duration.

In comparison with the clamshell dredge, the percentage of suspended material from a hydraulic (cutterhead) dredge is typically relatively small and typically in the lower water column. Disturbance of sediment may occur as the cutterhead of the dredge is dragged across the bottom and not all sediments being suspended by the cutterhead would be drawn into the suction tube. Pipelines that extend from the seafloor to the scows during cutterhead dredging minimize mid-water and surface plumes. Suspended materials are restricted to the immediate vicinity of the cutterhead itself. When all other factors are equivalent (e.g., the sediment sizes, hydrodynamic conditions, etc.) suspended sediment concentrations above background near hydraulic dredging are usually lower than those for mechanical dredging. However, there have been projects that have reported lower suspended sediment using mechanical dredging than those using a hydraulic dredge (Anchor 2003).

A study characterizing the spatial extent of turbidity plumes during clamshell dredging operations in Oakland Harbor found that the closed bucket dredge generated elevated concentration of suspended sediments. While exact plume trajectories were dynamic, turbidity levels above ambient concentrations were detected up to 400 meters both up- and down-current from the source. Ambient TSS concentrations were typically less than 50 mg/l. Significantly elevated TSS concentrations, greater than 225 mg/l, were detected up to 250 meters from the source. The proposed Project would use an environmental bucket during clamshell dredging of contaminated sediments which can reduce suspended solids up to 35 to 45%.

The removal and replacement of the fuel pipeline by clamshell dredge or directional drilling is expected to have short term localized less than significant effects on TSS similar to channel dredging using a clamshell dredge. There is little information regarding the impacts from a jet sled or pipeline jetting operation; however, the TSS levels would be expected to be substantially higher throughout the water column than 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 is expected to be 50-100 months which is 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 area, and no long term turbidity effects are expected.

Studies cited in O'Connor (USACE and Port of Oakland 1998) demonstrate that direct biological effects of suspended sediment are caused by extremely high concentrations (greater than 3,400 mg/l) that extend for long periods. For the dredging of the RWC, TSS levels are anticipated to be raised over ambient levels in the localized area of the dredging operations for short durations. The short duration and localized effect of the elevated TSS levels would have short term significant effect during construction; however, with the implementation of Mitigation Measure WQ-M1 (***Section A.15.4***) the impact would be reduced to less than significant. The dredging of the SBS channel would be expected to have a similar less than significant impact with the implementation of Mitigation Measure WQ-M1 (***Section A.15.4***).

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 (***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).

Significant long-term impacts after construction is complete due to elevated suspended sediment concentrations are not expected.

Salinity, Temperature and pH

There are no projected effects to salinity or temperature from construction and operation of the proposed Project. The Corps studied the effect of a hydraulic cutterhead and clamshell dredge on the water column (USACE and Port of Oakland 1998). This Corps study revealed that dredging operations did not typically cause significant fluctuations in salinity, temperature, or pH over the short or long term. Slight fluctuations were detected only 25 percent of the time while the dredges were monitored. Surface water quality objectives for these parameters are expected to be satisfied.

Dissolved Oxygen

Dissolved oxygen (DO) concentrations may decline in the vicinity of dredging operations with the suspension of dredged sediments. In a Corps study of DO levels (USACE and Port of Oakland 1998), DO concentrations declined in only four of the 12 measurements. Reductions in DO concentrations were greatest in the lower 2 meters of the water column. The greatest fluctuation in dissolved oxygen (3.5 ppm) occurred at a near-bottom sampling location within 50 meters of the dredge. Concentrations declined from 9.0 ppm to 5.5 ppm (USACE and Port of Oakland 1998). This meets the minimum DO requirement of 5.0 mg/l set by the RWQCB for downstream of the Carquinez Bridge. In all cases, background levels of DO reestablished within 10 minutes of the sampling event.

Studies conducted by SFEI have also indicated that there is no risk to the ecosystem due to increased nutrient loading caused by dredging activities and that sediment disruption caused by dredging activities does not pose an environmental risk related to decreased DO concentrations.

While the available data suggests it is unlikely, concentrations in the immediate vicinity of the dredging operations may become depressed below the minimum RWQCB threshold for a short period. However, due to the fact that this effect would be localized and of short duration, impacts on DO in the water column would be less than significant.

Release of Metals and Contaminants from Resuspended Particulate Matter

Urban waterways have received large amounts of toxic metals, pesticides, and hydrocarbons from past releases from a variety of urban sources, spills, and other processes. These contaminants are not very soluble in natural surface waters, but instead tend to sorb onto particulate matter and eventually accumulate in sediments. As a result, the sediments in the waterways and ports of many urban areas are contaminated with a wide variety of these substances. There is therefore concern that dredging and placement of these contaminated sediments may result in the release of toxic substances back to the open water where they may have negative impacts on exposed biota.

Sediments within the proposed dredging prism would be characterized as per DMMO and LTMS guidance to determine the quality of the sediment and its suitability for various placement options. Characterization would be completed before the dredging project permits are approved. The presence of measurable metals contamination in seawater is highly affected by pH and, to a certain degree, salinity. Oxidation of organic material during dredging could release metals, but field monitoring data rarely demonstrate significant contamination. The small concentrations of metals that could be released into the water column would be highly diluted by the surrounding water. The majority of heavy metals, nutrients, petroleum, and chlorinated hydrocarbons are typically associated with the fine-grained and organic components of the sediment. The available data suggest that biologically significant releases of these constituents during dredging has not been routinely observed (USACE and Port of Oakland 1998, USACE and RWQCB 2014).

Chemical reactions between suspended sediments and the water column have the potential to release metals to the environment during dredging operations. Chemical reactions are highly dependent on the redox potential of the seawater, pH and, to a certain degree, salinity. Field monitoring data from numerous dredging projects has rarely demonstrated significant contamination. This is due to the fact that metals adsorb to available particulates within the sediment and water column. This reaction rapidly binds metals and the small amounts of metals that are released within the water fraction are highly diluted by the surrounding water.

Organic compounds are generally less soluble than metals. Consequently, direct toxicity via organic compounds dissolved in the water column is typically less likely. However, organic compounds tend to bioaccumulate in organisms. This can occur both through dissolved phase exposure through the water column and from organic compounds adsorbed to particulate matter.

Past maintenance dredging characterizations for the Port of Redwood City indicated that generally sediment concentrations were similar to ambient levels in the Bay. 2008, 2010 and 2014 testing indicated a lack of toxicity in elutriate and solid phase biological tests which would support the conclusion that contaminant concentrations are not available in the water fraction. The minimization of the suspended sediment load through operational controls and dilution at most dredging sites occurs quickly, and as a result substantial releases of contaminants would not be expected.

Dredging and sediment disposal operations would disturb and resuspend bottom sediments, including contaminated sediments. Project-related operations could result in temporary and localized decreases in DO and possibly water column sediment concentrations; however, these conditions would not persist following the completion of the dredging operations. Compliance with applicable water quality regulations, permits, the implementation of BMPs and Mitigation Measure WQ-M1 (***Section A.15.4***) would ensure that potential water quality impacts would be less than significant. Sediment dredging would not result in discharges that create pollution, contamination, or a nuisance as defined as defined by the California Water Code, the Clean Water Act, or that would cause regulatory standards to be violated and therefore the impact is less than significant.

Impact WQ-2: Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force.

The tugs attending the dredge and towing scows a could create a wake that could scour the channel banks and contribute to erosion of mudflats and the shoreline adjacent to RWC

Channel and increase turbidity and affect habitat as a result. As discussed in ***Section A.4.1***, however, provided tugs move at slow speeds, the wave heights and energy generated by passing tugs would be similar to those generated by wind waves, and would not be expected to cause increased erosion. During construction up to five single tug trips per day could occur in RWC Channel (i.e., two complete round trips and a partial trip). This would increase the vessel wake energy by a factor of approximately 40 compared to the energy generated by the barge calls, to approximately 8% of the average wind wave energy. This impact is less than significant.

<u>Impact WQ-3: Acceleration of Sedimentation resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat</u>

Natural sedimentation processes, such as river and surface runoff, wind-driven resuspension of sediment by waves, and tidal currents would not be changed by the Project. However, the deepening of the channels could result in greater volumes of sediment depositing in the channels, and increase maintenance dredging requirements, as discussed in **Section 4.2 of the Main Integrated Report**.

There would be a short term effect from the dredging of the RWC and SBS Channels and the berth deepening that would suspend sediments and cause a small amount of the sediment to settle on the site, possibly several hundreds of feet from the dredging activity.

Resuspended sediments in RWC Channel (from berth deepening and/or channel deepening) and SBS Channel may be circulated in the area and re-deposited. Waters moving through the channels would deposit the suspended sediment load into the depressions or adjoining aquatic areas; however, current velocities would not change. Impacts to channel hydrology would not be significant during or after dredging.

This would be a short term effect during construction. Sediment dredging associated with implementation of the dredging options would not result in sediment deposition outside the Project Area that would result in a permanent significant effect on receiving water quality or aquatic habitat and therefore the impact is less than significant.

<u>Impact WQ-4: Substantial Adverse Effect on State- or Federally-Protected Wetlands</u>

The realignment of the RWC Channel has been engineered to limit expansion of the top width of the channel while still providing for the required slope stability for the channel and would avoid removal of mudflats adjacent to Bair and Greco Islands. In the vicinity of Greco Island the channel top width could increase by 6 to 42 feet, depending on the dredging option selected. The channel would be tapered to avoid any removal of mudflat outboard of Greco Island. This impact would be less than significant.

<u>Impact WQ-5: Substantial Increase in Salinity in Public or Private Wells from Salt Water Intrusion</u>

The City of Redwood City, including the Port and the adjacent Pacific Shores Center development, do not use water wells for potable water; all the drinking water is delivered by SFPUD. According to the RWQCB, saltwater intrusion has occurred into groundwater within the San Mateo Plain sub-basin (City of Redwood City 2010a). However, several commercial and institutional properties in the Project area (including the Sequoia Union High School District (1 well), PSC (3 wells with depths between 250 and 330 bgs), and the Cemex Company (3 wells with depths between 330 and 375 bgs) extract groundwater using private wells (City of Redwood City 2010a). The City of Redwood City is located in the San Mateo Plain Groundwater sub-basin which is believed to be divided into the upper and lower aquifer systems closer to the Bay. The majority of the groundwater production wells in the sub-basin appear to be completed in and are likely to be screened in the deeper aquifer. Thus deepening of the channel is unlikely to intersect or adversely affect the water-bearing units of the wells in the vicinity of the channel. Recent borings completed as part of the geotechnical studies for the Wharves 1 & 2 Replacement Project (Treadwell and Rollo 2011) indicate that the predominant geologic materials encountered adjacent to the channel are clay silt to very stiff clay with likely low transmissivity. This impact is less than significant.

Placement Sites

The Project would not conduct excavation or any other activities at the placement sites that could affect any groundwater aquifer. Therefore this issue not evaluated further.

Cullinan Ranch Tidal Restoration Project

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

At the Cullinan Ranch site the Project would either deliver the sediment by scow to the offloader (operated by or on behalf of USFWS, the site owner) or construct the necessary offloader and piping from the offloader to the levee top. If the Project only delivers the sediment by scow to an offloader, there would be no change in water quality. The transit of the scow to the placement site would not be expected to impact salinity, pH, temperature, DO, or increase turbidity (USACE and RWQCB 2015). Barges transporting sediment would be required to meet requirements to prevent the discharge of fuel, harmful substances, garbage and accidental discharges. The impacts from delivering the sediment by scow to the offloader would be less than significant.

The USFWS currently has SLC authorization to lease, construct and operate the offloader, and approval from BCDC, and has assessed the impacts relevant to that work in the *Addendum to the Final EIR for the Cullinan Ranch Project* (SLC 2012). If USFWS does not construct and operate the offloader, the Project would obtain permits to construct and operate the offloader. Construction and operations would occur in compliance with all permit requirements.

Construction of the offloader would require driving pilings for 2-3 mooring dolphins as well as 2-3 spuds into the channel to secure the offloader. In addition, laying the floating pipeline requires installation of small dead weight anchors to secure the pipeline in place. It is likely that pile driving and construction of the pipeline would disturb the channel bottom and suspend sediment for a short period. Sediment would settle out after the short term disturbance. The disturbance would occur in a naturally relatively turbid environment near the shoreline of the Napa River. The impacts would be expected to be short term and temporary. There would be a potential for an impact from the offloader operations if accidental spills were to occur during construction or operations; however BMPs are included as part of the Project and therefore the impact is less than significant.

<u>Impact WQ-2: Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force</u>

During construction of the offloader, boats would be required to lay the pipeline in Dutchman Slough and to construct the offloader. Scows would also be tied up to the offloader once the construction is complete to offload sediment. Both of these operations would be very intermittent and the vessels speeds would be slow in the areas adjacent to Dutchman Slough (during construction) and adjacent to the offloader during operation. Impacts from vessel wake force are expected to be less than significant.

<u>Impact WQ-3: Acceleration of Sedimentation Resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat</u>

Sedimentation from the construction of the offloader and piping is expected to be short term and localized within the Project site. No impacts to receiving water or aquatic habitat due to accelerated sedimentation are expected as a result of sediment delivery; potential impacts associated with decant water and management of sediment within the Cullinan site are the responsibility of the site owner. Impacts from sediment suspended by the RWC Project are expected to be less than significant.

<u>Impact WQ-4: Substantial Adverse Effect on State- or Federally-Protected Wetlands</u>

The pipeline from the offloader would cross a small area of mudflats and possibly a very narrow strip of tidal marsh along the levee (the levee is heavily eroded and has a very steep slope; there is little outboard habitat). A work area of up to 40 to 50 feet in width would be required to lay the pipe; the pipe itself could be up to 36 inches in diameter. Most of the pipeline would be located offshore in Dutchman Slough. The impact to the mudflats and tidal marsh would be temporary and after the operation of the offloader any affected tidal marsh is expected to revegetate quickly. Although there would be short term impacts to wetland, no long term effects are anticipated after operations are complete. The purpose of the sediment delivery is to raise grades at Cullinan to support rapid tidal marsh creation in Cullinan; reducing the time required for tidal marsh to establish from 60 to 100 years to several years. The accelerated habitat formation on 290 acres of the site would not be possible without sediment delivery. The short term impacts from pipeline construction would be small in comparison to the benefit provided by sediment delivery and the extensive wetlands present in the area. The impact is less than significant.

Montezuma Wetland Restoration Project

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

The Project would deliver the sediment by scow to the offloader (operated by Montezuma LLC). Impacts associated with offloader operations and the operations at the Montezuma site are the responsibility of the site owner. The transit of the scow to the placement site would not be expected to impact salinity, pH, temperature, DO, or increase turbidity (USACE and RWQCB 2015). Barges transporting sediment would be required to meet requirements to prevent the discharge of fuel, harmful substances, garbage and accidental discharges. The impacts from delivering the sediment by scow to the offloader would be less than significant.

Impact WQ-2: Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force

Impacts associated with the offloader and the operations at the Montezuma site have been evaluated as part of the permitting process. There would be no impact to the shoreline from the Project.

Impact WQ-3: Acceleration of Sedimentation Resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat

The Project would not accelerate natural sedimentation during the transit to the offloader. There would be no impact.

Impact WQ-4: Substantial Adverse Effect on State- or Federally-Protected Wetlands

The Project would not adversely affect wetlands. There would be no impact from the Project.

SF-DODS

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

The Project would deliver the sediment by scow to SF-DODS; the sediment would be bottom dumped from the scow at that point. Disposal of the sediment at SF-DODS would occur in compliance with all applicable permit requirements. Impacts associated with bottom dumping of the sediment have been evaluated as part of the site's permitting process. The only effect on water quality would be a short term sediment plume as the scow bottom dumps the sediment. The plume dissipates quickly to background levels (USACE and RWQCB 2014). The transit of the scow to the placement site would not be expected to impact salinity, pH, temperature, DO, or increase turbidity (USACE and RWQCB 2015). Barges transporting sediment would be required to meet requirements to prevent the discharge of fuel, harmful substances, garbage and accidental discharges. The impacts from delivering the sediment by scow to the site would be less than significant.

Impact WQ-2: Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force

Once a scow leaves RWC channel or SBS Channel it would not transit near the shoreline. There would be no impact to the shoreline from the Project's use of this site.

Impact WQ-3: Acceleration of Sedimentation resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat

The Project would not accelerate natural sedimentation during the transit to the SF-DODS. There would be no significant effect from this Project due to accelerated sedimentation on receiving water or aquatic habitat.

Impact WQ-4: Substantial Adverse Effect on State- or Federally-Protected Wetlands

The Project would not adversely affect wetlands. There would be no impact from the Project.

Eden Landing Ponds

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

Sediment could be transported to the Eden Landing Pond site by two potential methods. If cutterhead dredging is used, the dredged sediment would be pumped through up to 15 miles of piping from the RWC or SBS Channels to the top of the Pond E2 levee. Sediment would be suspended during the construction of the pipeline as small temporary dead weight anchors are placed to secure the pipeline in place. Piping would cross the mudflats in a shallow 2- to 3-foot wide area with minor disturbance to sediment as it is laid across the mudflats. Securing the pipe to the levee at Pond E2 would require a work area estimated to be 40 to 50 feet wide.

Alternately, the Project would construct an offloader in deep water and piping from the offloader to the levee top at the Eden Landing Pond E2. Sediment would be loaded onto a scow at the dredge site and be transported to the offloader where it would be slurried prior to being pumped through a pipeline to the top of the Eden Landing levee. Construction of the offloader would require driving pilings for 2-3 mooring dolphins and several piles to be used to secure the offloader to the Bay bottom. In addition laying the floating and/or submerged pipeline requires installation of small dead weight anchors to secure the pipeline in place. It is likely that pile driving and construction of the pipeline would disturb the Bay bottom and suspend sediment for a short period. There would be little impact from the offloader facilities operations unless an accidental spill occurs. The offloader would be in at least 20 feet of water so only minor short term disturbance of sediment may occur as the scow transits to the offloader.

The transit of the scow to the placement site would not be expected to impact salinity, pH, temperature, DO, or increase turbidity (USACE and RWQCB 2014). Barges transporting sediment would be required to meet requirements to prevent the discharge of fuel, harmful substances, garbage and accidental discharges.

Compliance with applicable water quality regulations, permits, the implementation of BMPs and Mitigation Measure WQ-M1 (***Section A.15.4***) would ensure that potential water quality impacts would be less than significant.

<u>Impact WQ-2: Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force</u>

During construction of the offloading pipeline, boats would be required to lay the pipeline in the mudflats adjacent to Eden Landing ponds and to construct the offloader. These operations would be very intermittent in nature and the vessels would be required to slow in the areas adjacent to the ponds. The proposed offloader location is more than 3 miles from shore, and there would be no effects to the shoreline during operation. Impacts from vessel wake force are less than significant.

<u>Impact WQ-3: Acceleration of Sedimentation Resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat</u>

Sedimentation associated with the construction of the offloader and piping is expected to be short term and localized to the Project site. No impacts to receiving water or aquatic habitat due to accelerated sedimentation are expected during the operation of the offloader and sediment delivery pipeline. Impacts from sedimentation by the Project are less than significant.

<u>Impact WQ-4: Substantial Adverse Effect on State- or Federally-Protected Wetlands</u>

The pipeline from the offloader would cross an extensive area of mudflats and a narrow strip of tidal marsh along the levee. The sediment delivery location was chosen to minimize the effects on habitat from the pipeline. The required work area for pipeline construction is 40 to 50 feet, and the work would likely occur on wooden mats as described in ***Section 4.2***. The pipeline itself would be 2 to 3 feet in diameter. A portion of the pipeline would be submerged offshore of the Eden Landing ponds. The impact to the mudflats and tidal marsh outboard of Pond E2 would be limited in area and temporary. Although there would be short term impacts to wetland, no long-term effects are anticipated after operations are complete. After the pipeline is removed, the marsh area is expected to revegetate readily. The purpose of the sediment delivery is to raise grades at Eden Landing to accelerate tidal marsh formation in the ponds and/or support creation of ecotone habitat or other desired habitat features. The accelerated habitat formation on the site would not be possible without sediment delivery. The short term impacts from pipeline construction would be small in comparison to the benefit provided by sediment delivery. The impact is less than significant.

Alviso Ponds

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

Sediment would be transported to the Alviso site by constructing an offloader, booster pump(s) and piping from the offloader to the levee top at the either pond A2W or A9. Sediment from RWC Channel could also be delivered by hydraulic cutterhead, as described for Eden Landing, above. Sediment delivery would occur in the same manner as for Eden Landing. Potential effects from offloader and pipeline construction and operation would be the same as for Eden Landing.

Compliance with applicable water quality regulations, permits, the implementation of BMPs and Mitigation Measure WQ-M1 (see ***Section A.15.4,*** below) would ensure that potential water quality impacts are less than significant.

Impact WQ-2: Increased Erosion, Especially at Bair Island or Greco Island, due to Increased Vessel Wake Force

During construction of the offloading pipeline, boats would be required to lay the pipeline in the mudflats adjacent to the Alviso ponds and to construct the offloader. These operations would be very intermittent in nature and the vessels would be required to slow in the areas adjacent to the ponds. The proposed offloader location is more than 3,000 feet from the closest shore, and there would be no effects to the shoreline during operation. Impacts from vessel wake force are less than significant.

Impact WQ-3: Acceleration of Sedimentation Resulting in Significant Effects on Receiving Water Quality or Aquatic Habitat

Sedimentation associated with the construction of the offloader and piping is expected to be short term and localized to the Project site. No impacts to receiving water or aquatic habitat due to accelerated sedimentation are expected during the operation of the offloader and sediment delivery pipeline. Impacts from sedimentation due the Project are less than significant.

Impact WQ-4: Substantial Adverse Effect on State- or Federally-Protected Wetlands

The pipelines from the offloader would cross an extensive area of mudflats and narrow strips of tidal marsh along the levee. The sediment delivery locations were chosen to minimize the effects on habitat from the pipeline (i.e., are located in areas with minimal tidal marsh). Construction activities would be very similar to those for Eden Landing, and impacts to the mudflats and tidal marsh outboard of the two sediment delivery locations would be limited in area and temporary. Although there would be short term impacts to wetlands, no long-term effects are anticipated after operations are complete. After the pipeline is removed, the marsh area is expected to revegetate readily. The purpose of the sediment delivery is to raise grades at Alviso to accelerate tidal marsh formation in the ponds and support creation of ecotone habitat or other desired habitat features. The accelerated habitat formation on the site would not be possible without sediment delivery. The short term impacts from pipeline construction would be small in comparison to the benefit provided by sediment delivery. The impact is less than significant.

Mitigation Measures

With implementation of this mitigation measure, potential impacts to water quality and water resources from the proposed Project would be less than significant.

Mitigation Measure WQ-M1: Monitor Turbidity and Implement Minimization Measures

Conduct monitoring of turbidity in accordance with regulatory agency permits. If regulatory thresholds are exceeded at the designated monitoring location, implement turbidity minimization measures. Possible turbidity minimization measures include:

- Increased cycle time/reduced bucket deployment: longer cycle times reduce the velocity of the ascending bucket through the water column, which reduces potential sediment wash from the bucket.
- For clamshell dredging operations: Use an environmental (closed) bucket instead of an excavator.
- Use floating debris booms/silt curtains to contain turbidity and suspended sediments in shallow waters as required by the permitting agency.

A.16 References

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