Environmental Assessment (with Draft FONSI) and 404 (b)(1) Analysis

&

Initial Study (with Draft Mitigated Negative Declaration)

San Francisco Bay Strategic Shallow-Water Placement Pilot Project

Photo by Noah Berger, courtesy of MTC, Albany Mudflats with Mount Tamalpais in the distance

Photo by Pete Kauhanen, San Francisco Estuary Institute (SFEI), Corte Madera Marsh

September 23, 2022

US Army
Corps of Engineers
San Francisco District

Water Boards

TABLE OF CONTENTS

TABLES

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

APE	Area of Potential Effects
AWOIS	Automated Wreck and Obstruction Information System
BAAQMD	Bay Area Air Quality Management District
BCDC	Bay Conservation and Development Commission
BMPs	Best Management Practices
BUDM	Beneficial Use of Dredged Material
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CM	Centimeters

CO_{2EQ}	Carbon Dioxide Equivalents
CRHP	California Register of Historic Places
CVL	Confederated Villages of Lisjan
CWA	Clean Water Act
CY	Cubic Yards
CZMA	Coastal Zone Management Act
DMMO	Dredged Material Management Office
EA	Environmental Assessment
EBDA	East Bay Dischargers Authority
EDER	Eden Landing Ecological Reserve
EFH	Essential Fish Habitat
EIR	Programmatic Environmental Impact Report
EIS	Environmental Impact Statement
ER	Engineering Regulation
ESA	Endangered Species Act
EWN	Engineering With Nature
FESA	Federal Endangered Species Act
FMP	Pacific Groundfish Fisheries Management Plan
FONSI	Finding of no Significant Impact
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
FWS	Fish and Wildlife Service
GHGs	Greenhouse Gases
IS	Initial Study
LTMS	Long Term Management Strategy
MBTA	Migratory Bird Treaty Act
MHEA	Middle Harbor Enhancement Area
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MSC	Main Ship Channel
MSFCMA	Magnuson Stevens Fishery Conservation and Management Act
MTL	Mean Tidal Level
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NAVD	North American Vertical Datum
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Units
NUAD	Not Suitable for Unconfined Aquatic Disposal
O&M	Operations and Maintenance
PCBs	Polybrominated Diphenyl Ethers
RMP	Regional Monitoring Program
ROG	Reactive Organic Gases
RWQCB	Regional Water Quality Control Board
SBSP	South Bay Salt Ponds
SBSPRP	South Bay Salt Ponds Restoration Project

SF Bay	San Francisco Bay
SFEI	San Francisco Estuary Institute
SF-11	Alcatraz Island Disposal Site
SF-DODS	San Francisco Deep Ocean Disposal Site
SHPO	State Historic Preservation Offices
SLR	Sea-Level Rise
SPN	San Francisco District
SPUR	San Francisco Bay Area Planning and Urban Research Association
SSC	Suspended Sediment Concentration
TSS	Total Suspended Solids
USACE	U.S. Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WRDA	Water Resources Development Act

1.1 INTRODUCTION

This environmental assessment (EA) initial study (IS), and mitigated negative declaration (MND) for the San Francisco Bay Strategic Shallow-Water Pilot Project is written in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. § 4321 *et seq*), as amended; the California Environmental Quality Act (CEQA) of 1970 (Pub. Res. Code, §§ 21000 et seq.), Regulations for Implementing the Procedural Provisions of the NEPA (40 C.F.R. §§1500-1508), U.S. Army Corps of Engineers (USACE) Planning Regulations (Engineering Regulation (ER) 200-2-2), and the Guidelines for Implementation of CEQA (Title 14, California Code of Regulations § 15000 *et seq*). It evaluates the potential impacts associated with strategically placing approximately 100,000 cubic yards (CY) of dredged sediment from a federal navigation channel over approximately 19 – 56[1] days using a clamshell dredge and a dump scow at a shallow-depth (9 - 12 feet[ft]), in southern San Francisco Bay to leverage natural, in-bay, hydrodynamic processes for transporting sediments to existing mudflats and marshes. This proposed project addresses tidal mudflat and salt marsh responses to strategic sediment placement at one South-Bay location.

1.2 DESCRIPTION AND LOCATION

The proposed project is in San Francisco Bay (SF Bay or the Bay) in Northern California, which is a large tidal estuary receiving the outflow of large rivers (e.g., Sacramento and San Joaquin Rivers) and their respective watersheds. Approximately 40% of California's water drains into SF Bay from the Sierra Nevada Mountain Range and the State's Central Valley, which ultimately connects with the Pacific Ocean via the Golden Gate Strait under the Golden Gate Bridge. In particular, the proposed project location comprises tidal mudflats, salt-water tidal marshes, and subtidal shallow-water environments at the southern end of SF Bay. It is located offshore of the City of Hayward in Alameda County and is bounded by the San Mateo Bridge to the north and the southern shoreline of the Bay to the south.

The proposed project would place sediment dredged from a federal in-bay navigation channel in shallow waters on the periphery of the Bay to examine the ability of tides and currents to move the placed material to existing mudflats and marshes. This aquatic placement technique – placing dredged sediment in shallow water in the nearshore adjacent to a tidal wetland and utilizing natural hydrodynamic and morphodynamic processes to move the sediment onto the mudflat and marsh – is referred to as strategic shallow-water placement. This strategic shallow-water placement pilot project is expected

[1] The range of 19 – 56 days was calculated assuming a 400 CY/hour maximum production rate for a clamshell dredge plant and the corresponding range of 1 – 3 placements using 900 CY scows every high tide with two high tides per day. This resulted in between 1,800 – 5,400 CY/day of dredged material placement at the placement site, and consequently, 19 – 56 days to achieve the target 100,000 CY of dredged material.

to move a portion of the placed sediment to the mudflats and the marsh plain, mimicking natural sediment supply to wetland ecosystems to improve habitat. Monitoring will be integrated to evaluate the success of the pilot project and its environmental effects.

1.2.1 Federal Navigation Projects

As part of its Operations and Maintenance (O&M) dredging program in the SF Bay area, USACE annually dredges four federal channels (Suisun, Richmond Inner Harbor, Oakland Harbor, and Main Ship Channel [MSC]), biannually dredges three federal channels (Pinole Shoal, Redwood City Harbor, and Richmond Outer Harbor), and periodically dredges several other federal channels (Figure 1-1). This project proposes sourcing dredged sediment from either Redwood City Harbor or Oakland Harbor federal navigation channel for strategic placement.

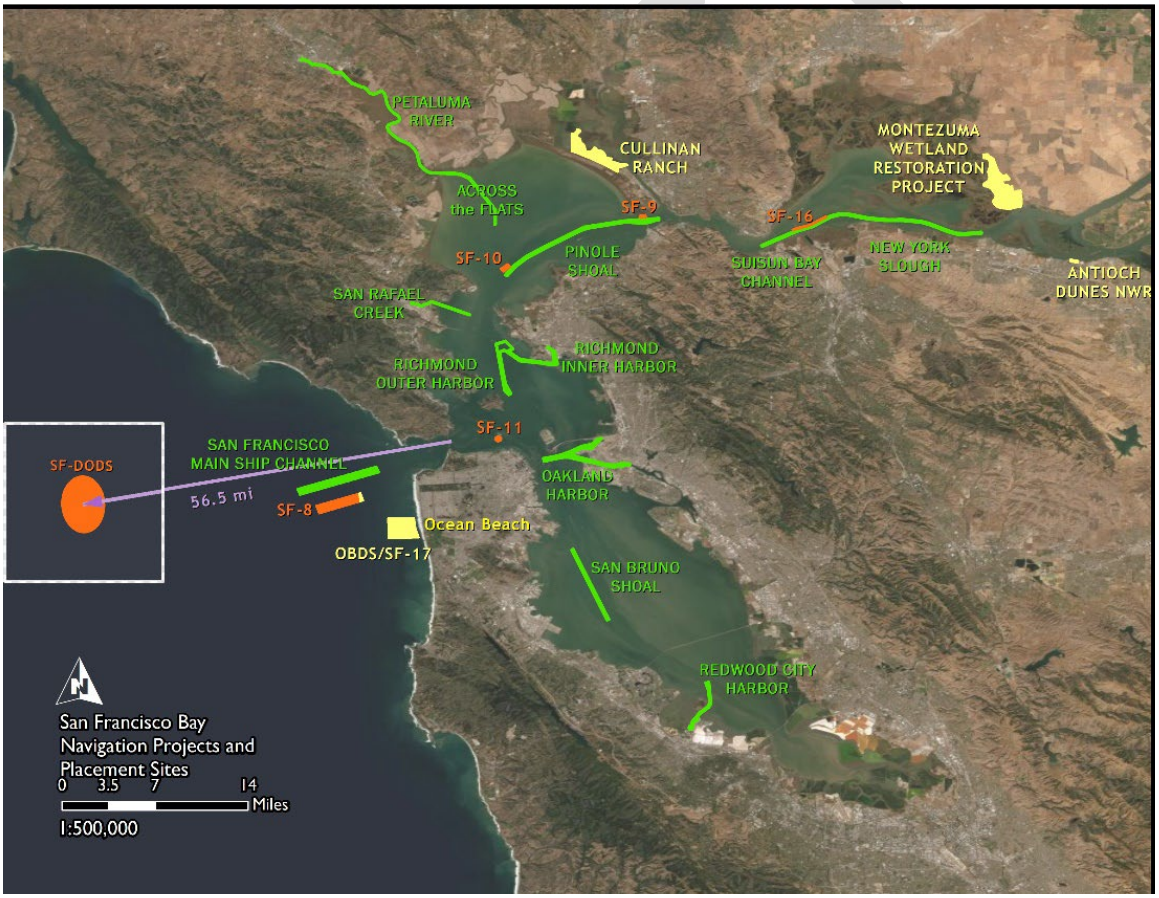

Figure 1-1. San Francisco District (SPN) federal navigation projects (green) and traditional placement sites (orange [aqueous] and yellow [beneficial use]).

1.3 Purpose and Need for Proposed Action

The *purpose* of the proposed action is to determine the effectiveness of strategically placing dredged sediment in the nearshore, shallow water environment to maximize sediment transport to existing tidal mudflats and tidal marshes while minimizing ecological impacts to benthic habitats and environmental resources. Specifically, the proposed project aims to assess the ability of this novel sediment placement technique to transport sediment onto target mudflats and marshes.

Need – To capitalize on the opportunity to enhance sea-level-rise resilience for tidal mudflats and salt marshes by beneficially using material dredged from SF Bay navigation channels using an innovative placement method that has not been used in SF Bay.

The San Francisco Baylands (e.g., mudflats, marshes, and other intertidal habitats) protect the adjacent communities, improve water quality, and provide habitat for thousands of fish and wildlife species, including several endangered and special-status species. Before 1850, the SF Bayregion included 200,000 acres of tidal wetlands (icnluding salt marsh, brackish, and freshwater wetlands) (Figure 1-2). However, historical loss of these landscapes to development has drastically reduced the acreage of such habitats across San Francisco Bay. The region has lost over eighty-five percent of that acreage through diking, dredging, and development. In addition, Sea-Level Rise (SLR) and sediment deficits further threaten long-term bayland sustainability.

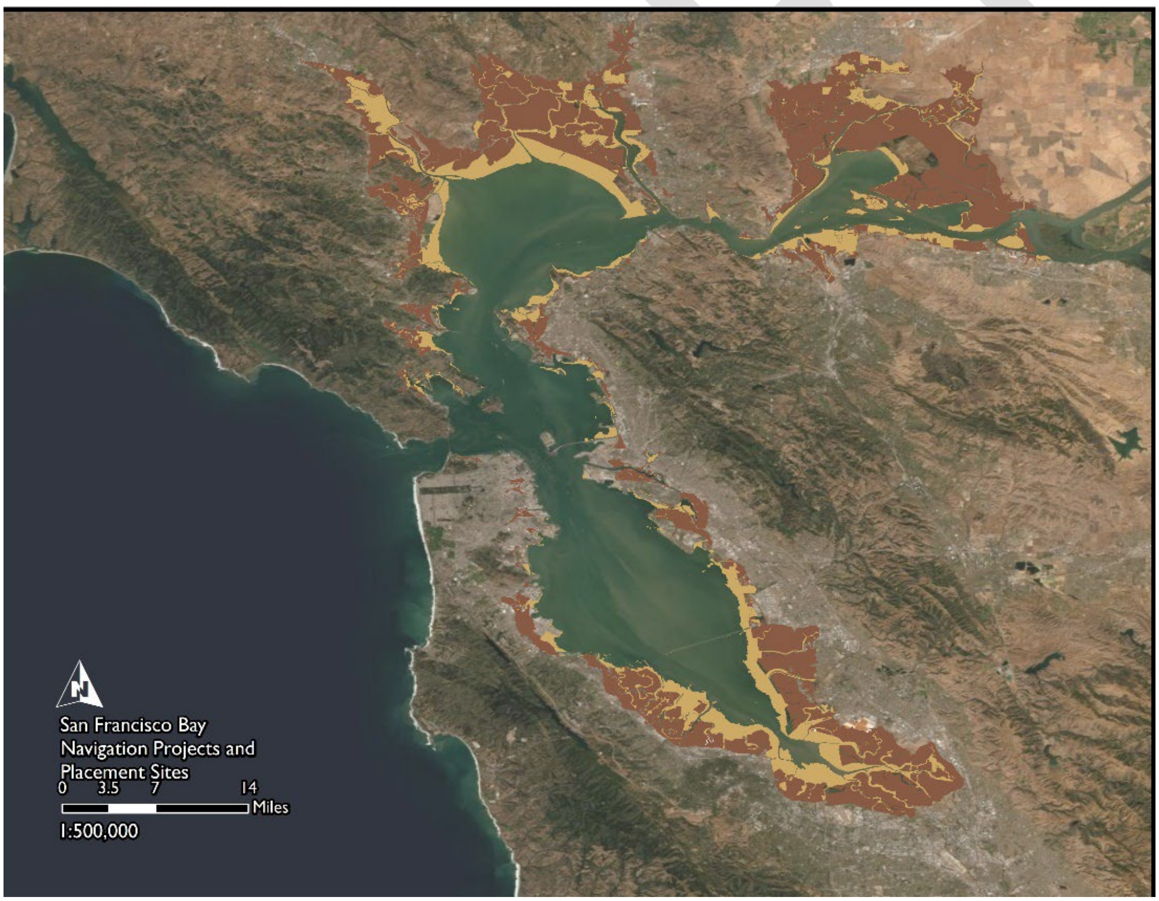

Figure 1-2. SF Bayhistorical (dark brown) and modern (light brown) baylands.

Efforts are underway to restore these baylands with sediment from other locations. (Dusterhoff et al. 2021) of the San Francisco Estuary Institute (SFEI) estimate the Bay's tidal marshes and mudflats will need approximately 450 million CY of sediment between now and 2100 to maintain existing tidal marshes and those currently slated for restoration. Sediment dredged from federal navigation channels represents a significant source of supply available for restoration. The practice of beneficially using these sediments to restore marshes already exists and has been successfully implemented (i.e., beneficial use of dredged material or (BUDM)). Federal, state, and local agencies and organizations are currently on track to restore 60,000 acres of tidal wetlands to augment 40,000 already-restored acres. The resulting 100,000 acres will help protect the region from tidal flooding and reduce storm damage, especially if SLR continues as predicted or accelerates, as well as protect habitat for endangered species.

These agencies, through a variety of partnerships, have acquired land, developed regional plans, conducted environmental reviews, received permits, and are implementing multiple projects to restore critical tidal wetlands for both ecosystem benefits and shoreline protection. Meeting the goal of wetland climate resilience, however, will require optimization on several levels, including finding least cost methods with streamlined and more efficient permitting processes to match dredged material with potential placement site characteristics and capacities.

In the SF Bay area, the current paradigm of BUDM is to place material directly on diked, subsided baylands to raise site elevations to adjacent marsh plains prior to tidal breaching, thereby supporting rapid development of tidal marsh vegetation and habitat. Subsided restoration sites that are breached without raising site elevations are projected to take 60–75 years to develop into tidal marsh, while direct placement BUDM can cut development time down to 10–15 years. This is important because restored marshes breached without sufficient sediment supply may not accrete fast enough prior to increased rates of SLR in the future. Although direct placement is a critical tool for subsided baylands, it can be a costly restoration strategy, and given the projected increase in SLR, the SF Bay region is actively experimenting with new tools to complement and add to the regional toolbox of BUDM actions, particularly those that reduce cost by working with existing natural processes that drive tidal marsh development and resilience under current and future SLR conditions. Shallow-water placement or thin-layer placement are alternative BUDM practices.

The targeted areas for strategic shallow-water placement are locations on the margins of the Bay adjacent to marshes and mudflats in need of sediment. Shallow water ranges from near the bayward edge of the mudflat (around Mean Lower Low Water (MLLW), which is approximately 0 feet North American Vertical Datum [NAVD]) to the top of the deep channel (a depth of about 13 feet NAVD).

1.4 Basic and Overall Project Purpose

Under Section 404 of the Clean Water Act (CWA), USACE is granted permitting authority for any activity that would involve the discharge of dredge or fill materials into waters of the U.S., including wetlands (33 U.S.C. § 1344). The section 404(b)(1) guidelines prohibit discharge of dredged or fill material if a practicable alternative to the proposed project exists that would have less adverse impacts on the aquatic ecosystem, including wetlands, so long as that alternative does not have other significant adverse environmental consequences. The USACE does not issue itself a permit for its actions involving the discharge of dredge or fill material to waters of the U.S., but instead integrates an equivalent 404(b)(1) analysis in its NEPA documentation. This analysis requires identification of the basic and overall project purposes as defined by the 404(b)(1) guidelines and an evaluation of alternatives consistent with those purposes to identify the least environmentally damaging practicable alternative.

1.4.1 Basic Project Purpose

The basic purpose is to ascertain the feasibility of using strategic, in-water sediment placement to maintain mudflats and tidal marshes. This is a water-dependent project under Section 404(b)(1).

1.4.2 Overall Project Purpose

The overall purpose of the Strategic Shallow Water Placement Pilot Project is to test a novel approach to increase mudflat and tidal marsh resilience to SLR in SF Bay via strategic placement of sediment dredged from federal navigation channels at a shallow, in-Bay location adjacent to the mudflat and tidal marsh. This Engineering with Nature (EWN) approach will augment sediment supply in a sediment-starved system to leverage existing morphodynamic processes to transport sediment toward mudflat-marsh systems for habitat enhancement. The goal is to determine if this EWN approach can be a successful, low-cost method to achieve BUDM. The overall project purpose is to ascertain whether placing sediment derived from maintenance dredging of an in-Bay federal navigation channel at a shallow, in-Bay location adjacent to the mudflat and tidal marsh can help a mudflat and tidal marsh in the SF Bay can be sustained in the face of rising sea levels (i.e., BUDM). This project aims to understand the impacts to benthic (i.e., Bay bottom) habitats, and communities; the spatial extent of the effect zone; the temporal scale of disturbance and recovery time; and monitor for effects to eelgrass beds, oyster beds, or similar environmental resources.

This project also aims to understand the scale of sediment deposition post-placement at the placement site, on the intertidal mudflat, and on the adjacent tidal marsh; and the wind, wave, and sediment flux conditions pre- and post-placement across the interconnected subtidal-mudflat-marsh complex. This project will include robust monitoring protocols using appropriate methods and techniques to determine sediment deposition and impacts (beneficial or adverse) resulting from strategic placement.

1.5 Study Authority

The beneficial use of material dredged from a SF Bay federal navigation channel and placed in shallow bay water is authorized by Section 1122 of the Water Resources Development Act (WRDA) 2016. Section 1122 requires USACE to establish ten pilot projects, nationwide, that beneficially use dredged material. According to Section 5 of the Implementation Guidance, each pilot project is to serve one of the purposes identified in Section 1122(a):

a. Reducing storm damage to property and infrastructure;
b. Promoting public safety;
c. Protecting, restoring, and creating aquatic ecosystem habitats;
d. Stabilizing stream systems and enhancing shorelines;
e. Promoting recreation;
f. Supporting risk management adaptation strategies; and
g. Reducing the costs of dredging and dredged-material placement, such as projects that use dredged material for:
    8. Construction or fill material;
    9. Civic improvement objectives; and
    10. Other innovative uses and placement alternatives that produce public economic or environmental benefits.

This pilot project addresses Implementation Guidance Section 5.g.3 and this document follows the Implementation Guidance 11-point Checklist requirements for Pilot Project Implementation:

1. Clear description of the recommended plan;
2. Demonstration of the project justification based on standard Corps project justification criteria for the particular project purpose in accordance with the general guidance applicable to the project purpose(s)
3. Documentation of compliance with appropriate federal, state, and local environmental and regulatory requirements such as NEPA, and other environmental laws normally included in a feasibility study specifically authorized by Congress
4. Documentation of compliance with policies applicable to Section 204 of the Continuing Authorities Program
5. Completed Real Estate Plan consistent with Chapter 12 of ER 405-1-12
6. The non-federal sponsor financial analysis and financing plan at a level of detail appropriate to the scale of the project.
7. District Real Estate certification that the non-federal sponsor has the capability to acquire and provide the required real estate interests
8. Detailed description of the non-federal sponsor's local cooperation requirements
9. Identification of the anticipated operation, maintenance, repair, replacement, and rehabilitation activities, including estimated costs;

10. District Counsel statement of legal sufficiency for the decision documentation and compliance with NEPA and other applicable environmental laws.
11. Approval of the report and the environmental compliance decision documents are delegated to the MSC commander.

2 Scope of Analysis

Preparing an EA/IS involves analyzing whether the proposed action – the effects associated with placing dredged material at a shallow-water, in-Bay site – and any action alternatives will significantly affect the quality of the human environment. This analysis will consider the direct, indirect, and cumulative impacts of the proposed action and any action alternatives relative to the No Action Alternative. The potential impacts associated with the O&M dredging of the selected channel are presented in the *Final Environmental Assessment/Environmental Impact Report for Maintenance Dredging of the Federal Navigation Channels in San Francisco Bay Fiscal Years 2015-2024* and are incorporated by reference without further analysis herein.

2.1 Direct Impacts

A direct impact is caused by the action and occurs at the same time and place as the action. In San Francisco Bay, shallow-water, dredged-material placement, can have several direct impacts, such as bathymetric change, sediment mismatch, increased noise and boat traffic, temporary subtidal and intertidal burial, and temporary increased turbidity and suspended-sediment concentration. These actions are immediate – i.e., contemporaneous with dredged-material placement.

Geographically, direct impacts will be confined to surface waters in the transport area where it deviates from the route taken to reach the federal-standard site; the nearshore aquatic environment, mudflat, and marsh at the project site; and the air basin (emissions). Temporally, direct impacts will be confined to the duration of placement activity, approximately between 19 – 56 days.

2.2 Indirect Impacts

Geographically, indirect impacts will be confined to the nearshore aquatic environment, mudflat, and marsh at the project site; adjacent mudflats and marshes; and nearby parts of the Bay. Temporally, indirect impacts will end when the placed sediment has been dispersed, after project completion which is estimated to take 19 - 56 days, or when the fauna reestablish in the project area.

3 Alternatives

In USACE planning, alternatives comprise one or more measures: a measure is a feature or an activity that can be implemented at a specific geographic location to address one or more planning objectives. Reasonable measures for the Strategic Placement Project include placement of dredged material from a federal navigation channel to a shallow nearshore site. The USACE planning process was followed to identify an initial array of alternatives, screen that array down to a final array of alternatives and select a plan – the proposed action.

To satisfy NEPA and CEQA requirements and provide the basis for the required 404(b)(1) alternatives analysis, three alternatives were evaluated as part of the EA/IS. Alternatives assessed in the EA/IS include the No Action Alternative (not placing material from a federal navigation channel at a shallow water site); and two action alternatives that involve placing material from a federal navigation channel strategically nearshore for beneficial use.

3.1 Plan Formulation Summary

The USACE planning process is a structured approach to problem solving. Usually, it comprises six steps:

1. Identifying problems and opportunities;
2. Inventorying and forecasting conditions;
3. Formulating alternative plans;
4. Evaluating alternative plans;
5. Comparing alternative plans;
6. Selecting a plan.

Further discussion of the plan formulation analysis, process and selection of the proposed action is discussed in the Decision Document and Plan Formulation Appendix (Appendix B).

To reduce the number of potential shallow water placement sites from twelve (Figure 3-1Figure 3-1), to two, eight criteria were applied (Table 3-1Table 3-1). These criteria include:

1. Eroding or drowning marsh; lack of natural sediment supply;
2. Sufficient wind-wave action to resuspend placed sediment;
3. Proximity to a federal channel;
4. Open to tidal exchange, existing marsh;
5. Water deep enough to get scow close to shore;
6. Resilience for shorelines near disadvantaged communities (DACs);
7. Lower populations of critical species;
8. Avoiding large eelgrass beds and nearshore reef projects.

Figure 3-1. Potential sites for strategic placement across San Francisco Bay.

Table 3-1. Initial site selection – the checks mark appliable criteria.

Site (south to north)	Criteria 1.	2	3	4	5	6	7	8	Reject
	Eroding or drowning marsh	Sufficient wind-wave action	Prox. to federal channel	Open to tidal exchange	Water deep enough	Shoreline resilience near DACs	Lower pop. Of critical species	Avoiding eelgrass & reef projects	
Pond A6								✔	✔
Faber Tract		✔	✔	✔	✔	✔		✔	✔
Cogswell Marsh	✔	✔	✔	✔	✔	✔			✔
Eden Landing (Whale's Tail)	✔	✔	✔	✔	✔	✔		✔	
Arrowhead Marsh	✔		✔	✔		✔		✔	✔
Emeryville Crescent	✔	✔	✔	✔	✔	✔	✔		
Bothin Marsh	✔			✔				✔	✔
Stege Marsh	✔	✔		✔		✔			✔
Corte Madera Marsh	✔	✔		✔					✔
Giant Marsh		✔	✔	✔	✔	✔		✔	✔
China Camp		✔			✔			✔	✔
Point Edith	✔	✔	✔			✔		✔	✔

3.1.1 Alternatives Considered but Eliminated from Further Study

After screening, ten of the sites were considered but eliminated from further NEPA analysis. Sites were eliminated because they would not meet the purpose and need for the action (i.e., they were unlikely to transport sediment onto target mudflats and marshes while minimizing impacts to environmental resources) or were infeasible. Screening criteria 1, 2, 4, 7, and 8 focused on site ability to meet the purpose and need, whereas criteria 3 and 5 focused on feasibility of implementation. Sites that did not meet most criteria were eliminated from the focused array and further study in the EA/IS. Two alternative sites were carried forward (Eden Landing Whale's Tail marsh and Emeryville Crescent marsh).

Next, those two sites were analyzed using a quantitative modeling approach (i.e., the UnTRIM Bay-Delta model and the Short-Term Fate [STFATE] of dredged material in open water model) to determine sediment fluxes, shear stresses, transport pathways, and deposition zones for different placement depths (i.e. locations) and volumes in the feasible placement grids (Figure 3-2) to refine the design of these alternatives. The modeling approach was used to consider various volume and depth scenarios at the two sites, and those scenarios that were less likely to move sediment onto target mudflats and marshes while minimizing impacts to environmental resources were eliminated.

Figure 3-2. Strategic placement sites narrowed down from twelve to two: Emeryville (top) and Eden Landing (bottom). Site map includes both placement footprint (red grid) and target marsh for restoration (aqua hatch).

Placement alternatives incorporated information on flood tides at various stages of the tidal cycle, including Mean Higher High Water (MHHW), Mean Sea Level (MSL), and MLLW, during the San Francisco Bay's environmental dredging window (i.e., June 1 – November 30). This determined specific depths for each cell in the placement grid, and ultimately, the design footprints based on depth isolines. The first set of alternatives all utilized the same placement volumes (i.e., 100,000 CY) distributed across the footprint based on scow loading capability as correlated with depths of greater than 9 feet for the shallowest placement; 10 feet for the intermediate placement; and 11 feet for deepest placement. In the first round of modeling, six placement alternatives were analyzed – three for Eden Landing and three for Emeryville Crescent Marsh. The first six scenarios were used to determine whether Emeryville or Eden Landing is most suitable for the pilot project. Different placement strategies at each location were then analyzed to determine the second round of modeling scenarios, and ultimately, to narrow in on the most effective placement strategy (Table 3-2).

Table 3-2. First round modeling scenarios testing placement locations, scow volumes, and tidal timings at Emeryville and Eden Landing locations.

Scenario	Placement Grid	Location	Placement Volume (10^3 CY)	Scow Volume (CY)	Minimum Time Between Placements (hrs)	Notes
1	Emeryville	Deep	100	1,400	6	
2	Emeryville	Middle	100	1,150	2	Placements during flood tide
3	Emeryville	Shallow/East	100	900	2	
4	Eden Landing	Deep	100	1,400	5	
5	Eden Landing	Middle	100	1,150	1.5	Placements during flood tide
6	Eden Landing	Shallow/East	100	900	1.5	

The second round of modeling consisted of six scenarios to evaluate the effect of different placement volumes, seasonal differences (summer versus winter), alternate sediment sourcing, and placement footprints (Table 3-3).

Table 3-3. Second round of modeling scenarios testing the effect of different placement volumes, seasonality, alternate sediment sourcing and footprint sizes at the Eden Landing location.

Scenario	Placement Grid	Location	Placement Volume (10^3 CY)	Scow Volume (CY)	Minimum Time Between Placements (HRS)	Notes
6	Eden Landing	Shallow/East	100	900	1.5	From First Set
7	Eden Landing	Shallow/East	50	900	1.5	
8	Eden Landing	Shallow/East	75	900	1.5	
9	Eden Landing	Shallow/East	100	900	1.5	Winter Placement
10	Eden Landing	Shallow/East	100	900	1.5	Oakland Sediment
11	Eden Landing	Expanded East	100	900	1.5	
12	Eden Landing	Expanded East	125	900	1.5	

This second round of modeling first examined how efficient different placement volumes (50,000; 75,000; and 100,000 CY) were at Eden Landing assuming the Shallow/East placement strategy. Another sensitivity analysis examined 100,000 CY placements subject to wind and wave climate conditions during summer and winter months. Modeling also examined placement sensitivity to the original east/shallow placement footprint versus an expanded east footprint that represented a hybrid of the shallow and intermediate depth scenarios with an overall footprint over twice the size of the original shallow-east size (Table 3-3). Different sediment source channels (i.e., Oakland Harbor versus Redwood City Harbor) were tested to understand the impact of different grain sizes on sediment resuspension and mobility, with coarse sediments from Oakland Harbor channel and fine sediments from Redwood City Harbor channel. Finally, different placement volumes (100,000 CY versus 125,000 CY) were tested within this expanded east footprint.

Modeling results indicated that summer placements were more efficient at delivering sediments to the target mudflat and marsh system. Analysis of wave resuspension potential indicated significantly higher transport because of waves in summer months than in winter months, because of higher wind speeds. Significantly more placed sediment transported to Eden Landing mudflat/marsh complex in the two months following summer placement than in the three months following winter placement. There was also more regional sediment transport north out of South Bay following winter placement. Dredged material placements earlier in the summer when wind speeds are seasonally high are likely to be more effective at transporting sediment into the marsh than late-fall and winter placements.

Larger placement volumes resulted in more sediment reaching the target mudflat and marsh on short time scales (on the order of one to two millimeters) and will therefore be more measurable to determine pilot project success, although millimeter-scale deposition is difficult to measure over a wide area. Placement volume and mudflat and marsh deposition volume were linearly correlated with higher detectability for the 100,000 CY placement at the shallow/east footprint (Figure 3-3). A larger fraction of Oakland Harbor sediment remains in the placement footprint at end of the two-month analysis period. Dredged material with lower sand content is better for strategic placement, but the differences between dredged material from Oakland Harbor and Redwood City Harbor do not have a large effect on the overall volume of sediment that reaches Eden Landing after two months.

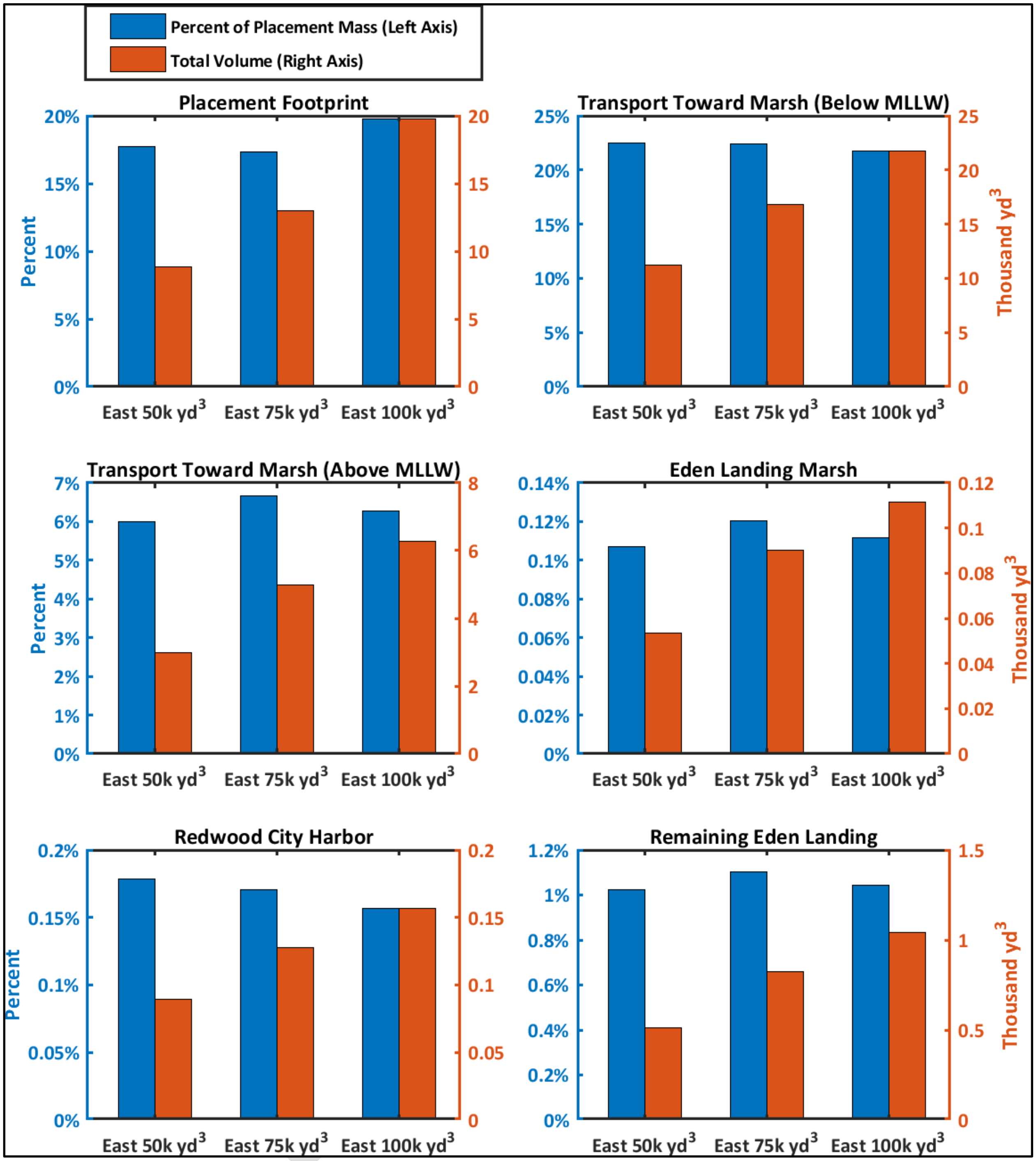

Figure 3-3. Predicted percentage of dredged sediment mass and dredged material volume in each region at the end of the 2-month simulations for evaluating the placement volume in the shallow/east placement footprint.

The expanded footprint includes areas of greater depth than the original footprint but allowed for thinner placements over the placement footprint. Less sediment was transported out of placement footprint in the two months following placement for the expanded footprint. Overall, results indicate that placements closest to the target marsh at the shallowest depths possible, where wave energy is highest, are most effective at transporting sediment to the marsh.

The final site selection process analyzed the percentage and volume of sediment delivered to the transition tidal flat and upland marsh, as well as the percentage dispersed outside the placement footprint but not to the target locations (i.e., nearshore tidal flat and adjacent marsh) and the percentage re-deposited in federal navigation channels or in nearby flood control channels (Figure 3-4). These criteria describe the efficiency and impacts of each design alternative, with the goal of maximizing sediment deposition to tidal flats/marshes, and minimizing sediment lost to the Bay, navigation channels and flood control channels. Modeling results indicated that the 100,000 CY shallow/east placement alternative at Eden Landing in the summer months using dredged material from the Redwood City Harbor federal navigation channel was the optimal strategy, which corresponds to scenario 6 (Figure 3-5, Figure 3-6, Table 3-2, Table 3-3).

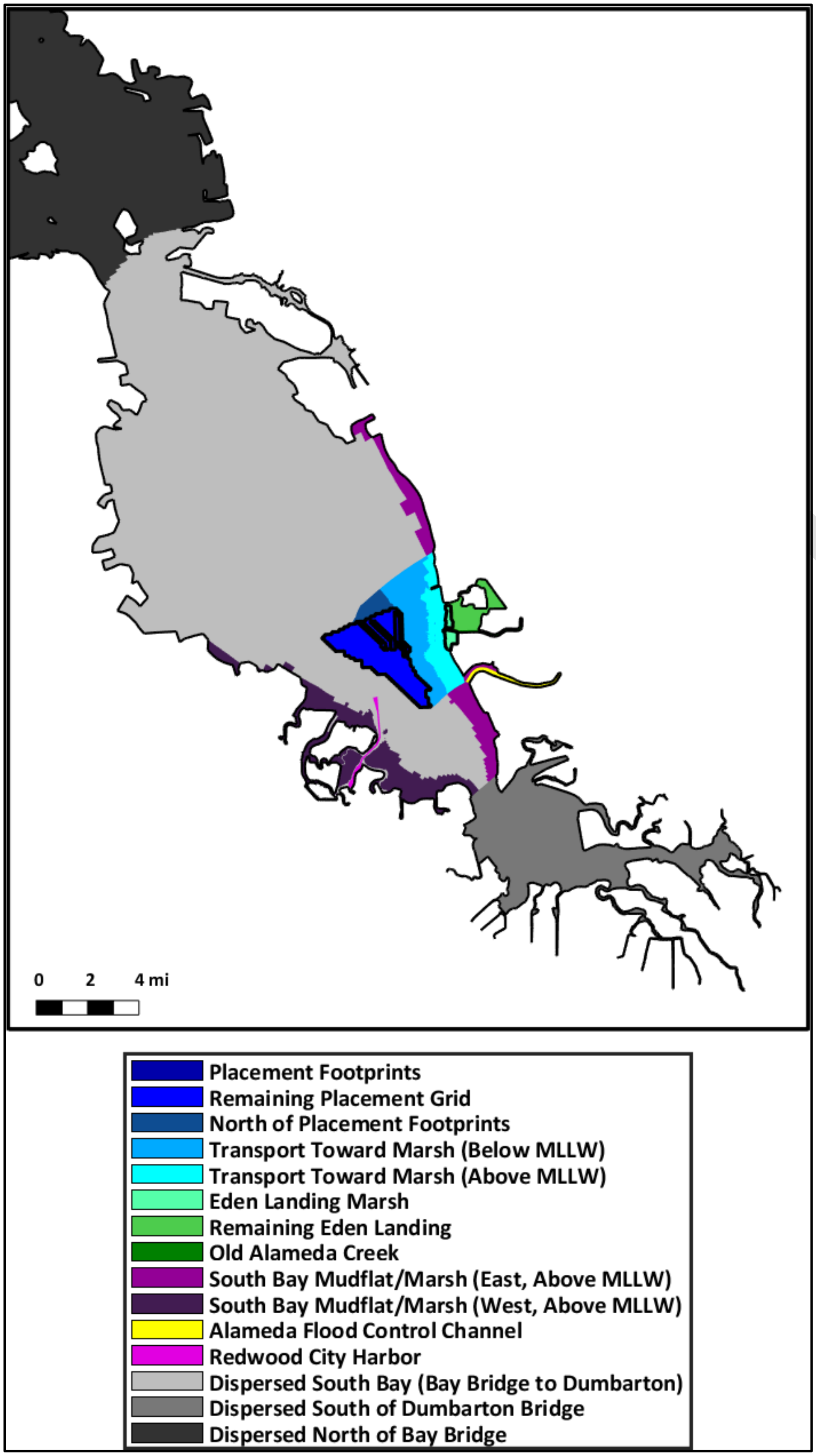

Figure 3-4. Binned regions to determine sediment transport fate from strategic placements toward target mudflats and marshes , ancillary mudflats and marshes, federal navigation channels, and flood control channels.

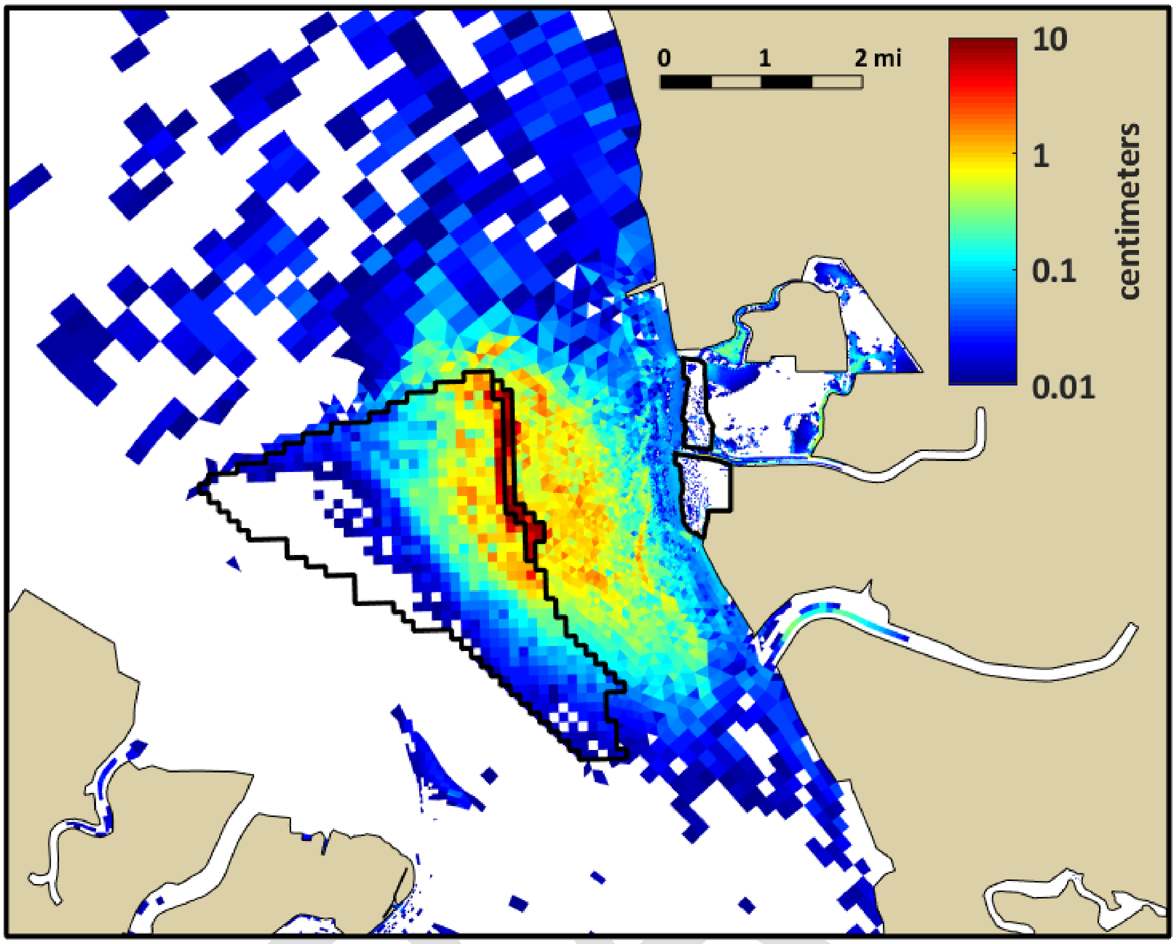

Figure 3-5. Eden Landing shallow/east placement planview indicating sediment deposition thickness after two-month summer model run for 100,000 CY. Note that deposition thickness is on the order of one to two millimeters in the target mudflat and marsh complex.

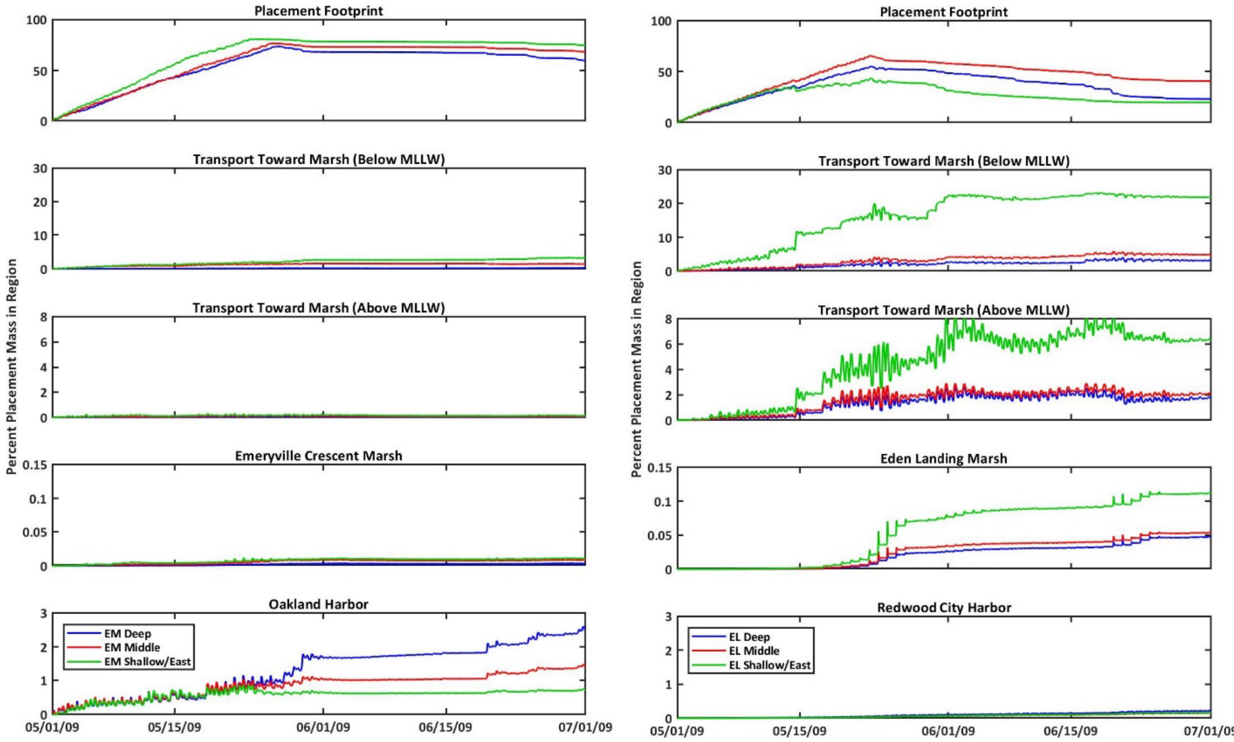

Figure 3-6. Predicted percentage of dredged sediment mass in each region during the 2-month simulations for the initial three Emeryville scenarios (left) and Eden Landing scenarios (right).

Based on the sediment-transport modeling defined above, Eden Landing shallow/east 100,000 CY summertime placement was designated as the proposed action, and Emeryville Crescent shallow/east 100,000 CY summertime placement was designated as Alternative B. For more details on the plan formulation and modeling analyses, see the Decision Document and Appendix B.

3.2 Clean Water Act (404) Alternatives Analysis

In evaluating its projects under Section 404 of the CWA, USACE must clearly demonstrate that there are no practicable, less-damaging alternatives than the Proposed Action. The USACE is responsible for making the formal determination of compliance with the 404 (b)(1) Guidelines. This alternatives analysis, and other available data, will provide input to inform that determination. Proposed alternatives for the Strategic Placement Project include placement of approximately 100,000 CY of material at either Eden Landing marsh or Emeryville Crescent marsh.

Table 3-4 shows the direct, indirect, permanent, and temporary impacts of these alternatives to waters of the U.S. including wetlands. The placement of dredged material is in Bay waters, which are non-wetland waters of the U.S. Direct temporary impacts are measured as the volume of material placement in the project footprint for each alternative.

Table 3-4. Summary of Impacts to Waters of the United States, including Wetlands

Alternative	Non-Wetland (10^3 CY)				Wetlands (10^3 CY)			
	Permanent		Temporary		Permanent		Temporary	
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
Proposed Action (Eden Landing)	0	0	100[1]	0	0	0	0	0
Alternative B (Emeryville Crescent)	0	0	100[2]	0	0	0	0	0
No Action	0	0	100[3]	0	0	0	0	0

[1] Placement of 100,000 CY will be spread across the 138-acre footprint for the Eden Landing Whale's Tail Marsh alternative.
[2] Placement of 100,000 CY will be spread across the 69-acre footprint for the Emeryville Crescent Marsh alternative.
[3] Placement of 100,000 CY will be spread across 8 acres at the Alcatraz Island Disposal Site (SF-11) in-bay placement site or at the San Francisco Deep Ocean Placement Site (SF-DODS).

All alternatives, including the no-action alternative, would place the same volume of material, approximately 100,000 CY, into non-wetland waters of the U.S. Therefore, both these action alternatives would have equivalent direct, temporary impacts to non-wetland waters of the U.S. Both alternatives were carried forward in the focused array.

The following Section 3.3 outlines the two action alternatives, which are analyzed against the No Action Alternative throughout the remainder of this document.

3.3 Focused Array

After screening, two action alternatives were carried forward, placement at Eden Landing and Emeryville Crescent, in addition to a No Action Alternative.

3.3.1 No Action Alternative

The No Action Alternative comprises placing material from a SF Bay federal navigation channel O&M project at its federal standard (aka, base plan) location. In the case of Redwood City Harbor, this material would be placed at the Alcatraz Island Disposal Site (SF-11), the in-bay placement site near Alcatraz Island; in the case of Oakland Harbor, this material would be placed at the offshore location, San Francisco Deep Ocean Disposal Site (SF-DODS). In either case, the No Action Alternative would result in sediment being lost either to the deep ocean or dispersed to deeper subtidal, Bay environments. The consequence is a lost opportunity to maximize BUDM in the Bay.

3.3.2 Eden Landing Whale's Tail Marsh (Proposed Action)

Under this alternative the proposed action would place approximately 100,000 CY of sediment from a SF Bay federal O&M dredging project in a shallow-water placement area adjacent to the mudflat and marsh at Eden Landing (Figure 3-7) to evaluate the ability of tides and currents to move dredged sediment placed in the nearshore environment to the adjacent mudflat and marsh (Figure 3-8, and Figure 3-9). Throughout one dredging episode (i.e., the entirety of channel dredging in any one year) of the Redwood City Harbor O&M Project, scows with dredged material will be diverted from the federal standard placement site SF-11 (Figure 1-1). Typical dimensions for the scows placing sediment are approximately 180 ft (length) by 50 ft (breadth). The material will be placed at the in-bay, strategic placement site with a target thickness between about 0.33 ft and 1 ft. Based on wave and current modeling, it is expected that the scows will need to unload in water depths between 9 and 12 feet in absolute depths (i.e., placement location will vary depending on the stage of the tide, or how deep the water is at any given point) to maximize marsh-ward transport by waves and currents. The total volume of placed material will be approximately 100,000 CY, and placements will occur during flood tides in an approximately 9,700 feet long and 630 feet wide placement footprint (138-acres – comprised by the polygon of yellow and blue grid cells in Figure 3-7) that was determined by computer modeling and geospatial analysis to be most suitable for successful dispersal. Scows, which will be light loaded to approximately 900 CY, will make approximately 112 round trips between Redwood City and the placement site, taking between 19 – 56 days. The placement area and adjacent mudflat-marsh complex will be monitored before and after placement.

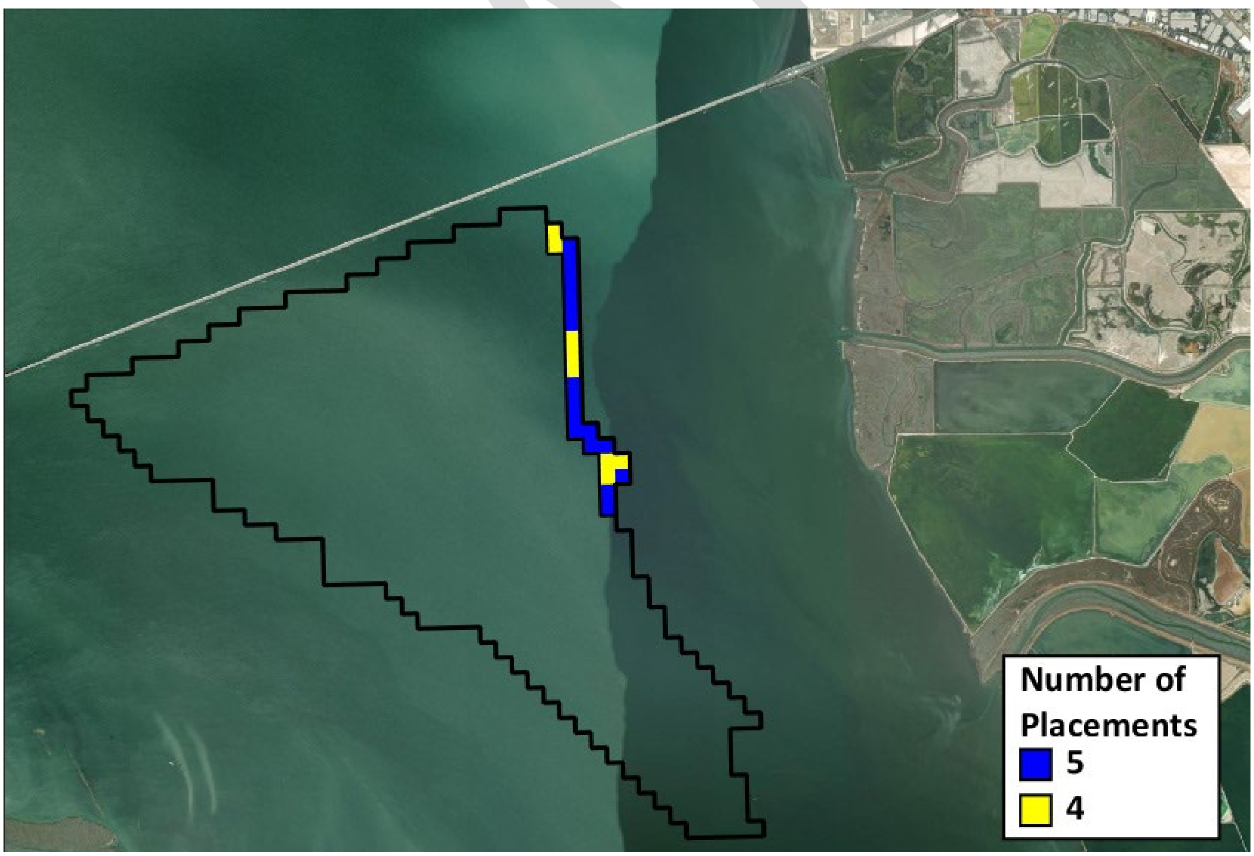

Figure 3-7. Placement cells in shallow water aproximately two miles off the marsh at Eden Landing (i.e., Whale's Tail) for the Shallow/East placement. The black outline represents the entire placement grid, while the blue and yellow cells represent the Eden Landing

Shallow/East placement footprint cells with five and four placements respectively depending on the water depths and tidal timings.

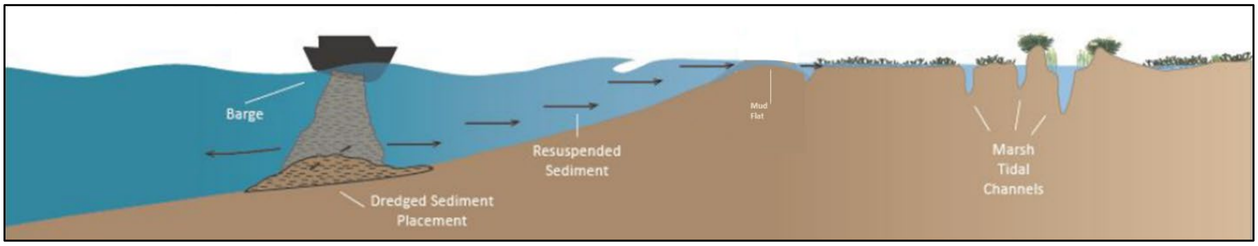

Figure 3-8. Strategic shallow-water placement cross-sectional conceptual model (Stantec and SFEI 2017).

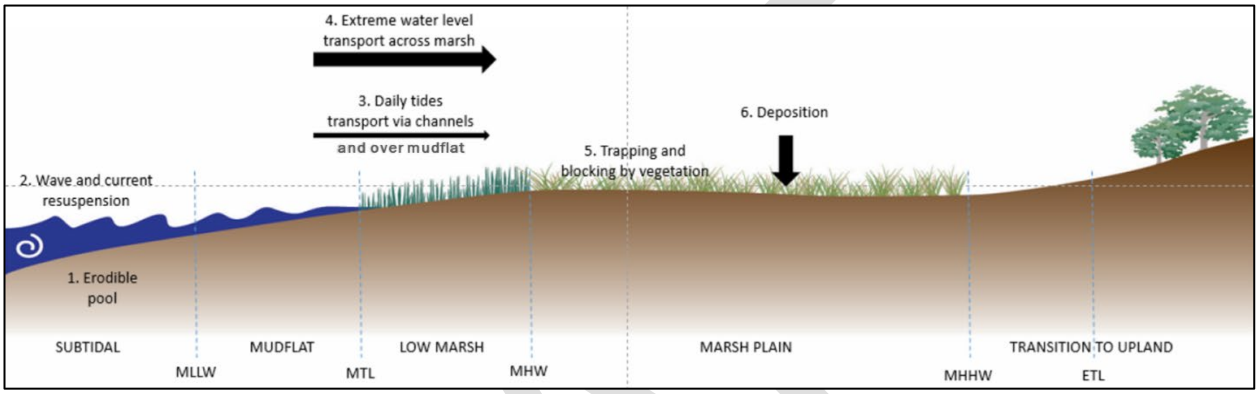

Figure 3-9. Inorganic sediment supply to mudflats and marshes (SFEI 2015). This pilot project aims to mimic the way sediment moves with waves and tides from the shallow subtidal to the mudflats and marshes.

3.3.3 Emeryville Crescent Marsh (Alternative B)

Under this alternative the proposed action would place approximately 100,000 CY of sediment from a SF Bay federal O&M dredging project in a shallow-water placement area adjacent to the mudflat and marsh at Emeryville Crescent (Figure 3-10) to evaluate the ability of tides and currents to move dredged sediment placed in the nearshore environment to the adjacent mudflat and marsh (Figure 3-8 and Figure 3-9). During O&M dredging of Oakland Harbor scows with dredged material would be diverted from the federal standard placement site SF-DODS (Figure 1-1). Typical dimensions for the scows placing sediment are approximately 180 ft (length) by 50 ft (breadth). The material would be placed at the shallow water strategic placement site with a target thickness between about 0.33 ft and 1 ft. Based on wave and current modeling, the scows would need to unload in water depths less than 10 ft in absolute depth (i.e., placement location will vary depending on the stage of the tide) to maximize marsh-ward transport by waves and currents. The total volume of placed material would be approximately 100,000 CY, and placements would take place during flood tides within an approximately 2,500 feet long and 1,250 feet wide placement footprint (69-acres) that was determined by computer modeling and geospatial analysis to be most suitable for successful placement (Figure 3-10 shows the target placement areas shaded in blue and yellow). Scows, which will be light loaded to approximately 900 CY, will make approximately 112 round trips between Oakland Harbor federal navigation channel and the Emeryville Crescent Marsh placement site.

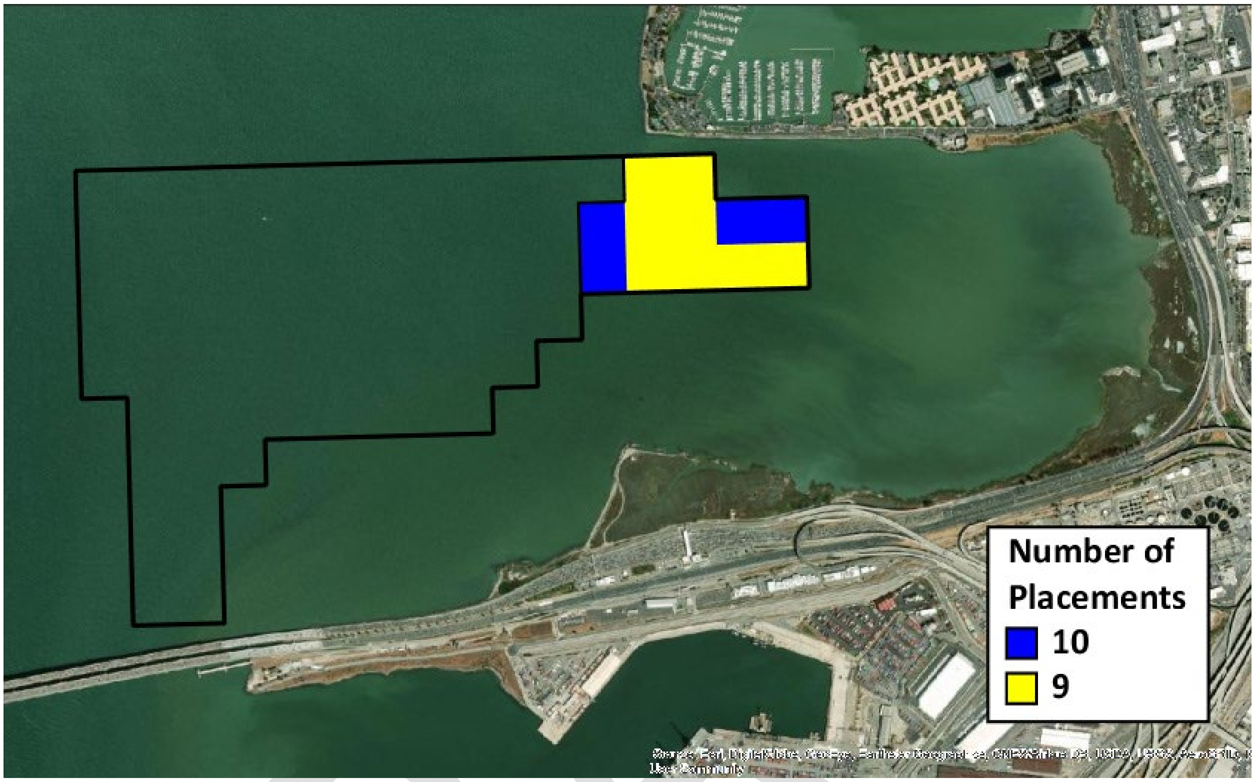

Figure 3-10. Placement cells in shallow water aproximately 2/3rd mile off the marsh at Emeryville Crescent for the Shallow/East placement.

The black outline represents the entire placement grid, while the blue and yellow cells represent the Emeryville Crescent Shallow/East placement footprint cells with 10 and 9 placements respectively depending on the water depths and tidal timings. The placement.

3.4 Pre- and Post-Project Monitoring

Monitoring would be performed for either action alternative and will focus on assessing the following questions and methods. Please see Appendix D for the complete draft monitoring plan for the Proposed Action. Study questions include:

- How quickly does the sediment disperse from the placement area?

The monitoring team will perform repeated bathymetric surveys to determine the initial impact of placement of dredged sediment on the bayfloor morphology and to assess the rate of sediment dispersal out of the placement area. Surveys will be conducted immediately prior to, and following, completion of the dredged material placement operations to quantify the thickness of sediment deposited.

- How do the local wave energy, storms, and the spring-neap tidal cycle influence sediment flux and dispersal of the disposed sediment in the study area?

The monitoring team will measure and collect time-series oceanographic data in bay shallows to 1) monitor for changes in Suspended-Sediment Concentration (SSC) produced by the sediment placement; and 2) document oceanographic forcing before, during, and after the placement of the dredged material, to support the interpretation and modeling of the fate and transport of the sediment.

- Does placement material deposit on the marsh surface or in the restoration area? How long and what abiotic processes determined arrival?

Sediment deposition transects will be established across elevation gradients and vegetation type (see Buffington et al. 2020 for details) across Eden's Landing marsh and restoration sites. At each sampling location we will deploy glass filter pads along a shore/channel-normal transect that collect mineral and organic matter deposited on the marsh surface. Sediment pad samples will be analyzed in the lab for mineral mass and organic matter. Data collection will occur prior to placement and post placement. Samples will be collected monthly for up to 6 months post-placement. To translate deposition into accretion rates we will collect short soil cores adjacent to sediment traps in the marsh to analyze for bulk density and organic matter. Marker Horizons will be deployed using feldspar plots and can provide a comparison between this short-term study and long-term trends. These will be measured throughout the project period.

- Are sediment tracers an effective monitoring tool for sediment addition projects?

To track muddy sediments, the project team will utilize a practical approach commonly termed floc tagging, which requires the tracer particles to have similar hydraulic characteristics (i.e. size, density and settling rate) to one or more of those constituent sediment size fractions found within naturally flocculated material, which facilitates floc tracing by directly labelling them (i.e. the floc aggregates will carry tracer particles during ensuing cycles of resuspension and deposition enabling a means of tracking the movement, and crucially, the fate of the mud flocs. Tracers will be sampled for in the placement area, on target mudflats, on marsh surface, and in nearby restoration ponds with tidal influence.

- How does shallow dredge placement influence the benthic community and foraging resources for demersal fishes and waterbirds? What is the spatial extent of impacts on the benthic community? How long does it take for functional recovery of the benthic community to occur?

To assess the impacts of the shallow placement of beneficial dredge material on the benthos, the project will evaluate both the modeled impact zone as well as a "reference" site using a Before After Control Impact (BACI) framework. The sampling design will incorporate benthic coring on parallel transects within the placement area to ensure intensive sampling of this zone, as well as perpendicular transects extending in all directions from the placement area. The addition of perpendicular transects will allow the team to analyze impacts to the benthos as distance from source increases and modeled sediment depth decreases. The number of cores taken during each sampling event will be based on previous power analyses run on benthic core data from both the Dumbarton shoals and the Central Bay (De La Cruz et al. 2020) to identify the minimum sample size needed to determine a 50% reduction in invertebrate density with 80% power (Steidl et al. 1997; Quinn & Keough, 2002; Di Stefano 2003)

The team will use a modified Benthic Resources Assessment Technique (BRAT), a functional approach first developed by the USACE, to quantitatively evaluate and compare dredge impacted sites in terms of trophic support for bottom feeding fishes (Lunz & Kendall 1982). The BRAT framework integrates information on fish foraging ecology and prey profitability to estimate the energy that is available to particular fish feeding guilds. The modified BRAT (hereafter, MBRAT) is based on SFBE benthic fish foraging ecology and diet information and has been used previously for studies of dredged sites in the estuary (De La Cruz et al. 2017, 2020).

- How does eelgrass respond to strategic shallow water placement?

Eelgrass surveys will be conducted prior to sediment placement to assess conditions at the site. Post placement repeat surveys will be conducted in coordination with other monitoring efforts to sample for size, location, density, and any observed changes to eelgrass conditions post placement.

Monitoring timing will vary by task, but will begin 2 months before placement, and will extend one year after placement. Decisions about specific timing and duration will be made adaptively in consultation with the monitoring team, and project team.

4 Effects Analysis

The following sections assess the existing conditions and potential impacts to physical, biological, and human resources under NEPA and CEQA where appropriate. The CEQA Checklist, prepared by the Regional Water Quality Control Board (RWQCB), can be found in Appendix F.

4.1 Physical Environment

The Strategic Placement Project would not result in adverse effects to tidal marshes or tidal flats, nor would it affect the surface area, flow of water into the Bay, and volume of the Bay. The project does not involve any construction, sewage systems, bayside parking lots, or commercial fishing docks. This project will not cause harm to the public, Bay resources or long-term beneficial uses of the Bay.

Potential impacts to water quality, turbidity, suspended particulates, substrate, currents, circulation, mixing zone, flood control functions, storm, wave and erosion buffers, and erosion and accretion patterns from the two action alternatives, strategic placement at Eden Landing marsh (shallow, 100,000 CY), and Emeryville Crescent marsh (shallow, 100,000 CY), are assessed below in comparison to the No Action Alternative.

Physical resources not analyzed further in this effects analysis include aquifer recharge, base flow, mineral resources, and water supplies/conservation. These resources are not addressed in this analysis because the alternatives would have no impact on these resources.

4.1.1 Water Quality – temperature, salinity patterns and other parameters:

EXISTING CONDITIONS

The seasonal range of water temperature in SF Bay is about 46–74°F. The salinity of the Bay varies daily with the tides and seasonally with weather patterns (lower salinities when freshwater inputs occur from rains or higher salinities during drier periods of low freshwater flows and higher temperatures). In the South Bay where the Eden Landing site is located, salinities remain at near-ocean concentrations (i.e., 28 - 33 parts per thousand) during much of the year. Salinities at the Emeryville Crescent site are similar.

The pH (measure of the acidity or basicity of an aqueous solution) of waters in SF Bay is relatively constant and typically ranges from 7.8 to 8.2 (LTMS, 1998; SFEI, 2013).

The water in the Bay is generally well oxygenated (above 5 mg/L), except during the summer in the extreme southern end of the South Bay, where concentrations are reduced by poor tidal mixing and high-water temperature. Typical concentrations of dissolved oxygen in most of the Bay range from 9 to 10 milligrams per liter (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 (SFEI, 2008).

POTENTIAL IMPACTS

The No Action Alternative would have short-term minor direct and indirect impacts that are less than significant to dissolved oxygen, salinity, temperature, and pH during placement of material from the Redwood City Harbor channel at SF-11 and/or the Oakland Harbor Channel at SF-DODS. Water quality impacts from the action alternatives would include those associated with placement of approximately 100,000 CY of sediment at either Eden Landing under the Proposed Action or Emeryville Crescent under Alternative B. The effects of either alternative would be similar in nature and magnitude largely given the same volume of material would be placed under similar conditions.

The USACE 2015 Federal Navigation Channels EA/ Programmatic Environmental Impact Report (EIR) (USACE, 2015) discusses water quality effects from in-Bay placement associated with plumes from the initial placement event; or in some cases, from subsequent resuspension (from dispersive sites). In most cases, such effects would be limited to the area of the plume following placement and would be temporary and localized. The USACE studies show turbidity plumes at placement sites last only 20 minutes, and plume duration is even less during placement of sandy material because coarse sediments settle out of the water column more quickly than fine sediments (USACE 1976a; LTMS, 1998; Anchor, 2003). Moreover, the nearshore environment is naturally turbid and therefore short-term turbidity increases may differ little from ambient conditions. Direct, localized, minor, and temporary reductions in dissolved oxygen may also occur during placement of material. The impact to dissolved oxygen would be short-term given the placements would take approximately 15 minutes per trip for 112 trips occurring over 19 – 56 days. In general, sediment placed from the scow settles rapidly, and any temporary increases in turbidity or dissolved oxygen concentrations would be dispersed from the small placement area by the broader open water in the Bay. Similar to other in-Bay placements, no impacts to salinity, temperature, and pH are anticipated from either action alternative. The action alternatives could directly result in beneficial effects to water quality by augmenting the local supply of sediment available to support accretion in mudflats and tidal wetlands, which in turn may provide water quality benefits such as filtration functions.

NEPA Determination: For both action alternatives, temporary, minor direct and indirect impacts from changes in turbidity and dissolved oxygen would occur because of material placement in the nearshore aquatic environment. These effects would be largely localized based on the bathymetry, depth, time of year, and tide stage, of the proposed sites and would cease shortly after placement activities. These impacts would be less than significant.

CEQA Determination: Given the naturally turbid nearshore environment in the project vicinity, temporary local increases in turbidity would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality, so this impact would be **less than significant**. Moreover, in permitting the discharge, the Regional Water Board will have to ensure the discharge meets water quality standards, including antidegradation requirements, further ensuring impacts remain less than significant.

4.1.2 Turbidity, suspended particulates:

EXISTING CONDITIONS

Turbidity is the measure of the relative clarity of water that denotes the amount of incident light scattered by suspended material in a water sample. The higher the intensity of scattered light, the higher the turbidity. Materials that contribute to turbidity include clay, silt, small inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms. Turbidity is expressed in Nephelometric Turbidity Units (NTUs). Total suspended solids (TSS) is a measure of the amount of dry-weight mass of non-dissolved solids suspended per unit of water (often measured in mg/L). TSS include inorganic solids (clay, silt, and sand) and organic solids (algae and detritus). In general, higher TSS results in more turbid water.

The bathymetry of SF Bay is an important factor affecting sediment dynamics. South Bay, where the Eden Landing (Proposed Action) Alternative and Emeryville Crescent (Alternative B) action would take place, is characterized by broad shallows that are incised by narrow channels, which are typically 33 to 66 feet deep. These shallower areas are more prone to wind-generated currents and sediment resuspension than deeper areas such as the Central Bay. Net circulation patterns in SF Bay are influenced by Delta inflows, gravitational currents, and by tide- and wind-induced horizontal circulation (LTMS, 1998).

Levels of TSS in the Estuary vary greatly, ranging from 10 mg/L to over 100 mg/L (SFEI, 2011). This variability is influenced by season, tidal stage, and depth. The highly variable nature of SSC in the Bay has also been noted (O'Connor 1991), with the North, Central, and South embayments of the San Francisco Estuary experiencing variability in physical processes that affect SSC and turbidity, including differences in freshwater inflow, hydrology, tides, bathymetry, winds, currents, water quality and salinity (Rich 2010). Shallow areas—and channels adjacent to shallow areas—have the highest SSC. Within the South Bay, sedimentation caused by river inflow was not as important as re-suspension associated with spring-neap tidal cycles in higher TSS (Schoellhamer 1996). The Central Bay generally has the lowest TSS concentrations; however, wind-driven wave action and tidal currents during seasonal windy periods (typically early spring), as well as dredged material placement and sand mining operations, cause elevations in suspended solids concentrations throughout the water column (LTMS, 1998).

Potential impacts

The No Action Alternative would have short-term minor direct and indirect impacts that are less than significant to turbidity and suspended particulates during placement of material from the Redwood City Harbor channel at SF-11 and/or the Oakland Harbor Channel at SF-DODS. Turbidity and TSS impacts from the action alternatives (Proposed Action and Alternative B) would result from placement of approximately 100,000 CY of sediment at either Eden Landing or Emeryville Crescent. Placement of material will create a temporary (on the order of 15 minutes) sediment plume and mound per scow trip (Anchor QEA, 2022). A temporary increase in suspended sediments from the placement plume may reduce light penetration and cause siltation on bottom flora and fauna. Wind waves in this area are sufficient to mobilize the bed most afternoons in the summer, so the difference between ambient conditions and placement conditions at either placement site under the two action alternatives would be minimal.

Predicted SSC adjacent to the placement footprint for Eden Landing and Emeryville Crescent are shown in Figure 4-1 and Figure 4-2. The SSC could be temporarily elevated by as much as 500mg/L in the most extreme case. However, SSC during placement would most frequently range between 50-300mg/L over baseline conditions with the SCC quickly returning to baseline after each placement episode. In comparison, SSC range from 200 mg/L in the winter to 50 mg/L in the summer with shallow areas and their adjacent channels having the highest SSC (Rich 2010). In some cases, SSC of up to 600 mg/L have been measured in turbidity maximum zones during the winter flush which delivers sediments to the northern Bay, though mean TSS values have been measured between 45 and 65 mg/L -1 (O'Connor 1991).

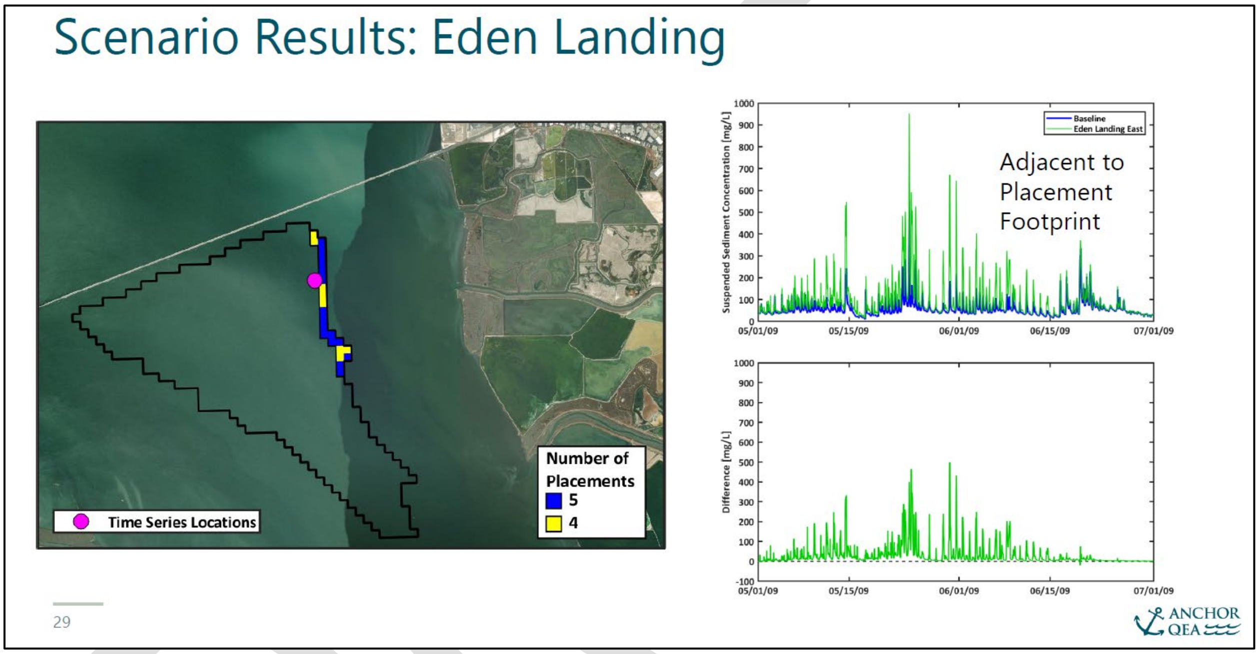

Figure 4-1 SSCs at Eden Landing east placement site relative to basline conditions

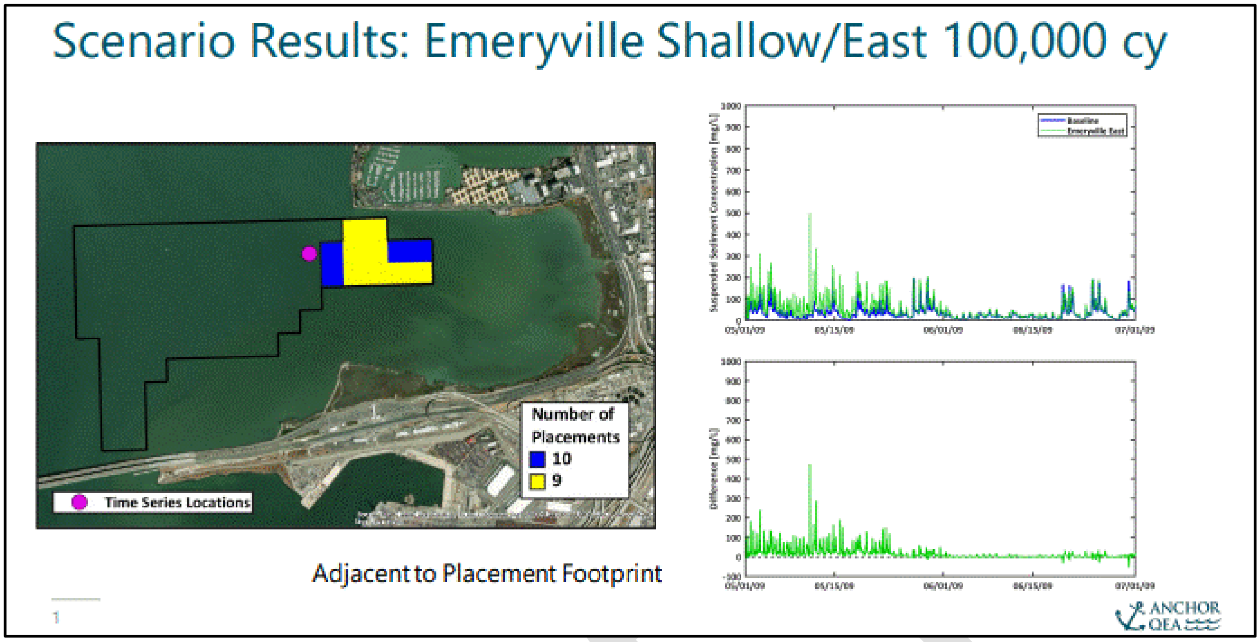

Figure 4-2 SSCs at Emeryville Crescent east placement site relative to basline conditions

NEPA Determination: For both action alternatives, direct, localized, and temporary increases in turbidity and TSS that are similar in nature and magnitude ,may occur during placement of dredge material at the proposed Eden Landing or Emeryville Crescent sties. The effects of both action alternatives would be short-term, and less than significant.

CEQA Determination: Given the naturally turbid nearshore environment in the project vicinity, temporary local increases in turbidity and TSS would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality, so this impact would be **less than significant**. Moreover, in permitting the discharge, the Regional Water Board will have to ensure the discharge meets water quality standards, including antidegradation requirements, further ensuring impacts remain less than significant.

4.1.3 Substrate:

Existing Conditions

Benthic habitats are dominated by younger Bay Muds with occasional lenses/deposits of silt, sand, shell, and other coarse estuarine materials. The benthic substrate for both Eden Landing and Emeryville Crescent is largely mud flat, but also includes oyster shell "hash" (S. De La Cruz, USGS, personal communication, June 28, 2022) and bryozoan reefs (Zabin et al. 2010). Sediment within the Federal navigation channels are primarily Reyes-Clay soils characterized as Bay Mud, containing less than 80 percent sand (Stantec and SFEI, 2017). Grain size sampling from Oakland Harbor Channel September 2022 show; Sand 72% - Silt 21% - Clay 7% - and Percent Fines (Silt and Clay) 28%. Redwood City

Harbor Channel will be sampled in November 2022 and is expected to be slightly siltier than Oakland based on historical data.

POTENTIAL IMPACTS

The No Action Alternative would have short-term minor direct and indirect impacts that are less than significant to substrate during placement of material from the Redwood City Harbor channel at SF-11 and/or the Oakland Harbor Channel at SF-DODS (USACE, 2018). Impacts to substrate from the Proposed Action (Eden Landing Alternative) or Alternative B (Emeryville Crescent Alternative) would derive from placement of approximately 100,000 CY of sediment to the proposed placement sites. Source channel material and receiver site substrate characteristics would be similar and compatible. Placement will result in initial burial of substrate currently in the proposed placement sites and temporary mounding. However, once placed, the material will transport over time via natural processes that would not create sedimentation outside of the normal range. The proposed shallow-water placement areas under each action alternative would avoid sensitive substrate habitats such as eelgrass and oyster beds. Burial for benthic communities living in substrate will occur but would be less than significant given that benthic communities in the shallow water environment are adapted to the scale of predicted deposition. Burial of marsh plant species by sediment naturally transported to the marsh is unlikely to occur and is not a reasonably foreseeable result of strategic subtidal placement.

Monitoring of SSC, sedimentation, oceanographic data, benthic invertebrates (as they pertain to avian and fish foraging), and eelgrass distribution will be conducted during placement and for two months after to verify modeling predictions and effects of the pilot (see Appendix E).

NEPA Determination: Impacts of either of the action alternatives on substrate would be less than significant given the localized, temporary placement activities that involve a limited amount of dredge material which would be generally consistent with the material composition of the substrate at the site.

CEQA Determination: Any changes in the composition and distribution of substrates in the vicinity of the project site would be temporary, and within the range of natural variation observed in local substrates because of the effects of winds, tides, storms, and other physical drivers. Impacts to substrates from the project would therefore be less than significant.

4.1.4 Currents, circulation or drainage patterns:

EXISTING CONDITIONS

The South Bay is a tidally oscillating, lagoon-type estuary, where variations are determined by water exchange between the northern reach and the ocean. Circulation is affected by tides, local winds, basin bathymetry, and the local salinity field (LTMS, 1998). Tides in SF Bay are mixed semidiurnal tides (i.e., two high and two low tides of unequal heights each day). The South Bay can be characterized as a large shallow basin, with a relatively deep main channel surrounded by broad shoals and mudflats. Emeryville Crescent Marsh is located north of Oakland Harbor, and the majority of the marsh is at an elevation around mean high water (MHW) and MHHW. The Whale's Tail portion of Eden Landing Marsh is located on the eastern side of South Bay, and the majority of the marsh is also at an elevation around MHW and MHHW. The surface elevations of the marshes are high enough that the majority of the inundation and sediment transport onto the marshes will occur when water surface elevations are near MHHW or higher (Anchor CEQ, 2022).

POTENTIAL IMPACTS

The No Action Alternative would have short-term minor direct and indirect impacts that are less than significant to circulation patterns during placement of material from an SF Bay federal navigation channel O&M project at its base plan location. Placement of dredged material in shallow water under either of the action alternatives would not disrupt currents, circulation, or drainage patterns and is in fact intended to be performed in a manner that will allow natural currents to deliver sediment to the marshes. Once placed, the material will transport over time via natural processes as discussed above in the Substrate NEPA analysis. Any effects to micro-scale circulation or currents within the placement footprint would be localized, temporary, and with the range of natural variability.

NEPA Determination: The Proposed Action (Eden Landing Alternative) or Alternative B (Emeryville Crescent Alternative) will have a less than significant effect on the natural currents and circulation of the Bay waters.

CEQA Determination: Any changes in local currents or circulation patterns from the project would be temporary, and within the range of natural variation observed in local currents and circulation patterns because of the effects of winds, tides, storms, and other physical drivers. Impacts to currents and circulation patterns from the project would therefore be less than significant.

4.1.5 Mixing zone:

EXISTING CONDITIONS

SF Bay is an ocean-river mixing zone (salt and fresh water) that fluctuates with tides, currents, and circulation patterns. The bay is composed of a northern reach, which is strongly influenced by delta discharge, and South Bay, a tributary estuary which responds to conditions in Central Bay. Circulation is influenced in the northern reach by river flows, tides, and winds. A surface layer of relatively fresh water in Central Bay generated by high delta discharges can induce gravitational circulation in South Bay. During low delta discharges South Bay has nearly the same salinity as Central Bay and is characterized by tide- and wind-induced net horizontal circulation. The Sacramento-San Joaquin Delta contributes approximately 90 percent of freshwater flows to the Bay, the remaining 10 percent comes from streams. Freshwater discharge is highly seasonal and is characterized by large storm inflows during the winter and small, steady summer inflows.

Tidal currents are stronger by a factor of 2 to 3 during spring tides than during neap tides as a result of the greater tidal range (Cheng and Gartner, 1984). A major consequence of this difference is more intense vertical mixing and reduced vertical stratification during spring tides, (Cloern, 1984). Tidal currents are stronger in the channels [more than 100 cm/s (centimeters/second) (3 ft/s)] and weaker in the shallows [less than 20 cm/s (0. 7 ft/s)] and tend to parallel the contours of the bay bottom (Cheng and Gartner, 1984). Slack water occurs earlier in the shallows than in the channels nearby (Cheng and Gartner, 1984). These current asymmetries enhance exchanges of water parcels between the shallows and channels during the tidal cycle. The net shallow-channel exchange contributes significantly to the landward mixing of ocean water and enhances the seaward mixing of river water (Fischer and Dudley, 1975) (Smith (USGS), 1987).

POTENTIAL IMPACTS

The term “mixing zone” means a limited volume of water serving as a zone of initial dilution in the immediate vicinity of the discharge point. In general, a mixing zone should be confined to the smallest practicable zone for the applicable placement site, however , where there is adequate justification to show that widespread dispersion by natural means will result in no significantly adverse environmental effects, the discharged material may be intended to be spread naturally in a very thin layer over a large area rather than be contained at a placement site (EPA & USACE, 1998). The following factors may affect the mixing zone and the USACE considers these when evaluating placement sites of dredged material:

- Depth of water at placement site;
- Discharge vessel speed and direction;
- Rate of discharge;
- Dredged material characteristics (constituents, amount, and type of material, settling velocities); and
- Number of discharges per unit of time.

The No Action Alternative would have short-term direct effects to mixing zones at established material placement locations either during placement of material from the Redwood City Harbor channel at SF-11 or during placement of material from the Oakland Harbor Channel at SF-DODS (USACE, 2018). Mixing zone effects from the Proposed Action or Alternative B would include those associated with placement of approximately 100,000 CY of sediment at the proposed placement site, Eden Landing or Emeryville Crescent, and natural transport of that material to mudflats and marshes. Under either action alternative, a mixing zone will occur. Approximately 900 CY of material will be placed from a scow at depths between 7-9 ft MLLW. The dredged material from each scow-load would be released all at once through the bottom release doors. Release time is expected to require 9 minutes. The material would mix with the water column and because of drift in the water column, maximum depth of the sediment layer as the dredged material settles on the bottom substrate is expected to be between approximately 0.3 feet and 1 foot. The entire placement volume will be 100,000 CY, requiring approximately 112 scow-loads to complete. At maximum, the placement process will occur 24 hours per day, 7 days per week, for approximately 19 - 56 days. Therefore, 4-5 scow-loads will be placed per day on average, although placements could occur as often as every 1.5 hours if the tides allow the site to remain deep enough. The material from the source channels has or will be tested prior to implementation and deemed suitable for in-bay placement. Given the limited volume of material to be placed, the relatively shallow placement, the natural turbidity of the placement areas, and the suitability of the dredge material for placement in-bay, no significantly adverse environmental mixing zone effects are expected, and modeling indicates sediment will be naturally transported onto the marshes will occur during high tides. The placement area and adjacent mudflat-marsh complex will be monitored before and after placement (Anchor QEA, 2022).

NEPA Determination: The Proposed Action (Eden Landing Alternative) or Alternative B (Emeryville Crescent Alternative) would have direct, localized, and temporary mixing zone effects during placement. These effects would be short-term and less than significant.

CEQA Determination: Any changes in local mixing zones from the project would be temporary, and within the range of natural variation observed in local mixing zones because of the effects of winds, tides, storms, and other physical drivers. Impacts to mixing zones from the project would therefore be less than significant.

4.1.6 Flood Risk Management functions:

EXISTING CONDITIONS

The Eden's Landing alternative is in the Bay adjacent to former salt ponds with non-engineered dikes serving as flood risk management features and a flood damage reduction channel (Alameda Creek). Much of the existing marsh is muted tidal and does not fully support flood risk management functionality. Emeryville Crescent is in the Bay adjacent to West Oakland and Emeryville. The landward side is highly developed with industries and communities. Remnant marshes are present in portions of McLaughlin Eastshore State Park. Marshes at Emeryville Crescent are subsided and provide minimal flood risk reduction.

POTENTIAL IMPACTS:

The No Action Alternative would have no impacts to flood-control functions.

The shallow water placement of dredged material at either Eden Landing (Proposed Action) or Emeryville Crescent (Alternative B) could potentially deposit up to 1 mm of sediment in the nearshore area. The action alternatives are expected to have beneficial effects on flood control functions by providing a supplemental source of sediment to accelerate marsh and mudflat accretion to offset future changes in sea level.

NEPA Determination: Either Action Alternative would result in less than significant effects to flood risk management functions. Placement of approximately 100,000 CY of material at either of the action areas would have beneficial impacts on food damage reduction functions.

CEQA Determination: Modeling indicates that the project could drive modest amounts of accretion in tidal areas near the shallow water placement site, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. These accretion rates do not represent a substantial adverse impact to local and regional flood risk management functions. Accretion in local mudflats and marshes would result in a beneficial impact to local and regional flood risk management functions because higher mudflats and marshes are more effective at attenuating wave energy. Impacts to flood risk management functions from the project are therefore less than significant.

4.1.7 Storm, wave, and erosion buffers:

EXISTING CONDITIONS

Subtidal and intertidal mudflats along with marshes, salt ponds and associated non-engineered dikes, and flood control channels serve as buffers to reduce damage from storms, waves, and erosion on land adjacent to the Bay. Uncertainties in terms of impacts to marshes as flood barriers consist of the rate of SLR, which is dependent on future emissions, and whether long-term availability of sediment will be enough for tidal elevations to keep pace with changes in water levels (SBSP 2019). More recent studies suggest that if we don't restore subsided areas to tidal action before mid-century (when the rate of SLR is projected to accelerate), they may never achieve desired marsh elevation (Point Blue Conservation Science et al. 2019), and areas restored by 2030 are more likely to be resilient (Goals Project 2015). A change in sediment regime and SLR could lead to localized erosion and long-term loss of mudflats and marshes in San Francisco Bay.

POTENTIAL IMPACTS

The No Action Alternative would place material from the Redwood City Harbor channel at SF-11 or the Oakland Harbor Channel at SF-DODS and would have no effect on storm, wave, or erosion buffers, including no beneficial effects on such buffers.

Strategic placement techniques such as the nearshore, shallow-water placement under the Proposed Action or Alternative B, offer one of many possible management approaches to address the future problem of losing mudflats and marshes (Stantec and SFEI, 2017), which provide storm, wave, and erosion buffers along the margins of the Bay. Waves can potentially feed sediment toward existing marsh to mitigate shoreline erosion and flooding. Because of the nature of the transport method, which relies on wind-wave resuspension and tidal transport, the shallow-water placement technique has several ecological advantages:

• It would allow for natural patterns of sediment delivery in marshes and mudflats, thus preserving natural processes that support the creation of microtopography;

• Since there are natural limits on the amount of sediments that can be resuspended, SSC, after the initial plume settles, would be within the range of natural variability for water column, mudflats, and marshes; and mudflats and marshes would be fed at a continuous low rate;

• Sediment particles arriving on marshes and mudflats will have been reworked by waves, ensuring that resulting soil properties will likely match the soils already present in receiving areas.

Therefore, either the Proposed Action or alternative B would have a potentially beneficial effect on the functions of erosion buffers or storm or wave attenuation of Bay waters.

NEPA Determination: Both action alternatives would result in negligible adverse impacts to storm, wave, or erosion buffers. Placement of approximately 100,000 CY of material at either nearshore site would have beneficial impacts on storm, wave, and erosion buffers.

CEQA Determination: The purpose of the project is to increase sediment delivery to tidal mudflats and marshes. Though the placed sediment is likely to erode into the water column and be advected into adjacent tidal waters, sediment placement is unlikely to influence the erosion of *in situ* benthic sediment elsewhere in the vicinity. Modeling indicates that the project could drive modest amounts of accretion in tidal areas near the shallow water placement site, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. These accretion rates do not represent a substantial adverse impact to local storm, wave, and erosion buffers. Accretion in local mudflats and marshes would result in a beneficial impact to local storm, wave, and erosion buffers because higher mudflats and marshes are more effective at attenuating wave energy. There would therefore be **less than significant** impacts to storm, wave, and erosion buffers from the project.

4.1.8 Erosion and accretion patterns:

EXISTING CONDITIONS

Eden Landing and Emeryville Crescent are both subsided marshes that will continue to experience adverse impacts from climate changes. Holocene tidal marsh and mudflat ecosystems in SF Bay have evolved to respond to and benefit from episodic pulses of sediment from both watershed- and estuarine-derived sources; without this sediment, these systems are unlikely to be resilient to rising sea levels driven by climate change (Goals Project 2015).

POTENTIAL IMPACTS

The No Action Alternative would have no effect on erosion or accretion patterns during placement of material from the Redwood City Harbor channel at SF-11 and/or the Oakland Harbor Channel at SF-DODS (USACE, 2018).

Impacts to erosion and accretion patterns from either the Proposed Action or alternative B would include those associated with the placement of material in the nearshore at either Eden Landing or Emeryville Crescent. Modeling indicates that the project could drive modest amounts of accretion in nearby tidal areas, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. Given this tolerance of variability in natural sediment delivery across space and time, and the relatively modest amount of accretion expected in the region's tidal systems as a result of the project, it is highly unlikely that sensitive tidal marsh communities (and their dependent special-status species) would be adversely impacted by the project. Indirect accretion is expected to occur after placement as tidal processes transport material to adjacent mudflats and marshes. These impacts would be short-term. Material to be placed will be suitable for shallow water placement.

NEPA Determination: The action alternatives are expected to have indirect beneficial effects including increased mudflat and marsh accretion. No significant adverse effects to erosion or accretion would occur under the action alternatives.

CEQA Determination: See previous discussion under 4.1.6 and 4.1.7. The purpose of the project is to increase sediment delivery to tidal mudflats and marshes. Modeling indicates that the project could drive modest amounts of accretion in tidal areas near the shallow water placement site, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. These accretion rates do not represent a substantial adverse impact to local accretion and erosion patterns. The project would likely result in beneficial impacts to local accretion rates. There would therefore be **less than significant** impacts to accretion and erosion rates from the project.

4.1.8.1 Marshes Erosion and Accretion:

EXISTING CONDITIONS

Emeryville Crescent Marsh is located north of Oakland Harbor, and the majority of the marsh is at an elevation around mean high water (MHW) and mean higher high water. The Whale's Tail portion of Eden Landing Marsh is located on the eastern side of South Bay, and the majority of the marsh is also at an elevation around MHW and MHHW. The surface elevations of the marshes are high enough that the majority of the inundation and sediment transport onto the marshes will occur when water surface elevations are near MHHW or higher.

POTENTIAL IMPACTS

Successful implementation of strategic placement under either the Proposed Action (Eden Landing Alternative) or Alternative B (Emeryville Crescent) would increase rates of sediment accretion either in shallow water, mudflats, or marsh habitats, and possibly offshore, or in all four. If these methods are effective, it is assumed that they will alter existing habitat conditions and stabilize marshes or mudflats that would be losing elevation as sea-level rises. Effective options for increasing accretion of sediment on mudflats and marshes may have direct and indirect effects to valued species and communities as discussed in the Biological Environment Section Below. Tradeoffs will be almost inevitable, and impacts must be considered in context of the likelihood that management actions could improve the overall long-term survival of baylands habitats and species.

The No Action Alternative would have no effect on marshes The No Action Alternative would result in a lost opportunity to beneficially use dredged material during dredging from a SF Bay federal navigation channel O&M project and placement at its base plan location. In the case of Redwood City Harbor, this material would be placed at SF-11, the in-bay placement site near Alcatraz Island; in the case of Oakland Harbor, this material would be placed at the offshore location, SF-DODS.

NEPA Determination: Placement of approximately 100,000 CY of material under either the Proposed Action (Eden Landing Alternative) or Alternative B (Emeryville Crescent) would have beneficial impacts on marsh elevation.

CEQA Determination: See previous discussion under 4.1.6, 4.1.7, and 4.1.8. The purpose of the project is to increase sediment delivery to tidal mudflats and marshes. Modeling indicates that the project could drive modest amounts of accretion in tidal areas near the shallow water placement site, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. These accretion rates do not represent a substantial adverse impact to local marshes. The project would likely result in beneficial impacts to local accretion rates by helping marshes to keep pace with rising sea levels. There would therefore be **less than significant** impacts to marshes from the project.

4.1.8.2 Mudflats Erosion and Accretion:

EXISTING CONDITIONS

Mudflats are sparsely vegetated intertidal areas that occur from approximately MLLW to mean tide level. Beaches occur where mudflats extend above the mean tide level. Mudflats provide banks and upland shoreline with protection from wave energy and capture suspended sediment.

The bayward edge of the marsh erodes or grows (progrades) horizontally depending on the energy and direction of waves produced by the wind (wind waves), sediment supply, vegetative structure, and SLR. Mudflat governs many of these conditions at the bayward marsh edge, as the extent and depth of mudflat influences the size and energy of waves reaching the marsh and regulates its contribution as a local source of sediment. Thus, mudflats and marshes are interdependent parts of the complete tidal wetlands system. Mudflats dampen and regulate offshore waves, causing the waves that reach the marsh to be relatively constant in height for a given water depth. Mudflat slope and shape thus control to some degree the balance between marsh erosion and progradation. A combination of sediment supply and wave energy determines the shape and elevation of the mudflat. If mudflat elevation does not keep pace with SLR, more wave energy will reach the marsh edge, leading to erosion and loss of marsh extent (Goals Project 2015).

The mudflat serves to temporarily store sediment for resuspension and filter offshore waves. As small waves grow with shoaling, they break or are attenuated because of friction on the mudflat and marsh surface.

Within the normal tidal range, mudflats can dampen offshore waves to a lower height; if the mudflat is high enough in the tidal frame, high energy events will only reach the marsh edge at extreme water levels (Lacy and Hoover 2011). Where the mudflat is lower in the tidal frame, or narrow, wave energy at the marsh edge tends to be higher. Thus, the effects of mudflat slope and shape on shoreline position likely represent a negative feedback loop; the marsh edge may erode, depositing on and widening the mudflat until wave energy is reduced sufficiently such that erosion no longer occurs (Lacy and Hoover 2011). If mudflat elevations do not keep pace with SLR, more wave energy will reach the shoreline more frequently, thus increasing exposure of the marsh to higher wave energy and increasing the risk of shoreline erosion (BCDC 2013).

Mudflats at the project alternative sites (i.e., Eden Landing and Emeryville Crescent) consist of Bay Mud, which is comprised of soft and unconsolidated silty clays. These mudflats are found in the intertidal and subtidal environment and are either periodically saturated or fully saturated with water. Mudflat environments have high organic content because of the accumulation of decaying marine organism material. They include living organisms as well, such as mollusks and arthropods, and serve as important feeding and resting habitat for shorebirds and other aquatic species. SF Bay mudflats also serve as important substrate for primary producers such as eelgrass.

These mudflats formed from alluvial deposits of clays, silts, and sands from tributaries and other fluvial inputs into San Francisco Bay. Deposition on these mudflats has been interrupted by sea-level changes and previous human activities, including mining during the Gold Rush Era in the mid-19th Century. Much of the deposition on mudflats in SF Bay occurred during this time period, and the sediment on these mudflat plains is often referred to as Young Bay Mud.

POTENTIAL IMPACTS

The No Action Alternative would have no effect on mudflats. The No Action Alternative would result in a lost opportunity to beneficially use dredged material during dredging from a SF Bay federal navigation channel O&M project and placement at its base plan location. In the case of Redwood City Harbor, this material would be placed at SF-11, the in-bay placement site near Alcatraz Island; in the case of Oakland Harbor, this material would be placed at the offshore location, SF-DODS.

Based on initial modeling results, the proposed project action alternatives would see 1-2 mm of sediment deposition on the mudflats between the nearshore strategic placement site and adjacent mudflats (Anchor QEA, 2022).

NEPA Determination: Less than significant impacts to mudflats would occur under either the Proposed Action (Eden Landing Alternative) or Alternative B (Emeryville Crescent). Placement of approximately 100,000 CY of material at the study area would have beneficial impacts on mudflats through dispersion of sediment onto the flats.

CEQA Determination: See previous discussion under 4.1.6, 4.1.7, 4.1.8, and 4.1.8.1. The purpose of the project is to increase sediment delivery to tidal mudflats and marshes. Modeling indicates that the project could drive modest amounts of accretion in tidal areas near the shallow water placement site, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. These accretion rates do not represent a substantial adverse impact to local mudflats. The project would likely result in beneficial impacts to local accretion rates by helping mudflats to keep pace with rising sea levels. There would therefore be **less than significant** impacts to mudflats from the project.

4.1.9 Air Quality:

REGULATORY SETTING

Regulation of air pollution is achieved through both national and State ambient air quality standards and emission limits for individual sources of air pollutants. As required by the federal Clean Air Act (CAA), the United States Environmental Protection Agency

(USEPA) has identified criteria pollutants and has established the National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These pollutants are called "criteria" air pollutants because standards have been established for each of them to meet specific public health and welfare criteria, as well as thresholds to determine if a project complies. The following EPA criteria for air pollutants have been classified for the project area: ozone = over 8 hr 0.070 ppm ([O_3] Nonattainment-Marginal); carbon monoxide = over 1 hr 35 ppm, or over 8 hours 9 ppm ([CO] Non-Attainment Moderate); nitrogen dioxide = over 1 hr 100 ppb, or over 1 year 53 ppb([NO_2] Attainment-Maintenance); sulfur dioxide = primary over 1 hour 75 ppb, secondary over 3 hours 0.5 ppb ([SO_2] Attainment-Unclassifiable); particulate matter less than 10 microns in diameter = over 24 hours 150 µg/m3 ([PM_{10}] Attainment-Maintenance); and particulate matter 2.5 microns or less in diameter = over 24 hours 35 µg/m3 ([$PM_{2.5}$] Attainment-Unclassifiable).

In addition to the Federal NAAQS and the yearly significance thresholds, there are also state laws which have established California Ambient Air Quality Standards (CAAQS) for criteria air pollutants and criteria pollutant thresholds for projects. These thresholds are set by air quality management districts for projects within their air basin of jurisdiction. The project area lies within the Bay Area Air Quality Management District (BAAQMD) which has set daily and yearly criteria pollutant thresholds based on CAAQ (Table 4-1).

Table 4-1. NAAQS, EPA Yearly Significance Thresholds, CAAQS, and BAAQMD thresholds that are effective in the project area.

NAAQS, CAAQS, Federal, and BAAQMD Thresholds for Criteria Air Pollutants Criteria Pollutant	NAAQS	EPA Yearly Significance Thresholds (tons/year)	CAAQS	BAAQMD Daily Threshold (Pounds/Day)	BAAQMD Yearly Threshold (Tons/Year)
Reactive Organic Gases (ROG)	N/A	100	N/A	54	10
Nitrogen Oxides (NO_x)	.05 ppm (Annual) .10 ppm (1-Hour)	100	.03 ppm (Annual) .18 ppm (1-Hour)	54	10
Ozone (O_3)	.07 ppm (Annual)	N/A	.07 ppm (Annual) .09 ppm (1-Hour)	N/A	N/A
PM_{10}	150 µg/m3 (24-Hour)	100	20 µg/m3 (Annual) 50 µg/m3 (24-Hour)	82	15
$PM_{2.5}$	12 µg/m3 (Annual)	100	12 µg/m3 (Annual)	54	10

	35 µg/m3 (24-Hour)				
Sulfur Dioxide (SO_2)	.03 ppm (Annual) .14 ppm (24-Hour)	100	.04 ppm (24-Hour)	N/A	N/A
Lead	0.15 µg/m3 (90-Day)	N/A	1.5 µg/m3 (30-Day)	N/A	N/A
Sulfate	N/A	N/A	25 µg/m3 (24-Hour)	N/A	N/A
Carbon Monoxide (CO)	9 ppm (Annual) 35 ppm (1-Hour)	100	9 ppm (Annual) 20 ppm (1-Hour)	N/A	N/A
Hydrogen Sulfide (H_2S)	N/A	N/A	.03 ppm (1-Hour)	N/A	N/A
Vinyl Chloride	N/A	N/A	.01 ppm (24-Hour)	N/A	N/A

AIR QUALITY ANALYSIS

Based on the Federal emissions thresholds established by EPA using NAAQS and BAAQMD thresholds established using CAAQS, an emissions inventory and air quality analysis was performed using the steps below to ensure that project emissions would not exceed these thresholds:

Step 1 (Emissions Inventory)
Calculate the total emissions across all the dredging and placement equipment for each day for each criteria air pollutant, to calculate the daily emissions expected. For this step emissions factor data will be needed, such as those available through the EPA Port Emissions Inventory Guidance (EPA 2022).

Step 2 (Emissions Inventory)
Sum the results of step one for each criteria air pollutant and multiply by the number of working days over the total work schedule for each calendar year and convert to tons to calculate the total emissions expected to be released for the project, to calculate the yearly emissions expected.

Step 3 (Air Quality Analysis)
Compare the results of step one and two with the applicable threshold from the EPA and BAAQMD to ensure project emissions are below the thresholds for each individual criteria air pollutant.

Table 4-2 summarizes the air quality analysis. The full air quality analysis is in Appendix A-4. The air quality analysis shows that under all action alternatives, emissions do not exceed federal CAA de minimus thresholds and therefore a general conformity analysis is not needed.

Table 4-2. Air Quality Analysis Results.

		ROG	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$
Alternative A: Proposed Action	REDWOOD CITY HARBOR SEDIMENTS TAKEN TO EDEN LANDING PLACEMENT SITE						
	Peak Daily Emissions Total (lbs/day)	1.24	3.87	28.45	5.09	0.61	0.55
	Yearly Project Emissions Totals (tons/year)	0.04	0.13	0.94	0.17	0.02	0.02
	BAAQMD Average Daily Threshold (lbs/day)	54.00	N/A	54.00	N/A	82.00	54.00
	Project Emissions Exceed BAAQMD Daily Thresholds?	NO	N/A	NO	N/A	NO	N/A
	BAAQMD Yearly Threshold (tons/year)	10.00	N/A	10.00	N/A	15.00	10.00
	Project Emissions Exceed BAAQMD Yearly Thresholds?	NO	NO	NO	NO	NO	NO
	EPA Yearly Significance Thresholds (tons/year)	100.00	100.00	100.00	100.00	100.00	100.00
	Project Emissions Exceed Federal Yearly Threshold?	NO	NO	NO	NO	NO	NO
Alternative B	OAKLAND DREDGING TAKEN TO EMERYVILLE CRESCENT PLACEMENT SITE						
		ROG	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$
	Peak Daily Emissions Total (lbs/day)	1.27	3.98	29.26	5.24	0.63	0.57
	Yearly Project Emissions Totals (tons/year)	0.04	0.13	0.97	0.17	0.02	0.02
	BAAQMD Average Daily Threshold (lbs/day)	54.00	N/A	54.00	N/A	82.00	54.00
	Project Emissions Exceed BAAQMD Daily Thresholds?	NO	N/A	NO	N/A	NO	N/A
	BAAQMD Yearly Threshold (tons/year)	10.00	N/A	10.00	N/A	15.00	10.00
	Project Emissions Exceed BAAQMD Yearly Thresholds?	NO	NO	NO	NO	NO	NO
	EPA Yearly Significance Thresholds (tons/year)	100.00	100.00	100.00	100.00	100.00	100.00
	Project Emissions Exceed Federal Yearly Threshold?	NO	NO	NO	NO	NO	NO

AIR QUALITY EMISSIONS: ALTERNATIVES COMPARED TO THE NO ACTION ALTERNATIVE:

In addition to considerations for federal and BAAQMD thresholds for compliance with the CAA, the project alternatives may also be evaluated for air emissions production when compared to the No Action Alternative. For this comparison, emissions for each alternative were multiplied by 5 since scow sizes for project alternatives are 900 CY, whereas the scow size for the No Action Alternative for Oakland and Redwood City Harbors are 4,500 CY, five times more. Emissions for No Action Alternatives were calculated using emissions factors from the USACE EA for Maintenance Dredging of the Federal Navigation Channels in SF Bay Fiscal Years 2015-2024, Appendix A: Air Quality, which included ROG, CO, NOx, and PM for criteria air pollutants which were used for the comparison to emissions from project alternatives.

For Alternative A and B, the placement sites were closer in distance than for the No Action Alternative, though would still result in an expected increase in overall barge emissions from a five-fold increase in barge trips because of the need for light loading to only 900 CY which increases the number of barge trips. Although an increase to emissions above the No Action Alternative is expected, emissions produced from project alternatives would still not exceed federal or BAAQMD thresholds. Table 4-3 summarizes the results of comparing the No Action Alternative with 1 barge trip to the equivalent volume loaded for project alternatives using five barge trips.

Table 4-3. Alternative A and B Emissions Compared to No Action Alternative Emissions.

Alternative A Compared to No Action Alternative		ROG (lbs)	CO (lbs)	NO_x (lbs)	PM_{10} (lbs)
No-Action	Redwood City to SF-11 Using 1 Scow with 4,500 CY/load	0.73	18.84	23.64	0.55
Alternative A	Redwood City to Eden Landing Using 5 Scows with 900 CY/load	6.18	19.35	142.26	3.06
Alternative B Compared to No Action					
No Action	Oakland Harbor to SF-DODS Using 1 Scow with 4,500 CY/load	1.77	52.13	57.24	1.32
Alternative B	Oakland Harbor to Emeryville Using 5 Scows with 900 CY/load	6.36	19.90	146.31	3.14

NEPA Determination: Based on the emissions inventory and air quality analysis, the project alternatives and the No Action Alternative would produce emissions below the federal thresholds for criteria air pollutants, and therefore result in less than significant impacts to air quality.

CEQA Determination: The BAAQMD 2017 Clean Air Plan/Regional Climate Protection Strategy (CAP/RCPS) provides a roadmap for BAAQMD's efforts over the next few years to reduce air pollution and protect public health and the global climate.

When a public agency contemplates approving a project where an air quality plan consistency determination is required, BAAQMD recommends that the agency analyze the project with respect to the following questions: (1) Does the project support the primary goals of the air quality plan; (2) Does the project include applicable control measures from the air quality plan; and (3) Does the project disrupt or hinder implementation of any air quality plan control measures? If the first two questions are concluded in the affirmative and the third question concluded in the negative, the BAAQMD considers the project consistent with air quality plans prepared for the Bay Area.

The recommended measure for determining project support of these goals is consistency with the previously mentioned BAAQMD thresholds of significance. As indicated in Table 4-2, the proposed project would not exceed the BAAQMD significance thresholds; therefore, the proposed project would support the primary goals of the 2017 CAP/RCPS and would not hinder implementation of any of the control measures. Impacts to air quality would be limited to the duration of construction, during which Mitigation

Measure AQ-1 would be implemented; no long-term changes to emissions would occur as a result of the project.

Mitigation Measure AQ-1

Basic Exhaust Emissions Reduction Measures

BAAQMD's CEQA Air Quality Guidelines require several best management practices to control exhaust emissions regardless of the estimated construction emissions. The BAAQMD requires that the following measures be implemented by the construction contractor:

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations). Clear signage shall be provided for construction workers at all access points.

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

Project construction would generate short-term emissions of air pollutants, including equipment exhaust emissions. The BAAQMD CEQA Air Quality Guidelines recommend quantification of construction-related exhaust emissions and comparison of those emissions to significance thresholds.

Table 4-2 provides the estimated construction emissions for the proposed project. The average daily construction period emissions (i.e., total construction period emissions divided by the number of construction days) were compared to the BAAQMD significance thresholds. Construction-related emissions would be below the BAAQMD significance thresholds. Implementation of mitigation measure AQ-1 would reduce impacts to air quality from project construction to less than significant with mitigation.

4.1.10 Climate Change (Greenhouse Gas Emissions)

EXISTING CONDITIONS

SF Bay is classified as warm and temperate, with an average temperature of 56.4 degrees F and 22.9 inches of annual average rainfall. The winters are rainier than the summers and the least amount of rainfall occurs in July, while the greatest amount of precipitation occurs in February, with an average of 4.6 inches. Temperatures are highest on average in September, at around 62.7 degrees F, with the lowest average temperatures in the year occurring in January when it is around 49.2 degrees F (Climate-data.org, 2022).

Regulatory Setting

Climate change as a broad science can encompass air, water, and biological resources, though the root cause has been attributed by most of the scientific community to atmospheric carbon dioxide concentration and other greenhouse gases (GHGs) such as methane and oxides of nitrogen, collectively referred to as GHGs (Mora et al. 2018). To make comparisons more easily for GHGs released by different projects, various GHGs such as carbon dioxide, methane, and oxides of nitrogen are often combined into carbon dioxide equivalents (CO_{2eq}), by using the global warming potential of each gas as it relates to carbon dioxide, as found in CFR Title 40 Chapter I Subchapter C Part 98 Table A-1 “Global Warming Potentials”. In this way, all greenhouse gas emissions from a given project could be converted to CO_{2eq} and used for comparing to a given threshold to determine whether GHG project emissions would represent a significant impact. Although the scientific community largely agrees on GHGs as a major driver of climate change and how to use CO_{2eq} to compare the total GHG emissions from various projects, federal guidance on thresholds for determining whether mobile source emissions from a project would result in a significant impact are lacking Although BAAQMD does have established thresholds for determining impacts to climate change for operational-related emissions, no such threshold has been established for the equipment. Therefore, until a numeric threshold is established a qualitative assessment will be used to determine if the emission of CO_{2eq} from the project constitutes a significant impact.

GHG Emissions Inventory & Qualitative Assessment:

Carbon emissions would only be increased temporarily during the project from equipment emissions and would not significantly increase barging emissions over the No Action Alternative, which would vary by the alternative that is carried out. The overall project emissions pertinent to GHGs like oxides of carbon, methane, nitrogen, and methane were converted to CO_{2EQ} to compare alternative emissions pertinent to climate change to the regional output of CO_2. Please see Table 4-4 below for the global warming potentials used to make the conversion. After converting GHG emissions to CO_{2EQ} and comparing to the regional output, it was found that project emissions were very small in comparison to the total constant output of the surrounding urban area, such as San Francisco County, which has an output measured in millions of metric tons per year (UCB 2020). The results of the GHG inventory can be found below in (Table 4-5) for each alternative. Please see Appendix A-4 for the full analysis.

Table 4-4. CO_{2EQ} Conversion Equation

$CO2eq = CO2 + X*CO + Y*NOx + Z*CH4$
Where X = 100 Year Global Warming Potential for Carbon Monoxide = 1
Where Y = 100 Year Global Warming Potential for Oxides of Nitrogen = 298
Where Z = 100 Year Global Warming Potential for Methane = 25
CFR Title 40 Chapter I Subchapter C Part 98: Table A-1 Global Warming Potentials

Table 4-5. GHG Emissions Inventory Results

	Redwood Dredging Taken to Eden Landing Placement Site	
Proposed Alternative A	Total CO2eq (lbs/day)	1382.78
	Total Project CO2eq (Tons)	45.63
	Council on Environmental Quality Yearly GHG Threshold (CO2eq) (Tons)	None
	Project Exceeds Council on Environmental Quality Yearly GHG Threshold?	**N/A**
	Project is Significant with Respect to Regional Output?	**No**

	Oakland Dredging Taken to Emeryville Crescent Placement Site	
Alternative B	Total CO2eq (lbs/day)	1422.22
	Total Project CO2eq (Tons)	46.93
	Council on Environmental Quality Yearly GHG Threshold (CO2eq) (Tons)	None
	Project Exceeds Council on Environmental Quality Yearly GHG Threshold?	**N/A**
	Project is Significant with Respect to Regional Output?	**No**

NEPA Determination: After quantifying the expected GHG emissions from the project alternatives it was found they would be small relative to the regional output. Therefore, the proposed project Alternatives A and B, and the No Action Alternative would not have a measurable adverse effect and no significant impacts to climate change are expected from the project.

CEQA Determination: See Section 4.1.9 and Appendix A-4 for information about the model used to quantify GHG emissions associated with project construction activities. The proposed project's estimated construction related GHG emissions would be approximately 108.3 tons of CO2e. There is no BAAQMD CEQA significance threshold for construction-related GHG emissions. However, this value would be below the 2030 bright line GHG significance threshold of 660 metric tons per year. Therefore, this impact would be less than significant.

4.1.11 Contaminants in dredge or fill material:

EXISTING CONDITIONS

Within the SF Bay area, the Dredged Material Management Office (DMMO) requirements for sediment testing conducted prior to each maintenance dredging episode are based on a tiered structure, and depend on the placement sites being considered, and past testing results.

Regional Monitoring Program (RMP) monitoring results indicate that sediment toxicity in SF Bay has consistently been observed in a large proportion of samples tested, but varies over time (SFEI, 2006). These variations probably reflect changes in sediment contamination and toxicity related to seasonal and annual changes in run-off, salinity, and contaminant loadings.

The continual re-suspension of sediments in the San Francisco Estuary system also means it can be expected that sediments accumulating in navigation channels may have been exposed to pollutant sources in several locations, far removed from the dredging site. This helps to explain why almost all maintenance dredging projects from throughout SF Bay show at least some degree of elevated (above ambient or "background") concentrations of trace contaminants. However, particles carrying pollutants also may get diluted with particles from other areas that settle in the same location that have lower concentrations of associated contaminants. Thus, the sediment from many dredging projects, even when trace pollutants are present, is not contaminated to a degree that causes toxicity, or that otherwise represents any significant environmental risk (LTMS, 1998).

The existing characteristics of material in the Oakland and Redwood City Harbor federal navigation channels and at the Eden Landing and Emeryville Crescent sites are described in the "Substrate" section above.

POTENTIAL IMPACTS

Suspension of sediment can mobilize sediment-bound contaminants into the water column, where they have the potential to become dissolved into the water itself. However, most contaminants bind to finer sediment, such as silt, clay, and organic matter, and are not readily water soluble (LTMS, 1998). The USACE will complete Tier III (chemical and biological) testing of Redwood City Harbor federal navigation channel sediments prior to dredging in 2023 and submit the results to the DMMO to determine the suitability of the material for placement at upland and in-bay sites including the strategic placement site. The channel is expected to produce between 400,000 – 600,000 CY of suitable material to source the 100,000 CY placement for the Eden Landing strategic placement site. Similarly, the Oakland Harbor federal navigation channel is currently undergoing sediment sampling and analysis and a suitability determination will be obtained from the DMMO prior to the 2023 dredging cycle. Previous testing of the material at Oakland Harbor has shown the material to largely clean and suitable for in-bay placement and there will be sufficient volume of material to source the 100,000 CY for placement for the Emeryville Crescent strategic placement site.

Sediment testing and suitability determination will protect the placement site from contaminants in the dredged material and thus no significant adverse effects from contaminants in dredge material are expected under the No Action Alternative or either of the Action Alternatives.

NEPA Determination: The proposed action and Alternative B would utilize dredge material that has been determined to be suitable for unconfined aquatic in-bay placement and would therefore result in less than significant impacts associated with contaminants in dredge or fill material.

CEQA Determination: Any sediment delivered to the project site for subtidal placement would be tested and approved for placement by the Dredged Material Management Office, which bans the in-Bay disposal of any sediment that could be classified as hazardous or polluted material. Therefore, even though the project site is within San Francisco Bay, there would be **no impact** with respect to the risk of releasing pollutants.

4.2 Biological Environment

4.2.1 Aquatic habitat and species, including special aquatic sites

Existing Conditions:

Shallow-water Benthic habitat

As in most estuaries, the soft bay bottom harbors most of the San Francisco Estuary's benthic organisms (Schaeffer et al. 2007) but probably not most of its species. Benthic species composition is highly variable and depends on water depth, sediment grain size, and position along the estuarine salinity gradient. Most of the species of the soft-bottom benthos are introduced, and species composition is highly variable in time and space (Nichols and Thompson 1985). Species composition at any one location is largely determined by the overlapping distributions of the species in salinity space (Schaeffer et al. 2007, Figure 35 in Kimmerer 2004). Distributions of benthic organisms shift as the salt field moves in response to changing freshwater flow. Mud flats, sand flats, and beaches around the Estuary provide habitat for many types of invertebrates, including diatoms (microscopic algae), polychaetes (marine bristleworms), oligochaetes (earthworms and relatives), amphipods (shrimp-like organisms), isopods (sow bugs and relatives), crustaceans (shrimps, crabs, barnacles, etc.) and molluscs (*Mya, Corbula*).

The macrobenthos in the Bay estuary is largely composed of non-native invertebrate species that have little traditional conservation value themselves, but rather their importance arises from their key position at the base of subtidal and mudflat food webs (Nichols and Thompson 1985). Non-native species are more abundant in terms of biomass and number of taxa (Thompson et al. 2000). One important exception is the native oyster, *Ostrea lurida*. Macrobenthic organism densities generally recover from dredge disturbance in 3 months to 5 years, depending on the species and the impact (Borja et al. 2010), but the recovery of ecological functions that the assemblage performs may not be equivalent after disturbance. Recovery times for the Bay estuary's benthic primary producers and consumers (from dredging actions) is the focus of a Long Term Management Strategy (LTMS)-funded United States Geological Survey (USGS) study (de la Cruz et al 2020).

Benthic microalgae and phototrophic bacteria, collectively called microphytobenthos and sometimes called biofilm, are ubiquitous photosynthetic organisms in aquatic areas where sunlight reaches hard and sediment surfaces (VIMS n.d., Janousek et al. 2007). Sediment burial and increased SSC could directly affect microphytobenthos by reducing or preventing their ability to photosynthesize, reducing growth and abundance (Cahoon 1999, Jaffe et al. 2010, MacIntyre et al. 1996). Movement of microphytobenthos is limited to a few millimeters (McGlathery et al. 2013), so burial by more than a few millimeters would be expected to smother the biofilm, and recolonization from surrounding areas would be the mechanism for recovery. In a Southern California study, microphytobenthos took 1.6 to 2.2 years to colonize in created marshes (Janousek et al. 2007). Indirect effects of reductions in the microphytobenthos could occur because they form an important base of the food web (Nichols and Pamatmat 1988, Kwak and Zedler 1997, McGlathery et al. 2013). If microphytobenthos were disrupted over large areas, an important food resource for many organisms could be disrupted (Roggero 2010). Benthic grazers, filter feeders, insects, and shorebirds all consume the benthic microalgae that form subtidally and on mudflats and marshes (Luoma et al. 1998, Kuwae et al. 2009, Hsu et al. 2011).

Benthic organisms support many demersal fish, including recreationally important species (e.g., California halibut, striped bass, white sturgeon) and threatened species such as green sturgeon. Some demersal fish such as bat rays forage on mudflats at high tide. Numerous bird species forage in shallow soft substrate, including diving ducks (canvasback, greater and lesser scaup, surf scoter). The San Francisco Estuary is a key stop on the Pacific Flyway for ducks and shorebirds, which forage in salt ponds and intertidal mudflats (Warnock et al. 2002). Marine mammals forage on the bottom (gray whales) or consume demersal and pelagic fish (seals, sea lions).

Eelgrass, San Francisco Bay's only rooted seagrass, is present in some areas of this habitat type (Subtidal Goals 2010). Eelgrass is particularly important to many species of fish such as Pacific herring, which deposit eggs on the blades of this plant; and to the endangered least tern (*Sterna antillarum browni*), which can forage on small fishes associated with the eelgrass. It is also considered an Essential Fish Habitat (EFH) area of particular concern. Eelgrass occurs in shallow subtidal areas and has been mapped in the Bay (Merkel & Associates et al. 2013).

Surveys at both the Eden Landing and Emeryville Crescent have shown the presence of small ephemeral patches of eelgrass that change from year to year (Figure 4- and Figure 4-4). Conditions at both sites are not particularly conducive to healthy eelgrass growth. One exception is a slowly expanding colony along the north side of the Bay Bridge abutment near the Emeryville Crescent site. A shoal is developing there that appears to be more conducive to eelgrass growth.

Figure 4-3. Eelgrass mapped near Emeryville Crescent. Data collected in 2003, 2009, 2013, and 2019.

Figure 4-4. Eelgrass mapped near Eden Landing. Includes data from surveys conducted in 2003, 2009, 2013, and 2019. The orange border indicates the 250 m turbidity buffer from National Marine Fisheries Service (NMFS) (2011). A comparison with Figure 3.9 indicates no encroachment of the dredged disposal.

Any eelgrass in the direct footprint of the placement would likely be buried by the either of the action alternatives. Surveys to map any potential eelgrass patches in the area will be conducted before and after the material is placed. This will allow the project to minimize the potential to directly bury eelgrass by avoiding areas where it is detected if possible. Material would migrate by natural physical processes after the initial plume settles and is not expected to raise turbidity beyond the ambient range. Areas immediately adjacent to the mound could receive up to 2 cm of sediment from the placed berm. This is at the lower range of where sensitivity to burial can occur. Eelgrass further up on the subtidal flats would receive much less sedimentation and would not be affected. Monitoring of turbidity, SSC, and sedimentation will be conducted during placement and for two months after to verify modeling assumptions.

POTENTIAL IMPACTS

Impacts associated with either the Proposed Action (at Eden Landing) or Alternative B (at Emeryville Crescent) would include the deposit of approximately 100,000 CY of dredged sediment onto subtidal surfaces, with the potential for direct effects on the subtidal benthic community via burial of organisms living on and within sediments of 4 inches to 1 foot in the middle of the placement area, grading to 1 mm in the surrounding area (Appendix E). Benthic plants and animals directly under a placement mound would generally not survive large amounts of burial, and recolonization from surrounding areas would be the mechanism for recovery. Generally, the effects of burial on benthic biota are mortality or reduction in growth (e.g., Wilber et al. 2007, Kemp et al. 2011). If the properties of sediments placed differ from the placement areas, or the residual particle size differs from the original substrate after waves work the sediments, community shifts in species abundance and composition could be expected (Bishop et al. 2006). Reduction in subtidal benthic primary producers and consumers has the potential to indirectly affect higher trophic levels in the estuarine food web.

Example taxa and species in the subtidal benthic community potentially affected by direct and indirect changes caused by shallow-water placement include (Table 4-6): microphytobenthos (e.g., diatoms, cyanobacteria, dinoflagellates), macroalgae (e.g., seaweeds like *Ulva angusta*), submerged vegetation (e.g., eelgrass *Zostera marina*), benthic macrofauna (e.g., polychaete worms, amphipods), oysters and bivalves (e.g., *Ostrea lurida*), Dungeness crab (*Metacarcinus magister*), deeper-water ground fishes (e.g., green sturgeon (*Acipenser medirostris*), and shallow subtidal fishes (e.g., leopard shark (*Triakis semifaciata*) juveniles)

Eelgrass and macroalgae could suffer mortality or reduced productivity as a result of burial and/or increased SSC. Eelgrass is adapted to low-light, turbid conditions (Duarte 1991), but very turbid conditions are associated with reduced vigor and growth (Zimmerman et al. 1995, Boyer and Wyllie-Echeverria 2010). High levels of turbidity associated with resuspension of dredge sediment may have been partially responsible for failure of transplant efforts in the Bay estuary (Onuf 1994). Species with horizontal rhizomes, like Z. marina, show very strong mortality effects even under low burial levels (Munkes et al. 2015). Eelgrass has been shown to be sensitive to disturbance by burial around 5 cm (Erftemeijer and Lewis 2006), and as low as 2 cm (Mills and Fonseca 2003). Eelgrasses has been shown to recover from burial after two to three years (Cabaco et al. 2008, Preen et al. 1995, Birch and Birch 1984, Onuf 1991, Blake and Ball 2001, Frederiksen et al. 2004, and Sheridan 2004), but repeated disturbances of eelgrass communities have eliminated them in the Mediterranean Sea (Cabaco et al. 2008). It is not known how resilient seagrasses in the Bay estuary would be to different patterns of repeated or long-term disturbance.

Adult demersal fishes and crabs would be expected to avoid burial by sediment-placement actions, though juveniles may be unable to move away from the impacted area, depending upon species and timing of the action. Example species and taxa indirectly affected by reductions in food availability include demersal fishes that feed on benthic invertebrates, such as green sturgeon and leopard shark; and water-column species that rely on food production by benthic plants and animals, such as zooplankton, fishes, and diving ducks that feed on submerged vegetation, invertebrates, and bivalves (Table 4-6). Piscivorous birds may suffer from reduced food resources if their fish prey is less abundant or harder to hunt because of changes in turbidity. The spawning habitat of pelagic fishes, such as Pacific herring (*Clupea pallasi*), may be altered by the burial or coating of eelgrasses and other surfaces by sediments. Table 4-6 summarizes the potential direct and indirect impact and recovery times for aquatic species.

Table 4-6. Potential direct and indirect impacts and recovery times for aquatic species.

Example Species	Physical Effect	Potential Direct Effects	Potential Indirect Effects	Recovery Time
Macroalgae Green algae e.g., *Ulva spp, Gracilaria pacifica*, *Fucus gardneri*	Burial and high SSC	Light reduction: mortality or reduced growth Siltation of vegetative structures: Reduced photosynthesis Smothering of hard surfaces: Reduced habitat area		Unknown in Bay estuary Laminaria shown to rebound from burial after 3 years in other systems (Gubelit 2012)
Microphytobenthos (Subtidal) e.g., diatoms, cyanobacteria, and dinoflagellates	Burial	Smothering: mortality, reduced growth, altered species composition	Reduction in food availability for higher trophic levels Sediment stabilization may be disrupted Reduction in microphytobenthos may increase phytoplankton growth	1.6 to 2.2 years in Southern California mudflats (Janousek *et al.* 2007) Burial by more than a few millimeters smothers the biofilm, and recolonization from surrounding areas would be the mechanism for recovery
Phytoplankton e.g., diatoms, microflagellates	High SSC	Light reduction: decreased primary production (Cohen 2008)	Increase in phytoplankton can occur if burial reduces microphytobenthos production (McGlathery *et al.* 2013)	Effect is probably minor and difficult to estimate because of transient nature of sediment plume; light attenuation would last only a few hours

			Increased phytoplankton blooms possible if release of nutrients from sediments elevates nutrient concentrations (Lohrer and Wetz 2003, Cardoso-Mohedano *et al.* 2016, Zhang *et al.* 2012)	
Vegetation (Subtidal) eelgrass (Zostera marina)	Burial and high SSC	Light reduction: mortality or reduced growth via burial and high turbidity Reduced photosynthesis and growth via siltation of vegetative structures Habitat modification possible if substrates are changed in properties (grain size, etc.)	Reduced numbers or altered composition of eelgrass-associated species (e.g., epiphytic macroalgae, Pacific herring, halibut, Canada geese) if eelgrass beds were to be significantly altered or reduce	In general, eelgrasses recover from burial in 2 to 5 years (Cabaco *et al.* 2008, Preen et al. 1995, Birch and Birch 1984, Onuf 1991, Blake and Ball 2001, Frederiksen *et al.* 2004, Sheridan 2004) Eelgrasses are sensitive to burial by around 2 to 5 cm, or to about 20 percent of total plant height (Cabaco *et al.* 2008, Munkes *et al.* 2015)
Invertebrates (Benthic) Macrobenthos: benthic epifauna and infauna, including worms, amphipods, etc.	Burial and high SSC	Smothering: mortality or reduced growth resulting in decreased species number, population density, and biomass of benthic organisms can result from burial and high turbidity	Reduction in food via changes in macrobenthos abundance and composition Habitat modification possible if substrates are changed in properties (grain size, etc.)	3 months to 5 years (Borja *et al.* 2010) Rates of recovery are highly variable depending on the substrate, community type, depth of burial, and the extent to which the affected communities adapt to high levels of sediment disturbance
Invertebrates (Pelagic) Zooplankton e.g., copepods and amphipods	Burial and high SSC	Siltation: clogging of physical structures	Decreased primary production via burial or increased turbidity can lead to decreased food availability	Unknown
Invertebrates Native oysters (*Ostrea lurida*) and other bivalves	Burial and high SSC	Smothering: adult mortality or morbidity	Reduction in food, via decreased proportion of food items compared to sediments for filter feeding	Unknown

		Siltation and high SSC: disruption of larval dispersal and settling	Reduction of habitat by burial of hard surfaces where larva attach	Zabin *et al.* (2009) found that oysters permanently buried by mud suffered mortality, but survived temporary burial of less than one month
Invertebrates Dungeness crab (*Metacarcinus magister*)	Burial	Smothering: mortality of juveniles if they are unable to excavate from burial by dredge-material placement	Reduction of food via burial of benthic feeding grounds	Areas affected by dredge disposal repopulate with crabs in about 3 weeks (Roegner and Fields 2015) Crabs generally avoid sediment plume and burial, and can dig themselves out of approximately 10 cm of material (Roegner and Fields 2015)
Ground Fishes leopard shark (*Triakis semifaciata*) green sturgeon (*Acipenser medirostris*)	Burial	Smothering: mortality of juveniles if they are unable to avoid burial by dredge-material placement	Reduction of food via burial of benthic feeding grounds	Unknown
Pelagic Fishes (use of near-benthic habitats) Pacific herring (*Clupea pallasi*) Longfin smelt (*Spirinchus thaleichthys*)(spawning habitat)	High SSC	Siltation: morbidity and mortality of eggs, delays in hatching via increased SSC, which can adhere to eggs	For Pacific herring, limitation of spawning habitat if eelgrass or other structures, where eggs adhere, are buried or reduced. For longfin smelt, Moyle (2002) states that spawning occurs in fresh water over sand, gravel, rocks, and aquatic plants so spawning habitat could be impacted as well if project effects extend into more fresh water areas	Jabusch *et al*. (2008) concluded that effects of elevated SSC from Bay dredging were lower than those experienced by herring during natural tidal cycles, specific effects of actions unknown Longfin smelt expected to be similarly affected
Pelagic Fishes e.g., salmonids, smelt, herring, anchovy	High SSC	Siltation: gill impairment, stress response, morbidity or mortality if SSC is very high	Decreased food availability for demersal fishes if benthic prey is affected	Varies by species, most studies are from lab settings

		Responses vary by species	Reduced spawning habitat If eelgrass beds or other breeding surfaces are disrupted	
Birds (Dabbling Ducks) e.g., mallard (*Anas platyrhynchos*), green-winged teal (*Anas carolinensis*), Northern shoveler (*Anas clypeata*)	Burial		Reduced food availability if subtidal vegetation is matted or killed, resulting in reduced seed production, an important dietary element for dabbling ducks (Joint Venture 2006) Reduced cover and nesting habitat if marsh vegetation is matted or buried (Enright n.d.)	Unknown Invertebrate (i.e., food) recovery from burial is 3 months to 7 years Vegetation (i.e., food, cover) recovery from burial is 6 months to 7 years
Birds (Diving Ducks) e.g., surf scoter (*Melanitta perspicillata*), bufflehead (*Bucephala albeola*)	High SSC	Reduced ability to forage if SSC is too high for visual hunting	Reduced foraging and prey availability if actions affect mollusks, bivalves, crustaceans, aquatic invertebrates, fish roe, and if submerged aquatic vegetation is reduced (Lovvorn et al. 2013)	Unknown Invertebrate (i.e., food) recovery from burial is 3 months to 7 years Eelgrass beds' (i.e., food) recovery is 2 to 5 years
Birds (Piscivorous) e.g., California least tern (*Sternula antillarum browni*)	High SSC	Reduced ability to forage if SSC is too high for visual hunting	Reduced prey availability if fish species are negatively affected by increased SSC, reductions of eelgrass beds or food resources (USACE 1998, United States Fish and Wildlife Service (USFWS) 1998)	Unknown Recovery will depend on fish response and nesting success

Biological Resources Mitigation Measure (BIO-1)

a. The project shall comply with the provisions of the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (NMFS) in the project's Endangered Species Act (ESA) consultations.

Water-quality objectives and beneficial uses (i.e., standards) for the project site are described in the Water Quality Control Plan for the SF Bay Basin (Basin Plan) adopted by the SF Bay RWQCB (Water Board). Beneficial uses of mudflats and tidal marshes in the region include providing estuarine habitat (EST), habitat for special-status and/or rare organisms (RARE), fish migration (MIGR), and recreation (REC-1 and REC-2). Climate change threatens these beneficial uses via rising sea levels, which can drown mudflats and tidal wetlands and convert them to shallow open water habitats (Goals Project 2015).

The project is intended to result in beneficial environmental impacts, by augmenting the local supply of sediment available to support accretion in mudflats and tidal wetlands and help them keep pace with rising sea levels. The water quality objectives at issue for the project are sediment and turbidity. The water quality objective for sediment provides that the sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses. Similarly, the turbidity water quality objective states that waters shall be free of turbidity changes that cause nuisance or adversely affect beneficial uses and increases in turbidity from discharges shall not be greater than 10 percent where background turbidity is greater than 50 NTU. During periods of sediment placement, nearby tidal waters would likely experience temporary increases in sediment and turbidity because of placed material settling on the Bay mudflats and dispersing into the water column.

Modeling indicates that after dredged sediment placement, SSC adjacent to the placement footprint would most frequently range between 50 and -300 mg/L over baseline conditions and could be elevated by as much as 500 mg/L in the most extreme case. However, the modeling also indicates that SCC would quickly return to baseline after each placement episode. Once the material is placed, tidal currents and waves are expected to re-work these sediments and disperse additional sediment into the water column to support accretion in nearby mudflats and tidal marshes. Given the naturally turbid nearshore environment in the project vicinity, temporary local increases in turbidity would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality, so this impact would be less than significant. Moreover, in permitting the discharge, the Regional Water Board will have to ensure the discharge meets water quality standards, including antidegradation requirements, further ensuring impacts remain less than significant.

Biological Resources Mitigation Measure (BIO-2)

a. Consistent with the June 9, 2011, Programmatic Essential Fish Habitat Consultation Agreement (Agreement) between the U.S. EPA, USACE, and the NMFS, the Permittee shall conduct pre- and post-dredge surveys of eelgrass areal coverage and density within the dredge footprint where it overlaps the 45-meter direct impact buffer zone.

b. Consistent with the Agreement, the Permittee shall implement operational control best management practices (BMPs) to protect eelgrass beds within 250 meters of dredging activity from adverse impacts because of excess turbidity in the water column.

The permittee shall mitigate for potentially significant impacts in accordance with the California Eelgrass Mitigation Policy and Implementing Guidelines (noaa.gov). In accordance with the policy, monitoring will be performed to assess potential impacts to eelgrass, and if found, eelgrass impacts will be mitigated to less than significant by creating, restoring, and/or enhancing eelgrass habitat at a minimum ratio of 1.2:1 acres. If the Project adversely impacts eelgrass, the Permittee shall submit and implement a mitigation plan and schedule, acceptable to Water Board staff. A NMFS-approved mitigation plan and schedule shall be considered acceptable to Water Board staff.

NEPA Determination: For both action alternatives, direct and indirect impacts from changes to the water column and benthic habitats would be largely localized based on the bathymetry, depth, time of year, and tide stage, of the study site. Temporary and minor impacts to water quality parameters may occur during placement. Implementation of mitigation measure BIO-1(above) would reduce impacts to habitats, communities, and species to temporary and minor and less than significant.

CEQA Determination: Though direct impacts would be limited to benthic habitats within the sediment placement footprint (Section 4.2.3), a temporary reduction or shift in subtidal benthic primary producers and consumers could potentially result in indirect impacts to higher trophic levels within the estuarine food web outside the placement footprint, including special-status aquatic species, such as longfin smelt, green sturgeon, and salmonids. These impacts would be temporary, and again, would be unlikely to exceed natural background variation in the region's estuarine food webs. In addition, sediment placement is likely to drive temporary local increases in turbidity within and beyond the placement footprint, which could drive temporary impacts to eelgrass and other light-sensitive species. However, because turbidity is driven by the effects of local tidal currents and waves on the benthos, it is unlikely that turbidities will exceed background levels that are regularly experienced by local biota, especially during high-energy events such as winter storms. Modeling indicates that after dredged sediment placement, SSC adjacent to the placement footprint would most frequently range between 50 and 300 mg/L over baseline conditions and could be elevated by as much as 500 mg/L in the most extreme case. However, the modeling also indicates that SCC would quickly return to baseline after each placement episode, making these effects on local turbidities and biota temporary.

Example taxa and species in the nearshore community potentially impacted from shallow-water placement at the project site are described in Table 4-6. Table 4-7 documents state and federally listed (or proposed) endangered or threatened species under the California Endangered Species Act (CESA) and the Federal Endangered Species Act (FESA); designated and proposed critical habitat under FESA; Essential Fish Habitat in accordance with Magnuson Stevens Fishery Conservation and Management Act (MSFCMA); marine mammals protected under the Marine Mammal Protection Act (MMPA); and avian species protected under the Migratory Bird Treaty Act (MBTA) with the potential to occur in the project action area.

Table 4-7. Special Status Species, Critical Habitats, and EFH potentially occurring in and adjacent to the proposed action area.

SCIENTIFIC NAME	COMMON NAME	STATUS	STATUTORY PROTECTION
Sterna antillarum browni	California least tern	Endangered	FESA; CESA
Rallus obsoletus obsoletus	Ridgway's rail	Endangered	FESA, CESA
Charadrius alexandrinus nivosus	Western snowy plover	Threatened	FESA
Acipenser medirostris	North American green sturgeon, Southern Distinct Population Segment (DPS)	Threatened with Critical Habitat Present	FESA
Onchorhynchus mykiss	Steelhead, Central California Coast DPS	Threatened with Critical Habitat Present	FESA
Spirinchus thaleichthys	Longfin smelt	Threatened	CESA
Reithrodontomys raviventris raviventris	Southern salt marsh harvest mouse	Endangered	FESA; CESA
Enhydra lutris nereis	Southern sea otter	Threatened	FESA
Zalophus californianus	California Sea Lion	Protected	MMPA
Phoca vitulina	Pacific harbor seal	Protected	MMPA
—	Pacific Groundfish Fisheries Management Plan (FMP)	Essential Fish Habitat; Seagrass (I.e., Eelgrass) and Estuary HAPCs	MSFCMA
—	Coastal Pelagic FMP	Essential Fish Habitat	MSFCMA
—	Pacific Salmon FMP	Essential Fish Habitat; Marine and Estuarine Submerged Aquatic Vegetation (I.e., Eelgrass) and Estuary HAPCs	MSFCMA
—	Bryozoan Reefs	---	NA
—	Olympia oyster beds	---	NA

Impacts from the project to sensitive aquatic habitats other than eelgrass would be temporary, and within the range of natural physical and biological variability experienced by these ecosystems. This includes impacts to habitats presumably used as migratory corridors by anadromous fish, such as salmonids, and catadromous fish, such as green sturgeon. The project would not 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. None of the threatened or endangered species in Table 4-7 are sessile benthic species that will be smothered by placed sediment, therefore, they are not expected to be adversely impacted by the project. USACE, as federal lead for the project, is consulting with the U.S. Fish and

Wildlife Service and the NMFS to ensure compliance with FESA. These consultations are expected to result in provisions that will further ensure the protection of the special-status species and communities listed in Table 4-7, including state-listed longfin smelt. Impacts to habitats, communities, and species other than eelgrass would therefore be **less than significant.**

Impacts from the project to eelgrass habitats offshore of Eden Landing are potentially significant, because of multiple factors including the sensitivity of these communities and their dependent food webs to burial and turbidity, and the uncertain rate and extent of recolonization, growth, and recovery post-burial. The SF Bay Conservation and Development Commission's website has a web-based application, SF Bay Eelgrass Impact Assessment Tool (Tool), for assessing the potential impacts of dredging projects on eelgrass. The Tool, which is located at SF Bay Eelgrass Impact Assessment Tool | BCDC Open Data Portal (arcgis.com), shows 1) the maximum extent of eelgrass beds that have been surveyed in SF Bay as of 2021; 2) a 45-meter growth buffer for potential bed expansion (direct impact buffer zone); and 3) a 250-meter turbidity buffer around eelgrass for determining indirect impacts (indirect impact buffer zone). Using the Tool to map the location of the project relative to the location of eelgrass beds and adjacent buffer zones shows that most areas of the project are within the 45-meter direct impact buffer zone and 250-meter indirect impact buffer zone. Implementation of mitigation measure BIO-2, above, would reduce impacts to eelgrass communities to **less than significant with mitigation.**

4.2.2 Water column habitat

The Goals Report (Goals Project, 1999) subdivides the open bay habitats into two habitat subunits: deep bay and shallow bay. Deep bay habitat is defined as those portions of SF Bay deeper than 18 feet below MLLW, including the deepest portions of SF Bay and the largest tidally influenced channels. Shallow bay, which includes the vast majority of San Francisco Bay, is defined as that portion of SF Bay between 18 feet below MLLW and MLLW. Both placement sites are within shallow bay habitat.

The shallow bay habitat, including that at Eden Landing or Emeryville Crescent, serves as a feeding area for Pacific herring, longfin smelt. northern anchovy (*Engraulis mordax*), bat ray, and jacksmelt (*Atherinopsis californiensis*), as well as at least 40 other species of fish, crabs, and shrimp. Pacific herring spawn on hard substrates and eelgrass (*Zostera marina*) along the shallow margins of the Central Bay. Longfin smelt spawning occurs in fresher locations, over sand, gravel, rocks, and aquatic plants. Shallow bay habitat is also a nursery area for juvenile halibut and sanddabs (*Citharichthys stigmaeus*), shiner perch (*Cymatogaster aggregata*), and other fishes. Anadromous fish use the shallow bay area as migratory pathways to and from upstream spawning areas.

This habitat is in the depth range of many diving birds, such as greater and lesser scaups, surf scoters and double-crested cormorants and therefore provides important avian foraging habitat. In addition, plunge divers such as brown pelican, Caspian tern, Forster's tern and least tern forage in shallow water, where their prey is more abundant. Marine mammals such as Pacific harbor seals also forage in this habitat type.

Phytoplankton are simple, often microscopic, plants or algae suspended in the water column that represent the base of the marine food web. The dominant species found in SF Bay are diatoms, dinoflagellates, and cryptophytes (Cloern and Dufford, 2005). Studies have shown that plankton growth and distribution in SF Bay can be attributed to the amount of sunlight, turbidity, and influx of fresh water (Cloern et al., 1985; Alpine and Cloern, 1988; Cloern, 1999; Jassby et al., 2002; May et al., 2003; NOAA, 2007). The productivity of other organisms, including clams, worms, mussels, and zooplankton, depends on the growth of phytoplankton (SFEP, 1992). Phytoplankton, which rely on photosynthesis for energy generation, are vulnerable to light attenuation caused by turbidity plumes.

Zooplankton consist of microscopic and macroscopic animals that either free-float or feebly swim in open water. Their distribution is controlled largely by tides, current, and wind. Common zooplankton found in SF Bay include species of copepods, rotifers, tintinnids, and meroplankton (larval forms of gastropods, bivalves, barnacles, polychaetes, and crustaceans such as the Dungeness crab [*Cancer magister*]) (Ambler et al., 1985; NOAA, 2007). Zooplankton also provide an ecologically important food source for many types of fish, such as anchovies, smelt, and striped bass.

Ichthyoplankton are the eggs and larval forms of marine fishes, such as Pacific herring, northern anchovy, goby (family *Gobiidae*), white sea bass (*Cynoscion nobilis*), staghorn sculpin, and diamond turbot (*Hypsopsetta guttulata*). Seasonal abundance and distribution of individual ichthyoplankton species are dependent on the reproductive cycles of the adult fish species and their circulation in San Francisco Bay.

POTENTIAL IMPACTS

Shallow-water placement associated with either the Proposed Action (at Eden Landing) or Alternative B (at Emeryville Crescent) would include the deposit of approximately 100,000 CY of dredged sediment. Water-column communities could be affected by increased SSC, turbidity and potential exposure to resuspended contaminants caused by the release of a sediment plume during shallow-water placement. However, the increase in SSC and turbidity would be temporary and limited while sampling and testing of source channel material will ensure the material characteristics and constituent levels are suitable for in-bay placement.

Example taxa and species potentially affected by increased SSC: phytoplankton (e.g., diatoms, dinoflagellates), zooplankton (e.g., copepods, amphipods), pelagic fishes (migratory and resident), and birds that forage in water-column habitats, including dabbling ducks, diving ducks, and piscivorous birds. Cohen (2008) identifies several potential direct effects on organisms from large increases in SSC in the water column. Table 4-8 describes examples of fish species found in San Francisco Bay at different depth classes that may be affected by the Proposed Action or Alternative B. Effects include clogging the gills of fish and invertebrates, changing the behavior of adult fish, providing cover for prey species and reducing predation, and reducing light penetration, photosynthesis, and the productivity and growth of eelgrass, seaweeds, and phytoplankton.

Table 4-8. Example of fish species found in the different depth classes of the San Francisco Estuary

	Shallow-Water and Tidal-Flat Habitats (Approximately 0 to -7 ft MTL)	Deeper-Bay Habitats (Approximately -7 to -20 ft MTL)
Ground Fishes	Members of family Gobidae: e.g., cheekspot goby (**Bypnus gilberth**) leopard Shark (*Triakis semifasciata*) (juvenile)	California Halibut (*Paralichthys californicus)* leopard Shark (*Triakis semifasciata*) (adult)
Pelagic Fishes	Topsmelt *(Atherinops affinis*) Mississippi Silverslde (*Menidia Audens*)	Northern anchovy (*Engraulis mordax*) Pacific herring (*Clupea pallasi)* *Longfin smelt (Spirinchus thaleichthys)*
Anadromous Fishes	Salmonids e,g., Chinook salmon (*Oncorhynchus tshawytscha*) longfin smelt (*Spirinchus thaleichthys*)	Salmonids e,g., Chinook salmon (*Oncorhynchus tshawytscha*)

Sources: Example species selected from Bay Study (Orsi 1999; De La Cruz personal communication), and beach seine studies (Greenfield and Jahn 2010) In SF Bay MTL= mean tide level

Indirect effects to water-column species may include reductions in food availability because of burial of benthic communities or reductions in phytoplankton because of light limitation, leading to reductions in zooplankton prey for pelagic fish communities.

Shallow-water placement associated with either the Proposed Action (at Eden Landing) or Alternative B (at Emeryville Crescent) will result in short term changes to SSCs in the water column which will spread out and travel from the source in a sediment plume, locally increasing SSC and turbidity. The larger and heavier particles quickly settle to the bottom near the source, but fine material may remain suspended for some time (usually hours) and travel some distance before settling. Cohen (2008) identifies several potential direct and indirect impacts on organisms from large increases in SSC in the water column. These include clogging the gills of fish and invertebrates, changing the behavior of adult fish, providing cover for prey species and reducing predation, and reducing light penetration, photosynthesis and the productivity and growth of eelgrass, seaweeds and phytoplankton.

SSC can directly affect primary production via regulation of light penetration into the water, and therefore the potential reduction of the photic zone in turbid conditions (O'Connor 1991).

Elevated fine sediment loads can impact fish by causing physical damage to organs, or indirectly by influencing water quality. Primary responses include damage to gills because of erosion of the mucus coating and abrasion of tissue (Kemp et al. 2011). The extent of response depends on water velocity, concentration, particle size and shape with smaller and more angular clasts having the most negative impact (Kemp et al. 2011). Elevated sediment concentrations can directly influence the fitness of fish by increasing stress and reducing feeding and growth rates. High SSC can cause mortality in fish because of reduced oxygen uptake because fish must keep their gills clear for oxygen exchange. Fine particles can coat the gill surfaces preventing gas exchange (Rich 2010). On the other hand, intermittent and short-term increases in SSC may benefit some species, such as salmonids, because of the associated increase in density of drifting prey (reviewed in Kemp et al. 2011).

Fishes in mobile life phases would be expected to avoid the placement area and the temporary sediment plume, but those in egg or early larval stages, or fishes that burrow into benthic sediments or hunker down on the bottom, would likely not be able to escape and may suffer morbidity and/or mortality at the placement site. Increased SSC and turbidity would be limited in time and space, but could have consequences for water-column species, as discussed above. Reduced food availability could result if burial or high SSC have a large effect on primary or secondary productivity.

Shallow water placement has the potential to resuspend sediments with their contaminant loads into the water column, making the contaminants available to the food web. Chemical contamination can significantly disrupt survival, fitness, or reproductive success of various organisms including fish (Ostrach et al. 2008) and birds (Takekawa et al. 2002, Ackerman et al. 2008). In addition, sediment-bound contaminants such as mercury, Polybrominated Diphenyl Ethers (PCBs), and organic compounds can be concentrated in the food web, resulting in concentrations in fish that prompt warnings to limit consumption by humans. Contamination identified in testing can limit the utility of dredged material for wetland restoration and other purposes. Emerging contaminants such as endocrine disruptors may have ecological effects although the importance of sediments as reservoirs for these contaminants is less clear than for the other substances mentioned above.

However, most contaminants are tightly bound in the sediments, and are not easily released during short-term resuspension. 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 (Jabusch et al., 2008). Organic contaminants such as pesticides, polychlorinated biphenyls, and polyaromatic hydrocarbons are generally not very soluble in water, and direct toxicity by exposure to dissolved concentrations in the water column is not very likely (Jabusch et al., 2008).

A study on the short-term water quality impacts of dredging and dredged material placement on sensitive fish species in SF Bay was completed by the SFEI (Jabusch et al., 2008). The review considered five fish species: Chinook salmon, coho salmon, delta smelt, steelhead trout, and green sturgeon. Water quality impacts of concern include dissolved oxygen reduction, pH decrease, and releases of toxic components such as heavy metals, hydrogen sulfide, ammonia, and organic contaminants (including polyaromatic hydrocarbons, polychlorinated biphenyls, and pesticides). Potential short-term effects include acute toxicity, subacute toxicity, and biological and other indirect effects, such as avoidance. The study concluded that direct short-term effects on sensitive fish by contaminants associated with dredging plumes are minor.

Sediments are tested prior to dredging in the SF bay and are reviewed by the DMMO, which bans the in-Bay disposal of any sediment that could be classified as hazardous or polluted material. Sediment testing results for previous USACE maintenance dredging episodes at Oakland Harbor and Redwood City Harbor indicate that, in general, dredged materials from the subject federal navigation channels have been suitable for unconfined aquatic disposal. Historically, some isolated areas in Reach 5 of the Redwood City channel have been identified as containing sediment that is Not Suitable for Unconfined Aquatic Disposal (NUAD); USACE is testing material from both potential source channels prior to the 2023 dredging episodes and would avoid importing material from any unsuitable areas. Therefore, dredging and placement activities would not be expected to increase contaminant concentrations in the environment above baseline conditions.

Dredged material suitability for placement in-bay would be obtained from the DMMO for source channel sediments prior to the proposed action or alternative B. This process would identify contaminated sediments and screen out any material that is unsuitable for shallow water placement. Additionally, USACE would implement BMPs and comply with water quality protection measures included as conditions to the Water Quality Certification issued by the Regional Water Board and the letter of agreement issued by the Bay Conservation and Development Commission (BCDC) for USACE's consistency determination. Adherence to these measures and BMPs would minimize the potential for water quality degradation that could impact aquatic organisms.

NEPA Determination: For both action alternatives, direct and indirect impacts from changes to the water column and benthic habitats would be largely localized based on the bathymetry, depth, time of year, and tide stage, of the study site. Temporary and minor impacts to water quality parameters may occur during placement. Implementation of mitigation measure BIO-1 would reduce impacts to habitats, communities, and species to temporary and minor and less than significant.

CEQA Determination: Discussion in Section 4.2.1.

4.2.3 Mudflat, Sandflat, and beach habitat

Mud flats, sand flats and beaches are sparsely vegetated intertidal areas that occur from approximately MLLW to mean tide level. Beaches occur where sand flats extend above the mean tide level. In the Estuary, mud flats are far more common than sand flats or beaches. They provide banks and upland shoreline with protection from wave energy and capture suspended sediment. Given the purpose of this project, mudflats exist adjacent to both the Proposed Action placement site (at Eden Landing) and the Alternative B placement site (at Emeryville Crescent). Mud flats, sand flats, and beaches around the Estuary provide habitat for many types of invertebrates, including diatoms (microscopic algae), polychaetes (marine bristleworms), oligochaetes (earthworms and relatives), amphipods (shrimp-like organisms), isopods (sow bugs and relatives), and crustaceans (shrimps, crabs, barnacles, etc.).

During low tide, mud flats, sand flats, and beaches provide crucial foraging and roosting areas for almost one million shorebirds that use the Estuary during the spring migration. Shorebirds frequently found on mud flats, sand flats, and beaches in the Estuary include 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*). During high tide, mud flats, sand flats, and beaches provide foraging habitat for fish, including longfin smelt (*Spirinchus thaleichthys*), staghorn sculpin (*Leptocottus armatus*), starry flounder (*Platichthys stellatus*), and leopard shark (*Triakis semifasciata*). One of the few mammals occasionally present on mudflats, sand flats, and beaches is the Pacific harbor seal (*Phoca vitulina*).

Ecologically, tidal flat foraging habitats and associated high tide roost habitats of shorebirds are a functional unit (Luis et al. 2005). Shorebird use of intertidal flat foraging habitat can be limited by the distribution of high tide roost areas in SF Bay (Takekawa et al. 2000) and globally (Rogers 2003, Rogers et al. 2006, Dias et al. 2006). Long-distance flights between tidal flat foraging habitats and high tide refuges are energetically expensive.

POTENTIAL IMPACTS

Mudflat communities could be affected by dredged material placed nearby in the subtidal zone, under either the Proposed Action (at Eden Landing) or Alternative B (at Emeryville Crescent), by increased turbidity and SSC, and potentially by burial and changes in soil texture. Example taxa and species potentially affected by this method include: microphytobenthos, macrobenthos, fishes that forage in shallow waters (e.g., leopard shark), and shorebirds (e.g., Western sandpiper [*Calidris mauri*], American avocet [*Recurvirostra americana*]).

Water-column SSCs, resulting from resuspension of the subtidally-placed sediment, are expected to be limited by the shear stress exerted on the bed by tidal currents and wind waves. This method would not affect the energies applied to the deposit, so there is no expectation that SSC will exceed the maximum observed natural concentrations. Deposition of sediments on mudflats and marshes would be controlled by particle size (and associated settling velocity) and water-column turbulence and would be expected to occur at times of year that coincide with high-energy events when high concentrations of sediment are allowed to settle out of the water column during slack tides. Since the processes controlling resuspension, transport, and deposition would not be affected by the placement method, it is expected that effects of resuspension and deposition would be within the range of natural variability.

Because of the nature of the transport method, which relies on wind-wave resuspension and tidal transport, the shallow-water method has several ecological advantages. It would allow for natural patterns of sediment delivery in marshes and mudflats, thus preserving natural processes that support the creation of microtopography. These methods of natural transport also have the advantage in that there would be no need to place piping or other infrastructure on mudflats or in marshes. Since there are natural limits on the amount of sediments that can be resuspended, SSC, after the initial plume settles, would be within the range of natural variability and be fed at a continuous low rate for mudflats, and marshes. Sediment particles arriving on marshes and mudflats will have been reworked by waves, ensuring that resulting soil properties will likely match the soils already present in receiving areas. The potentially adverse effect of this is that sediments that remain in subtidal areas have the potential to be of higher grain size, and of different properties, than those present before placement, which could result in differing species diversity and composition at the placement site. This effect would be temporary as the placed material would be covered by, and mixed with, sediment falling out of the water column over time.

NEPA Determination: For both action alternatives, direct and indirect impacts from changes to the water column and benthic habitats would be largely localized based on the bathymetry, depth, time of year, and tide stage, of the study site. Temporary and minor impacts to water quality parameters may occur during placement. Implementation of mitigation measure BIO-1 (Section 8) would reduce impacts to habitats, communities, and species to temporary and minor and less than significant.

CEQA Determination: The project would result in direct impacts to subtidal mudflat/sandflat habitats (benthos) within the placement footprint offshore of the California Department of Fish and Wildlife (CDFW) Eden Landing Complex by burying these habitats with a layer of dredged sediment. Sessile organisms, including eelgrass, within the footprint of sediment placement would generally not survive large amounts of burial (e.g., Wilber et al. 2007, Kemp et al. 2011), and would primarily recover via recolonization from surrounding areas (eelgrass discussion in Section 4.2.1). If the properties of placed sediment differs substantially from *in situ* sediment in the placement areas, or if the residual particle size in the placement footprint differs from the original substrate after waves and tidal currents re-work the placed sediments, community shifts in species abundance and composition could occur (Bishop et al. 2006). However, any shifts would be within the natural range of variation in the region's benthic characteristics and dependent biological communities driven by tides, waves, and storms, freshwater inputs from local watersheds, seasonal shifts in fields, shoreline erosion, and actions related to salt pond management/restoration.

The project could result in indirect impacts to nearby mudflat communities within the Eden Landing complex. The overall project purpose is to test a novel approach to increase mudflat and salt marsh resilience to sea level rise in SF Bay via strategic placement of dredged sediment at a shallow, in-Bay location adjacent to target mudflats and tidal marshes. Holocene tidal marsh and mudflat ecosystems within the Eden Landing complex and elsewhere in SF Bay have evolved to respond to and benefit from episodic pulses of sediment from both watershed- and estuarine-derived sources; without this sediment, these systems are unlikely to be resilient to rising sea levels driven by climate change (Goals Project 2015). Modeling indicates that the project could drive modest amounts of accretion in nearby tidal areas, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. Given this tolerance of variability in natural sediment delivery across space and time, and the relatively modest amount of accretion expected in the region's tidal systems as a result of the project, it is highly unlikely that sensitive mudflat communities (and their dependent special-status species) would be adversely impacted by the project.

Example taxa and species in the nearshore community potentially affected by shallow-water placement at the project site are described in Table 4-6. and Table 4-7 documents state and federally listed (or proposed) endangered or threatened species under CESA and FESA; designated and proposed critical habitat under FESA; Essential Fish Habitat in accordance with MSFCMA; marine mammals protected under the MMPA; and avian species protected under the MBTA)with the potential to occur in the project action area.

Impacts from the project to mudflats, sandflats, and beaches would be temporary, and within the range of natural physical and biological variability experienced by these ecosystems. None of the threatened or endangered species in Table 4-7 are sessile benthic species that will be smothered by placed sediment, therefore, they are not expected to be adversely impacted by the project. USACE, as federal lead for the project, is consulting with the U.S. Fish and Wildlife Service and the NMFS to ensure compliance with FESA. These consultations are expected to result in provisions that will further ensure the protection of the special-status species and communities listed in Table 4-7. Impacts to mudflat, sandflat, and beach habitats would therefore be **less than significant.**

4.2.4 Marsh habitat

Tidal marshes are extremely productive and diverse ecological communities that provide important habitat and resources, both to organisms that live solely in the marsh and to species more commonly found in upland and aquatic areas. Tidal marshes occur at scattered locations along the margins of the South Bay, along the waterways of the delta, at the mouths of the Petaluma and Napa rivers, at the margins of San Pablo Bay, and in Suisun Marsh. Given the purpose of this project, marshes exist adjacent to both the Proposed Action placement site (at Eden Landing) and the Alternative B placement site (at Emeryville Crescent). These marshes can be segregated into salt, brackish, and freshwater types based on water and soil salinity. The vegetative cover in tidal marshes is largely controlled by salinity. Saltwater tidal marshes are dominated by saltgrass (*Distichlis spicata*), pickleweed (*Salicornia virginica*), and California cordgrass (*Spartina foliosa*) while freshwater tidal marshes are dominated by cattails (*Typha* sp.) and tules (*Schoenoplectus acutus*).

The composition of the invertebrate community in tidal marsh habitats is primarily influenced by salinity, the frequency and duration of tidal inundation, and the type and density of emergent vegetation. Common invertebrate species in tidal marsh habitats include the ribbed horse mussel (*Geukensia demissa*); clams (including Baltic clams [*Macoma balthica*], *Tapes japonica, Potamocorbula amurensis*, and soft-shelled clams [*Mya arenaria*]); isopods such as (*Sphaeroma quoyana*); amphipods such as (*Corophium spinicorne* and *Grandidierella japonica*); snails (such as California hornsnails [*Cerithidea californica*], *Assiminea californica*, and *Ovatella myosotis*); polychaete worms; and the yellow shore crab (*Hemigrapsus oregonensis*). Of these species, only Baltic clams, the yellow shore crab, and the three snail species are native (LTMS, 1998).

The sloughs and tidal channels in tidal marshes provide critical cover, forage, and nursery areas for adults and juveniles of a number of sportfish and special-status fishes. The distribution of fish communities in tidal marsh habitats is influenced by the same factors that influence the composition of invertebrate communities. Common fishes include native species such as arrow goby (*Clevelandia ios*), topsmelt (*Atherinops affinis)*, staghorn sculpin, and tule perch (*Hysterocarpus traskii*); and introduced species such as yellowfin goby (*Acanthogobius flavimanus*), inland silverside (*Menidia beryllina*), and mosquitofish

(*Gambusia affinis*). Commercially important species that rear and forage in these habitats include native Chinook salmon (*Oncorhynchus tshawytscha*) and the introduced striped bass. Certain life stages of special-status species that use tidal marshes include winter-run Chinook salmon, steelhead (*Oncorhynchus mykiss*), longfin smelt, Sacramento splittail (*Pogonichthys macrolepidotus*), and green sturgeon.

Tidal marshes also provide a variety of resources for birds and other terrestrial wildlife, including resting, nesting, escape cover, and—most importantly—foraging habitat. A diversity of wildlife, including reptile, bird, and mammal species use tidal marshes. In addition to other habitat types, tidal marshes in the study area are very important for migratory birds, providing foraging habitat and roosting sites. Special-status birds and mammals that use tidal marshes include Ridgway's rail (*Rallus longirostris obsoletus*), black rail (*Laterallus jamaicensis*), and salt marsh harvest mouse (*Reithrodontomys raviventris)*.

POTENTIAL IMPACTS

Placement of 100,000 CY of material in the nearshore under the Proposed Action (at Eden Landing) or Alternative B (at Emeryville Crescent) would affect marsh habitats and species through transport of sediment to these marshes. Example taxa and species potentially affected by this method include: microphytobenthos, macrobenthos, marsh vegetation (e.g. Pacific cordgrass (*Spartina foliosa*), perennial pickleweed (*Sarcocornia pacifica*), annual pickleweed (*Salicornia europaea*), marsh gumplant (*Grindelia stricta*)), rare plant species (e.g., Soft bird's beak (*Chloropyron molle ssp. molle*)), fishes that forage in inundated marshes (e.g., topsmelt), piscivorous birds (e.g., least tern), shorebirds (e.g., American avocet), dabbling ducks (e.g., mallard (*Anas platyrhynchos*)), marsh birds (e.g., Ridgway's rail, tidal marsh song sparrow (*Melospiza melodia*)), and marsh mammals (e.g., salt marsh harvest mouse).

Pacific cordgrass and pickleweed provide important cover and food resources in the lower tidal marsh zone. Marsh gumplant is an important native shrub that occurs along channels in tidal marshes, and it provides food resources, vertical cover, and refugia for multiple species at high tides. Specific local studies for Pacific cordgrass recovery from potential burial have not been published, but recovery of *Spartina alterniflora*, *S. foliosa*, and other marsh species has been shown to take from six months (Barko et al. 1977) to seven years (LaPeyre et al. 2009). Responses to burial depend on species, depth, frequency, timing, and method of sediment accretion. Species that depend on marsh vegetation for food and cover that could be indirectly affected by changes in vegetation include the tidal marsh song sparrow, Ridgway's rail, and the salt marsh harvest mouse. Reductions in food or cover could adversely affect these species. The scale of predicted deposition on the marsh plain and in tidal channels from this type of sediment placement, however, is limited to one or two millimeters (Appendix E). As such, it is unlikely that this method of placement in the subtidal environment would result in any burial of marsh plants, and in fact, it could help marsh plants avoid drowning because of SLR by augmenting inorganic sediment supply to the marsh ecosystem.

Modeling suggests sediment deposition in marsh tidal channels on the order of 0 – 1 mm and no deposition on existing marsh plain, and as such, burial of marsh habitat and species is highly unlikely to occur. Burial, if it does occur, could directly reduce marsh benthic communities. Marsh macrobenthos can recover from burial in three months to one year, with various results for abundance and species composition (Bolam et al. 2006, Croft et al. 2006). Species that depend on benthic communities for food – like rails, passerines, and mammals – could be indirectly affected by a reduction in food resources.

If burial patterns were to flatten marsh topography, the vertical structure that marsh invertebrates, birds, and mammals need could be altered. Variability in marsh topography, and the resulting vegetation patterns, provide foraging, nesting, and refuge habitats for mice and rails. Ridgway's rails and salt marsh harvest mice use tall vegetation that grow on higher topographies for high-tide refuge.

Shallow-water placement with a thickness between 10 cm and 1 ft will be timed to minimize or avoid impacts to special-status species and could be placed to avoid sensitive habitats such as eelgrass and oyster beds.

Because of the nature of the transport method, which relies on wind-wave resuspension and tidal transport, the shallow-water placement has several ecological advantages:

- It would allow for natural patterns of sediment delivery in marshes and mudflats, thus preserving natural processes that support the creation of microtopography;
- Because there are natural limits on the amount of sediments that can be resuspended, SSC, after the initial plume settles, would be within the range of natural variability for water column, mudflats, and marshes; and mudflats and marshes would be fed at a continuous low rate; and
- Sediment particles arriving on marshes and mudflats will have been reworked by waves, ensuring that resulting soil properties will likely match the soils already present in receiving areas.

NEPA Determination: Impacts of the action alternatives (Proposed Action and Alternative B) on the aquatic environment and the species it supports would be less than significant. The direct effects of shallow water placement are localized and temporary. Once placed, the material will transport over time via natural processes that would not create sedimentation or turbidity outside of the normal range. Burial of marsh plant species is unlikely to occur and is not a reasonably foreseeable result of strategic subtidal placement.

Monitoring of SSC, sedimentation, oceanographic data, benthic invertebrates (as they pertain to avian and fish foraging), and eelgrass distribution will be conducted during placement and for two months after to verify modeling predictions. Burial for benthic communities is possible but less than significant as suggested in Appendix E, especially given benthic communities are adapted to the scale of predicted deposition.

The No Action Alternative would result in no change to the aquatic environment. O&M dredged material disposal would continue as permitted at the usual placement sites.

CEQA Determination: The project could result in indirect impacts to nearby tidal marsh communities within the Eden Landing complex. The overall project purpose is to test a novel approach to increase mudflat and salt marsh resilience to sea level rise in SF Bay via strategic placement of dredged sediment at a shallow, in-Bay location adjacent to target mudflats and tidal marshes. Holocene tidal marsh and mudflat ecosystems within the Eden Landing complex and elsewhere in SF Bay have evolved to respond to and benefit from episodic pulses of sediment from both watershed- and estuarine-derived sources; without this sediment, these systems are unlikely to be resilient to rising sea levels driven by climate change (Goals Project 2015). Modeling indicates that the project could drive modest amounts of accretion in nearby tidal areas, ranging from about 0.01 cm at the target tidal marsh to about 0.1 cm on adjacent mudflats over a two-month period. Given this tolerance of variability in natural sediment delivery across space and time, and the relatively modest amount of accretion expected in the region's tidal systems as a result of the project, impacts on tidal marshes from the project would be **less than significant.** Special Status Species, Critical Habitat, Fishery Managed Species

Table 4-7 documents federally- and state-listed (or proposed) endangered or threatened species under FESA and CESA; designated and proposed critical habitat under FESA; EFH in accordance with MSFCMA; marine mammals protected under the MMPA; and two unique South SF Bay habitats (*i*.e. bryozoan reefs and Olympia oyster beds) that have no official statutory protections with the potential to occur in the project action area.

The USACE has determined that the proposed action will have no effect on any FESA-listed species under the purview of United States Fish and Wildlife Service (USFWS). Delta smelt (*Hypomesus transpacificus*) do not occur in South SF Bay(and hence the species is not listed in Table 4-7), and no effects are expected to wetland species primarily because the dredge material placement is 2 miles offshore and the sediment deposition rate in wetlands will be so low it will be difficult to measure. The USACE has determined that the proposed action may affect but is not likely to adversely affect two species and their respective critical habitats (i.e., green sturgeon and steelhead) under the purview of NMFS. The request for NMFS's concurrence with this determination is attached in Appendix A-2.

4.2.5 California Least Tern

The breeding population of the California least tern (*Sternula antillarum browni*) is distributed in five clusters along the coast: Bay area, San Luis Obispo/Santa Barbara

County, Ventura County, Los Angeles/Orange County, and San Diego (HT Harvey 2012). The California least tern was listed as a federal endangered species in 1970 under the FESA, and as a State endangered species in 1980 under the CESA. Least terns typically arrive at California breeding areas in middle or late April and begin courting immediately (Goals Project 1999). Nesting happens in two waves, one from early May through early June, and the second from mid-June through early July (Goals Project 1999). Least terns prefer to build their nests on open sand or fine gravel substrate with sparse vegetation. They are opportunistic nesters and will sometimes use newly filled or graded lands and airports. Nests are usually found near open water, usually along coastal beaches and estuaries, with adequate food sources (Goals Project 1999). California least terns forage in both shallow and deep water by hovering and diving into the water to catch prey. Nesting sites for least terns exist along the runway apron at the former Naval Air Station Alameda in the city and county of Alameda. Least terns have been observed to forage primarily along the breakwaters and shallows of the southern shoreline of Naval Air Station Alameda and in Ballena Bay during May through August. Least terns are known to use a restoration site (i.e., the Middle Harbor Enhancement Area [MHEA]) in the middle harbor area of Oakland Harbor for foraging and roosting. Foraging from this colony probably also extends into the Emeryville Crescent. Surveys conducted by the SF Bay Bird Observatory have documented least tern nesting in the Eden Landing Ecological Reserve (EDER). Between May 27 and July 22, 2019, at least 48 pairs established at least 101 nests at pond E14 that were confirmed and monitored (SF Bay Bird Observatory, 2019). These birds would be expected to forage in the waters nearby including the proposed placement area and areas where the material would settle.

POTENTIAL IMPACTS TO CALIFORNIA LEAST TERN

Eelgrass beds are important spawning habitat for San Francisco topsmelt and jacksmelt, both species on which least terns prey. However, all eelgrass in the project area would be outside of the 250 m buffer zone (i.e., from the dredge placement site) established by NMFS (2011) for protection from indirect effects of dredging activity such as turbidity. Dredge material from Redwood City Harbor normally is placed at the designated in-bay site, SF-11. Consequently, impacts such as increased turbidity and its effects on prey resources and potential release of contaminants from project dredge material placement have been accounted for as part of the USFWS biological opinion on the LTMS (USFWS 1998). As placement activities for this project will occur approximately 2 miles offshore, disruption of least tern nesting and/or breeding activities is not anticipated.

NEPA Determination: Both action alternatives would result in less than significant impacts to California Least Tern nesting habitat and breeding activities given the placement of dredged material and the associated impacts will be a sufficiently far distance from their nesting, foraging, and breeding habitats. In the event there are impacts to eelgrass beds, on which Least Tern depend for food availability, the BIO-1 measure (Section 8) will mitigate the impacts such that they will be less than significant.

CEQA Determination: See discussion of impacts to aquatic habitats under Section 4.2.1; also see discussion of impacts to mudflat, sandflat, and beach habitats under Section 4.2.3. California least terns are a mobile bird species that does not utilize subtidal habitats and would therefore not be impacted by sediment placement activities; implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to California least terns would be less than significant.

4.2.6 Ridgway's rail

Ridgway's rail (previously known as the California Clapper rail) was listed as endangered under the ESA by the USFWS on October 13, 1970 (35 Fed. Reg. 16047). Ridgway's rail is also listed as endangered under CESA by CDFW and is considered a fully protected species. The species formerly occurred in salt marshes along the California coast from Humboldt Bay to San Luis Obispo County, but at present it is only found in salt marshes around San Francisco, San Pablo, and Suisun bays. Ridgway's rails favor habitats that are dominated by pickleweed (*Salicornia pacifica*) with extensive stands of Pacific cordgrass (*Spartina foliosa*) and are subject to direct tidal circulation. These habitats provide an intricate network of tidal sloughs and abundant numbers of benthic invertebrates for foraging (Harvey 1988) and also serve as escape routes from predators (Zembal and Massey 1983; Foerster et al. 1990).

Ridgway's rail is a permanent resident of salt and brackish marshes around San Francisco Bay. The only remaining populations occur in San Francisco Bay. Since the mid-1800s, about 80 percent of San Francisco Bay's marshlands have been eliminated through filling, diking, or conversion to salt evaporation ponds. As a result, Ridgway's rail lost most of its former habitat, and the population declined severely. These birds also require shallow areas or mudflats for foraging, particularly channels with overhanging banks and vegetation (Goals Project, 2000). Ridgway's rails forage on crabs, mussels, clams, snails, insects, spiders, worms, and occasionally mice and dead fish. As a refuge from extreme high tides and as a supplementary foraging area, rails move to the upper marsh vegetation where it intergrades with upland vegetation. These birds have no requirement for fresh water. Ridgway's rails nest from early March through August in the tallest vegetation along tidal sloughs, particularly in California cordgrass and marsh gumplant. They are nonmigratory, although juveniles disperse during late summer and autumn. The USFWS considers all potential habitat to be occupied by this species unless surveys that year document its absence.

Surveys conducted by the San Francisco Estuary Invasive Spartina Project in 2020 (Olofson Environmental, Inc. 2021) detected Ridgway's rails in the project area at Whale's Tail Marsh, The EDER along Mt Eden Creek, and along Alameda Creek. Densities were highest in the south units of Whale's Tail Marsh and EDER. The surveys also detected rails in the Emeryville Crescent, although in lower densities. (Olofson Environmental, Inc. 2021).

POTENTIAL IMPACTS TO RIDGWAY'S RAIL

The potential impact to Ridgway's rails would be the alteration or degradation of their foraging and nesting habitat on the mudflats because of increased sedimentation as the placed material migrates on to the flats and into the marsh. Modeling predicts that less than 0.1 mm would be deposited in areas of the tidal marsh. This is not expected to affect the availability of rail prey species. In addition, this low level of inundation is not expected to affect Spartina health and vigor and therefore would not have a deleterious effect on Ridgway's rail nesting habitat. As placement activities for this project will occur approximately 2 miles offshore, disruption of Ridgway's rail nesting and/or breeding activities is not anticipated.

NEPA Determination: Both action alternatives would result in less than significant impacts to Ridgway's Rail nesting habitat and breeding activities given the placement of dredged material and the associated impacts will be a sufficiently far distance from their nesting, foraging, and breeding habitats. Furthermore, sediment deposition on tidal mudflats and marsh plains, as well as in marsh channels, will be on an order of magnitude that is negligible to prey species and Spartina nesting habitat for Ridgway's Rail.

CEQA Determination: See discussion of impacts to tidal marsh habitats and dependent special-status species under Section 4.2.4. Ridgway's rails are a mobile bird species that does not utilize subtidal habitats and would therefore not be impacted by sediment placement activities; implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to Ridgway's rails would be less than significant.

4.2.7 Western Snowy Plover

The western snowy plover (*Charadrius alexandrinus nivosus*) is listed as threatened under the ESA. Western snowy plovers are one of two recognized subspecies of snowy plovers in North America. The coastal population, about 2,000 birds, breeds along the Pacific coast from southern Washington to southern Baja California, Mexico. Breeding occurs from March through September. Plovers forage for invertebrates on wet sand areas of intertidal zones, in dry, sandy areas above high tide lines, on salt pans and along the edges of salt marshes and salt ponds. They nest on coastal sand spits, dune-packed beaches, gravel bars, beach strands with little or no vegetation, open areas around estuaries, and on beaches at river mouths and gravel bars from early March to the third week in July. Both eggs and nests are extremely difficult to see even at close range. Chicks leave the nest within hours of hatching but cannot fly for about a month. Western snowy plovers are site-faithful nesters, returning to successful nesting sites year after year.

Surveys conducted by the SF Bay Bird Observatory monitored 79 nests in the EDER with the highest densities in ponds E14, E6B, and E8. Weekly counts were higher at the preserve than at any other South Bay site monitored with a weekly average of 122.7 birds per week

(SF Bay Bird Observatory, 2021). Snowy plovers also forage along the marsh edge at Whale's Tail Marsh. Plover foraging also occurs along the marsh edge and in pannes at Emeryville Crescent.

POTENTIAL IMPACTS TO WESTERN SNOWY PLOVER

The potential impact to snowy plovers would result from the alteration or degradation of their foraging habitat on the mudflats because of increased sedimentation as the placed material migrates on to the flats and into the marsh. Modeling predicts that less than 1 mm would be deposited on areas of the mudflat. This is not expected to affect plover prey species or plover's ability to forage. As placement activities for this project will occur approximately 2 miles offshore, disruption of snowy plover nesting and/or breeding activities is not anticipated.

NEPA Determination: Both action alternatives would result in less than significant impacts to Western Snowy Plover nesting habitat and breeding activities given the placement of dredged material and the associated impacts will be a sufficiently far distance from their nesting, foraging, and breeding habitats, 2 miles offshore. Furthermore, sediment deposition on tidal mudflats and marsh plains, as well as in marsh channels, will be on an order of magnitude that is negligible to prey species and nesting habitat for snowy plovers.

CEQA Determination: See discussion of impacts to mudflat, sandflat, and beach habitats and dependent special-status species under Section 4.2.3. Western snowy plovers are a mobile bird species that does not utilize subtidal habitats and would therefore not be impacted by sediment placement activities; implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to western snowy plovers would be less than significant.

4.2.8 North American Green Sturgeon Southern DPS

On April 7, 2006, the Southern DPS of the North American green sturgeon was listed as threatened under the ESA by the National Oceanic and Atmospheric Association (NOAA) Fisheries (71 Fed. Reg. 17,757). Green sturgeon is also considered a species of special concern by CDFW. Green sturgeon are not abundant along the Pacific Coast but are known to exist in the Estuary (Pycha, 1956; Skinner, 1962; Moyle, 2002). Green sturgeon are anadromous fish that spend most of their lives in estuarine or marine waters and return to natal rivers to spawn. Adult southern DPS green sturgeon spawn in the reaches of the Sacramento River watershed with swift currents and large cobble. Adult green sturgeon enter SF Bay between late February and early May, as they migrate to spawning grounds in the Sacramento River (Heublein et al., 2009). Post-spawning adults may be present in SF Bay Estuary during the spring and early summer for months prior to migrating to the ocean. Green sturgeon larvae begin feeding approximately 10 to 15 days after hatching, and approximately 35 days later metamorphose into juveniles. After hatching, young-of-the-year (i.e., first-year juvenile) green sturgeon move into the Delta and Estuary where they may remain for 2 to 3 years before migrating to the ocean (Allen and Cech, Jr., 2007; Kelly et al., 2007). 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).

Potential Impacts to Green Sturgeon

Eggs or larval life stages of green sturgeon are not expected to be present at either of the shallow water placement alternative sites or at the No Action Alternative placement locations because they spawn upstream in the Sacramento River as stated above. Large adult and juvenile fish would be motile enough to avoid the physical effects in areas of high turbidity plumes caused by dredged material disposal. Green sturgeon are fairly tolerant of turbidity and may even be attracted to the invertebrates contained within the placed material as a food source. There is the remote possibility that an individual may be smothered by the placed material if the barge were to discharge directly overhead. Sturgeon sometimes will remain immobile on the bottom rather than flee. The likelihood of a barge depositing directly on a green sturgeon is extremely remote.

Brief plumes caused by in-water placement have the potential to reduce food availability and foraging success for green sturgeon that might be in the vicinity of the placement sites. Species that might be affected can forage in the unaffected areas surrounding the placement site, so any temporary reduction in food supply and foraging success would be minor. No significant long-term effects to pelagic-based food resources are expected, because of the fairly rapid recovery expected in these communities and the small area affected.

NEPA Determination: No significant impacts are expected to green sturgeon as discussed above. Spawning grounds are not present in the proposed placement sites and sturgeon are motile and able to avoid areas affected by higher turbidity during placement. Additionally the implementation of mitigation measures BIO-1, compliance with the ESA provisions, and BIO-2, EFH eelgrass surveys and BMPs, will further reduce the likelihood of any significant adverse effects to green sturgeon.

CEQA Determination: See discussion of impacts to aquatic habitats and dependent special-status species in Section 4.2.1 and discussion of impacts to eelgrass habitats in Section 4.2.13. Green sturgeon are a mobile, non-benthic species that can avoid the placement footprint, and would therefore not be impacted by sediment placement activities. Implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to green sturgeon would be less than significant.

4.2.9 Central California Coast Steelhead DPS and Central Valley Steelhead DPS.

Central California Coast steelhead was federally listed as threatened on August 18, 1997 and is a CDFW species of concern. The Central Valley steelhead was initially listed as threatened under the ESA by NOAA Fisheries on March 19, 1998 (63 Fed. Reg. 13,347); this listing was reaffirmed on January 5, 2006 (71 Fed. Reg. 834).

Steelhead historically ranged throughout the northern Pacific Ocean, from Baja California to Kamchatka Peninsula. Currently, their range extends from Malibu Creek in southern California to Kamchatka Peninsula (Busby et al., 1996). SF Bay and its tributary streams support migrating steelhead populations. *O. mykiss* can be either anadromous or can complete their entire life cycle in fresh water. Those fish that remain in fresh water are referred to as rainbow trout. Steelhead, the anadromous form of *O. mykiss*, can spend several years in fresh water prior to smoltification, and can spawn more than once before dying, unlike most other salmonids (Busby et al., 1996). Adult steelhead typically migrate from the ocean to fresh water between December and April, peaking in January and February (Fukushima and Lesh, 1998). Juvenile steelhead migrate as smolts to the ocean from January through May, with peak migration occurring in April and May (Fukushima and Lesh, 1998). Central California Coast Steelhead DPS spawns in tributaries of San Francisco Bay, including the watersheds of the Petaluma and Napa rivers, and several tributaries of the South Bay. Central Valley steelhead DPS spawn in the Sacramento and San Joaquin watersheds.

Potential Impacts to Steelhead

Eggs or larval life stages of steelhead are not expected to be present at either of the shallow water placement alternative sites or at the No Action Alternative placement locations because of the use of the June 1 – November 30 work window for the dredge placement. Similarly, few adult or juvenile fish are expected to be present in South SF Bay during the work window, and any that are present would be motile enough to avoid areas of high turbidity plumes caused by dredging.

Brief plumes caused by in-water placement have the potential to reduce food availability and foraging success for fish and marine mammals that might be in the vicinity of the placement sites. It is expected that steelhead will avoid the plumes, which are ephemeral in nature (LTMS, 1998). Species that might be affected can forage in the unaffected areas surrounding the placement site, so any temporary reduction in food supply and foraging success would be minor. No significant long-term effects to pelagic-based food resources are expected because of the rapid recovery of species in these communities and the small area affected.

NEPA Determination: No significant impacts are expected to Central California Coast steelhead DPS as discussed above. For both action alternatives placement would occur outside the time of year spawning occurs and adult steelhead are motile and able to avoid areas affected by higher turbidity during placement. Additionally the implementation of mitigation measures BIO-1, compliance with the ESA provisions, and BIO-2, EFH eelgrass surveys and BMPs, will further reduce the likelihood of any significant adverse effects to steelhead.

CEQA Determination: See discussion of impacts to aquatic habitats and dependent special-status species in Section 4.2.1 and discussion of impacts to eelgrass habitats in Section 4.2.13. Steelhead are a mobile, non-benthic species that can avoid the placement footprint, and would therefore not be impacted by sediment placement activities. Implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to steelhead would be less than significant.

4.2.10 Longfin Smelt

Longfin Smelt was listed as threatened under the CESA in 2009 (CDFG 2009). The species generally has a 2-year life cycle and die after spawning. However, some individuals delay spawning until age 3, and repeat spawning may be possible (Baxter 2018).

Adult longfin smelt inhabit bays, estuaries, and near shore coastal habitats; including Suisun, San Pablo, Central, and South San Francisco bays (CDFW 2009). During the late fall, adults migrate from these areas to the low salinity zone of eastern Suisun Bay and the western Delta. Spawning may start as early as November and extend through July (Baxter 1999).

Embryos hatch primarily between January through March and are buoyant (CDFW 2009). They move into the upper part of the water column and are transported to Suisun, San Pablo, Central, and South San Francisco bays with high spring and winter flows to waters with salinities ranging from 15 to 30 practical salinity units.

Longfin smelt larvae begin feeding on copepods and cladocerans, and as they grow, they also feed on mysids and amphipods (CDFW 2009). Juveniles predominately feed on mysids, amphipods, copepods and daphnia, with fish making up a smaller portion. Adult longfin smelt feed primarily on opossum shrimp, *Acanthomysis* spp. and *Neomysis mercedis*, when available. Longfin smelt feed throughout the day and into the night, which suggests that turbidity may not hamper feeding success. They have well developed olfactory organs that aid in finding prey (CDFW 2009).

Potential Impacts to Longfin Smelt

All life stages of longfin smelt are rare in South SF Bay in the summer and fall (Robinson and Greenfield 2011). Often zero individuals have been detected near the project area in over 25 years of sampling (Robinson and Greenfield 2011). Their presence even in winter months tends to occur during years of high freshwater outflow. Consequently, longfin smelt are unlikely to be adversely affected by proposed project activities.

Longfin Smelt are a State-listed species, and as such, the significance of impacts to longfin smelt as a special status species are evaluated under CEQA only.

CEQA Determination: See discussion of impacts to aquatic habitats and dependent special-status species in Section 4.2.1 and discussion of impacts to eelgrass habitats in Section 4.2.13. Longfin smelt are a mobile, non-benthic species that can avoid the placement footprint, and would therefore not be impacted by sediment placement activities. Implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to longfin smelt would be less than significant.

4.2.11 Salt Marsh Harvest Mouse

The salt marsh harvest mouse (*Reithrodontomys raviventris*) was listed as Federally Endangered in 1970 under the FESA, and as a State endangered species under the CESA in 1971. It occurs in native salt and brackish habitats of tidal or diked marshes throughout the San Francisco Estuary. The northern subspecies (*R.r. halicoetes*) is found on the upper portion of the Marin Peninsula, and in the Suisun, Petaluma, and Napa marshes and San Pablo Bay. A few, small disjunct populations are found on the northern coast of Contra Costa County. The southern subspecies (*R.r. raviventris*) occurs primarily in the South Bay with a few, small disjunct populations on the Marin Peninsula and along the Richmond shoreline (Goals Project 2000). The highest number of consistent populations occurs in marshes on the eastern side of San Pablo Bay and in the dredged material disposal ponds on the Mare Island Shipyard property (Bias and Morrison 1993; Duke et al. 2004).

Salt marsh harvest mice depend on dense vegetative cover for protection from predators (Goals Project 2000). The mice prefer the deepest (60-75 cm tall), most dense pickleweed, mixed with fat hen and alkali heath.

Salt marsh harvest mice breed from March to November, and during this time, they build ball like nests of dry grasses and other vegetation on the ground or up in the pickleweed (Goals Project 2000). Salt marsh harvest mice are known to occur in the tidal marshes around Eden Landing and Emeryville Crescent. This project will assume presence of the mice in any pickleweed habitat.

POTENTIAL IMPACTS TO SALT MARSH HARVEST MOUSE

Increased sedimentation has the potential to affect the health and vigor of the salt marsh vegetation that they depend upon for cover from predation, feeding, and nesting. Modeling predicts that less than one millimeter would be deposited in areas of the tidal marsh. This is not expected to affect the health of marsh vegetation or have any effect on the salt marsh harvest mouse. As placement activities for this project will occur approximately 2 miles offshore, disruption of salt marsh harvest mouse nesting and/or breeding activities is not anticipated.

NEPA Determination: Both action alternatives would result in less than significant impacts to salt marsh harvest mouse nesting habitat and breeding activities given the placement of dredged material and the associated impacts will be a sufficiently far distance, 2 miles offshore, from their nesting, foraging, and breeding habitats. Furthermore, sediment deposition on tidal mudflats and marsh plains, as well as in marsh channels, will be on an order of magnitude that is negligible to salt marsh vegetation that the salt marsh harvest mouse depends on for protection, feeding and nesting. Additionally, the implementation of mitigation measure BIO-1, compliance with the ESA provisions will further reduce the likelihood of any significant adverse effects to salt marsh harvest mouse.

CEQA Determination: See discussion of impacts to tidal marsh habitats under Section 4.2.4. Salt marsh harvest mouse are a mobile species that does not utilize subtidal habitats and would therefore not be impacted by sediment placement activities; implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to salt marsh harvest mouse would be less than significant.

4.2.12 Marine Mammals

The most common marine mammals in the Estuary are the Pacific harbor seal, harbor porpoise (*Phocoena phocoena*), and the California sea lion (*Zalophus californianus*). Other marine mammal species that have been seen occasionally in SF Bay include the gray whale (*Eschrichtius robustus*), northern elephant seal (*Mirounga angustirostris*), Steller sea lion (*Eumetopias jubatus*), northern fur seal (Callorhinus ursinus), and, less frequently, the southern sea otter (*Enhydra lutris*). These rare visitors to the Bay are generally sited in the deeper Central-Bay waters. On rare occasions, individual humpback whales (*Megaptera novaeangliae*) have entered San Francisco Bay. The only marine mammals expected to be in the project area are harbor seals, California sea lion and possibly harbor porpoise on occasion.

Pacific harbor seals are nonmigratory and use the Estuary year-round, where they engage in limited seasonal movements associated with foraging and breeding activities (Kopec and Harvey, 1995). Harbor seals haul out (come ashore) in groups ranging in size from a few individuals to several hundred. Habitats used as haul-out sites include tidal rocks, bayflats, sandbars, and sandy beaches (Zeiner et al., 1990). No haul-out sites are in either of the shallow water placement sites, however it is possible that an individual may haul out on the mud flats from time to time.

Harbor porpoise have been regularly sighted in SF Bay in recent years, indicating that the species has likely recolonized the area after a long absence. Studies are currently underway to determine the size and status of this population. Most of the sightings have occurred near the Golden Gate, with some sightings occurring in the vicinity of Angel Island and Alcatraz (Keener, 2011). Harbor porpoises feed on fishes such as herring, sardines, and whiting, and on squid.

California sea lions breed in Southern California and along the Channel Islands. After the breeding season, males migrate up the Pacific Coast and enter the Estuary. In San Francisco Bay, sea lions are known to haul out at Pier 39 in the Fisherman's Wharf area. During anchovy and herring runs, approximately 400 to 500 sea lions (mostly immature males) feed almost exclusively in the North and Central bays (USFWS, 1992).

POTENTIAL IMPACTS TO MARINE MAMMALS

Increased turbidity and activity during dredge material placements at either the Proposed Action placement site (at Eden Landing) or the Alternative B placement site (at Emeryville Crescent) at either the Proposed Action placement site (at Eden Landing) or the Alternative B placement site (at Emeryville Crescent) may disturb marine mammal foraging activities by temporarily decreasing visibility or causing the relocation of mobile prey from the area affected by the sediment plume. Marine mammals would not be substantially affected by placement operations because they forage over large areas of SF Bay and the ocean and can avoid areas of temporarily increased turbidity and placement disturbance.

NEPA Determination: No significant impacts are expected from either of the action alternatives to sea lions, harbor seals, porpoises, or other marine mammals as discussed above. Spawning grounds are not present in the proposed placement sites and these marine mammals are motile and able to avoid areas affected by higher turbidity during placement. Additionally, the implementation of mitigation measures BIO-1, compliance with the ESA provisions, and BIO-2, EFH eelgrass surveys and BMPs (see Section 4.2.1, and Section 8), will further reduce the likelihood of any significant adverse effects to marine mammals' behavior or habitats.

CEQA Determination: See discussion of impacts to aquatic habitats and dependent special-status species under Section 4.2.1; also see discussion of impacts to mudflat, sandflat, and beach habitats and dependent special-status species under Section 4.2.3. Marine mammals are mobile species that would not be impacted by sediment placement activities; implementation of mitigation measure BIO-1 (Section 8) would further ensure that impacts to marine mammals would be less than significant.

4.2.13 Habitats of Special Significance

The MSFCMA was enacted to maintain healthy populations of commercially important fish species. Under the MSFCMA, eight regional Fishery Management Councils are responsible for developing FMPs to manage these species. The 1996 amendments to the

MSFCMA included protecting the habitats of species for which there is an FMP; these habitats are designated as EFH.

EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 United States Code 1802.10). EFH can consist of both the water column and the underlying surface (e.g., seafloor) of a particular area, and it includes those habitats that support the different life stages of each managed species. A single species may use many different habitats throughout its life to support breeding, spawning, nursery, feeding, and protection functions. The Central SF Bay(Central Bay), including the Action Area, is designated EFH for assorted fish species managed under the following FMPs:

- Pacific Coast Groundfish,
- Coastal Pelagic Species, and
- Pacific Salmon.

In the San Francisco Bay-Delta region, NMFS has designated two HAPCs that may be affected by the proposed action. HAPCs are a subset of EFH; these areas are rare, particularly susceptible to human-induced degradation, especially ecologically important, and/or located in an environmentally stressed area. They include:

- Eelgrass (*Zostera marina*) beds, and
- Estuary.

Two additional rare habitat types occur in South SF Bay and may be present in the proposed project areas:

- Olympia oyster (*Ostrea lurida*) beds
- Bryozoan reefs.

POTENTIAL IMPACTS TO HABITATS OF SPECIAL SIGNIFICANCE

Surveys at both the Eden Landing and Emeryville Crescent have shown the presence of small ephemeral patches of eelgrass that change from year to year. Conditions at both sites are not particularly conducive to healthy eelgrass growth. One exception is a slowly expanding colony along the north side of the Bay Bridge abutment. A shoal is developing there that appears to be more conducive to eelgrass growth (4.2.1).

Any eelgrass in the direct footprint of the placement would likely be buried by the either of the action alternatives. However, the most recent available maps show that all eelgrass in the project area would be outside of the 250 m buffer zone (i.e., from the dredge placement site) established by NMFS (2011) for protection from indirect effects of dredging activity such as turbidity. In any case, surveys to map any potential eelgrass patches in the area will be conducted as part of the proposed project before and after the material is placed. This will allow the project to minimize potential effects to eelgrass by avoiding areas where it is detected if possible. Material would migrate by natural physical processes after the initial plume settles and thereafter is not expected to raise turbidity beyond the ambient range. Areas immediately adjacent to the mound could receive up to 2 cm of sediment from the placed berm. This is at the lower range of where sensitivity to burial can occur. Eelgrass further up on the subtidal flats would receive much less sedimentation and would not be affected. Monitoring of turbidity, SSC, and sedimentation will be conducted during placement and for two months after to verify modeling assumptions.

The proposed project (under either action alternative) would be located in estuary habitat, which in South SF Bay has relatively high background levels of turbidity and suspended sediment. The action areas under either alternative would be very small compared to the large amount of estuary habitat available. Specifically, the dredge material placement site is about 138 acres or 0.22 square miles in size, whereas the area of Suisun, San Pablo, and San Francisco bays combined is estimated to be about 225 square miles (i.e., assuming dimensions of 75 miles long x 3 miles wide on average). In general, project effects to the existing estuary habitat are expected to be minor, temporary, and localized.

Olympia oysters are considered a historical keystone species for SF Bay and contribute to EFH where oyster beds occur. A century ago, native oysters were a highly visible component of SF Bay ecosystems, supporting industries from cement-making to gourmet dining. Oysters require hard substrate for larval settlement, preferably other oyster shells, and this settling habit led to the formation of oyster reefs, the nooks and crannies of which support communities of fish, crab, and other invertebrates. By the early 1900s, however, overfishing, habitat degradation, and the introduction of nonnative shellfish led to the decline of native oysters. Although “shell hash” occurs near Eden Landing and differs from the typical mud or sand benthic substrate, oyster beds are not known to occur at either of the alternative placement sites.

Bryozoan reefs occur in South SF Bay and may be present in the project area (Zabin et al. 2010). As with shell hash, bryozoan reefs constitute a unique benthic substrate compared to the typical sand or mud. They are relatively widespread in South SF Bay and are not expected to be greatly impacted by the proposed project because of its small size and the likelihood of bryozoan recolonization.

NEPA Determination: Based on the above analysis, USACE has determined that the proposed action alternatives will not affect FESA-listed species under the purview of the USFWS may affect but is not likely to adversely affect (NLAA) FESA-listed the Central California Coast DPS of steelhead, southern DPS of North American green sturgeon, or the designated critical habitats of these two species; and may affect EFH. The USACE is undergoing section 7 and EFH consultation with NMFS prior to implementation of the proposed action and the letter requesting concurrence from NMFS with the USACE NLAA determination are included in Appendix A.

Under the No Action Alternative there would be no change in existing conditions. The temporary and localized turbidity impacts associated with O&M dredging disposal would continue. However, there would be no potential for significant impacts or benefits to special status species and their critical habitat.

CEQA Determination: Impacts from the project to eelgrass habitats offshore of Eden Landing are potentially significant, because of multiple factors including the sensitivity of these communities and their dependent food webs to burial and turbidity, and the uncertain rate and extent of recolonization, growth, and recovery post-burial. The SF Bay Conservation and Development Commission's website has a web-based application, SF Bay Eelgrass Impact Assessment Tool (Tool), for assessing the potential impacts of dredging projects on eelgrass. The Tool, which is located at SF Bay Eelgrass Impact Assessment Tool | BCDC Open Data Portal (arcgis.com), shows 1) the maximum extent of eelgrass beds that have been surveyed in SF Bay as of 2021; 2) a 45-meter growth buffer for potential bed expansion (direct impact buffer zone); and 3) a 250-meter turbidity buffer around eelgrass for determining indirect impacts (indirect impact buffer zone). Using the Tool to map the location of the project relative to the location of eelgrass beds and adjacent buffer zones shows that most areas of the project are within the 45-meter direct impact buffer zone and 250-meter indirect impact buffer zone. Implementation of mitigation measure BIO-2, below, would reduce impacts to eelgrass communities to less than significant with mitigation.

Mitigation Measure BIO-2:

a. Consistent with the June 9, 2011, Programmatic Essential Fish Habitat Consultation Agreement (Agreement) between the U.S. EPA, USACE, and the NMFS, the Permittee shall conduct pre- and post-dredge surveys of eelgrass areal coverage and density within the dredge footprint where it overlaps the 45-meter direct impact buffer zone.

b. Consistent with the Agreement, the Permittee shall implement operational control BMPs to protect eelgrass beds within 250 meters of dredging activity from adverse impacts because of excess turbidity in the water column.

c. The permittee shall mitigate for potentially significant impacts in accordance with the California Eelgrass Mitigation Policy and Implementing Guidelines (noaa.gov). In accordance with the policy, monitoring will be performed to assess potential impacts to eelgrass, and if found, eelgrass impacts will be mitigated to less than significant by creating, restoring, and/or enhancing eelgrass habitat at a minimum ratio of 1.2:1 acres. If the Project adversely impacts eelgrass, the

Permittee shall submit and implement a mitigation plan and schedule, acceptable to Water Board staff. A NMFS-approved mitigation plan and schedule shall be considered acceptable to Water Board staff.

4.3 Human Environment

4.3.1 Cultural Resources

Cultural resources are defined as several different types of properties ranging from precontact to historic archaeological sites, built-environment architectural properties such as buildings, bridges, or structures, and resources that have traditional, religious, or cultural significance to Native American Tribes such as traditional cultural properties or even sacred sites. The methodology used for identifying cultural resources in the study area includes review and development of environmental, precontact, ethnographic, and historical contexts associated with the project area's cultural resources as well as meaningful consultation with Tribes.

The National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470).

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to consider the effects of a proposed undertaking on properties that have been determined to be eligible for listing or are listed in the National Register of Historic Places (NRHP). The regulations implemented for the NHPA by the Advisory Council on Historic Preservation fall under Protection of Historic Properties 36 C.F.R. § 800. For purposes of complying with Section 106 of the NHPA, 54 U.S.C. § 306108, a Federal agency will decide the area of potential effects (APE) for the project or undertaking. The APE is defined under 36 C.F.R. § 800.16(d) as "the geographic areas or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Additionally, the APE "is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking".

Defining the APE for the Project

The APE for the Proposed Action includes the offshore placement site (approximately 138 acres) and the marsh and mudflats within the western extent of the EDER (approximately 2,500 acres), including all monitoring sites. The vertical APE is a minimum depth of 2' and maximum depth of 10' below the surface of the Bay. The APE for indirect effects includes access routes to monitoring sites located within the EDER, and a large buffer around both the placement and replacement site.

Cultural Resources Identified in the APE of the Proposed Action

A records search was completed at the Northwest Information Center located in Sonoma State University. Records were also reviewed online for results from underwater surveys at NOAA's Automated Wreck and Obstruction Information System (AWOIS), in addition to T-Charts from the U.S. Coast Survey located at https://historicalcharts.noaa.gov/. Four archaeological survey reports, an MA thesis, and an MOA between the USFWS and State Historic Preservation Offices (SHPO), were reviewed within a one-mile radius of the APE. The entire study area has gone through extensive reconnaissance as well as archival research. Surveys have been funded by government agencies, including the Fish and Wildlife Service (FWS) and CalTrans, since the early 1980s. The results of the records search show there is one eligible historic district within the APE – HALS-CA-91, the Eden Landing Salt Works landscape – and ten cultural resources are in or contributing to HALS-CA-91. Additionally, the San Mateo Bridge is an eligible historic property within the APE.

The offshore placement site was surveyed for cultural resources beginning in 1996, when a seismic retrofit for the San Mateo Bridge was first proposed. Numerous other inventories were completed for ecological restoration work at Eden's Landing as part of the South Bay Salt Pond Restoration Project, which resulted in the identification of the EDER Historic District located in the southern end of San Francisco Bay. The Historic District encompasses 6,612 acres divided into 23 ponds and is being mitigated for ecological restoration, which will focus on restoring the salt ponds to naturally functioning, tidally influenced salt marsh which requires breaching levees and opening ponds to the tides, building levees between the newly restored tidal marsh areas and local communities, and restoring habitat features.

Eden Landing was placed on the NRHP because it is the birthplace of SF Bay's solar salt industry, which grew to be one of the world's largest salt producers. Beginning in the 1850s, Eden Landing's natural conditions of shallow tidal marsh land, relatively dry summers, and navigable creeks that provided shipping points, were critical features for developing the salt industry. The Eden Landing Salt Works landscape encompasses elements that include archaeological features, salt ponds, and water control structures from three of the original salt company operations that provide an essential link to the earliest period of this important industry.

Ten cultural resources have been recorded within HALS-CA-91, all of which are related to the historic period of salt manufacturing. Four sites have been determined eligible, five sites have been determined ineligible, and one site is unevaluated. And, one architectural resource, the Archimedes Screw Windmills, has been determined to be a contributing element of the HALS-CA-91.

4.3.2 Native American Consultation

The USACE and the California Water Board contacted the Native American Heritage Commission (NAHC) requesting an updated Native American tribal consultation list for the Project. The Sacred Lands File search was negative. USACE obtained a tribal consultation list from the NAHC on 14 April 2020. The following Ohlone Tribes were identified as tribal consulting parties under Section 106 of NHPA and NEPA: The Amah Mutsun Tribal Band, Amah Mutsun Tribal Band of Mission San Juan Bautista, Costanoan Ohlone Rumsen-Mutsun Tribe, Indian Canyon Mutsun Band of Costanoan, and the Muwekma Ohlone Indian Tribe of the SF Bay Area.

On June 1, 2022, a virtual Tribal consultation meeting was held with the Confederated Villages of Lisjan (CVL). The CVL is interested in the Pilot Project and wishes to be involved in the monitoring of plants and the effectiveness of the study. The Tribe identified the marsh itself as a cultural resource and would like access to the monitoring data that is collected and are interested in learning if the Pilot Project successful. Consultation with the CVL Tribe is ongoing.

Potential Impacts to Historic Properties Identified in the APE of the Preferred Alternative

Effects to historic properties in the study area of the Preferred Alternative are not significant, as modeling results over a two-month period show minimal accretion ranging from approximately 0.01 cm at the target marsh to approximately 0.1 cm on the mudflats. Modeling results show that two months after placement, the change in bathymetry at the placement site will be between 0.8 and 17 cm. A determination of effect under Section 106 of the NHPA is made only for those resources determined to be eligible for listing in the NRHP. Resources that have been determined to be eligible for listing in the NRHP, or are listed in the NRHP, are referred to as Historic Properties. Resources that have been found or recommended to be ineligible for listing in the NRHP/California Register of Historic Places (CRHP) are not considered further in this EA. The USACE has determined that the Proposed Action constitute a "No Historic Properties Affected", because of the limited deposition potential of strategic placement. The USACE is consulting with SHPO and Tribes on our determination of effect.

NEPA Determination: Effects to historic properties in the study area of the Preferred Alternative are not significant, as modeling results over a two-month period show minimal accretion ranging from approximately 0.01 cm at the target marsh to approximately 0.1 cm on the mudflats. This is similar to natural accretion rates observed by the U.S. Geological Survey. Modeling results show that two months after placement, the change in bathymetry at the placement site will be between 0.8 and 17 cm. Effects to historic properties in either the Proposed Action, at Eden Landing, or Alternative B, at Emeryville Crescent Marsh, would be less than significant. Under the No Action Alternative, effects to historic properties would not be significant as placement would occur at established in-Bay or ocean placement locations.

CEQA Determination: CEQA (California Public Resources Code [PRC] Section 21000 et seq.) is the principal statue governing the environmental review of projects in the state, and Section 21084.1 of CEQA and Section 15064.5 of the State CEQA Guidelines establish the definition of historical resource for the purposes of CEQA. California PRC as a result of

Assembly Bill (AB)-52; PRC Sections 21083.2, 21084.3 CG 15126.4, and CG 15064.5. AB 52 became effective for all projects, including this one, with NOPs published after July 1, 2015. The bill added a definition of "tribal cultural resource," which is separate from the definitions for "historical resource" and "archaeological resource" (PRC Section 21074; 21083.09). The bill also added requirements for lead agencies to engage in additional consultation procedures with respect to California Native American tribes (PRC Sections 21080.3.1, 21080.3.2, 21082.3). Specifically, PRC Section 21084.3 states: "a. Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. b. If the lead agency determines that a project may cause a substantial adverse change to a tribal cultural resource, and measures are not otherwise identified in the consultation process provided in Section 21080.3.2, the following are examples of mitigation measures that, if feasible, may be considered to avoid or minimize the significant adverse impacts: 1) Avoidance and preservation of the resources in place, including, but not limited to, planning and implementation to avoid the resources and protect the cultural and natural context, or planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria." California Register of Historical Resources California PRC Section 5024.1 and 14 California Code of Regulations Section 4850 establishes the CRHR, the "authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historical resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change." No historical resources, archaeological resources, or tribal cultural resources were identified in addition to those already analyzed under the NHPA. Therefore, implementation of the project alternatives would have no adverse impacts to cultural resources.

4.3.3 Navigation/Transportation

Existing Conditions

The distance from Redwood City Channel to Eden's Landing is approximately 10,000 to 18,300 ft. Distance from Oakland Harbor to Emeryville Crescent is approximately 5,500 to 16,000 ft. Average travel time from Redwood City Channel to Eden Landing is approximately 4.5 hours and for Oakland Harbor to Emeryville Crescent estimated travel time is 1 to 1.5 hours. Typical tow speeds are 3-7 knots. The anticipated placement ranges from 19 – 56 days. This assumes a 400 CY/hour maximum production rate for a clamshell dredge plant and the corresponding range of 1 – 3 placements using 900 CY scows every high tide with two high tides per day. This resulted in between 1,800 – 5,400 CY/day of dredged material placement at the placement site, and consequently, 19 – 56 days to achieve the target 100,000 CY of dredged material.

Potential Impacts

While some delays to waterway transportation may occur under either the Proposed Action or Alternative B during placement of material onto the scow or at the placement site these delays are not expected to cause significant adverse impacts to navigation, transportation, or recreational watercraft. Effects of the action alternatives on navigation and transportation would be less than significant when considering the amount of open bay waters available to other marine vessels, both commercial and recreational, utilizing the Bay. No permanent changes to underwater bathymetry is anticipated to impact navigation by recreational or commercial vessels.

NEPA Determination: The Proposed Action, Alternative B, and No Action alternatives would have less than significant impacts on navigation or transportation resources.

CEQA Determination: The project site is more than two miles offshore of Eden Landing within San Francisco Bay, and would be constructed by equipment and personnel that are barged to the project site. No equipment or personnel would be transported to the project site on local surface roads or freeways. Therefore, the project would have **no impact** on traffic and transportation.

4.3.4 Noise

Noise during transport of dredged materials would not be noticeable in the context of other vessel traffic in San Francisco Bay. Similarly, noise from placement of dredged materials in the nearshore would be negligible.

Therefore, implementation of the project alternatives would have negligible impacts on the human noise environment, and this resource is not evaluated further in this EA/IS.

CEQA Determination: Noise from dredging equipment such as a dredging ship can generate noise levels from 55 to 87dBA (Joint Guam 2010), or 62 to 80 dBA (Epsilon 2006), which are below the construction noise thresholds in the Federal Transit Administration (FTA) guidelines of 90 dBA during daytime hours. It does not fall below the nighttime hours threshold, however, the project is over 4 miles from a residential receptor (USACE 2021). It does not fall below the nighttime hours threshold; however, the project is over 4 miles from a residential receptor (USACE 2021). The placement site is over open waters, and there are no sensitive receptors nearby. Short-term noise impacts may occur during placement at the placement site. However, sediment management (including the excavation and placement of dredged materials) has occurred in the past at this location, and ongoing noise from sediment management activities and ambient noise from existing vessel traffic are part of the existing condition. In this context, noise impacts specific to placement of dredged materials from the federal navigation channels would be **less than significant**.

4.3.5 Recreation (boating, fisheries, other):

Dredged material placement activities under the Proposed Action or Alternative B would not involve the construction of recreation facilities, would not create demand for new recreational facilities, and would not result in increased use and deterioration of existing recreational facilities.

The Action alternatives, as well as the No Action alternative may occasionally delay or temporarily impede recreational watercraft during placement activities. However, there would be sufficient room for recreational vessels to maneuver around placement equipment, and vast areas of open Bay waters for vessels to utilize outside of the action area. Therefore, impacts are expected to be negligible. During placement activities, notes to mariners and navigational warning markers would be used as needed to prevent navigational hazards.

Because the project alternatives would have negligible effects on recreational resources, this resource is not evaluated further in this EA/IS.

CEQA Determination: The project site is located more than two miles offshore of existing recreational facilities at Eden Landing and does not propose any new public facilities or activities. Therefore, there would be no impact on recreation.

4.3.6 Land use classification:

The proposed dredging, transport, and placement activities would not require any new land-based construction or facilities and would not result in any new residences or infrastructure that could indirectly induce growth or development in the study area.

Therefore, the project alternatives would not affect land uses, and this resource is not evaluated further in this EA/IS.

CEQA Determination: The project site is over two miles offshore of Eden Landing and is not included in any applicable land use plan, general plan, specific plan, local coastal program, or zoning ordinance. The project would not change the existing land use on site and would therefore have no impact on land use, established communities, or habitat plans.

4.3.7 Environmental Justice:

Environmental justice was a consideration during project site selection, as low-lying communities at the margins of SF Bay are more likely to flood as SLR impacts are felt along the shoreline. As the purpose of this project is to use dredged sediment to sustain mudflats and marshes over time, it is important to consider where that resource may be directed to historically marginalized communities. The two sites considered under the action alternatives are both near underserved communities (Emeryville Crescent, near West Oakland; Eden Landing, near communities in Hayward and Union City). Outreach was conducted to local government groups, and community organizations in Oakland and in Hayward and Union City as well as all tribes in the areas nearby.

EXISTING CONDITIONS

The Proposed Action would take place in the subtidal area just offshore of Eden Landing near Redwood City Harbor (Figure 4-5). The project area is located about 2 miles offshore of the Eden Landing and therefore is not near community infrastructure. According to the BCDC's community vulnerability mapper, census block groups within 2 miles of the project extent are considered to have low social vulnerability (Figure 4-5). Adjacent to Eden Landing, just over 4 miles away from the project extent, there are census block groups with low, moderate, high and highest social vulnerability. On the southwestern side of the project extent, just over 4 miles outside the project extent, there are census block groups with the highest contamination vulnerability and moderate social vulnerability (Figure 4-5).

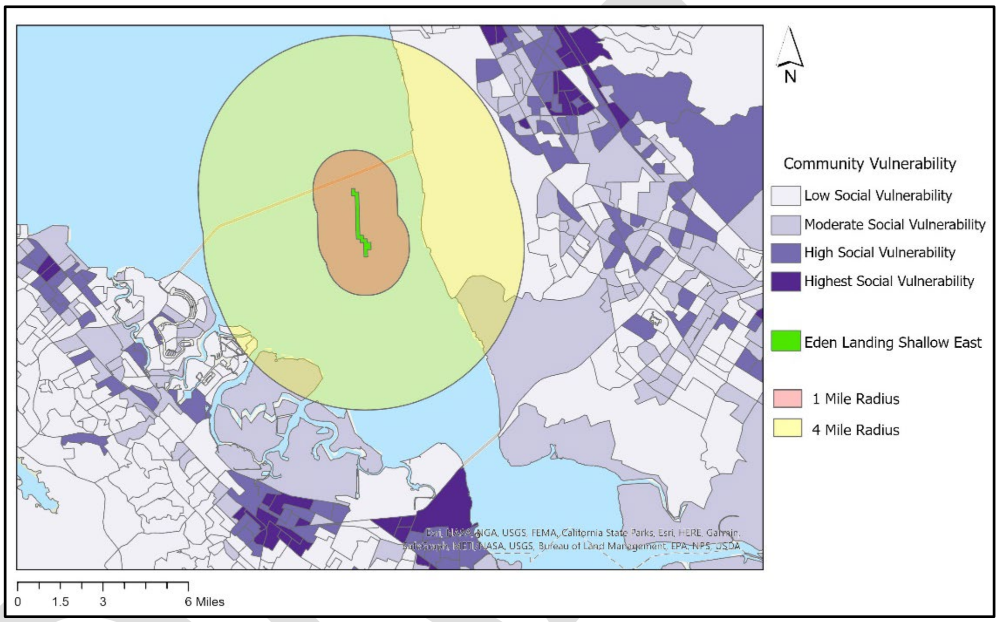

Figure 4-5. Community vulnerability offshore of Union City, Alameda County (BCDC Mapping Tool, 2020).

Figure 4-5 shows the project extent of the Proposed Action (in green) as well as the different levels of community vulnerability in the surrounding areas. A 1-mile (shown in red) and 4-mile (shown in yellow) buffer radius around the project extent is also shown. There are census block groups with moderate, high, and highest social vulnerability 4 miles outside the project area, but no such census block groups within 1 mile.

Alternative B would take place in an area just offshore of Emeryville Crescent near West Oakland. There are communities with moderate, high, and highest social vulnerability within 1 mile of the Emeryville Crescent project extent (Figure 4-6).

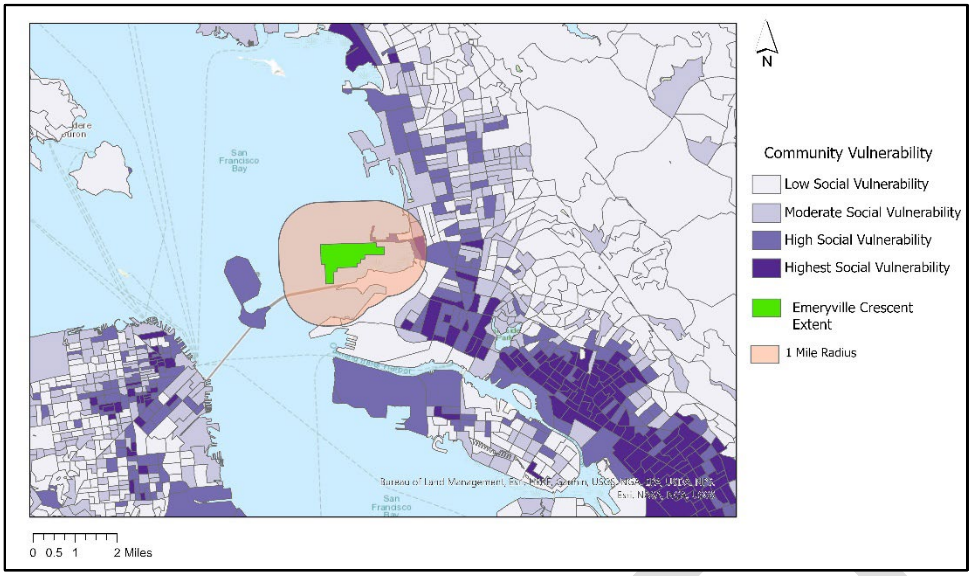

Figure 4-6. Community vulnerability offshore Emeryville, Alameda County (BDCD Mapping Tool, 2020).

Figure 4-6 Shows the project extent of the proposed plan (in green) as well as the different levels of community vulnerability in the surrounding areas. A 1-mile radius (shown in orange) is also shown. There are census block groups with moderate, high, and highest social vulnerability within 1 mile of the project extent.

Potential Impacts

At both action alternative sites, the dredged material placement activities would not result in construction or modification of residences or commercial facilities and would not require a large workforce. Therefore, the project alternatives would have no adverse effect on population and housing or socioeconomics.

Based on the nature and location of the proposed dredged material placement activities, no adverse impacts resulting from the project alternatives would be disproportionately borne by minority or low-income populations. Both alternatives avoid impacts to vulnerable populations. Eden Landing (under the Proposed Action) or the Emeryville Crescent Marsh (under Alternative B) would act as a buffer between marshland and vulnerable communities. Implementation of either action alternative would attempt to enhance coastal marshland and counteract coastal erosion, which would indirectly benefit surrounding communities.

NEPA Determination: No adverse environmental justice impacts would occur under the Proposed Action, Alternative B, or the No Action alternatives. While the Proposed Action or Alternative B have the potential to indirectly benefit nearby communities by enhancing coastal marshland and counteracting coastal erosion, the No Action alternative would not provide any such potential benefits as it would place material at existing in-Bay or Ocean placement sites. Growth inducing impacts - community growth, regional growth:

This project occurs offshore and will not contribute to community or regional growth. This resource is not evaluated further in this EA/IS.

CEQA Determination: The project would not build new housing or businesses, nor build any infrastructure that could indirectly support new housing or businesses. Therefore, the project would not induce new development on nearby lands, and no impact on growth would occur.

4.3.8 Conflict with other use plans, policies or controls:

This project occurs offshore and would have no effect on or conflict with other use plans, policies, or controls.

CEQA Determination: See discussion under Section 4.3.6; there would be no impact on use plans, policies, or controls.

4.3.9 Irreversible changes, irretrievable commitment of resources:

This project does not result in any irreversible changes or an irretrievable commitment of resources.

5 Cumulative impacts

The Council on Environmental Quality's regulations for implementing NEPA define a cumulative effect as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). Under CEQA, cumulative impacts are defined "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." (Cal. Code Regs., tit. 14, § 15355.) A cumulative impact from several projects is "the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time." (Cal. Code Regs., tit. 14, § 15355, subd. (b).)

This section discusses the potential cumulative effects of the 1122 Strategic Placement EA when added to other past, present, and reasonably foreseeable future actions. As presented in the Affected Environment (Section 4), resources are identified as potentially impacted by the project. These resources could experience a cumulative effect related to the project and are therefore evaluated below. Resources that would not be affected are not evaluated.

5.1 Methodology and Geographic Scope of the Analysis

The cumulative effects analysis determines the combined effect of the proposed project with other past, present, and reasonably foreseeable projects. Cumulative effects were evaluated by identifying projects in and around the study area with effects that, when combined with the effects of the proposed alternatives, could have significant adverse or beneficial effects. These potential effects are combined with the potential adverse or beneficial effects of the proposed alternatives to determine the type, length, and magnitude of potential cumulative effects. Significance of cumulative effects is determined by meeting Federal and State mandates and the specific criteria identified throughout the Affected Environment Section of this document for the affected resources.

Table 5-1 presents the general geographic areas associated with the different resources addressed in this cumulative effects analysis.

Table 5-1. Geographic areas that would be affected by the strategic shallow-water placement project.

Resources	Geographic Area	Temporal Scope
Hydrology and Hydraulics	Eden Landing shallow/east placement footprint: 138 acres Emeryville Crescent shallow/east placement footprint: 69 acres	This will be adaptively managed and monitored for 12 months. Most sediment transport expected in 0-3 months.
Water Quality	Eden Landing shallow/east placement footprint: 138 acres Emeryville Crescent shallow/east placement footprint: 69 acres	Duration of placement: 19 - 56 days
Biological Resources	Eden Landing shallow/east placement footprint: 138 acres Emeryville Crescent shallow/east placement footprint: 69 acres	0-2 years
Special Status Species	Eden Landing shallow/east placement footprint: 138 acres Emeryville Crescent shallow/east placement footprint: 69 acres	Duration of placement: 19 - 56 days
Cultural Resources	The area of potential effects (APE) includes the offshore placement site (~138 acres) and the marsh and mudflats within the western extent of the Eden Landing (~2,500 acres), including all monitoring sites. The vertical APE is a minimum depth of 2’ and maximum depth of 10’ below the surface of the Bay.	0-2 years
Navigation/Transportation	Eden Landing shallow/east placement footprint: 138 acres Emeryville Crescent shallow/east placement footprint: 69 acres	Redwood City Dredging to Eden’s Landing Travel Distance: Range 10,000-ft to 18,300-ft.

		Oakland Dredging to Emeryville Crescent Travel Distance: Approximately 5,500-ft to 16,000-ft Duration of placement: 19 - 56 days
Air Quality/Greenhouse Gas	South SF Bay portion of Bay Area Air Quality Management District	Duration of placement: 19 - 56 days
Noise	Immediate vicinity of the individual placement sites	Duration of placement: 19 - 56 days
Recreation	Eden Landing shallow/east placement footprint: 138 acres Emeryville Crescent shallow/east placement footprint: 69 acres	Duration of placement: 19 - 56 days
Visual Resources	South San Francisco Bay	Duration of placement: 19 - 56 days
Marshes	Eden Landing Ecological Reserve Whale's Tail marsh Emeryville Crescent Marsh	This will be adaptively managed and monitored for 12 months. Most sediment transport expected in 0-3 months.
Mudflats	Area between Eden Landing Ecological Reserve Whale's Tail Marsh and the shallow/east placement footprint Area between Emeryville Crescent Marsh and the placement area	This will be adaptively managed and monitored for 12 months. Most sediment transport expected in 0-3 months.
Shoreline	Eden Landing Ecological Reserve Whale's Tail marsh edge Emeryville Crescent Marsh edge	This will be adaptively managed and monitored for 12 months. Most sediment transport expected in 0-3 months.

5.2 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE PROJECTS

Projects and actions with the potential to result in cumulative effects are summarized below in Table 5-2. The exact timing and sequencing of these projects are not yet determined or may depend on uncertain funding sources. All these projects are required to evaluate the effects of the proposed project features on environmental resources in the area. In addition, BMPs and avoidance, minimization, or must be developed to avoid or reduce any adverse effects to less than significant effect levels based on federal and local agency criteria. Those effects that cannot be avoided or reduced to less than significant are more likely to contribute to significant cumulative effects in the area. The 1122 Strategic Placement Project and related projects will be in South San Francisco Bay. Relevant projects are projects that are related or similar projects that are reasonably foreseeable and have the potential to affect the same resources and fall within the same geographic and temporal scope. A cumulative impact refers to two or more individual effects which, when considered together, are significant or compound or increase other environmental impacts. The individual effects may be changes resulting from a single project or several separate projects.

Table 5-2. Past, Present, and Reasonably Foreseeable Future Projects

PROJECT NAME/LEAD AGENCY	DESCRIPTION	POTENTIAL CUMULATIVE EFFECTS
South Bay Salt Ponds Restoration Project (SBSPRP) California State Coastal Conservancy (lead) South SF Bay Shoreline Phase I and II US Army Corps of Engineers	This Project is the largest tidal wetland restoration project on the West Coast. When complete, the project will restore 15,100 acres of industrial salt ponds to a rich mosaic of tidal wetlands and other habitats. The Restoration Plan calls for turning at least 50%, and potentially as much as 90%, of the Project's 15,100 acres into tidal marsh over the next few decades. In Phase 2 construction habitat work will include using fill to build higher-ground areas in wetlands and ponds that wildlife can escape to during floods, high tides and in the face of SLR. Phase 2 work will focus largely on restoring salt marsh, because our modeling to date indicates that speeding the restoration of wetlands could enable those newly restored areas to help protect against SLR.	Longshore transport could move the placed sediment from the Eden Landing area to some of the Salt Ponds. Any transport of material from Emeryville Crescent outside of the placement area would not impact the South Bay Salt Ponds (SBSP) or Shoreline Projects. Given the small quantity of material being placed during the Pilot Project, the possibility of transport of those sediments in several directions, and the likelihood that much of the sediment would take several years to move, the cumulative impact should be less than significant.
Oakland Turning Basin	The project will improve navigation at the Port of Oakland turning basins to accommodate larger vessels.	No direct combined cumulative impacts to the Port of Oakland are expected with the Strategic Shallow-Water Placement Project under either action alternative.
Calabazas/San Tomas Aquino Creek Marsh connection Project	The project will restore natural connections between the watershed and San Francisco Bay. Restoration of natural processes, such as the deposit of marsh-sustaining sediment, will support the development of tidal marsh in a group of former salt production ponds (Ponds A8, A8S, A5, and A7, referred to as the Pond A8 Complex), as well as riparian habitat and freshwater marsh.	This project, which is at the southern end of San Francisco Bay, is in the planning stage, so no cumulative effects are expected with the one-time Strategic Shallow-Water Placement Project.

5.3 SUMMARY OF INDIRECT AND CUMULATIVE EFFECTS FROM THE PROPOSED ACTION.

There are expected to be less than significant indirect and cumulative impacts to hydraulics and hydrology, water quality, biological resources, special status species, navigation/transportation, air quality/greenhouse gas emissions, noise, recreation, visual resources, marshes, mudflats, and shorelines. Of these categories, there may be the potential for cumulative impacts on air quality/greenhouse gas emissions, but with mitigation, as well as the short time span of project duration (approximately 19 - 56 days), it is unlikely that any emissions resulting from this project will result in significant cumulative impacts.

One possible indirect impact is sediment deposition in nearby flood control channels and federal navigation channels. About 0.2% of the dredged material was predicted to be transported into Redwood City Harbor, and 0.3% was transported into the Alameda FCC (Appendix E). A second potential indirect impact is sediment deposition in non-target subtidal and tidal mudflat areas. About 18% of the placed dredged material was predicted to be dispersed within the South Bay below MLLW, 2% dispersed north of Dumbarton

Bridge, and 4% dispersed north of the Bay Bridge (Appendix E). Given the volume of sediment placed for this project, the indirect impacts outlined above are expected to be less than significant. On the contrary, the indirect impact of sediment deposition on adjacent tidal mudflats will provide additional benefits for the Bay's mudflat-marsh systems more broadly.

NEPA Determination: For both action alternatives, direct and indirect impacts would be temporary and minor and less than significant. For the No Action Alternative, no change to cumulative impacts would be expected as O&M dredging would continue utilizing existing placement sites. The project's action alternatives in combination with other restoration projects in the bay would have a cumulative beneficial impact on adjacent marsh.

CEQA Determination: The project, with mitigation measures in place, would not contribute to adverse cumulative impacts. Cumulative impacts would be **less than significant**.

6 Compliance with Applicable Laws and Regulations

Compliance with Applicable Laws and Regulations

The status of the proposed action's compliance with applicable Federal environmental requirements is summarized below. Prior to initiation of any work, the work would comply with all applicable Federal laws and Executive Orders. Project alternatives comply with applicable laws and regulations as shown below in Table 6-1 and the Environmental Appendix, A.

Table 6-1. Summary of environmental compliance with applicable laws

Statute	Status of Compliance
Clean Air Act	An emissions inventory has been completed and the emissions are below the de minimis threshold. No general conformity analysis is needed.
Clean Water Act	Water Quality certification will be requested in parallel with Release of EA/IS/MND for Public Comment
Coastal Zone Management Act of 1972 (16 USC 1451 et seq)	A Consistency Determination has been prepared and is being coordinated with the BCDC
Endangered Species Act	Request for concurrence from NMFS with Not Likely to Adversely Affect determination prepared. Consultation will be initiated in parallel with EA/IS/MND release for Public Comment
Fish and Wildlife Coordination Act	Planning Aid Letter is underway by USFWS and will be obtained prior to NEPA decision.
Magnuson-Stevens Fishery Conservation and Management Act	EFH Assessment prepared. Will be submitted to NMFS when EA/IS/MND is circulated for Public Comment
Migratory Bird Treaty Act	No impacts to migratory birds are expected from the proposed action.
Marine Mammal Protection Act	No significant impacts to marine mammals are expected from the proposed action.

National Environmental Policy Act Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the NEPA (40 CFR 1500-1508) dated July 1986	This EA has been prepared in compliance with NEPA and CEQ regulations. All agency and public comments will be considered and evaluated. If appropriate, a Finding of No Significant Impact (FONSI) will be signed with a conclusion of no significant impacts from this proposed action. A Draft FONSI is included in this EA/IS/MND.
National Historic Preservation Act Executive Order 11593: Protection and Enhancement of the Cultural Environment Archaeological and Historic Preservation Act of 1974, (16 USC 469 et seq)	The proposed action would not affect any historical and cultural resources as none occur within the proposed action area. Concurrence request sent to SHPO on 25 Jul 22. Currently responding to subsequent information request
Marine Protection Research and Sanctuaries Act of 1972 (33 USC 1401 et seq)	Dredged material will not be disposed at an established ocean dumping site.

7 Agencies Consulted and Public Notification

Since the project began in earnest in February 2021, there have been two stakeholder meetings (March 10, 2021, and May 16, 2021) which included resource agencies, the dredging community, community and environmental groups, science organizations, and others. These stakeholder charettes helped the team narrow in on key environmental concerns, and criteria for site selection, as well as logistical constraints. Two separate resource agency working group meetings were held with participating and cooperating agencies on March 26, 2021, and April 23, 2022. These discussions included concerns for impacts to environmental resources, and biological communities, and discussions of appropriate levels of monitoring and consultation for this pilot study. Before a site was selected, the project team coordinated with both the South Bay Salt Ponds (SBSP)and CDFW regarding the Eden Landing Site and worked with the West Oakland Environmental Indicators Project (WOIEP)'s Shoreline Leadership Academy exploring potential partnerships around the Emeryville Site.

Once the Eden Landing Site was selected as the Proposed Action, the project team met with City of Hayward, Alameda County Flood Control and Water Conservation District, Union Sanitary District (USD), and East Bay Dischargers Authority (EBDA) to discuss modeling results and potential impacts and benefits to this part of the shoreline. Given that the results of the modeling show 1-2 mm of deposition, these parties were not concerned with any impacts, and were hopeful in this experiment's viability as a tool as SLR rates increase. Both EBDA and USD are engaged in SLR vulnerability studies and adaptation planning, as saw this project as beneficial to the region.

A CEQA notice of scoping was send on July 1, 2022, and a public scoping meeting was held on July 15, 2022, by the Waterboard. During this meeting, members of the public asked thoughtful questions about the potential of this effort to impact waterbirds foraging, which

On August 18, 2022, the members of the team partnered with the SBSP program to staff a Table at the Downtown Hayward Street Party which is an annual event sponsored by the Chamber of Commerce. The team engaged with members of the public describing the pilot project with visuals and answered questions.

Table 7-1 through Table 7-4 identify consulting parties and when consultation was intiated. Tribal consultation, which has been ongoing since May 2022, will include a site visit in October 2022 with interested tribes and stakeholders. The Confederated Villages of Lisjan's representative described this project as "hopeful" during a consultation with USACE cultural resources staff. The Tribe will be involved throughout the study and will monitor the data that is collected showing the effectiveness and impacts to the environment that result from this study.

Table 7-1. Community and community-based organization contact details.

Organization	Contact Person	Date Contacted	Type of Communication	Communication Purpose
West Oakland Environmental Indicators Project/Shoreline Leadership Academy	Phoenix Armenta	3/31/2022	E-mail	Community Science coordination
East Bay Regional Park District	Matthew Graul (Chief of Stewardship, Stewardship Administration); Doug Bell (Wildlife Program Manager)	11/19/2021, 12/10/2021, 3/29/2022	E-mail (and WebEx)	Volunteer days/community outreach
City of Hayward	Erik Pearson (Environmental Services Manager); Mary Thomas (Management Analyst); Leigha Schmidt; Jennifer Ott; Chuck Finnie; Alex Ameri; Sara Lamnin; Zach Ebadi; Dustin Claussen; Bryant Duong; Taylor Richard; John Holder (EBRPD, Coordinator for Hayward Area Shoreline Planning Agency)	5/24/2022, 6/14/2022	E-mail (and WebEx)	Public meeting brainstorm and outreach strategy feedback
Stakeholders	Camen Zind Dredging, Curtin Maritime, Dutra Group, Kiewit, Lind Marine, Manson Construction, Pacific Dredge, Pacific Maritime Group, Restaite Ridredge	5/10/2021, 5/15/2022	E-mail and WebEx	Stakeholder feedback
Downtown Hayward Street Party	City of Hayward	8/18/2022	In-person	Public engagement
Oakland San Leandro Adaptation Working group	Daniele Mieler, City of Alameda	8/14/2022	Virtual	Communication to community groups and local government representatives

Table 7-2. Agency engagement details.

Agency	Contact Person	Date Contacted	Type of Communication	Purpose of Communication
BCDC	Nahal Ghoghaie (EJ Manager), Brenda Goeden (Sediment Program Manager)	8/23/2021	E-mail	Environmental Justice Community Engagement
Alameda County Flood Control & Water Conservation District	Hank Ackerman (Flood Control Program Manager)	5/10/2022, 5/13/2022	E-mail and WebEx	Flood Control channel impacts
Resource Agency Working Group	California State Coastal Conservancy, Bay Conservation and Development Commission, California State Water Control Board, US Environmental Protection Agency, California Department of Fish and Wildlife, California State Lands Commission, National Oceanic and Atmospheric Administration, US Fish and Wildlife Service, California State Parks	3/26/2021, 5/23/2022	E-mail and WebEx	Project Updates
California Department of Fish and Wildlife/South Bay Salt Ponds		1/20/2022, 5/6/2022, 5/31/2022 (incl. State Coastal Conservancy and Invasive Spartina Project)	E-mail and WebEx	Coordination Outreach

Table 7-3. Tribal contact details for required consultations under Section 106 of the National Historic Preservation Act.

Tribe	Contact Person	Date Contacted	Type of Communication	Purpose of Communication
Amah MutsunTribal Band of Mission San Juan Bautista	Chairperson Irene Zwierlein	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
Costanoan Rumsen Carmel Tribe	Chairperson Tony Cerda	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
Guidiville Indian Rancheria	Chairperson Donald Duncan	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
Indian Canyon Mutsun Band of Coastanoan	Chairperson Ann Marie Sayers and Kanyon Sayers-Roods, MLD Contact	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
Muwekma Ohlone Indian Tribe of the SF Bay Area	Chairperson Charlene Nijmeh and Vice Chairwoman Monica Arellano	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
North Valley Yokuts Tribe	Chairperson Katherine Perez and Timothy Perez	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
The Ohlone Indian Tribe	Andrew Galvan	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
Wuksache Indian Tribe/Eshom	Chairperson Kenneth Woodroy	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
The Confederated Villages of Lisjan	Chairperson Corrina Gould	4/15/2022	E-mail	Initiate Tribal consultation for NEPA/CEQA and Sec. 106
The Confederated Villages of Lisjan	Chairperson Corrina Gould	6/1/2022	Zoom Meeting	Meeting to discuss Tribe's involvement in project. Especially interested in all things related to monitoring.

Table 7-4. Other relevant project communications.

Meeting	Date
Planning Charette	3/10/2021
USGS Monitoring Discussion	3/23/2021
Resource Agency Working Group	3/26/2021
USGS Monitoring Discussion	3/30/2021
USGS Monitoring Discussion	4/29/2021
Presentation to Bay Planning Coalition Dredging and Beneficial Reuse Committee	5/3/2021
Presentation to LTMS Management Committee	5/7/2021
Presentation to Bay RMP Sediment Workgroup	5/20/2021
Presentation to Bay RMP Steering Committee	7/21/2021
Presentation to LTMS Management Committee	9/10/2021
Presentation to Bay Planning Coalition Annual Meeting	10/21/2021
Bay Area One Water Network and San Francisco Estuary Partnership RoundTable on Nature-Based Solutions for climate adaptation	11/3/2021 - 11/4/2021
Presentation to SPN Dredging day	1/27/2022
Presentation to LTMS Project Coordination Meeting	4/19/2022
East Bay Dischargers Authority	7/12/2022
CEQA Notice of Scoping	7/15/2022

7.1 Agencies Contacted

The following agencies were provided this EA/IS for review and comment, along with the interested public, during the public comment period.

A. Federal agencies:

1) U.S. Environmental Protection Agency (EPA Region 9)
2) Advisory Council – Historic Preservation
3) U.S. Fish and Wildlife Service
4) National Marine Fisheries Service

B. State and local agencies:

1) Bay Conservation and Development Commission (BCDC)
3) State Lands Commission
4) State Historic Preservation Officer
5) Regional Water Quality Control Board Region (RWQCB)
6) Bay Area Air Quality Management District (BAAQMD)

7.2 Evaluation and incorporation of comments

NOTE: Summary of USACE evaluation and incorporation of comments will be added after public comment period.

There are no significant impacts anticipated from this project, the following avoidance and minimization and possible mitigation for biological resources and air quality.

1. **Biological Resources Mitigation Measure (BIO-1)**

   b. The project shall comply with the provisions of the U.S. Fish and Wildlife Service and the NMFS in the project's ESA consultations.

Water-quality objectives and beneficial uses (i.e., standards) for the project site are described in the Water Quality Control Plan for the SF Bay Basin (Basin Plan) adopted by the SF Bay RWQCB (Water Board). Beneficial uses of mudflats and tidal marshes in the region include providing estuarine habitat (EST), habitat for special-status and/or rare organisms (RARE), fish migration (MIGR), and recreation (REC-1 and REC-2). Climate change threatens these beneficial uses via rising sea levels, which can drown mudflats and tidal wetlands and convert them to shallow open water habitats (Goals Project 2015).

The project is intended to result in beneficial environmental impacts, by augmenting the local supply of sediment available to support accretion in mudflats and tidal wetlands and help them keep pace with rising sea levels. The water quality objectives at issue for the project are sediment and turbidity. The water quality objective for sediment provides that the sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses. Similarly, the turbidity water quality objective states that waters shall be free of turbidity changes that cause nuisance or adversely affect beneficial uses and increases in turbidity from discharges shall not be greater than 10 percent where background turbidity is greater than 50 NTU. During periods of sediment placement, nearby tidal waters would likely experience temporary increases in sediment and turbidity because of placed material settling on the Bay mudflats and dispersing into the water column.

Modeling indicates that after dredged sediment placement, SSC adjacent to the placement footprint would most frequently range between 50 and -300 mg/L over baseline conditions and could be elevated by as much as 500 mg/L in the most extreme case. However, the modeling also indicates that SCC would quickly return to baseline after each placement episode. Once the material is placed, tidal currents and waves are expected to re-work these sediments and disperse additional sediment into the water column to support accretion in nearby mudflats and tidal marshes. Given the naturally turbid nearshore environment in the project vicinity, temporary local increases in turbidity would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality, so this impact would be less than significant. Moreover, in permitting the discharge, the Regional Water Board will have to ensure the discharge meets water quality standards, including antidegradation requirements, further ensuring impacts remain less than significant.

2. **Biological Resources Mitigation Measure (BIO-2)**

Eelgrass

a. Consistent with the June 9, 2011, Programmatic Essential Fish Habitat Consultation Agreement (Agreement) between the U.S. EPA, USACE, and the NMFS, the Permittee shall conduct pre- and post-dredge surveys of eelgrass areal coverage and density within the dredge footprint where it overlaps the 45-meter direct impact buffer zone.

b. Consistent with the Agreement, the Permittee shall implement operational control BMPs to protect eelgrass beds within 250 meters of dredging activity from adverse impacts because of excess turbidity in the water column.

c. The permittee shall mitigate for potentially significant impacts in accordance with the California Eelgrass Mitigation Policy and Implementing Guidelines (noaa.gov). In accordance with the policy, monitoring will be performed to assess potential impacts to eelgrass, and if found, eelgrass impacts will be mitigated to less than significant by creating, restoring, and/or enhancing eelgrass habitat at a minimum ratio of 1.2:1 acres. If the Project adversely impacts eelgrass, the Permittee shall submit and implement a mitigation plan and schedule, acceptable to Water Board staff. A NMFS-approved mitigation plan and schedule shall be considered acceptable to Water Board staff.

We expect less than significant impacts to eelgrass beds. The SF Bay Conservation and Development Commission's website has a web-based application, SF Bay Eelgrass Impact Assessment Tool (Tool), for assessing the potential impacts of dredging projects on eelgrass. The Tool, which is located at SF Bay Eelgrass Impact Assessment Tool | BCDC Open Data Portal (arcgis.com), shows 1) the maximum extent of eelgrass beds that have been surveyed in SF Bay as of 2021; 2) a 45-meter growth buffer for potential bed expansion (direct impact buffer zone); and 3) a 250-meter turbidity buffer around eelgrass for determining indirect impacts (indirect impact buffer zone). Using the Tool to map the location of the project relative to the location of eelgrass beds and adjacent buffer zones shows that most areas of the project are neither within the 45-meter direct impact buffer zone nor the 250-meter indirect impact buffer zone.

To ensure there won't be any significant impacts to eelgrass, however, we (the Permittee) will conduct pre- and post-dredge surveys of eelgrass areal coverage and density within the dredge footprint if it overlaps the 45-meter direct impact buffer zone. In addition, we will implement operational control BMPs to protect eelgrass beds within 250 meters of dredging activity from adverse impacts because of excess turbidity in the water column. If the Project adversely impacts eelgrass, we will submit and implement a mitigation plan and schedule, acceptable to Water Board staff, which will mitigate eelgrass losses at a 3:1 ratio. A NMFS-approved mitigation plan and schedule will be considered acceptable to Water Board staff. Condition required pursuant to CWC Section 13267; 33 CFR 332.4(a)(C)(4); and 33 CFR 332.6(a)(1).

3. Air Quality Mitigation Measure (AQ-1)

Basic Exhaust Emissions Reduction Measures

BAAQMD's CEQA Air Quality Guidelines require several best management practices to control exhaust emissions regardless of the estimated construction emissions. The BAAQMD requires that the following measures be implemented by the construction contractor:

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations). Clear signage shall be provided for construction workers at all access points.

- All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

FINDING OF NO SIGNIFICANT IMPACT

SF BAY STRATEGIC SHALLOW-WATER PLACEMENT PILOT PROJECT
SAN FRANCISCO, CALIFORNIA

The U.S. Army Corps of Engineers, San Francisco District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended. The final EA/IS/MND for the SF Bay Strategic Shallow-Water Placement Pilot Project dated 23 September 2022, addresses the placement of Dredged material from the Redwood City Harbor Operations and Maintenance Dredging Project in shallow water adjacent to the mudflat and salt marsh at Eden Landing, Alameda County, California under the authority of Section 1122 of the WRDA of 2016.

The EA, incorporated herein by reference, evaluated various alternatives that would promote the transport of fine-grained, dredged sediment onto the target tidal mudflat and tidal marsh. The recommended plan includes:

- The placement of up to 100,000 CY of annual maintenance dredged material from the Redwood City Harbor Federal Navigation Channel directly into shallow water (between 9 and 12 ft MLLW) at a thickness of between four inches and one foot approximately two miles offshore of Eden Landing.
- Pre- and post-placement monitoring to determine the environmental impact and the effectiveness of waves and currents in transporting the sediment to the mudflat and marsh

In addition to the proposed action, a No Action Alternative was evaluated. The alternatives included the input of resource agencies, the public, and local tribes in identifying potential effects.

For both alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 9-1.

Table 9-1: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects because of mitigation*	Resource unaffected by action
Recreation and Aesthetics	☒	☐	☐
Air quality	☐	☒	☐
Aquatic resources/wetlands	☐	☒	☐
Invasive species	☐	☐	☒
Fish and wildlife habitat	☒	☐	☐
Threatened/Endangered species/critical habitat	☒	☐	☐
Historic properties	☐	☐	☒
Other cultural resources	☐	☐	☒
Floodplains	☐	☐	☒
Hazardous, toxic & radioactive waste	☒	☐	☐
Hydrology	☒	☐	☐
Land use	☐	☐	☒
Navigation	☒	☐	☐
Noise levels	☐	☐	☒
Public infrastructure	☐	☐	☒
Socio-economics	☐	☐	☒
Environmental justice	☐	☐	☒
Geology, Topography, Soils	☒	☐	☐
Tribal trust resources	☐	☐	☒
Water quality	☐	☒	☐
Climate change	☒	☐	☐
Transportation	☒	☐	☐
Safety	☐	☐	☒

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. BMPs as detailed in the EA will be implemented, if appropriate, to minimize impacts.

No compensatory mitigation is required as part of the recommended plan.

Public review of the draft EA and FONSI was completed on 24 October 2022. All comments submitted during the public review period were responded to in the Final EA and FONSI. A 30-day state and agency review of the Final EA was completed on 24 October 2022.

Pursuant to section 7 of the ESA of 1973, as amended, the USACE determined that the recommended plan may affect but is not likely to adversely affect the following federally listed species or their designated critical habitat: California least tern, marbled murrelet, western snowy plover, coho Salmon, chinook salmon, steelhead, green sturgeon, leatherback turtle, black abalone.

Pursuant to section 106 of the National Historic Preservation Act of 1966, as amended, the USACE determined that historic properties would not be adversely affected by the recommended plan. Consultation with the California State Historic Preservation Office is ongoing, and concurrence is expected by 31 October 2022.

Pursuant to the CWA of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The CWA Section 404(b)(1) Guidelines evaluation is found in Section 4 of this EA.

A water quality certification pursuant to section 401 of the CWA will obtained from the SF Bay RWQCB. All conditions of the water quality certification would be implemented to minimize adverse impacts to water quality.

A determination of consistency with the California Coastal Zone Management program pursuant to the Coastal Zone Management Act (CZMA) of 1972 will be obtained from the Bay Conservation and Development Commission prior to the start of work. All conditions of the consistency determination shall be implemented to minimize adverse impacts to the coastal zone. The BMPs include:

- Biological Resources Mitigation Measure (BIO-1)
    - a) The project shall comply with the provisions of the U.S. Fish and Wildlife Service and the NMFS in the project's ESA consultations.
- Biological Resources Mitigation Measure (BIO-2)
    - a) Eelgrass
        - i) Consistent with the June 9, 2011, Programmatic Essential Fish Habitat Consultation Agreement (Agreement) between the U.S. EPA, USACE, and the NMFS, the Permittee shall conduct pre- and post-dredge surveys of eelgrass areal coverage and density within the dredge footprint where it overlaps the 45-meter direct impact buffer zone.
        - ii) Consistent with the Agreement, the Permittee shall implement operational control BMPs to protect eelgrass beds within 250 meters of dredging activity from adverse impacts because of excess turbidity in the water column.
        - iii) If the Project adversely impacts eelgrass, the Permittee shall submit and implement a mitigation plan and schedule, acceptable to Water Board staff. A NMFS-approved mitigation plan and schedule shall be considered acceptable to Water Board staff.
        - iv) This mitigation measure is required pursuant to CWC Section 13267; 33 CFR 332.4(a)(C)(4); and 33 CFR 332.6(a)(1).
- Air Quality Mitigation Measure (AQ-1)

a) Basic Exhaust Emissions Reduction Measures
   i) BAAQMD's CEQA Air Quality Guidelines require several best management practices to control exhaust emissions regardless of the estimated construction emissions. The BAAQMD requires that the following measures be implemented by the construction contractor:
b) Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to five minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations). Clear signage shall be provided for construction workers at all access points.
c) All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

Technical, environmental, economic, and cost effectiveness criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 <u>Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.</u> All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State, and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement (EIS) is not required.

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Date

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Kevin P. Arnett
LTC, EN, Corps of Engineers
District Commander

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