EAST SAN PEDRO BAY ECOSYSTEM RESTORATION FEASIBILITY STUDY

City of Long Beach, CA

FINAL Integrated Feasibility Report and Environmental Impact Statement/ Environmental Impact Report (EIS/EIR)

January 2022

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City of Long Beach Incorporated 1897

US Army Corps of Engineers®
Los Angeles District

EAST SAN PEDRO BAY ECOSYSTEM RESTORATION STUDY
CITY OF LONG BEACH, CALIFORNIA
FINAL INTEGRATED FEASIBILITY REPORT
AND
ENVIRONMENTAL IMPACT STATEMENT/
ENVIRONMENTAL IMPACT REPORT

The Federal lead agency responsible for implementing the National Environmental Policy Act {NEPA} is the U.S. Army Corps of Engineers [USACE), Los Angeles District. The local lead agency responsible for implementing the California Environmental Quality Act {CEQA} is the City of Long Beach.

The Integrated Feasibility Report {IFR} for the East San Pedro Bay Ecosystem Restoration Feasibility Study evaluates alternatives for restoring 18 square miles of the East San Pedro Bay from approximately the Port of Long Beach to Alamitos Bay.

Restoration objectives include restoring aquatic ecosystems in a marine environment, to increase abundance and biodiversity of marine populations in East San Pedro Bay. Restoration measures considered include establishing additional rock habitat structure that would support kelp, eelgrass, and other sensitive species or habitat types, and expanding sandy shorebird habitat and coastal wetlands. The study is focused on evaluating opportunities to restore substrate habitats with broad ecosystem value, rather than focusing on restoring for individual species. The study evaluated the No Action Alternative and three action alternatives, Alternatives 2, 4A, and 8 in detail. The Recommended Plan is the National Ecosystem Restoration Plan, Alternative 4A, which includes the following activities:

- Sourcing, transporting, and staging approximately 680,000 tons of quarry stone over the eight years of active construction;
- Construction of 24 separate kelp beds totaling approximately 121 acres, consisting of a single layer of rock approximately five acres each using “push off” method from an anchored derrick barge;
- Construction of two separate open water rocky reefs totaling approximately 29 acres, with each reef containing roughly 50 individual mounds of rocks ranging in height between 3-12 feet and approximately 80-100 feet in diameter;
- Construction of six separate nearshore rocky reefs totaling approximately 20 acres, with each reef covering 4-5 acres in a linear configuration parallel to the shoreline;
- Dredging approximately 100,000 cubic yards of sand from the Surfside/Sunset borrow area, and placing sand on leeward or beach side of nearshore rocky reefs for eelgrass beds;
- Planting of eelgrass in six discrete beds totaling approximately 30 acres on leeward side of the six nearshore rocky reefs using transplanted eelgrass material from donor beds.

A notice of availability of the draft environmental impact statement (EIS) was published in the Federal Register on November 25, 2019. The Draft IFR, which contains the EIS, was also published on the Los Angeles District’s website November 25, 2019. The 60-day public comment period ended on January 27, 2020. All comments received were considered and incorporated into the Final IFR, as appropriate.

For further information, please contact the USACE at the following address:

ESPB DDN Comments
Headquarters
U.S Army Corps of Engineers
ATTN: CECQ-P (IP)
7701 Telegraph Road
Alexandria, VA 22315-3860

This Final IFR serves as the Final EIR under CEQA. It has been posted to the State of California's Clearinghouse at the Governor's Office of Planning and Research at http://opr.ca.gov/clearinghouse/ceqa. The State Clearinghouse number for the EIR is ___________. The State Clearinghouse may be contacted at (916) 445-0613 or state.clearinghouse@opr.ca.gov.

EAST SAN PEDRO BAY
ECOSYSTEM RESTORATION FEASIBLITY STUDY
FINAL INTEGRATED FEASIBILITY REPORT AND
ENVIRONMENTAL IMPACT STATEMENT /
ENVIRONMENTAL IMPACT REPORT

CITY OF LONG BEACH, CALIFORNIA

JANUARY 2022

Prepared by:

U.S. ARMY CORPS OF ENGINEERS

LOS ANGELES DISTRICT

In Partnership With:

THE CITY OF LONG BEACH

With Technical Assistance From:

RECON ENVIRONMENTAL, INC

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AAHU	Average Annual Habitat Units
AAQS	Ambient Air Quality Standards
ACHP	Federal Advisory Council on Historic Preservation
ACRA	Abbreviated Cost Risk Analysis
AMT	Adaptive Management Team
APE	Area of Potential Effects
ASACW	Assistant Secretary of the Army Civil Works
ATR	Agency Technical Review
BCC	Birds of Conservation Concern
BEM	Bay Ecosystem Model
BMPs	Best Management Practices
BNSF	Burlington Northern Santa Fe Railway
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCC	California Coastal Commission
CCD	Coastal Consistency Determination
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CEICA	Cost-Effectiveness/Incremental Cost Analysis
CERLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	(White House) Council on Environmental Quality
CEQA	California Environmental Quality Act of 1970
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CO	Carbon monoxide
CO2	Carbon dioxide
CO2e	CO2-equivalency
CSLC	California State Lands Commission
Cu	Copper
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act
dBA	Decibels
DDT	Dichlorodiphenyltrichloroethane
IFR	Integrated Feasibility Report
DM	Decision Milestone
DPM	Diesel Particulate Matter
DQC	District Quality Control
EA	Environmental Assessment
ECO-PCX	(USACE) Ecosystem Restoration Planning Center of Expertise
EFDC	Environmental Fluid Dynamic Code
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ER	Engineer Regulation
ERDC	(USACE) Engineering Research and Development Center
ESA	Endangered Species Act
ESPB	East San Pedro Bay
EQ	Environmental Quality
FCSA	Feasibility Cost Sharing Agreement
FE	Federal-listed, endangered species
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
FY	Fiscal year
GHG	Greenhouse gas
GRP	Gross Regional Product
H2S	Hydrogen Sulfides
IEPR	Independent External Peer Review
IFR	Integrated Feasibility Report
INRMP	Integrated Natural Resources Management Plan
LARE	Los Angeles River Estuary
LBWD	Long Beach Water Department
LBFD	Long Beach Fire Department
LCP	Local Coastal Program
LERRD	Land, Easements, Rights-Of-Way, Relocation, and Disposal Areas
Ldn	Day-night average noise level
Leq	Average equivalent noise level
LPP	Locally Preferred Plan
LUP	Land Use Plan
MBTA	Migratory Bird Treaty Act
MCX	(USACE) Cost Engineering Center of Expertise
MLLW	mean lower low water
MLPA	Marine Life Protection Act
MMPA	Marine Mammal Protection Act of 1972
MMT	Million metric tons

MSA	Metropolitan Statistical Area
MT	Metric tons
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NER	National Ecosystem Restoration
NEPA	National Environmental Policy Act of 1969
NFS	Non- Federal Sponsor
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NOAA	National Oceanographic and Atmospheric Administration
NOx	oxides of nitrogen
NRHP	National Register of Historic Places
OMRR&R	Operations and Maintenance, Repair, Replacement and Rehabilitation
OPR	California Office of Planning and Research
OSE	Other Social Effects
OSHA	Occupational Safety and Health Administration
OWPR	(USACE) Office of Water Policy Review
O3	Ozone
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PCBs	Polychlorinated biphenyls
PDT	Project delivery team
PED	Planning Engineering and Design
PFMC	Pacific Fishery Management Council
PGN	Planning Guidance Notebook
PL	Public Law
PM10	Particulate matter equal to or less than 10 microns in size
PM2.5	Fine particulate matter equal to or less than 2.5 microns in size
PMP	Port Master Plan
POLB	Port of Long Beach
ppm	parts per million
PPV	Peak Particle Velocity
RED	Regional Economic Development
RIT	Regional Integration Team
RWQCB	Regional Water Quality Control Board
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management Board
SCB	Southern California Bight
SCCWRP	Southern California Coastal Water Research Program
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SM	Silty Sand
SPB	San Pedro Bay
SPD	(USACE) South Pacific Division
SPL	(USACE) Los Angeles District
SPSM	Sand with some silt
SO2	Sulfur dioxide
SOx	Oxides of sulfur
SSC	Species of Special Concern
SWRCB	California State Water Resources Control Board
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Loads
TPCS	Total Project Cost Summary
TSP	Tentatively Selected Plan
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
VT	(USACE) Vertical Team
WMA	Watershed Management Areas
WRAP	Water Resources Action Plan
Zn	Zinc
µg/m3	Micrograms per cubic meter

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This Final Integrated Feasibility Report (IFR) presents a summary of the ongoing planning process for the East San Pedro Bay (ESPB) Ecosystem Restoration Feasibility Study (Study). This IFR also fulfills both federal National Environmental Policy Act (NEPA)[1] and state California Environmental Quality Act (CEQA) environmental documentation requirements as the combined Environmental Impact Statement (EIS) and Environmental Impact Report (EIR).

The City of Long Beach, California (City) requested Federal partnership from the U.S. Army Corps of Engineers (USACE) Los Angeles District to address aquatic ecosystem restoration opportunities within ESPB. A Feasibility Cost Sharing Agreement was signed between the City, the non-Federal sponsor for the Study, and the Department of the Army on November 10, 2010, initiating the feasibility phase of the Study. Staff from the USACE Los Angeles District office and the City make up the Project Delivery Team, or PDT.

The Study is being conducted and prepared as an interim response to Senate Committee on Public Works Resolution, approved 25 June 1969, reading in part:

> *"Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on the Los Angeles and San Gabriel Rivers and Ballona Creek, California, published as House Document Numbered 838, Seventy-sixth Congress, and other pertinent reports, with a view to determining whether any modifications contained herein are advisable at the present time, in the resources in the Los Angeles County Drainage Area."*

The Energy and Water Development and Related Agencies Appropriations Act for Fiscal Year 2010, Pub. L. 111-085, provided funds for the Long Beach Breakwater Reconnaissance Study, as specifically listed on the table on page 41 of Conference Report No. 111-278 to accompany H.R. 3183 dated September 30, 2009.

ES.2 STUDY AREA AND PROPOSED PROJECT AREA

The Study Area, shown in Figure ES-1, encompasses the entire San Pedro Bay, whereas the proposed Project Area is focused on the eastern portion of San Pedro Bay. The Study Area is part of a larger area known as the Southern California Bight (SCB), a coastal region from Point Conception west of Santa Barbara to the Mexico border. The proposed Project Area shown below in Figure ES-2, located within the broader Study Area shown in Figure ES-4, is located offshore from the city of Long Beach, California. This 18 square mile area (11,465 acres), shown as a shovel-shaped red polygon, lies within the eastern portion of San Pedro Bay, and typically referred to as ESPB.

The proposed Project Area includes approximately 4 miles of the Long Beach shoreline bisected by the Belmont Pier as labeled in Figure ES-2. The Los Angeles River estuary (LARE) and major features including Shoreline Village and the Queen Mary, are shown on the upper left corner of the map. The

[1] The new NEPA regulations issued by the Council on Environmental Quality (CEQ) apply to NEPA processes begun after September 14, 2020, but federal agencies have discretion to apply the new NEPA regulations to on-going NEPA processes or proceed to apply the prior CEQ regulations. The NEPA process in this instance started before September 14, 2020, and the USACE has decided to proceed to apply the prior CEQ regulations. For more information pertaining to NEPA and CEQ regulations, please visit https://ceq.doe.gov/.

Port of Long Beach and associated piers are shown to the west. The Middle Breakwater and the Long Beach Breakwater are the horizontal green lines at the bottom of the map to the south. The green lines on the breakwaters, along shorelines, oil islands and port infrastructure represent existing kelp beds. To the east of the proposed Project Area are Alamitos Bay Jetties, which serve as the entrance to Alamitos Bay, just northwest of the City of Seal Beach. The pink areas within Alamitos Bay and along the Long Beach shoreline represents existing eelgrass beds. The blue contour lines represent the depths in feet of water below Mean Lower Low Water or MLLW surface water elevation.

ES.3 PURPOSE AND NEED

The purpose of the action (i.e., the ecosystem restoration project) is defined as the "planning objectives" described below and in Section 2.2 and the need for the action is defined as the "Study Problems" described below and in Section 2.1.

PROBLEMS, OPPORTUNITIES, OBJECTIVES, AND CONSTRAINTS

The following **Study Problems** have been identified for this Study:

1. ***Loss of sensitive marine habitat with associated nursery, reproductive, and other ecological functions; and***
2. ***Reduced abundance and biodiversity of marine populations as a result of habitat loss.***

This Study's purpose addresses the USACE aquatic ecosystem restoration mission with the stated goal to:

Restore and improve aquatic ecosystem structure and function for increased habitat biodiversity and ecosystem value of the San Pedro Bay within the proposed Project Area of East San Pedro Bay.

Figure ES-1: Study Area (San Pedro Bay)

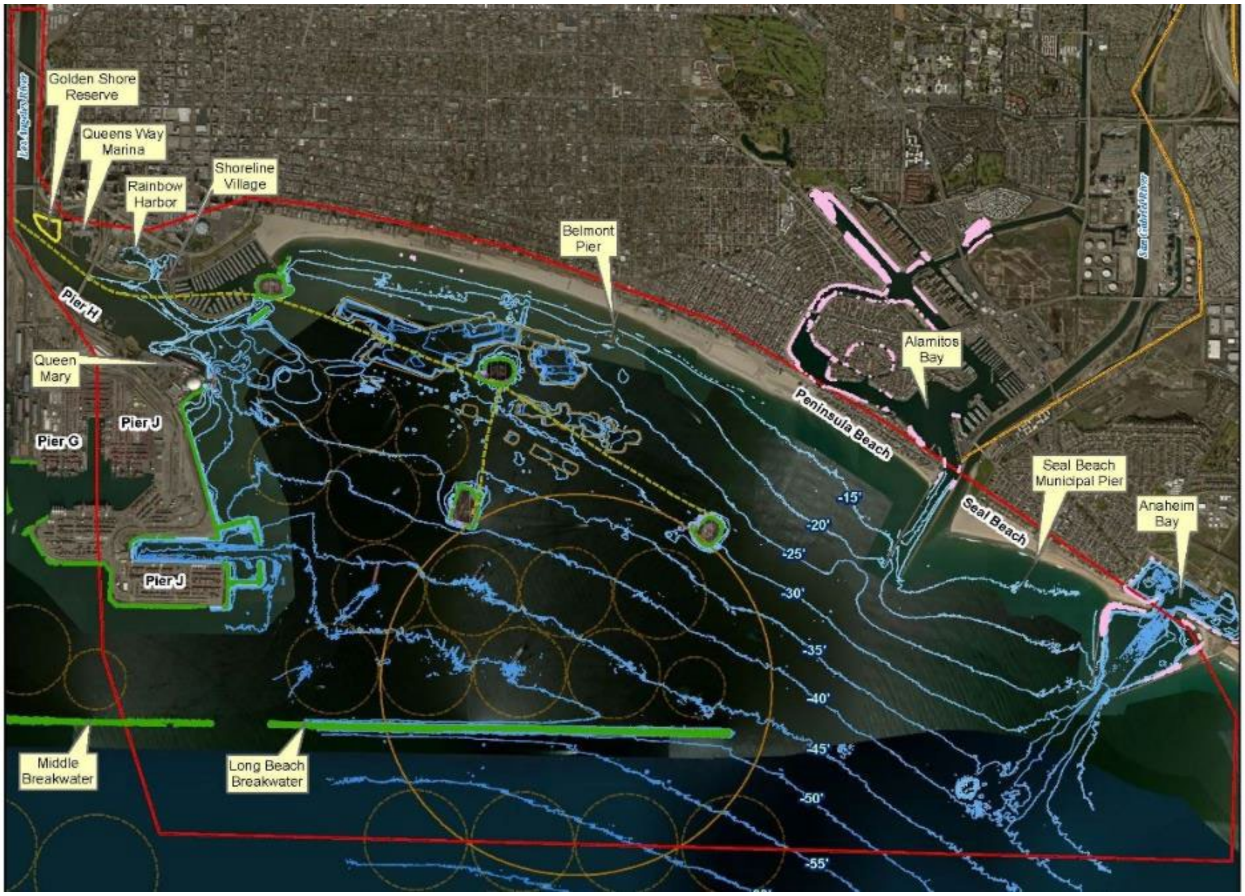


Figure ES-2 Proposed Project Area Map

- Existing open and undeveloped areas with minimal or degraded habitats in the proposed Project Area are available for restoration to provide restored ecosystem functions and increased biodiversity in ESPB within the regional setting of San Pedro Bay and the greater Southern California Bight (SCB).
- The proposed Project Area contains an abundance of soft-bottom habitat that can be converted to complex habitats to restore lost ecological functioning within the San Pedro Bay, including benefits to support migratory species with ranges that extend far beyond the San Pedro Bay.
- Restoration features can be located within the proposed Project Area to be compatible with existing environmental conditions and processes and to contribute to regional connectivity to estuarine and open water environments within and outside of the region.
- Restoration features can be configured within the proposed Project Area to intentionally deliver highest habitat value, augmenting the value of existing habitat that grew as an "unintended consequence" of construction of ports, the breakwaters, and oil islands.
- Augment existing habitat on the breakwaters with strategically placed rock to maximize optimal environmental conditions for rocky reef and/or kelp beds.
- Beneficial uses of dredged sediments and construction materials can be used to construct features that mimic degraded or lost habitats such as rocky reefs, emergent sandy islands, kelp beds, or coastal wetlands to restore regional patterns of ecosystem functions and outputs.

- Kelp beds and rocky reef lost or degraded due to navigational functions in San Pedro Bay can be restored within the proposed Project Area where optimal open ocean conditions exist that do not interfere with navigational operations.
- Shallow nearshore areas provide suitable restoration opportunities for intertidal and subtidal habitats that have been lost such as sandy islands and rocky reef.

Restoring coastal marine habitat within the San Pedro Bay is expected to 1) increase breeding and nursery areas for a wide array of coastal organisms, 2) provide habitat for fishes, invertebrates, mammals, and reptiles, 3) boost aquatic wildlife and coastal bird populations, and 4) support populations of fishes and invertebrates that are important forage for high level consumers within the surrounding SCB ecosystem and along the remainder of the U.S. west coast.

The overall planning objective is to:

> ***Restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands, and other types historically present in San Pedro Bay of sufficient quality and quantity to support diverse resident and migratory species within the San Pedro Bay during the period of analysis (50 years).***

The 50-year period of analysis begins in 2030, known as the Base Year. [2]

The specific sub-objectives related to the overall planning objective are as follows:

a. Increase the extent (total area) of complex aquatic habitats within the proposed Project Area.
b. Increase the diversity and spatial heterogeneity of complex aquatic habitat types (*e.g.*, rocky reef, kelp forest, etc.) within the proposed Project Area.
c. Increase the overall connectivity of complex aquatic habitat types within and adjacent to the proposed Project Area by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs.

The planning constraints and considerations for the Study include:

- Constraint 1: Avoid negative impacts to U.S. Navy's operations including activities in support of national security and other missions.
- Constraint 2: Do not significantly reduce operational capacity for the ports, THUMS oil extraction islands or other existing maritime operations.
- Constraint 3: Do not allow for infilling any of the energy island borrow pits located within the ESPB boundary.
- Consideration 1: Minimize impacts to known major utilities or navigation channels and anchorages.
- Consideration 2: Avoid increases in shoreline erosion, wave related damages, and coastal flooding to existing residences, public infrastructure, marinas, existing jetties, other structures, and recreational beaches.
- Consideration 3: Minimize impact to flood risk management operations on the Los Angeles River.
- Consideration 4: Minimize vulnerability of coastal areas to accelerating sea level rise.

[2] The Base Year is when the proposed project is expected to be operational, typically following construction completion. The Base Year was identified early in the Study process for estimating planning-level annual benefits of the alternatives. During the feasibility design phase, Recommended Plan construction assumptions were refined, resulting in an updated construction completion year of 2039. Because the Base Year is a planning-level analysis tool, it was not necessary to update.

ES.4 PLAN FORMULATION PROCESS

Through a robust stakeholder input process, 200+ measures were collected, compiled, and screened to address identified problems and opportunities. Various habitat restoration measures and breakwater modifications were screened based on specific evaluation criteria from the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (1983) (P&G), including: completeness, effectiveness, efficiency, and acceptability metrics. The Planning Guidance Notebook, ER 1105-2-100, broadens its use for any of the accounts including National Ecosystem Restoration or NER Plan. The following measures proceeded forward with technical analysis and within alternatives.

Habitat measures considered:

- Kelp Beds
- Rocky Reef (subtidal and open water zones)
- Eelgrass
- Coastal Wetland
- Oyster Reef
- Sandy Island

Breakwater modifications considered:

- Lower entire breakwater to -30’ MLLW
- Remove eastern 1/3 down to -30’ MLLW
- Remove western 1/3 down to -30’ MLLW
- Two 1,000’ notches in eastern side
- Two 1,000’ notches in western side
- Single 1,000’notch in the western side
- Single 1,000’ notch in the center

Technical modeling and analysis efforts supported the evaluation of the measures and alternatives including:

- Coastal and hydrodynamic modeling
- Habitat evaluation modeling
- Cost estimating
- Cost Effectiveness/Incremental Cost Analysis (CEICA; cost-benefit)

Analysis results show that the breakwater modifications resulted in providing no habitat value for the types of habitats being proposed for restoration, could negatively impact port and Navy operations, and could lead to increased erosion of beaches that would lose current protection from ocean waves. However, because breakwater plans remain a high priority measure to the City, they were carried forward in the Preliminary Array of Alternatives. These six plans include the No Action Plan, and five action alternatives. All five action alternatives included habitat restoration measures in varying combination of scales and locations. The two breakwater plans include restoration features equivalent to Alternative 2.

<u>Preliminary Array of Alternatives</u>

- Alternative 1: No Action Plan
- Alternative 2: “Kelp Restoration Plan”
- Alternative 4A: “Reef Restoration Plan”

- Alternative 8: "Scarce Habitat Restoration Plan"
- Alternative BW1: "Breakwater Western Notching Plan"
- Alternative BW2: "Breakwater Eastern Removal Plan"

The six plans were evaluated based on completeness, effectiveness, efficiency, and acceptability metrics. The five action alternatives are complete and effective in addressing the planning objectives of ecosystem restoration. However, in terms of efficiency, the two breakwater plans were inefficient in terms of costs per acre of restoration. For example, the western notching alternative BW1 had an average annual cost/average annual habitat unit value of over 10 times Alternative 2. Overall, the breakwater plans had low acceptability due to significant navigational impacts and violation of constraints.

Navigational impacts from breakwater modifications were evaluated against the planning constraints. Stakeholders characterized impacts based on wave modeling results showing locations, increase in occurrence and height of wave impacts. Impacts to the U.S. Navy, port ship pilots, THUMS oil islands, Carnival Cruise Line, and other maritime stakeholders including recreational activities were evaluated. Due to impacts to national security, ports operations and safety, only the three restoration focused plans were carried forward in the Final Array of Alternatives.

ES.5 FINAL ARRAY OF ALTERNATIVES

Ecosystem restoration is one of the primary missions of the USACE Civil Works program. All plans considered for implementation are required by USACE policy to be evaluated on how well they contribute to the national objective of National Ecosystem Restoration (NER). Contributions to NER, NER outputs, are increases in the net quantity and/or quality of desired ecosystem resources. The following plans were carried forward into the Final Array of Alternatives for full evaluation and comparison. All action alternatives include environmental commitments, as detailed in Chapter 4. Table ES-1 below captures all of the measures included in each of the plans in the Final Array of Alternatives.

Table ES-1: Measures Included in Final Array of Alternatives

Zone	ALT 2	ALT 4A	ALT 8
Nearshore	**(5) Eelgrass Beds** (4.0-5.3 ac./ea.; 25 ac. total) **(5) Rocky Reef** (0.2-4.0 ac./ea.; 15.9 ac. total)	**(6) Eelgrass Beds** (4.0-5.3 ac./ea.; 30.3 ac. total) **(6) Rocky Reef** (0.2-4.0 ac./ea.; 19.9 ac. total)	**(7) Eelgrass Beds** (4.0-5.3 ac./ea.; 52.3 ac. total) **(6) Rocky Reef** (0.2-4.0 ac./ea.; 19.9 ac. total) **(1) Sandy Island** (23.8 ac.) **(2) Oyster Reef** (0.3 ac.)
Open Water	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total) **(2) Rocky Reef** (14.6 ac./ea.; 29.2 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total) **(7) Rocky Reef** (14.6 ac./ea.; 102.2 ac. total)
LA River	N/A	N/A	**(1) Coastal Wetland** (10.0 ac.)
Port	N/A	N/A	**(1) Coastal Wetland** (42.1 ac.)
Break-water	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)

ES.5.1 ALTERNATIVE 1: No Action Alternative

Under the No Action Alternative, existing kelp and hard bottom habitat within ESPB would likely continue to be limited to features associated with the breakwater and other artificial hard substrates. Eelgrass beds located along a narrow band of shallow water offshore of Cherry Beach would not likely increase significantly in acreage under the No Action Alternative but may increase in density of the existing beds. Other existing habitats, such as native and non-native oysters, coastal saltmarsh, and soft bottom habitat would not substantially change. However, in light of the persistent threat from the effects of climate change, climate change-induced alteration to rainfall patterns, and sea level rise over time, it is expected that the existing habitats within the proposed Project Area will become increasingly vulnerable and less resilient to the effects of these stressors (e.g., exacerbated loss of existing habitat, decreased viability of existing increased chances of wetland/habitat type conversion, submergence of transitional habitats). Eelgrass beds located offshore of Cherry Beach could migrate shoreward with sea level change, offsetting the effects of increased water depths predicted for this area.

ES.5.2 ALTERNATIVE 2: Kelp Restoration Plan

Alternative 2 is the smallest plan analyzed in the Final Array of Alternatives. This plan introduces three habitat types including extensive giant kelp (kelp) beds, nearshore rocky reef, and eelgrass, creating a horseshoe shaped benefit area in the bay. Total restoration area covers 162.3 acres. The nearshore rocky reef and eelgrass are co-located and also referred to as shoals or shoal complexes. Construction methods and materials required for Alternative 2, which provide the basis for cost estimates and environmental impacts analysis, are provided in more detail in Section 4.5.2. It is anticipated to take approximately 90 months to construct Alternative 2.

Due to natural processes, kelp coverage varies over time and space within the Study and proposed Project Areas. To address the Future Without Project (FWOP) considerations of potential kelp die-off, and to increase kelp resiliency within the SCB and Study Area, the PDT identified kelp restoration locations that would optimize conditions for kelp to thrive. These locations provide the ideal environmental conditions important for the growth and reproduction of kelp. To grow and regenerate, kelp requires appropriate light, temperature, and rocky substrate for the anchoring of its holdfast.

Twenty-four (24) 5-acre kelp beds totaling 121 acres are included in all Final Array of Alternative plans. The kelp beds are placed in two mega-groupings of approximately 60 acres each, outside of the breakwater. Each kelp reef would be roughly circular in shape, spanning approximately 500’ in diameter, with approximately 20% total bottom coverage of substrate with only one layer of stone thickness. Locating kelp outside the breakwater ensures unimpeded access to cold water currents and is expected to maximize kelp forest survival and health. Sixty acres of kelp beds would restore an open water kelp reef, similar to the degraded Horseshoe Kelp Reef that was historically offshore in the western part of the Study Area. Together, these beds are expected to improve the long-term resilience of kelp in the Study Area.

Sixteen (16) acres of nearshore rocky reef habitats are composed of rock outcrops (e.g., granite, basalt, or other metamorphic conglomerate) of varying relief or height and configuration of stone large enough so as not to be normally moved by waves and currents. Each reef footprint is conceptually designed as a rectangle with crest limits roughly 1,000’ long by 175’ wide, running parallel to the shoreline in about -20’ MLLW depth of water. Reef crest elevations, or submerged depths below MLLW elevation, will vary from -3 to -10 feet MLLW. The stone pile height (or reef relief) would be roughly 2’ to 17’ in vertical height above the seabed. This shallow subtidal zone reef receives more light than deeper giant kelp reef and allows for other kelp and algae species to thrive. This aquatic plant variety increases coastal biodiversity within the bay. The design for these submerged reefs involves constructing sufficient voids for provision of refuges for smaller juvenile and adult fish and invertebrates. This placement also provides the conditions needed (calm, shallow waters) for eelgrass establishment. The multifunctional reefs could reduce shoreline erosion rates and provide incidental coastal storm damage protection.

Because nearshore rocky reef may potentially pose a hazard to small boats and other nearshore recreational activities, the U.S. Coast Guard will design and install "aids to navigation" or ATONs in the form of signage or buoys. ATONs will be placed at each of the four corners of the nearshore rocky reefs to ensure visibility. ATONs will be integrated with the design and construction of restoration features. Twenty-five (25) acres of eelgrass habitat would be established at five locations in the nearshore zone, co-located with the nearshore rocky reefs described above. These beds would provide connectivity to existing eelgrass beds west of Belmont Pier, effectively doubling span of eelgrass habitat in the bay. The presence of the 16 acres of nearshore rocky shoals would provide the calm, shallow conditions eelgrass requires by stabilizing the bathymetry of the nearshore environment. Beach compatible sediment would also be placed leeward of the rocky shoal to optimize ideal conditions and depth for eelgrass growth. See Chapter 4 for construction details.

Immediately following completion of construction, monitoring and adaptive management activities, including but not limited to periodic habitat surveys of kelp and eelgrass (aerial, sidescan sonar, and SCUBA), transplanting of eelgrass and kelp if necessary, monitoring and removal of invasive and non-native species, and reconfiguring of rocky reef habitat (if necessary), would take place for a period of 5-10 years, to ensure success of the ecosystem restoration project. See Appendix F: Monitoring and Adaptive Management Plan (MAMP) for more details. Once the habitat is established after the MAMP period ends, the City would be responsible for Operations and Maintenance, Repair, Replacement and Rehabilitation (OMRR&R).

ES.5.3 ALTERNATIVE 4A: Reef Restoration Plan

Alternative 4A introduces a productive new habitat type of rocky reef placed along Island Chaffee (oil island). This open water placement augments existing rocky reef habitat at the oil island. The central location provides "stepping-stones" between proposed shoals and kelp beds, augmenting habitat connectivity between zones. The resultant benefit area is larger than Alternative 2, roughly forming a triangular configuration, with 200.7 acres in restoration features. Construction methods and materials required for Alternative 4A, which provide the basis for cost estimates and environmental impacts analysis, are provided in more detail in Section 4.5.3. It is anticipated to take approximately 96 months to construct Alternative 4A.

In Alternative 4A, 30 acres of open water rocky reef and 20 acres of nearshore rocky reef significantly increase available high quality, productive, rocky reef habitat in the proposed Project Area. Rocky reef by the Island Chaffee would increase habitat complexity due to variation in rock grouping size, rugosity, and relief, interspersed with sandy habitat for enhanced "edge effect." These design complexities echo natural rocky reef that once existed and currently exist in degraded conditions in the western part of the Study Area. The existing rocky reef on the oil islands, hardened shoreline, and along the breakwater are not designed for optimum habitat benefit and are susceptible to climate change-induced stressors. The additional 50 acres of rocky reef are expected to bolster productivity and biomass in the proposed Project Area, ensuring healthy reef-based fish and invertebrate populations into the future.

Open water rocky reef, similar to nearshore rocky reef introduced in Alternative 2, provides high habitat value due to the ability to support of a wide variety of aquatic species, and have vertical as well as horizontal habitat benefits. Placing open water rocky reef patches near Island Chaffee augments existing rocky reef habitat on the existing oil island infrastructure. Co-locating two rocky reef patches adjacent to each other promotes synergies between the patches, augmenting habitat value. Soft-bottom spaces in between patches of rock add edge effect complexity, creating more biodiversity opportunities. The relatively short distances between reef patches increase exchanges and expands distribution of species, enhancing biodiversity.

Open water reefs are made up of individual rock groupings, roughly 100 feet in diameter, spaced apart within a circular area. This distribution would offer a variety of habitats for different species by providing alternating rocky reefs and sandy bottom in a concentrated area. The individual patches make up a single reef complex, covering about 15 acres. Each individual rock grouping varies in height between 3 feet to 12 feet above the seabed. This distribution would offer a variety of habitats for different species. Higher reefs would be placed furthest away from any marine navigation (commercial and recreational) as possible. The highest crest elevation would be set no more than -15 ft. MLLW. A medium stone weight of 10 tons would provide for sufficient stability.

The greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that sedimentation from storm events could fill in rocky reef voids where species live with the possibility of burying entire reefs. Increased sedimentation due to more frequent storm events as a result of Global Climate Change is expected to increase the threat to fill in rocky reef voids where species live with the possibility of burying entire reefs after periods of successive storm activity. Turbidity associated with storm events would affect water quality (e.g., available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them.

Site selection and design considerations for kelp beds are the same as Alternative 2. Site selection and design considerations for nearshore rocky reed and eelgrass are the same as Alternative 2, plus one additional four-acre shoal (total of six), west of Belmont Pier.

Immediately following completion of construction, monitoring and adaptive management activities, including but not limited to periodic habitat surveys of kelp and eelgrass (aerial, sidescan sonar, and SCUBA), transplanting of eelgrass and kelp if necessary, monitoring and removal of invasive and non-native species, and reconfiguring of rocky reef habitat (if necessary), would take place for a period of 5-10 years, to ensure success of the ecosystem restoration project. See Appendix F: Monitoring and Adaptive Management Plan (MAMP) for more details. Once the habitat is established after the MAMP period ends, the City would be responsible for OMRR&R.

ES.5.4 ALTERNATIVE 8: Scarce Habitat Restoration Plan

Alternative 8 restores three scarce habitat types: a sandy island, coastal wetlands, and oyster beds; aquatic habitat types which have been largely lost or degraded within the SCB. These are in addition to kelp beds, open water rocky reef by Islands Chaffee and Freeman, subtidal zone rocky reef and eelgrass beds which places restoration features in all five opportunity zones. These distributed restoration measures effectively create a benefit area that encompasses the entire proposed Project Area. Restoration features cover 371.9 acres. Construction methods and materials required for Alternative 8, which provide the basis for cost estimates and environmental impacts analysis, are provided in more detail in Section 4.5.4. Alternative 8 is anticipated to take approximately 113 months to complete construction of restoration features.

The proposed 24-acre sandy island provides much needed habitat for threatened and endangered shorebirds which are subject to disturbance from people and predators. Under Alternative 8, a 24-acre sandy island would be constructed in the nearshore zone. Relatively shallow waters <20’ MLLW minimize construction material quantities and costs over locations out in deeper waters. The sandy island in this location off of Peninsula Beach may reduce shoreline erosion. The Study Area contains potential habitat for two federally listed shorebirds: western snowy plover (*Charadrius alexandrinus* *nivosus*) and California least tern (*Sternula antillarum browni*). Sea level rise would continue to limit potential nesting habitat (sandy beach and sand dunes) by inundating upland and intertidal sandy areas within the proposed Project Area. Under the FWOP conditions, sensitive shorebird breeding and foraging habitat within the study area will be degraded by climate change related effects.

Coastal saltmarshes provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, commercial species nursery habitat, and carbon sequestration. Two coastal tidal salt marsh wetlands are added in Alternative 8, providing transitional habitat functions where freshwater Los Angeles River flows intermixes with saltwater from the bay. The larger 42-acre wetland would be built along an inset of Pier J, between Carnival Cruise Lines and the Pier J entrance jetties. This wetland would require engineering a structure to build out into the bay, not unlike the ports which were also built out into the bay. This engineered wetland would allow for water and some sediment exchange. Recreational fishing access would be possible with the addition of a concrete cap atop the caisson structure, along the perimeter of the wetland. The smaller wetland is a 10-acre patch just inside the mouth of the Los Angeles River. Its proximity to the existing Golden Shores Reserve wetland would facilitate exchange of species and support nursery function. The construction would be similar to the larger Pier J wetland described above.

Oyster beds contribute important functions to local ecosystems, including biodiversity, water quality, nutrient cycling, refugia and nursery habitat for commercial fish species, and to the reduction of shoreline erosion in coastal areas. Under the FWOP conditions, oyster beds formation would continue to be depressed. Functions and overall distribution of individual oysters within the proposed Project Area may be degraded by projected increases of extreme storm events, ocean acidification, and ocean temperature. Oysters within the proposed Project Area would likely be resilient to sea level rise as appropriate hard-substrate habitat is available at higher elevations in the form of port infrastructure. Oyster beds along the Alamitos Bay jetties would be placed in areas between -4' and -1.5' MLLW. They would total less than one acre (0.3 acres) but would provide important filtration as well as habitat value. Locating oyster beds at the far end of the jetties limits potential for human access.

Site selection and design considerations for open water rocky reef are the same as Alternative 4A. In addition to the 29 acres in Alternative 4A, an additional five patches, each >14 acres in size, increase the total acreage of open water rocky reef by 63 acres for a total of 102 acres. Site selection and design considerations for kelp beds are the same as Alternative 2 and Alternative 4A for a total of 121 acres. Site selection and design considerations for nearshore shoals are the same as Alternative 4A for a total of 20 acres. For eelgrass beds, site selection and design considerations are the same as Alternative 4A. A new 22-acre eelgrass bed, created by the Sandy Island, results in a total of 52 acres of eelgrass beds in Alternative 8.

Immediately following completion of construction, monitoring and adaptive management activities, including but not limited to periodic habitat surveys of kelp, eelgrass, oyster reef, sandy island, and wetlands (aerial, sidescan sonar, SCUBA, field transects, topographic and bathymetric, mudflat and intertidal); transplanting or planting of eelgrass, kelp, wetland plants, oysters, mudflat and intertidal invertebrates if necessary; addition of sand or oyster shell seeding material; monitoring and removal of invasive and non-native species, and reconfiguring of wetland hydrology or rocky reef habitat (if necessary); would take place for a period of 5-10 years, to ensure success of the ecosystem restoration project. See Appendix F: Monitoring and Adaptive Management Plan (MAMP) for more details. Once the habitat is established after the MAMP period ends, the City would be responsible for OMRR&R.

ES.6 COMPARISON OF THE FINAL ARRAY OF ALTERNATIVES

To select the NER Plan, the Final Array of Alternatives were compared against each other and evaluated first against the planning objectives, then against the four P&G criteria once again. Consideration of the four accounts, Environmental Quality (EQ), National Economic Development (NED), Regional Economic Development (RED), and Other Social Effects (OSE) were also considered. Finally, NEPA/CEQA environmental impacts detailed in Chapter 5 were also considerations in the selection of the NER Plan. Public and agency inputs received on the Draft IFR are also summarized and considered in the NER Plan selection.

ES.6.1 Comparison by Planning Objectives

The No Action alternative does not meet Study planning objectives. All three action alternatives meet Study planning objectives to varying degrees, with Alternative 8 better meeting the objectives than Alternative 4A, which in turn meets objectives better than Alternative 2. The main reasons for the difference are based in not only increasing acreages, but also with an additional habitat type added to Alternative 4A from Alternative 2, and three additional habitat types added to Alternative 8 from Alternative 4A. The next section further compares the alternatives to each other in terms of meeting national objectives.

The following table compares the ability of each alternative in meeting the Study planning objectives.

Table ES-2: Comparison of Alternatives to Planning Objectives for Ecosystem Restoration

Objective / Sub-Objectives		Alternative 2	Alternative 4A	Alternative 8
Restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands, and other types historically present in San Pedro Bay of sufficient quality and quantity to support diverse resident and migratory species within ESPB		Restores kelp beds, subtidal rocky reef, and eelgrass	Restores Alt 2 + open water zone rocky reef	Restores Alt 4A + two coastal wetlands, a sandy island, oyster beds, additional open water rocky reefs, and additional subtidal rocky reef and eelgrass
a.	*Increase the extent (total area) of complex aquatic habitats*	162 restored acres of 3 sensitive habitat types	201 restored acres of 3+ sensitive habitat types	372 restored acres of 6 sensitive habitat types
b.	*Increase the diversity and spatial heterogeneity of complex aquatic habitat types*	Adds kelp, subtidal rocky reef, and eelgrass in new locations; 3 zones	Alt 2 plus open water rocky reef in new locations; 3+ zones	Alt 4A plus wetlands, sandy island, and oysters in new locations; 5 zones
c.	*Increase the overall connectivity of complex aquatic habitat types by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs*	Open water kelp beds connect existing rocky reef/kelp beds at breakwater with new nearshore shoals; "U" shape benefit area	Alt 2 plus new open water rocky reefs provide "stepping-stones" between breakwater and oil island rocky reef/kelp habitat with nearshore shoals; "Triangular" benefit area	Alt 4A plus 2 wetlands by LA River/ports and additional rocky reef by second oil island provides connectivity throughout ESPB; benefit area covers nearly all of project area

ES.6.2 Comparison by National Objectives

Ecosystem restoration is one of the primary missions of the USACE Civil Works program. All plans considered for implementation are required by USACE policy to be evaluated on how well they contribute to the national objective of NER. Contributions to NER, NER outputs, are increases in the net quantity and/or quality of desired ecosystem resources.

Table ES-3 below summarizes how strongly each of the Final Array of Alternatives contribute to the key evaluation criteria of completeness, effectiveness, efficiency, and acceptability. Low-Medium-High color-ramped weighting shows the degree to which each alternative meets the criterion, relative to the other plans. The darkest color represents strongest overall performance of that plan for that criterion and palest color indicated weakest performance of that plan, with respect to those criterion.

Table ES-3: Evaluation of the Final Array of Alternatives

CRITERIA	ALT 2	ALT 4A	ALT 8
COMPLETENESS			
EFFECTIVENESS			
Sub-Obj. 1 – increase habitat total area			
Sub-Obj. 2 – increase habitat diversity & spatial distribution			
Sub-Obj. 3 – increase habitat connectivity with project area			
Technical Recognition: Biodiversity			
Technical Recognition: Status & Trends			
Technical Recognition: Scarcity/ Rarity			
Technical Recognition: Connectivity			
Technical Recognition: Hydrologic/Geomorphic			
Technical Recognition: Special Status Species			
Institutional and Public Recognition			
EFFICIENCY			
Is the plan a Best Buy Plan or Cost Effective Plan?			
Incremental Cost/Habitat Unit			
To what extent are the benefits worth the cost, given the output?			
ACCEPTABILITY			
To what extent is PLAN acceptable re: applicable laws, regulations & public policies?			
To what extent is the PLAN acceptable to the Sponsor?			
To what extent is the PLAN acceptable to resource agencies and science community?			
To what extent is the PLAN acceptable to maritime interests?			
To what extent is the PLAN acceptable to residents?			
To what extent is the PLAN acceptable to recreational interests?			

Completeness: As defined by ER 1105-2-100 Appendix E-3.a.(4)(a)(2), completeness "is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects." The No Action plan is a complete plan that does not meet planning objectives. All three action plans are complete and planning objectives can be realized.

Effectiveness: As compared to Alternative 2, Alternative 4A more effectively meets the Study planning objective and sub-objectives with the addition of the rocky reef. IFR Table ES-2: Comparison of Alternatives to Planning Objectives for Ecosystem Restoration, illustrates qualitatively increased effectiveness of Alternative 4A over Alternative 2. It better meets the Study planning objective and three sub-objectives of increased habitat area by restoring 200.7 acres versus 162.3 acres. It increases habitat diversity and spatial distribution by introducing a new habitat type of open water rocky reef in a central location. Alternative 4A improves habitat connectivity over Alternative 2 with the "stepping stones" functionality of this additional productive habitat type that is lacking in Alternative 2. This results in Alternative 4A exhibiting a triangular benefit area which is effectively larger than the "U" shaped benefit area of Alternative 2.

The addition of rocky reef provides habitat for key life stages for diverse populations of fish and other aquatic species. This benefit is realized primarily through the provision of foraging opportunities, protective shelter and critical nursery functions, which support population health and growth. The plan also provides sustainable resilience and redundancy to withstand stressors and occasional habitat loss events. Table ES-3: Evaluation of the Final Array of Alternatives, qualitatively visualizes how Alternative 4A better meets (National) significance criteria of biodiversity, status and trends, scarcity/rarity, connectivity, special status species and institutional and public recognition. Significance criteria of rocky reef in connection with other habitats is discussed at length in other sections of this document.

Alternative 8 is more effective than Alternative 4A at meeting the Study planning objectives due to the addition of complex habitat types including wetlands and sandy islands.

Efficiency: Efficiency refers to the extent to which a plan is the most cost-effective means of achieving the objectives. In reference to the comparison above, the No Action Plan lacks provision of benefits. Alternative 2 and 8 are Best Buy Plans, while Alternative 4A is a Cost-Effective Plan. Due to Alternative 8's high cost and higher incremental AAC/AAHU than Alternatives 2 and 4A, it received a medium weight for efficiency, while the other two plans received strong weights.

Table ES-4 summarizes benefits and costs for the Final Array of Alternatives. Note also that cost estimates for the Final Array Plans were refined and also include estimates of LERRD that were not included in the prior sections of the report. The changes in Project First Cost estimates for the Final Array plans are minor (less than 5%) relative to the estimates in the prior sections and do not impact the plan formulation, evaluation or selection conclusions.

Alternatives 2 and 4A have relatively lower first and OMRR&R costs than Alternative 8. Alternative 8 has roughly twice the output as Alternative 4A, but at nearly four times the first cost. Alternative 2 is the most efficient of the Final Array alternatives, as shown by its low AAC/AAHU. However, Alternative 4A has only a slightly higher AAC/AAHU while providing substantially greater output. Alternative 8, while providing a significant increase in output, is much less efficient than Alternatives 2 and 4A.

Wetlands included with Alternative 8 were considered high value habitat, but at a high cost as noted above. The cost estimates were calculated in compliance with guidance for conducting the Abbreviated Cost Risk Analysis. Suitable wetlands restoration sites simply do not exist in the heavily urbanized proposed Project Area, which is nearly completely built out with the Port of Long Beach, downtown Long Beach and developed public beaches along the coastal shoreline. As a result, the assumed design includes high risk factors, including the fact that it would be a highly engineered structure built out in open water, and includes costly specialty fabrication and equipment. As a result, wetlands costs include a high contingency.

Alternative 4A provides three productive habitat types for $141 million. This cost has been shown to be reasonable, especially with the modification to Best Buy Plan 4 to introduce a smaller scale of the open water rocky reef measure. Further, Alternative 4A is efficient as it provides output of $35,400 AAC/AAHU. Given these factors, the incremental cost of Alternative 4A is considered "worth it," in terms of maximizing net ecosystem restoration benefits.

In terms of incremental costs per output, as the smallest Best Buy Plan, Alternative 2 (by definition) has the highest level of efficiency. Alternative 4A shows a substantial increase incremental AAC/AAHU relative to Alternative 2. However, this incremental cost is considered "worth it" in terms of the additional restoration output achieved and the greater extent to which it meets the planning objectives and sub-objectives, per discussions above. Alternative 4A provides a 28% increase in AAHUs and a 24% increase in restored acres relative to Alternative 2. While Alternative 8 does provide a significant amount of additional restoration output, it also shows a much higher incremental AAC/AAHU than

Alternatives 2 and 4A, as well as a much higher overall cost. In addition, Alternative 8 has a much higher OMRR&R costs to sustain the habitat ($5.9 million vs. $251,000). The gains in output for this plan were not considered "worth it," given reasonableness of cost considerations, in terms of incremental average annual costs, total project first costs and OMRR&R costs relative to the additional benefits achieved.

Table ES-4: Final Array of Alternatives Costs and Benefits

Item	**ALT 2**	**ALT 4A**	**ALT 8**
First Cost	$83,587,000	$140,908,000	$560,681,000
OMRR&R	$207,000	$251,000	$5,853,000
Average Annual Cost	$3,407,000	$5,689,000	$27,892,000
AAHUs	125.4	160.9	307.3
AAC/AAHU	$27,200	$35,400	$90,800
Incremental AAC/AAHU	$27,200	$64,300	$151,600
Zones with Restoration	3	3	5
Restored Acres	162	201	372
First Cost/Restored Acre	$516,000	$701,000	$1,507,000

Acceptability: Acceptability is the workability and viability of the alternative plan with respect to acceptance by Federal and non-Federal entities and the public and compatibility with existing laws, regulations, and public policies. Resource agencies and the science community generally support the restoration measures considered for all alternatives. Because more restoration acreage, diversity and connectivity are desired, Alternative 4A is more desirable over Alternative 2 for restoration proponents. Large vessel maritime stakeholders, including the Navy, would not be impacted by the restoration features in the NER Plan and have expressed support for the NER Plan. Small boats and some nearshore recreational activities may experience some impacts specifically related to kelp bed placement, which will be addressed in more detail during the pre-construction engineering and design (PED) phase. Residents and recreational stakeholders vary in their support for a plan without and with breakwater modifications. It is anticipated Peninsula Beach residents may support placement of rocky reef/eelgrass shoals offshore, possibly reducing coastal erosion. Alternative 4A adds an additional shoal, which would offer increased shoreline protection.

The Draft IFR was released November 25, 2019, and public and agency comments were received by January 27, 2020. Approximately 250 separate comments were received. To further gauge acceptability, inputs from key stakeholders including resource agencies and the science community, maritime stakeholders, residents, and recreational interests were considered.

Of the 170+ separate written comments received, resource agencies commented on support for restoration and Alternative 4A (identified in the Draft IFR as the TSP) but were concerned about lack of wetlands in the TSP. Additionally, resource agencies had specific concerns about impacts to existing eelgrass beds and potential impacts project construction would have on Green Sea Turtles, and possible increases in non-native/invasive species within the proposed Project Area. Members of the public who provided comments included recreational stakeholders, primarily surfers and boaters, residents, ports and other navigational stakeholders. Public resource agencies, residents and the navigational stakeholders supported the NER Plan. Surfing stakeholders were not supportive of the NER Plan, and recreational boaters were opposed to aspects of the NER Plan, but not totally opposed to restoration in general.

Surfing stakeholders provided numerous detailed comment letters, including a form email that was sent by 70+ individuals. Essentially their comments centered around ecosystem restoration alternatives that would improve water quality and water circulation. Their main concern was lack of modification of the breakwater from lack of emphasis on the restoration of sandy bottom, further addressed in Section 4.5.8 Evaluation of the Preliminary Array of Alternatives. Breakwater plans would violate planning constraints and impact navigational operations, including to the U.S. Navy. Recreational boaters were concerned about locations of kelp beds impacting various boating events. The PDT met with boaters in January 2020 to obtain further clarification of their original comments, and it was determined that subsequent discussions would ensue during the pre-construction engineering and design or PED phase following conclusion of the study. During PED, options to refine the design could be explored with the boating stakeholders, while maintaining habitat outputs.

Below are summary characterizations of the level of support based on public and agency comments received on the Draft IFR:

- No Action Alternative – Little support for this alternative.
- Alternative 2 – Little support for this alternative.
- Alternative 4A – Support for this alternative from resource agencies, residents and navigational interests; Opposition to the whole or parts of the plan by recreational stakeholders.
- Alternative 8 – Support for this alternative due to presence of wetlands and the sandy island.

Those who oppose Alternative 4A desired breakwater modifications which would violate planning constraints at a significant cost with no habitat output from that cost. They coupled breakwater modifications with restoration of sandy bottom habitat, which is abundant and not a complex habitat type and was therefore screened out during the plan formulation process. As a result of these areas of misalignment to Study planning objectives and USACE plan formulation guidance, no other feasible alternative existed that was considered under this Study. Those who had concerns about boating impacts from Alternative 4A wanted those impacts acknowledged, which is addressed in Section 5.16. These stakeholders desire another opportunity to discuss design refinements, which is expected to take place during PED.

Alternative 2 didn't receive any support in the public review process. Although Alternative 8 most strongly meets restoration objectives, and received resource agency support, it is not an efficient plan as costs four times as much as Alternative 4A. In addition, the wetlands and sandy island features are not self-sustaining and are in fact, highly engineered structures that would require costly annual maintenance in perpetuity. Both Alternative 2 and 4A have low annual maintenance costs.

ES.6.3 Comparison of Potential Environmental Effects

From the detailed environmental impacts assessment in Chapter 5, the table below summarizes the potential effects under each of the alternatives, including the No Action Alternative.

Table ES-5: Potential Effects under Each Alternative

Resource Category	Alternatives			
	No Action	**2**	**4A**	**8**
Hydrology (Coastal and Shoreline Resources)	N	I	I	I
Marine Geology and Geologic Hazards	N	I	I	I
Water Quality	N	I	I	I
Air Quality and Greenhouse Gases	N	I	I	S
Noise and Vibration	N	I	I	I
Biological Resources: Marine Habitats	N	I	I	I
Biological Resources: Special-Status Species	N	I	I	I
Biological Resources: Significant Ecological Areas	N	N	N	N
Biological Resources: Essential Fish Habitat	N	I	I	I

Resource Category	Alternatives			
	No Action	2	4A	8
Biological Resources: Invasive Species	N	I	I	I
Cultural and Historic Resources	N	I	I	I
Aesthetic and Visual	N	I	I	I
Ground and Vessel Traffic and Transportation	N	I	I	I
Land and Harbor Use	N	I	I	I
Socioeconomics	N	I	I	I
Recreation	N	I	I	I
Utilities and Public Services	N	I	I	I
Public Health and Safety	N	I	I	I
S=Significant impacts I=Insignificant impacts (Less than Significant) M=Insignificant impacts with mitigation N=No impact - No Action Alternative is not evaluated for Significance				

Cumulative Impacts

NEPA requires that cumulative impacts be analyzed and disclosed. Cumulative impacts are impacts on the environment that would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or Non-Federal) 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 C.F.R. § 1508.7).

California guidelines for implementing the CEQA require a discussion of significant impacts resulting from incremental effects considered significant when viewed in combination with the effects of "past, present, and probable future projects", or in relation to "a summary of projections contained in an adopted general plan or related planning document" (Cal. Code. Regs, Title 14, § 1506(c) and § 15130(b)(1)(A)(B)).

Cumulative projects considered in this analysis included nearby ongoing or proposed dredge projects, capital improvement or development projects, and other reasonably foreseeable future actions. The results of this analysis concluded that there are no significant cumulative impacts that would occur as a result of implementing any of the action alternatives, except for cumulative impacts to air as a result of implementing Alternative 8.

Effects Found Not To Be Significant

Issues that were brought forward for the proposed East San Pedro Bay Ecosystem Restoration project for further analysis and included in this IFR included the following resource categories for which impacts were found to be less than significant: Hydrology (Coastal and Shoreline Resources), Marine Geology and Geologic Hazards, Water Quality, Greenhouse Gases, Noise and Vibration, Biological Resources: Marine Habitats, Biological Resources: Special-Status Species, Significant Ecological Areas (SEAs), Biological Resources: Essential Fish Habitat, Biological Resources: Invasive Species, Cultural and Historical Resources, Aesthetics and Visual Resources, Ground and Vessel Traffic and Transportation, Land and Harbor Use, Socioeconomics, Recreation, Utilities & Public Services, and Public Health and Safety. The details of this analysis are found in Chapter 5.

Growth-Inducing Impacts

An important issue in California is whether a proposed action may directly or indirectly foster population growth and the consequent growth in demand for services and utilities or may remove an obstacle that clears the path for the implementation of a separate development project. In this case, the proposed action is the restoration of offshore biological resources. The type or nature of the proposed action is such that population growth would not be an expected direct or indirect result. The proposed habitat restoration features under the action alternatives are not associated with a housing development project of any kind or with any project that would provide new services or utilities to facilitate the development of new housing. In addition, the proposed habitat restoration features are not actions that would be used as an offset or compensation measure for another proposed action. The proposed action would create new, short-term (temporary), construction employment, however, the levels of employment would be not statistically significant and as such would not result in an increase in the demand for housing or related services. For these reasons, the potential for growth inducement was considered, but eliminated from further detailed analysis.

ES.6.4 Comparison of Four Accounts

Significant Unavoidable Adverse Effects

The USACE uses a system of accounts as a way to keep track of effects of alternative plans in support of identifying the Recommended Plan. These were originally put forward by the U.S. Water Resources Council, in the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, commonly referred to as the Principles and Guidelines (P&G). These include Environmental Quality (EQ), National Economic Development (NED), Regional Economic Development (RED), and Other Social Effects (OSE). Consideration is given to the four accounts for a more holistic and acceptable approach to account for national, regional, and local stakeholder interests.

To comply with the January 2021 "Policy Directive – Comprehensive Documentation of Benefits in Decision Document," benefits associated with the four account categories were evaluated. Further qualitative and quantitative analysis for EQ can be found within Chapter 5, and for OSE and RED accounts in Appendix C: Economic and Social Considerations. The following section offers a qualitative summary of the types of benefits associated with Alternative 4A in support of its selection as the NER Plan. Most of the comparisons are between Alternatives 2 and 4 because they have the most similarities. Alternative 8 can be expected to have overall greater benefits to all four accounts due it being a larger plan as compared to Alternative 4A. However, due to its high costs and lack of sustainability of features, it lacks efficiency as compared to Alternatives 2 or 4A.

Environmental Quality (EQ)

In addition to the ecosystem outputs calculated by the Habitat Evaluation Model (HEM; discussed in Appendix D), Alternatives 2, 4A, and 8 produce qualitative benefits that contribute both nationally and regionally to the EQ account. Incidental benefits associated with the three alternatives such as carbon sequestration, coastline stabilization, and improving water quality are included in the comprehensive benefits of the alternatives and are further described below.

- Restore nationally recognized essential fish habitat (EFH) and habitat areas of particular concern (HAPC) (eelgrass, rocky reef, and kelp) to the U.S. West Coast.
- Increase available habitat and forage for the ESA-federally listed Green Sea Turtle East Pacific distinct population segment (DPS) (threatened), and Western Snowy Plover (threatened) and California Least Tern (endangered), birds recognized as Birds of Conservation Concern by the United States Fish and Wildlife Service (USFWS), as well as abalone species identified as Species of Concern by the National Marine Fisheries Service (NMFS).
- All restored habitats support federally managed species within the Coastal Pelagics and Groundfish Fishery Management Plans (especially open water rocky reef for rockfishes).

- Climate Resilience. Restored acreage of kelp and eelgrass is expected to sequester carbon and mitigate the impact of global climate change. Eelgrass is a key habitat of the Blue Carbon Initiative.
- Restored habitats have the potential to aid in the stabilization of the coastline within the San Pedro Bay (SPB) which would result in potential lowering or removal of the protective berm which is a visual eyesore.
- Eelgrass is expected to provide regional goods and services (*e.g.*, improving water quality) within the SPB.
- Kelp is expected to stabilize ecological communities within the SPB resulting in enhanced local biomass and biodiversity.
- Rocky reef and kelp are regionally recognized as important by the USFWS. "Rocky reefs and kelp beds are highly important fish habitats of the project region (*e.g.*, the Palos Verdes Shelf) that have been reduced in most of southern California." (Appendix H).
- Increase numbers of regionally important commercial and recreationally fished species that are managed by the California Department of Fish and Wildlife (*e.g.*, California Spiny Lobster, Barred Sand Bass, Giant Sea Bass).
- Enhance population connectivity throughout the SCB for regionally important fishes (*e.g.*, Kelp Bass, Barred Sand Bass, Giant Sea Bass) and invertebrates (*e.g.*, California Spiny Lobster).
- Coastal saltmarshes are expected to provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, and commercial species nursery habitat.

National Economic Development (NED)

Per the P&G, contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct benefits that accrue in the planning area and the rest of the nation. Alternative 4A, has incidental impacts to the NED including existing recreation resources and activities. In addition, shoreline stabilization from the nearshore reefs has the potential to reduce the City's operations and maintenance expenditures. Alternative 2 would also produce these incidental benefits, but Alternative 4A would produce greater incidental benefits over Alternative 2 due to the addition of open water rocky reef habitat. The inclusion of open water rocky reefs is expected to provide added recreational opportunities to snorkelers, divers, and fishers (commercial and recreational) and the inclusion of an additional nearshore shoal is expected to reduce wave energy to reduce shoreline erosion. Because the project purpose for this Study is NER, the NER benefits are captured above in the NER justification as well as in the discussion of EQ account benefits.

Regional Economic Development

As described above in NED, Alternative 4A is expected to positively impact the regional economy with an overall addition of construction-related jobs being supported. Overall, the construction of Alternative 4A is expected to add value added in goods and services to the region and provide increased labor income. Because Alternative 2 is a smaller plan, RED benefits are expected to be lower due to reduced construction period and reduced construction spending. RED is discussed further in Section 6.6, and in Appendix C, Addendum C.

Other Social Effects

When compared, there are expected to be only minor differences in the OSE effects for Alternative 4A relative to Alternative 2 due to the key difference of increased habitat restoration including an additional nearshore shoal and two open water rocky reefs. Primary differences would be some minor impacts to recreation with the added features, which positively influence some types of recreation uses and negatively impact others, *e.g.,* rocky reef and associated marine life could attract scuba divers and snorkelers and may increase fishing, while there could be reduced visitation for those who prefer more waves. Economic Vitality could be more positively impacted with Alternative 4A than Alternative 2 due to greater job creation from construction and presence of contractors to spend locally. Alternative 4A could impact Community Cohesion and Identity/Well-Being by a small amount, with anticipated mixed impacts in terms of beach and near-beach based recreation.

ES.7 IDENTIFICATION OF THE NATIONAL ECOSYSTEM RESTORATION (NER) PLAN

After evaluation of the three action plans in the Final Array of Alternatives, and consideration of all of the criteria identified above, the USACE vertical team (VT) identified Alternative 4A as the NER Plan. This decision was endorsed by the USACE VT at the Tentatively Selected Plan (TSP) Milestone held in August 2019, where vertical alignment was achieved with Alternative 4A as the NER Plan. Following the Agency Decision Milestone, the NER Plan was subsequently endorsed by the USACE VT to be carried forward as the Recommended Plan in this Final IFR.

Alternative 4A has been identified as the NER Plan because it best meets ecosystem restoration objectives as well as planning objectives and reasonably maximizes environmental benefits compared to cost while passing tests of cost effectiveness and incremental cost analysis. The NER Plan meets all Study planning objectives including the three sub-objectives to increase the footprint, complexity and connectivity of habitats with national and regional resource significance. The NER Plan is the Preferred Alternative.

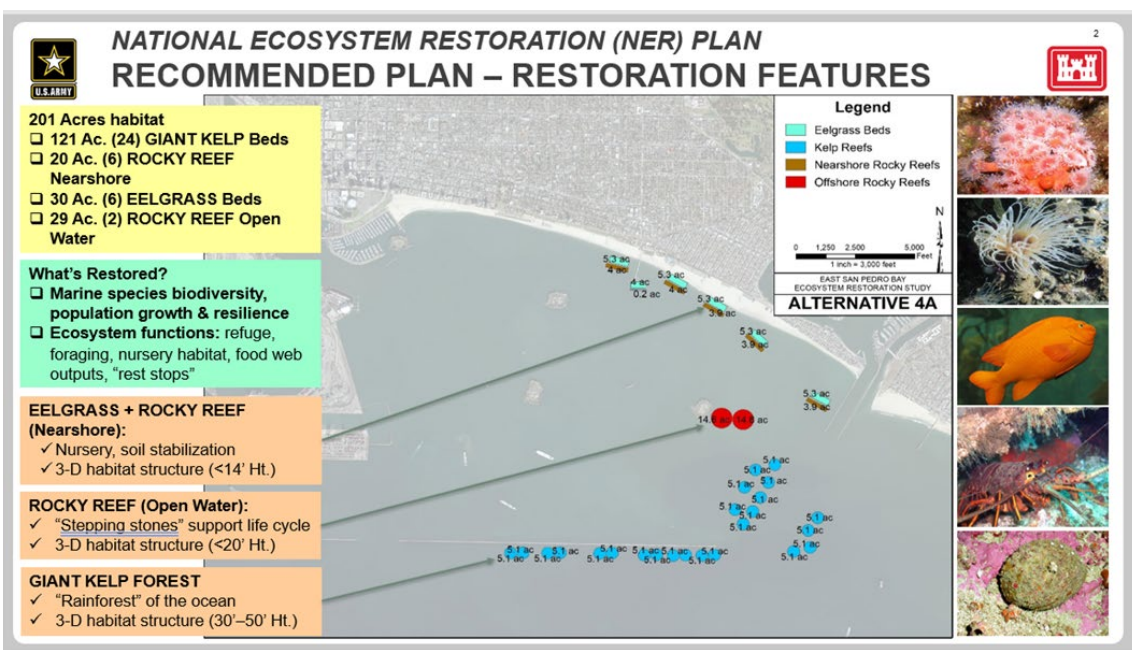


Figure ES-3: Recommended Plan

The NER Plan selection rationale can be summarized within the framework of the four P&G criteria:

ES.7.1 Completeness

Alternative 4A is complete in that it accounts for all necessary investments and actions to realize the planning objectives and does not require substantial additional activities by others to achieve full benefits.

ES.7.2 Effectiveness

Alternative 4A strongly meets the planning objectives, as well as the national significance criteria, detailed in Section 2.4. National significance criteria include biodiversity, status and trends, scarcity/rarity, connectivity, hydrologic/geomorphic, special status species, institutional and public recognition. Criteria are very similar to the sub-objectives, resulting in similar scoring for the action alternatives.

Alternative 4A directly restores 200.7 acres of aquatic habitat and generates 161 AAHUs. It provides connectivity for productive habitats including open water rocky reef, nearshore zone rocky reef, eelgrass and open water kelp. These habitats have been reduced, fragmented, or eliminated by urbanization of coastal watersheds, development of ports and Federal infrastructure projects such as the three breakwaters.

ES.7.3 Efficiency

Alternative 4A provides three productive habitat types for $141 million. This cost has been shown to be reasonable, especially with the modification to Best Buy Plan 4 to introduce a smaller scale of the open water rocky reef measure. Further, Alternative 4A is efficient as it provides output of $35,400 AAC/AAHU. Given these factors, the incremental cost of Alternative 4A is considered "worth it," in terms of maximizing net ecosystem restoration benefits.

ES.7.4 Acceptability

Alternative 4A is acceptable with regards to applicable laws, regulations and public policies. The non-Federal sponsor supports the NER Plan. Resource agencies and the science community generally support the restoration measures considered for all alternatives.

ES.8 THE RECOMMENDED PLAN

The NER Plan is the Recommended Plan. Following the publication of the Draft IFR, feasibility level analysis resulted in refinements to the NER Plan (Alternative 4A). Refinements include updated costs and construction assumptions, updated monitoring and adaptive management assumptions, and refined OMRR&R assumptions. Note, the quantities, locations and sizes of the measures included in the NER Plan are unchanged from the Draft IFR to this Final IFR.

Restoration features for rocky reef, kelp beds, and eelgrass are detailed in Section 6.3 in terms of their ecosystem structure, function, and national benefits as well as likely marine inhabitants and visitors. See Figure ES-4: The Recommended Plan, which also identifies locations of the staging area, Surfside-Sunset borrow site, and both potential quarries analyzed in this IFR. A close-up of the staging area located in Pier T, Port of Long Beach, can be seen in Figure ES-5. Framing the restoration project are the refined construction assumptions. Construction would take place from approximately Fall 2026 to Spring 2039 for a total construction timeframe/duration of approximately 12.5 years. Active construction is expected to take about 96 months, or roughly 8 years total due to blackout periods. Construction would cease during the Olympics between Fall 2027 and Spring 2029. Each year, blackout months are assumed from November through March to account for potential winter storms.

The area of potential effect (APE) has been surveyed for the presence of cultural resources. All potential historic properties within the APE would be avoided by the project construction activities. Further details on cultural and historic resources can be found in Section 5.11 and in Appendix K.

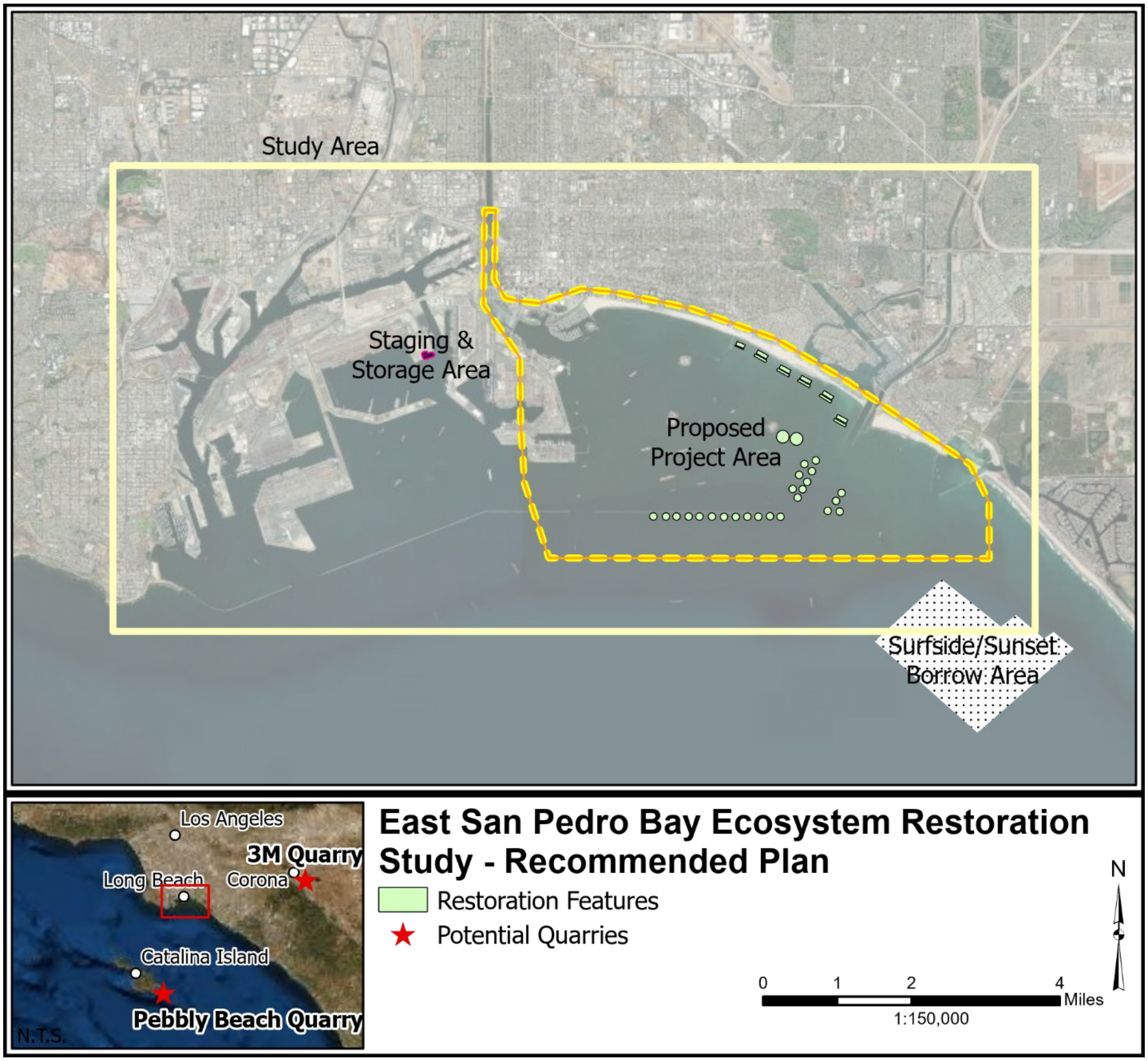


Figure ES-4: The Recommended Plan With Restoration Features, Borrow Site and Potential Quarries

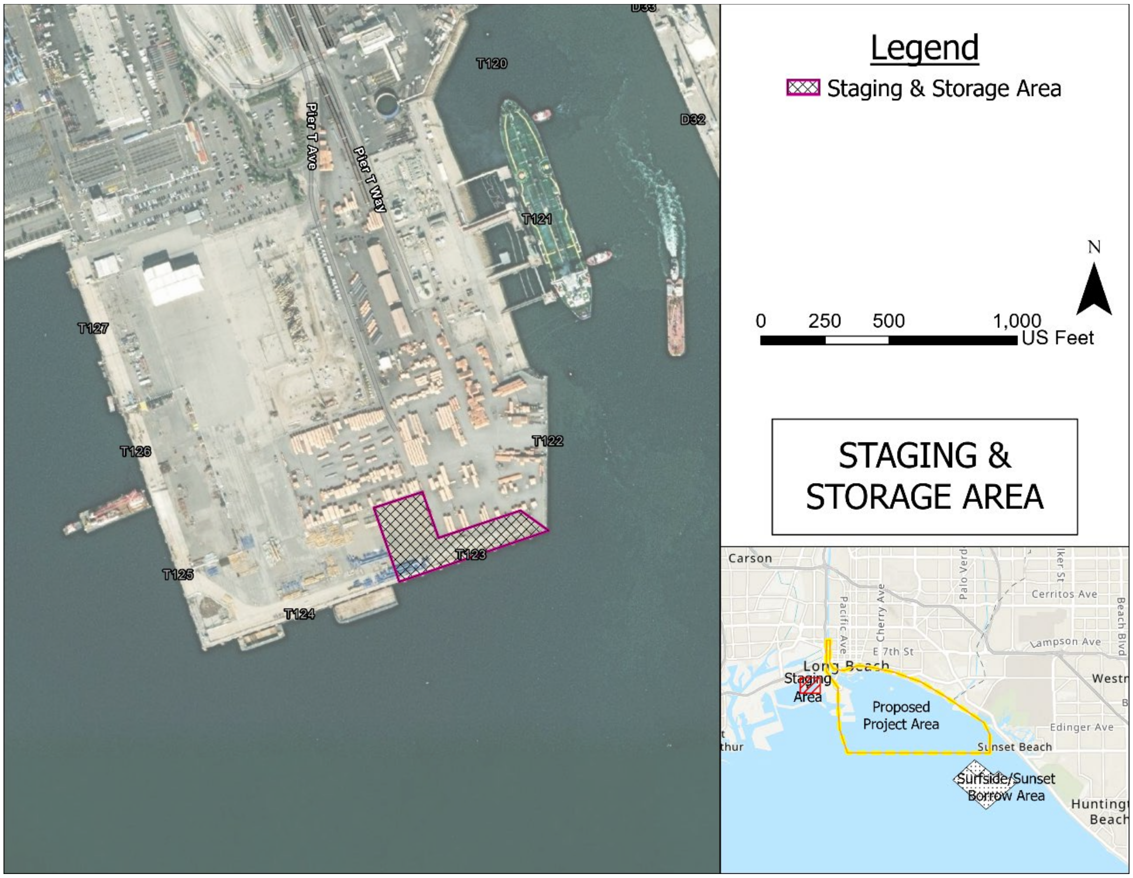


Figure ES-5: Staging and Storage Area

ES.8.1 Project Costs, Benefits and Cost Apportionment

Table ES-6 provides a summary of Project First Costs, as well as average annual benefits and costs for the Recommended Plan. Investment Cost includes interest during construction, based upon a 96-month period of construction. Total annual costs include annualized investment costs plus annual OMRR&R costs and are estimated at $10.2 million. These costs were updated from the Draft IFR to reflect current cost estimates for stone material and transportation (the bulk of the construction cost), equipment, temporary staging area, PED phase planning engineering and design, construction management, monitoring and adaptive management, and a cost contingency.

Table ES-6: Economic Table for Project Costs and Benefits

Project First Cost (FY 2022 Price Levels)	
Total Project First Cost + Associated Cost	$263,701,000
LERRD – Lands & Damages	$9,703,000
Construction	$143,937,000
Monitoring and Adaptive Management	$5,870,000
Planning Engineering & Design (PED)	$17,655,000
Construction Management	$9,355,000
Associated Cost (Aids to Navigation by U.S. Coast Guard)	$1,290,000
Contingency	$75,891,000

Average Annual Costs & Benefits Summary (FY 2022 Price Levels, 2.25% Discount Rate 2022)	
Interest during Construction	$24,659,000
Investment Cost	$288,360,000
Annualized Investment Cost	$9,665,000
OMRR&R	$535,000
Total Average Annual Cost (AAC)	$10,200,000
Average Annual Habitat Units (AAHU)	160.9
AAC/AAHU	$63,400
Zones with Restoration	3
Restored Acres	200.7
First Cost/Restored Acre	$1,313,900

As the non-Federal sponsor for the Study, the City is responsible for project implementation in partnership with the USACE. The total project first cost is just over $262 million, which would be cost-shared between the federal government (65%) and City of Long Beach (35%). Project first costs include the PED costs, construction costs of restoration features, monitoring, and adaptive management, LERRD values, and contingencies. The cost sharing requirements for the Recommended Plan are provided in Table ES-7. Project contingency estimates for construction costs were determined through the Abbreviated Risk Analysis (see Appendix B: Cost Engineering). Associated costs of $1.29 million include ATONs, which are fully borne by the U.S. Coast Guard, bring total construction costs to $263.7 million.

Table ES-7: Project Costs and Cost Apportionment Table

Category	TOTAL	FED (65%)	NON-FED (35%)
Construction of Restoration Features			
Construction	**143,937,000**	93,559,050	50,377,950
Monitoring and Adaptive Management	**5,870,000**	3,815,500	2,054,500
Planning Engineering & Design (PED)	**17,655,000**	11,475,750	6,179,250
Construction Management	**9,355,000**	6,080,750	3,274,250
Contingency	**75,891,000**	49,329,150	26,561,850
Sub-Total Project Construction-Only First Costs	**252,708,000**	**164,260,200**	**88,447,800**
Non-Federal Sponsor LERRDS	9,703,000		9,703,000
TOTAL PROJECT FIRST COST	**262,411,000**	**164,260,200**	**98,150,800**
Associated Costs (ATONS by U.S. Coast Guard)	1,290,000	1,290,000	
TOTAL PROJECT CONSTRUCTION COST	**263,701,000**	**165,550,200**	**98,150,800**

Non-Federal Sponsor's Capabilities

The non-Federal sponsor has submitted a self-certification of financial capability for the project.

View of Non-Federal Sponsor

The non-Federal sponsor supports this project. The letter of support can be found in Appendix N.

ES.8.2 Total Benefits of the Recommended Plan

Consideration is given to the four accounts including EQ, NED, RED and OSE for a more holistic and acceptable approach to account for national, regional, and local stakeholder interests. Much of the detailed analysis for NED, RED and OSE came from Appendix C: Economic and Social Considerations. Details of EQ are derived from Chapter 5. A summary of the four accounts and their effects for the Recommended Plan are presented below.

National Economic Development (NED)

For this Study, the project purpose is National Ecosystem Restoration (NER), rather than NED. Benefits associated with NER projects are captured under the EQ Account (as described below). The Recommended Plan is anticipated to have some incidental impacts to the NED account, primarily associated with existing recreation resources and activities.

For general recreation, Appendix C, Addendum A: Incidental Recreation Impacts, summarizes qualitative recreational analysis. Depending on the type of recreation, the value increased slightly due to the inclusion of open water rocky reefs which are expected to provide enhanced environmental quality and added recreational opportunities to snorkelers, SCUBA divers, and fishers (commercial and recreational). However, analysis and public input revealed minor overall impacts to near beach water activities and more negative impact for commercial, recreational, sail boats from restoration measures within the bay. Personal watercraft is also affected. The more substantial recreation impacts would be to boating.

For general recreation and recreational boating, the estimated annual recreation value under without project conditions is about $2,398,641 million and the estimated annual recreation value under with-project conditions have been updated to new estimate of about $2,214,455 million. The reduction in the annual recreation value with the Recommended Plan is estimated at about $120,186. The reduction in value accounts for not only the negative impacts to boating but also the improvements of boating activities such as recreational fishing and recreational diving. The estimated reduction in annual recreation value provided in the Draft Report was approximately $64,000.

Regional Economic Development (RED)

The RED account registers changes in the distribution of regional economic activity that result from the Recommended Plan (P&G). It is closely related to the NED account but captures those economic effects that have regional, not national, implications. Regional perspectives are important to the non-Federal partners and stakeholders as it answers the question what they are getting for their money. The implementation of the Recommended Plan is also expected to positively impact the regional economy. For more detail on RED refer to Appendix C.

The implementation of the Recommended Plan is also expected to positively impact the regional economy. In terms of regional economic development (RED), based on the estimated direct impacts we can expect about 2,524 jobs to be created within the Los Angeles County, California region from construction of the RP. These impacts are anticipated to occur over a span of about 8 years. Overall, there would be 3,715 jobs supported (direct, indirect, and induced) by the construction of the Recommended Plan, primarily in planting, invasive species and forestry services, construction activities for habitat, fish facilities and water resources infrastructure, architectural, design, engineering, and related services, planning environmental compliance and technical services, repair, and maintenance construction activities, USACE overhead, and USACE Wages and benefits. Overall, the construction of the Recommended Plan is expected to lead to about $318 million in value added in goods and services to the region and increased labor income of over $283 million. For more detail on Regional Economic

Development refer to Addendum C of this report entitled East San Pedro Bay Ecosystem Restoration - Regional Economic Development.

Table ES-8: RED Impacts from the Recommended Plan

Area	**Local Capture**	**Output**	**Jobs***	**Labor Income**	**Value Added**
Local					
Direct Impact		$263,069,669	2,524.4	$199,790,393	$171,927,801
Secondary Impact		$238,135,526	1,191.5	$83,792,933	$147,067,080
Total Impact	$263,069,669	$501,205,195	3,715.8	$283,583,326	$318,994,881
State					
Direct Impact		$265,062,914	2,613.7	$206,235,603	$174,759,943
Secondary Impact		$311,669,565	1,449.5	$106,606,357	$187,591,215
Total Impact	$265,062,914	$576,732,480	4,063.2	$312,841,961	$362,351,159
US					
Direct Impact		$266,111,754	2,880.9	$211,295,111	$175,300,436
Secondary Impact		$548,285,751	2,564.4	$172,393,350	$297,561,950
Total Impact	$266,111,754	$814,397,506	5,445.3	$383,688,461	$472,862,386
* Jobs are presented in full-time equivalence (FTE)					

In addition to construction impacts, post-construction operation and maintenance (O&M) expenses will also increase output, jobs, labor income, and added value of the local economy annually (as shown below in Table ES-9). These increases are in addition to the increases displayed in Table ES-8.

Table ES-9: RED from Operations and Maintenance Expenditures (Annual)—Recommended Plan

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$513,215	4.2	$386,745	$389,922
Secondary Impact		$438,439	2.2	$157,001	$273,168
Total Impact	$513,215	$951,653	6.4	$543,746	$663,089
State					
Direct Impact		$525,805	4.4	$393,928	$397,723
Secondary Impact		$548,886	2.6	$192,613	$336,898
Total Impact	$525,805	$1,074,690	7.0	$586,541	$734,621
US					
Direct Impact		$532,426	4.8	$414,507	$401,047
Secondary Impact		$947,703	4.5	$304,589	$523,724
Total Impact	$532,426	$1,480,130	9.4	$719,096	$924,771
* Jobs are presented in full-time equivalence (FTE)					

Additionally, potential incidental shoreline stabilization benefits from the nearshore shoals have been identified but not quantified. The nearshore shoals have the potential to reduce the City's operations and maintenance expenditures by anticipated reductions in wave energy which would likely reduce shoreline erosion.

Environmental Quality (EQ)

Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. Adverse effects in the EQ account are unfavorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources and are detailed in Chapter 5. In addition to the ecosystem outputs calculated by the HEM, the NER Plan produces qualitative benefits that contribute both nationally and regionally to the EQ account. Beneficial effects associated with the NER Plan such as carbon sequestration, coastline stabilization, and improving water quality are further described below.

- Restores nationally recognized EFH and HAPC (eelgrass, rocky reef, and kelp) to the U.S. West Coast.
- Increases available habitat and forage for the federally listed Green Sea Turtle East Pacific DPS (threatened), and Western Snowy Plover (threatened) and California Least Tern (endangered), birds recognized as Birds of Conservation Concern by the USFWS, as well as abalone species identified as Species of Concern by the NMFS.
- All restored habitats support federally managed species within the Coastal Pelagics and Groundfish Fishery Management Plans (especially open water rocky reef for rockfishes).
- Restored acreage of kelp and eelgrass is expected to sequester carbon and mitigate the impact of global climate change. Restored EFH (kelp and eelgrass) acreage in the proposed Project Area has the potential to reduce approximately 760 tons of atmospheric carbon annually. Eelgrass is a key habitat of the Blue Carbon Initiative.
- Restored habitats have the potential to aid in the stabilization of the coastline within the San Pedro Bay which would result in potential lowering or removal of the protective berm which is a visual eyesore.
- Eelgrass is expected to provide regional goods and services (e.g., improving water quality) within the San Pedro Bay.
- Kelp is expected to stabilize ecological communities within the San Pedro Bay resulting in enhanced local biomass and biodiversity.
- Rocky reef and kelp are regionally recognized as important by the USFWS. “Rocky reefs and kelp beds are highly important fish habitats of the project region (e.g., the Palos Verdes Shelf) that have been reduced in most of southern California.” (Appendix H).
- Increase numbers of regionally important commercial and recreationally fished species that are managed by the CDFW (e.g., California Spiny Lobster, Barred Sand Bass, Giant Sea Bass).
    - From the additional Rocky Reef Habitat alone (nearshore, open water, and kelp reef rock), there is potential for an increase of approximately over 30 million average annual fishes in the proposed Project Area with many species that are managed by the NMFS.
    - This does not consider potential increases in fishes and invertebrates associated with kelp and eelgrass habitats. It is likely that numbers of fishes and invertebrates will be much greater overall from all restored habitats.
- Enhance population connectivity throughout the SCB for regionally important fishes (e.g., Kelp Bass, Barred Sand Bass, Giant Sea Bass) and invertebrates (e.g., California Spiny Lobster).

Other Social Effects (OSE)

Appendix C: Economics, Addendum B presents detailed OSE analysis, which is summarized below. OSE characterizes the highly complex set of relationships and interactions between inputs and outputs of a plan within the social cultural setting of the proposed Project Area. The OSE analysis focuses on the social impact induced by plans with a focus on the Recommended Plan relative to the No Action Plan in the Study Area. Five dimensions of interest are considered including public health and safety, environmental justice, economic vitality, community cohesion, and identity/well-being.

Table ES-10: Dimensions of Interest Summary

Category	Current Level within proposed Project Area Without Project Condition	The Beneficial or Negative Effects from the Recommended Plan
Public Health	Moderate	Small Positive or No change
Environmental Justice	Moderate	Very Small Negative or No change
Economic Vitality	Moderate	Small to Moderate Positive
Community Cohesion	Moderate	Small Positive
Identity/Wellbeing	Moderate	Small Positive

- Public health: The project may result in an increase in recreation visitation for some users, which could encourage individuals who are less active to become more active in these recreational areas. However, the Recommended Plan will likely result in a decline in recreation visitation for other users (e.g., surfers and others who prefer more waves).
- Environmental justice: Many social groups are represented in the city and surrounding areas. The Recommended Plan would restore key areas along the coastline. This may benefit homeowners with real estate appreciation but could negatively impact home renters who could face higher rents. These impacts may disproportionately impact minorities or other disadvantaged groups. However, these impacts, if realized, are anticipated to be very small.
- Economic vitality: Economic vitality is strong within the Los Angeles County area. Many economic sectors are represented. The construction of the Recommended Plan would encourage the contractors to spend money and support jobs within the County. These expenditures within the area would generate multiplicative effect of indirect and induced spending, helping the local economy.
- Community Cohesion: The sense of community is moderately facilitated by the many existing recreational facilities within the proposed Project Area. The Recommended Plan is not anticipated to have a significant impact on community cohesion in the Study Area.
- Identity/wellbeing: The many existing recreational activities available at the bay encourage youths, adults, and seniors to recreate there. These recreational facilities to support these activities may even help to reduce crime. The Recommended Plan could impact community cohesion and identity by a small amount. There are likely mixed impacts in terms of beach and near-beach based recreation, so the overall impact associated with beach recreation on these OSE factors is not anticipated to be significant.

1 INTRODUCTION AND STUDY BACKGROUND

As the main report documenting the East San Pedro Bay Ecosystem Restoration Feasibility Study (Study), this Final Integrated Feasibility Report (Final IFR) combines two distinct but interrelated purposes. First, the Final IFR documents the Study Project Delivery Team's (PDT) extensive plan formulation activities and related technical analysis in accordance with the requirements of the U.S. Army Corps of Engineers (USACE) Civil Works planning process, as documented in the Planning Guidance Notebook or "PGN" (Engineer Regulation (ER) 1105-2-100). It also fulfills both federal National Environmental Policy Act (NEPA) and state California Environmental Quality Act (CEQA) environmental documentation requirements as the combined Environmental Impact Statement (EIS) and Environmental Impact Report (EIR). References to this report will be as the "Final IFR," or "IFR." In the situation where the reference is specifically to address NEPA and/or CEQA, the term "EIS/EIR" will be used.

Each of these sets of regulations require public agencies to provide the public with documentation of the purpose of a proposed project, the process used to develop and compare alternatives to fulfill the project purpose, the environmental and socioeconomic impacts of the alternatives, and the basis for the agency decision. NEPA regulations encourage the preparation of combined documents that meet the requirements of NEPA, equivalent state requirements such as CEQA, and technical planning and decision-making processes of an agency, such as the USACE Planning process, as specified in 40 CFR 1506.2(c)[3].

The Study PDT is led by the USACE Los Angeles District staff, in partnership with staff from the City of Long Beach (City). The City is the non-Federal sponsor and shares the Study costs. This IFR presents the alternatives for restoration of aquatic habitat within East San Pedro Bay (ESPB), analyzes the impacts of implementing those alternatives, steps through the process for selecting the best restoration alternative and concludes with the Recommended Plan[4] proposed for future implementation. Detailed technical work can be found in the appendices to this IFR.

1.1 USACE PLAN FORMULATION PROCESS

The USACE has a well-defined study process intended to identify a plan or alternative which can be supported by USACE leadership, recommended by the Chief of Engineers, and authorized for construction by Congress. The USACE iterative six-step planning process is outlined in the USACE PGN. Additional planning guidance, the Planning Manual II: Risk Informed Planning (July 2017), supplements the six-step process as shown in Figure 1-1. The planning process is summarized below with references to the corresponding sections of this IFR.

- Step 1: Scoping (Identifying Problems and Opportunities): Specify problems, opportunities, objectives, and constraints (See Section 2.1 - 2.3). These four elements form the foundation of the planning process and are critical to the success of a study. They clarify what the problems are and what is being proposed to solve those problems.

[3] The new NEPA regulations issued by the Council on Environmental Quality (CEQ) apply to NEPA processes begun after September 14, 2020, but federal agencies have discretion to apply the new NEPA regulations to on-going NEPA processes or proceed to apply the prior CEQ regulations. The NEPA process in this instance started before September 14, 2020, and the USACE has decided to proceed to apply the prior CEQ regulations. For more information pertaining to NEPA and CEQ regulations, please visit https://ceq.doe.gov/.

[4] For purposes of this Study and to conform to NEPA requirements, the Recommended Plan may also be referred to as the preferred alternative.

- Step 2: Data Gathering (Inventorying and Forecasting Conditions): Conduct inventory of historic and existing conditions (Chapter 3) as well as forecast future conditions without the project (if the project was never built, what would happen if problems continued?). Chapter 3 includes discussion of the No Action Alternative, which describes the Future Without-Project (FWOP) forecast for each specific resource (marine habitat, air quality, recreation, etc.).
- Step 3: Formulation (Formulate Alternative Plans): Plan formulation is the process of identifying specific ways to achieve planning objectives while avoiding constraints to solve the problems and realize the opportunities identified at the outset. Brainstorming measures and alternatives are the creative heart of the planning process (See Section 4.1 - 4.2).
- Steps 4: Evaluation (Evaluating Effects of Alternative Plans): Evaluate measures and alternatives to determine the effects to existing conditions or change in baseline conditions against the future without project condition, which could be described as type, location, or magnitude of change. Evaluation is conducted through various technical analyses including coastal and hydrodynamic modeling, habitat evaluation modeling and cost estimating (See Section 4.3, as well as technical Appendices), as well as in the environmental impacts' analysis in Chapter 5.
- Steps 5: Comparison (Compare Alternatives Plans): A comprehensive decision-making process where alternative plans are evaluated against each other, specifically to compare important plan effects such as effectiveness of meeting planning objectives and the cost-benefits of each plan (See Sections 4.4 and 6.1).
- Step 6: Selection (Select Recommended Plan): The National Ecosystem Restoration (NER) Plan is identified, which is the plan that reasonably maximizes ecosystem restoration benefits compared to costs. See Section 6.2 for how the NER Plan was identified. The NER Plan is generally selected as the Recommended Plan (or project) for future implementation, unless there is a locally preferred plan, as described in more detail on the following pages. The Recommended Plan is detailed starting with Section 6.3 through the end of Chapter 6. Implementation happens after project authorization.

All USACE feasibility studies follow this six-step process. Formulating plans is not a linear process, which means every step, even the problems and opportunities at Step 1 are refined over time. This IFR details the process the team went through to complete each step culminating in how and why the Recommended Plan was selected. Note that the terms "plans" and "alternatives" are used interchangeably. Other key terms critical to the USACE plan formulation process are highlighted below.

Figure 1-1: Planning Process

NER Plan. Ecosystem restoration is one of the primary missions of the USACE Civil Works program. The USACE objective in ecosystem restoration planning is to contribute to NER with the identification of the NER Plan. Contributions to NER outputs are increases in the net quantity and/or quality of desired ecosystem resources. Identification of the NER Plan by the USACE is a key step in the ecosystem restoration planning process. The NER Plan is described in the Plan Formulation section in Chapter 4 and fully described in Chapter 6 of this IFR.

As described in the PGN, the NER Plan is the alternative which maximizes monetary and non-monetary beneficial effects over monetary and non-monetary costs. This is loosely translated as the plan which maximizes net benefits. More precisely, the incremental beneficial effects of the plan just equal the incremental costs or alternatively stated, the extra environmental value is just worth the extra costs. The USACE and City have to answer the question about whether the plan’s benefits are worth the costs.

See Chapter 6 for details on comparison of the final array of alternatives and the screening process to identify the NER Plan. The alternatives were developed and evaluated using the planning objectives, USACE Principles and Guidelines (P&G) comparison criteria (completeness, effectiveness, efficiency, acceptability), and the four USACE comparison “accounts” including: (1) National Economic Development (NED); (2) Environmental Quality (EQ); (3) Regional Economic Development (RED); and (4) Other Social Effects (OSE). The plans’ environmental impacts were evaluated, as required by the USACE planning process, and in accordance with NEPA and CEQA requirements. These considerations all provide information to the public in comparing alternatives and assist the USACE and City in identifying the Recommended Plan.

Recommended Plan. The Recommended Plan is detailed in Chapter 6. This is the plan that the USACE and City recommend for future implementation and with which the City must concur. The Recommended Plan is usually the NER plan unless the non-Federal sponsor requests a Locally Preferred Plan (LPP). No LPP has been requested by the City. This Final IFR does, however, discuss plans of local interest in detail as requested by the City.

1.2 STUDY AUTHORITY

The East San Pedro Bay Ecosystem Restoration Feasibility Study is being conducted and prepared as an interim response to the following:

Senate Committee on Public Works Resolution, approved 25 June 1969, reading in part:

> *"Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors, created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on the Los Angeles and San Gabriel Rivers and Ballona Creek, California, published as House Document Numbered 838, Seventy-sixth Congress, and other pertinent reports, with a view to determining whether any modifications contained herein are advisable at the present time, in the resources in the Los Angeles County Drainage Area."*

The Energy and Water Development and Related Agencies Appropriations Act for Fiscal Year 2010, Pub. L. 111-85, provided funds for the Long Beach Breakwater Reconnaissance Study, as specifically listed in Conference Report No. 111-278 to accompany H.R. 3183 dated September 30, 2009.

In 2010, the USACE completed a reconnaissance study addressing ecosystem restoration and recreation improvements in ESPB at Long Beach, California (part of the Los Angeles County Drainage Area). The study report, entitled the Long Beach Breakwater (East San Pedro Bay) Ecosystem Restoration Study Reconnaissance Phase 905(b) Report, dated August 2010, determined that the Study should proceed into the cost-shared feasibility phase to evaluate opportunities to restore the degraded ecosystem of ESPB and to improve related incidental nearshore recreation in the City of Long Beach. The Department of the Army and City subsequently entered into a Feasibility Cost Sharing Agreement (FCSA) for the feasibility study.

1.3 STUDY SPONSOR AND TEAM PROCESS

The non-Federal sponsor is the City. The USACE and the City share the costs of the Study, with the exception of the USACE "Type I Independent External Peer Review" which is 100% federally funded.

This Study was aided by extensive input received from technical experts, stakeholders, and the public. Many members of the public expressed concerns and shared potential restoration ideas. Contributions by technical experts ensured the Study outcomes were feasible and defensible.

1.3.1 Habitat Technical Advisory Committee (TAC)

Because this Study focused on restoring aquatic ecosystems in a marine environment, the PDT consulted with scientists from several resource agencies, academic and non-profit institutions to obtain critical input and feedback throughout the Study. The TAC members' participation in the planning process does not constitute endorsement of the alternatives or of the Recommended Plan. Their input was critical in identifying and evaluating measures.

1.3.2 Ports Advisory Working Group (City of Long Beach)

The City convened a Ports Advisory Working Group to provide feedback at strategic junctures throughout the course of this Study. Participants include representatives from the Port of Long Beach, Jacobson Pilots, THUMS Oil Islands, Carnival Cruise Lines, Port terminal operators, Pacific Merchant Shipping Association, U.S. Coast Guard and U.S. Navy.

1.3.3 USACE Team Structure

The USACE requires multi-level teaming for each study to ensure technical rigor and adherence to policy and guidance. The following details the USACE "Project Delivery Team" and the "Vertical Team," and identifies the reviewers of this IFR.

<u>Project Delivery Team (PDT)</u> – The PDT includes a complex team make-up responsible for technical analysis and plan formulation, as well as internal levels of review to ensure execution of sound technical practices and policy compliance. All team members are from the USACE Los Angeles District unless otherwise indicated.

- USACE technical team members, assisted by contractors/consultants for technical analysis: Project Manager, Lead Planner, Lead Biologist/Ecologist, Environmental Coordinator, Economist, Coastal Engineer, Geotechnical Engineer, Soils Engineer, Cost Engineer, Archaeologist, Realty Specialist
- USACE Engineering Research and Development Center (ERDC), Vicksburg, MS – ERDC team of subject matter experts responsible for developing the habitat evaluation model
- USACE Management: Supervisors, Branch Chiefs, Division Chiefs, Deputy District Engineer and District Commander/Chief Engineer.
- City of Long Beach: Office of City Manager, City Development Services/Planning Department, Parks Recreation and Marine Department
- City Consultants: Anchor QEA, Everest International Consultants

<u>Vertical Team (VT)</u> – The VT is an enterprise-wide team made up of USACE technical and policy experts from across the nation, which includes USACE staff from the following offices:

- USACE Headquarters (HQ), Washington, D.C.
- USACE South Pacific Division (SPD), San Francisco, CA
- Ecosystem Restoration Planning Center of Expertise (ECO-PCX)

<u>Reviewers</u>

- District Quality Control (DQC) Team and Legal Review (Los Angeles District)
- Agency Technical Review (ATR)
- Independent External Peer Review (IEPR)
- Policy and Legal Compliance Review Team

1.4 RELATED STUDIES AND REPORTS

The following projects, as well as reports from consultants and public entities including the USACE, have been reviewed as part of this Study. This list contains only the reports that were most relevant and useful to the Study; a comprehensive list may be found in the bibliography.

1.4.1 Existing USACE Projects and Studies

- Los Angeles and Long Beach Harbors are authorized by the 1896 River and Harbor Act and subsequent River and Harbor Acts. There are 3 breakwaters (see
- Figure 1-4): San Pedro Breakwater (not shown on figure) is 11,150 ft long, Middle Breakwater is 18,500 ft long and the Long Beach Breakwater is 13,350 ft long. The Long Beach Harbor portion of the existing Federal Project (see
- Figure 1-4) includes the Approach Channel through Queens Gate that is about 15,800 ft long, 1200-1300 ft wide and has a depth of 76 ft below Mean Lower Low Water (MLLW). The Main Channel is about 16,700 ft long, with a varying width between 400-1400 ft and an authorized depth of 76 ft below MLLW.
- Port of Long Beach Navigation Improvements Feasibility Study, U.S. Army Corps of Engineers (in progress). This ongoing study is examining navigational improvements for existing and future container and liquid bulk ships and is partially within the proposed project area at Pier J. The Final IFR was released in August 2021.
- Port of Long Beach (Main Channel Deepening Project) Final Feasibility Study Long Beach, California 7 (Sept 1995)—Prepared by the U.S. Army Corps of Engineers.
- Los Angeles River Estuary (LARE): dredged periodically (roughly every 3-5 years as funding allows and need requires), last dredged in 2021. Next dredge event is anticipated to be 2025, and may occur during project construction in between 2028 and 2032. Dredging usually performed by clamshell dredge due to access issues for bridge crossing the channel.

1.4.2 Other Relevant Projects and Studies

- Naval Weapons Station Seal Beach Integrated Natural Resources Management Plan. Naval Weapons Station Seal Beach finalized the Integrated Natural Resources Management Plan (INRMP) in 2014. The INRMP's purpose is to provide the Naval Weapons Station Seal Beach with a viable framework for future management of natural resources on lands it owns or controls.
- Port of Long Beach–Port Master Plan. The Port of Long Beach Draft Program Environmental Impact Report and Port Master Plan were updated August 2019. The plan identifies Planning Districts and guides different port related activities.
- Port of Long Beach–Strategic Plan. The Port of Long Beach 2016 Strategic Plan Update reflects updated and continued priorities, goals, and challenges. The 2016 Strategic Plan Update describes the Port of Long Beach's commitment to environmental stewardship; safety and security; community; business, and supply chain optimization; business development; financial strength; and organization development (Port of Long Beach 2016).
- City of Long Beach–General Plan. Guides land use within the City and areas that fall in the project area.
- City of Long Beach–Livable West Long Beach: The West Long Beach Livability Implementation Plan. This plan identifies, prioritizes, and strategizes the implementation of projects and initiatives that will provide a variety of neighborhood benefits including enhancements to the community's physical environment, improved accessibility and connectivity, a cleaner environment, a vibrant economy, and improved community health.
- City of Long Beach–Local Coastal Program (LCP). The City's adopted LCP was certified by the CCC in 1980. Its policies emphasize shoreline access, new development, and coastal resources. The LCP also includes community plans for Downtown Shoreline, the Bluffs, Bixby Park, Belmont

Heights/Belmont Park, Belmont Shore, Naples and the Peninsula, and Southeast Area as well as a Resource Management Plan for the Waterlands.

- City of Seal Beach–General Plan. The proposed Project Area (defined below) is within the City of Seal Beach General Plan Planning Area 1, Old Town/Surfside, and encompasses the land use designation Beach. Adjacent land use designations include Residential Low Density and Residential High Density, located just inland of the beach. The Anaheim Bay located just southeast of Seal Beach is utilized as the Naval Weapons Station.
- The Los Angeles County Drainage Area (LACDA) project, specifically the Los Angeles River channelization, is subject to ongoing dredging at the mouth of the river within the proposed Project Area.
- City of Long Beach Sediment Management Feasibility Study for Peninsula Beach is within the proposed Project Area.
- Southern California Bight Regional Monitoring Program, Southern California Coastal Waters Research Program (SCCWRP). This ongoing marine monitoring collaboration examines how human activities have affected the health of more than 1,500 square miles of Southern California's coastal waters. Via this partnership facilitated by SCCWRP, dozens of participating organizations pool their resources and expertise to investigate the condition of this marine ecosystem at risk.
- 2008 Biological Surveys of Los Angeles and Long Beach Harbors, Science Applications International Corporation, 2010. This study evaluated potential effects from in-bay projects at the Ports of Los Angeles and Long Beach.
- Ports of Los Angeles/Long Beach Water Resources Action Plan (WRAP) model.
- Comprehensive Condition Survey – Los Angeles-Long Beach Breakwaters – January 1985. This study provides useful details of the breakwaters' history, their construction and current condition.
- Peninsula Beach Erosion – Draft Feasibility Study. This study provides data regarding erosion of the Peninsula Beach area of Long Beach, which is adjacent to ESPB.
- Wetlands of the Southern California Coast: Historical Extent and Change Over Time, Southern California Coastal Water Research Project (2014).

1.5 STUDY TIMELINE

The Long Beach City Council approved a motion to begin working with the USACE in 2005. In 2009, the City developed a draft reconnaissance report to investigate opportunities to modify the breakwater and restore habitat within ESPB. The USACE subsequently reviewed and incorporated the City's report as the basis for the 2010 Reconnaissance 905(b) Report. This report recommended the USACE continue the study with the specific focus of ecosystem restoration problems and opportunities in the feasibility phase. The feasibility phase startup was delayed due to lack of funding and the need to rescope the Study to reduce the Study cost and schedule to comply with the USACE modernized planning process. The Los Angeles District received funding in 2015 to rescope this Study. In January 2016, the FCSA between the City and the Department of the Army was amended, which updated the original FCSA initially executed in November 2010.

For the full Study timeline, see Figure 1-2 1-2. This Final IFR marks the end of the "Feasibility Analysis of the Selected Plan" phase. At the beginning of this phase, the Draft IFR was released for a 60-day public and agency review, November 25, 2019 through January 29, 2020. The Draft IFR put forward the Tentatively Selected Plan (TSP), selected from the Final Array of Alternatives. Public and agency comments were received and processed, which the USACE and City considered in determining if the TSP would be identified as Recommended Plan at the Agency Decision Milestone (ADM). After the ADM, it was determined that Alternative 4A, which was identified as the NER Plan and the TSP, would be carried forward in this Final IFR as the Recommended Plan. Feasibility-level analysis of the Recommended Plan was conducted with the results incorporated into this Final IFR. The final step and decision point for the USACE is the signing of the Report of the Chief of Engineers (Chief's Report), which provides the Chief of Engineers' recommendation of a project for authorization by Congress. To complete the NEPA process, the Record of Decision will be signed by the Assistant Secretary of the Army/Civil Works (ASACW) approximately 6 months following the Chief's Report. The final step and decision point for the City is the City Council hearing to adopt the CEQA document, which is part of the IFR. See the key SMART Planning Milestones in Table 1-1.

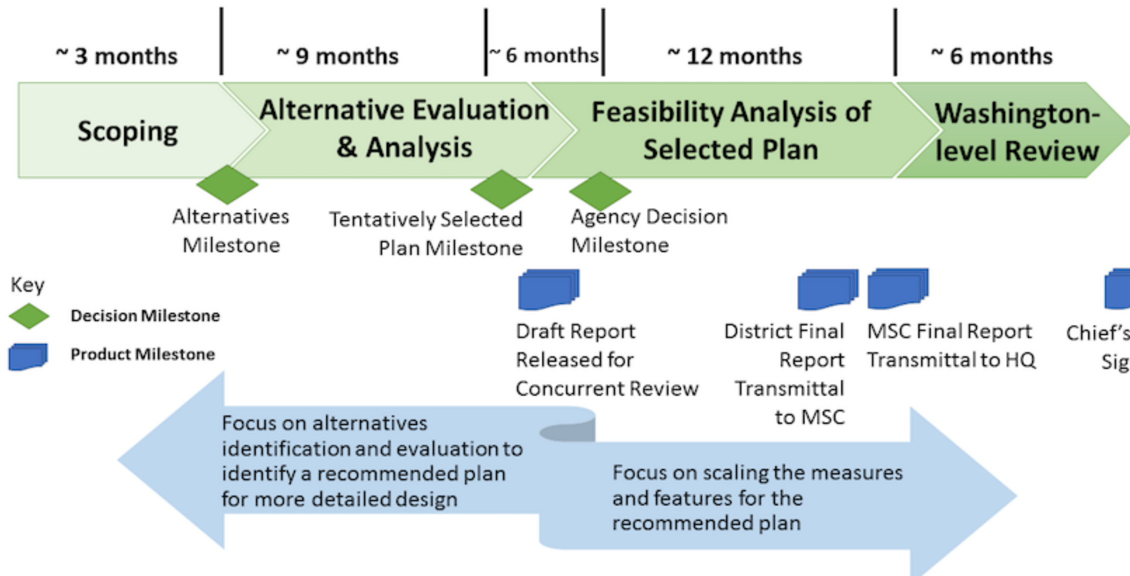


Figure 1-2: Feasibility Process: Key Decision and Product Milestones

Table 1-1: SMART Planning Milestones

Task / Deliverable	Date
3-Year SMART Timeline Start	February 2016
NEPA Scoping Meetings	April 2016
Alternatives Milestone #1	September 2016
Tentatively Selected Plan (TSP) Milestone #2	August 2019
Release Draft for Public and Concurrent Agency Review	November 2019
Public Meeting	December 2019
Agency Decision Milestone (ADM) #3	July 2020
District Engineer's Final Report to South Pacific Division/HQ	January 2022
S&A/Senior Leaders Panel Briefing	April 2022
State and Agency Review	April-May 2022
Chief's Report	June 2022

1.6 PROJECT LOCATION

San Pedro Bay is within the Southern California Bight (SCB) (see

Figure 1-3), a coastal region from Point Conception west of Santa Barbara to the Mexico border.

Figure 1-4 shows the greater Study Area which includes areas that may be used for reference sites. The proposed Project Area, shown in

Figure 1-4, is located offshore from the city of Long Beach, California, in ESPB. It includes the area extending out from the Long Beach shoreline, including the LARE, to offshore of the Middle Breakwater, which is west of the Long Beach Breakwater as shown below. The proposed Project Area is within the 47th Congressional District, represented by U.S. Representative Alan Lowenthal.

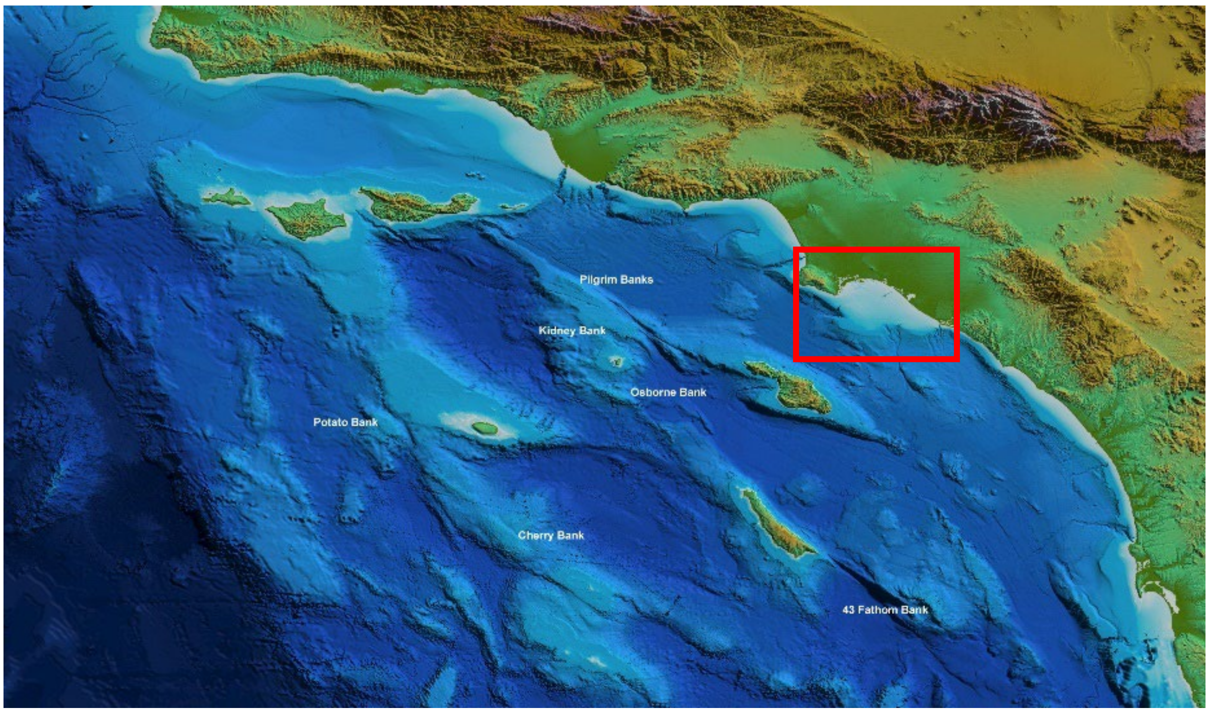


Figure 1-3: Southern California Bight (Study Area in Red Box)

Figure 1-4: Study Area (San Pedro Bay)

1.6.1 Study Area

Figure 1-4 (above) shows the greater Study Area. Locations within the Study Area are used as reference sites for existing habitat including Point Fermin on the Palos Verdes peninsula to the west. The approximately 50 square mile San Pedro Bay (inclusive of the proposed Project Area within ESPB) historically supported important marine habitats such as eelgrass along the shallow subtidal associated with tidal flats and wetland areas (e.g., inlets and at the mouths of estuaries), rocky reef in the western San Pedro Bay (e.g., Deadman's Island (KCET, 2014)), saltwater marsh, soft bottom habitat, and giant kelp reefs (e.g., Horseshoe Kelp Reef) adjacent to the Palos Verdes Peninsula (MBC, 2012) and southeast of the Peninsula along the San Pedro Shelf (USGS, 2012) that likely extended into the Study Area. Through a series of USACE facilitated projects (e.g., construction of breakwaters, Federal Channel deepening, ongoing dredging, relocation and channelization of the Los Angeles River, etc.) that led to the development of the Los Angeles-Long Beach Port Complex (Port Complex) and the cities of San Pedro, Wilmington, and Long Beach, wetlands, eelgrass, kelp reef, and rocky reef, etc. have been lost or significantly degraded in the Study Area. Overall, at least 40% of natural habitat area within the San Pedro Bay has been lost or converted into artificial habitat, resulting in a tremendous loss of natural habitat area (including wetland, open water, and subtidal habitats) and associated biodiversity. Section 2.1 Study Problems expands the discussion on historic habitat loss and alterations.

Although the entire San Pedro Bay area has been subject to habitat loss resulting from development of navigation infrastructure and alterations to the shoreline and the seafloor of San Pedro Bay (breakwaters, dredged channels, dredged material placement), practical constraints result in limiting opportunities for restoration to the "proposed Project Area" described below.

1.6.2 Proposed Project Area

The proposed Project Area shown in Figure 1-5, located within the broader Study Area shown in

Figure 1-4, is located offshore from the city of Long Beach, California. This 18 square mile area (11,465 acres), shown as a shovel-shaped red polygon, lies within the eastern portion of San Pedro Bay, and typically referred to as ESPB. The proposed Project Area includes approximately 4 miles of the Long Beach shoreline bisected by the Belmont Pier as labeled in Figure 1-5. The LARE and major features including Shoreline Village and the Queen Mary, are shown on the upper left corner of the map. The Port of Long Beach and associated piers are shown to the west. The Middle Breakwater and the Long Beach Breakwater are the horizontal green lines at the bottom of the map to the south. The green lines on the breakwaters, along shorelines, oil islands and port infrastructure represent existing kelp beds. To the east of the proposed Project Area are Alamitos Bay Jetties, which serve as the entrance to Alamitos Bay, just northwest of the City of Seal Beach. The pink areas within Alamitos Bay and along the Long Beach shoreline represents existing eelgrass beds. The blue contour lines represent the depths in feet of water below MLLW surface water elevation.

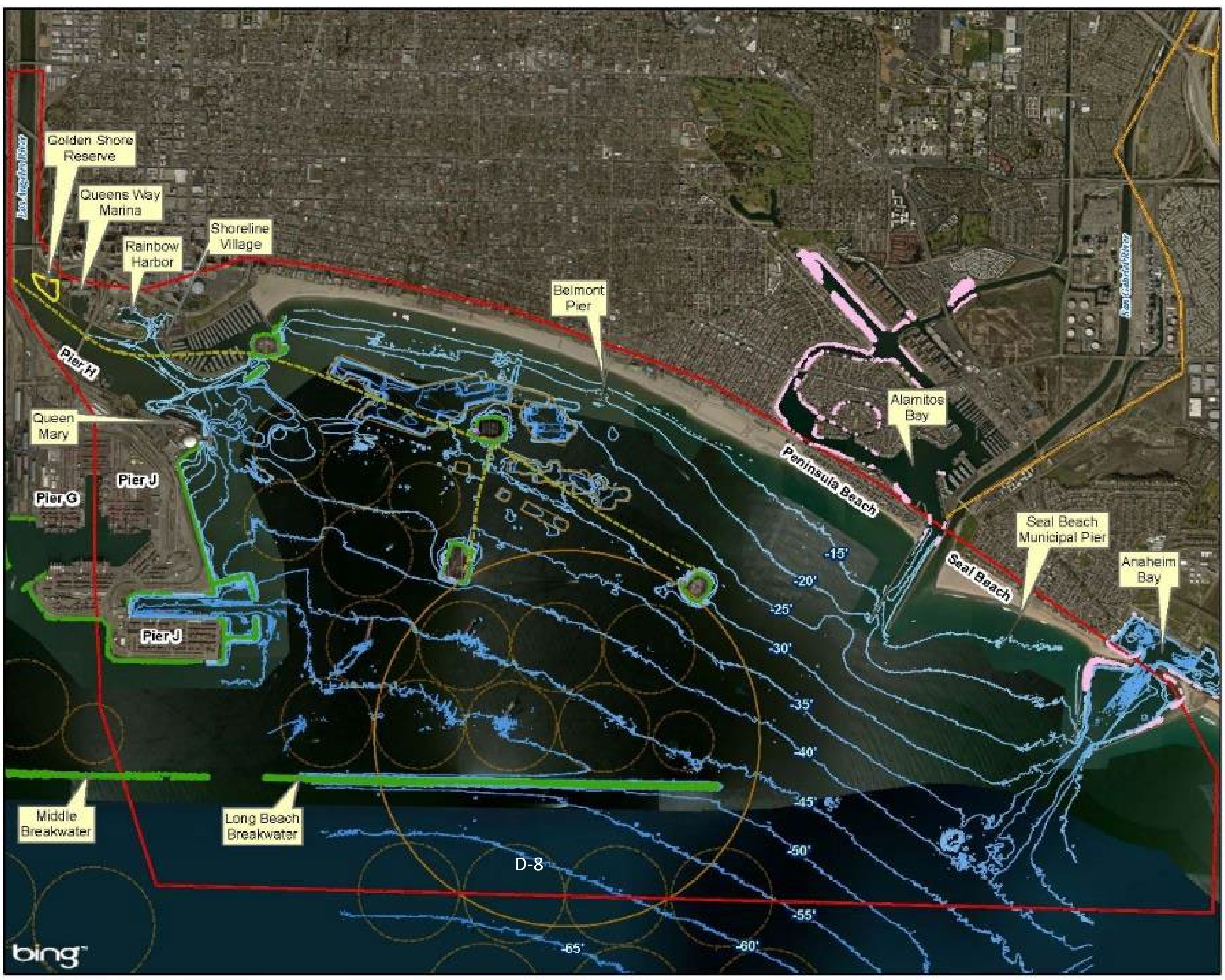


Figure 1-5: Proposed Project Area Map

Within the proposed Project Area, water depths range from 0 to about minus 60' MLLW, outside the breakwater. Fourteen ship anchorages sit inside the breakwater and the proposed Project Area boundary bisects four more anchorages outside of the breakwater. Inside the breakwater, the D8 explosives anchorage is required by the Navy for contingency operations in support of national defense. Only the D8 anchorage is approved for use by the Navy for the transfer of ammunition. This "blast zone" is shown as a large orange circle. The North and South borrow pits lay on the seabed floor in the northern portion of the proposed Project Area. Four oil extraction islands sit within ESPB including Island Grissom (nearest Shoreline Marina), Island White (east of Grissom), Island Freeman (south of White) and Island Chaffee (most southeast). Also within the Study Area is Pier T, a location within the Port of Long Beach used for material storage and staging, and the Surfside/Sunset borrow area that is commonly used for the dredging and placement of sediment (Figure 1-6). Although not within the polygon used to describe the proposed Project Area, these areas are considered to be associated with the proposed Project Area as they would likely be locations used for staging/storage and for acquiring sediment due to their close proximity.

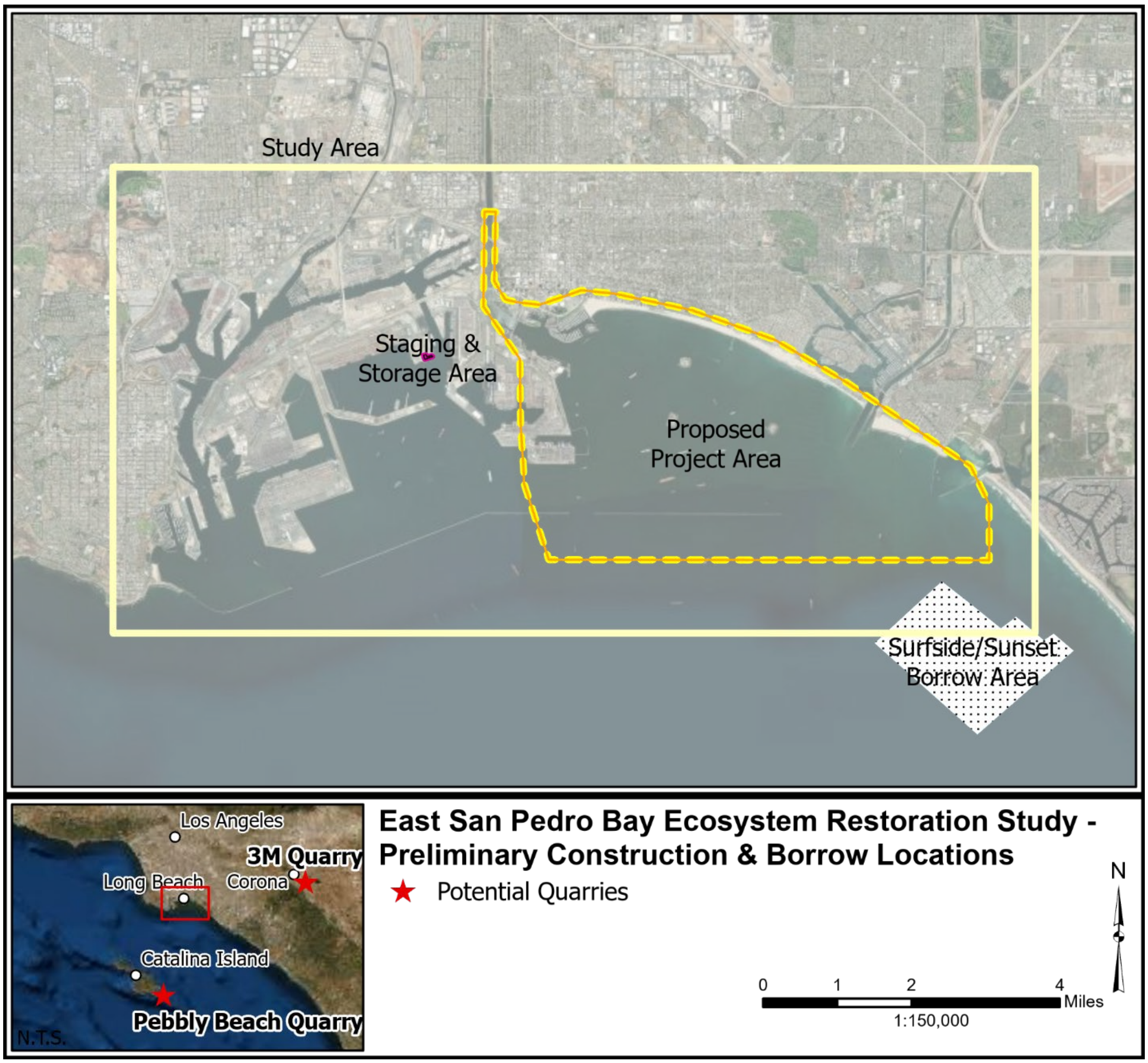


Figure 1-6: Proposed Project Area Map with Proposed Staging Area and Sediment Borrow Site

Other key features, landmarks, and infrastructure within the proposed Project Area:

- Queen's Gate is the opening between the Long Beach Breakwater and Middle Breakwater and functions as one of the two major shipping passages in and out of the ports complex
- Port of Long Beach, including Pier H and Pier J, flank the western edge of the proposed Project Area, and includes the Queen Mary, Queensway Bay and Carnival Cruise Line
- The Los Angeles River mouth and estuary, and approximately one mile of the river upstream from West Ocean Boulevard are included
- Downtown Long Beach's shoreline includes:
    - Golden Shore Reserve, the only existing coastal wetland in the project area
    - Rainbow Harbor, a recreation and commercial harbor including Catalina Island Express;
    - Shoreline Village commercial district
    - Aquarium of the Pacific, with 1.5 million visitors annually
    - Shoreline Marina, a recreational marina run by the City of Long Beach Parks Recreation and Marine Department
- Long Beach beaches include Long Beach City Beach, Belmont Shore Beach and Belmont Pier, Rosie's Dog Beach, and Peninsula Beach
- Alamitos Bay a recreational harbor with two jetty structures
- San Gabriel River, immediately adjacent to the jetties, generally divides the cities of Long Beach from Seal Beach

This is the largest remaining undeveloped area of San Pedro Bay, representing the largest opportunity areas for restoration in open waters. In addition, the nearshore zone along the Long Beach beaches have not been filled in like the ports area. Western San Pedro Bay does not offer large scale habitat restoration opportunities due to existing Port of Long Beach and Port of Los Angeles infrastructure and heavy vessel traffic.

The need for restoration in the proposed Project Area is driven by the losses in habitat that have occurred historically throughout the Study Area, including the negative impacts caused directly or significantly influenced by USACE projects. The proposed Project Area is ideally suited for restoration because of the large expanse of relatively undisturbed open water area and with minimal ecosystem stressors as compared to the ports. Port area stressors include poor water quality and circulation within numerous dead-end slips and basins, frequent large vessel traffic and constant ports operations. Stressors coupled with extensive hardened shoreline and ports infrastructure create unsuitable and unsustainable conditions for restoration, leaving ESPB as the nearest and most suitable site to restore lost habitat. Boating traffic (primarily recreational) is expected throughout the Project Area and impacts to kelp within surface waters of the proposed Project Area may occur due to "prop stir" as recreational vessels travel through kelp. However, kelp can grow very rapidly (potentially many feet per day) and due to its rapid rate of growth and recovery, kelp is expected to persist considering potential impacts from boating traffic. All other restoration measures would be sited at depths expected to be below the draft of boating traffic and would be adequately marked and denoted on navigation charts to minimize impacts to the public and to restoration measures. The non-Federal sponsor has an interest in supporting ecosystem restoration within their jurisdiction which includes the majority of the proposed Project Area.

1.6.3 Current Baseline Condition of Habitat in the Project Area

The existing principal biological resources within the proposed Project Area are dominated by soft bottom habitats, hard substrate habitats primarily incidental to port infrastructure, and water column habitats. These remaining habitats are degraded, minimal, simplified and of overall lower quality than historic habitat in the Study Area, especially in ESPB. This is due largely to the fact that existing productive, complex habitats have naturalized unintentionally on engineered structures not designed for ecological benefits. Further details on existing conditions are in Chapter 3 – Existing Conditions of the Affected Environment.

- Soft Bottom Habitat. As the most prevalent habitat type in the proposed Project Area, soft bottom habitat is composed of silt and sand and include depauperate borrow pits (North and South Energy Island Borrow Pits) roughly 15 to 35 feet deeper than the surrounding area.
- Coastal Salt Marsh. The only wetlands within the proposed Project Area is a 6.5 acre Golden Shore Marine Biological Reserve, which supports typical salt marsh plant species.
- Eelgrass. Eelgrass (*Zostera marina* L. and *Z. pacifica*) beds are rooted in the shallow, soft-bottom, calm waters along Belmont Shore and around the Belmont Pier. Historic dredged materials placed offshore created the calm shallow conditions ideal for eelgrass, and it naturalized in that location.
- Sandy Beach. Sandy beaches are the dominant intertidal habitat within the proposed Project Area but are heavily used by the public for recreational activities. Regular grooming reduces the abundance of the biological community.
- Kelp. Giant kelp (*Macrocystis pyrifera*) is a brown alga that naturalized on the breakwater, pier armoring, and oil islands within the proposed Project Area. Kelp coverage in this area has ranged from 29 acres (2007) to 120 acres (2012). This includes a combination of giant kelp (equal to or greater than 95 percent) and feather boa kelp (equal to or less than 5 percent). There are no naturally occurring kelp beds in the proposed Project Area. The quality of the kelp diminishes greatly further into the proposed Project Area as compared to outside the breakwater where the conditions for kelp are considerably more favorable.
- Rocky Reefs. The only natural rocky reefs in the Study Area are at Palos Verdes and Horseshoe Kelp Reef and none are in the proposed Project Area. Rocky reef habitats within the proposed Project Area are primarily found on riprap and shoreline armoring associated with port, breakwaters, jetties and THUMS oil island infrastructure. The physical characteristics of these structures differ from natural reefs, such as the linear breakwater (e.g., "relief," or height off the seafloor, and "rugosity," the complexity of the substrate). These infrastructures are not designed nor sited for optimal habitat output, although they support incidental kelp and rocky reef habitat. The "riprap community" refers to invertebrates that live on riprap, pilings, and concrete, or live among the riprap organisms.

Anticipated FWOP conditions for the 50-year period of analysis, from 2030 to 2080, include assumptions that the relatively low value habitat condition will continue and will not improve due to limited existing coverage, poor configuration, and ongoing stressors. General trends for key habitat types in the region including kelp, eelgrass and rocky reef habitats suggest overall global decline in quantity and quality of these critical coastal habitats. Sea levels are expected to rise a few inches and may impact eelgrass and coastal wetlands but would have minimal impact to kelp or rocky reef. Subsequent chapters will further address FWOP conditions in the context of formulating alternatives.

2 PLANNING FOUNDATIONS AND NATIONAL SIGNIFICANCE

One of the USACE primary missions within the Civil Works Program is aquatic ecosystem restoration. In the updated USACE Civil Works Strategic Plan (Strategic Plan 2014-2018: Sustainable Solutions To America's Water Resources Needs), the ecosystem restoration strategic goal and objective is to, "restore, protect, and manage aquatic ecosystems to benefit the Nation," and to "restore aquatic habitat to a more natural condition in ecosystems in which structure, function and dynamic processes have been degraded." Ecosystem restoration efforts involve an examination of the problems contributing to the system degradation, and the development of alternative means for their solution. The intent of restoration is to partially or fully reestablish the attributes of a natural, functioning, and self-regulating system.

USACE Civil Works Vision

"Contribute to the strength of the Nation through innovative and environmentally sustainable solutions to the Nation's water resources challenges."

Aquatic Ecosystem Restoration Strategic Goal

"Restore, protect, and manage aquatic ecosystems to benefit the Nation."

Within this chapter, the Purpose and Need statements, linked closely with the USACE aquatic ecosystem restoration mission, provide a fundamental basis for determining what alternatives to consider, per 40 CFR § 1502.13. The project purpose is defined as the Planning Objectives in Section 2.2 and project need is defined as the Study Problems under Section 2.1. These statements are part of the four planning foundations for all USACE feasibility studies, Problems, Opportunities, Objectives and Constraints, covered in more detail in this chapter.

2.1 STUDY PROBLEMS (PROJECT NEED) AND OPPORTUNITIES

Within the framework of aquatic ecosystem restoration, the project need focuses the Study around loss of habitats and ecosystem functions within the San Pedro Bay and their importance to the Nation. Well-vetted problem statements provide the foundation for successful NER Plan identification.

Feedback from the public during the project scoping meetings held in April 2016 included information used to identify significant issues, problems and opportunities as well as inform the plan formulation process.

Specific concerns expressed included:

- A question about restoration being based on pre-Navy (breakwater) or current conditions
- Economic impacts to ports due to increased wave activity (from breakwater modifications)
- Concerns that breakwater modifications would jeopardize homes and impact neighborhood safety
- Cleanliness of the sand and trash from rivers
- Impacts to existing sea life from modifying the breakwater
- Climate change and potential sea level rise and effects the breakwater has on mitigating those effects if it remained or was removed
- Unique opportunities for small sailboats, fishing boats, wind surfers and other recreational activities that benefit from the calm, protected waters due to the breakwater.
- Concerns over low water quality in the bay
- Concern over loss of beaches from breakwater construction

- Circulation needed in the bay
- Concerns over damages to the port and extended port-related employment (from breakwater modifications)

Significant issues raised were centered around concerns over removal of the breakwater impacting homes, beaches and port-related businesses and jobs and the condition of water quality in the bay. Restoration opportunities were also noted and considered during the measures screenings in Chapter 4.

2.1.1 Study Problems and Historical Context

The following **Study Problems** have been identified for this Study:

1. Loss of sensitive marine habitat with associated nursery, reproductive, and other ecological functions; and

2. Reduced abundance and biodiversity of marine populations as a result of habitat loss.

Beginning in 1899, San Pedro Bay and its associated complex marine habitats (*e.g.*, coastal wetlands, eelgrass, kelp forest, and rocky reef, etc.) have been altered significantly by infrastructure development performed by the USACE and local entities resulting in the development of the San Pedro Bay Port Complex (Port of Los Angeles and the Port of Long Beach) and the San Pedro, Middle, and Long Beach Breakwaters. The San Pedro and Middle breakwaters protect the ports of Los Angeles and Long Beach, respectively. The Long Beach Breakwater was constructed specifically to protect U.S. Navy facilities in Long Beach; it also protects shipping at the Port of Long Beach. All three sections of the 8.4-mile-long breakwater, which extends across San Pedro Bay, enabled the future development and expansion of the Port Complex.

As a result of this development, the Ports of Los Angeles and Long Beach together filled in nearly half of the available habitat within San Pedro Bay including the LARE mudflats. In addition, Port Complex development activities that the USACE indirectly facilitated included the filling in of naturally occurring wetlands along with areas of open water and the significant modification of islands in San Pedro Bay (*e.g*., Rattlesnake and Dead Man's Islands were joined and enlarged to become Terminal Island). Substrate not suitable for safe passage was removed by the USACE including the fully emergent rocky island, Deadman's Island, that was destroyed, and its material used for fill. The USACE dredged channels and harbors, randomly dumping material not required for ports expansion offshore. Dumped sediments buried portions of the Horseshoe Kelp reef, a large one square mile reef that has not recovered to this day.

Development within the Los Angeles River watershed, and the historic flooding of 1938, prompted the city of Los Angeles to call upon the USACE to channelize the broad and meandering Los Angeles River. By lining the riverbanks with concrete, sediment flowing into the bay was greatly reduced, starving habitats of needed sediments and nutrients within the San Pedro Bay. Construction of the Middle and Long Beach Breakwaters by the federal government along with the Alamitos Bay Jetties contributed to altered circulation and sediment movement patterns over time within the San Pedro Bay.

In particular, the following habitat types have been reduced, degraded, or altered in San Pedro Bay since 1899:

- Wetlands associated with the San Pedro Bay historically comprised a significant portion of the San Pedro Bay coastline and inland areas (see Figure 2-1). Today, this habitat has been reduced by > 80% of its historical extent. The only remaining wetlands under state or Federal jurisdiction within the Study Area are the restored coastal salt marshes at the Golden Shore Marine Reserve and the Los Cerritos Wetlands along the San Gabriel River.

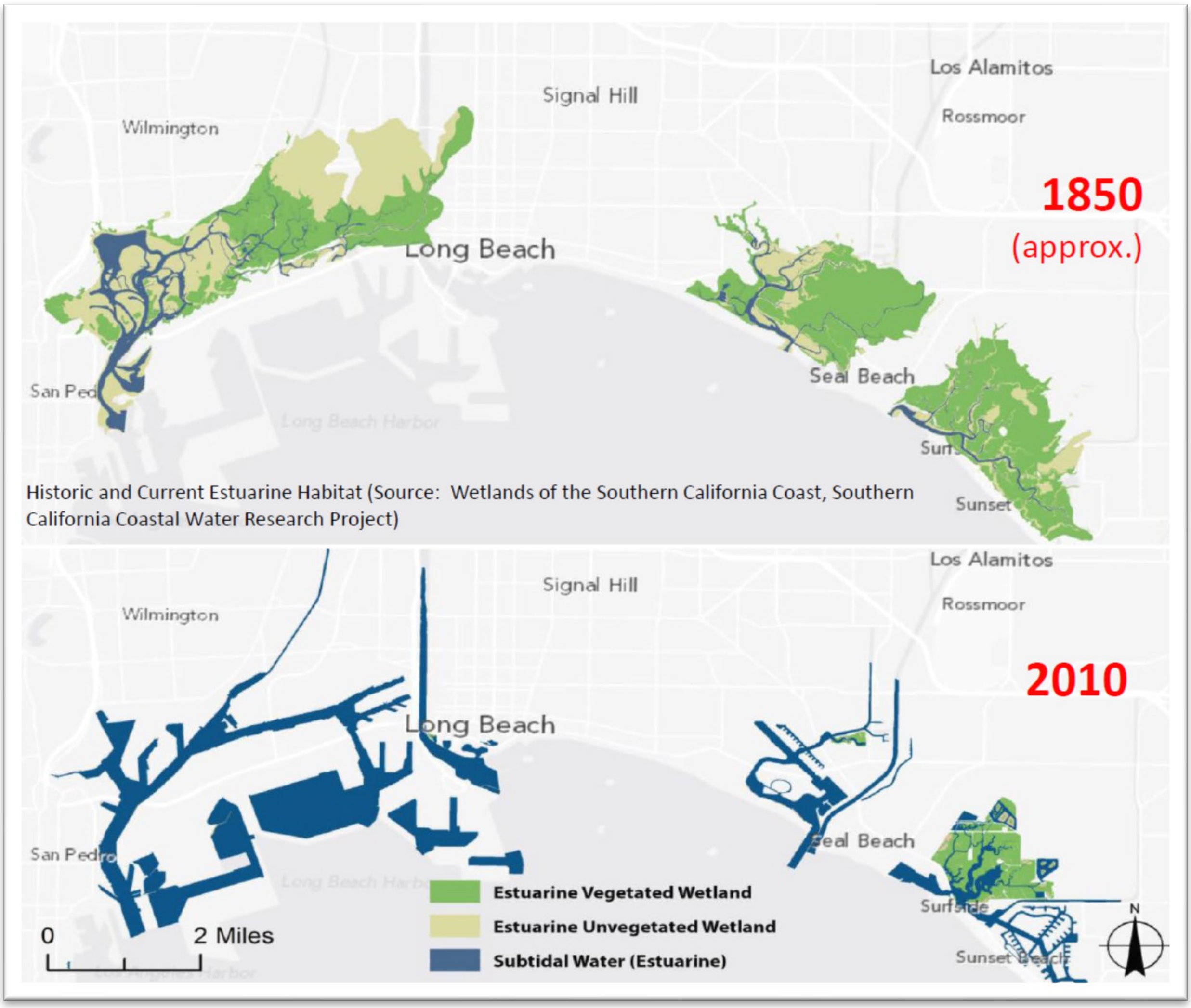


Figure 2-1: Estuarine Habitat Showing Habitat Conversion within San Pedro Bay

(Source: Wetlands of the Southern California Coast, Southern California Coastal Water Research Project)

- Historically, areas of San Pedro Bay likely had ideal conditions for eelgrass beds (*e.g.*, abundant light and appropriate depth, optimum temperatures and salinities, shelter from wave action behind sand bars, within inlets, etc.) and eelgrass was the predominant submarine aquatic vegetation of coastal estuaries in southern California (CDFW 2010). Although specific records of eelgrass in San Pedro Bay are sparse to nonexistent, based on the historic predominance of eelgrass in southern California estuaries, the availability of eelgrass habitat throughout the bay, and the estuarine vegetated wetlands described in Figure 2-1, it is highly likely that eelgrass existed within and throughout San Pedro Bay prior to its development into the San Pedro Bay Port Complex. Today, ideal conditions for eelgrass do not generally exist throughout San Pedro Bay except within protected harbors and in one location where offshore placement of dredged material remained long enough for eelgrass to establish unintentionally. As a result, eelgrass beds are limited in coverage and density along the Long Beach shoreline.

- Rocky reef and other hard bottom habitat provide valuable habitat for economically important fishes and macro invertebrates. Historically, hard bottom substrate existed in west San Pedro Bay along the San Pedro coastline of the Palos Verdes Peninsula (Reconnaissance Map of San Pedro Harbor by Bache 1852 , Rumsey 2022). Two prominent examples of hard bottom features within this area prior to their removal or degradation were the approximately four-acre Deadman's Island (KCET 2014; Gnerre 2018) and the Horseshoe Kelp Reef (Wong et al., 2012). Deadman's Island was a prominent feature associated with the San Pedro Bay and was located approximately a mile east of the city of San Pedro and marked the entrance to the Los Angeles Harbor (KCET 2014; Gnerre 2018). Additionally, historic hard bottom substrate extended from the San Pedro coastline southeast into the San Pedro Channel and likely comprised a portion of the Horseshoe Kelp Reef (Wong *et al.* 2012). Current hard bottom habitat within San Pedro Bay is limited to linear features of the breakwaters, riprap protecting the THUMS oil islands and port facilities, and remnants of the Horseshoe Kelp Reef extending several miles southeast into the San Pedro Channel from the San Pedro Breakwater (Wong *et al*. 2012).

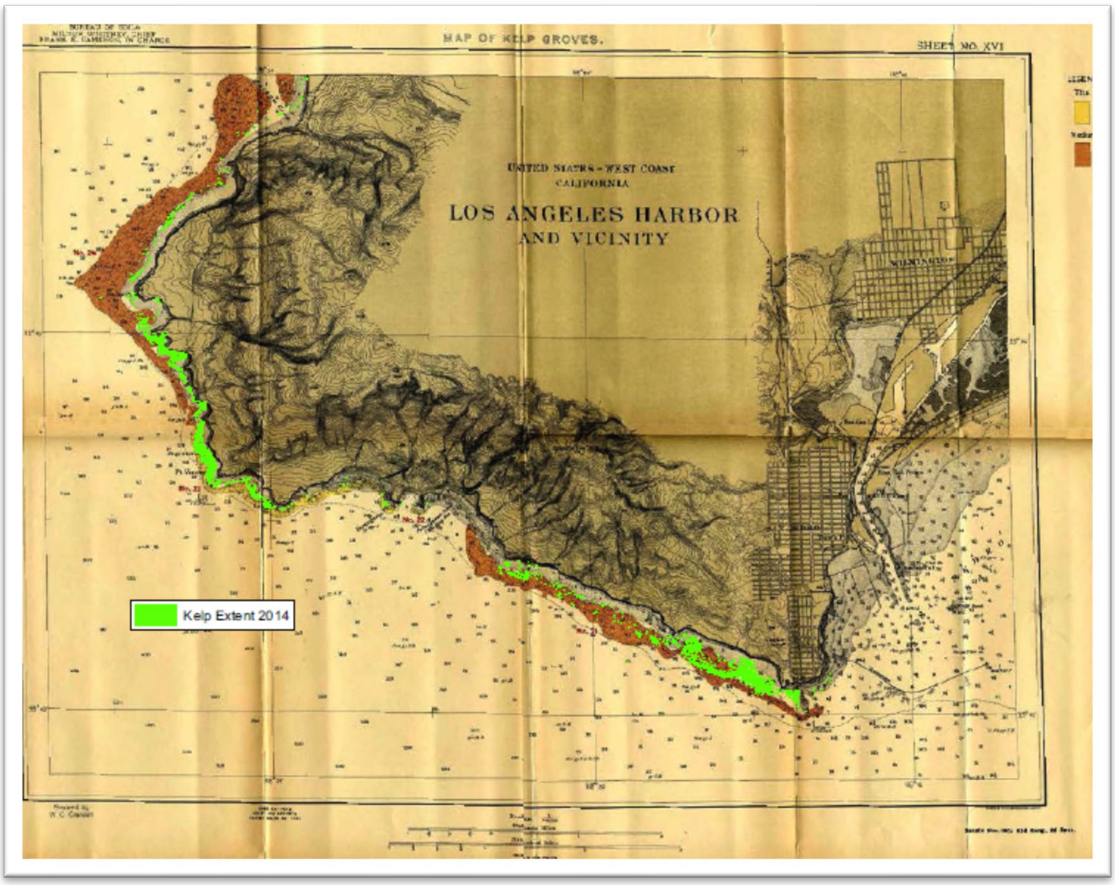


Figure 2-2:Historic (brown) and 2014 (green) distribution of persistent kelp along the Palos Verdes Peninsula

- Historically, kelp existed on rocky substrate located within San Pedro Bay (*e.g.*, at Deadman's Island; KCET 2014), within a large kelp bed measuring approximately two miles long and one-quarter to one-half mile wide (equating to approximately 320 - 640 acres; Wong *et al.* 2012), the Horseshoe Kelp Reef, located to the southeast of San Pedro and extending into the San Pedro Channel (Wong *et al.* 2012), and along the Palos Verdes Peninsula (Figure 2-2). Kelp at both

Deadman's Island and the Horseshoe Kelp Reef was lost or significantly degraded due to the development of the Federal San Pedro Breakwater and Port of Los Angeles in the early 1900s. Currently, kelp distributions within San Pedro Bay are only associated with features built by the USACE and the San Pedro Bay Port Complex in discreet locations. Kelp does currently exist along the Palos Verdes Peninsula adjacent to and within the Study Area (Figure 2-2).

Ecosystem Processes and Impacts of Port Complex Development

Together, this mosaic of previously existing San Pedro Bay habitats comprised an open marine system that served to increase and sustain biodiversity, provide a net positive effect on the delivery of provisioning services (*e.g.*, increase in fish stocks and forage), sequester atmospheric carbon, and provide storm protection and the reduction of shoreline erosion within the Study Area. Several of these habitats were composed of organisms considered to be ecosystem engineers (*e.g.*, kelp and eelgrass) that had an overly large influence on ecosystem function, processes, and services that supported multitudes of other marine species. As important as these ecosystem engineers were, the loss of connectivity between habitat patches was also significant.

Today, it is recognized that many adult rocky reef associated fish species reside in relatively small territories where they rarely travel distances in excess of 30 m from their territories (described as the halo effect (Johnson *et al*. 1994; Pondella *et al*. 2006)). These fishes, along with marine benthic organisms, have widely dispersed planktonic larvae or broadcast algal propagules. Dispersing individuals need a patchwork of habitat in order to find suitable habitat to colonize after drifting from their natal habitat patch. Reasons for this may be because many marine species are highly mobile and tend to use different types of habitats. As the number of habitat patches and different types of habitats increase, so do the opportunities for species to disperse between patches, increasing the likelihood of their reproductive success. Additionally, a mosaic of habitats provides greater functional diversity, which is linked to long-term stability, as multiple functional traits (built in redundancies) increase the resilience of marine systems in the face of environmental changes (Montoya *et al*. 2012).

As a result of the USACE construction of the Los Angeles/Long Beach breakwaters; creation, modification, and ongoing maintenance of federal navigation channels; relocation and channelization of the Los Angeles River; and facilitation of the urbanization and shoreline development of the San Pedro Bay Port Complex, at least 40% of natural habitat area within the San Pedro Bay along with its connectivity has been lost or converted into artificial habitat, resulting in a tremendous loss of natural habitat area (including wetland, open water, and subtidal habitats) and associated biodiversity and ecosystem function.

2.1.2 Study Opportunities

Opportunities to restore habitat types lost or degraded in the Study Area include:

- Existing open and undeveloped areas with minimal or degraded habitats in the project area are available for restoration to provide restored ecosystem functions and increased biodiversity in ESPB within the regional setting of San Pedro Bay and the greater SCB.
- The proposed Project Area contains an abundance of soft-bottom habitat that can be converted to complex habitats to restore lost ecological functioning within the San Pedro Bay, including benefits to support migratory species with ranges that extend far beyond the San Pedro Bay.
- Restoration features can be located within the proposed Project Area to be compatible with existing environmental conditions and processes and to contribute to regional connectivity to estuarine and open water environments within and outside of the region.

- Restoration features can be configured within the proposed Project Area to intentionally deliver highest habitat value, augmenting the value of existing habitat that grew as an "unintended consequence" of construction of ports, the breakwaters, and oil islands.
- Augment existing habitat on the breakwaters with strategically placed rock to maximize optimal environmental conditions for rocky reef and/or kelp beds.
- Beneficial uses of dredged sediments and construction materials can be used to construct features that mimic degraded or lost habitats such as rocky reefs, emergent sandy islands, kelp beds, or coastal wetlands to restore regional patterns of ecosystem functions and outputs.
- Kelp beds and rocky reef lost or degraded due to navigational functions in San Pedro Bay can be restored within the project area where optimal open ocean conditions exist that do not interfere with navigational operations.
- Shallow nearshore areas provide suitable restoration opportunities for intertidal and subtidal habitats that have been lost such as sandy islands and rocky reef.

Restoring coastal marine habitat within the San Pedro Bay is expected to 1) increase breeding and nursery areas for a wide array of coastal organisms, 2) provide habitat for fishes, invertebrates, mammals, and reptiles, 3) boost aquatic wildlife and coastal bird populations, and 4) support populations of fishes and invertebrates that are important forage for high level consumers within the surrounding SCB ecosystem and along the remainder of the U.S. west coast.

2.2 STUDY PURPOSE

This Study's purpose addresses the USACE aquatic ecosystem restoration mission, and the Study authority from Section 1.2. The purpose is presented in the form of an overarching Study goal and specific planning objectives.

2.2.1 Study Goal

> ***Restore and improve aquatic ecosystem structure and function for increased habitat biodiversity and ecosystem value of the San Pedro Bay within the proposed Project Area of East San Pedro Bay.***

2.2.2 Planning Objectives

Objectives must be clearly defined and relate directly to the problems and opportunities. Planning objectives describe the desired results and must be clearly defined with measurable success criteria. They must provide information on the effect desired (quantified, if possible), the subject of the objective (what will be changed by accomplishing the objective), the location where the expected result will occur, the timing of the effect (when would the effect occur) and the duration of the effect.

The overall planning objective is to:

> ***Restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands, and other types historically present in San Pedro Bay of sufficient quality and quantity to support diverse resident and migratory species within the San Pedro Bay during the period of analysis (50 years).***

ESPB restoration is focused on the restoration of habitats and the processes that maintain them, not the restoration of individual species.

The 50-year period of analysis begins in 2030, known as the Base Year[1].

For this Study, the term "restoration" includes provision of habitat structures (or the conditions for habitat establishment) to support ecosystem functions. To clarify, this Study aims to target restoration of "complex" aquatic habitat types historically present in the greater San Pedro Bay ecosystem, inclusive of kelp reef, rocky reef, eelgrass, oyster beds, sandy emergent islands, and coastal wetlands, of sufficient quantity and quality to support diverse resident and migratory marine and terrestrial species associated with the bay. This complexity is achieved through the three (3) associated sub-objectives described below. The intent then is to focus on restoration of habitats rather than individual species (except for those habitats that are created by a single or dominant species, e.g., eelgrass or oyster beds). This approach avoids prioritizing some species over others.

The restoration goals for this Study were not based on a desire to return habitats in ESPB to conditions that may have existed in the past but improve upon conditions that exist today. Restoration targets are based on what is known about the potential for habitats to be restored within the bay, the ecosystem services provided by habitats currently there, and their limiting factors. Restoration was approached to account for expected long-term changes. For this Study, restoration is targeted to locations and situations where long-term success is most likely. In many ways, the proposed Project Area is a "novel" ecosystem that supports a diverse and surprising number of fauna with anthropogenic structures and a mix of native and invasive species (Hobbs et al. 2009; Wensink and Tiegs 2016). As a result, the proposed Project Area offers significant potential for restoring ecosystem function of existing habitats.

2.2.2.1 <u>Sub-Objectives</u>

The specific sub-objectives related to the overall planning objective and their rationale are as follows:

a. ***Increase the extent (total area) of complex aquatic habitats within the proposed Project Area.***

   Rationale: Currently, the proposed Project Area offers one of the few opportunities within San Pedro Bay to conduct large-scale restoration of nearshore and open water habitats within a protected embayment. Current habitat conditions in the proposed Project Area are characterized by a general lack appropriate substrate conditions (e.g., gently sloping topography in the nearshore zone, areas of protected shallow water, hard and/or rocky surfaces) to support marine communities, such as kelp forests, eelgrass beds, and rocky reef species to the extent that they once occurred in San Pedro Bay.

a. ***Increase the diversity and spatial heterogeneity of complex aquatic habitat types (e.g., rocky reef, kelp forest, etc.) within the proposed Project Area.***

   Rationale: Habitat heterogeneity plays an important role in structuring ecological communities, as heterogeneous habitats (both spatially and structurally) generally support increased species density, richness, and diversity across terrestrial freshwater, and marine ecosystems. Habitat heterogeneity influences fundamental processes that organize communities, including species coexistence, dispersal recruitment success and mortality predation risk resource acquisition and the strength of trophic cascades (Paxton et al. 2017).

b. ***Increase the overall connectivity of complex aquatic habitat types within and adjacent to the proposed Project Area by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs.***

[1] The Base Year is when the proposed project is expected to be operational, typically following construction completion. The Base Year was identified early in the study process for estimating planning-level annual benefits of the alternatives. During the feasibility design phase, Recommended Plan construction assumptions were refined, resulting in an updated construction completion year of 2039. Because the Base Year is a planning-level analysis tool, it was not necessary to update.

Rationale: Connectivity is a defining characteristic of marine ecosystems (Carr et al. 2003). The persistence of many species depends on individuals successfully migrating among multiple, connected, patches or habitats (Sale et al. 2005, Hastings and Botsford 2006). Increased connectivity can benefit all life stages of marine organisms: larval, juvenile, and adult. For example, Brown et al. (2016) suggests connectivity between different types of habitats that occur in sheltered environments (e.g., seagrass, salt marshes) potentially have desirable characteristics for biodiversity conservation and can support local fisheries through spatial coupling and linkages between species life-history types.

The increased interchange between adjacent habitat types in terms of nutrient cycles, colonization, and recruitment of species is needed to maintain or increase biodiversity and ecosystem function within the proposed Project Area. Organisms, organic matter, and nutrients are transferred between habitat types, for example, between freshwater and the ocean via estuaries, pelagic (open water) and nearshore coastal waters, and kelp beds, seagrasses, and rocky reefs (Fairweather & Quinn 1993). The goal of restoration within a sheltered environment like ESPB should not only increase the amount and types of habitats within the bay (addressing sub-objectives 1 and 2), but create synergistic increases in overall species diversity, and sustain this diversity over time. For example, increases in fish species diversity abundance can be achieved through increases in nearshore nursery habitat for larval fish, as well as through increased habitat for juveniles on adjacent open water reefs. This can lead to higher retention of species within an area over the long term, resulting in desirable characteristics for regional biodiversity conservation and support for local fisheries (Brown et al 2016). Fish species diversity provides a central linkage in the analysis of marine food webs, and therefore, can serve as a reasonable and cost-effective indicator of habitat value across a wide range of marine habitats (Bond et al. 1999).

2.3 PLANNING CONSTRAINTS AND CONSIDERATIONS

Planning constraints and considerations were identified by the USACE and the City at the beginning of the Study and refined over time. Constraints are outcomes or conditions that are unacceptable for any reason, whether it be a practical, legal, or policy reason. Constraints cannot be violated. Measures or plans that violate constraints are either modified to avoid the constraint or eliminated from further consideration. The PDT also identified four considerations that guided the development and screening of measures and alternatives. Considerations flag areas of risk and uncertainty for the PDT to address.

The planning constraints and considerations for the Study include:

- **Constraint 1:** Avoid negative impacts to U.S. Navy's operations including activities in support of national security and other missions.
- **Constraint 2:** Do not significantly reduce operational capacity for the ports, THUMS oil extraction islands or other existing maritime operations.
- **Constraint 3:** Do not allow for infilling any of the energy island borrow pits located within the ESPB boundary.
- **Consideration 1:** Minimize impacts to known major utilities or navigation channels and anchorages.
- **Consideration 2:** Avoid increases in shoreline erosion, wave related damages, and coastal flooding to existing residences, public infrastructure, marinas, existing jetties, other structures, and recreational beaches.
- **Consideration 3:** Minimize impact to flood risk management operations on the Los Angeles River.
- **Consideration 4:** Minimize vulnerability of coastal areas to accelerating sea level rise.

2.4 NATIONAL SIGNIFICANCE

The consideration of significant resources and significant effects or impacts is central to plan formulation and evaluation for any type of water resources development project. NEPA requires evaluation of significant impacts, thus, expected benefits of restoration are significant positive changes to the environment. Per the PGN, significance of resources and effects will be derived from technical, institutional, or public recognition. Institutional recognition of a resource or effect means its importance is recognized and acknowledged in the laws, plans, and policies of government and private groups. Technical recognition of a resource or an effect is based upon scientific or other technical criteria that establishes its significance. Public recognition means some segment of the general public considers the resource or effect to be important. These sources of significance and the relative scarcity of the resources helps determine the significance of the resources to be restored. This information is used to help establish a Federal interest in the project.

2.4.1 San Pedro Bay

Human development has permanently and significantly reduced the amount of coastal habitat in San Pedro Bay, a large estuary located within the SCB. San Pedro Bay is a nationally significant estuary supporting a high concentration of biologically diverse species that all play a role in local, regional, and U.S. west coast ecosystems. From the tiniest crustaceans to the largest whales, the bay and its varied habitats are a central component in a complex system with many interdependencies. Resident and migratory species utilize the bay's habitats during critical life stages ranging from nursery areas to feeding and breeding areas. Some of these species include federally protected resources that transit the bay during long-distance/continental-scale migrations. Other species of importance are federally managed based upon interstate commerce and their transition between state, federal, and international waters. Partnerships play a vital role in efforts to protect and improve the quantity and quality of habitats in the San Pedro Bay and this plan would contribute to local, State, and federal restoration goals across a variety of stakeholders and plans. The USACE is particularly well-suited to contribute to these plans because of the agency's history and continuing role in multiple mission activities in the Study Area. The following details the national significance of the East San Pedro Bay Restoration Project and its relevance to the SCB and beyond.

The San Pedro Bay, inclusive of ESPB, is located within the SCB, a complex marine biogeographic region that supports greater biological diversity than adjacent U.S. waters to the north (from Washington State to Point Conception, California) due to differences in temperature, current patterns, and submarine geology that differentiate the two regions. Thousands of unique wildlife species (*e.g.*, over 5000 invertebrates, 480 fishes, and 195 marine birds and more than 70% of all algal species found along the California coast) are found within the SCB including over one dozen threatened or endangered marine mammals and seabirds. The Study Area, San Pedro Bay, is located within the SCB and was formerly a large estuary with habitat, ecosystems, and biodiversity that were representative of those described above for the greater SCB. Areas like San Pedro Bay not only support substantial biological diversity, but they also perform essential ecosystem services such as providing 1) breeding and nursery areas for a wide array of coastal organisms, 2) habitat for fishes, invertebrates, mammals, and reptiles, 3) and supporting populations of fishes and invertebrates that are important forage for high level consumers within the surrounding SCB ecosystem and along the remainder of the U.S. west coast.

The goal of this project is to restore multiple marine habitats (*e.g.*, wetlands, sandy island, oyster reef, kelp forest, eelgrass beds, and rocky reef) to the SCB from within the San Pedro Bay, habitats that historically existed within the San Pedro Bay prior to the USACE construction of the Los Angeles/Long Beach breakwaters; creation, modification, and ongoing maintenance of federal navigation channels;

relocation and channelization of the Los Angeles River; and facilitation of the urbanization and shoreline development of the Los Angeles-Long Beach Port Complex.

Wetlands, kelp forest, eelgrass beds, and rocky reef are recognized by National Marine Fisheries Service (NMFS) as being important essential fish habitat (EFH) for many management plans including the Groundfish and Coastal Pelagic Fishery Management Plans. Furthermore, NMFS has included these habitat types as components of the goals and objectives of the 2016-2020 National Oceanic and Atmospheric Administration (NOAA) Fisheries Habitat Enterprise Strategic Plan that is used to help prioritize Agency habitat conservation activities around the Nation. The proposed EFH restoration within the ESPB is expected to provide habitat and resources for several federally listed species, Special-Status species, marine mammals that are protected under the Marine Mammal Protection Act of 1972 (MMPA), migratory seabirds of the Pacific Flyway, and Gray Whales that filter feed on sediment-dwelling arthropods within Study Area sediments in Los Angeles Harbor during their migration from Baja California to Alaska. In addition, biological resources within the Study Area and proposed Project Area are connected to the surrounding waters of the SCB and the remainder of the U.S. west coast where they provide energy (in the form of biomass) and migrants to these regions. In contrast to restoration projects that target a single habitat type, the restoration of multiple habitat types within a subsection of the San Pedro Bay ecosystem, the ESPB, is expected to improve the delivery of important ecosystem goods and services (*e.g.*, increased biomass, forage, breeding and nursery areas, etc.) with benefits that could be enhanced by the presence of the other habitats (increased connectivity, synergism, etc.). As a result, this systems approach is expected to enhance/amplify potential outcomes of the restoration project.

2.4.2 Technical Recognition

Multiple criteria for evaluating technical merit are reviewed in this section include:

Biodiversity and Special-Status Species

- Biodiversity within the narrow, highly productive continental shelf of the SCB is greater than adjacent U.S. waters to the north (from Washington State to Point Conception, CA). This occurs due to differences in temperature, current patterns, and geology that separate the two regions resulting in thousands of unique species found only within the SCB (*e.g.*, over 5,000 invertebrates, 480 fishes, 195 marine birds, and more than 70% of all algal species found in California) including over one dozen threatened or endangered marine mammals and seabirds.
- SCB supports several ecologically important subtidal habitats, including rocky reefs dominated by the giant kelp (*Macrocystis pyrifera*) and scarce habitats including eelgrass (11,000-15,000 acres in California). Kelp forests are estimated to be among the most productive habitats on Earth, rivaling coral reefs, and eelgrass is an ecosystem engineer that protects coastlines, improves water quality, absorbs atmospheric carbon (along with kelp), and provides nursery and foraging habitat for many species of invertebrates, sharks, rays, skates, fishes, birds, and reptiles.
- The Study Area is located within the SCB and was formerly a large estuary with habitat, ecosystems, and biodiversity that were representative of the greater SCB.
- Three (3) federally listed threatened and endangered species including the California Least Tern (*Sternula antillarum browni*), White Abalone (*Haliotis sorensini*), and the Green Sea Turtle (*Chelonia mydas*) have been observed within the San Pedro Bay, either as migrants or as residents.

- Restoration of eelgrass, kelp, and rocky reef (EFH) within the San Pedro Bay is expected to increase forage (e.g., small fishes, eelgrass) and habitat for the California Least Tern, White Abalone, and the Green Sea Turtle.
- Sixteen (16) United States Fish and Wildlife Service (USFWS) Birds of Conservation Concern (BCC) have been observed in the Study Area as either migrants or residents with several that are known to migrate along the Pacific Flyway.
- Seven (7) species of mammals occur in the Study Area (seals, sea lions, common dolphins, killer whales, porpoises, and baleen whales such as the Gray Whale (*Eschrichtius robustus*)) and all of which are protected by the MMPA.

Connectivity

- SCB provides breeding and nursery areas for a wide array of coastal organisms; habitat for fishes, invertebrates, mammals, and reptiles; and supports populations of fishes and invertebrates that are important forage for high level consumers distributed throughout the SCB. San Pedro Bay is a large estuary within the SCB and provides these functions to numerous marine species as described in the Biodiversity section above.
- San Pedro Bay is located in an area recognized as an Important Bird Area for pelagic species of the Pacific Flyway and provides resting and over-wintering stops for birds along the Pacific Flyway.
- San Pedro Bay provides resources for migratory mammals including Gray Whales that have been observed foraging within the Study Area (inside Los Angeles Harbor) with increasing frequency since 2017.
- Many federally and State managed commercially and recreationally important adult fishes and invertebrates are known to reside in EFH within the San Pedro Bay and release larvae into adjacent coastal waters, including the southern and northern Channel Islands, resulting in increased biomass and connectivity throughout the region.
- Many commercially important groundfish and coastal pelagic species (e.g., California Halibut (*Paralichthys californicus*) and Pacific Sardine (*Sardinops sajax*) managed by NMFS's Fishery Management Plans found in San Pedro Bay are members of, and contribute to, large, widespread populations that span the majority of the U.S. west coast and into Baja California.

S***tatus and Trends***

- Historic San Pedro Bay EFH (wetlands, eelgrass, kelp reef, rocky reef, etc.) has been lost or significantly degraded due to USACE facilitated projects (e.g., construction of breakwaters, Federal Channel deepening, ongoing dredging, relocation and channelization of the Los Angeles River, etc.) that led to the development of the Port Complex and the cities of San Pedro, Wilmington, and Long Beach.
- As a result of urbanization and shoreline development, at least 40% of historic natural habitat area within the approximately 50 square mile Study Area has been lost or converted into artificial habitat resulting in a tremendous loss of natural habitat area and biodiversity.
- Potential climate change factors including sea level rise, ocean temperature rise, and ocean acidification may impact existing habitats, although some habitats may be resilient to sea level rise such as rocky reef.

- Special-Status species numbers are expected to remain static based on currently available forage area. Invasive and non-native species establishment and range expansions are expected to continue throughout the SCB including the Study Area.
- Sediment transport provides critical structure and function for ecologic health. Historic patterns of sediment transport from inland sources have been highly disrupted, resulting in loss of annual coarse sand replenishment. Development of coastal watersheds including the Los Angeles and San Gabriel Rivers have completely altered sediment and nutrient transport from upper watershed sources to the ocean floor. Deltaic deposits within the bays are no longer replenished with fresh, clean, coarse sands on an ongoing basis. In addition, presence of ports, jetties, and breakwaters have altered sediment movement in the littoral zones close to shore, resulting in either localized deposition areas or erosion of nearshore and beach deposits.
- Shoreline and beach erosion will likely continue as a result of sea level rise, particularly in the proposed Project Area.

Habitat Scarcity/Rarity

- Approximately 10,000 acres of wetland and associated habitats were historically located along the majority of the San Sedro Bay coastline from the Los Angeles River to the west. Today, approximately 400 acres of wetland and associated habitats exists west of the Los Angeles River because of restoration efforts over the years.
- Soft bottom habitat is the primary subtidal habitat within the majority of San Pedro Bay. Historically, scarce rocky reef and kelp were located along the rocky, western coastline of San Pedro Bay prior to USACE facilitated Port Complex development.
- Today, rocky reef and kelp within San Pedro Bay are only associated with features built by the USACE and the Port Complex in discreet locations distributed throughout the San Pedro Bay (e.g., breakwaters, shallow subtidal west of Belmont Pier, etc.).
- Eelgrass, an ecosystem engineer that improves water quality, absorbs atmospheric carbon (CO2), and provides nursery and foraging habitat is found in the San Pedro Bay and is recognized as scarce throughout the State by NOAA/NMFS.

Representativeness

- Historic natural habitats and ecosystems of the San Pedro Bay were highly representative of those found within the greater SCB prior to USACE facilitated Port Complex development and urbanization.
- Historically, San Pedro Bay contained substantial EFH including wetlands, kelp beds, rocky reef, eelgrass, and oyster beds.
- EFH and species within San Pedro Bay are components of NMFS's Fishery Management Plans including those for Groundfish and Coastal Pelagic.
- Rocky reef restoration projects as proposed for San Pedro Bay are consistent with the goals of NOAA's abalone recovery plans and are expected to increase abalone densities in key areas along the west coast and the SCB, including the federally endangered White Abalone along with Pink (Haliotis corrugata), Pinto (Haliotis kamtschatkana), and Green Abalone (Haliotis fulgens) (all are Species of Concern (NMFS)) that historically existed in or adjacent to the San Pedro Bay.

Limiting Habitat

- Due to limited space in West San Pedro Bay as a result of human activities and Port Complex infrastructure, the proposed Project Area, ESPB, offers one of the few opportunities within the larger San Pedro Bay ecosystem to conduct large-scale restoration of nearshore and open water habitats within a relatively small, protected bay environment.

- Environmental conditions within the relatively unprotected ESPB (e.g., sufficient wave energy; consistent influx of water, nutrients, and forage; adjacent populations of rocky reef fishes, invertebrates, and kelp; etc.) are favorable for these restored habitats and the species that they support.
- Restoration of proposed habitats is expected to have a net positive effect on the delivery of provisioning services (e.g., increase in fish stocks and forage), conservation of native biodiversity, climate regulation, storm protection, and reducing shoreline erosion.
- As this project seeks to restore multiple habitat types within a relatively small system, ecosystem goods and services and benefits could be enhanced by this systems approach and serve as a Nationally Significant example of an improved restoration approach.

2.4.3 Institutional Significance

Significance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and other policy statements of public agencies, tribes, or private groups. Sources of institutional recognition include: (1) public laws, executive orders, rules and regulations, treaties, and other policy statements of the Federal government; (2) plans, laws, resolutions, and other policy statements of states with jurisdiction in the planning area; (3) laws, plans, codes, ordinances, and other policy statements of regional and local public entities with jurisdiction in the planning area; and (4) charters, bylaws, and other policy statements of private groups. Habitats (both currently existing and those to be restored) and species within ESPB are institutionally significant and are recognized by their contributions and relationships to the following laws, programs, and plans.

- Urban Waters Federal Partnership (Los Angeles River Watershed)
- Essential Fish Habitat and Habitat of Particular Concern (NOAA/NMFS) for groundfish and coastal pelagic species
- Key Habitats of Federal Fishery Management Plans (NOAA/NMFS)
- Federal Fishery Management Plans manage fisheries within U.S. Exclusive Economic Zone (EEZ)
- NOAA Fisheries' Habitat Enterprise Strategic Plan
- NOAA Fisheries' Western Regional Action Plan
- Endangered Species Act threatened and endangered Species
- USFWS BCC
- Migratory bird species of the Pacific Flyway
- Restored EFH for NOAA Abalone restoration plans including the multiagency White Abalone Restoration Consortium
- Channel Islands National Marine Sanctuary

2.4.4 Public Significance

Public recognition means some segment of the general public considers the resource or effect to be important. These sources of significance and the relative scarcity of the resources helps determine the significance of the resources to be restored.

- 140 individuals participated in the public scoping meetings and almost 80 stakeholders participated in a working group charrette since the study kicked off in early 2016.
- TAC members included more than 12 subject matter experts in marine biology and ecology from several resource agencies, universities, and scientific organizations.

- The San Pedro Bay is located within an hour's drive of more than 13 million people with over six million people visiting Long Beach beaches annually including those of the ESPB. In addition, the San Pedro Bay contains the Port Complex, one of the largest in the Western Hemisphere that supports the employment of 1.6 million people worldwide, three million people nationwide, and approximately one million jobs within the surrounding five counties. Subtidal habitat as proposed for this restoration project and the resources that they support within the SPB have the potential to support the focus, efforts, and/or goals of multiple societies, research institutions, agencies, and monitoring programs including the following:
    - Environmental Protection Agency
    - American Cetacean Society
    - American Society for Ichthyologists and Herpetologists
    - American Elasmobranch Society
    - American Ornithological Society
    - American Society of Mammalogists
    - American Malacological Society
    - World Association of Copepodologists
    - The Crustacean Society
    - Southern California Academy of Sciences
    - California Academy of Science
    - Aquarium of the Pacific, Long Beach, CA
    - Cabrillo Marine Aquarium, Los Angeles, CA
    - University of California, Los Angeles
    - University of California, Santa Barbara
    - University of Southern California
    - Loyola Marymount University
    - California State University, Long Beach
    - California State University, Northridge
    - California State University, Fullerton
    - Vantuna Research Group at Occidental College
    - Southern California Marine Institute
    - Santa Monica College
    - Southern California Bight Regional Marine Monitoring Program
    - Partnership for the Interdisciplinary Study of Coastal Oceans (PISCO)
    - Reef Check California (RCCA)
    - Cooperative Research Assessment of Nearshore Ecosystems (CRANE)
    - The Bay Foundation
    - Central Region and the Region Nine Kelp Survey Consortia
    - California Coastkeeper Alliance and the Southern California Regional Kelp Restoration Project
    - Ocean Protection Council Science Advisory Team (OPC-SAT)
    - California Gray Whale Coalition
    - Local whale watching businesses (numerous within San Pedro Bay area)

3 EXISTING CONDITIONS OF THE AFFECTED ENVIRONMENT

The sections of this chapter provide a description of the existing conditions within the proposed Project Area for a suite of environmental resources. This provides a baseline to compare the potential impacts that may result from implementation of the proposed alternatives.

Public scoping is one tool but not the only method used to determine which resource categories should be evaluated for NEPA and CEQA in Chapter 3 Existing Conditions of the Affected Environment and Chapter 5 Environmental Impacts Evaluation of the Final Array of Alternatives. Existing conditions were also considered such as which resources are present in the area of potential effects (APE), and the likelihood of adversely or beneficially affecting those resources. A review is conducted of other environmental documentation prepared in the general area and may include certain resource categories for consistency. The goal is to ensure full disclosure of all potential effects to existing resources, whether or not those resources were specifically mentioned or highlighted during the scoping process.

3.1 HYDROLOGY (COASTAL AND SHORELINE RESOURCES)

The proposed Project Area is located primarily within the Los Angeles River Watershed and the San Gabriel River Watershed, with small portions of the proposed Project Area within the Dominguez Channel Watershed and the Seal Beach Watershed (Figure 3-1). The upper portions of these watersheds are located in naturally vegetated national forest lands and flow to the Pacific Ocean, to the south, through the heavily urbanized Los Angeles metropolitan area. Hydrologic inputs into these watersheds include natural precipitation, treated wastewater, and urban runoff.

Water resources in the proposed Project Area include Los Angeles and Long Beach harbors, the Los Angeles and San Gabriel rivers, and the Pacific Ocean.

During flood tide currents enter Long Beach Harbor through Queen’s Gate. Currents flow to either side of Pier J, but primarily to the west of Pier J up the Long Beach Main Channel. During the ebb tide, water is drawn from the harbor towards the entrance gaps. Ebbing water from Long Beach Harbor and from Queensway Bay exits Queen’s Gate. Water exiting through the opening at the eastern tip of the breakwater comes from eastern San Pedro Bay and Alamitos Bay (Port of Los Angeles and Port of Long Beach 2009).

Tidal currents within San Pedro Bay are generally not strong, generally less than approximately 0.26 feet per second. Tidal currents entering and exiting Queen’s Gate are typically higher but generally less than 0.66 feet per second. These velocities are usually too small to cause re-suspension and transport of bed sediments, although re-suspension and transport of bed sediments could occur during rain events (Port of Los Angeles and Port of Long Beach 2009).

Wind plays an important role in driving the surface currents in the open water area of Long Beach Harbor. Wind can sometimes drive surface water in a counterclockwise direction, creating an ebb dominant flow along Dominguez Channel Estuary (Port of Los Angeles and Port of Long Beach 2009).

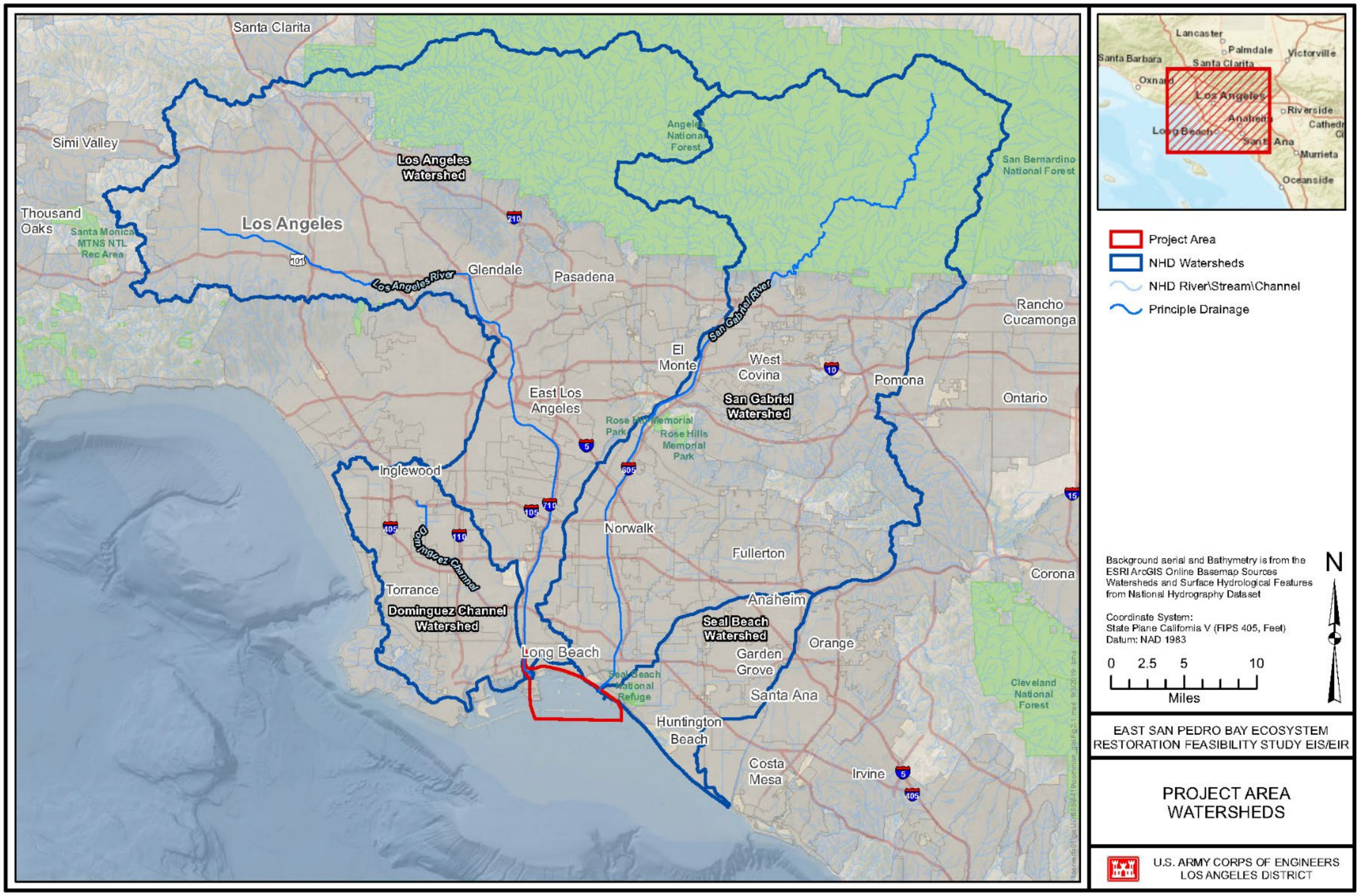


Figure 3-1: Proposed Project Area Watersheds

3.2 MARINE GEOLOGY AND GEOLOGIC HAZARDS

Local Marine Geology. Information for local marine geology is taken from Appendix I (Geotechnical). The proposed Project Area is located entirely within the San Pedro Shelf, which is a relatively flat, isolated and narrow projection of the continental shelf. The bathymetry of the ocean surface at the shelf mimics this flat surface and slopes to the south at a rate of 10 feet per mile. The natural water depth of the Bay ranges from 20 to 50 feet. These depths have been increased from 50 to 70 feet locally due to dredging along the man-made channels and harbors and basins, as part of the creation of the marine infrastructure in the proposed Project Area.

Based on background information, the uppermost 20 to 100 feet of material beneath the Bay is unconsolidated Quaternary-aged marine sediments (symbol Qsed). These sediments consist primarily of alternating layers of sand and silt, with very minor amounts of clay, gravel and seashells. The shelf sediment is consistently found across the proposed Project Area and all of the man-made features are founded upon it. The thickness of the sand and silt layer varies in thickness 5 to 50 feet and increases in density with depth. Clay, gravel and seashells are relegated to the uppermost 50 feet of the sediment and are found as thin localized lenses mixed within the thicker layers of sand and silt. The very top of the ocean bottom sediment consists of a semi-floating, light layer of mud (suspended clay and silt) atop a very loose layer of sand to silt. The thickness of the floating layer is approximately 2 to 6 inches.

The Port of Long Beach and marina infrastructure in the bay is composed of anthropogenic (man-made) fill (symbol af). The fill consists of loose sand, silty sand and silt that was placed as a result of sediments dredged from the Bay since the 1930s. The marine sediment geology is shown on Figure 3-3.

Sediment Substrate. Except for localized fine grained clayey and silty sediments at the mouth of the LARE, the physical character of the sediments is the same as those described in Local Marine Geology and are predominantly made up of thick alternating layers of silty sand (SM), sand (SP-SM) with some silt. Minor thin layers and localized lenses of gravel and clays are present within the sandy sediment and are found mostly within the upper 50 feet. The sediment is unconsolidated and increases in density with increasing depth.

Sediments in the proposed Project Area comprise sand, silt, and clay of varying proportions. Gravel, cobble, and debris may be encountered in limited quantities, within project depths. A thin layer of semi-floating silt and mud (clay) exists atop the ocean bottom surface, in areas of less disturbance or where recent manmade activities (*e.g.*, dredging and harbor modifications) have not altered the surrounding natural subsurface conditions. This layer is approximately two to six inches thick and overlies a very loose unconsolidated layer of sand or silt. Underlying this shallow surface sediment are the thicker alternating layers of silty sand to sand, as mentioned above.

From 1990 to 2013, various investigations and testing have been conducted of the sediment within the Federal dredging footprint of the LARE in support of routine maintenance activities. Surface grab samples and vibratory core samples were collected at various locations and tested for bulk sediment chemistry and grain size. Some of the sediment was tested and analyzed as compatible for beach nourishment (considered suitable if grain size is less than 10 percent fines above weighted average fines limit of beach nourishment placement size grain curve and if sediment chemistry data indicates sediment is below sediment quality criteria). Other portions of LARE sediments were found contaminated with chemicals above sediment quality criteria and with grain size that was too fine and therefore were considered unsuitable for beach nourishment.

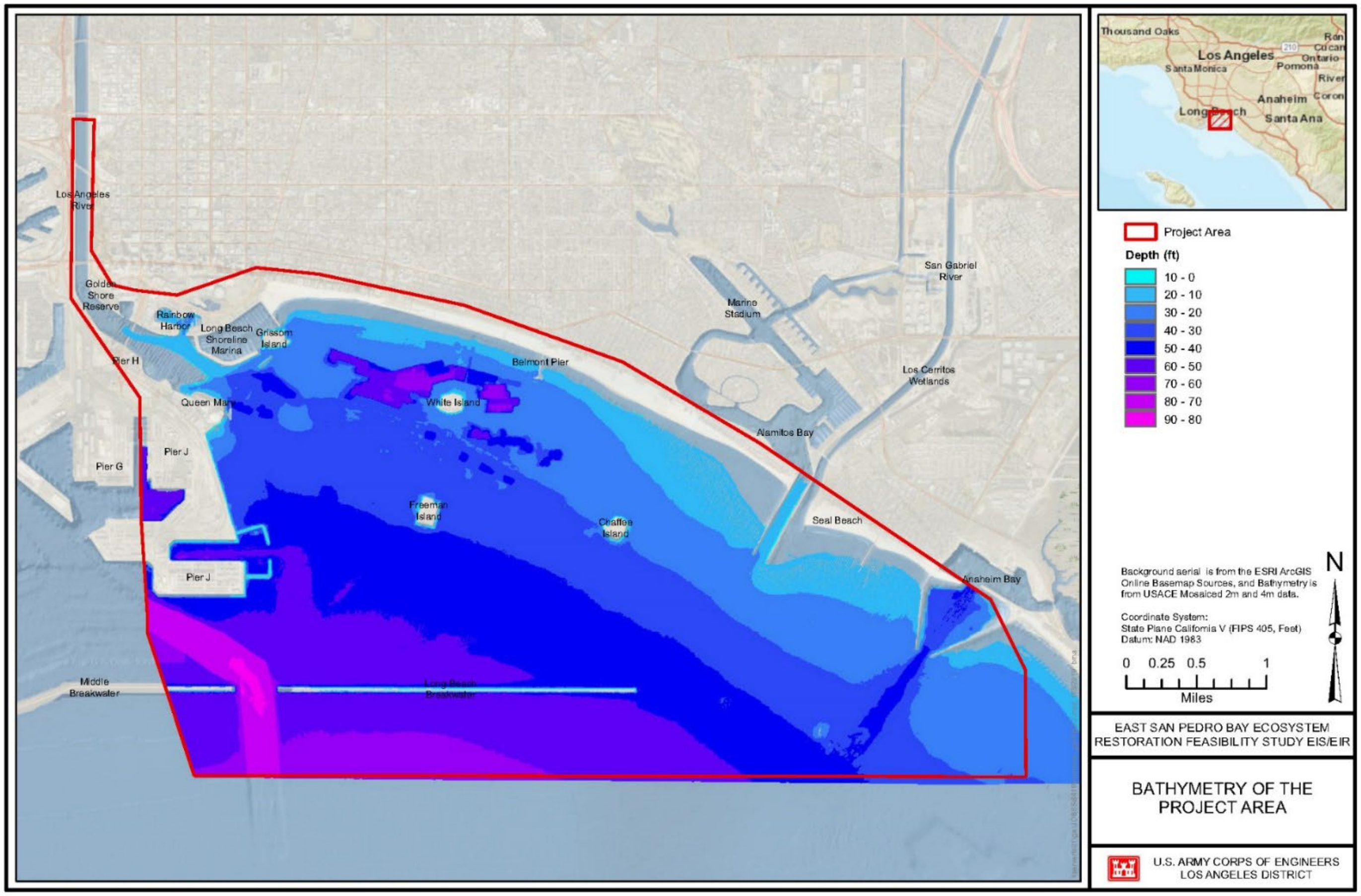


Figure 3-2: Bathymetry of the Proposed Project Area

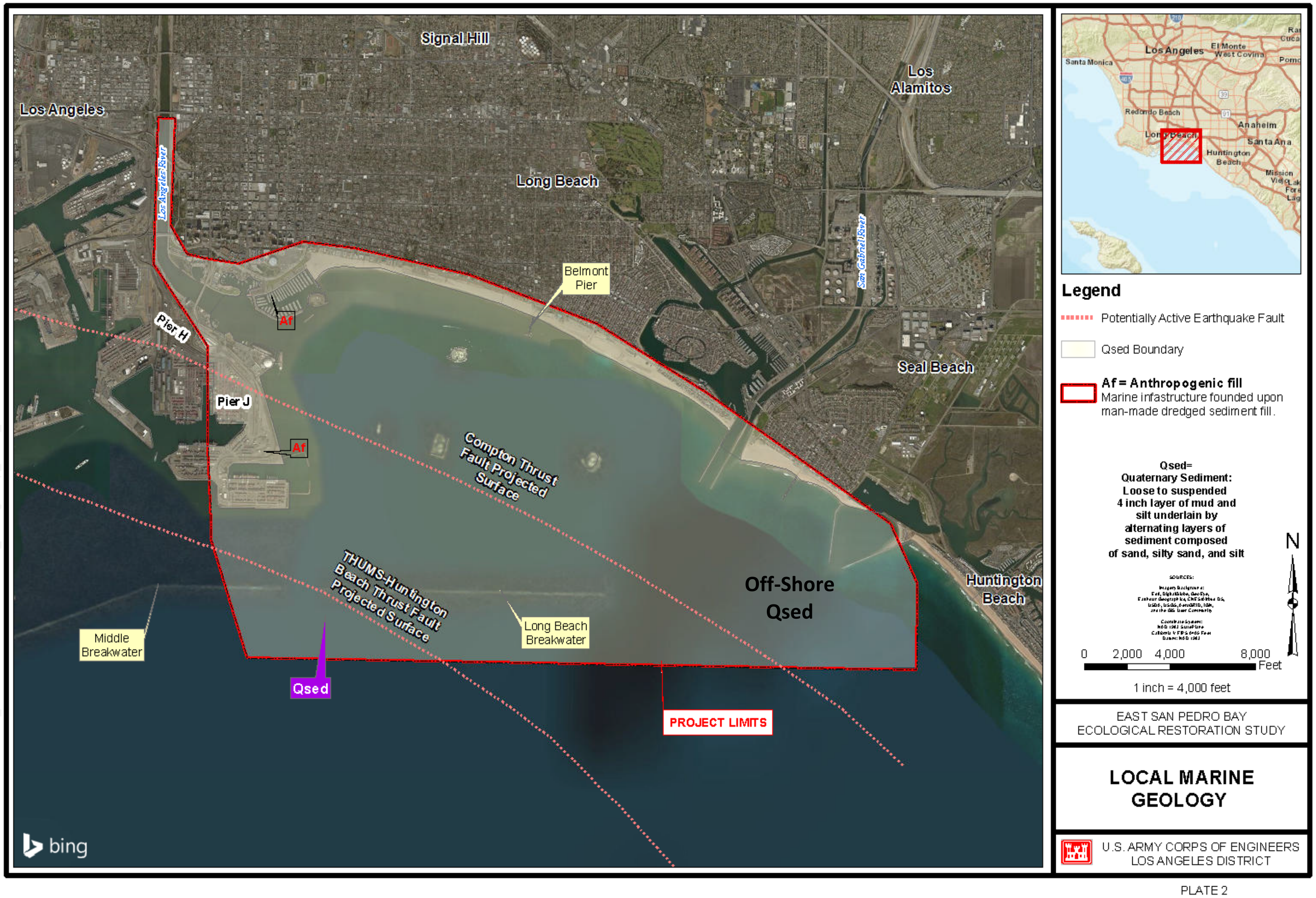


Figure 3-3: Geology of the Proposed Project Area

Much of the unsuitable sediment was placed offshore at the U.S. Environmental Protection Agency (USEPA) Los Angeles/Long Beach (LA-2) open ocean dredged material disposal site. Other unsuitable sediment was placed at the North Energy Island Borrow Pit and capped with an impermeable layer of coarse grained sediment to meet the definition of a Confined Aquatic Disposal site. Some of the unsuitable sediment was also placed at other Confined Aquatic Disposal sites at Port of Long Beach Slip G and Slip 1. Additional dredging activities have been planned for LARE, with the expectation that contaminated soils remain.

In 2008, approximately 180,000 cubic yards of suitable dredged sediment was placed at the Cherry Avenue nearshore placement site in Long Beach. Sediment from LARE was dredged by the USACE in 2013 and 2021, with the placement of the dredged material in LA-2

The existing Surfside/Sunset Borrow site described in Section 1.6.2 has been used regularly since 1964, in particular for the San Gabriel River to Newport Beach Nourishment project. This site is proposed for use to obtain necessary materials for the restoration project. The Surfside/Sunset Borrow site is located approximately 7,000 feet offshore of Sunset Beach in approximately 45 to 55 feet of water and includes approximately 1,700 acres. The capacity of this site to provide sand material is approximately 2 million cubic yards. A Sampling and Analysis Program was conducted in 2018, the material in the borrow area has been determined to be clean, beach-compatible sand. This determination was presented to the Southern California Dredged Material Management Team (SC-DMMT) on May 23, 2018, who concurred with the suitability determination.

Seismicity and Faulting. All of southern California, including the proposed Project Area, is seismically active. The proposed Project Area is located in the San Pedro Bay shelf, whose seismicity is characteristic of recurring small earthquakes with moment magnitudes less than 4.5.

Four major active faults of San Andreas, Palos Verdes (which branches from the THUMS-Huntington Beach fault), Newport-Inglewood, and Wilmington Blind-Thrust exist within or in the vicinity of the proposed Project Area and are all capable of producing a moment magnitude 6 to 7 earthquake (Figure 3-3). The San Andreas is the largest principal active fault in Southern California and is located approximately 65 miles north-northeast of the proposed Project Area. The Newport-Inglewood and Palos Verdes are located approximately 2 miles northeast and 2 miles southeast of the proposed Project Area, respectively (California Geological Survey 2010). The Wilmington Blind-Thrust fault is located within the proposed Project Area. This fault is tectonically active and capable of generating large, damaging earthquakes. The size of the fault suggest that is capable of generating moderate-magnitude earthquakes (magnitude 6.2 to 6.3), while potential linkages with other nearby faults (*e.g.*, Huntington Beach, Torrance, Compton (Figure 3-3)) pose the threat of larger, multi-segment events (greater than 7.0 magnitude). These earthquakes would directly impact the Ports of Los Angeles and Long Beach, as well as the broader Los Angeles metropolitan area (Wolfe *et al.* 2019).

The San Andreas is the largest principal active fault in Southern California and is located approximately 65 miles north-northeast of the proposed Project Area. The Newport-Inglewood and Palos Verdes are located approximately 2 miles northeast and 2 miles southeast of the proposed Project Area, respectively (California Geological Survey 2010). The THUMS Huntington Beach Thrust Fault and Compton Thrust Fault are located within the Study Area (shown on Figure 3-3) and are both potentially active.

Liquefaction. Soil liquefaction is the partial loss of strength in sandy soils beneath the water table that occurs due to temporary increases in pore water pressure during intense earthquake shaking. As previously mentioned, much of the unconsolidated natural marine sediments in the proposed Project Area are composed of coarse sandy to fine silty materials that become denser with depth. Because of the increasing density with depth, the liquefaction potential of such sediments is low, except for shallower deposits of small natural isolated lenses of loose coarse sandy and silty sandy sediment. The liquefaction potential is higher for loose to less dense sandy to silty sandy sediments that have been recently disturbed by anthropogenic activity (anthropogenic fill).

Sediments with high potential for liquefaction are found in the various manmade fill marina infrastructures in the project area that are composed of loose, dredged fill. Examples of such structures are Port of Long Beach and its ancillary jetties, slips and wharfs, San Pedro breakwater, and THUMS islands.

3.3 WATER QUALITY

The Los Angeles Regional Water Quality Control Board (RWQCB) has jurisdiction over all coastal drainages flowing to the Pacific Ocean between Rincon Point and the eastern Los Angeles County line. The region encompasses 10 Watershed Management Areas (WMAs). The proposed Project Area is located within the Dominguez Channel WMA and the Los Cerritos Channel and Alamitos Bay WMAs.

Los Angeles River Water Quality. Water quality of the Los Angeles River is primarily affected by point source and non-point source discharges entering tributaries of the main river channel. The Los Angeles River is predominantly fed by effluent, with the majority of water coming from water reclamation plant tertiary-treated water discharged outside of storm events. The primary source of water quality degradation is storm water runoff that enters storm drains feeding into the Los Angeles River. Runoff from pervious and impervious areas–streets, parking lots, lawns, golf courses and agricultural land–carry accumulated contaminants (i.e., atmospheric dust, trace metals, street dirt, hydrocarbons, fertilizers and pesticides) that enter storm drains feeding into the Los Angeles River (USACE 2013). Currently there are several Total Maximum Daily Loads (TMDLs), the maximum amount of a specific pollutant that could be discharged into a waterbody causing it to become impaired, within the river watershed. These include metals, nutrients, trash, and bacteria (City of Los Angeles Storm Water Program 2016).

San Gabriel River Water Quality. Water quality of the San Gabriel River Watershed has also been affected by high levels of surrounding urban development. Non-point-source pollution from urban impervious surfaces such as parking lots, roadways, sidewalks, and rooftops is a major contributor to impairment of streams and water bodies. Pollutants from dense clusters of residential and commercial activities have impaired water quality in the middle and lower watershed. Tertiary effluent from several sewage treatment plants enters the river in its middle reaches (which is partially channelized) while two power-generating stations discharge cooling water into the river's estuary. The San Gabriel River has similar TMDLs as the Los Angeles River.

Harbor and Bay Water Quality. The 2016 California Clean Water Act section 303(d) List of Water Quality Limited Segments identified water segments where water quality standards are not met and a TMDL is required are listed below.

- Dominguez Channel Estuary (unlined portion below Vermont Ave.)
- Downtown Shoreline Marina (part of San Pedro Bay Near/Off Shore Zones)
- Long Beach City Beach
- Cabrillo Beach (Outer)
- Los Angeles Harbor - Cabrillo Marina, Consolidated Slip, Fish Harbor, and Inner Cabrillo Beach Area
- Los Angeles/Long Beach Inner Harbor
- Los Angeles/Long Beach Outer Harbor (inside breakwater)
- Los Cerritos Channel
- Los Angeles River Estuary (Queensway Bay)

- Los Angeles River Reach 1 (Estuary to Carson Street)
- San Gabriel River Reach 1 (Estuary to Firestone)
- San Pedro Bay Near/Off Shore Zones
- Alamitos Bay

One or more pollutants or endpoints for each waterbody were listed as the cause of impairment for these waterbodies that comprise the Greater Harbor Waters. For ESPB, the pollutants requiring TMDLs for tissue were Chlordane, Dieldrin, dichlorodiphenyltrichloroethane (DDT), polychlorinated biphenyl (PCBs), and Toxaphene. TMDLs for sediment were metals, Chlordane, Polycyclic Aromatic Hydrocarbon (PAH), and DDT (California Environmental Protection Agency 2019).

The TMDL for Toxic Pollutants in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters (Harbor Toxics TMDL) became effective on March 23, 2012. The requirements of the Harbor Toxics TMDL are specified in Attachment A to Resolution No. R11-008, Amendment to the Water Quality Control Plan – Los Angeles Region (RWQCB 2011). The Harbor Toxics TMDL was promulgated to protect and restore fish tissue, water, and sediment quality in Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters. To protect marine life and minimize human health risks due to the consumption of fish, the Harbor Toxics TMDL includes annual contaminant limits in surface sediment, stormwater effluent, and fish tissues in the Greater Harbor Waters. These limits are defined as target loads or concentrations for compliance with the Harbor Toxics TMDL. The intent of a TMDL is to: (1) determine the quantity of contaminants a system can assimilate while protecting water quality; (2) determine all inputs of contaminants to the system and linkages of inputs to impairments; and (3) allocate reductions to each source to bring the waterbody into compliance with established criteria for the protection of beneficial uses related to water quality (Anchor QEA 2017).

Water quality monitoring conducted within the water column in 2016 showed that water quality objectives were met. In situ and physical parameters were all within expected ranges. Chemical results were all below applicable water quality criteria. Sediment results indicated the following: all metals were measured at concentrations greater than effects range low values; organics, including total PCBs and total DDTs, were occasionally measures at concentrations greater than effects range low values; and total chlordane, total DDTs, and total PCBs exceeded the fish-associated sediment targets (Anchor QEA 2017).

Total PCBs were measured at concentrations greater than the fish contamination goal in all fish from all stations. Total DDTs were measured at concentrations greater than the fish contamination goal in all White Croaker (*Genyonemus lineatus*), some California Halibut (*Paralichthys californicus*), all Shiner Surfperch (*Cymatogaster aggregate*), and all but two Northern Anchovy (*Engraulis mordax*). Total chlordane was measured at concentrations greater than the fish contamination goal in all White Croaker, Shiner Surfperch, and Northern Anchovy, but only four California Halibut (Anchor QEA 2017).

Within the proposed Project Area, the Port of Long Beach area is included in the State of California's Clean Water Act section 303(d) list as impaired by PCB, DDT, copper (Cu), zinc (Zn), lead (Pb), benzo(a)pyrene, chrysene, benthic community effects, chlordane, and sediment toxicity. The City has obtained municipal storm sewer system permits issued by the RWQCB that requires a reduction in the level of these pollutants being discharged to downstream waterbodies. The City's Watershed Management Program has been developed to comply with the permit and reduce water contaminants through control measures (structural and nonstructural) (City of Long Beach 2016).

East San Pedro Bay Water Quality. The ocean within the proposed Project Area is bordered by urban and industrial development. During dry weather, runoff from these areas into the ocean typically consists of landscape irrigation, the draining of swimming pools, car washing, and various commercial activities. Dry weather runoff is the most common cause of water contaminants in the ocean. Water quality within the proposed Project rea is affected by factors such as storm events, water circulation, biological activity, surface runoff, effluent discharges, and accidental discharges of pollutants from shipping activities as well as water flushed from Long Beach Harbor piers (e.g., washed off during storm events) and vessel activity.

Bacteria in the sand along the shoreline can also be problematic and are the most common contaminants. The City conducts weekly monitoring of bacterial levels (total coliforms, fecal coliforms, and *Enterococcus*) on City beaches. In order to protect the safety of recreationists, the City tests samples of ocean water for three types of bacteria (total coliform, fecal coliform, and *Enterococcus*) and results are evaluated against water quality standards established by the California State Water Resources Control Board (CSWRCB). The thresholds to determine hazardous health conditions are:

- Total Coliform: 1,000 per 100 milliliters (mL) if Fecal/Total is > 0.1; 10,000 per 100 mL if Fecal/Total is < 0.1
- Fecal Coliform: 400 per 100 mL
- *Enterococcus*: 104 per 100 mL

After significant rainfall (0.1 inch or more) high levels of bacteria from storm drains, rivers, and polluted runoff enter the ocean and settle on the shoreline. Recent monitoring indicates that bacterial levels are within CSWRCB standards. However, significant rain events in the winter of 2016–2017, as well as a sewage spill in 2016, resulted in elevated bacterial levels requiring warnings to beach goers and swimmers (City of Long Beach 2017a). Fecal indicator bacteria have been elevated in dry weather discharges from the Los Angeles River in recent years and have resulted in City of Long Beach closures of coastal swimming areas. Periodic sewage spills also contribute to elevated bacteria levels in the Los Angeles River (most recently in January of 2017).

Trash and floating debris from the Los Angeles River and San Gabriel River are considered a problem to recreational use, as well as to marine and estuarine habitats within the ESPB and along the Long Beach shoreline. An average of 4,000 tons of trash and debris was deposited on City of Long Beach beaches annually that affected water quality and recreation, prior to infrastructure improvements that reduced the amount of trash entering the river and tributaries. The prevailing winds out of the southwest transported brackish water surface plume towards the western end of the ocean beaches between Shoreline Marina and the Belmont Pier. During periods when the winds shifted to a more southerly pattern, the plume was quickly transported to the beach face with limited additional dilution. Bacterial water quality criteria for full body contact, that affect recreational activities, were exceeded when such conditions were concurrent with elevated fecal indicator bacteria in the Los Angeles River. The largest quantities of trash and debris wash up on the western end of the City beaches, but significant quantities are also collected at the far eastern end, adjacent to the Alamitos Bay jetty (California RWQCB 2007).

Aside from aesthetic issues, organic matter associated with these materials harbor bacteria (total coliforms, fecal coliforms, and *Enterococcus*). Algae on beaches can serve as reservoirs for fecal indicator bacteria (Imamura *et al.* 2011). Beach closures and water advisories due to harmful bacteria continue to occur in Long Beach, particularly after storm events.

Transmissivity (clarity) of ESPB waters is impacted during storm events as a result of discharges from the Los Angeles River and San Gabriel River. Reduced circulation within the harbor contributes to persistence of turbid water in the bay as compared to coastal ocean waters.

The ESPB area is considered a "hotspot" for harmful algal blooms. These blooms are thought to be created by a combination of natural and non-natural inputs of nutrients in the water column that allow algae to bloom. Harmful toxins released from algae blooms are harmful to both marine life and humans.

Toxins can cause allergic reactions, gastroenteritis, and seizures in humans. Blooms also can result in decreased oxygen and food levels, which directly impact marine life.

Water quality off Long Beach beaches has been steadily improving due to improvements in water quality management and current beach grades are consistently high (L.A.Times 2011; L.B.Post 2020). Ongoing, planned, and ad-hoc restoration and conservation projects, including small-scale projects in watersheds, by government agencies, municipalities, and non-governmental organizations, are expected to result in gradual habitat improvements. Soft bottom habitat and kelp reefs are likely to benefit from continuing management efforts within the Los Angeles and San Gabriel watersheds to improve water quality, sediment quality, and to reduce trash within the area.

The Fish Contamination Education Collaborative, the public outreach and education component of the USEPA, has established warning zones where contaminated fish have been found (red and yellow zones). Fishing areas in the red zone within the project area include Seal Beach, Pier J, and Belmont Pier. Potential contaminants within the red zone include DDT and PCB. Health problems linked to DDT and PCB include effects on the nervous, immune, endocrine, and reproductive systems, infant development, and cancer (Fish Contamination Education Collaborative 2017).

3.4 AIR QUALITY AND GREENHOUSE GASES

Area of Influence. The air quality area of influence for the project is included in the South Coast Air Basin (SCAB), which consists of the urbanized areas of Los Angeles, Riverside, San Bernardino, and Orange counties, and the ocean offshore of the South Coast waters. The SCAB onshore area covers 6,000 square miles.

Climate and Meteorology Conditions. The SCAB lies within the semi-permanent high-pressure zone of the eastern Pacific Ocean. The climate of the region is classified as Mediterranean, which is generally characterized by warm, dry summers and mild winters with moderate rainfall (SCAQMD 1993). Prevailing daily winds in the region are westerly, with a nighttime return flow. This pattern is typically broken when strong northeasterly winds, commonly known as “Santa Ana Winds,” sweep down from the desert.

The climate and topography in the SCAB are conducive to the formation of ozone. The heaviest concentrations of ozone occur during the summer months when there are warm temperatures, stagnant wind conditions, high solar radiation, and an inversion layer at lower elevations. An inversion layer forms when warmer, lighter air traps cooler, denser air in the basin. Carbon monoxide (CO) concentrations are highest during the winter, when relatively stagnant air conditions result in an accumulation of this pollutant. Highest CO concentrations are found near heavily traveled and congested roadways (SCAQMD 2012). However, in the case of particulate matter (PM), maximum concentrations primarily occur during high wind events or near man-made ground disturbing activities, such as vehicular activities on roads and earth moving during construction activities.

Winds across the proposed Project Area are an important meteorological parameter as they control both the initial rate of dilution and direction of pollutant dispersion. As sea breezes blow pollutants onshore, they may result in the transport of air pollutants to adjacent air basins, such as the Mojave Desert, San Diego, and Salton Sea air basins. Winds blowing from the west are dominant during February and April, and the prevailing winds during March and summer (May through July) blows from the south. During August through January, dominant winds blow from the west-northwest.

Attainment Status. Under the Federal Clean Air Act (CAA), a state or region is given the status of "attainment," “maintenance,” or “unclassified” if national ambient air quality standards (NAAQS) have not been exceeded. A status of "nonattainment" for particular criteria pollutants is assigned if the

NAAQS for that pollutant has been exceeded. Attainment may be achieved after three years of data showing non-exceedance of the standard. Once an area is designated as attainment, it is reclassified from nonattainment to attainment; it is then designated as a "maintenance area," which requires the establishment and enforcement of a plan to maintain attainment of the standard. Each attainment plan is reviewed after ten years. California classifies areas of the state as attainment, nonattainment, nonattainment-transitional, extreme or unclassified with respect to the state ambient air quality standards (CAAQS). The NAAQS and CAAQS are provided in Table 3-1. Federal and state attainment status designations for the SCAB are summarized in Table 3-2.

Table 3-1: National and California Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	National Standards	Health Effects
O_3	1-hour	0.09 ppm	—	Breathing difficulties, lung tissue damage
	8-hour [2]	0.070 ppm	0.070 ppm	
PM_{10}	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	Increased respiratory disease, lung damage, cancer, premature death
	Annual	20 $\mu g/m^3$	—	
$PM_{2.5}$	24-hour [3]	—	35 $\mu g/m^3$	Increased respiratory disease, lung damage, cancer, premature death
	Annual	12 $\mu g/m^3$	12 $\mu g/m^3$	
CO	1-hour	20 ppm	35 pm	Chest pain in heart patients, headaches, reduced mental alertness
	8-hour	9.0 ppm	9 ppm	
NO_2	1-hour	0.18 ppm	0.100 ppm [1]	Lung irritation and damage
	Annual	0.030 ppm	0.053 ppm	
SO_2	1-hour	0.25 ppm	0.075 ppm [1]	Increases lung disease and breathing problems for asthmatics
	3-hour	—	0.5 ppm	
	24-hour	0.04 ppm	—	

Notes:

ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter; "—" = no standards

[1] The federal 1-hour NO_2 and SO_2 standards are based on the 3-year average of the 98th and 99th percentiles of the annual distribution of daily maximum values, respectively.

[2] The federal 8-hour O_3 standard is based on the annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.

[3] The federal 24-hour $PM_{2.5}$ standard is based on the 3-year average of the 98th percentile of the daily values.

Table 3-2: SCAB Attainment Status

• Pollutant	• Attainment Status	
	• Federal	• State
O_3	Extreme Nonattainment	Nonattainment
PM_{10}	Maintenance	Nonattainment
$PM_{2.5}$	Moderate Nonattainment	Nonattainment
CO	Maintenance	Attainment
NO_2	Maintenance	Attainment
SO_2	Attainment	Attainment
Pb	Nonattainment (partial)	Attainment

Source: USEPA 2019; CARB 2019.

For potential stone quarry from the 3M Corona Quarry, this site is located within the Western Riverside County portion of the SCAB. The Surfside/Sunset Borrow site is in the Orange County portion of the SCAB. The only difference in attainment status between Los Angeles, Western Riverside, and Orange County is that Los Angeles is nonattainment for lead, and Western Riverside and Orange counties are in attainment.

Air quality problems in the SCAB include periodic violations of Federal and state air quality standards for ozone, PM less than 10 microns in diameter (PM_{10}), and PM less than 2.5 microns in diameter ($PM_{2.5}$). The frequency with which ozone standards have been exceeded has declined significantly over recent decades.

Regional and Localized Air Quality. The State and Local Air Monitoring Network Plan provides the results of the annual review of the air monitoring stations in California. These stations house monitoring instruments that measure ambient levels of air pollutants. The closest air monitoring stations to the proposed Project Area are the Long Beach and North Long Beach Air Monitoring Stations. The Long Beach air monitoring station is located at 2425 Webster Street, about 5.5 miles north of the proposed Project Area. The North Long Beach air monitoring station is located at 3648 North Long Beach Boulevard, about 9.2 miles north of the proposed Project Area. Table 3-3 presents the air quality data for ozone, NO_2, PM_{10}, and $PM_{2.5}$ for the last three reported years at these two air quality monitoring stations.

Table 3-3: Summary of Air Quality Measurements – Long Beach and North Long Beach Air Quality Monitoring Stations

Pollutant/Standard	2015	2016	2017
Ozone (Long Beach)			
Days State 1-hour Standard Exceeded (0.09 ppm)	0	0	0
Days State 8-hour Standard Exceeded (0.07 ppm)	0	0	0
Days Federal 8-hour Standard Exceeded (0.075 ppm)	0	0	0
Max. 1-hr (ppm)	0.09	0.08	0.08
Max 8-hr (ppm)	0.07	0.06	0.07
Nitrogen Dioxide (Long Beach)			
Days State 1-hour Standard Exceeded (0.18 ppm)	0	0	0
Days Federal 1-hour Standard Exceeded (0.100 ppm)	1	0	0
Max 1-hr (ppm)	102	76	90
Annual Average (ppm)	20	18	18
PM_{10} (Long Beach)			
Estimated Days State 24-hour Standard Exceeded (50 $\mu g/m^3$)	38	--	--
Days Federal 24-hour Standard Exceeded (150 $\mu g/m^3$)	0	0	0
State Max Daily ($\mu g/m^3$)	79	--	--
State Annual Average ($\mu g/m^3$)	31	--	--
Federal Max Daily ($\mu g/m^3$)	80	75	79
Federal Annual Average ($\mu g/m^3$)	31.5	32	34
$PM_{2.5}$ (North Long Beach)			
Estimated Days Federal 24-hour Standard Exceeded (35 $\mu g/m^3$)	--	0	8.0
Max Daily ($\mu g/m^3$)	49	33	85
State Annual Average ($\mu g/m^3$)	--	12	13
Federal Annual Average ($\mu g/m^3$)	--	12	13

Sources: CARB 2016a
"—" = Not published on CARB Air Quality Data Statistics webpage (iADAM); ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter

Sensitive Receptors. The impact of air emissions on sensitive members of the population is a special concern. Sensitive members of the population include those that may be more negatively affected by poor air quality than other members of the population, such as children, the elderly, or the infirm. Schools, hospitals, and convalescent homes are considered sensitive land uses because children, the elderly, and the infirm are more susceptible to respiratory distress and other air-quality-related health problems than the general public.

Sensitive receptors within approximately one mile of the proposed Project Area include the following:

- Schools: International Elementary School; Mary Bethune School; Educational Partnership High School; James A. Garfield Elementary; Reid Senior High School; Woodrow Wilson Classical High School.
- Elder Care Facilities: All Care Senior Services; Oxford Health Care; Long Beach Senior Arts Colony; St. Mary Tower; Heritage Board and care; Colonial Care Center; Villa Maria Care Center.
- Hospitals: Alamitos Rehabilitation Hospital; St. Mary Medical Center Long Beach; Centinela Medical Center; Molina Healthcare Facility; Veterans Administration Medical Center; Marlora Post-Acute Rehabilitation Hospital.

Greenhouse Gases. Greenhouse gases (GHGs) are considered gases that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO2), methane (CH_4), nitrous oxide (N_2O), hydrochlorofluorocarbons (HCFCs), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). The Greenhouse Gas Effect phenomenon is responsible for maintaining a habitable climate on earth. Anthropogenic emissions of these greenhouse gases in excess of natural ambient concentrations are responsible for the enhancement of the Greenhouse Effect and have led to a trend of unnatural warming of the Earth's natural climate, known as global warming or climate change. Emissions of gases that induce global warming are attributable to human activities associated with industrial/manufacturing, agriculture, utilities, transportation, and residential land uses. According to the CARB website, transportation is responsible for around 41 percent of the State's greenhouse gas emissions, followed by the industrial sector (23%) and electricity generation (10%). Emissions of CO_2 and N_2O are byproducts of fossil fuel combustion. Methane, a potent greenhouse gas, results from off-gassing associated with agricultural practices and landfills. Sinks of CO_2, where CO_2 is stored outside of the atmosphere, include uptake by vegetation and dissolution into the ocean. GHGs have varying global warming potential (GWP). The GWP is the potential of a gas or aerosol to trap heat in the atmosphere; it is the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to the reference gas, CO_2.

The California Air Resources Board (CARB) performs statewide GHG inventories. The inventory is divided into nine broad sectors of economic activity: agriculture, commercial, electricity generation, forestry, high global warming potential emitters, industrial, recycling and waste, residential and transportation. Emissions of GHGs are attributable to human activities associated with the transportation, industrial/manufacturing, electric utility, residential, commercial, and agricultural sectors. Emissions of CO_2 are byproducts of fossil fuel combustion while CH_4, a highly potent GHG, is the primary component in natural gas and also is associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management.

Toxic Air Contaminants. Toxic air contaminants are airborne compounds that are known or suspected to cause adverse human health effects after long-term (i.e., chronic) and/or short-term (i.e., acute) exposure. Cancer risk is associated with chronic exposure to some toxic air contaminants, and non-cancer health effects can result from either chronic or acute exposure to various toxic air contaminants. Examples of toxic air contaminant sources in the SCAB include diesel- and gasoline-powered internal combustion engines in mobile sources; industrial processes and stationary sources, such as dry cleaners, gasoline stations, and paint and solvent operations; and stationary fossil fuel-burning combustion sources, such as power plants.

Cancer risk due to toxic air contaminants has declined in the SCAB as a result of federal, state and local regulations. The South Coast Air Quality Management District (SCAQMD) initiated the first urban toxic air pollution study, Multiple Air Toxics Exposure Study (MATES) in 1998. The MATES studies together show a steady decline in SCAB cancer risk despite continuing population growth.

The Study Area is located within the vicinity of the Port Complex. Due to the prevalence of diesel-powered sources that operate at ports, subsequent studies (MATES-IV) identified the Port Complex area as having higher toxic air contaminant-related cancer risks in the SCAB compared to the average toxic air contaminant-related cancer risk within other portions of the SCAB.

3.5 NOISE AND VIBRATION

Existing Ambient Noise Environment. The proposed Project Area and area of influence encompass a variety of noise sources. The assumed existing primary source of noise is from high traffic arterials, which generate consistent noise patterns along the periphery of the proposed Project Area. Other major noise sources in the area include terminal activities, railways and yards, surface street traffic, and marine traffic.

Ambient noise conditions are documented primarily through qualitative assessment of potential noise sources in the proposed Project Area and a review of recent noise modeling assessments completed by the National Center of Green Technology & Education, College of Engineering, California State University Long Beach (Khoo *et al.*, 2014). Noise monitoring was not conducted as a part of this EIR/EIS.

Based on t*he Development and Validation of Noise Maps for the Container Terminals at the Port of Long Beach,* noise levels within the port area range from 75 to 80 A-weighted decibels [dB(A)] average sound level (L_{eq}) but attenuate to approximately 65 dB(A) L_{eq} at the western edge of the terminals nearest the proposed Project Area. While the analysis does not provide noise level data for the entire proposed Project Area, based on these data and the volume of marine traffic as well as noise from wave action, ambient noise within the area of influence would typically be 65 dB(A) L_{eq} or less. Occasional short-term maximum noise levels greater than the hourly equivalent noise level would also likely occur in close proximity to anchored ships and ships passing through the channel. Based on the noise levels measurement taken along local freeways, existing ambient noise levels along these routes range from 70 to 75 dB(A) L_{eq}.

Noise Sensitive Receptors. Noise sensitive receptors are generally locations where people sleep or where noise can affect the function of the receptor. Examples of noise sensitive receptors include, but are not limited to, residential dwellings, schools, parks, community centers, public facilities, hotels, hospitals, places of worship, and office buildings. Sensitive receptors within one mile of the proposed Project Area include all of the above-mentioned sensitive receptors, including several hotels, tourist attractions, and outdoor recreation areas.

Vibration. Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity or acceleration. The peak particle velocity (PPV) or the root mean square (RMS) velocity is usually used to describe vibration amplitudes. PPV is defined as the maximum instantaneous peak or vibration signal, while RMS is defined as the square root of the average of the squared amplitude of the signal. PPV is typically used for evaluating potential building damage, whereas RMS is typically more suitable for evaluating human response. Typically, ground-borne vibration, generated by man-made activities attenuates rapidly with distance from the source of vibration. Man-made vibration issues are therefore usually confined to short distances (i.e., 500 feet or less) from the source.

Both construction and operation of development projects can generate ground-borne vibration. In general, demolition of structures preceding construction generates the highest vibrations. Construction equipment such as vibratory compactors or rollers, pile drivers and pavement breakers can generate perceptible vibration during construction activities. Heavy trucks can also generate ground-borne vibrations that vary depending on vehicle type, weight and pavement conditions.

Typically, groundborne vibration generated by human activities attenuates rapidly with distance. Man-made vibration problems are therefore usually confined to short distances (500 to 600 feet or less) from the source (Federal Transit Administration 2006). Common sources of ground-borne vibration in the City of Long Beach include construction activities, rail operations, heavy vehicle traffic, and vehicle loading and delivery operations. Other sources which have the potential to cause vibration impacts are aircraft operations, low-frequency music, and some stationary sources. (City of Long Beach 2019). A list of sources of vibration within the ESPB proposed Project Area was not available.

3.6 BIOLOGICAL RESOURCES: MARINE HABITATS

3.6.1 Habitat Evaluation (HE)

USACE guidance for ecosystem restoration (ER 1105-2-210, Appendix E, Section V) provides information on the purpose and importance of quantifying environmental outputs of ecosystem restoration projects to assure that civil work investments have the intended beneficial effects. To perform this type of analysis, it is necessary that the environmental outputs be based on some quantifiable unit (*e.g.*, Habitat Units, Functional Capacity Units, etc.) that reflects both the baseline conditions in an area and the projected effects of project alternatives.

The USACE organized a TAC, consisting of members from various federal, state, local institutions, and private organizations with expertise in the principles of wildlife biology, fisheries, and restoration of riverine and estuarine systems as well as knowledge of the ESPB ecosystem. The TAC met periodically to review evaluation methods, decide upon an appropriate methodology to use for this Study, and to lead the development of that methodology. The TAC agreed to develop a Habitat Evaluation (HE) for the baseline conditions and project alternatives to quantitatively assess the quality of existing habitats in ESPB. In general, the TAC reached a consensus on the most important environmental issues related to the Study. The habitat evaluation greatly benefited from this consensus building approach, and the varied expertise of the members of the TAC was fully utilized in this analysis. The HE analysis is provided in Appendix D.

3.6.2 Marine Habitats

The existing principal biological resources within the proposed Project Area are dominated by soft bottom habitats, hard substrate habitats (primarily incidental to port infrastructure), and water column habitats. These habitats have been extensively studied for decades by the Ports of Los Angeles and Long Beach to establish biological baselines (studied approximately every five years) and these studies have been used as a primary data source for biological resources within the proposed Project Area (MBC 2016; Merkel 2017). The most recent comprehensive biological surveys within the Port Complex were completed in 2013–2014 by MBC Applied Environmental Sciences and Merkel and Associates, Inc. (2016) and in 2016 by Merkel and Associates, Inc. (2017). Such studies have documented lower value inner harbor habitats compared to higher outer harbor habitats, due to better water quality and water circulation in outer harbor areas. The inner harbor consists of a number of dead-end slips and basins in the inner areas of the two ports, while the outer harbor includes the open waters immediately behind the breakwaters that protect the Port Complex and the main navigation channels and a number of basins in the middle and inner areas of the two ports. Waters in the western portion of the proposed Project Area are considered outer harbor habitat (Figure 3-4).

Soft Substrate Habitats

Soft Bottom Habitat. Benthic organisms are associated with seafloor sediments. Animals that live within soft sediments, primarily invertebrate species, are referred to as "infauna," and animals living on the sediment surface are referred to as "epifauna." Benthic organisms are an important component of the food web and are indicators of environmental quality. Since the 1950s, improvements in water quality have aided the establishment of diverse assemblages of the benthic community in areas that were once largely devoid of marine life (MEC and Associates 2002; SAIC 2010).

Soft bottom habitat is the most common habitat type and is located throughout the proposed Project Area including the Surfside/Sunset borrow site. Sediment composition of soft bottom habitats within the proposed Project Area is composed of various combinations of silt and sand, with highest concentrations of soft bottom habitats found in the western central portion of the proposed Project Area near Pier J and offshore of the mouth of the Los Angeles River. Soft bottom habitats in the proposed Project Area include borrow pits (North and South Energy Island Borrow Pits) that are shown on bathymetry maps of the San Pedro Bay.

The South Energy Island Borrow Pit is located at depths of -40 to -50 feet MLLW, roughly 10-20 feet deeper than the surrounding area. The North Energy Island Borrow Pit is located at depths of -45 to -65 ft MLLW, roughly 15 to 35 feet deeper than the surrounding area. Data taken as part of a capping project in the North Energy Island Borrow Pit shows the bottom of the pit to be depauperate relative to the surrounding areas. The same conditions can be assumed for the South Energy Island Borrow Pit (Sampling and Analysis Report North Energy Island Borrow Pit, USACE 2014b).

Coastal Salt Marsh Wetlands. Coastal salt marsh wetland consists of salt-tolerant herbaceous plant species and occurs in bays, estuaries, and lagoons in California from Point Conception to the U.S.-Mexico International border. Typical salt marsh plant species include salt grass (*Distichlis* species), pickleweed (*Salicornia* species), and cord grass (*Spartina foliosa*). Southern California salt marshes are highly productive wetland ecosystems that are driven by tidal cycles that bring a daily influx of nutrients (Holland 1986).

The only known wetlands under state or Federal jurisdiction within the proposed Project Area are found at the Golden Shore Marine Biological Reserve, which is relatively small (approximately 6.5 acres) and isolated from other areas of similar habitat (Figure 3-4 and Figure 3-5; USFWS 2016). Within the general Study Area, coastal salt marsh and freshwater wetlands are located within the Los Cerritos Wetlands along the San Gabriel River approximately one mile northeast of the proposed Project Area and in the Anaheim Salt Marsh within Anaheim Bay in the Seal Beach National Wildlife Refuge (see Figure 3-4).

Eelgrass. Eelgrass beds are considered "vegetated shallows" under the USEPA's Clean Water Act section 404(b)(1) Guidelines (40 CFR Part 230). Eelgrass (*Zostera marina* and *Z. pacifica*) is a rooted aquatic plant found in shallow soft-bottom habitats in quiet waters of bays and estuaries, as well as sheltered coastal areas (Dawson and Foster 1982). Eelgrass beds function as habitat and nursery areas for commercially and recreationally important open ocean marine fishes and invertebrates and provide critical structural environments for resident bay and estuarine species, including abundant fishes and invertebrates. Most eelgrass beds in bays and estuaries are found in waters less than approximately 19 feet deep and light is the primary limiting factor.

Eelgrass, an ecosystem engineer that is nationally recognized as EFH and a habitat of particular concern (HAPC) by the NMFS (NOAA 2020b; NOAA 2020d), improves water quality, provides nursery and foraging habitat, is found in the ESPB, and is recognized as scarce throughout California waters by the NMFS with estimates of only 10,000-15,000 acres currently existing along the entirety of the California coast (NOAA 2014). EFH, including eelgrass, are components of the goals and objectives of the 2016-2020 NOAA Fisheries Habitat Enterprise Strategic Plan that is used to help prioritize Agency habitat conservation activities around the Nation (NOAA 2016a).

Not only is eelgrass used as foraging habitat for many species of invertebrates, sharks, rays, skates, fishes, birds, and the federally threatened Green Sea Turtle that occurs in ESPB, but eelgrass, in addition to kelp, has been identified as important for atmospheric carbon (CO_2) reduction by the NOAA Fisheries' Western Regional Action Plan (NOAA 2016b). Additionally, eelgrass is considered a key habitat for the Blue Carbon Initiative (https://www.iucn.org/resources/issues-briefs/blue-carbon) in which the restoration of marine plants is expected to remove atmospheric carbon from the atmosphere and reduce greenhouse gasses and slow the rate of global climate change.

Within the proposed Project Area, eelgrass is known to grow along Belmont Shore (see Figure 3-4). In 2015, the USACE conducted an eelgrass survey on a nearshore placement area offshore of Cherry Beach that was associated with the LARE dredging project within the proposed Project Area (USACE 2015). The survey observed 177 eelgrass patches within the 2.25-acre survey area. The patches were composed of mixed species (*Z. marina* and *Z. pacifica*) and were found at depths between -5.2 and -15 feet MLLW. It appears likely that the placement of dredged material at the site created wave and current conditions suitable for eelgrass. The eelgrass beds subsequently expanded as the size of the placement site expanded. As part of comprehensive eelgrass surveys in island and nearshore areas of the SCB, eelgrass benchmark surveys were conducted within ESPB in 2016. The survey found 16.45 acres of eelgrass within the ESPB portion of the proposed Project Area (see Figure 3-4) (Merkel 2017). Eelgrass is also found at the mouth of Anaheim Bay adjacent to the bay breakwaters (see Figure 3-4) (Merkel 2017). For eelgrass, the general trend from 2013-2016 is a 16% decline in acreage throughout the SCB and within the Study Area, including west San Pedro Bay, eelgrass declined by 21% over the same period (Merkel 2017).

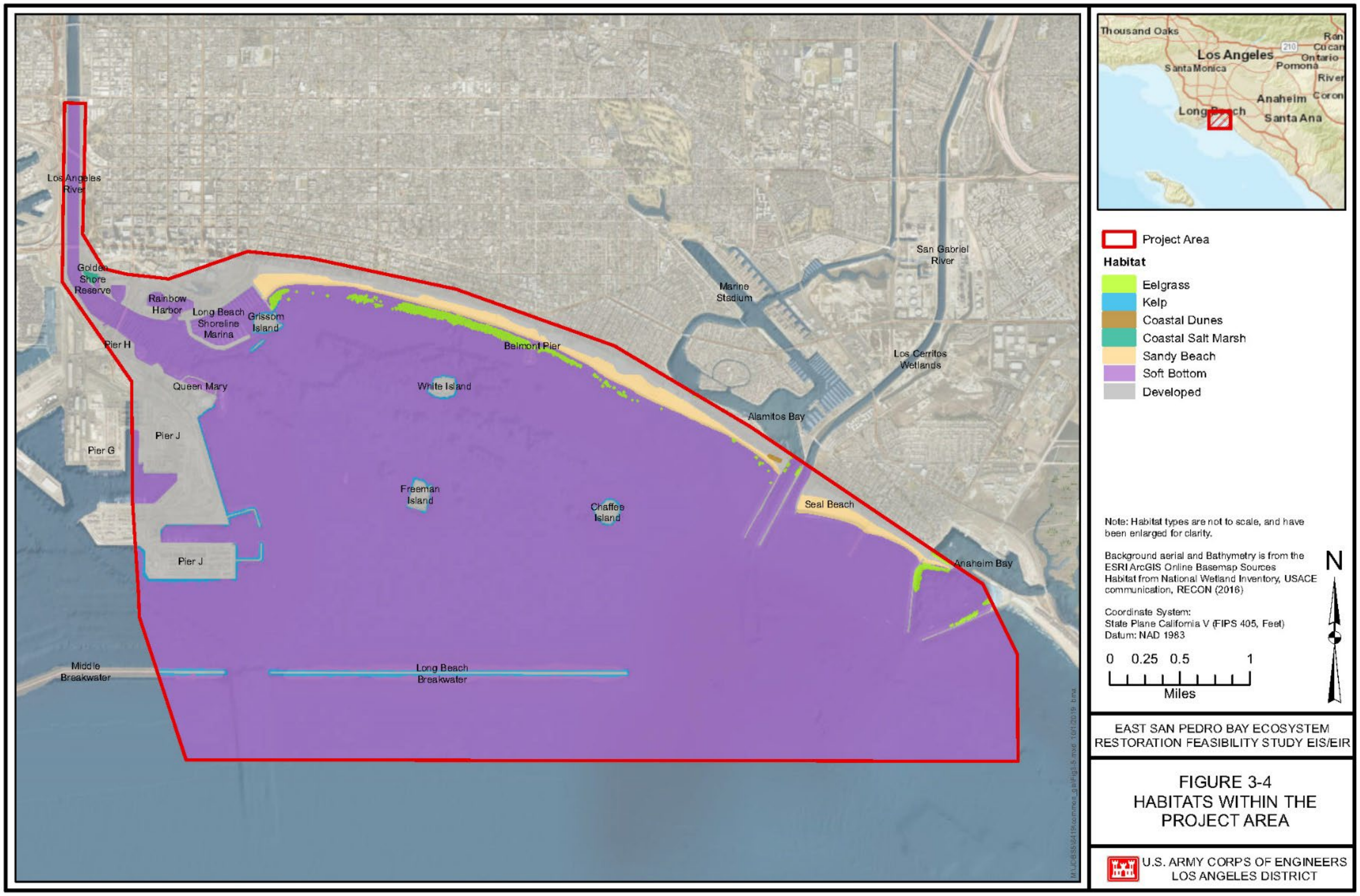


Figure 3-4: Habitats within the Proposed Project Area

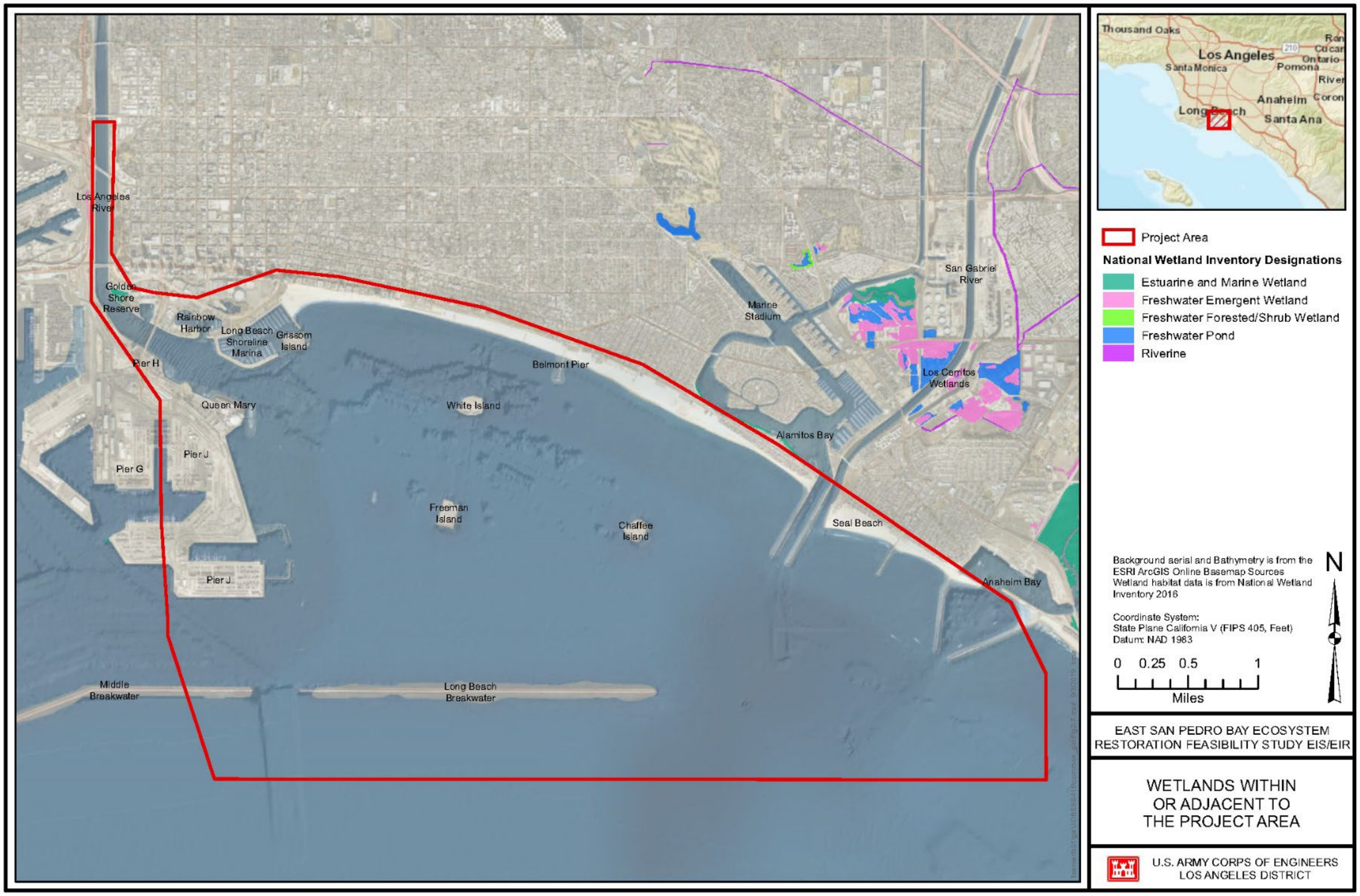


Figure 3-5: Wetlands within or adjacent to the proposed Project Area

Sandy Beach. Sandy beach is a habitat composed of sandy or gravelly substrates deposited and sorted by wave action and tides. Beaches are mainly unvegetated except for sparse herbaceous species that may occur along the upper margins. Sandy beaches are the dominant intertidal habitat within the project area and extend east-to-west along the shoreline from Marina Green Park in the city of Long Beach to the mouth of Anaheim Bay. Many crustaceans inhabit sandy beaches, particularly mole crabs (*Emerita* spp.) in the intertidal zone, and sand dollars (*Dendraster excentricus*) often are common.

Sandy beaches within the proposed Project Area are heavily used for public recreational activities including sunbathing, surfcasting, swimming, sightseeing, and boogie boarding. The City grooms beaches regularly to remove accumulated debris and refuse deposited after storm events that can reduce biological community abundance.

Coastal Sand Dunes. Coastal dunes is a habitat type that contains barren, mobile sand accumulations whose size and shape are determined by abiotic (non-living chemical and physical parts of the environment) site factors rather than by stabilizing vegetation. A variety of terrestrial plants adapted to grow in salty, shifting sand conditions comprise the dune vegetation. Open sandy areas can provide nesting habitat for endangered California least terns and threatened western snowy plovers. A small patch (0.66 acre) of highly disturbed coastal sand dune vegetation exists adjacent to sandy beach habitat on the western side of the Los Alamitos Bay jetty at Peninsula Beach. The dunes are dominated by the non-native species of ice plant (*Carpobrotus edulis*) and Beach Bur (*Ambrosia chamissonis*).

Hard Substrate Habitats

Kelp. Giant Kelp (*Macrocystis pyrifera*) is a brown alga that occurs along the entire coast of California where there is suitable habitat (*e.g.*, hard substrate such as reefs, cobble, engineered reefs, jetties, breakwaters, and riprap). It usually grows at depths of 20 to 60 feet, although in a few locations it can grow as deep as approximately 100 feet. When individual kelp plants reach sufficient size, the fronds (stipes and blades) spread out on the sea surface to form canopies. Feather Boa Kelp (*Egregia menzisii*) is usually found in the lower intertidal zone to about 20 feet (Dawson and Foster 1982).

Within the SCB, kelp provides habitat and resources for several federally listed species, Special-Status species, marine mammals that are protected under the MMPA, and migratory seabirds of the Pacific Flyway. Both Giant Kelp, hard bottom kelp, and associated Giant Kelp forest habitats are considered to be important habitat for various algae, many rockfish species, Lingcod (*Ophiodon elongates*), Kelp and Barred Sand Bass (*Paralabrax clathratus* and *P. nebulifer*, respectively), other fishes, invertebrates, and marine organisms. Giant Kelp forests provide habitat for sensitive commercially valuable fishes (NMFS 2016) and also contribute significantly to elevated primary and secondary production, nutrient cycling, biodiversity, and carbon sequestration (Smale *et al.* 2013). Kelp forests are estimated to be among the most productive habitats on Earth, rivaling coral reefs (Claisse *et al.* 2013; Pondella *et al.* 2015). Globally, kelp has been in decline due to human impacts associated with coastal development along with global climate change resulting in a global decline in kelp by approximately 38% over the past fifty years (Filbee-Dexter and Wernberg 2018). In 2021 it was reported that 95% of the dominant canopy-forming kelp, bull kelp, distributed along the northern California coastline has been lost due to prolonged marine heat waves and an explosion of sea urchins along the coast that feed on kelp (McPherson *et al.* 2021; https://phys.org/news/2021-03-collapse-northern-california-kelp-forests.html).

Based on estimates of atmospheric carbon sequestration potential for kelp and eelgrass (Duarte *et al.* 2017; Pewtrusts 2019), these habitats aid in combating Global Climate Change. A recent Washington Post article supports this statement by asserting “giant kelp is among the best organisms on the planet for taking planet-warming gases out of the atmosphere,” providing critical ecosystem services to combat global warming by “storing up to 20 times as much carbon as an equivalent expanse of terrestrial trees” (https://www.washingtonpost.com/climate-solutions/2021/04/22/earth-day-biodiversity/). As a result of the various ecological functions that kelp provides, kelp forests are recognized by the NMFS as being important EFH for many management plans including the Groundfish and Coastal Pelagic Fishery Management Plans. Furthermore, NMFS has included this habitat as a component of the goals and objectives of the 2016-2020 NOAA Fisheries Habitat Enterprise Strategic Plan that is used to help prioritize Agency habitat conservation activities around the Nation.

The nearest natural reefs to the Study Area are those along the Palos Verdes Peninsula and the Horseshoe Kelp Reef; there are no known natural reefs in the immediate vicinity of the proposed Project Area. The submerged hard substrate of the breakwaters, pier armoring, and oil islands support rocky reef communities even though the physical characteristics of these structures differ from those of natural reefs in "relief" (*i.e.*, height off the seafloor) and "rugosity" (*i.e.*, the complexity of the substrate). In the proposed Project Area, Giant Kelp grows on the Long Beach Breakwater, on Pier J (Port of Long Beach), and on the oil islands and consists of a combination of Giant Kelp (equal to or greater than 95 percent) and Feather Boa Kelp (equal to or less than 5 percent).

Survey data for the Port of Los Angeles/Port of Long Beach based on canopy coverage (canopy area in km^2) from 2005-2016 (MBC 2017) demonstrated variation in the amount of kelp cover with a mean canopy area of 0.295 km^2 and a range of 0.118-0.494 km^2 (equivalent to approximately 26-111 American football fields without endzones). Reduced canopy coverage below the average (*i.e*., < 0.3 km^2) was observed in the years 2005, 2007, 2008, 2009, 2010, and 2014 and relatively high canopy coverage above the average (*i.e*., > 0.3 km^2) was observed in 2006, 2011, 2012, 2013, 2015, and 2016. Of note, the effect of cold and warm-water years had little effect on canopy coverage as low and high coverage were both observed during both water "extremes". Interestingly, the highest canopy coverage was observed during the two "neutral" years of 2006 (0.494 km^2) and 2013 (0.337 km^2). Numerous factors including sea surface temperature, cold water influx, El Nino Southern Oscillation (ENSO), marine heatwaves (*i.e.*, the "warm water blob"), etc., were associated with variances in kelp coverage along the central and southern California coastlines during 2016 with kelp coverage increasing or decreasing depending on time of the year and location. Ultimately, kelp coverage varies over time and space within the Study Area and the proposed Project Area. Additionally, numerous studies have demonstrated the resilience of kelp to environmental variability and its ability to recover both naturally and through restoration (*e.g*., Dayton et al., 1992; Reed et al., 2006; and Layton et al., 2020).

Rocky Reefs. Rocky reefs are a resource in southern California that support a high diversity and abundance of fishes relative to other habitats in the region (Stephens *et al.* 2006). Research has demonstrated that an area of rocky reef/kelp habitat is estimated to support between 6 to 15 times the density of fishes when compared to soft-bottom substrate of a similar size (Bond *et al.* 1999). Rocky reefs are important habitats for species in which juveniles and adults each spend a proportion of their lives in completely different habitats/environments (referred to as a bipartite life history). Under this scenario, juveniles spend their early years sheltered in the nearshore rocky reef environment followed by their dispersal into the open ocean as adults (or vice versa). It has been estimated that approximately 68% of federally managed groundfish stocks commonly encountered in depths of 60 m or less spend their lives in the nearshore (PFMC 2005). In addition, many species of fishes and shellfish demonstrate high site fidelity as adults to recruitment sites within reefs; dispersing distances less than 100 square meters over the course of their lives and exhibiting population connectivity similar to that of a stepping stone model (Gunderson *et al.* 2008). Finally, open ocean and nearshore ecosystems (*e.g*., rocky reefs) are linked as energy in the form of biomass is transported between the two in the form of trophic subsidies (Zuercher and Galloway 2019). For example, the dispersal of rockfish larvae from the nearshore to the open ocean is considered to be an important contributor to trophic subsidies along the

Pacific coast of North America (Zuercher and Galloway 2019) as each female inhabiting the reef is capable of releasing between 18,000 to 2.7 million larvae per spawning event (Love *et al.* 2002).

A comparison of naturally occurring rocky reefs throughout the SCB revealed that 58% are considered to be either degraded or severely degraded (17% are degraded and 41% are severely degraded) (Pondella 2008). The three rocky reefs closest to the Study Area, 3 Palms, White's Point, and Pt. Fermin, are all severely degraded (Pondella 2008). Major sources of current and predicted reef degradation were identified as overfishing, sedimentation, and turbidity (Pondella 2008). Also, with increased storms and runoff projected from Global Climate Change, sedimentation is likely to increase off the coast adding to increases in turbidity that will further degrade rocky reef habitat.

Rocky reefs provide habitat for attached algae and small invertebrate species, such as California Mussels (*Mytilus californianus*), that support a wide variety of commercially and recreationally valuable invertebrates and fishes. Species composition varies with water depth and the physical structure of the reef. Rocky reef habitats within the proposed Project Area are primarily found on riprap and shoreline armoring associated with port and THUMS oil island infrastructure and a "riprap community" composed of invertebrates that live on riprap, pilings, and concrete, or among riprap organisms can be observed on this rocky reef habitat. While the breakwaters outside of the Port Complex serve as a large rocky reefs, there is likely a lack of general connectivity between the breakwater and the nearshore waters of the ESPB as adults of marine species associated with the breakwater are expected to have high site fidelity and not travel great distances away from the breakwater.

Additionally, breakwaters were designed to limit wave activity within the San Pedro Bay and to shelter the harbors of Los Angeles and Long Beach, not to provide complex rocky reef habitat for fishes and invertebrates. As a result, the breakwaters' linear design is similar to that of a wall and lacks the key features that result in complex and highly productive rocky reefs found along the southern California coastline such as varying void sizes (for a variety of fishes of different sizes), variation in verticality, sandy areas between the bases of rocks that create edges (edge effects are important for breaking up habitat and for creating transitional zones within and between reefs), etc. As breakwaters are linear structures with tightly interlocked stones (with small void spaces) that rises from the seabed to above the surface of the water, they lack the features associated with complex and highly productive rocky reefs described above. Based on this significant lack of complexity, the currently existing breakwaters have reduced biological value when compared to the naturally occurring rocky reefs.

Oyster Beds. Oysters have gained recent attention in southern California due in part to the historic decline and virtual extirpation of naturally occurring oyster beds throughout California, the complexity of oyster reef habitat, and the potential for shoreline protection and water quality improvements via oyster reef restoration/creation.

Historically, oyster beds composed of Olympia Oysters (*Ostrea lurida*) were likely not widely distributed within the Study Area prior to the dredging and filling of the Los Angeles and San Gabriel river estuaries to create port, harbor, and marina infrastructure due to lack of an abundance of natural, hard substrates in the Study Area. However, records of fossils and contemporary samples collected from within the Study Area on Deadman's Island and within and adjacent to San Pedro are listed in numerous museum collections such as the Global Biodiversity Information Facility (www.gbif.org). Currently, native and non-native oysters are limited to shoreline hard substrates associated with coastal armoring and infrastructure, including the Los Angeles River channel.

There are no known "oyster reefs" in the proposed Project Area. In the general Study Area, non-native oysters occur in a few locations in the Port Complex. In addition, an oyster restoration project is ongoing in Alamitos Bay at Jack Dunster Marine Biological Reserve.

For restoration purposes, shell hash is used to create oyster beds. Shell hash is generally obtained from commercial sources.

Water Column Habitats

Plankton. "Plankton" refers to small organisms incapable of resisting currents within the water column, including fish eggs and larvae (*ichthyoplankton*), and small, free-floating photosynthetic organisms including algae (*phytoplankton*) along with animals (*zooplankton*). Ichthyoplankton were surveyed in the project area in November 1990 and February 1991. More plankton species on average occurred in the coastal ocean waters of San Pedro Bay than in Queensway Bay at the mouth of the Los Angeles River. The most abundant larval taxa were gobies (Gobiidae), Northern Anchovy, and White Croaker, and all three were more abundant in the water column than near the seafloor. Gobies were most abundant in Queensway Bay, but Northern Anchovy and White Croaker were more abundant in San Pedro Bay than in Queensway Bay.

Pelagic Fishes (inhabiting the upper layer of the water column). The general Study Area consists of habitat for more than 130 species of juvenile and adult fishes. Several species, however, have dominated fish populations in the harbors: White Croaker, Northern Anchovy, Queenfish (*Seriphus politus*), Pacific Sardine (*Sardinops sagax*), and Topsmelt (*Atherinops affinis*) (Brewer 1983; MEC and Associates 2002; SAIC 2010; MBC 2016). Juvenile and adult individuals of most species are usually more abundant during the spring and summer than in winter (Horn and Allen 1981); however, pelagic fishes in 2008 were most abundant in winter (SAIC 2010). The general study area also provides habitat for recreationally important species such as California Halibut, Barred Sand Bass, and Pacific Barracuda (*Sphyraena argentea*).

Water-Associated Bird Habitat

Water-associated birds use the habitats within the proposed Project Area as both residents and as seasonal visitors. The Study Area is in an area recognized as an Important Bird Area for pelagic species of the Pacific Flyway (Audubon 2020a) and the remaining scarce EFH within the San Pedro Bay provides resting and over-wintering stops for birds along the Pacific Flyway (Audubon 2020b). Four survey zones were analyzed in (and adjacent to) the proposed Project Area: Long Beach outer harbor, Middle Breakwater, East Pier J, and the Maersk Terminal (Pier 400, Port of Los Angeles). A total of 40 water-associated bird species (and six upland species) were observed in these four zones)(MBC 2016). California Brown Pelican (*Pelecanus occidentalis californiensis*) and cormorant species were much more abundant in the breakwater zone than in the outer harbor or east of Queen's Gate. With the exception of the Western Grebe (*Aechmorphorus occidentalis*), the top six species presented in Table 3-4 along with the Black Oystercatcher (*Haematopus bachmani*) were observed in the proposed Project Area year-round, while all other species were only observed for part of the year. Black Oystercatchers are known to nest historically on the San Pedro and Middle Breakwaters, but no nesting was observed in 2013–2014.

Table 3-4: Ten Most Abundant Water-Associated Bird Species in the Project Area (2013-2014) ranked from most abundant to least abundant

Common Name	Scientific Name	Long Beach Outer Harbor	Middle Breakwater	East Pier J	Maersk Terminal
Western Gull	*Larus occidentalis*	253	523	337	206
California Brown Pelican	*Pelecanus occidentalis californiensis*	83	595	69	58
Double-crested Cormorant	*Phalacrocorax auritus*	8	627	49	38

Common Name	Scientific Name	Long Beach Outer Harbor	Middle Breakwater	East Pier J	Maersk Terminal
Brandt's Cormorant	*Phalacrocorax penicillatus*	72	607	7	1
Western Grebe	*Aechmophorus occidentalis*	45	42	334	153
Heermann's Gull	*Larus heermanni*	101	185	131	71
Elegant Tern	*Thalasseus elegans*	106	94	196	89
California Gull	*Larus californicus*	52	31	148	105
Black Oystercatcher	*Haematopus bachmani*	1	68	6	4
Great Blue Heron	*Ardea herodias*	1	5	13	33
Remaining Species		25	156	84	48
Total Number of Birds Observed in 2013-2014		**747**	**2,933**	**1,374**	**806**
Source: MBC 2016					

3.7 BIOLOGICAL RESOURCES: SPECIAL-STATUS SPECIES

3.7.1 Federal and State Listed Bird Species

Two federally listed threatened or endangered bird species and one state listed bird species have historically been observed or have the potential to occur in the proposed Project Area (Table 3-5). No designated or proposed critical habitat occurs within the proposed Project Area.

Table 3-5: Threatened and Endangered Bird Species that have Potential to Occur in the Proposed Project Area

Common Name	Scientific Name	Federal Status	State Status	Comments
California Least Tern	*Sternula antillarum browni*	E	E	Breeds in the Port of Los Angeles at Pier 400 from approximately April through September; the Port nest site is approximately 3 miles west of the proposed Project Area. One individual was observed at the Maersk Terminal in July 2014. The species is considered to be infrequent visitor to the proposed Project Area.
Western Snowy Plover	*Charadrius alexandrinus nivosus*	T	--	Infrequent or transient migratory visitor to the San Pedro Bay; occasionally observed at Pier 400, Point Fermin, and outer Cabrillo Beach. No observations of the species were made during 2007–2008 or 2013–2014 surveys.
Belding's Savannah Sparrow	*Passerculus sandwichensis beldingi*	--	E	Inhabits pickleweed marsh exclusively. No individuals were observed in 2007–2008 or 2013–2014. Only suitable habitat is located on Golden Shore Marine Reserve. This species is not present in the proposed Project Area.
Note: E = Endangered, T = Threatened Source: California Department of Fish and Wildlife 2018; MBC 2016				

There are multiple bird species that are not listed by the state or Federal governments as threatened or endangered, but have special status designated by either the California Department of Fish and Wildlife (CDFW) (state) or U.S. Fish and Wildlife Service (USFWS) (Federal) (Table 3-6; CDFW 2018).

Special status species designations include the following:

- CDFW Species of Special Concern: Vertebrates with declining population levels, limited ranges, and/or continuing threats make them vulnerable to extinction.
- CDFW Watch List: Birds that are: (1) not on the Bird Species of Special Concern list, but were on previous lists, and have not been listed under the Federal Endangered Species Act (ESA); (2)

were previously state or federally listed, and now are on neither list; or (3) are on the list of Fully Protected Species.

- CDFW Fully Protected: This was the state's initial effort to identify and protect animals that were rare or faced possible extinction. Most of the animals on the Fully Protected list were subsequently listed under state and/or Federal ESAs. It is unlawful to take these species except with an authorization for necessary scientific research.
- USFWS BBC: BCC are those identified by USFWS that represent the highest conservation priorities. The designation is meant to draw attention to species in need of conservation action.

Table 3-6: Special-Status Bird Species that have Potential to Occur in the proposed Project Area

Common Name	Scientific Name	Status	Comments
Black Oystercatcher	*Haematopus bachmani*	USFWS – BCC	Nested in Port Complex in 2007 –2008, but nesting not observed in 2013–2014; Observed in all four zones near proposed Project Area in 2013–2014. Common on Middle Breakwater.
Black Skimmer	*Rynchops niger*	CDFW – SSC, USFWS – BCC	Seen in three of the four zones near the proposed Project Area in 2013–2014. Uncommon.
Brant	*Branta bernicla*	CDFW – SSC	No observations in four zones near the proposed Project Area in 2013–2014.
Burrowing Owl	*Athene cunicularia*	CDFW – SSC, USFWS – BCC	Observed at Pier 400 in 2007–2008; nesting status within the Port Complex is unknown.
California Brown Pelican	*Pelecanus occidentalis californiensis*	CDFW – FP	Abundant throughout the Port Complex.
Caspian Tern	*Sternula caspia*	USFWS – BCC	Nested at Pier 400 in 2011 and 2012. No observations in four zones near the proposed Project Area in 2013–2014.
Common Loon	*Gavia immer*	CDFW – SSC	Seen in one zone near the proposed Project Area in 2013–2014. Uncommon.
Double-crested Cormorant	*Phalacrocorax auritus*	CDFW – Watch List	Nested in transmission towers in Long Beach Harbor in 2013–2014; among the most abundant birds in the Harbor.
Elegant Tern	*Thalasseus elegans*	CDFW – Watch List	Nested at Pier 400 in 1998–2005 and 2012; abundant, forages over water near nests.
Loggerhead Shrike	*Lanius ludovicianus*	CDFW – SSC, USFWS – BCC	Observed in inner harbor areas of Port Complex in 2001–2002; no observations near the proposed Project Area in 2013–2014.
Long-billed Curlew	*Numenius americanus*	CDFW – Watch List, USFWS – BCC	No observations in four zones near the proposed Project Area in 2013–2014.
Merlin	*Falco columbarius*	CDFW – Watch List	One individual observed on riprap in Long Beach outer harbor in December 2007; No observations in four zones near the proposed Project Area in 2013–2014.
Osprey	*Pandion haliaetus*	CDFW – Watch List	Observed in three of the four zones near the proposed Project Area in 2013–2014. Uncommon.
Peregrine Falcon	*Falco peregrinus*	CDFW – FP USFWS – BCC	Nests on the Schuyler Heim and Gerald Desmond Bridges. One individual observed at the Maersk Terminal in November 2013.
Note: BCC = USFWS Bird of Conservation Concern; SSC = CDFW Species of Special Concern; FP = CDFW Fully Protected. Zones include the Long Beach Outer Harbor, Middle Breakwater, East Pier J, and the Maersk Terminal (Pier 400). Sources: SAIC 2010; Keane Biological Consulting 2009, 2010.			

Sensitive Shorebird Habitat. There are no known nesting areas for sensitive shorebirds in the proposed Project Area. Western Snowy Plover (*Charadrius alexandrinus nivosus*) and Belding's Savannah Sparrow (*Passerculus sandwichensis*) have been observed infrequently near the proposed Project Area, but these species are not known to nest or utilize habitat within the proposed Project Area for foraging or roosting. Belding's Savannah Sparrow could use pickleweed located at Golden Shore Marine Reserve, and Western Snowy Plover could use sandy beach habitat located along Belmont Shore. Long-billed Curlew could also use the sandy intertidal area for foraging; however, the species was not observed in the Port Complex during monthly surveys in 2013–2014 (MBC 2016).

3.7.2 Federal and State Listed Reptile Species

Sea Turtles. Several marine sea turtle species are distributed throughout the eastern Pacific and have the potential to be observed within the Study Area (Table 3-7). Although observations are possible based on species distributions, few species have been observed during more than 20 years of biological surveys (Table 3-7; MEC 1988; MEC and Associates 2002; SAIC 2010; MBC 2016) except for the Green Sea Turtle (*Chelonia mydas*). Green Sea Turtles are common within the Study Area and are primarily observed in the San Gabriel River, adjacent to Alamitos Bay within the proposed Project Area, and along the coast of the Palos Verdes Peninsula (Crear *et al.* 2017; Bredvik *et al.* 2019). Within the vicinity of the San Gabriel River, the Green Sea Turtle is likely attracted to the presence of warm water discharged by local power plants (AES Alamitos and Scattergood Generating Stations) (Crear *et al.* 2017). No designated or proposed critical habitat occurs in the proposed Project Area.

Table 3-7: Special Status Sea Turtle Species that have Potential to Occur in the proposed Project Area

Common Name	Scientific Name	Federal Status	State Status	Comments
Loggerhead Sea Turtle	*Caretta caretta*	E	--	North Pacific distinct population segment. Found in all temperate and tropical waters throughout the world and are the most abundant species of sea turtle found in U.S. coastal waters. This species has not been documented within the proposed Project Area.
Green Sea Turtle	*Chelonia mydas*	T	--	Small population uses the lower San Gabriel River and Seventh Street Basin in the Seal Beach National Wildlife Refuge as habitat and travels between the two areas primarily during winter months when water temperatures are below 15 degrees Celsius. They rarely are observed in the open ocean. This species has been observed monitored at various locations within the Study Area and proposed Project Area.
Leatherback Sea Turtle	*Dermochelys coriacea*	E	--	Found worldwide with the largest north and south range of all the sea turtle species. A deceased adult washed ashore at Seal Beach within the proposed Project Area the week of 23 October 2017 (although it is not clear whether the individual was alive within the proposed Project Area). The proposed Project Area is outside of the normal range for this species and it is considered to be uncommon.
Olive Ridley Sea Turtle	*Lepidochelys olivacea*	T	--	Found in tropical regions of the Pacific, Indian, and Atlantic oceans. This species has not been documented within the proposed Project Area.
Note: E = Endangered, T = Threatened Designations from California Department of Fish and Wildlife 2018. Sources: National Marine Fisheries Service 2011; Crear *et al.* 2016				

3.7.3 Federal and State Listed Mammal Species

Marine Mammals. All marine mammals are protected under the MMPA , and some are also protected by the ESA of 1973 (Table 3-8). Marine mammal species may forage in the general Study Area but do not breed there. California Sea Lions (*Zalophus californianus*) have been observed near the proposed Project Area, while Harbor Seals (*Phoca vitulina*) are limited to outer harbor waters. Neither of these pinniped species is endangered, and there are no designated Significant Ecological Areas (SEAs) for either species within the general Study Area. Several species of dolphin and porpoise are commonly found in coastal areas near Los Angeles. Bottlenose and Common Dolphin were observed during the 2013–2014 Port-wide surveys; most observations were in the Los Angeles and Long Beach outer harbors (MBC 2016). Bottlenose Dolphins were observed in groups of three to five individuals throughout the survey year, whereas Common Dolphins were only observed in a single group (of 40 individuals) in the Main Channel of Los Angeles Harbor. Recurrent sightings of juvenile Grey Whales (*Eschrichtius robustus*) over recent years within the Study Area have been documented in Los Angeles Harbor in the vicinity of the Cabrillo Pier where individuals were hypothesized to be feeding (Daily Breeze 2018; KNBC 2019). The proposed Project Area is outside of the normal migration paths for the whale species listed in Table 3-8; however, many species including Humpback Whales (*Megaptera novaeangliae*) and Blue Whales (*Balaenoptera musculus*) are commonly observed migrating through the San Pedro Channel that is located adjacent to the Study Area and proposed Project Area (Table 3-8). There is no designated or proposed critical habitat in the proposed Project Area.

Table 3-8: Marine Mammals Potentially Occurring in the in or adjacent to Study Area and proposed Project Area

Common Name	Scientific Name	Federal Status	State Status	Comments
Guadalupe Fur Seal	*Arctocephalus townsendi*	T	T	Occasional visitor to southern California.
Stellar Sea Lion	*Eumetopias jubatus*	T	-	Once common in southern California, now rare.
Southern Sea Otter	*Enhydra lutris nereis*	T	-	The USFWS stopped enforcing the no-otter zone in 2011. Observations of sea otters in southern California have been increasing since, including reports of otters at Palos Verdes and in Huntington Harbor.
Grey Whale	*Eschrichtius robustus*	-	-	Migrate through Southern California twice per year. Individuals have been observed in the Los Angeles Harbor.
Sei Whale	*Balaenoptera borealis*	E	-	Offshore species that is rare in California.
Blue Whale	*Balaenoptera musculus*	E	-	Abundance in southern California has increased, likely due to the increased use of feeding areas and not due to population increases. Observations include feeding individuals offshore of Palos Verdes and at multiple locations in Orange County.
Fin Whale	*Balaenoptera physalus*	E	-	Abundance has increased in California coastal waters.
Humpback Whale	*Megaptera novaeangliae*	E	-	Occasional visitor to southern California.

Common Name	Scientific Name	Federal Status	State Status	Comments
Northern Pacific Right Whale	*Eubalaena japonica*	E	-	Only 12 sightings in California since 1950.
Sperm Whale	*Physeter macrocephalus*	E	-	Occasional visitor to southern California.
Note: E = Endangered; T = Threatened. Sources: Bonnell and Dailey 1993; SAIC 2010; Los Angeles Times 2011; Bay (pers. comm. 2012); Carretta *et al.* 2013; Orange County Register 2013; NOAA 2013; and Chris L. Chabot (pers. obs. 2016 and 2019)				

3.7.4 Federal and State Listed Invertebrate Species

Abalone. Several species of abalone have been historically observed within or adjacent to the Study Area or are the focus of active abalone restoration programs including the White Abalone (*Haliotis sorensini*), Black Abalone (*Haliotis cracherodii*), Pink Abalone (*Haliotis corrugata*), Pinto Abalone (*Haliotis kamtschatkana*), Red Abalone (*Haliotis rufescens*), and Green Abalone (*Haliotis fulgens*). Adjacent to the Study Area, two abalone restoration projects are currently underway including the multiagency (Federal, State, and local) White Abalone Restoration Consortium (WARC) and the Southern California Green Abalone Restoration Project. The WARC has begun releasing captive-bred White Abalone back into the SCB including within the vicinity of the Study Area (NOAA 2019). A single White Abalone (not associated with the WARC efforts) was reported in Los Angeles Harbor during the 2018 biological baseline survey (Luedy, personal communication, 2019). White abalone are listed as endangered under the ESA. Additional restoration efforts by the Southern California Green Abalone Restoration Project are underway for Green Abalone and captive-bred Green Abalone are being released off the coast of the Palos Verdes Peninsula (The Bay Foundation 2020). Black Abalone, a federally endangered species, has not been observed during more than 20 years of baseline surveys with the Study Area. All abalone species, except for federally endangered White and Black Abalone, are considered Species of Concern by NMFS. No designated or proposed critical habitat is in the proposed Project Area.

3.8 BIOLOGICAL RESOURCES: SIGNIFICANT ECOLOGICAL AREAS

The County of Los Angeles has established SEAs to preserve a variety of biological communities for public education, research, and other non-disruptive outdoor uses. The closest designated SEA, and the only SEA located in the general Study Area, is the Terminal Island SEA, which is limited to the Pier 400 California least tern nesting site (County of Los Angeles 1980 and 2015). There are no designated Marine Protected Areas within the proposed Project Area.

3.9 BIOLOGICAL RESOURCES: ESSENTIAL FISH HABITAT

The proposed Project Area is located in an area with habitat designated as EFH (*i.e.*, those waters and substrates necessary to fish for spawning, breeding, feeding, and growth to maturity) for federally managed species. Water column, wetlands, estuaries, eelgrass, rocky reef, and kelp reefs in the SCB and San Pedro Bay are all recognized as important EFH and several habitats are also recognized as HAPC by NMFS (NOAA 2020b; NOAA 2020d). EFH is key to several of NMFS's Federal Fishery Management Plans (FMPs) defined by Federal law that establish the authority for the management of fisheries in the EEZ as well as for interstate and international migratory species (NOAA 2020c). EFH are components of the goals and objectives of the 2016-2020 NOAA Fisheries Habitat Enterprise Strategic Plan that is used to help prioritize Agency habitat conservation activities around the Nation (NOAA 2016a). Of particular importance to the Study Area and proposed Project Area are the Groundfish, Coastal Pelagic Species, and Highly Migratory Species FMPs as four (4) coastal pelagic and more than 20 groundfish species managed under these plans are commonly found within the area (Robbins 2006) (Table 3-9).

Table 3-9: Federally managed fish species known to occur within the Study Area and proposed Project Area

					EFH				
Common Name	**Species Name**	**WC**	**EST**	**EG**	**SI**	**RI**	**SS**	**RR**	**KR**
Rockfish and Allies									
Black Rockfish	*Sebastes melanops*	L	J,A	J		J	J	J,A	J,A
Blue Rockfish	*Sebastes mystinus*	L						J	J,A
Bocaccio	***Sebastes paucipinis***	L,J,A					J,A	J,A	L,J,A
Brown Rockfish	***Sebastes auriculatus***	L	J,A	J,A				A	A
Cabezon	*Scorpaenichthys marmoratus*		J,A	A		J,A	X	J,A	J,A
Calico Rockfish	***Sebastes dalli***	L					J,A	J,A	
California Scorpionfish	***Scorpaena guttata***	E				A	A	A	J,A
Chilipepper	*Sebastes goodei*	L					X	J	L,J
Grass Rockfish	*Sebastes rastrelliger*					J		J	J,A
Halfbanded Rockfish	*Sebastes semicinctus*	L					J	J	
Kelp Greenling	*Hexagrammos decagrammus*		J,A			A		A	A
Kelp Rockfish	*Sebastes atrovirens*					J		J,A	J,A
Olive Rockfish	*Sebastes serranoides*	L	J	X		J,A		J,A	J,A
Stripetail Rockfish	***Sebastes saxicola***	L					J,A	X	J,A
Treefish	*Sebastes serriceps*							J,A	J
Vermilion Rockfish	***Sebastes miniatus***	L,A					J	J,A	L,A
Flatfishes									
California Halibut	***Paralichthys californicus***	J		X	J,A				
Curlfin Sole	***Pleuronichthys decurrens***	E					X		
Dover Sole	*Microstomus pacificus*	E							
English Sole	***Pleuronectes vetulus***		J,A	J,A	J,A		X		
Pacific Sanddab	*Citharichthys sordidus*		J,A				X		A
Rex Sole	*Errex zachirus*		J,A				X		
Sand Sole	*Psettichthys melanosticus*		J				A		
Starry flounder	*Platichthys stellatus*		X				X		
Carangids, Scombrids, Engraulids, and Clupeids									
Jack Mackerel	***Trachurus symmetricus***	J						J	J
Northern Anchovy	***Engraulis mordax***	X	L,J,A	X			X	L,J,A	
Pacific Mackerel	***Scomber japonicus***	X	J	X			X	X	J

Pacific Sardine	***Sardinops sagax***	X	X						
Elasmobranchs									
Leopard shark	***Triakis semifasciata***		X	X	J,A	X	J,A	X	X
Spiny Dogfish	*Squalus acanthias*		J,A		X		X	X	
Big Skate	***Raja binoculata***						X	X	
California Skate	***Raja inornata***		X	X			X		

WC = Water Column, EST = Estuarine, EG = Eelgrass, SI = Sandy Intertidal, RI = Rocky Intertidal, SS = Soft Subtidal, RR = Rocky Reef, KR = Kelp Reef; E = Eggs, L = Larvae, J = Juvenile, A = Adult, X = Present but life-history stage not recorded
Bolded species are commonly observed in both the Study and Project Areas.
Sources: Robbins 2006; MBC 2016; and Mike Franklin (California State University, Northridge) pers. comm.

The FMP for U.S. West Coast Fisheries for Highly Migratory Species includes important species of tunas, billfish, and sharks. The management plan is designed to minimize adverse effects on EFH for all life stages of each species, including early and juvenile stages, and adults. For most species, EFH is located offshore, beyond the 100-fathom isobaths, and therefore is outside the proposed Project Area. However, for certain species, EFH includes coastal waters that could include the proposed Project Area. Juvenile and adults of Dorado or Dolphinfish (*Coryphaena hippurus*) and Common Thresher Shark (*Alopias vulpinus*) could occur within the proposed Project Area; however, there are no records of their catch in scientific studies within the proposed Project Area in the last 40 years and these species are highly unlikely to occur.

In 2005, krill (Euphausiids) were added as a managed unit under the Coastal Pelagic Species FMP, and their harvest is prohibited in U.S. waters (Pacific Fishery Management Council [PFMC] 2011a). This is intended to ensure that, to the extent practicable, fisheries will not develop that could put krill stocks at risk and impact other marine resources that depend on krill. EFH for krill varies by species, but the waters of the Port Complex are considered EFH. Due to their small size, krill are not typically identified during biological surveys within the Ports.

In 2010, Jacksmelt (*Atherinopsis californiensis*) and Pacific Herring (*Clupea pallasii pallasii*) were added as “Ecosystem Component Species” to the Coastal Pelagics FMP (PFMC 2011a). The Study Area is near the southern extent for Pacific Herring (Miller and Lea 1972). In 2014, Jacksmelt were most abundant in Los Angeles Harbor (in shallow-water mitigation areas, near the Vincent Thomas Bridge, and in West Basin) (MBC and Merkel 2016).

3.10 BIOLOGICAL RESOURCES: INVASIVE SPECIES

Non-native species can become invasive, competing with or preying upon indigenous species, thereby altering the local ecology. This may cause economic impacts as well. Invasive species in the general Study Area include the Japanese brown alga (*Sargassum muticum*), New Zealand bubble snail (*Philine auriformis*), Japanese mussel (*Musculista senhousia*), a burrowing isopod (*Sphaeroma quoyanum*), and Yellowfin Goby (*Acanthogobius flavimanus*). Another species of *Sargassum* (*S. horneri*) was discovered in Long Beach Harbor during annual subtidal surveys in 2003.

The primary sources of invasive organisms are believed to be hull fouling (organisms that grow on the exterior surfaces of ships) and the discharge of ballast water from cargo vessels (California Department of Fish and Wildlife (CDFW) 2008). Other potential sources include fisheries, natural dispersal, aquatic plant shipments, discarded seafood, pet releases, discarded bait, aquaculture escape, biocontrol, cargo, scientific escape, and habitat restoration (CDFW 2008).

Among the hundreds of species collected in 2013–2014, 27 were classified as non-native, and the origin of another 107 could not be determined (MBC 2016). These included 8 non-native infaunal species, 8 epibenthic species, 18 riprap (hard-substrate) species, 3 algae, and 2 introduced fish species (Yellowfin Goby and Chameleon Goby (*Tridentiger trigonocephalus*)).

The aquarium strain of *Caulerpa* (*Caulerpa taxifolia*) is an invasive algal species that has infested more than 30,000 acres in the Mediterranean Sea and is listed as a Federal noxious weed under the U.S. Plant Protection Act. In September 2001, AB 1334 was enacted by the State of California banning the transport, sale, and possession of nine potentially invasive species of *Caulerpa*, including *C. taxifolia*. *Caulerpa taxifolia* was found in two southern California locations in 2000. This species has never been identified in the Study Area but is of particular concern because it is a fast-growing green alga native to tropical waters, where it typically grows in isolated patches. Additionally, another species of *Caulerpa, C. prolifera*, was observed approximately 15 miles to the south in Newport Bay in March 2021 (https://wildlife.ca.gov/News/invasive-seaweed-found-in-newport-bay1). Due to its potential to create severe ecological and economic losses, a *Caulerpa* survey must be completed in accordance with the *Caulerpa* Control Protocol (https://media.fisheries.noaa.gov/2021-12/caulerpa-control-protocol-v5.pdf) prior to specific underwater disturbances (such as bulkhead repair, dredging, and placement of navigational aids).

3.11 CULTURAL RESOURCES

Cultural resources are locations of past human activities on the landscape. The term generally includes any material remains that are at least 50 years old and are of archaeological or historical interest. Examples include archaeological sites such as lithic scatters, villages, procurement areas, resource extractions sites, rock shelters, rock art, shell middens; and historic era sites such as trash scatters, homesteads, shipwrecks, railroads, ranches, and any structures that are over 50 years old. Under the National Historic Preservation Act (NHPA), federal agencies must consider the effects of federal undertakings on cultural resources that are listed in or eligible for listing in the National Register of Historic Places (National Register or NRHP). Cultural resources that are listed in or eligible for listing in the National Register are referred to as historic properties.

3.11.1 Area of Potential Effects

The APE is the geographical area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties (36 CFR § 800.16). In June of 2018, in the early stages of the Study, the USACE, in consultation with the State Historic Preservation Officer (SHPO), defined the APE as the proposed Project Area as shown in Figure 1-1-3. The proposed Project Area includes the entire ESPB from the Long Beach shoreline to offshore of the Middle Breakwater. At the time that the APE was determined, the entire proposed Project Area was being considered for habitat enhancement features. In July of 2021, the SHPO requested that the USACE scale down the APE to more accurately reflect the limits of possible disturbance associated with the Recommended Plan. In response, , the USACE redefined the APE as the staging area, the Surfside/Sunset Borrow site, and the 900-acre polygon that envelopes the Recommended Plan's project features (Figure 3-6).

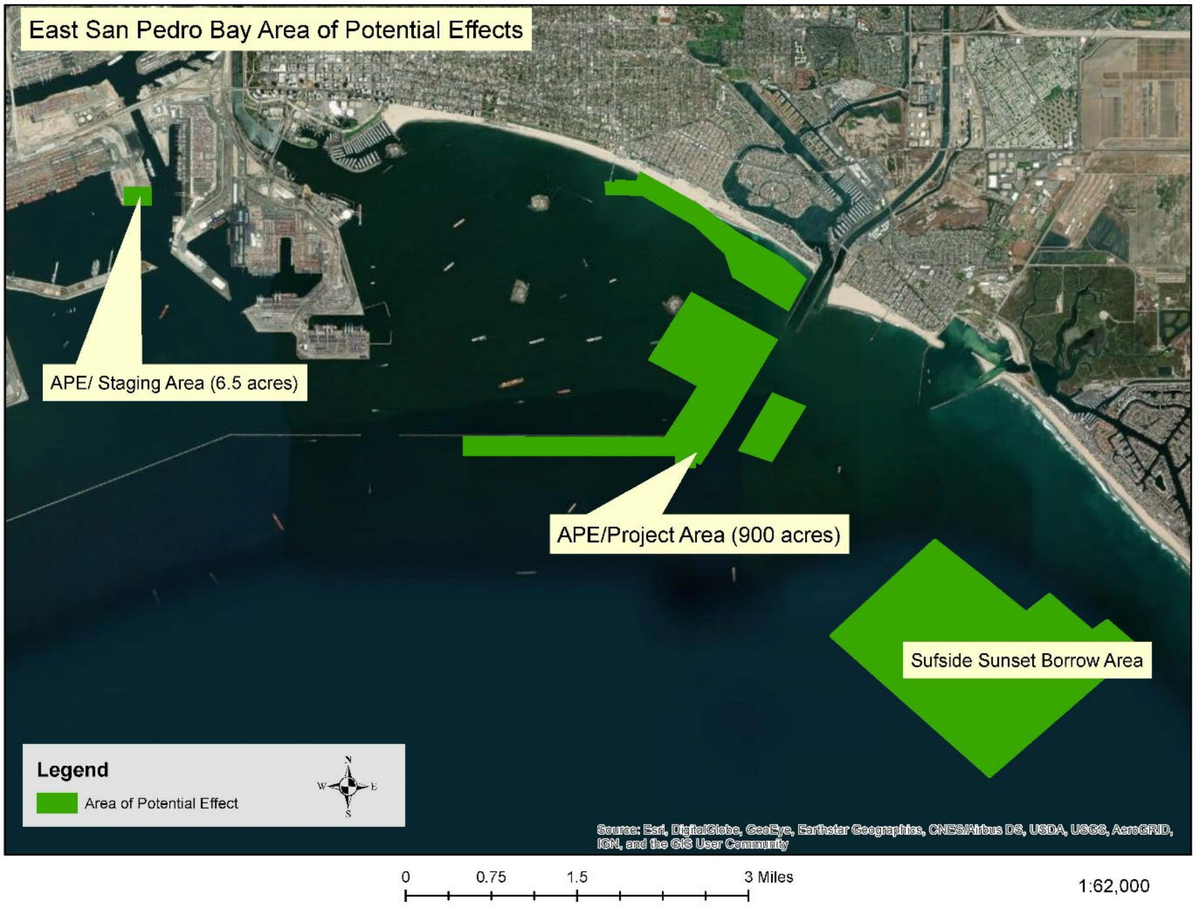


Figure 3-6: Area of Potential Effects within the ESPB Study Area

3.11.2 Cultural Resources Known Within the Study Area

A records search of the proposed Project Area with a one-mile buffer was requested from South Central Coastal Information Center (SCCIC) to determine if there are historic properties within the proposed Project Area. A total of 259 cultural resources have been recorded within a one-mile buffer of the proposed Project Area. The majority are historic buildings with only 13 prehistoric cultural resources. Of these 259 resources, 12 cultural resources are located within the proposed Project Area, including five buildings (Long Beach Harbor Light, one restaurant, three apartment buildings), one historic district and a set of utilities (Naval Weapons Station Seal Beach), one ocean liner (Queen Mary), one airplane (Hughes Flying Boat/The Spruce Goose), and three structures (Shoreline Looff Carousel, Long Beach Breakwater, and Middle Breakwater).

Hughes Flying Boat/the Spruce Goose was recorded within the proposed Project Area; however, it has since been moved out of the area; therefore, this resource will not be discussed further. Additionally, the group of Naval Weapons Station Seal Beach Morale, Welfare, and Recreation buildings were recorded but are not over fifty years old and do not qualify for listing on the NRHP; therefore, this resource was not counted in the total.

Two of the 12 cultural resources are listed on the NRHP. The remaining cultural resources have been recommended or determined not eligible for listing on the NRHP.

The Queen Mary is listed on the NRHP and qualified under Criterion A as significant in the area of recreation and social history as the last example of a North Atlantic passenger liner from the 1930s. It is also important in its role in WWII as a troop ship. It is located in the western portion of the proposed Project Area.

The Long Beach Village Riviera is a 15-story apartment building listed on the NRHP under Criterion C as an outstanding example of a Châteauesque-style luxury apartment building. It was designed by Richard King and completed in 1929. It is located in the northwestern portion of the proposed Project Area.

The Naval Weapons Station Seal Beach Historic District encompasses the entire base. The Historic District was listed in the NHRP under Criterion A as being associated with the development of the U.S. Navy on the west coast during WWII; under Criterion C for its architectural design related to the magazine development areas; and under Criterion D for its ability to yield data relating to building styles, military development of ammunition depots, and the role of the West Coast in the Pacific Theater. After completion of a statewide context for WWII ammunition depots in 2000, the Navy provided a framework that established that the Historic District was not exceptional when comparted to similar facilities. The district was determined ineligible for the NRHP in 2003 (Ambacher 2007).

The Naval Weapons Station Seal Beach utility structures were built in 1945. They house above ground and underground utilities. The structures were recommended not eligible for the NRHP (Crawford 1992).

The restaurant/commercial building at 880 S. Harbor Scenic Drive was built circa 1958. It has been altered extensively with added sections and removed sections. This building is not associated with persons or events of significance and does not have a distinctive architectural style. It was recommended not eligible for the NRHP (Crawford 2012).

The apartment building at 635 East Ocean Boulevard was built in 1941. The apartment building at 645 East Ocean Boulevard was built in 1910. Alterations to both these buildings have significantly compromised their integrity. These buildings are not associated with persons or events of significance and do not have a distinctive architectural style. Both were recommended not eligible for the NRHP (Tibbet 2005a, 2005b).

The Shoreline Looff Carousel is a hand-carved carousel built by Charles Looff in 1906. It operated in Seattle from 1907 to 1913, and then in San Francisco from 1914 to 1973. It was moved to Long Beach after 1973. Looff was instrumental in the development of amusement parks. As noted, the carousel is not original to the Long Beach area and was recommended not eligible for the NRHP by the State Historical Resources Commission in a letter dated March 23, 1984. It is a California point of interest (Elder 1984).

The Long Beach Harbor Light, the Long Beach Breakwater, and the Middle Breakwater have not been recorded with the SCCIC, but the USACE, in consultation with the SHPO, has determined that they are not eligible for inclusion in the NRHP. The SHPO has also concurred with the USACE determination that the San Pedro Breakwater is eligible under Criterion A for its association with the Free Harbor Fight that established Los Angeles maritime commerce free from railroad monopoly.

The local register of historic landmarks for the City was also reviewed. No listed landmarks are within the proposed Project Area; however, the Marine Stadium is close to the proposed Project Area and is sensitive to sea levels and tides. The Marine Stadium was built for the 1932 Olympics. The original Alamitos Bay estuary land was dredged to create the stadium in 1925 and extended in 1932 for the Olympics Rowing Events (City of Long Beach 1992). This resource has not been evaluated for listing on the NRHP.

Given the environmental setting and past dredging within the harbor for the navigation channels, the Surfside/Sunset borrow area, and the North Energy Island borrow pits, the proposed Project Area has been highly disturbed in the past. The record search did not list any underwater prehistoric resources or historic shipwrecks. A cultural resources report for the Los Angeles-Long Beach Harbor Areas by Weinman and Stickel (1978) indicated that shipwrecks are present in the harbor but have not been accurately recorded and documented. They list three shipwrecks as examples of what may be found underwater. Given past improvements to the harbor, such as dredging to deepen the channel and construction of artificial islands, the possibility of intact underwater historic and prehistoric cultural resources is considered low.

In addition to the above searches, the databases maintained by the NOAA and California State Land Commission (CSLC) were searched for known shipwrecks and obstructions. The CSLC lists 22 shipwrecks, but only one had information in their database. The NOAA (2017) database lists six obstructions. Although the location of most wrecks is ambiguous at best, the large number of wrecks thought to be in the general vicinity of the proposed Project Area and the number of wrecks and obstructions noted on the NOAA navigational charts suggests that there is some number of wrecks present within the proposed Project Area. Additional inventory would be necessary to determine the exact locations and eligibility of any particular wreck.

A sacred lands search was requested from the Native American Heritage Commission (NAHC). The NAHC indicated that the results were negative; however, the area is sensitive for cultural resources (Appendix K). The NAHC also provided a list of five tribal members who are culturally affiliated with the proposed Project Area and who may have specific knowledge of sacred lands. According to a technical synthesis report (*Underwater Archaeological Survey, Cabrillo Shallow Water Habitat Expansion Site Port of Los Angeles, California) prepared in 1999* by Macfarlane Archaeological Consultants, sea levels started falling about 30,000 years B.P. from levels near or slightly below modern levels. They may have reached a low approximately 400 feet below modern levels circa 18,000 B.P. This would have exposed several miles of the continental shelf and caused erosion of the exposed surface. Sea level drop reversed with the warming at the onset of the Holocene. The rise in sea levels probably slowed about 8,500 B.P. to a rate of 10-15 cm/100 years until it reached a standstill approximately 3,500 B.P. As the sea level rose, wave action and sedimentation would have reworked the coastline as it traveled inland. Submerged prehistoric sites, either resulting from occupation during periods of lower sea levels or as a result of direct deposition into the ocean, are known to exist along the California coast. These sites are commonly situated on relic submerged landforms. Within the proposed Project Area, these could include buried estuarine deposits and buried relict channel(s) associated with the ancestral Los Angeles and San Gabriel Rivers. However, the high-energy nature of the shoreline environment along the California coast makes preservation of intact submerged prehistoric cultural resources very unlikely except in specific locations that are somewhat protected by natural features. San Pedro Bay does have environmental features that could have preserved prehistoric cultural resources, but no submerged resources have been reported in or near the proposed Project Area. This indicates the likelihood of encountering such during the proposed project, particularly given the long history of disturbance and construction in and around the port, to be low. This assessment is supported by the results reported in the *Final Report, Marine Archaeological Survey Pier J and the Southeast Basin Expansion* prepared by Ocean Surveys, Inc. (1985), which determined that, while bathymetric and sub-bottom profiler records do indicate that there are both transgressive and regressive coastal sequences displaying stratigraphy present in the proposed Project Area, no discrete targets of probable cultural material or prehistoric coastal/riverine shoreline areas that would have been particularly favorable for habitation sites were identified. Thus, it is unlikely that any intact submerged prehistoric resources are extant in the proposed Project Area.

<u>Cultural Resources known within the APE</u>

In 2021, the USACE retained Merkel & Associates Inc. (M&A) to conduct a presence/absence survey for potential shipwrecks and/or historic features in the 900-acre portion of the APE (Appendix K). M&A conducted the survey using interferometric sidescan sonar (ISS) and a remotely operated vehicle (ROV). The interferometric sidescan sonar provided an acoustic backscatter image of the seafloor concurrent with collecting high-density swath bathymetric data. Following the sidescan survey, the survey team deployed an ROV to inspect some of the debris items.

While the survey identified 164 items on the sea floor only a small subset of these items was suggestive of a historic era resource. The overwhelming majority of the surface features appear to be general marine debris. Of the possible historic era features, M&A identified three shipwrecks and five features that were suggestive of a shipwreck but were either eroded or buried and could not be positively identified. Beyond the shipwrecks, M&A found evidence of 20 additional buried debris features. These buried debris features are problematic in that there is not enough surface manifestation to determine what the feature is; however, these debris features do not appear to be shipwrecks. Other features that were identified were manmade reefs that appear to be composed of pilings and rubble that has fallen off the long beach breakwater or one of the oil extraction platforms within ESPB.

3.12 AESTHETICS AND VISUAL RESOURCES

The significance of a change in visual character is influenced by social considerations, including public value placed on aesthetics; recognized or otherwise special views, vistas, or observation points; and general community concern for visual resources in an area. These social considerations are addressed as visual sensitivity and can be defined as the degree of public interest in a visual resource and the concern over potential changes in the quality of that resource. High visual sensitivity exists when the viewing public has a high expectation of scenic resources and / or aesthetic qualities and is expected to react strongly to a perceived adverse change in visual quality. Moderate visual sensitivity exists when changes to affected views would be perceived as being less critical or would result in visual characteristics similar to others in the region. Low visual sensitivity exists when the viewing public has a low expectation for visual quality, little or no concern for visual change, or when the affected area is very seldom viewed.

3.12.1 Aesthetics and Visual Character

The entire San Pedro Bay area has been subject to extensive industrial, commercial, residential, and port development since the late 1800s. This has resulted in significant changes to the visual character of the area. Once a large, undeveloped and biologically rich bay and estuary system with salt marshes and coastal wetland habitat, the visual character is now dominated largely by port and harbor oriented industrial uses, and commercial activities. There remains a wide sandy beach along the east side of the bay. Adjacent inland areas area highly developed; the built environment includes residential, commercial, and public buildings.

Four islands, named the THUMS Oil Islands, are located offshore within the proposed Project Area. These islands were designed by Disneyland architect Joseph Linesch and built in 1965. Each measures approximately 10 acres and were designed to disguise the industrial oil derricks and muffle production sounds with waterfalls, screens, extensive landscaping, blue-and-white towers, and colorful lights at night (Long Beach Marinas 2019). These islands are a distinct visual feature within ESPB and contribute to the aesthetics and visual character of the proposed Project Area.

Recreational activities also contribute to the aesthetics and visual character and include beach related activities along Long Beach and Seal Beach, the permanently moored Queen Mary ocean liner, small parks, as well as activities such as walking, cycling, swimming, boating and water-based activities. The

Mediterranean climate contributes to the scenic quality of this coastal area, while periods of heavy smog and air pollution can be a detraction. Other factors that diminish the scenic quality include the presence of trash and debris on the beaches and floating on the water, and diminished water quality. The lack of notable surf is due to the effect of the offshore breakwater structures.

3.12.2 Viewer Groups and Visual Sensitivity

The quality of any given visual experience depends on the visual resources and the viewer response to those resources. When characterizing viewers, the following factors are considered: the type of viewer group; the viewer exposure (their distance, location, number of people in group, and duration and frequency of view); and viewer sensitivity (viewer activity, expectations, awareness and values).

The viewer groups for the project area can be classified as follows: commercial and industrial harbor and port users; water-based recreationists; onshore and water-based recreationists; residents and vacationers; and persons traveling in vehicles on nearby streets.

Commercial and Industrial Harbor and Port Users (*e.g.*, large container ships). While highly cognizant of their visual surroundings, persons involved in commercial and industrial activities are primarily focused on safe transport, maneuvering, loading, and unloading, and much less on scenic quality. As such, they are not considered sensitive viewers for the purpose of this analysis.

Water-Based Recreationists (related to charter boats, marinas, sport fishing, scuba diving, whale watching, harbor touring, sailing, and water-skiing). These persons have views to the shore while on the water, as well as open water views from the beaches or marina areas. Recreationists are considered a highly sensitive viewer group because they typically have expectations for scenic quality and are often much more focused on the aesthetic quality of their surroundings than are commuters or people at work. Recreationists' focus is usually on their surroundings and their recreational activity. In addition, the recreation activity they are engaging in is usually enhanced by the surroundings. Long Beach and Seal Beach both have high visitation, particularly during late spring and summer months. Recreationists have direct and open views of the shoreline and open-water areas from the beach and nearby parks, and the quality of the view is considered high. Recreationists are generally highly sensitive to changes in the visual quality of an area.

Onshore and Near-Shore Recreationists (related to beach-related activities, parks, sightseeing, sunbathing, cycling, picnicking; and other visitor-serving attractions such as the Queen Mary, Shoreline Village, aquariums, fishing piers, hotels, and restaurants). These persons have views of other near-shore areas as well as open-water views from the beaches, piers, and marina areas. As recreationists, they are considered highly sensitive to the scenic quality of their surroundings, and any changes in visual quality.

Residents and Vacationers. Residents and visitors are considered highly sensitive viewers. Residents have frequent opportunities to experience the views from their homes, and view duration can be lengthy (lasting hours) or fleeting. Vacationers and short-term renters typically experience the same views, at least on a temporary basis, and the quality of their views is often a key factor in enjoying their vacation experience.

Drivers and Passengers Traveling in Vehicles. Drivers and passengers traveling on streets east of Long Beach and Seal Beach have open or intermittent views of ESPB, depending on location and intervening structures, vegetation, and other vehicles. Many locations along Shoreline Drive and Ocean Boulevard offer open foreground views of ESPB, with no intervening structures. For the purposes of this analysis, these viewers are considered to have a moderate to high viewer sensitivity. Sensitivity may be somewhat lower than residents and recreationists because views from the roadway are short-term and somewhat restricted by their vehicle, and because the driver's attention is primarily concentrated on safely maneuvering the roadway.

3.12.3 Visibility of Proposed Project Area

Specific views of the proposed Project Area, shown in representative photographs (Photographs 1 through6), are described below. Photo point locations are shown in Figure 3-7:

- **Photograph 1: View south/southeast from the Queen Mary.** The view south/southeast from the Queen Mary shows the ocean of San Pedro Bay in the foreground and large cargo ships in the background. The Long Beach Breakwater is not clearly visible.
- **Photograph 2: View south/southeast from Marina Green Park vicinity.** The view south/southeast from the Marina Green Park beach area shows Island Grissom and the ocean of San Pedro Bay in the foreground and Island White and Island Freeman, along with cargo ships, in the background.
- **Photograph 3: View southeast from Belmont Pier.** The view southeast from the Belmont Pier shows the beach and pier in the foreground, San Pedro Bay in the middle ground, and Island Chaffee and cargo ships in the background.
- **Photograph 4: View west from the Public Art Sculpture of "The Lone Sailor."** The view west from the "Lone Sailor" sculpture along Ocean Boulevard shows the beach and multiuse path in the foreground, San Pedro Bay in the middle-ground, and Long Beach Harbor, Queensway Bay, and Grissom Island in the background.
- **Photograph 5: View southwest from Alamitos Jetty.** The view southwest from the Alamitos Jetty shows the beach (with rock riprap erosion protection) and jetty in the foreground, San Pedro Bay and Island Chaffee in the middle-ground, and the Long Beach Harbor, cargo ships, and sailboats in the background.
- **Photograph 6: View south from Pier T Way.** The view south from Pier T Way shows the proposed staging area.

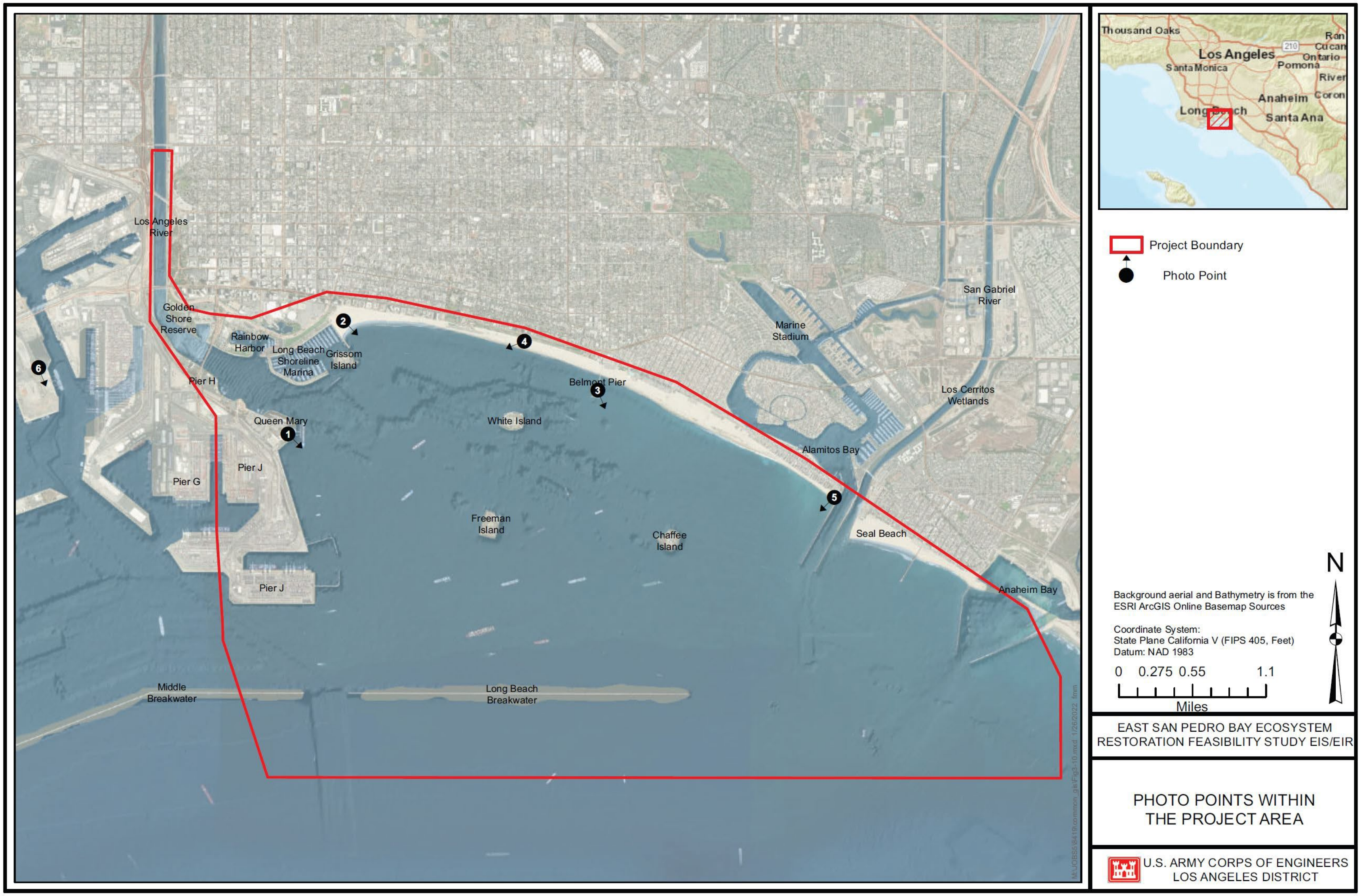


Figure 3-7: Photo Points within the Proposed Project Area

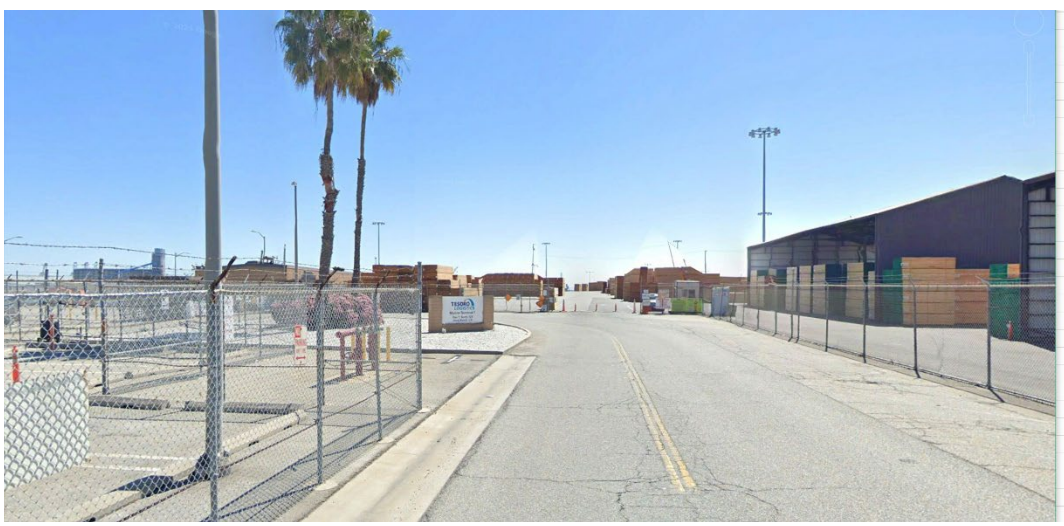
PHOTOGRAPH 1
View of Project Area Looking South/Southeast from Queensway Bay

PHOTOGRAPH 2
View of Project Area Looking South/Southeast from Marina Green Park Vicinity

PHOTOGRAPH 3
View of Project Area Looking Southeast from Belmont Pier

PHOTOGRAPH 4
View of Project Area Looking West from the Public Art Structure of "The Lone Sailor"

PHOTOGRAPH 5
View of Project Area Looking Southwest from Alamitos Jetty



PHOTOGRAPH 6

View south from Pier T Way

3.13 GROUND AND VESSEL TRAFFIC AND TRANSPORTATION

Highways and City Roadways. The roadway system in the proposed Project Area vicinity consists of a dense network of locally maintained surface streets plus freeways and other roadways that are managed and maintained by the California Department of Transportation (Caltrans). City streets in the proposed Project Area vicinity are managed by The Los Angeles Department of Transportation, which manages approximately 6,500 miles of city streets, and the City of Long Beach Public Works Engineering Bureau, which manages approximately 1,000 miles of City-owned streets. Locally maintained streets carry substantially less traffic than freeways and are managed and maintained by the agency in which they are located.

Freeways in the vicinity of the proposed Project Area generally have three to five lanes of travel in each direction and experience very high traffic volumes, particularly during peak commuting periods. Caltrans maintained facilities near the proposed Project Area includes interstate highways (Interstates 405, 605, and 710) and State Routes (1 and 22) (Figure 3-8). Annual average daily traffic volumes for these interstates and routes are shown in Table 3-10.

Table 3-10: Annual Average Daily Traffic for Freeways and Arterial Roadways in the Vicinity of the proposed Project Area Maintained by Caltrans

Route	2014 Annual Average Daily Traffic[a]
Interstate 405 (San Diego Freeway)	289,000
Interstate 605	132,000
Interstate 710	115,000
State Route 1 (Pacific Coast Highway)	38,000
State Route 22	66,000

Source: Caltrans 2014

[a] Average between interchanges or intersections near the proposed Project Area

Locally managed streets in the vicinity of the proposed Project Area include arterial, collector, and local roadways. Selected City roadways in the vicinity of the proposed Project Area with their average daily traffic volumes are presented in Table 3-11 below.

Table 3-11: Average Daily Traffic Volumes for Selected City Roadways in the Vicinity of the proposed Project Area

Roadway Segment	2014 Average Daily Traffic Volumes[a]
Ocean Boulevard between Shoreline Drive and Livingston Drive	29,800
Shoreline Drive (Alamitos Avenue) between Queens Way and Pacific Coast Highway	12,000
Second Street between Park Avenue and Studebaker Road	31,200
Redondo Avenue between Livingston Drive and Pacific Coast Highway	21,500
Santa Fe Avenue between Anaheim Street and Wardlow Road	16,000

Source: City of Long Beach 2014

[a] Total number of vehicles, both directions. Average for roadway segments near the proposed Project Area.

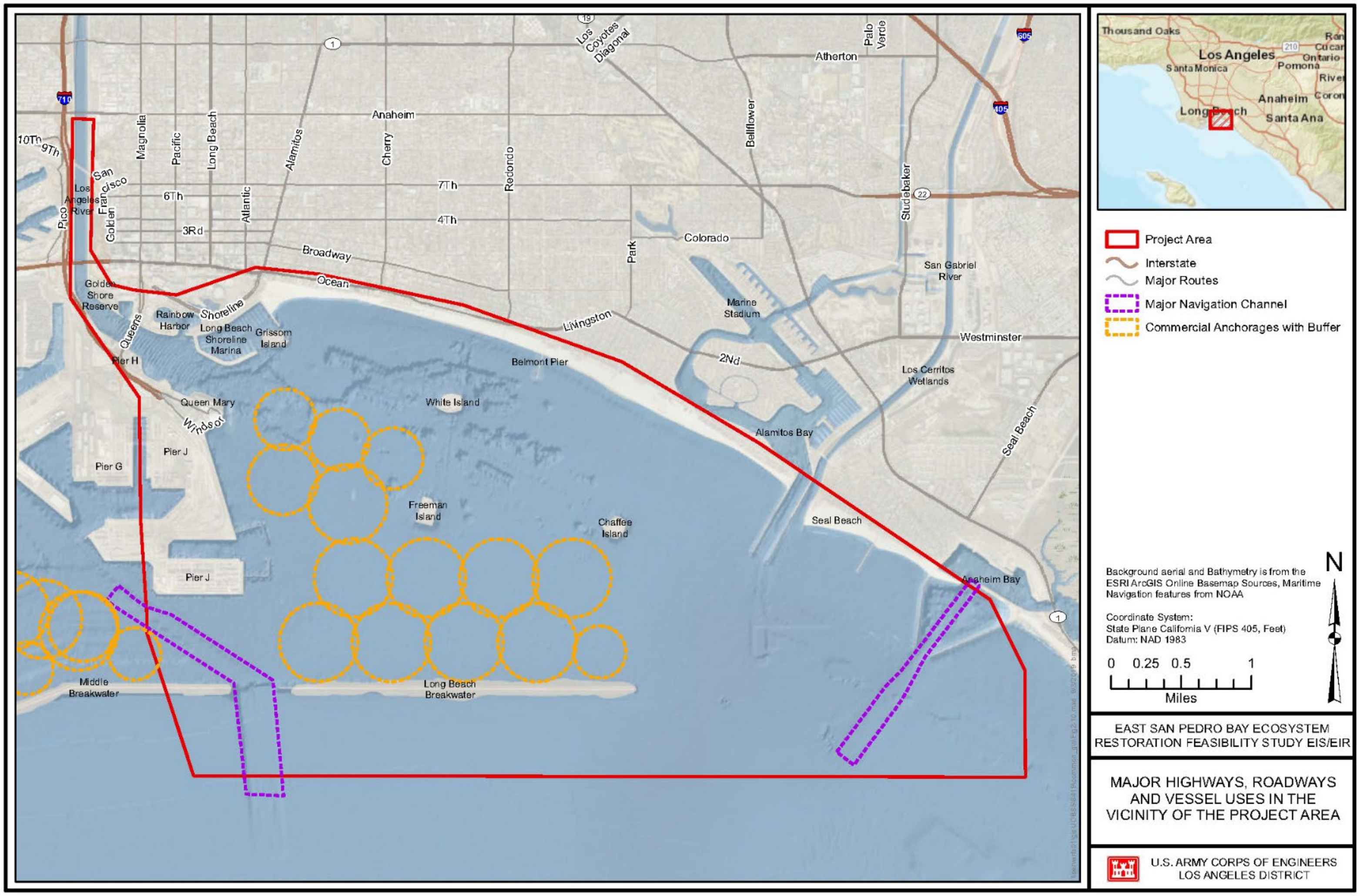


Figure 3-8: Major Highways, Roadways, and Vessel Uses in the Vicinity of the proposed Project Area

Traffic congestion is an ongoing issue throughout the Long Beach and Los Angeles area; however, due to constraints to roadway expansion, local and regional governments have shifted focus to utilizing existing roadways more efficiently. Measures to ease congestion include the addition of carpool lanes and synchronization of traffic signals. Focus has also shifted to alternative means of travel such as public transit and non-motorized transport, as well as encouraging land use development patterns where residents live close to public transit and job opportunities (City of Los Angeles 2014).

Public Transit. Long Beach Transit is the primary public transit provider in the vicinity of the proposed Project Area. Long Beach Transit has 34 bus routes and nearly 2,000 bus stops within the City. Routes also connect to the Long Beach Airport and the Metro light rail service to Los Angeles, El Segundo, and Norwalk, as well as connections to neighboring cities (Carson, Compton, Paramount, Bellflower, Artesia, Cerritos, Hawaiian Gardens, and Norwalk).

Heavy Rail Transit. The Los Angeles River corridor is a major rail transportation corridor. The major rail operators in the proposed Project Area are Union Pacific, Burlington Northern Santa Fe Railway (BNSF), Southern California Regional Rail Authority (Metrolink, regional commuter rail system), and Amtrak, which is a long-distance passenger train line. Union Pacific and BNSF operate freight services, while Metrolink and Amtrak provide passenger rail service over Union Pacific and BNSF tracks. Union Pacific carries goods for import and export and operates over 100 freight trains per day in the Los Angeles service area. BNSF rail lines in the Los Angeles area transport passengers and a variety of freight. The rail corridor is connected to the Port of Los Angeles and the Port of Long Beach, which is located in San Pedro Bay.

Sea Ports. The Port of Los Angeles and the Port of Long Beach are respectively located nearby or in the proposed Project Area. These ports feature passenger and cargo terminals and are considered two of the busiest ports in the U.S.

Vessel Traffic. The proposed Project Area encompasses offshore areas in ESPB, which is situated to the east of the primary port facilities of the Port of Long Beach and the Port of Los Angeles. ESPB includes vessel anchorages, breakwaters, and four artificial petroleum production islands. The Los Angeles River and the San Gabriel River drain into ESPB, which provides access for vessels sailing from Long Beach Shoreline Marina, Alamitos Bay, Anaheim Bay, and other nearby harbor or marina facilities.

Ships operating in ESPB include vessels such as cruise ships, oil tankers, cargo vessels, pleasure craft (both sail and motorboats), pilot boats, tugs, fishing boats, high-speed ferries providing service to Catalina Island, and others (Marine Traffic 2017). Ships destined for the Port of Long Beach pass through Queens Gate, the opening between the Long Beach Breakwater and the Middle Breakwater, before proceeding to port facilities (Port of Long Beach 2013).

The waters of Anaheim Bay Harbor between the east side of the Entrance Channel and the East Jetty, and the west side of the Entrance Channel and the West Jetty are designated as an Explosive Safety Quantity Distance for the Seal Beach Naval Weapons Station. Seal Beach Naval Weapons Station's primary purpose is to support Navy ordnance missions and other fleet activities. The base services an average of 50 ships annually, which travel to and from the base through Anaheim Bay, located in the southern portion of the proposed Project Area.

The Long Beach Channel extends in a northwesterly direction through the southeastern portion of the proposed Project Area from Queens Gate to the primary Port of Long Beach facilities (NOAA 2017).

During 2014, the Port of Long Beach accommodated approximately 13,000 inbound and 13,000 outbound foreign and domestic vessel trips for waterborne commerce (USACE 2014). Most recent available data indicate that inbound and outbound vessel traffic is similar (12,289 and 12,154, respectively) to that of 2014 within the Port of Long Beach (http://cwbi-ndc-nav.s3-website-us-east-1.amazonaws.com/files/wcsc/webpub/#/report-landing/year/2019/region/4/location/4110).

The area of Queensway Bay receives predominately recreational boaters, dinner and harbor cruise ships, and the Catalina Island Expressway, which port in the adjacent marinas. Vessels in Queensway Bay must adhere to the speed limit of 4 knots per hour. Boat traffic, including commercial boats, fishing vessels, and recreational vessels, often traverse the proposed Project Area. Safe navigation is maintained by well-marked channels and the presence and activity of various law enforcement agencies (*i.e.*, County Lifeguards, U.S. Coast Guard, California Department of Fish and Wildlife).

3.14 LAND AND HARBOR USE

The proposed Project Area falls within the boundaries of Los Angeles and Orange counties. The communities of San Pedro and Wilmington are located to the west and northwest of the proposed Project Area but lie outside of the area. The cities of Long Beach and Seal Beach are located within the proposed Project Area boundaries and to the north and east. The proposed Project Area is under the land and/or harbor use authority of the Port of Long Beach, city of Long Beach, and city of Seal Beach. The Long Beach Breakwater is within Federal waters and outside the reaches of any Local Coastal Program (LCP) or land use plans.

Naval Weapons Station Seal Beach. Naval Weapons Station Seal Beach is located within the city of Seal Beach in Orange County, south of ESPB and within the proposed Project Area. The inner harbor has docking facilities for U.S. Navy vessels. Much of the weapons station has been developed into support facilities, including magazines for ordnance storage, office buildings, roads, railroad revetments, parking lots, housing, recreation facilities, and open space. The other primary land use areas are the National Wildlife Refuge, agricultural leases, other leases, easements, and rights-of-way. Explosive Safety Quantity Distance arcs originating from most of the weapons stations’ 127 magazines encumber over 3,448 acres of land. General development and other uses of the safety arc-encumbered land for non-ordnance related functions are severely constrained. The waters of Anaheim Bay Harbor between the East and West Jetties outside of the central navigational channel (as marked by buoys) are designated as an Explosive Safety Quantity Area. This area is reserved for use of naval vessels carrying or transferring ammunition or explosives under standard military restrictions. No pleasure or commercial craft shall navigate or anchor within this area at any time without first obtaining permission from the Commanding Officer at the weapons station.

California Coastal Zone. The proposed project area is located within the Coastal Zone (Figure 3-9) and is under the land use planning and regulatory jurisdiction of the California Coastal Commission (CCC). The CCC retains permanent coastal permit authority over development proposed on tidelands, submerged lands, and public trust lands.

It is the responsibility of the USACE to determine if a proposed Federal activity affects coastal resources in a manner that is consistent to the maximum extent practicable with the enforceable policies of the approved California Coastal Management Plan pursuant to section 307(c) of the Coastal Zone Management Act. To do so, the USACE has prepared a consistency determination that has been concurred with by the CCC in December 2020.

The major land uses within the proposed Project Area consist of commercial services (Port of Long Beach and nearby marinas, such as the Long Beach Shoreline Marina and Rainbow Harbor Marina in the northeastern portion of the proposed Project Area, and Alamitos Bay Marina in the southwestern portion of the proposed Project Area), and open space areas, which includes parks and beaches (Figure 3-10).

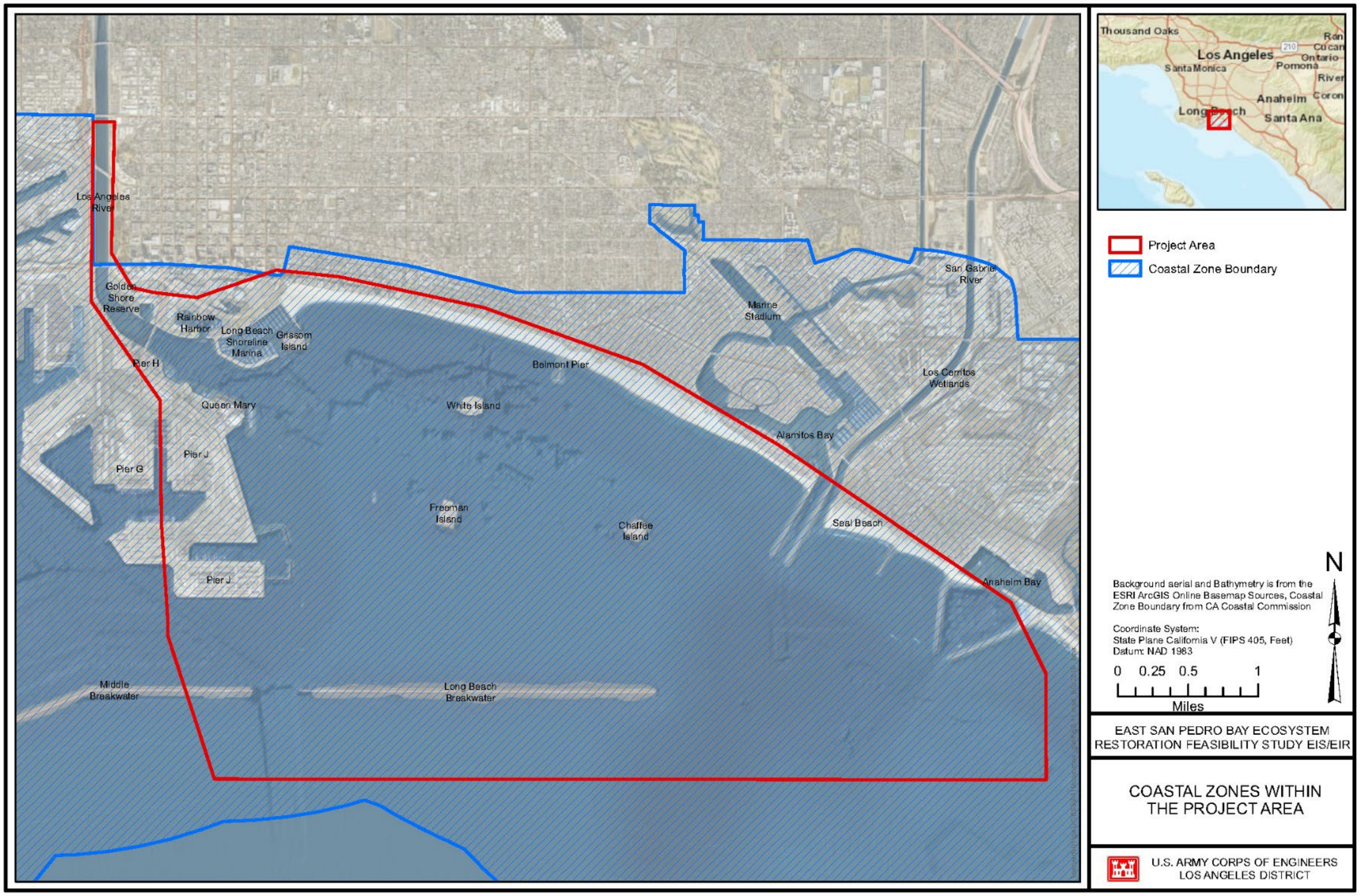


Figure 3-9: Coastal Zones within the proposed Project Area

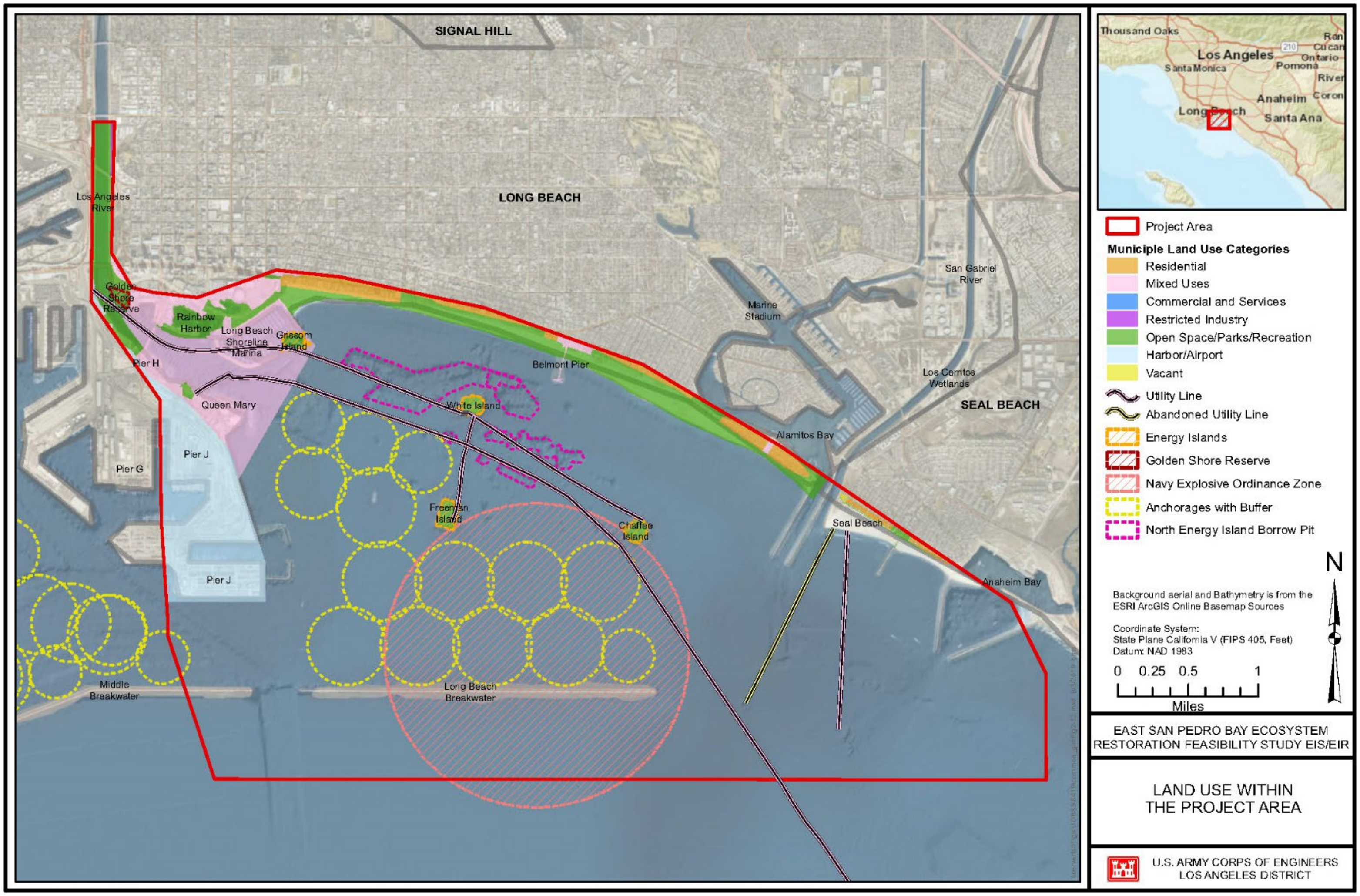


Figure 3-10: Land Use within the proposed Project Area

Port of Long Beach. The proposed project area falls within Planning District 7, Queensway Bay and portions of Planning District 10, Southeast Harbor, and Planning District 11, Outer Harbor. Permitted uses in District 7 include recreation, commercial, primary port facilities, oil production, and ancillary port facilities. Water sports and recreation are encouraged in areas of this district, which serves as a recreational buffer between Downtown Long Beach and Port operations. Permitted uses in District 10 include primary port facilities, port-related activities, oil production, and ancillary port facilities. Permitted uses in District 11 include navigation and maneuvering.

City of Long Beach. The proposed Project Area falls within Long Beach General Plan Land Use Districts 3, 4, 5, and 6, and largely encompasses the land use designations of Open Space/Parks (11), Harbor/Airport (12), and Mixed Uses (7). Adjacent land use designations include Mixed Style Homes (2), High Density Residential (4), High Rise Residential (6), Single Family Residential (1), and Moderate Density Residential (3B). The proposed Project Area spans the Downtown Shoreline, Ocean Boulevard, and Belmont Pier Planned Development Districts. Queensway Bay is also included as a City planned development district. The largest feature within the proposed Project Area, aside from the Port of Long Beach, is Long Beach itself, an approximately two-mile-long sandy beach. Land use within the City portion of the proposed Project Area consists primarily of commercial and open space, with a portion of residential areas adjacent to the beach.

City of Seal Beach. The proposed Project Area is within the city of Seal Beach General Plan Planning Area 1, Old Town/Surfside, and encompasses the land use designation Beach. Adjacent land use designations include Residential Low Density and Residential High Density, located just inland of the beach. The Anaheim Bay located just southeast of Seal Beach is utilized as the Naval Weapons Station.

3.15 SOCIOECONOMICS

For purposes of the Socioeconomics section, an assessment area was generated by creating a 0.5-mile buffer around the proposed Project Area, a distance expected to capture immediate area impacts, and then including all census tracts that lie wholly or partially within it, for a total of 31 census tracts (Figure 3-11).

Population and Housing. Los Angeles County spans over 4,700 square miles and has approximately 10 million residents. Within the 31 census tracts, the total population is estimated at 113,600 residents, equating to an average density of 3,158 residents per square mile, about 1.5 times denser than the County as a whole. The population, density, and racial profile of the socioeconomic assessment area compared to adjacent communities and the County are provided in Table 3-12.

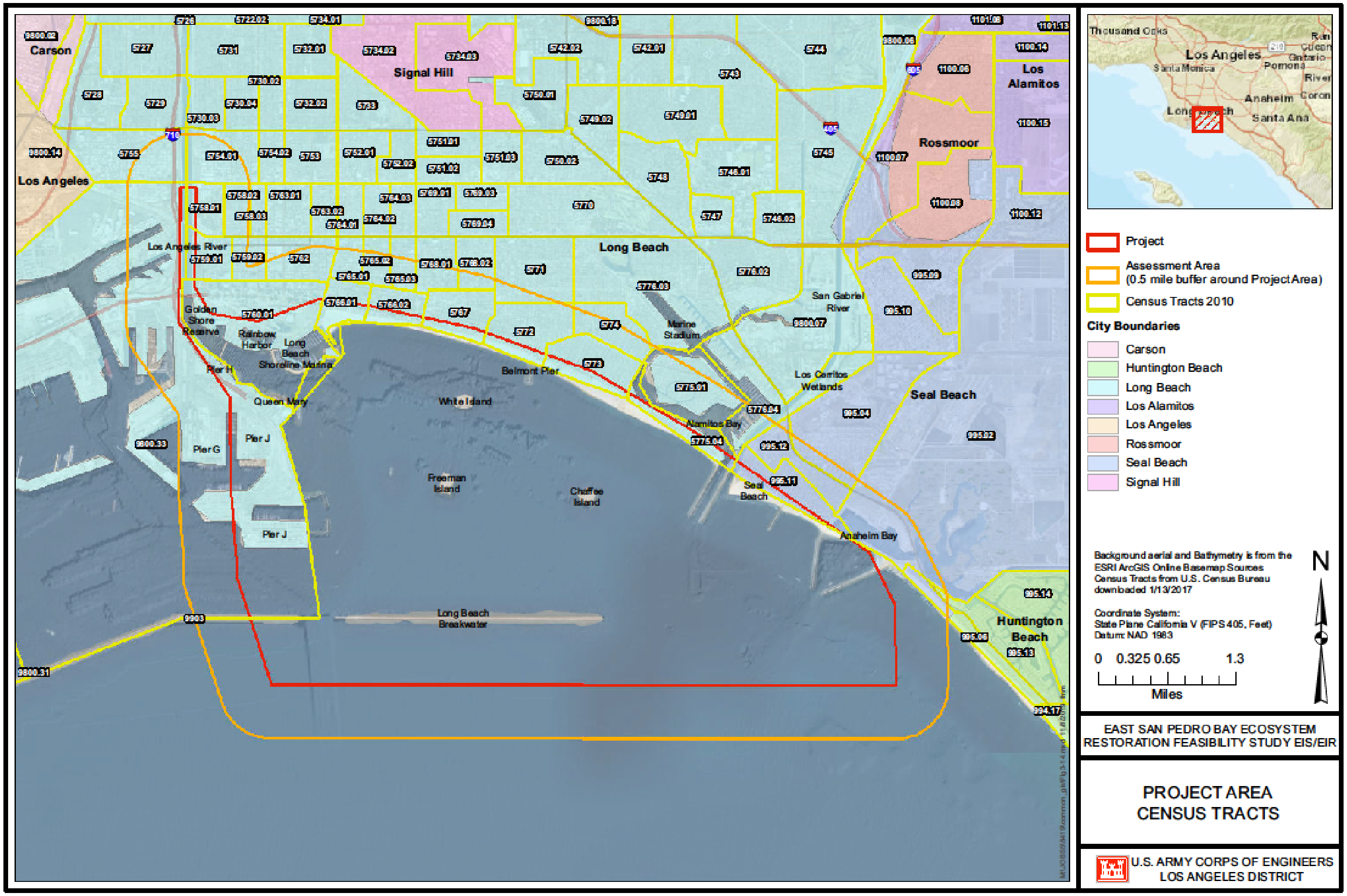


Figure 3-11: Proposed Project Area Census Tracts

Table 3-12: Population, Density, and Race[1]

Area	2010 Population	Density (persons per square mile)	% White Alone, Non-Hispanic	% Hispanic White Alone	% Black[2]	% Asian[2]	% Other[3]
City of Long Beach	462,257	9,191	28.1%	25.3%	12.9%	12.9%	20.8%
City of Los Angeles	3,792,621	8,092	28.4%	24.3%	9.0%	11.6%	26.7%
City of Seal Beach	24,168	2,141	73.3%	7.6%	1.1%	9.7%	8.3%
Los Angeles County	9,818,605	2,420	26.9%	26.3%	8.3%	14.1%	24.3%
Socioeconomic Assessment Area Tracts Total	**113,600**	**3,158**	**48.4%**	**21.8%**	**9.3%**	**7.0%**	**13.5%**

Source: U.S. Census 2010, 2016

1 The 2010 Decennial Census was utilized to provide the actual population counts. The 2011–2015 American Community Survey was used as the most recent complete data source for the percentage values.

2 Includes both Hispanic/Latino and Non-Hispanic/Latino.

3 Includes both Hispanic/Latino and Non-Hispanic/Latino, and 2 or more races.

Table 3-12 shows the recent and projected population for the County of Los Angeles and the cities in the vicinity of the socioeconomic assessment area. For all areas, the previous and projected rate of annual growth has generally been relatively low. Because the extent to which redevelopment and increased density that will affect population in the socioeconomic assessment area has not been quantified, it is assumed that conditions will generally follow the same trends as Los Angeles County and area cities, with overall modest growth throughout the period of analysis.

Table 3-13: Population by Year within the Socioeconomic Assessment Area Tracts

Year	Compound Annual Growth Rate (Los Angeles County)	Population			
		Los Angeles County	City of Long Beach	City of Los Angeles	City of Seal Beach
2000	--	9,544,000	461,522	3,694,820	24,157
2010	0.28%	9,818,605	462,257	3,792,621	24,168
2012	1.43%	10,102,200	466,300	3,845,500	24,400
2040	0.56%	11,796,900	484,500	4,609,400	24,800

Source: U.S. Census Bureau 2010, 2016

Housing in the socioeconomic assessment area is summarized in Table 3-13, which includes household, housing, and ownership metrics. Among the 31 census tracts, total housing units range from zero to 3,903, with a total of 59,787 units in the socioeconomic assessment area, and an overall vacancy rate of 8.3 percent. The vacancy rate in the socioeconomic assessment area is almost 2 percentage points higher than the City of Los Angeles rate and 2.2 percentage points higher than the County of Los Angeles rate. Additionally, the socioeconomic assessment area contains a larger proportion of rental units, with only 31 percent owner-occupied units, compared to 37 percent in the City of Los Angeles and 46 percent in the County.

Table 3-14: Housing within the Socioeconomic Assessment Area Tracts

Area	# Household	# Housing Units	% Vacant	% Owner Occupied
City of Long Beach	164,406	174,742	5.9%	40.2%
City of Los Angeles	1,342,761	1,436,543	6.5%	36.8%
City of Seal Beach	12,498	14,036	11.0%	75.1%
Los Angeles County	3,263,069	3,476,718	6.1%	46.0%
Socioeconomic Assessment Area Tracts Total	**54,804**	**59,787**	**8.3%**	**30.9%**
Source: U.S. Census Bureau 2016				

Employment and Income. Los Angeles County has a highly diverse economy, with a gross annual product of approximately $664 billion in 2014 (Los Angeles County Economic Development Corporation 2016), or 27.7 percent of the gross annual product for all of California. Table 3-15 shows some of the basic economic indicators at the county and state level compared to the socioeconomic assessment area. Socioeconomic conditions in the assessment area are assumed to reflect similar trends as the county and state.

Table 3-15: Comparison of Southern California County Economic Indicators

Area	Median Household Income	Unemployment Rate	Poverty Rate	Median Home Value
City of Long Beach	$52,783	10.6%	20.6%	$431,300
City of Los Angeles	$50,205	10.3%	22.1%	$471,000
City of Seal Beach	$55,270	5.7%	8.1%	$300,400
Los Angeles County	$56,196	10.0%	18.2%	$441,900
All of California	$61,818	9.9%	16.3%	$385,500
Socioeconomic Assessment Area Tracts[1]	**$61,858**	**8.1%**	**19.4%**	**$573,314**
Source: U.S. Census Bureau 2016 [1] Average used to compile the Median Household Income and the Median Home Value for the socioeconomic assessment area tracts				

Trends over the last decade largely mimic the effects of the Great Recession that began in 2008 and have had national impact. California's unemployment rate has recently been higher than the rate for the nation. The unemployment rate in the socioeconomic assessment area, based on American Community Survey data, is about 1.9 percentage points lower than the unemployment rate for Los Angeles County. Within the census tracts making up the assessment area, the unemployment rate ranges from 3.5 to 15.9 percent.

According to a Los Angeles County Economic Development Corporation report (2016), Los Angeles County's "signature industries, entertainment, tourism and fashion," are complemented by its "enormous and diversified economy," which is home to "the largest port complex in the Western Hemisphere and the largest number of manufacturing jobs of any county in the country. Other major industries include health care, education, and knowledge creation." According to the same report, "Los Angeles County has seen steady improvement over the past four years, both in terms of job gains and unemployment rate declines. This improvement is expected to continue in 2016 and 2017, although at a slower pace" (Los Angeles County Economic Development Corporation 2016).

Table 3-16 provides the aggregated employment by industry data for resident workers in the 31 census tracts in the socioeconomic assessment area. Education and Professional Services are the two major industries of employment for the Economic socioeconomic assessment area residents, followed by Retail Trade, Manufacturing, and Finance and Insurance.

Table 3-16: Socioeconomic Assessment Area Employment by Industry

Industry	Percent
Educational services, and health care and social assistance	21.9%
Professional, scientific, and management, and administrative and waste management services	14.1%
Retail trade	8.8%
Arts, entertainment, and recreation, and accommodation and food services	11.5%
Information	2.9%
Manufacturing	8.7%
Construction	4.4%
Other services, except public administration	5.0%
Finance and insurance, and real estate and rental and leasing	8.6%
Transportation and warehousing, and utilities	5.6%
Public administration	3.8%
Wholesale trade	4.2%
Agriculture, forestry, fishing and hunting, and mining	0.5%
Source: U.S. Census Bureau 2016	

3.16 RECREATION

Within the proposed Project Area, recreational opportunities account for the majority of land and water uses, encompassing both onshore and offshore activities (Figure 3-12). The City has stated that certain recreational opportunities within the proposed Project Area are reduced compared to other beach communities, including beach visitation and surfing. These are due to a lack of surf, the presence of trash and debris on the beaches, and perceived water quality issues.

Recreational opportunities within the City were degraded in the past when compared to other beach communities due to a lack of surf, large amounts of trash and debris on the beaches, and poor water quality. Efforts to reduce the amount of trash reaching the bay (booms have been installed in tributary waterways upstream of the bay) and other infrastructure improvements have resulted in improved water quality and reductions in trash (Heal the Bay 2019). The 2019 Heal the Bay Beach Report graded the area of Long Beach at Coronado Avenue as an F in the summer and during wet weather, this beach area was negatively impacted by dry weather runoff. All beaches along Long Beach were graded an F during the wet weather season (beaches at 5th Street, 10th Street, Molino Avenue, Belmont Pier, Prospect Avenue, and Granada Avenue (Heal the Bay 2019). Most of these beaches were graded as A or B during the winter dry season (beaches at 10th Street, Molino Avenue, Coronado Avenue, Belmont Pier, Prospect Avenue, and Granada Avenue). Beach water quality and harmful bacteria warnings continue to occur, particularly during heavy rain events.

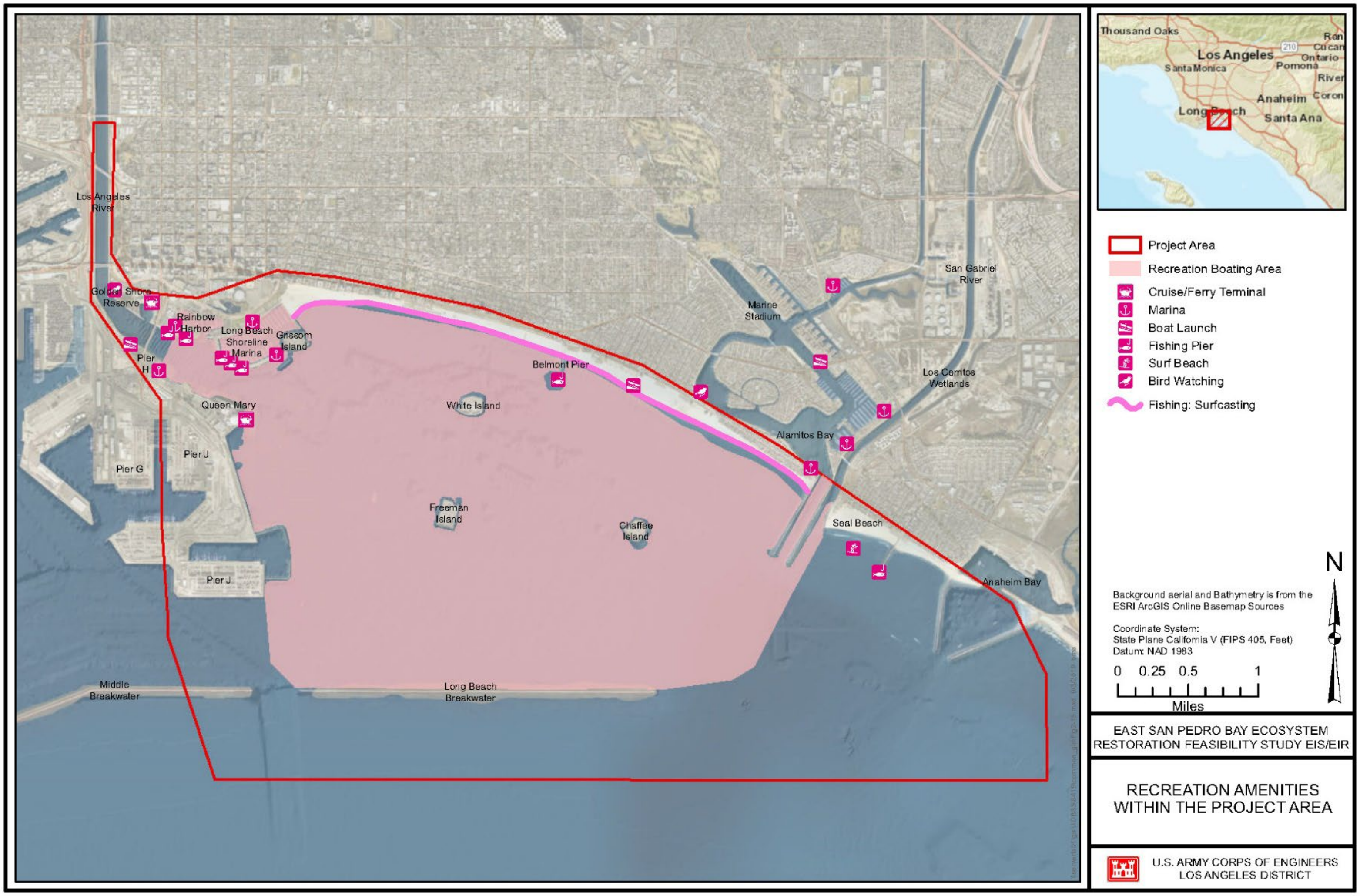


Figure 3-12: Recreation Amenities within the proposed Project Area

Below is a summary of current recreational activities in the proposed Project Area.

Visitor Amenities and Beaches. Onshore recreational amenities in the proposed Project Area include beaches, parks, recreation facilities, and other visitor serving amenities. The primary beach within the proposed Project Area is Long Beach, which is 4 miles long stretching from Shoreline Marina on the west to the tip of the peninsula at the mouth of Alamitos Bay to the south. The Belmont Pier is located in the central portion of Long Beach. Seal Beach is located in the southern portion of the proposed Project Area.

Recreational activities include sightseeing, birdwatching, sunbathing, swimming, snorkeling, boogie boarding, volleyball, surfcasting and fishing, and other beach activities, as well as walking, running, and cycling along the Shoreline Pedestrian Bike path located adjacent to the beach. The beach is open year-round, with highest visitation occurring in the summer tourist season. It is estimated that hundreds of thousands of individuals and families visit Long Beach's coastline each year.

Long Beach is protected by harbor breakwaters, which limit surf and surfing related activities. Paddle boarding is common, particularly within the calmer waters of the bay.

Approximately 45 sand volleyball courts are maintained by the City along the beach in Long Beach. These courts are actively used on a casual non-scheduled basis throughout the year. These courts are also scheduled for organized uses. During the 2016 fiscal year, the Parks and Recreation Office responsible for such permits, reported 6,531 hours of reserved court use associated with permits. Instructional and competition-based organizations also have volleyball programs that use the sand volleyball courts and attract thousands or participants and competitors (City of Long Beach 2017b).

An array of scheduled recreational special events take place along the beach in Long Beach. A sample of these events include: ASICS World Beach Volleyball Classic (nationally televised event); Cabana Beach Soccer Tournament; Pirate Invasion at Belmont Pier; Tiki Beach Festival; Annual Sand Castle Building Competition; Kids Fishing Rodeo; and Movies at the Beach Program. While no data are available related to attendance, these types of activities collectively bring hundreds of thousands of individuals to the beachfront in Long Beach each year. A number of organized fitness activities also take place along the shoreline of Long Beach, including beach yoga, fitness boot-camps, and similar activities that are regularly scheduled along the beach (City of Long Beach 2017b).

The western portion of the proposed Project Area includes the ship Queen Mary on the Long Beach Port, which serves as a tourist attraction featuring restaurants, a museum, and a hotel. Shoreline Village, aquariums, fishing areas, hotels, and restaurants are located along Queen's Way Bay, at the mouth of the Los Angeles River.

Bike and Pedestrian Path. A three-mile-long path begins on the west side of Long Beach at Alamitos Beach, and runs uninterrupted to Belmont Shore and the entry to the Bayshore Beach area of Alamitos Bay. The path features lanes for both cyclists and pedestrians. An electronic "counter" system was installed along the path showing counts from January 1, 2017 through May 16, 2017 in excess of 171,500 for bike users and 210,700 for pedestrians. Overall use projections for 2017 were expected to exceed 600,000 for both the bike user and pedestrian user categories. The path is also used as a route for various organized fund-raising walks/rides throughout the year (City of Long Beach 2017b).

Dog Beach. Approximately four acres on the east side of Long Beach has been designated as "Rosie's Dog Beach." While no reliable data are available, it is fair to estimate that tens of thousands of dog owners and their pets take advantage of this area for recreation with their pets each year (City of Long Beach 2017b).

Marinas and Harbor. City marinas, which includes Alamitos Bay Marina, Long Beach Shoreline Marina, and Rainbow Marina/Harbor, are located within the project area. Boats slipped at the Long Beach marinas are protected by the offshore breakwaters, as well as by the natural south-facing bay. Recreational boating in the project area includes fishing, sailing, and touring. Commercial landings and terminals within the Los Angeles and Long Beach Harbor complex include the Queensway Landing, South Shore Launch Ramp, Catalina Classic Cruises, and Carnival Cruise Line Terminal. Several major charter boat companies provide charter service to Avalon and Isthmus Cove on Santa Catalina Island from the harbor complex. Recreation charter companies departing from the harbor complex also serve specialized activities, including sport fishing, scuba diving, whale watching, and harbor touring.

Fishing. Commercial fishing within the proposed Project Area is limited to live-bait fishing and a variety of commercial fisheries that occur outside the harbors. Trap fisheries extend offshore from just outside the harbor breakwaters, while set and drift nets are restricted to beyond three miles from shore. Trawling occurs in deeper offshore waters. Primary target species from the various fishing operations include anchovies, squid, California halibut, rockfish, crab, and lobster.

The Pier J fishing spot is a primarily local fishing destination located south of the Queen Mary in the southeastern portion of Pier J of the Long Beach Harbor. The Pier J fishing spot is located along South Harbor Scenic Drive and has free parking adjacent to the fishing area. The waters in this fishing spot are calm and a variety of fish can be caught at this location. A fishing license is required to fish at this location. This fishing spot is used daily primarily by locals, with larger groups and families during weekends (Fish Contamination Education Collaborative 2018).

Veteran's Memorial Belmont Pier is a regional fishing destination. While no reliable data are available, a conservative estimate is that more than 16,400 individuals fish from the pier per year (45 recreational fishermen per day, 365 days per year) (City of Long Beach 2017b).

Sailing and Recreational Boating. The Los Angeles-Long Beach Harbor is the second largest breakwater harbor in the world. There are 16 marinas in the San Pedro-Cabrillo-Wilmington harbor areas that include fuel docks, marine equipment and supply stores, chandleries, dry docks, and repair facilities. Boats and yachts are available for charter. Temperate weather and constant winds allow sailing the year around. Catalina Island is within a day's sail, as are the harbors south to Dana Point and north to Marina del Rey.

Long Beach's protected waters within the ESPB and south facing shoreline create ideal conditions for local recreational sailing and boating. While no reliable data are available, it is estimated that hundreds of thousands of sailing and recreational boating excursions take place each year. More than 40,000 launches take place annually from Long Beach's launch ramp facilities, which serve smaller trailered vessels. In addition, more than 5,000 recreational vessels are maintained in-water within City's three public marinas, along with privately owned and operated docks and marinas within the City. In addition to casual use, many organized sailing races and regattas take place in Long Beach each year, including nationally recognized events such as the Congressional Cup, local yacht club sponsored races, collegiate and high school sailing competitions, and other youth programs (City of Long Beach 2017b).

Outrigger Paddling. Long Beach is home to an active community of outrigger boat enthusiasts. Recreational use of the local waterways for these users includes training and conditioning activities as well as races (City of Long Beach 2017b).

Surfing. Wave heights along the Long Beach shoreline are currently not suitable for surfing, although extremely limited surfing occurs during rare storm events that produce higher wave heights. In contrast, nearby beaches such as Seal Beach and Huntington Beach have larger waves and are popular surfing areas.

Kite Surfing. Due to the area's protected waters and south facing shoreline, Long Beach is frequently used for kite surfing (City of Long Beach 2017b).

Junior Lifeguard Program. Each summer the City hosts a six-week junior lifeguard program, serving approximately 300 local youth, ages 9 to 17. This activity includes both on beach and in-water activities (City of Long Beach 2017b).

Commercially Operated Recreational Activities. An array of for-profit recreational offerings take place off the waters of Long Beach within ESPB and adjacent areas. These activities include harbor cruise operations, whale watching excursions, dinner/special event vessel operators, "u-drive" boat rentals, jet-ski rentals, fishing charter-boat operations, SCUBA charter-boat operations, and other on-water experiences. Collectively, these operations provide for tens of thousands of recreational experiences each year (City of Long Beach 2017b).

3.17 UTILITIES AND PUBLIC SERVICES

3.17.1 Utilities

Electricity/Utility. Southern California Edison provides electricity to the City and the Port of Long Beach. Southern California Edison maintains a network of power stations that supply electricity throughout Southern California. The project area power facilities include transmission lines and substations. Existing gas lines serving the proposed Project Area are fed by the Long Beach Energy Department.

There are several underwater utility lines within ESPB. These lines provide service to the oil and gas islands (Grissom, White, Freeman, and Chaffee islands) from the mainland as well as other offshore areas (see Figure 3-10).

Water Services. Water service to the proposed Project Area is provided by the City Water Department (LBWD). LBWD is responsible for supplying, treating, and distributing water for a population of approximately 500,000. There are two sources of potable (drinking) water utilized by the LBWD, groundwater and imported water purchased from Metropolitan Water Districts of Southern California. Approximately 60% of the water supply comes from 26 groundwater wells located within the City limits with the remaining portion coming from Metropolitan Water District. Metropolitan's supplies come from their Colorado River Aqueduct and the California State Water Project.

Wastewater. LBWD operates and maintains nearly 765 miles of sanitary sewer lines that deliver over 40 million gallons per day to Los Angeles Sanitation District facilities located on the north and south sides of the City. The majority of the City's wastewater is delivered to and treated at the Terminal Island Treatment Plant, while the remainder is sent to the Long Beach Water Reclamation Plant of the Los Angeles County Sanitation Districts.

Stormwater Drainage. The Port of Long Beach stormwater drainage system includes approximately 463,000 linear feet of pipe, 1,150 catch basins, and 142 stormwater outfalls. These outfalls discharge to Long Beach Inner and Outer Harbor (City of Long Beach 2015). Within Long Beach City beaches, there are five storm drain basins that collect, convey and discharge runoff to the Long Beach City beach area, and are situated 100 to 200 feet above the water's edge (City of Long Beach 2015).

Solid Waste Disposal. The City's Automated Refuse Collection Division is in charge of refuse disposal and waste management planning services. Currently, the Refuse Collection Division provides service to approximately 109,000 residential customers and 5,600 businesses. Within the Port of Long Beach, tenants usually contract with private waste haulers for solid waste disposal. Non-hazardous solid waste is currently disposed of at the Southeast Resource Recovery Facility. This facility has a permitted daily capacity of 2,240 tons per day and an average daily throughput of 1,500 tons per day.

3.17.2 Public Services

U.S. Coast Guard Services and Facilities. The U.S. Coast Guard mission is to ensure the Nation's maritime safety, security, and stewardship. The Coast Guard Base Los Angeles/Long Beach is located on Terminal Island within the Port of Los Angeles/Long Beach. The Los Angeles/Long Beach Coast Guard station's primary missions are Search and Rescue, Maritime Law Enforcement, and Homeland Security. The station's area of responsibility extends from Dana Point to Point Dume, extending 20 nautical miles seaward, to include Catalina Island. The Coast Guard also manages six commercial anchorages within the breakwater of the Ports of Los Angeles and Long Beach that can accommodate vessels with lengths exceeding 800 feet overall and drafts greater than 40 feet.

Harbor Patrol. The Port of Long Beach Security Division is responsible for organizing all security coverage for the Port to ensure a safe and secure environment for all staff, tenants, customers, and the public. The Security Division directs the activities of the Harbor Patrol, which consists of trained and armed public officers who are responsible for security and public safety on Port property and any public roadways within the Port boundary.

Police Department. The Long Beach Police Department (LBPD) provides police services to the City as well as to the Port of Long Beach. LBPD established a dedicated Port Security Unit that is located within the Harbor District. The LBPD Port Security Unit provides both on-the-water and landside police services to the Port, tenants, and visitors. There are four police stations within the City. The nearest police station to the proposed Project Area is the West Division located on East Ocean Boulevard.

Fire Department. The Long Beach Fire Department (LBFD) provides fire protection services throughout the City. LBFD maintains 23 fire stations in addition to its headquarters and beach operations. LBFD is also responsible for fire prevention, fire protection, and emergency medical services within the Port of Long Beach. Four stations, including two land-based stations and two fireboat stations, are located within the Port.

3.18 PUBLIC HEALTH AND SAFETY, INCLUDING HAZARDOUS MATERIALS

Public Health and Safety Concerns. The proposed Project Area is located in ESPB, adjacent to the densely populated cities of Long Beach and Seal Beach. ESPB contains concentrated contaminants from urban runoff flowing from the Los Angeles and San Gabriel rivers. Contaminants within the bay include metals, pesticides, nutrients, and bacteria that can create a public health issue, particularly to swimmers. Highly elevated nutrient concentrations in the Los Angeles and San Gabriel rivers are related to more frequent and intense harmful algal blooms in the San Pedro Bay. Algal blooms can be harmful to both marine life and humans, causing illness and even death (though rare) (NOAA 2016).

The entire proposed Project Area is within a tsunami inundation area mapped by the California Emergency Management Agency (2009). There is very little risk for wildfire within the proposed Project Area as it is largely covered by water and otherwise adjacent to densely built urban land. The project area is located within a Non-Very High Fire Hazard Severity Zone within the Los Angeles Local Responsibility Area for fire hazards (California Department of Forestry and Fire Protection 2011)..

Hazardous, Toxic, or Radioactive Material. A hazardous material is any item or chemical that poses a risk to public safety or is an environmental hazard. Hazardous materials include, but are not limited to, carcinogens, toxic or highly toxic agents, irritants, corrosives, combustible liquids, compressed gases, explosives, and flammable liquids. The handling, transport, storage, and disposal of hazardous materials are heavily regulated; the previous subsection provides further detail on the Federal, state, and local regulations applicable to hazardous materials.

Sites of known or potential contamination and facilities permitted to treat, store, or dispose of hazardous material, store dangerous materials, or generate hazardous materials in the proposed Project Area were identified using the Department of Toxic Substances Control's EnviroStor Database. These sites are listed in Table 3-7 and their locations relative to the proposed Project Area are depicted in Figure 3-13. Two hazardous material cleanup sites were identified within the proposed Project Area. No other listed hazardous material sites were located within the proposed Project Area.

Table 3-17: Known Hazardous Sites within the proposed Project Area

EnviroStor ID	Location	Site Type	Potential Contaminants	Status/Notes
71002937	620 Ocean Boulevard, Huntington Beach, CA 92646	Cleanup	None Specified	Inactive – Needs Evaluation
19510064	1395 Pier J Avenue, Long Beach, CA 90802	Voluntary Cleanup	Oxygenated solvents, tank bottom wastes, unspecified acid solution, unspecified alkaline solutions, and unspecified solvent mixtures.	Active as of June 30, 2014
Source: California Department of Toxic Substances Control 2016				

The only active site located within the proposed Project Area—19510064—is owned by the Port of Long Beach. Contaminants at this site have potentially affected an aquifer used for drinking water supply. The site was leased to the Westway Terminal Company (Westway) and utilized as a bulk liquid storage terminal for acids, caustic soda, molasses products, chlorinated solvents, and specialty chemicals. Westway's lease with the Port of Long Beach has ended, and Westway has entered into an ongoing Voluntary Cleanup Agreement.

See Section 3.4 for a discussion on toxic air contaminants in the vicinity of the proposed Project Area. No known instances of radioactive material were identified within the proposed Project Area based on desktop-level research.

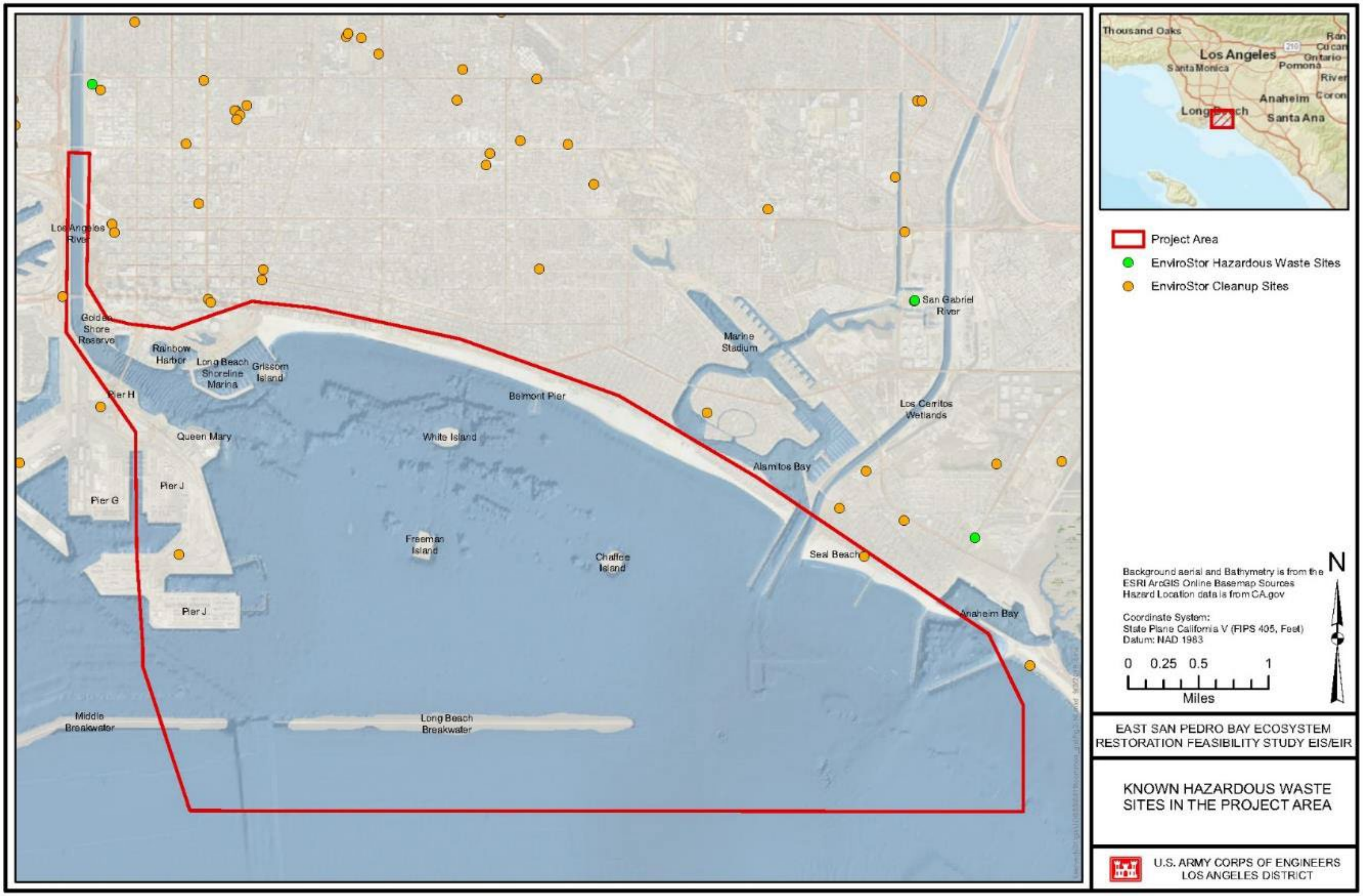


Figure 3-13: Known Hazardous Material Sites in the proposed Project Area

4 PLAN FORMULATION OF MEASURES AND ALTERNATIVES

This section details the plan formulation process which the Study team undertook, beginning with key terms below. All decisions on screening and evaluation are based on the planning objectives, see Figure 4-1.

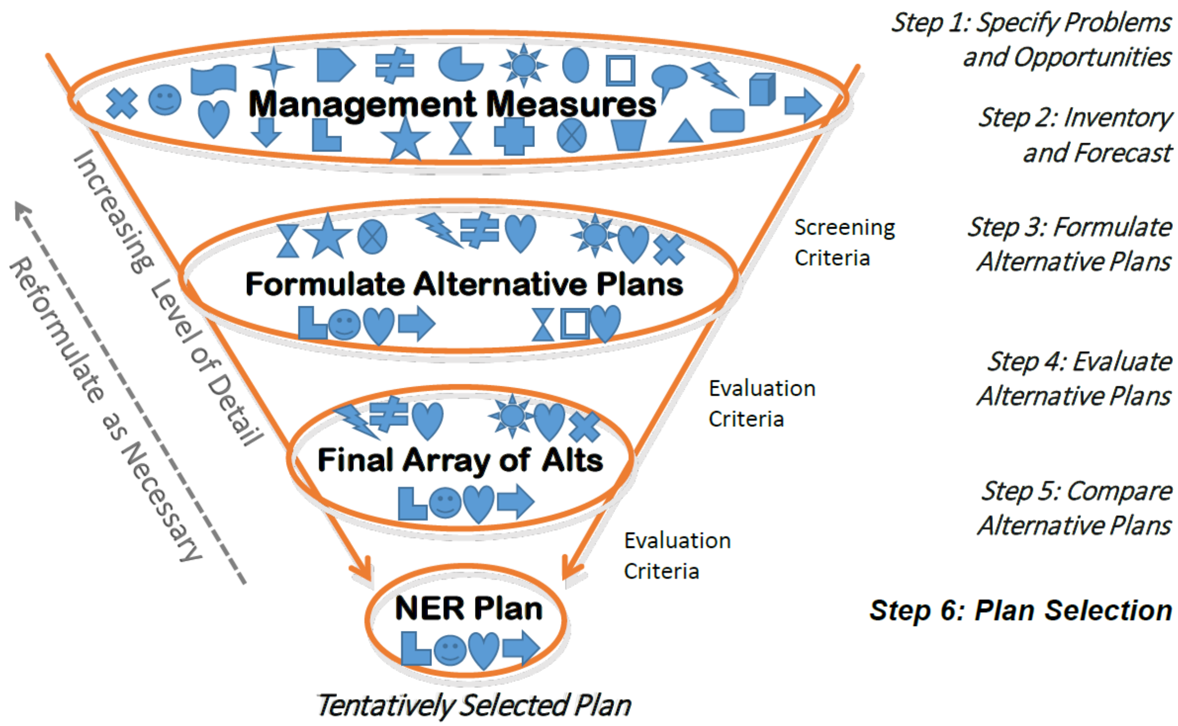


Figure 4-1: Screening and Evaluation Process

<u>What is a Management Measure?</u> Management measures, or simply "measures" or "features," form the building blocks of each alternative. Figure 4-1 depicts individual measures as distinct icons. Measures function individually or in groups to address one or more planning objectives. They can be a single feature (e.g., a rocky reef patch, kelp bed, or a coastal wetland), or an assemblage of different features that work together to achieve the planning objectives. Measures can also be scaled, small to large, or repeated within a single location.

<u>What is an Alternative?</u> Alternatives, also referred to as "plans" or "alternative plans," contain a grouping of individual measures that together make up that plan. As illustrated in Figure 4-1, different "plans" ("Formulate Alternative Plans") are shown as grouping of icons. These various plans can share the same measures, but in different combinations or scales.

<u>How Are Alternatives Developed?</u> The process of developing alternatives is at the heart of plan formulation. The team balances "*what*" from the public and stakeholders and "*how*" from subject matter experts. Input from the public and stakeholders such as habitat restoration experts and maritime interests are considered at key points throughout the process. Alternatives are formulated to meet planning objectives and avoid planning constraints, using the systematic but iterative six-step planning process shown in Figure 4-1 and in Chapter 1. Once alternatives are developed, they are then considered as a group, typically referred to as an array of alternatives.

How Is the Final Array of Alternatives Determined? Determining the Final Array of Alternatives is a process that involves multiple iterations of evaluation and screening, using both quantitative and qualitative methods. The team initially developed a Preliminary Array of Alternatives, reported to the public in 2018 by the City. The alternatives in the Preliminary Array were then evaluated and screened down further to determine the Final Array of Alternatives. In screening alternatives, specific evaluation criteria are used from the Federal Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (1983) (P&G), including: completeness, effectiveness, efficiency, and acceptability.

The Final Array of Alternatives includes a range of different plans representing the spectrum of reasonable alternatives that substantially respond to the purpose and need statement. There is a No Action alternative, and multiple “action” alternatives with proposed project features. Agencies are obligated to evaluate a reasonable range of alternatives in enough detail so that a reader can compare and contrast the environmental effects of the various alternatives. All plans in the Final Array of Alternatives must undergo both NEPA and CEQA review to identify and present information about any potentially significant environmental effects.

How is the Recommended Plan Determined? Ultimately, this process is intended to result in an informed recommendation of a specific plan for eventual project authorization. This Final IFR identifies the NER Plan as the Recommended Plan, the plan being put forward for future implementation. Typically, the NER Plan is the Recommended Plan unless the non-Federal sponsor requests a LPP. The Recommended Plan is selected from the action alternatives analyzed in this Final IFR. The environmental impacts of the plan alternatives are presented in Chapter 5. The comparison of plans by their combined outputs, impacts and costs is provided in this chapter, and the Recommended Plan and its implementation requirements are presented in Chapter 6.

4.1 PLAN FORMULATION PROCESS

Figure 4-2 maps out the specific steps that the team took to identify the Final Array of Alternatives and ultimately the NER Plan. Input from the public, stakeholders, the Habitat TAC members, Ports Working Group, and the USACE-City team was sought at strategic times throughout the planning process (yellow). The measures development took place early in the Study (purple). Alternatives were also developed early in the process, including conceptual alternatives developed at the 2016 stakeholder workshop (green). These were considered scenarios or working alternatives, and helped the team refine the vision for the Study. Working alternatives were used in technical modeling shown in blue. The modeling and design/cost outputs were input into the cost-benefit model shown as “CEICA” (Cost Effectiveness and Incremental Cost Analysis) in purple. The final phase of the Study includes alternatives evaluation and screening, then NER Plan identification.

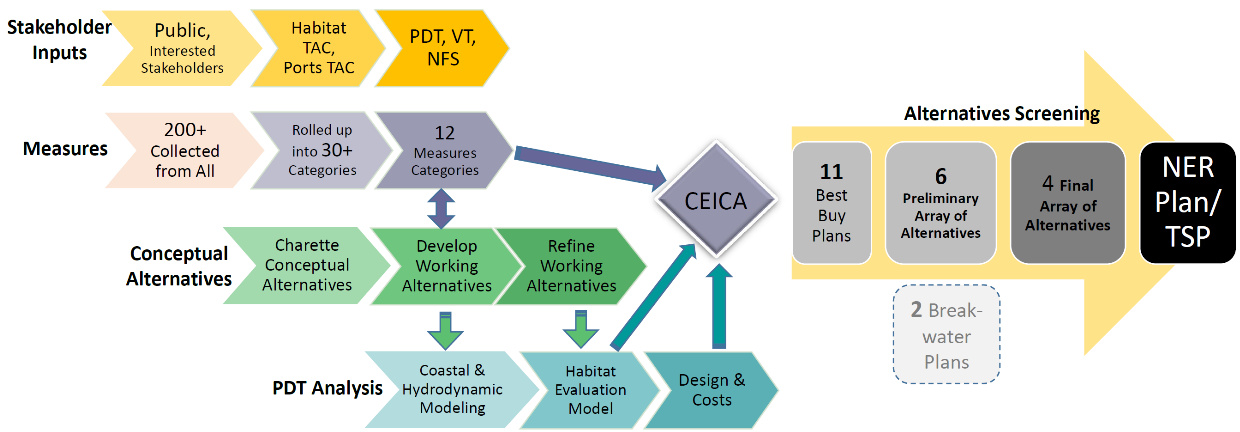


Figure 4-2: Plan Formulation Process

4.1.1 Key Assumptions

The key assumptions, decisions and planning considerations described here were developed by the core PDT (USACE and City) representing the lead agencies, with extensive input from the project's TAC and consultants. The following key assumptions were made when identifying the goals for this Study:

- Proposed Project Area Limits - The geographic scope of the proposed Project Area is a defined area within ESPB, located offshore from the city of Long Beach, California. This area was selected because (1) it is located within a semi-enclosed bay/estuary that in recent years has been shown to support diverse and abundant marine fauna that would further benefit from ecological restoration; (2) it offers a relatively sizeable area within which restoration activities can be conducted that would not impact (or be impacted by) on-going port activities; and (3) it is an area that lies within the geographic area of interest and jurisdiction of the project's non-Federal sponsor (city of Long Beach).
- For the purposes of this Study, *"subtidal habitat"* includes all submerged areas of the bay as they pertain to rocky reef, kelp beds, and eelgrass communities. The Study also addresses certain "*intertidal habitats,"* such as tidal wetlands and sandy shores associated with emergent islands.
- The goals of this Study are intended to focus on habitats rather than individual species, except for oyster beds, a single species habitat type. This approach avoids prioritizing some species over others.
- This Study recognizes marine coastal ecosystem functions of complexity and connectivity of rocky reef habitat patches which support many marine species throughout their lifecycle. For example, as noted in Section 2.1.1, many adult rocky reef associated fish species reside in relatively small territories where they rarely travel distances in excess of 30 m from their territories. Dispersing individuals need a patchwork of habitat in order to find suitable habitat to colonize after drifting from their natal habitat patch. As the number of habitat patches and different types of habitats increase, so do the opportunities for species to disperse between patches, increasing the likelihood of their reproductive success. Additionally, a mosaic of habitats provides greater functional diversity, which is linked to long-term stability, as multiple functional traits (built in redundancies) increase the resilience of marine systems in the face of environmental changes (Montoya *et al*. 2012).

- The Study's goals focus on alternatives that meet the planning objective to restore aquatic habitat types that have been lost or are reduced in abundance due to port development, associated navigation activities, and the effects of urbanization.
- Subtidal rocky outcrops, subtidal shoals, and tidal wetlands support a high level of biodiversity, provide valued ecosystem services, and are under threat from human activities and climate change in the SCB, thus a restoration focus on these features is warranted. Opportunity zones for effective, long-term restoration of these features are not abundant and are based on uncertain techniques, so this project emphasizes applying restoration methods experimentally and adapting accordingly.
- Anticipated FWOP conditions for the 50-year period of analysis (2030-2080) for both the Study Area and proposed Project Area include assumptions that the relatively low value habitat condition will continue and will not improve due to limited existing coverage of rocky substrate, poor configuration, and ongoing stressors. For example, the general trends for kelp, eelgrass and rocky reef habitats are that they are in global decline.
- The water column and sub-tidal muddy, soft-bottom habitats of the bay were not included in the Study goals for practical and technical reasons. Both the water column and muddy, soft-bottom habitats are recognized as being essential for marine species and supports valuable ecosystem services. Although both habitats are plentiful in the bay, they are recognized as being degraded due to various human activities.
- The Study acknowledges presence and value of existing habitats within the bay including kelp and rocky reef (on breakwater, oil islands, port infrastructure), the tidal salt marsh at Golden Shore Reserve, existing eelgrass beds, sandy bottom, and open water habitats.
- The focus of this Study is restoration opportunities for highly productive habitat types in their most suitable and optimal locations (e.g., open ocean currents for kelp beds) to ensure sustained functioning long-term. Placement of habitat restoration features in this Study is based on engineering and scientific analysis to determine the most suitable restoration locations within the proposed Project Area.
- This Study avoids valuing one habitat type targeted for ecosystem restoration over the other; however, restoration of some targeted habitats may result in conversion of other habitat types. For example, some muddy, soft-bottom substrate may be lost through the restoration of eelgrass or rocky reefs.
- Primary features of the "Surfrider Alternative," a plan proposed by the Surfrider Foundation's Long Beach Chapter, were evaluated as distinct measures in the plan formulation process. Their plan advocates lowering the entire breakwater and restoring sandy bottom.
- Construction assumptions assume start of construction to begin approximately Fall 2026 and cease temporarily during the Olympics between Fall 2027 and Spring 2029. Each year, blackout months are assumed from November through March to account for potential winter storms.

4.2 MANAGEMENT MEASURES FORMULATION AND SCREENING

Over 200 management measures were collected and compiled from the public, stakeholders, and team members. These ideas were collected as early as 2009 when the City and USACE first conducted the Reconnaissance phase of the Study, and in 2016 from the public scoping meeting April 7, 2016, and the interactive stakeholder workshop on April 18, 2016. A summary of both the scoping meeting transcript and stakeholder workshop inputs can be found in Appendix N: Public Involvement. At this facilitated workshop, 80 participants brainstormed inputs including measures to improve circulation and measures to restore habitat. The team evaluated the inputs and considered them in identifying specific measures used in formulating alternatives. Additional measures were provided by various stakeholders and team members over the course of the Study. A listing of all measures collected can be found in Appendix N: Public Involvement.

4.2.1 Measures Screening #1 (Initial Screening)

Initially, the team screened the 200+ individual measures primarily based on lack of direct contribution to the planning objectives of ecosystem restoration (see inset). Other screening rationale include:

- Focus on water quality improvements which is outside the Study authorization for ecosystem restoration (e.g., water quality treatment plant, mechanical water circulation system, trash nets, etc.), and beyond the USACE ability to implement;
- Highly unlikely and infeasible (e.g., close Queens' Gate opening between two breakwaters, tidal power lagoon, etc.);
- Miscellaneous ideas that were not appropriate for this Study but could be considered by others (e.g., public health, tap into underwater artesian resources to create natural bubbles, etc.).

4.2.2 Measures Screening #2 (Measure "Categories")

The number of remaining measures were still too numerous to screen effectively. Because many measures shared similar features, they were grouped together to create a single "type" or "category" of measure. For example, a measure to build a "training wall by the Los Angeles River" was mentioned several different times. These were collectively grouped into one measure, "Los Angeles River Training Wall." This resulted in a list of 29 measures categories, which helped to facilitate the decision-making process going forward.

PLANNING OBJECTIVE

To restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands, and other types historically present in San Pedro Bay of sufficient quality and quantity to support diverse resident and migratory species within ESPB

SUB-OBJECTIVES

- Increase the extent (total area) of complex aquatic habitats
- Increase the diversity and spatial heterogeneity of complex aquatic habitat types
- Increase the overall connectivity of complex aquatic habitat types by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs

At this stage of the iterative planning process, the Study goal, planning objectives, problems, opportunities, and constraints had undergone further refinement. However, poor circulation in the bay was still being considered as a Study problem since it was assumed that it negatively impacted ecosystem resources in the proposed Project Area. When screening the 29 measures types, the PDT kept in mind not only the planning foundations, but also considered the proposed Project Area boundaries, Federal vs local responsibility (e.g., water quality), and implementability (e.g., cost, likelihood of acceptance, technical feasibility, etc.).

The following section lists all of the measure's categories (or measures). The measures that remained after this screening are described below. The measures screened out are also listed below, along with justification as to why they were eliminated from further consideration. At the end of this screening, 12 measures were screened out, leaving 17 measures for further consideration.

4.2.2.1 List of Measures Remaining after Screening #2

1. Eelgrass Habitat – Restore in sandy bottom shallow waters <-20’ MLLW; requires protected calm conditions created with added sand/rock shoaling such as Nearshore Zone Habitat measure.
2. Kelp Habitat – Place rocks for anchoring kelp in waters >-20’ MLLW; can be located in deep, open water areas along and off of breakwater and oil islands. Kelp substrate can be created by pushing rock off a barge, as opposed to engineered/placed rock for rocky reef in a single layer.
3. Nearshore Zone Habitat – Place “shoals” of rock and/or sand within nearshore shallow waters <-20’ MLLW, creating subtidal rocky reef habitat. Placement of rock would be engineered to achieve specific “relief” or vertical formation to optimize habitat conditions such as appropriate spacing between rocks for spiny lobster. These shoals could provide incidental protection to the shoreline from storm surges and erosive wave action.
4. Oyster Bed – Place oyster shell beds in shallow waters (<-4’ MLLW) and seed with oysters or other filter feeders to filter pollutants. Locations could be near the shoreline, or off of existing rocky infrastructure like jetties, marinas, the ports or by mouth of the Los Angeles River. Potentially higher habitat value if co-located with eelgrass beds.
5. Rocky Reef Habitat – Place rock in waters >-20’ MLLW, either new rock or recycled from breakwater modification. Locations could be anywhere within the bay. Placement of rock would be engineered to achieve specific “relief” or vertical formation to optimize habitat conditions such as appropriate spacing between rocks for spiny lobster. Only rock material was considered; artificial reef material was not considered for this Study.
6. Sandy/Rocky Island Bird Habitat – Provide a sandy island for least tern and other shorebirds nearshore. Construction would be similar to the Nearshore Zone Habitat and include rocks engineered to also serve as rocky reef habitat. This sandy island could provide incidental protection to the shoreline from storm surges and erosive wave action.
7. Estuary/Coastal Wetland – Restore tidal salt marsh near mouth of Los Angeles River with an engineered structure that would contain fill and a sand or mud surface layer and appropriate tidal salt marsh vegetation. Vertical construction would limit impacts to navigation, but still allow simulation of flushing. The interior would consist of fill to approximately -5 ft MLLW and a sand cap at the surface. Channelization would be required to simulate the wetland’s natural processes and encourage adequate flushing of the system.
8. Bird Island at/near Breakwater – Construct sandy island along breakwater or near oil islands for shorebird habitat, using dredge fill and rock from breakwater removal, away from shoreline.
9. Sandy Bottom Restoration – Open borrow site “holes” on seabed flood is a degraded habitat “sink.” By adding high quality sand and leveling out seabed floor, the borrow sites could be restored.
10. Underwater Contouring Cut/Fill – “Channel” underwater flows via a dredged preferential flow channel, similar to a navigation channel, to swiftly move water for improved circulation; paired with measure #13 - Los Angeles River Training Wall.
11. Beach Sand Management – Replenish beaches with sand (source unknown) to address erosion and widen where possible, especially at Peninsula Beach.
12. Alamitos Bay Circulation Improvements – Restart closed power plant cooling pumps to recirculate water into Alamitos Bay.
13. Los Angeles River Training Wall – Create a diversion to redirect polluted urban runoff from LA River away from beaches to flow towards Queens Gate breakwater opening and exit East San Pedro Bay more quickly; paired with measure #10 - Underwater Contouring.

14. Alamitos Bay Jetty Modification – Shorten the jetties to potentially restore sand migration to Peninsula Beach.
15. Modify Breakwater – Partially lower or shorten from one or both ends, or notch in multiple locations; the modifications are subsequently defined as two notches to the west, two notches to the east, one-third removal of the west, one-third removal of the east.
16. Remove Entire Breakwater – Lower entire breakwater down to -30’ MLLW (not remove to ocean floor due to assumed high costs compared to expected benefits).
17. New Breakwater with Relocated Breakwater Rock – Modify breakwater and relocate rock to build a new breakwater; would mitigate increased waves from breakwater modifications.

4.2.2.2 List of Measures Screened Out after Screening #2

A. Mechanical Water Circulation – Place wind or underwater turbines, pumps, or other mechanical device out in the bay to move water around. Operations costs would be substantial, has the potential for significant environmental impacts, and a significant construction cost (>$1B) as compared to anticipated benefits. Screening Justification: Outside USACE Study authority, mechanical measure is not implementable by the USACE.

B. Wave Generation – Use mechanical or other methods of generating additional waves. Operations costs would be substantial, has the potential for significant environmental impacts, and excessive construction cost (>$1B) as compared to anticipated benefits. Screening Justification: Outside USACE Study authority, mechanical measure is not implementable by the USACE.

C. Reconfigure Breakwater – Significantly alter breakwater footprint to bend, curve or lengthen to increase circulation within the bay. Screening Justification: Does not provide ecosystem restoration benefits and therefore does not meet Study planning objectives. Excessive costs with unknown ecosystem restoration benefits and violates constraints with impacts to navigation.

D. Clean Polluted LA River Runoff – Trash racks, stormwater pollution measures. Screening Justification: Does not meet Study planning objectives for ecosystem restoration or address Study problems; Outside USACE Study authority, measure is not implementable by the USACE.

E. Major Infrastructure Modifications– One example was to relocate the ports to restore LARE. Screening Justification: Logistically infeasible, excessive costs and violates constraints.

F. Recreation Measures – Early input included ideas to increase surfing and sailing opportunities. Screening Justification: Does not meet Study planning objectives for ecosystem restoration or address Study problems; can be considered for ancillary benefit associated with ecosystem restoration measures.

G. Navigation Measures – Address boating noise and traffic. Screening Justification: Does not meet Study planning objectives for ecosystem restoration or address Study problems.

H. Coastal Protection from Storm Damage – Shoreline and ports protection from sea level rise impacts. Screening Justification: As a stand-alone measure, does not meet Study planning objectives for ecosystem restoration or address Study problems; will be considered for ancillary benefits from ecosystem restoration measures.

I. Redirect or Reconfigure Los Angeles River– Near the mouth of the Los Angeles River, redirect polluted flows away from ESPB; Screening Justification: Logistically infeasible and violates constraint of significantly impacting ports operations.

J. Restore Coastal Wetland at Alamitos Bay, San Gabriel River or Los Cerritos Wetlands – Multiple locations for potential coastal wetlands restoration opportunities were identified. Screening Justification: Beyond the proposed Project Area which was outside area of interest by non-Federal sponsor.
K. Water Quality Treatment Plant – Intended to improve water quality within the bay. Screening Justification: Outside USACE Study authority; does not address Study problems.
L. Stock Fish/Marine Species – Screening Justification: Does not address Study problems of degraded habitat and focuses on single species rather than habitat restoration which benefits multiple species; outside USACE Study authority.

4.2.3 Measures Screening #3 (Scoring)

By this stage, the planning foundations had undergone further refinements through quantitative and qualitative analysis. Based on input from subject matter experts on the TAC, the team made the decision to focus restoration on complex marine habitats rather than abundantly available habitats. Based on preliminary coastal modeling analysis, it was determined that the current circulation conditions are not a limiting factor for the scarce habitat types being considered for restoration (rocky reef, kelp, wetlands, etc.). However, circulation is one of several habitat suitability parameters that would need to be analyzed further as alternatives are being developed.

Using best professional judgment, the remaining 17 measure categories were screened by the PDT using the formulation criteria from the refined planning foundations as defined in the PGN (ER-1105-2-100) and further clarified below.

Table 4-1 below shows how each measure category was scored 0 to 5 with 5 meaning the criterion would be fully met, 3 indicating the criterion would be partially met, and 0 indicating the criterion would not be met. To aid in evaluating the criteria, metrics were defined with a series of questions as shown below. The scores were totaled to provide a final ranking score. Measures are listed below to show the ranking from highest to lowest scoring measures.

- <u>Effectiveness</u> (33%) – How well does the measure meet the primary Study planning objective of ecosystem restoration in the bay?
- <u>Efficiency</u> (33%) – Was this a cost-effective measure, e.g., were there less costly ways to achieve the same output? Would resources be efficiently used in the construction of this measure and would outputs produced by the measure be produced in an efficient manner?
- <u>Acceptability</u> (33%) – Each measure was scored based on how well it met both implementability and satisfaction. Implementability is whether the measure is feasible in the technical, environmental, economic, and social sense as well as complies with applicable laws, regulations, and public policies. Satisfaction considers whether the measure is supported by the non-Federal sponsor, stakeholders, and USACE. The two scores were averaged.

Table 4-1: Measures Scoring Matrix

No.	Measure Name	Effectiveness	Efficiency	Acceptability	TOTAL
1	**Eelgrass Habitat**	5	5	5	15
2	**Kelp Habitat**	5	5	5	15
3	**Subtidal Habitat**	5	4	5	14
4	**Oyster Bed/Other Filter Feeders**	5	5	4	14
5	**Rocky Reef Habitat**	5	3	5	13
6	**Sandy/Rocky Island Bird Habitat**	5	3	4	12
7	**Estuary/Coastal Wetland**	5	3	4	12
8	Bird Island at/near Breakwater	5	3	4	12
9	Sandy Bottom Restoration	4	4	3	11
10	**Underwater Contouring Cut/Fill**	2	2	5	9
11	Beach Sand Management	1	3	5	9
12	Alamitos Bay Circulation Improvements	2	2	3	7
13	**Los Angeles River Training Wall**	2	1	3	6
14	Alamitos Bay Jetty Modification	2	1	3	6
15	**Modify Breakwater**	2	0	3	5
16	**Remove Entire Breakwater**	2	0	1	3
17	New Breakwater with Relocated BW Rock	0	0	3	3

Out of 17 measures, 11 remained after this screening, shown in bold. These are the measures included in subsequent technical analysis, discussed in Section 4.3 Plan Evaluation. The highest scoring restoration measures reflect the refined planning objective. A few restoration measures were also screened out due to either excessive costs or lack of support for the Study planning objectives. Lower scores reflect the PDT's determination that circulation is not a limiting factor for the habitat types being considered for restoration. However, some circulation measures remained, as the City wished to continue pursuing circulation-focused alternatives. A low score did not determine whether or not it was screened out. Justification for screening out the five measures are provided below.

4.2.3.1 Measures Screened Out and Screening Justification

- #8) *Bird Island at Breakwater* – Although this meets the Study planning objectives, the location out in deep water would drive costs excessively high relative to the potential benefits.
- *#9) Sandy Bottom Restoration* – Does not meet the Study planning objectives to restore complex, habitat types; Sandy bottom is abundant within the SCB and the Study planning objectives are focused on restoration of complex habitats types such as kelp which only covers 0.1 percent of the SCB. Sandy bottom is not nearly as productive as rocky reef which has 9-23 times the fish productivity. Additionally, there was low acceptability by the non-Federal sponsor for this proposed restoration measure, which is reflected in constraint #3: *Do not allow for infilling any of the energy island borrow pits located within the ESPB boundary.*
- *#11) Beach Sand Management* – Does not meet Study planning objective of providing ecosystem restoration of complex habitat types; typically, sand management is a local responsibility.
- *#12) Alamitos Bay circulation improvements* – Does not meet Study planning objective of providing ecosystem restoration of complex habitat types; Low acceptability; Outside of the proposed Project Area.
- *#14) Alamitos Bay jetty modification* –Jetty modifications alone do not provide ecosystem restoration benefits and therefore do not meet Study planning objectives; low acceptability by boaters in and out of Alamitos Bay as modifications would impact navigational operations, violating study constraints; Excessive construction cost compared to anticipated benefits.

- *#17) New Breakwater with Relocated Breakwater Rock* – A breakwater structure does not meet Study planning objective of providing ecosystem restoration of complex habitat types; a new breakwater would likely be rejected by neighboring communities, resulting in low acceptability; extremely excessive costs to dismantle existing breakwater and rebuild a new breakwater far outweigh any potential benefits.

4.2.4 Opportunity Zones

To better organize and communicate the measures within the context of alternatives, the proposed Project Area was divided into five "opportunity zones" described below. Different measures or groups of measures would be implementable or more likely to be sustainable within particular zones.

1. **Nearshore Zone** (brown) **-** Includes the shallow waters <-20' MLLW off of the recreational beaches in Long Beach and Seal Beach, beginning at the Long Beach Shoreline Marina, up to and including the Anaheim Bay jetties. Measures considered: Eelgrass, Subtidal Rocky Reef, Sandy Island, Coastal Wetland, and Oyster Bed.
2. **Open Water Zone** (blue) **–** Includes open water areas >-20' MLLW including areas around the three oil islands, White, Freeman and Chaffee. Measures considered: Kelp, Rocky Reef.
3. **LA River Mouth Zone** (pink) **-** Extends from West Anaheim Street Bridge crossing down 1 mile to the river mouth and includes the Golden Shore Reserve (coastal wetland), Queen Mary, Carnival Cruise Line, Rainbow Harbor, Long Beach Shoreline Marina and Grissom Oil Island. Measures considered: Coastal Wetland, Oyster Bed, Training Wall, and Underwater Contouring.
4. **Port Zone** (green) **-** Includes the Carnival Cruise Pier, the rectangular inset along the eastern edge of Pier J, Pier J, and out approximately 3,000' out from the port shoreline to Queens Gate. Measures considered: Coastal Wetland, Oyster Bed.
5. **Breakwater Zone** (yellow) **-** A buffer zone approximately 1,500' on either side and around ends of the Long Beach Breakwater including the Queens Gate navigation opening. Measures considered: Kelp, Rocky Reef, Sandy Island, Coastal Wetland, Underwater Contouring, Breakwater Modifications (remove 1/3, notching, lowering entire).

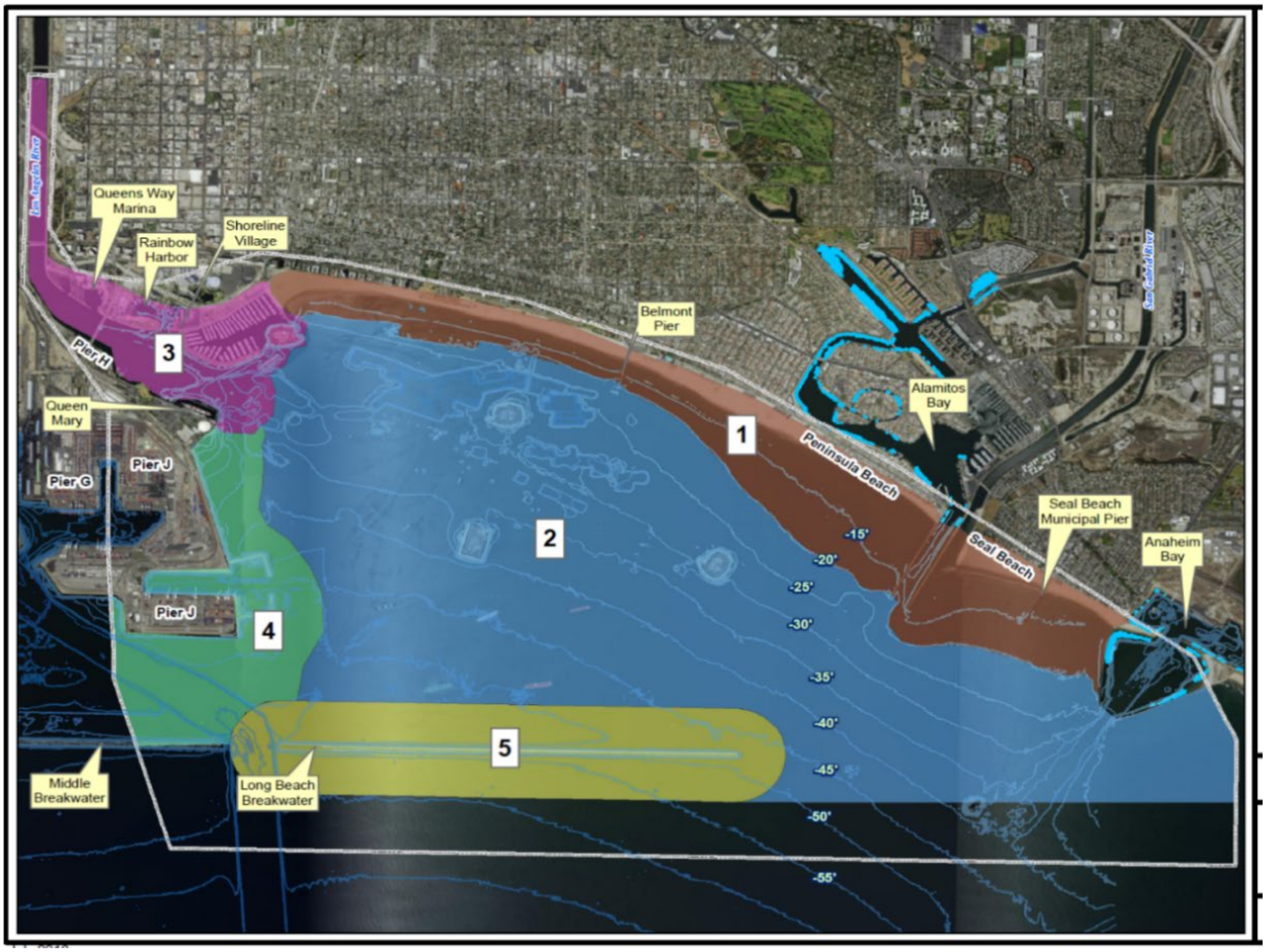


Figure 4-3: Opportunity Zones

4.2.5 Future Without Project Considerations for Target Habitat Restoration Types

The Opportunity Zones lists potential measures appropriate to each zone, as taken from the Table 4-1 Measures Scoring Matrix. Specifically, six target habitat restoration measures were identified, which ultimately persisted throughout the plan formulation process. These six target habitat types include Giant Kelp (kelp), Rocky Reef, Eelgrass, Coastal Wetland, Oyster Reef and Sandy Island. Anticipated FWOP conditions for the 50-year period of analysis for both the Study Area and proposed Project Area include assumptions that the relatively low value habitat condition will continue and will not improve due to limited existing coverage, poor configuration, and ongoing stressors. In formulating alternatives, the team considered habitat types, locations, layouts, proximities, and potential stressors under FWOP conditions to ensure project success. Below are FWOP considerations for the target habitat types.

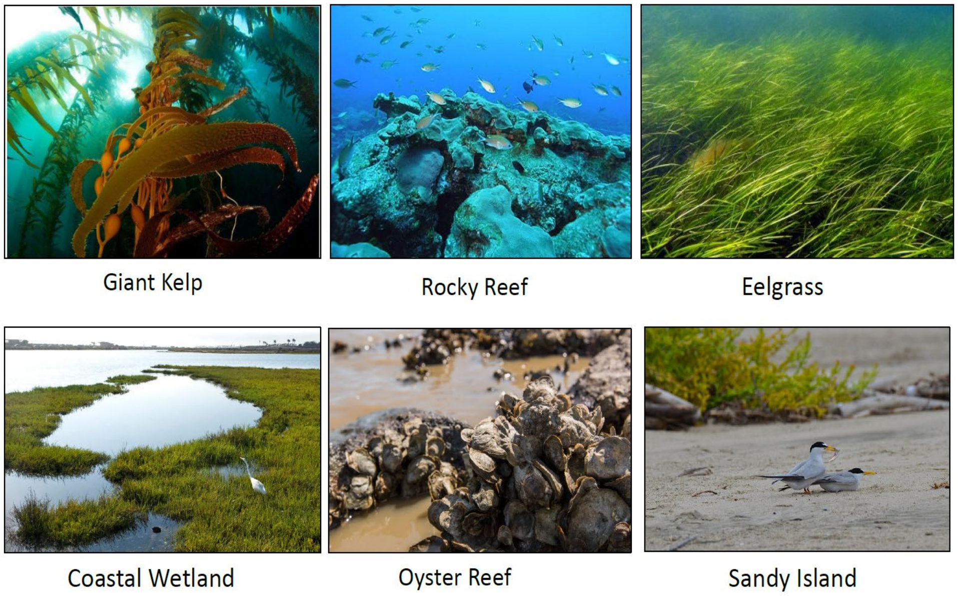


Figure 4-4: Target Habitat Restoration Types

Soft Bottom Habitat. Soft bottom habitats have the potential to provide fish and invertebrate habitat. Management efforts within the Los Angeles and San Gabriel watersheds to improve water quality, sediment quality, and reduce trash within the area would be expected to progress; however, overall improvement would likely continue to be slow in the near future. Soft bottom habitat may be impacted by hypoxia at greater depths and in pitted areas by stratification associated with sea level rise and climate change.

Coastal Salt Marsh. Coastal salt marshes provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, commercial species nursery habitat, and carbon sequestration. Under the FWOP conditions, sea level rise associated with climate change will reduce total saltmarsh area within the project area. Inland boundaries of the existing marsh are limited by seawalls and rock armoring. Over time, sea level rise will likely cause a type shift within the created estuary from coastal saltmarsh to mudflat and open water, reducing coastal salt marsh total area and functionality within the proposed Project Area.

Eelgrass. Ecological functions associated with eelgrass beds include trapping suspended sediments, absorption of dissolved nutrients, refugia, and nursery areas for many species of commercially and ecologically important shellfish and fishes, primary productivity for herbivores and detritivores, and the protection of shorelines from erosion. Eelgrass beds are currently located along a narrow band of shallow water offshore of Long Beach from the Long Beach Marina breakwater to Alamitos Bay, with the highest densities in the central portion of Long Beach on either side of the Belmont Pier. Eelgrass beds are also found at the mouth of Anaheim Bay adjacent to the bay breakwaters. It is likely that these beds would be vulnerable to sea level rise as they are located in areas where they cannot move shoreward to maintain current water depths due to the presence of the entrance jetties. Eelgrass beds are especially vulnerable to predicted increased storm intensity and frequency associated with climate change. Extreme storm frequency has the likelihood to scour benthic sediments beneath eelgrass beds and degrade its existing distribution and functionality. Under the FWOP conditions, functions and distribution of eelgrass beds within the proposed Project Area will be decreased by projected extreme storm events.

Kelp reefs. Under the FWOP condition, management efforts within the Los Angeles and San Gabriel watersheds to improve water quality, sediment quality, and reduce trash within the area would continue to progress; however, overall improvement would likely continue to be slow into the near future. In addition, water circulation issues within the proposed Project Area would continue to be affected by the existing breakwater. Impairment of water circulation and wave induced mixing would continue to concentrate pollutants and reduce water clarity within the bay. Giant Kelp on the seaward side of the breakwater would face increased pressures from storm frequency and intensity. Increased average ocean temperatures and stratification associated with climate change would increase the likelihood of Giant Kelp die-offs. Kelp is sensitive to seawater temperature and decreases substantially during El Niño years as a result. Under the FWOP condition, kelp beds would be susceptible to decreased productivity associated with impaired upwelling and ocean stratification resulting from ocean temperature increases. As a result, die-off may be more likely in the future if the existing populations cannot be augmented and sustained.

Rocky Reefs. Rocky reef and other hard bottom habitat are considered to provide valuable habitat for economically important fishes and macroinvertebrates. Current hard bottom habitat within ESPB is limited to linear features of the breakwater and riprap protecting the THUMS oil islands and Port of Long Beach facilities. Under the FWOP condition, rocky reef habitat will likely remain in a static special extent due to the reliance of rocky reef habitat on infrastructure. Ecological functions of existing rocky reef habitat will likely be degraded due to projected ocean acidification and increased stratification events.

Oyster Beds. Oyster beds contribute important functions to local ecosystems including biodiversity, water quality, nutrient cycling, refugia and nursery habitat for commercial fish species, and to the reduction of shoreline erosion in coastal areas. Under the FWOP conditions, oyster bed formation will continue to be depressed. Functions and overall distribution of individual oysters within the project area may be degraded by projected increases of extreme storm events, ocean acidification, and ocean temperature. Oysters within the proposed Project Area will likely be resilient to sea level rise as appropriate hard-substrate habitat is available at higher elevations in the form of port infrastructure.

Sandy Habitat (Sensitive Shorebird habitat). The Study Area contains potential habitat for two Federally listed shorebirds: Western Snowy Plover (*Charadrius alexandrinus nivosus*) and California Least Tern (*Sternula antillarum browni*). Sea level rise will continue limit potential nesting habitat (sandy beach and sand dunes) by inundating upland and intertidal sandy areas within the proposed Project Area. Currently, potential habitat within the proposed Project Area is not considered available for sensitive shorebird species due to the level of recreational use and beach grooming activities. The quality of foraging habitat for sensitive shorebirds (open water and intertidal sandy beach) is likely to be degraded to increased ocean temperatures. Under the FWOP conditions, sensitive shorebird breeding and foraging habitat within the Study Area will be degraded by climate change related effects.

Potential Locations For Target Habitats

Identifying potential locations for these target habitat restoration types was a necessary step in order to carry out subsequent technical hydrodynamic modeling and for the HE model to be covered in Section 4.3.

In formulating subsequent alternatives, the team considered locations, layouts, proximities, and potential stressors under future without project conditions for each of these habitat types to ensure long-term project success. To determine the sizes, shapes and locations for the target restoration types, multiple configurations were considered within the framework of the Opportunity Zones. These locations and sizes as well as co-location assumptions were derived from stakeholder and subject matter expert inputs. For example, it was acknowledged early on that co-locating nearshore sand/rock shoals with eelgrass throughout the project area was the only way to ensure survival of eelgrass given the presence of waves, especially towards the eastern region of the project area where waves are not attenuated by the long beach breakwater. Conceptual measures, including potential sizes, configurations and locations are shown for some of the habitat types in Figure 4-5. These early restoration scenarios formed the basis of the eventual alternatives and were critical in allowing the study to progress during the modeling stages.

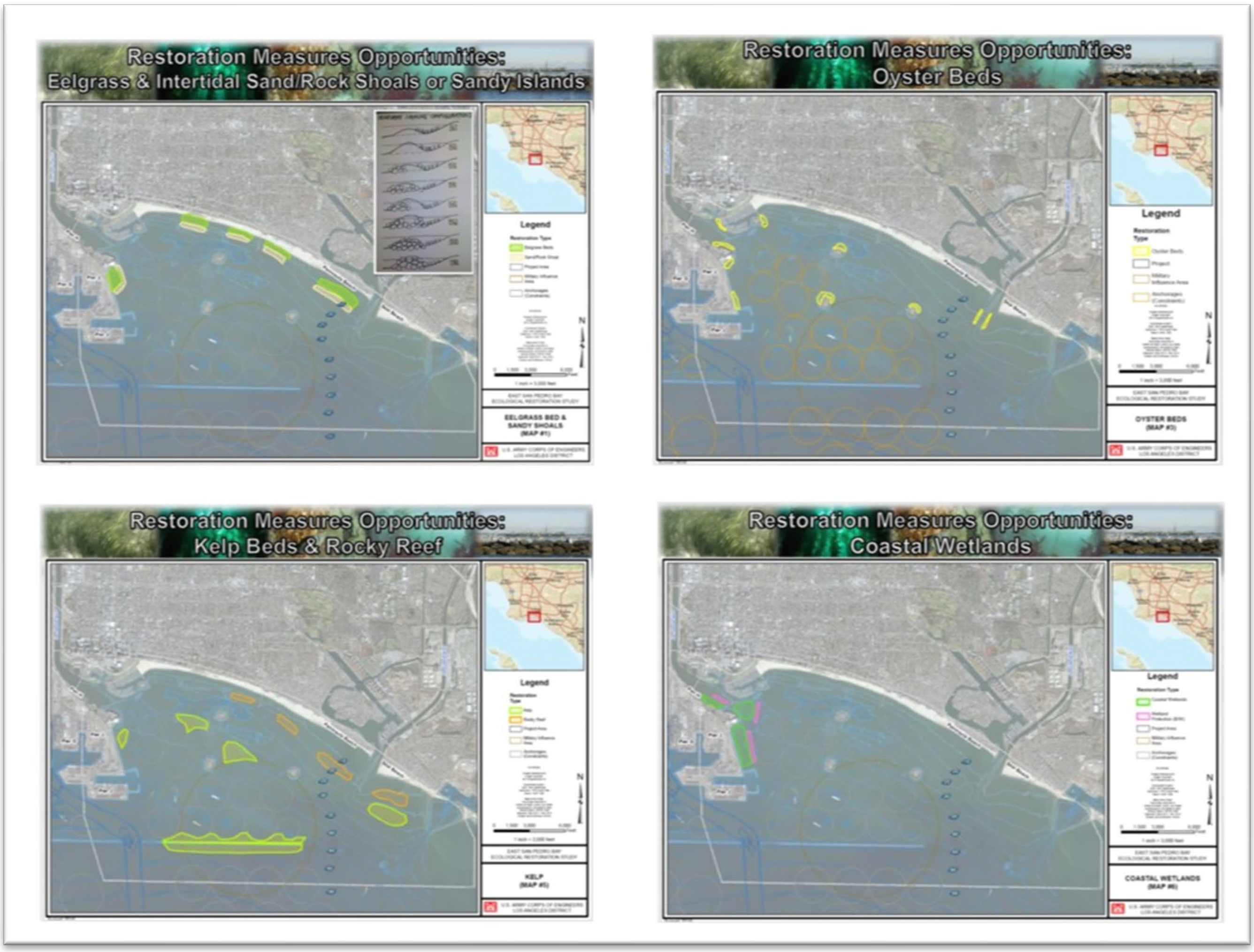


Figure 4-5: Target Habitat Types Restoration Opportunities

4.2.6 Base Plan

To ensure a minimum level of ecosystem restoration output would be achieved in terms of addressing the planning objectives, a Base Plan (See Figure 4-6) was developed to serve as the building block for potential plan combinations. The Base Plan is the smallest plan that is considered complete in that it minimally meets the planning objective. All subsequent plans that were considered include the Base Plan. The Base Plan includes five rocky reef shoals and eelgrass beds and one kelp reef. Four of the rocky reefs are east of Belmont Pier and one small reef is located at the end of the pier. It is the minimally acceptable plan to be evaluated and is therefore included in all combinations of larger alternatives considered.

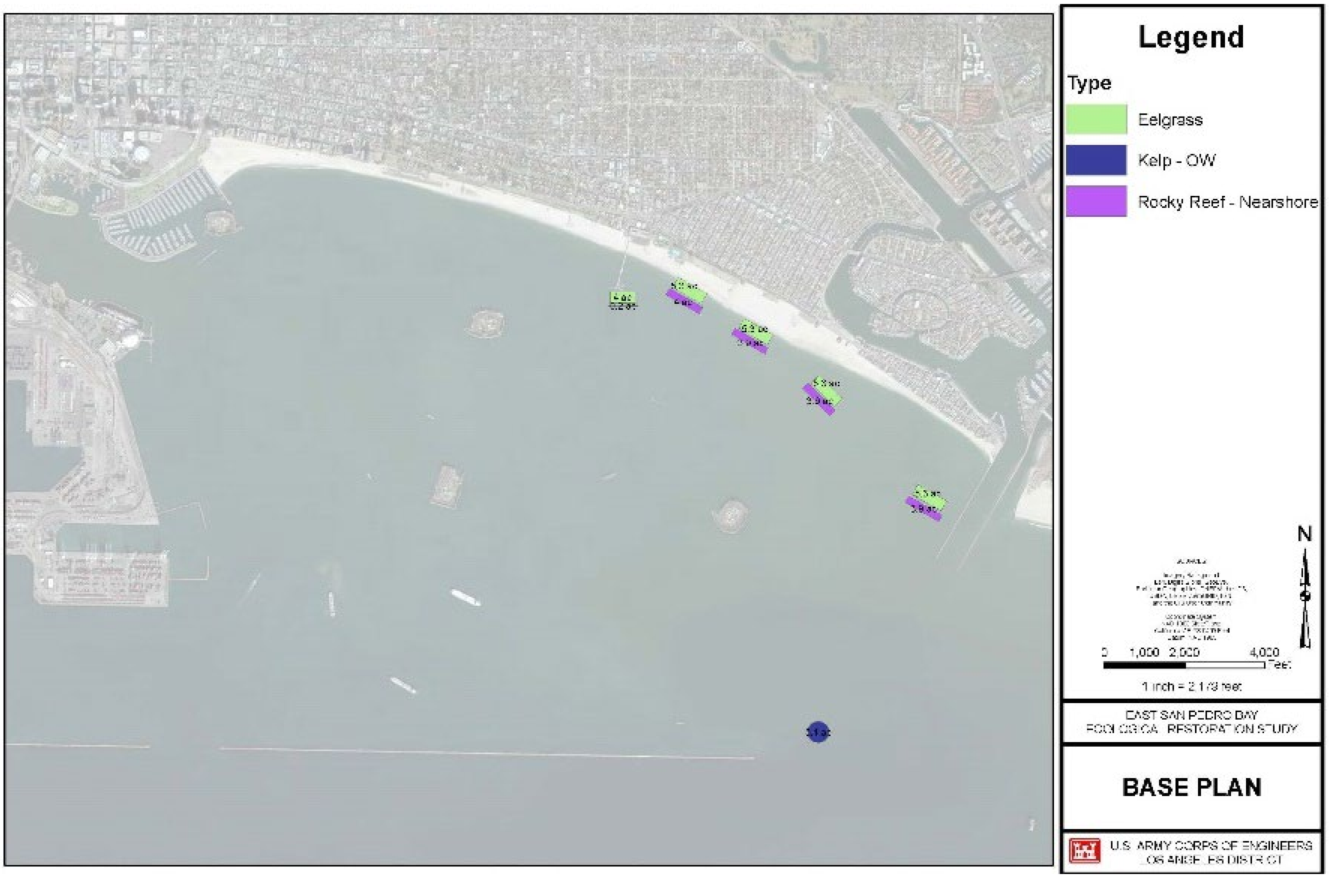


Figure 4-6: Base Plan

4.2.6.1 ***Base Plan Development Rationale***

To develop the Base Plan, a variety of factors and combinations of measures were considered in order to develop this minimum restoration plan. The main goal was to include at least three habitat types in at least two zones for the Base Plan. This would ensure that subsequent alternatives identified during the CEICA analysis would meet the sub-objectives of increased habitat acreage, complexity, spatial diversity, and some degree of connectivity. Other considerations include measure outputs, cost estimates, and Average Annual Habitat Units (AAHU), which are explained further in Section 4.3.2.

Rationale for Eelgrass and Nearshore Reefs in the Base Plan

Because eelgrass has national and regional resource significance and both eelgrass and rocky reefs are under threat from human activities, it was determined co-locating these habitats as a "two-in-one" measure would effectively meet restoration objectives. Eelgrass is generally observed in protected waters in which wave action is reduced to non-existent. As the proposed Project Area is largely unprotected from wave action, the restoration of eelgrass will be dependent on the associated nearshore reefs that are designed to reduce wave energy and provide hospitable conditions. The rocky reefs can exist independently of the eelgrass.

Five shoals in the nearshore zone would generally maximize the coverage of both eelgrass and subtidal rocky reef habitat within the Base Plan, while allowing for flexibility of adding shoals and/or additional habitat types suitable in the nearshore zone for larger scale plans. The spacing between each "shoal" provides for increased habitat complexity (eelgrass, rock, sand matrix), wave circulation, and recreational access to/from shore. In addition, the rock structure of the shoals provides a more comprehensive, albeit incidental, benefit of reducing shoreline erosion at Peninsula Beach. This is of concern to residents, resource agencies and to the City due to high cost of maintenance.

Appendix D: Biological Supplement, Section 3.3.3.1 Rationale for Eelgrass Bed Form and Sizing, provides more background on eelgrass bed sizing. There's some suggestion that from a monitoring perspective, eelgrass habitats of 20 acres or more "*contribute significantly to the overall regional estimates of extent of the habitat.*" Based on this rationale, five (5) eelgrass beds of 5 acres each are expected to contribute significant eelgrass habitat to the region as they exceed the 20 acres described above (Bernstein et al., 2011) and have a greater chance of succeeding and providing habitat for organisms within the area (Thom 2001). Any additional increase in eelgrass is expected to positively benefit the area and region; however, available space within the project area is limited based on existing eelgrass and the necessity to avoid areas of existing eelgrass for eelgrass restoration, and suitable depth in which to restore eelgrass habitat within the project area is also limited.

The Base Plan shows a "gap" in shoal placement at Peninsula Beach which provided flexibility in our plan formulation process to allow for potential inclusion of the sandy island feature or additional eelgrass/rocky reef shoals. A different measure such as sandy island would increase biological complexity within the nearshore zone by introducing additional habitat types near the eelgrass/subtidal rocky reef habitats.

Rationale for Kelp Bed in the Base Plan

Due to the sub-objectives to increase acreage, ensure habitat complexity and spatial distribution, the different habitat types were chosen within different opportunity zones. Factors including outputs, costs and AAHU were again considered. High-cost measures in other zones were omitted including wetlands, as those measures were considered on an incremental basis when evaluating larger scale plans than the Base Plan. Open water rocky reef was considered due to its location in a different zone, proximity to the nearshore shoals, and high output. However, when compared to kelp beds which had a high output at a significantly lower cost, the rocky reef was omitted due to its high-cost relative to output. As a result, kelp was selected as the third habitat type for the Base Plan.

Kelp forests are estimated to be among the most productive habitats on Earth, rivaling coral reefs (Claisse et al., 2013; Pondella et al., 2015). Only one kelp bed patch was included because, keeping with the intent of the Base Plan, it minimally provides suitable habitat and connectivity for various marine organism within the proposed Project Area. Due to its low cost and high output, kelp beds would be a dominant habitat type in alternatives identified by CEICA. By locating the kelp bed near the breakwater, this proximity increases the likelihood of it being "seeded" by existing breakwater kelp.

Regarding the size of kelp reefs, regional precedence was the basis for a 5-acre kelp bed size, as described in Appendix D: Biological Supplement, Section 3.3.3.2 Rationale for Kelp Bed Sizing. No standard sizing guidelines are available for kelp bed restoration. Five acres was used as the minimum size by for a giant kelp restoration project conducted in Laguna Beach, California (MBC Aquatic Sciences, pers. comm.). Because this project developed from an interest in the protection and preservation of giant kelp communities in the SCB, it is an appropriate regional example for the project in ESPB. A kelp bed with a canopy size of at least five acres would be likely to persist during extended periods of unfavorable conditions or following ecological disturbances (ENSO events, etc.). Technically, these kelp reefs would act as open water reefs.

As designed, the base plan contains all of the primary components of the requisite habitat features (eelgrass, kelp, and rocky reef) and meets the planning objectives of adding complexity and connectivity (although limited from the outer bay to the inner bay).

4.3 PLAN EVALUATION: TECHNICAL MODELING AND ANALYSIS OF MEASURES AND ALTERNATIVES

To further refine measures and identify potential alternatives, technical modeling was conducted with the remaining measures discussed in Section 4.2.3.

Working Alternatives

To aid in the refinement of the measures, a series of Working Alternatives were utilized in the modeling efforts. These Working Alternatives allowed the team to “test” potential alternatives by both running them through technical analysis and obtaining preliminary feedback from key stakeholders. Taking the measures previously identified, various combinations, sizes, and locations were developed for the Working Alternatives, shown in Figure 4-7. Measures included both target habitat restoration types and breakwater modification and circulation-related measures at the request of the non-Federal sponsor. Working Alternatives were necessary to conduct hydrodynamic modeling efforts to test actual measure sizes and locations and to ensure the HE model (HEM) evaluated location-specific suitability.

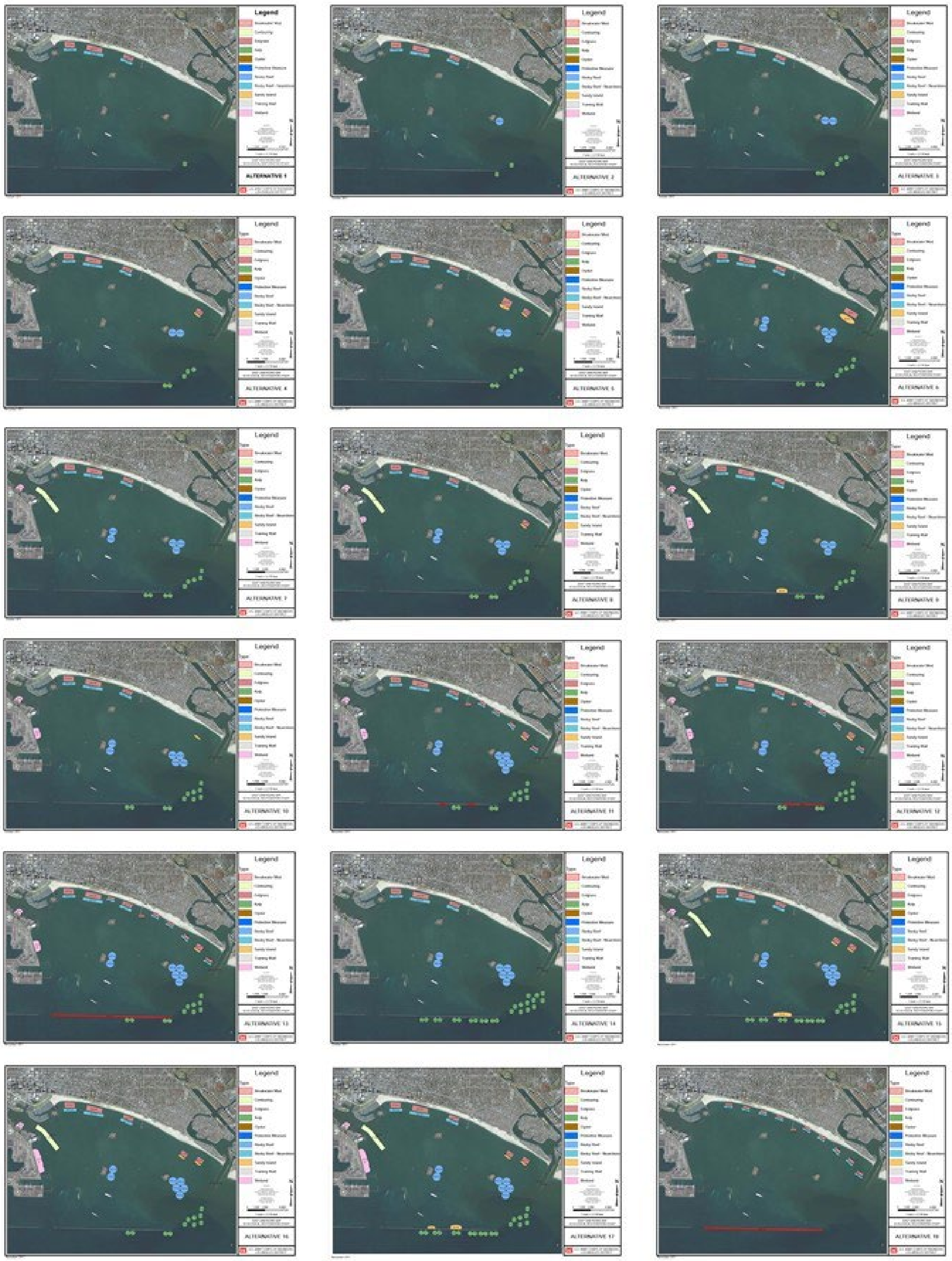


Figure 4-7: Working Alternatives

Breakwater Modifications Modeled

Multiple variations for breakwater modifications were considered during the plan formulation process. One of the measures, lowering the entire breakwater, is derived from the Surfrider Alternative. Other variations modeled are shown below. Not all breakwater alternatives were modeled at the same level; some were described by only the wave modeling and some were described with the combined wave and hydrodynamic modeling.

- Lower entire breakwater to -30’ MLLW (Wave & Current)
- Remove eastern 1/3 down to -30’ MLLW (Wave & Current)
- Remove western 1/3 down to -30’ MLLW (Wave Only)
- Two 1,000’ notches in eastern side (Wave & Current)
- Two 1,000’ notches in western side (Wave Only)
- Single 1,000’ notch in the western side (Wave Only)
- Single 1,000’ notch in the center (Wave Only)

4.3.1 Coastal and Hydrodynamic Modeling

Four numeric models were utilized to better understand changes to wave and current patterns within the bay, how proposed measures alter existing wave patterns, and to provide plan formulation support. Numeric models used include CMS-Wave, EFDC (Environmental Fluid Dynamics Code), Bouss-2D, and GenCade. Modeling results, alone and integrated, provide valuable data used by the team to verify, design, locate and estimate costs for the measures under consideration. Full model details and results can be found in Appendix A, A-1, and A-2.

Below is a summary of these coastal models.

a. CMS-Wave - CMS-Wave is a steady-state spectral wave model that provides transformation of an offshore wave condition to the nearshore environment using linear wave theory. The results of this model provide wave height, direction and period and assists with preliminary measure placement, orientation, and potential impacts due to structural changes. Measures that alter waves were analyzed including nearshore shoals, sandy island, coastal wetlands, training wall and breakwater measures. Open water rocky reef, kelp beds and oyster reefs are assumed to have a negligible impact to waves and do not warrant inclusion for this type of modeling. Wave heights were also used for calculation of the combined wave-current velocities at the seabed. Output of CMS-Wave feed into EFDC to provide additional hydrodynamic forcings.

b. Environmental Fluid Dynamics Code (EFDC) - EFDC is a 3D hydrodynamic model that is forced by tides and salinity and temperature gradients. Results of this model include total water surface elevation, velocities, salinity concentrations and total suspended solids throughout the modeling domain. Modified from the WRAP model already in use at the Ports of Long Beach/Los Angeles, results of this model provide current velocities and salinity concentrations used in the HEM for the measures noted above (everything except kelp beds and open water rocky reef). A particle tracking analysis was also conducted using the EFDC outputs to provide insight on how long a typical parcel of water remains within the bay and the path taken that provides a representation of how the system changes due to the structural modifications. See Appendix A-1 for complete EFDC documentation and Section 4.3.2 below and Appendix D for more on the HEM.

c. Bouss-2D - Bouss-2D is a two-dimensional wave model that utilizes a form of the Boussinesq equations to provide for a more complete solution to the wave transformation in intermediate water depths. Unlike the CMS-Wave model, this solution directly provides more physical processes including diffraction, which is important when considering structural modifications to breakwaters. Results of this model provide wave conditions at a structure, including wave setup, runup elevations and potential overtopping. Bay-wide oscillation were also examined based on the model results combined with a spectral analysis, detailed in Appendix A, Section 7.2.3. This analysis pertains only to the breakwater modifications measures, which are the only large structural changes considered.

d. GenCade - GenCade is a long-term shoreline change model that utilizes wave conditions to calculate the longshore sediment transport within the modeling domain. Results assist with the placement of the nearshore reefs, both with and without the breakwater modifications. Results also analyze the resulting shoreline change due to the change in wave conditions.

4.3.1.1 Coastal and Hydrodynamic Modeling Results

To support plan formulation, models' results were evaluated to validate assumptions and refine measures designs and locations. Prior experience suggests that oyster reefs, kelp reefs and offshore rocky reefs restoration measures will have little effect on wave and current patterns within ESPB. The tidal salt marsh will be designed to limit wave reflection within the bay so any affect will be negligible. The emergent island will shelter the shoreline and reduce the sediment transport potential in the lee of the structure. The nearshore reefs will cause waves to shoal and break causing a lower sediment transport potential in the lee of the structures. This lower sediment transport will produce a small salient, or bulge in the shoreline, and allow for the development of a perched shoreline. Any gain in shoreline position will have an associated erosional pocket or hoot without the inclusion of additional nourishment.

Modifications to the breakwater will allow for more wave energy within the bay. This increase of energy will cause more sediments to be available for transport; finer sediments will be mobilized and transported away by the underlying tidal currents leaving more coarse materials than are currently not present in the top layers of sediment. Changes to the shoreline configuration is expected. Lowering of the eastern end of the breakwater will widen the zone of erosion to a more western position, while notching of the western side will cause localized pockets of erosion from the Shoreline Marina to Belmont Pier.

Breakwater modifications allow for wave height increases of more than 100% in extreme events but generally only increase heights by 25% from existing conditions under other than extreme events. Various protective measures will be required to safeguard existing infrastructure from any breakwater modification.

Changes to the breakwater only have a minor effect on the overall time a typical particle remains in ESPB. The change is dependent on the size of the breakwater modification. Small openings show practically no change in duration. However, lowering the entire breakwater, on average, decreases the average duration a particle remains in ESPB compared to existing conditions. The training wall has the largest decrease on the average particle time during the winter months but correspond to flow events from the Los Angeles and San Gabriel Rivers. Other structural changes do not significantly alter the circulation patterns within ESPB.

The representative particle duration provides a quick overview of what occurs within the bay during specific flow and tidal conditions. Using a tracer study, with particles released at different times during the flow regime, the representative particle duration presents a simple method to show the changes to circulation patterns within the bay. For further information see the Particle Tracking section in Appendix A-1. These values were entered into the habitat evaluation model found in Section 4.3.2.

4.3.1.2 Structure Design, Sea Level Change and Quantity Estimates

Each habitat measure is evaluated for stability, sustainability and longevity based on the hydrodynamic conditions and wave environment. Per ER 1100-2-8162, Incorporating Sea Level Change in Civil Works Programs (2013), potential sea level change (SLC) was considered in the development of measures and alternatives. Over the 50-year planning horizon, from the years 2030 to 2080, SLCs were considered when formulating each habitat restoration measure. The projected SLC levels for the low, intermediate and high scenarios were 0.14', 0.7', and 2.5', respectively. The details can be found in Appendix A, Sections 3.3.2. Section 5.1 Description of Measures and Basis for Design consider SLC in the design of each habitat restoration measure.

All of these factors inform conceptual measures designs, enabling the development of cost estimates. The estimated quantities of materials include stone for armor, filter, and core as well as fill, sand and concrete. Material sources have been identified and analyzed to ensure adequate quantity for construction of the measures. All materials, besides large armor stone, are relatively easy to obtain and can be procured at a rate to keep up with construction activities. Large armor stone production may lag the construction due to the sizeable quantity required and the need from other maintenance projects within the southern California area. Beneficial re-use of material from adjacent large federal projects (Port of Long Beach Deepening Study and Naval Weapons Station, Seal Beach Pier Expansion) can be incorporated depending on the construction timeframe but should not be relied upon as a primary source.

4.3.2 Habitat Evaluation Modeling: Southern California Coastal Bay Ecosystem Model

For ecosystem restoration projects, the evaluation process focuses on quantitative and qualitative restoration outputs instead of monetary benefits which are incidental. Per the PGN, ecosystem restoration outputs must be clearly identified and quantified in appropriate units. For this Study, the quantitative unit of Habitat Units or HU's were identified. This would allow "evaluation of various physical, chemical, and/or biological parameters that can be modified by management measures which would result in an increase in ecosystem quantity and quality in the proposed Project Area, the use of units that measure an increase in "ecosystem" value and productivity…" (PGN, Section 3-5. Ecosystem Restoration, c. Evaluation Framework, sub-section (1)). The PDT evaluated various physical, chemical, and/or biological parameters that can be modified by management measures which would result in an increase in ecosystem quantity and quality in the proposed Project Area. It is preferable to use habitat units that measure an increase in ecosystem value.

The Southern California Coastal Bay Ecosystem Model (BEM) was developed in partnership with the USACE Engineering Research and Development Center (ERDC) out of Vicksburg, Mississippi, and the TAC. On July 25, 2018, the USACE ECO-PCX approved the use of this model for regional use within coastal southern California, from Point Conception to the California-Mexico border. The model provides quantitative valuation of outputs based on habitat quality and ecosystem functions provided by the restoration measures. Specifically, the model captures the suitability of habitat types associated with coastal ecosystems, which indicates the ability of a particular habitat to support species of concern. For the purposes of the model, habitat quality or suitability is defined as the ability of a particular habitat to support species of concern. As the suitability of a habitat increases, so does the likelihood that habitat will support a given suite of species.

Prior to the model, the PDT and TAC solidified the target restoration habitat types and determined key physical parameters required by each habitat type. Parameters included in part, temperature, depth, substrate residence time, circulation, salinity, and connectivity (between reef patches), and varied with each habitat type. These are shown in Table 4-2. At the heart of the BEM are a series of suitability curves, one for each parameter, for each habitat type, developed by the PDT with input from the TAC.

The model started with baseline conditions, taken from coastal and hydrodynamic model outputs, and predicted increases in habitat quality under various restoration scenarios or preliminary working alternatives. These working alternatives were used as case studies to illustrate the application of the model, illustrating how the model can be utilized. Each scenario incorporated the six habitat types selected for restoration as well as structural modification measures, including the Training Wall and breakwater modification measures. From the outputs, habitat values for individual measures could be ascertained.

The result was a set of habitat suitability indices and HUs for the restoration scenarios or working alternatives. Because the team decided to input individual management measures into the CEICA model, HU per measure were derived from the average annual HUs (AAHU) for the Working Alternatives. AAHUs are numerical habitat values or outputs generated by a measure or measure grouping. HU values ranged from 0.0 for the two breakwater measures and training wall, to 95.9 for the rocky reef complex, co-located in the nearshore zone. Kelp beds ranged from 4.2 to 42.3 HU, small to large wetlands ranged from 7.1 to 40.6 AAHU. Oyster beds outputs were negligible at <1.0 HU.

It must be noted that the BEM is not intended to project absolute system changes, but relative differences between proposed restoration alternative actions. Instead of trying to quantify the baseline and future with-project habitat value of all substrate and vegetation types present within ESPB, the model focused on the rare and diminishing components that the various measures are intended to restore. Results of the model analysis must be synthesized with other decision-making criteria and don't account for all considerations that impact the decision-making process. For example, the model was developed to be relevant to the targeted habitats of interest at the ecosystem level, not just specific marine species. The BEM output also did not fully capture habitat nodal connectivity within the Study Area and regionally.

Concerns about endangered species, support by a local sponsor or other interest group, cost sharing arrangements, and other factors may lead to the continuing consideration and selection of solutions that may not be the most cost effective, or that may incur additional incremental costs. In this spirit, the BEM can be an effective tool to communicate the overall benefits derived from a recommended restoration plan.

4.3.2.1 Habitat Suitability Modeling Parameters

Inputs for the habitat suitability model are calculated from model outputs and other derived quantities. For further descriptions of these parameters, see Appendix D: Habitat Evaluation and Model Documentation. Although referred to in the BEM as "residence time," the data shows representative particle durations modeled as part of the EFDC effort.

Table 4-2: Habitat Suitability Modeling Parameters

Habitat/Parameter		Description
Rocky Reef	Connectivity	The spatial distance between distinct reefs. Determined by placement.
	Residence Time	Average particle time in domain. Sections in the following chapters.
	Substrate	Type of underlying material. Determined by presented conditions and design. Either present/absent.
Kelp Reef	Temperature	Water temperature. Does not changed due to breakwater modification or habitat feature creation.

Habitat/Parameter		Description
	Substrate	Type of underlying material. Determined by presented conditions and design. Either present/absent of the hard substrate.
	Depth	Water depth from MLLW datum. Determined by existing and design conditions.
Eelgrass Bed	Circulation	Water velocity at the seabed. Velocities are expected to be slightly higher in magnitude near the sea bed since the calculation uses the significant wave height, and not the individual waves, but gives a good overall approximation.
	Depth	Water depth from MLLW datum. Determined by presented conditions and design.
	Temperature	Water temperature. This value is independent of any breakwater modification.
	Substrate	Type of underlying material, described in terms of % fines. Percent fines is the percentage of material that passes the No. 200 sieve. Determined by present and design conditions.
Oysters	Salinity	Calculated quantity from EFDC modeling output.
	Depth	Water depth from MLLW datum. Determined by presented conditions and design.
Tidal Salt Marsh	Elevation	Elevation above MLLW datum. Determined by presented conditions and design.
	Salinity	Calculated quantity from EFDC modeling output.
	Size	Spatial size of the marsh. Determined by design condition.
	Substrate Grain Size	Size of underlying material, separated by more course or more fine. More course represents gravels and cobbles and more fine contains all material finer than gravel. Determined by design and existing conditions
	Connectivity	Degree of connectivity between distinct tidal marshes.
Sandy Island	Vegetation Cover	Percent of vegetation cover. Determined by design.
	Effective Size	Spatial size of the island. Determined by design.
	Elevation	Surface elevation from MLLW. Determined by design and current conditions.
	Sediment Grain Size	Size of sediment. Determined by existing conditions and design.
	Distance	Spatial distance from other islands or the mainland. Determined by design.

The spatially indexed inputs for the HEM were provided as a geo-referenced database with the above identified parameters. The outputs in the form of AAHUs are presented in Table 4-4.

4.3.3 Cost Estimating

Construction costs, adaptive management costs, and operation, maintenance, repair, rehabilitation, and restoration (OMRR&R) costs were developed separately for each measure and are presented in Appendix B: Cost Engineering. Construction costs include the work required to initially install or construct a feature while adaptive management costs include additional labor and work to monitor and modify the feature as necessary to ensure it will fulfill the environmental restoration objective. OMRR&R costs include costs incurred after the measure is constructed or installed and the measure is established to where it addresses the ecosystem restoration objective as intended.

With the development of conceptual level designs and quantity estimates (see Section 4.3.1), preliminary costs for each measure were determined using a combination of parametric data, and development of labor, equipment and material costs utilizing cost book information where historical pricing was limited. Parametric costs are derived from looking at historical data on past projects with similar design and construction conditions, to estimate the time and cost of a current project. Each measure was divided into separate major components and unit prices were developed based on the work necessary to construct each component. A single unit price (i.e., core stone) was used for similar components found in multiple measures.

Cost estimates, including first or construction costs, operations and maintenance costs, and average annual costs, are provided for each measure in Table 4-4. A detailed breakdown of the components and associated costs of each measure can be found in Appendix B: Cost Engineering, Attachment 2 – Detailed Measure Cost Data. These estimates provide critical input into CEICA cost-benefit analysis.

Per USACE cost engineering guidance, this cost engineering assessment is compliant with ER 1110-2-1302 - Civil Works Cost Engineering dated 30 June 2016. An Abbreviated Cost Risk Analysis (ACRA) was completed for each of the measures in Table 4-4. All cost products went through DQC review by the Los Angeles District Cost Engineering Subject Matter Expert, as well as Agency Technical Review (ATR) by the Cost Engineering Center of Expertise (MCX) in the USACE Walla Walla District.

4.3.4 Measure Outputs (Cost Estimates and Habitat Evaluation Results)

In Section 4.2.3, 12 remaining measures were identified as measures to carry forward in technical analysis. These measures included target habitat restoration types and measures of interest to the non-Federal sponsor and evaluated in subsequent hydrodynamic and habitat evaluation modeling, as covered in prior sections. Following the modeling efforts, refinements to the measures were made allowing initial cost estimates to be developed in anticipation of CEICA.

To prepare for the cost-benefit analysis, measures were ordered into groupings that function as a unit and provide synergistic habitat benefits over individual measures alone. The measure groupings are also referred to as “mini alternatives” and provide a range of scales within compatible opportunity zones.

Multiple factors contributed to the formulation of the mini alternatives used in CEICA.

- Anticipated FWOP conditions for the 50-year period of analysis for both the Study Area and proposed Project Area include assumptions about sustainability for the different habitat types such as increased storms, kelp die-off, sedimentation of rocky reef, and sea level change. The team considered habitat types, locations, layouts, proximities, and potential stressors under FWOP conditions to ensure project success.
- The planning sub-objectives guided specific configurations, sizes, groupings and locations of the different habitat types. The specific sub-objectives include: (a) Increase the extent (total area) of complex aquatic habitats within the proposed Project Area; (b) Increase the diversity and spatial heterogeneity of complex aquatic habitat types within the proposed Project Area; and (c) Increase the overall connectivity of complex aquatic habitat types within the proposed Project Area by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs.
- The Working Alternatives identified in Section 4.3 aided in the refinement and plan formulation process. It was during this step that potential mini alternatives were drawn up and evaluated in the hydrodynamic and habitat evaluation modeling. In addition, valuable input was received on these Working Alternatives by the Ports Working Group and the TAC. The inputs received were useful in reducing uncertainties regarding impacts and for qualitative feedback on potential

ecosystem benefits. For example, resource agency representatives wanted to see existing eelgrass less impacted so eventually the nearshore rocky reef and eelgrass complexes were shifted to the east of Belmont Pier. This input reduced some of the risk and uncertainties that are inherent in placement of new features in a particular location.

All of these factors contributed to the creation of a "menu" of mini alternatives in preparation for CEICA analysis. Each measure grouping was given a discreet ID number for use in developing design, construction and maintenance assumptions, and for the CEICA analysis. This table includes the Base Plan measures identified earlier.

Table 4-3: Crosswalk of CEICA Measures With Original Measures Screened

	Measure or Mini Alternative	Measure Name
Base Plan	(5) Rocky Reef Shoals East (NB)	Nearshore Zone Rocky Reef + Eelgrass Habitat
	Place scattered rock for Kelp Forest (OB)	Kelp Habitat
Nearshore Zone	(2) Small Emergent Islands	Sandy Island Habitat
	(1) Small and (1) Medium Emergent Island	Sandy Island Habitat
	(1) Large Emergent Island	Sandy Island Habitat
	Small Oyster Reef (WJ)	Oyster Bed Habitat
	(2) Medium Oyster Reef (WJ + EJ)	Oyster Bed Habitat
	Add (1) Rocky Reef Shoal	Nearshore Zone Rocky Reef + Eelgrass Habitat
	Add (3) Rocky Reef Shoals East	Nearshore Zone Rocky Reef + Eelgrass Habitat
	(1) Small Emergent Island	Sandy Island Habitat
Open Water Zone	(1) Rocky Reef Complex Island A	Open Water Rocky Reef Habitat
	(2) Rocky Reef Complex Island A	Open Water Rocky Reef Habitat
	(3) Rocky Reef Complex Island A + (2) Rocky Reef Complex Island B	Open Water Rocky Reef Habitat
	(5) Rocky Reef Complex Island A + (2) Rocky Reef Complex Island B	Open Water Rocky Reef Habitat
	Add Scattered Rock (Scale 1)	Kelp Habitat
	Add Scattered Rock (Scale 2)	Kelp Habitat
	Add Scattered Rock (Scale 3)	Kelp Habitat
	Add Scattered Rock (Scale 4)	Kelp Habitat
LA River Zone	Small Tidal Wetland	Coastal Wetland Habitat
	Training Wall & Bottom Contouring	Los Angeles River Training Wall + Underwater Contouring Cut/Fill
	(1) Large Size Oyster Reef	Oyster Bed Habitat
Port Zone	Small Tidal Wetland	Coastal Wetland Habitat
	Medium Tidal Wetland	Coastal Wetland Habitat
	Large Tidal Wetland	Coastal Wetland Habitat
Breakwater Zone	Reduce Rock (Dropped)	Kelp Habitat
	Add Rock (Scale 1)	Kelp Habitat
	Add Rock (Scale 2)	Kelp Habitat
	Add Rock (Scale 3)	Kelp Habitat
	Add Rock (Scale 4)	Kelp Habitat
	(1) Small Emergent Island	Sandy Island Habitat
	(1) Small and (1) Medium Emergent Island	Sandy Island Habitat
	(1) Large Emergent Island	Sandy Island Habitat
	Notch Breakwater	Modify Breakwater (2 notches on the east side)

	Measure or Mini Alternative	Measure Name
	Notch Breakwater Westside-With Higher RR Shoals Zone N	Modify Breakwater (2 notches on the west side) + Nearshore Zone Rocky Reef (higher elev. than Alt 2) + Eelgrass Habitat
	Remove 1/3 Breakwater	Modify Breakwater (lower 1/3 of east side)
	Remove 1/3 Breakwater Eastside-With Higher RR Shoals Zone N	Modify Breakwater (lower 1/3 of east side) + Nearshore Zone Rocky Reef (higher elev. than Alt 2) + Eelgrass Habitat
	Lower Breakwater	Remove Entire Breakwater (lower to -30' MLLW)

See Table 4-4 for a summary of cost estimates per each measure or measure grouping.

Each line item shows estimates of first costs or construction costs, annual operations and maintenance costs, and average annual costs per measure. All costs are presented in 2018 price levels. Costs include monitoring and adaptive management costs. Interest during construction was also calculated based upon estimated construction periods to derive total investment cost. Annualized investment costs were then computed using the FY 2018 Federal discount rate of 2.75 percent over a 50-year period of analysis, starting in Base Year 2030. Finally, annual operation and maintenance costs were added to derive total average annual costs for each measure.

Results of the HEM or BEM are shown in the far-right column, as AAHU. AAHUs are numerical habitat values or outputs generated by that measure or measure grouping. AAHU shows a net increase compared to the future without project condition. These values are relative to each other and are not weighted between measures or habitat types. Measures in red indicate no or 0.0 AAHU value, including training wall and breakwater measures.

Based on habitat types and their proposed siting, it was observed that habitat measures currently reside in a range of acceptable parameters with the inclusion of the Long Beach Breakwater. The missing feature, in most cases, was proper substrate (e.g., rocky substrate for kelp within the open water of ESPB, wave protected water off Peninsula Beach). As a result, modeled breakwater modifications resulted in a lack of increased AAHUs for habitat measures.

Impacts on restoration measures were considered for breakwater modifications. For example, the removal or modification of the breakwater is expected to result in increased wave energy within the proposed Project Area that is detrimental to eelgrass and modification of the breakwater would limit the ability of restored eelgrass to exist within the proposed Project Area and potentially impact currently existing eelgrass. Regarding kelp, the breakwater does alter the temperature gradient within San Pedro Bay and could affect this habitat. However, kelp currently exists where there is hard substrate within the proposed Project Area and dense canopies of kelp can be observed along the breakwater (both along the seaward and bay sides). Although breakwaters were conservatively modeled as being impermeable (*i.e.*, no wave transmission and tidal flows through the structure), field experiments indicate that approximately 30% of wave energy is transmitted through the structure (depending on the dominate wave period at the time) along with nutrient-laden, cool seawater. A key environmental factor and modeling parameter for rocky reef is sedimentation and particle duration. Results of field observation and modeling indicates that representative particle duration within the Project Area is currently within an acceptable range for rocky reef. There is a slight decrease in this duration as a result of breakwater modification; however, a single parameter (unless it is zero) is not expected to significantly change HEM results. The mean of HEM results for each habitat type and breakwater modification were used and deemed acceptable both from the TAC and the Subject Matter Experts at ERDC and were approved by the ECO-PCX.

Table 4-4: Cost and Output by Measure

	Measure or Mini Alternative	First Cost	OMRR&R Cost	AA Cost	AAHU
	Description	**First Cost**	**OMRR&R Cost**	**AA Cost**	**AAHU**
Base Plan	(5) Rocky Reef Shoals East (NB)	$51,906,079	$207,390	$2,166,700	29.3
	Place scattered rock for Kelp Forest (OB)	$3,927,253	$0	$145,800	4.3
Nearshore Zone	(2) Small Emergent Islands	$60,974,761	$1,628,850	$3,923,500	13.8
	(1) Small and (1) Medium Emergent Island	$83,180,205	$2,062,310	$5,205,900	22.7
	(1) Large Emergent Island	$104,044,069	$2,498,250	$6,400,100	30.0
	Small Oyster Reef (WJ)	$816,903	$0	$30,300	0.07
	(2) Medium Oyster Reef (WJ + EJ)	$1,134,303	$0	$42,100	0.23
	Add (1) Rocky Reef Shoal	$11,429,493	$43,720	$468,000	8.1
	Add (3) Rocky Reef Shoals East	$41,899,298	$163,035	$1,734,100	12.1
	(1) Small Emergent Island	$33,429,766	$1,120,920	$2,368,300	7.0
Open Water Zone	(1) Rocky Reef Complex Island A	$23,110,916	$0	$858,000	13.7
	(2) Rocky Reef Complex Island A	$45,065,003	$0	$1,674,700	27.4
	(3) Rocky Reef Complex Island A + (2) Rocky Reef Complex Island B	$105,363,253	$0	$3,938,200	68.4
	(5) Rocky Reef Complex Island A + (2) Rocky Reef Complex Island B	$145,078,753	$0	$5,428,800	95.9
	Add Scattered Rock (Scale 1)	$1,150,003	$0	$42,700	8.3
	Add Scattered Rock (Scale 2)	$2,035,503	$0	$75,600	16.0
	Add Scattered Rock (Scale 3)	$2,921,003	$0	$108,400	24.4
	Add Scattered Rock (Scale 4)	$5,134,753	$0	$190,700	42.3
LA River Zone	Small Tidal Wetland	$24,973,211	$623,770	$1,560,400	7.1
	Training Wall & Bottom Contouring	$63,406,000	$2,473,967	$4,852,000	0.0
	(1) Large Size Oyster Reef	$759,403	$11,010	$39,400	0.08
Port Zone	Small Tidal Wetland	$76,775,476	$1,120,150	$4,025,800	7.8
	Medium Tidal Wetland	$106,244,476	$1,444,100	$5,472,800	17.6
	Large Tidal Wetland	$187,522,676	$2,479,495	$9,615,700	40.6
Breakwater Zone	Add Rock (Scale 1)	$4,548,250	$0	$168,900	4.2
	Add Rock (Scale 2)	$5,852,350	$0	$217,500	8.5
	Add Rock (Scale 3)	$8,484,700	$0	$316,100	16.9
	Add Rock (Scale 4)	$19,014,100	$0	$708,300	49.6
	(1) Small Emergent Island	$92,451,570	$3,923,310	$7,435,600	5.9
	(1) Small and (1) Medium Emergent Island	$142,085,070	$6,156,820	$11,566,300	18.0
	(1) Large Emergent Island	$124,166,070	$5,350,460	$10,042,800	19.2
	Notch Breakwater	$899,961,300	$1,440,670	$35,500,600	0.0
	Notch Breakwater Westside-With Higher RR Shoals Zone N	$982,220,985	$1,648,060	$38,821,100	0.0
	Remove 1/3 Breakwater	$600,640,000	$733,650	$24,025,400	0.0
	Remove 1/3 Breakwater Eastside-With Higher RR Shoals Zone N	$658,810,985	$941,040	$26,488,600	0.0
	Lower Breakwater	$1,419,918,300	$962,860	$56,409,300	0.0

Results of habitat evaluation and cost estimating show:

- The lowest first cost measures include oyster reefs at just under and over $1 million, but with <1.0 AAHU habitat outputs, reflective of the small footprint or coverage area. Oysters have no O&M costs and a low average annual cost (AAC) of $30,300 - $42,100, the lowest of all measures. AAHUs are less than 1.
- Breakwater measures have the highest first costs ranging from over $600 million to over $1.4 billion to construct. Annual OMRR&R costs range from $734,000 to $1.65 million. Average annual costs are the highest of all measures at $24 million to $56 million. All five breakwater measures scored 0.0 AAHUs of output, meaning they did not provide restoration benefits.
- AAHUs range from 0.07 for oysters to 95.9 for seven (7) open water rocky reef patches of the 36 measure groupings. Six measures scored above 30 AAHUs, 4 are above 20 AAHUs, 8 are above 10 AAHUs, 12 are above 0.01 AAHUs and 5 have 0.0 AAHUs.
- Oysters, kelp beds (scattered rock) and open water rocky reef (add rock and rock reef complex islands) have no OMRR&R costs, making the AAC low, ranging from $30,300 to $5.4 million. The highest AAC is due to the high construction or first costs of the open water rocky reefs at roughly $20 million per patch or complex.
- Besides oysters, the lowest cost habitat measure to construct are kelp beds in the open water zone, shown as “scattered rock,” ranging in first costs from $1.15 million to $5.1 million. With zero OMRR&R costs and low average annual costs ranging from $42,700 to $190,700, and AAHU from 4.3 to 42.3, kelp beds are the most cost effective of all habitat measures.
- The highest cost restoration measure, excluding breakwater measures, is the large tidal wetland in the port zone, at $188 million with a $2.5 million annual OMRR&R cost. This high OMRR&R cost factors into the high average annual cost of $9.6 million. The large wetland has an AAHU of 40.6.
- The smallest tidal wetland in the Los Angeles River zone costs $25 million, has an OMRR&R annual cost of $624,000, an AAC of $1.6 million and an AAHU of 7.1. This shows the broad range of costs and values for wetlands.

In conclusion, all measures showing a positive habitat output were included in the cost-benefit analysis described in the following section. Only measures with positive AAHU could be included in this analysis. Due in part to 0.0 outputs, as well as violation of constraints through impacts to the U.S. Navy and other maritime operations, all breakwater modifications and the training wall measures were screened out and dropped from further plan evaluation. However, at the non-Federal sponsor’s request, breakwater modifications were subsequently included in the Preliminary Array of Alternatives. See Section 4.5.

4.3.5 Final Measures Screening #4 (Post-Modeling)

As detailed in Section 4.2.3, 12 measures categories remained. These remaining measures were evaluated as part of the technical analysis described in prior sections (See Table 4-5). This table is intended to show a chronological progression of technical analysis tasks, and the eventual inclusion or exclusion of a particular measure from the array of alternatives. By this stage, the PDT had developed six variations of measure category #15 Breakwater Modification for technical evaluation.

The general trend shows non-habitat or restoration support measures falling out as the Study progressed. Some of these measures were initially anticipated to provide restoration benefits, but later determined, through quantitative and qualitative analysis, the anticipated benefits could not be realized. Eventually, only the restoration measures 1 - 7 in **bold** were carried forward in the Preliminary and Final Array of Alternatives. Two breakwater measures, also shown in bold, were included in the Preliminary Array of Alternatives, discussed in Section 4.5.

Table 4-5: Measures Tracking

	TECHNICAL ANALYSIS TASK / MANAGEMENT MEASURE	Hydro-dynamic Model (App A-1)	Coastal Processes Models (App A)	Conceptual Design & Cost Est. (App A & B)	Habitat Evaluation Model (App D)	CEICA (cost-benefit) Analysis (App C)	Prelim Array of Alt	Final Array of Alt
1	**Eelgrass Habitat**			X	X	X	X	X
2	**Kelp Habitat**	X	X	X	X	X	X	X
3	**Nearshore Zone Rocky Reef Habitat**	X	X	X	X	X	X	X
4	**Oyster Bed Habitat**			X	X	X	X	X
5	**Open Water Zone Rocky Reef Habitat**	X	X	X	X	X	X	X
6	**Sandy Island Habitat**		X	X	X	X	X	X
7	**Coastal Wetland Habitat**	X	X	X	X	X	X	X
10	Underwater Contouring Cut/Fill	X	X	X				
13	Los Angeles River Training Wall	X	X	X				
15a	**Modify Breakwater – Lower eastern 1/3**	X	X	X	X		X	
15b	Modify Breakwater – Lower western 1/3		X					
15c	Modify Breakwater – 2 Notches (east)	X	X	X	X			
15d	**Modify Breakwater – 2 Notches (west)**			X			X	
15e	Modify Breakwater – One Notch (center)		X					
15f	Modify Breakwater – One Notch (west)		X					
16	Remove Entire Breakwater	X	X	X	X			
17	New Breakwater with Relocated Rock		X					

4.3.5.1 Measures Screened Out

In addition to the breakwater modification measures that were removed from consideration as described above, the following three measures were eventually screened out through evaluation tasks conducted prior to selection of the Preliminary Array of Alternatives. The following summary describes the measures and provides justification for their elimination from further consideration in the planning process:

- <u>#10 - Underwater Contouring Cut/Fill</u> - The City requested additional analysis of this measure to determine if it improved circulation in the bay. Two locations were analyzed, one location was inside the breakwater, and the second location was along the Los Angeles River Training Wall. Underwater contouring is most effective in an enclosed environment, such as an enclosed harbor; therefore, it was paired with the Training Wall in the second analysis. Preliminary circulation analysis results show this measure does not improve circulation and provides no habitat benefit.
- <u>#13 - Los Angeles River Training Wall</u> - This concept was first introduced to the Study back in 2009 and is intended to guide Los Angeles River outflows towards the Queens Gate opening for more rapid flushing. The design assumes a rubble mound, three-layered structure that begins near the Shoreline Marina and continues south for about 3,500'. It was paired with measures #9 Underwater Contouring for evaluation of changes to water circulation. Analysis results show this measure does not improve circulation and provides no habitat benefit.
- <u>#17 - Remove Entire Breakwater</u> – Although this measure had the lowest score in prior screening, due to stakeholder interest it was included in coastal and hydrodynamic modeling efforts to determine level and types of outputs and impacts. The proposed measure is to remove approximately the upper half of the entire structure down to -30 feet MLLW. This would leave base layers intact but would require a stone cap to limit erosion. This modification would significantly increase wave energy in the bay, impacting the U.S. Navy's national security operations, and ports' operations and safety, violating both planning constraints 1 and 2, requiring protective measures of existing Port of Long Beach, Carnival Cruise line, Shoreline Marina, THUMS oil islands, and Peninsula Beach. Removal of the entire breakwater was analyzed and shown to have significant impacts to maritime operations. Cost estimates to construct and mitigate wave impacts was significant.
- <u>#18 - New Breakwater from Relocated Breakwater Rock</u> – As a stand-alone measure, building a new breakwater does not meet Study planning objective of providing ecosystem restoration. This measure was preliminarily considered as a way to relocate breakwater rock and to mitigate for increased waves from breakwater modifications but was screened out due to excessive construction costs compared to anticipated benefits.

4.4 COST-BENEFIT ANALYSIS AND GENERATION OF BEST BUY PLANS

USACE IWR-Planning Suite II (certified) was used to complete the CEICA analysis. Measures and alternatives were formulated to provide ecosystem restoration benefits within ESPB. Utilizing inputs described above, a CEICA was conducted to determine the most efficient plan combinations to support the identification of Final Array of Alternatives.

4.4.1 Cost-Effectiveness/Incremental Cost Analysis Results

For every ecosystem restoration study, the USACE utilizes a CEICA. This tool facilitates good decision making and communication for the traditionally challenging task of placing value on habitat restoration. CEICA is an evaluation tool that determines the most efficient plan combinations to support the identification of Final Array of Alternatives.

Two distinct analyses that must be conducted: (1) Cost Effectiveness Analysis. "Cost effective" means that, for a given level of non-monetary output, no other plan costs less, and no other plan yields more output for less money. (2) Incremental Cost Analysis. The subset of cost effective plans is examined sequentially (by increasing scale and increment of output) to ascertain which plans are most efficient in the production of environmental benefits. Those most efficient plans are called "Best Buys." They have the lowest incremental costs per unit of output. CEICA results identify a suite of Best Buy Plans. Results must be synthesized with other decision-making criteria (e.g., significance of outputs, acceptability, completeness, effectiveness, risk and uncertainty, reasonableness of costs) to help the planning team select the NER Plan. The full CEICA report can be found in Appendix C.

CEICA modeling was conducted using the USACE certified IWR Planning Suite II software. The CEICA modeling yielded 249 Cost Effective Plans, including the Base Plan (Figure 4-8), and 11 Best Buy Plans (10 action plans, and the No Action Plan) (Figure 4-9). These plans are the most efficient in the production of habitat output, i.e., they have the lowest incremental cost per additional unit of habitat output. The total first cost of the Best Buy action plans range from $80 million to $710 million. AAC range from $3.2 million to $38 million. AAHUs range from 125.4 to 330.6. Table 4-6 summarizes the costs, output, incremental cost and output, and incremental cost per unit of output for all of the Best Buy Plans.

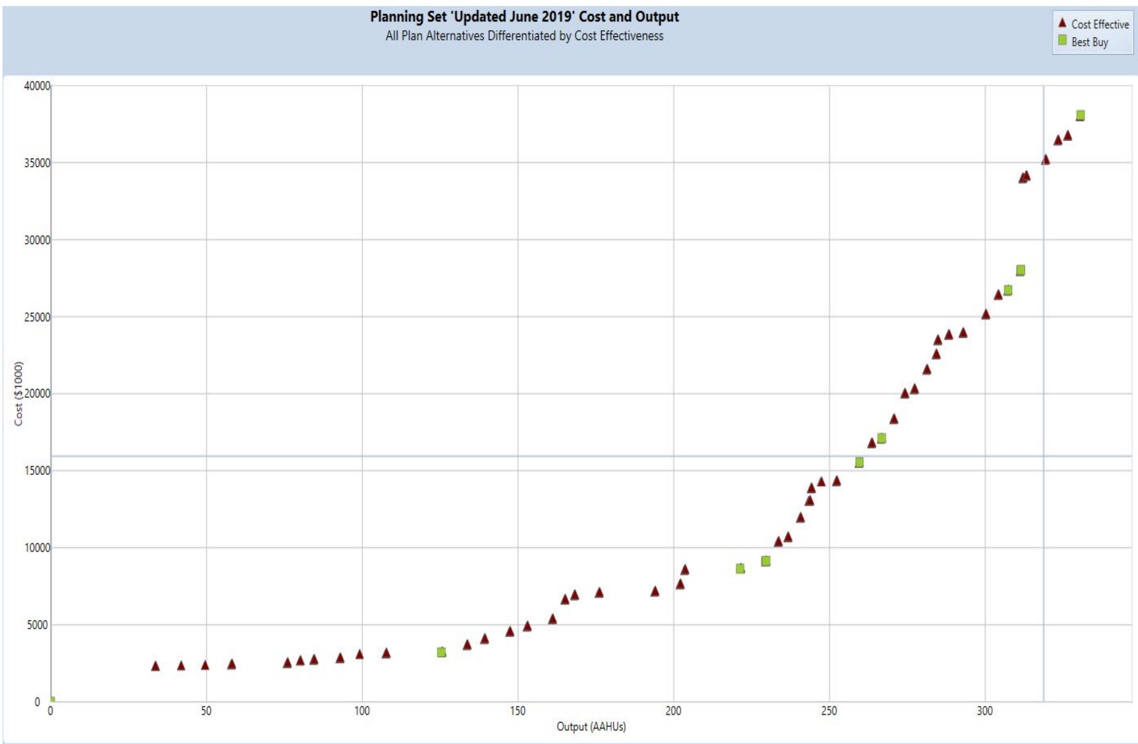


Figure 4-8: Cost Effective Plans

Table 4-6: Incremental Cost Analysis of Best Buy Plans

Plan	First Cost	O&M Cost	AA Cost	Inc. AAC	AAHU	Inc. AAHU	Inc. AAC/AAHU
Best Buy 2	$79,982,185	$207,390	$3,211,500	$3,211,500	125.40	125.4	$25,610
Best Buy 3	$225,060,938	$207,390	$8,640,300	$5,428,800	221.30	95.9	$56,611
Best Buy 4	$236,490,432	$251,110	$9,108,300	$468,000	229.40	8.1	$57,724
Best Buy 5	$237,624,735	$251,110	$9,150,400	$42,100	229.63	0.23	$186,283
Best Buy 6	$341,668,804	$2,749,360	$15,550,500	$6,400,100	259.63	30.0	$213,337
Best Buy 7	$366,642,015	$3,373,130	$17,110,900	$1,560,400	266.73	7.1	$219,775
Best Buy 8	$554,164,691	$5,852,625	$26,726,600	$9,615,700	307.33	40.6	$236,840
Best Buy 9	$584,634,496	$5,971,940	$27,992,700	$1,266,100	311.33	4.0	$316,525
Best Buy 10	$585,393,899	$5,982,950	$28,032,100	$39,400	311.41	0.1	$492,500
Best Buy 11	$709,559,970	$11,333,410	$38,074,900	$10,042,800	330.61	19.2	$523,063

The box plot graph below (Figure 4-9) depicts the incremental cost per output for the Best Buy Plans.

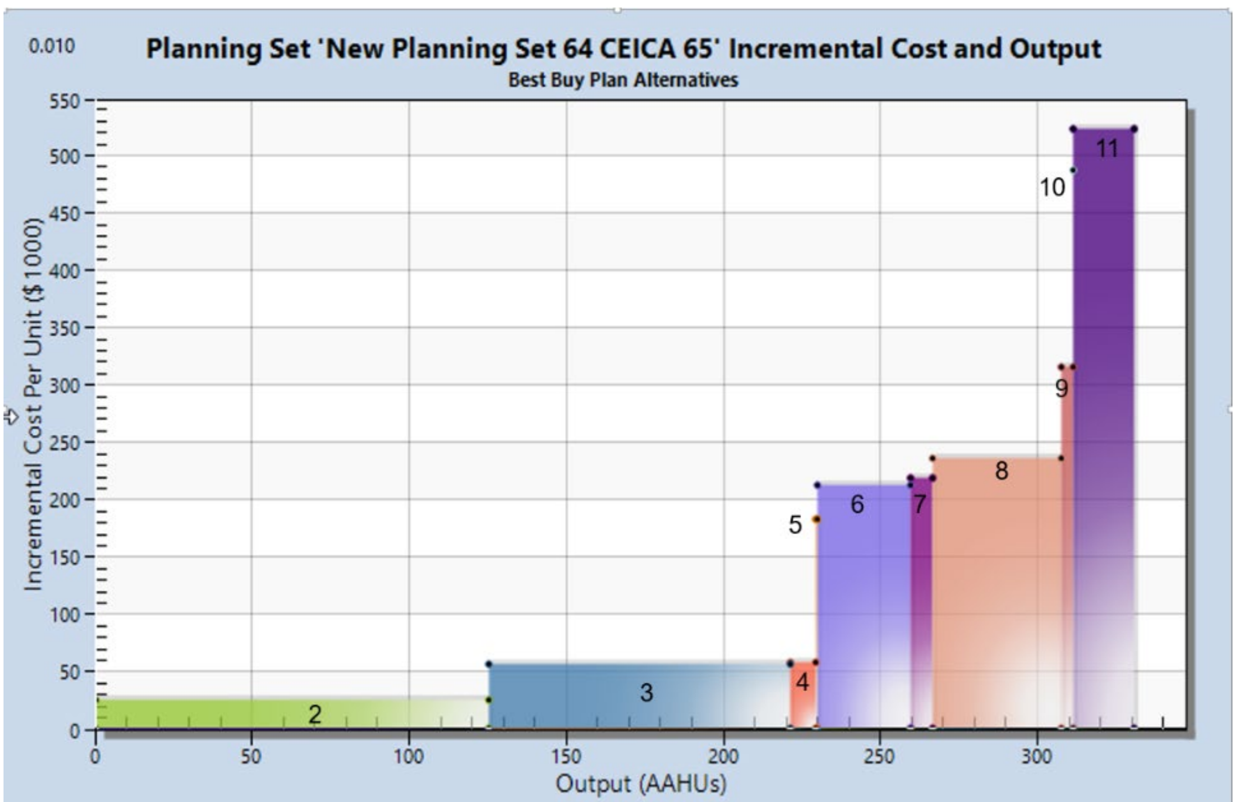


Figure 4-9: Incremental Cost and Output – Best Buy Plans

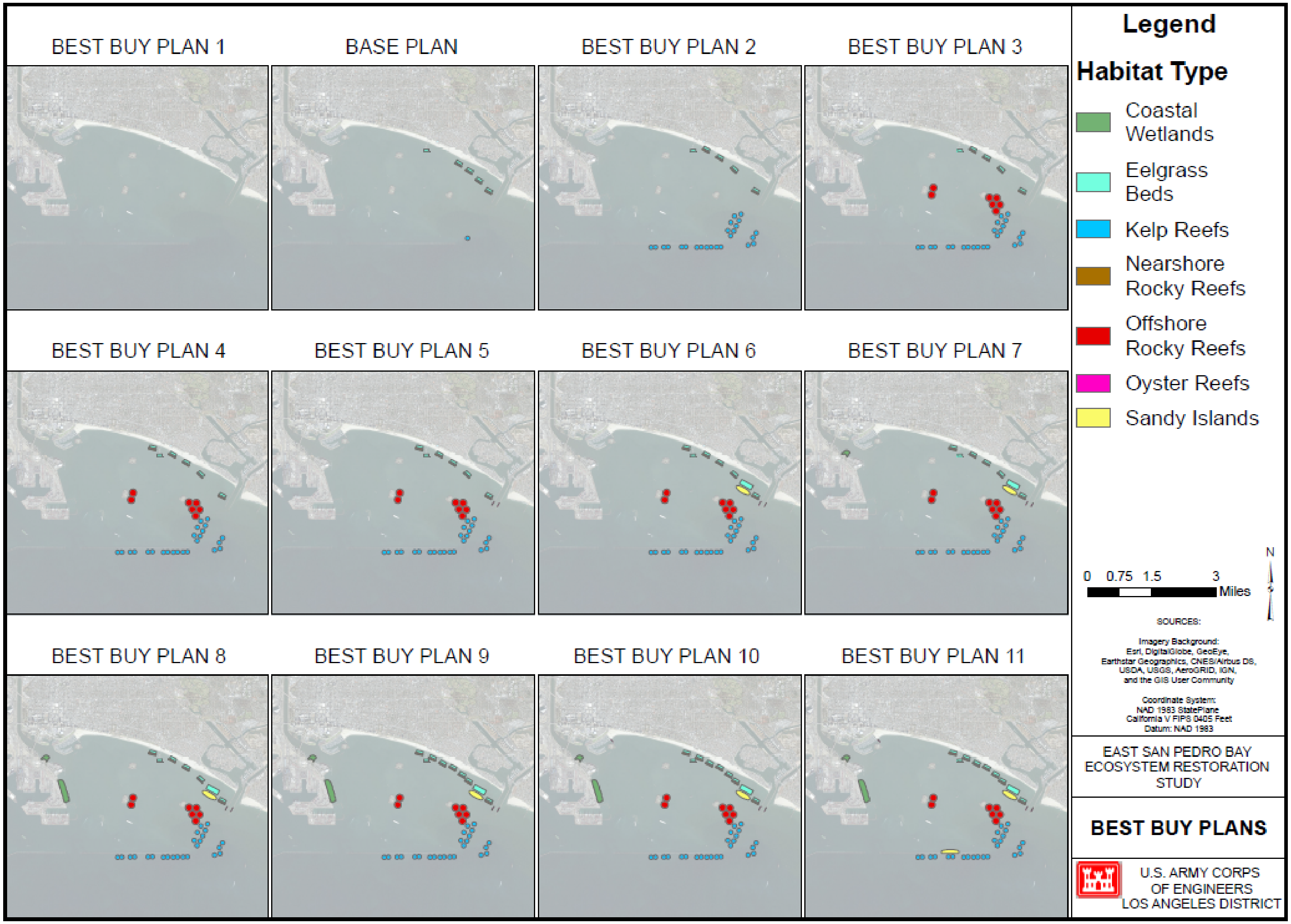


Figure 4-10: Best Buy Plans

4.4.2 Evaluation and Screening of Best Buy Plans

The PDT evaluated the 11 Best Buy Plans for potential inclusion in the Preliminary Array of Alternatives. The configurations of the Best Buy Plans can be seen in Figure 4-10. Best Buy Plan 1 is the No Action Plan, and the Base Plan noted earlier is shown beside Best Buy Plan 2. The team was especially interested in the “break points” shown in the box plot graph, Figure 4-9. This indicates major jumps in AAHUs and incremental costs per AAHU.

- Best Buy Plan 2 is the least cost Best Buy Plan that minimally meets project objectives. This includes open water giant kelp beds in two zones and nearshore rocky reef/eelgrass complexes in one zone. This plan is the most efficient plan, with the lowest AAC per AAHU. The first cost and annual cost of Best Buy Plan 2 are about $80 million and $3.2 million respectively. The plan generates 125.4 AAHUs and has an AAC per AAHU of $25,610.
- Best Buy Plans 3 and 4 add a new habitat type above Plan 2, seven (7) open water rocky reef patches, which functions as habitat “stepping-stones,” promoting improved connectivity. Best Buy Plan 4 also extends the nearshore reef/eelgrass complexes with an additional node to the west, strengthening the connection to existing eelgrass beds. CEICA shows Best Buy Plan 4 as having essentially the same incremental AAC/AAHU as Best Buy Plan 3, while producing an additional 8.1 AAHUs through the addition of another rocky reef shoal in the nearshore zone.
- Best Buy Plan 5, the next most efficient plan, adds a small amount of additional output, but at decreased efficiency, with an incremental AAC/AAHU three times greater than that of Best Buy Plan 4. Best Buy Plans 5 through 8 are all similar in terms of efficiency, with similar incremental costs per output.
- For the Preliminary Array, the team also looked for a more comprehensive plan with features located in all of the zones and that restores more of the complex habitat types valued by resource agencies (sandy islands, coastal wetlands, oyster beds). Sandy islands came in with Best Buy Plan 6, and the smallest coastal wetland in the Los Angeles River Mouth Zone came in with Best Buy Plan 7.
- Best Buy Plan 8 provides a jump in output to over 300 AAHUs with the inclusion of a second large-scale coastal wetland in the port zone. It shows similar efficiencies as the prior two Best Buy Plans, albeit at a greater cost. Best Buy Plan 8 has a First Cost of $554 million and average annual cost of $27 million and generates over 307 AAHUs. The incremental AAHU increases of larger plans were not significant nor did they introduce any new habitat types.
- The incremental cost per output for Best Buy Plan 9 increases significantly and is therefore a much less efficient plan. Plans 10 and 11 add more rocky reef/eelgrass complexes and oyster beds, which does not add much habitat value overall. Plans greater than 8 were considered to be excessive in cost.

4.4.3 Identification of Preliminary Array of Alternatives

Based upon the criteria of efficiency, reasonableness of cost, and the extent to which plans met planning objectives, Best Buy Plan 2 was chosen as the smallest alternative for the Preliminary Array of Alternatives for further evaluation. This plan is hereinafter referred to as Alternative 2. Alternative 2 was identified as our plan that minimally meets our restoration objectives, with kelp beds and five (5) nearshore rocky reef/eelgrass complexes. This plan is relatively inexpensive compared to larger plans due to the low cost of some of the project features that primarily consist of placing rock in different locations of the proposed Project Area.

Alternative 4 added seven (7) open water rocky reef complexes which provide transitional habitat centered in the proposed Project Area between the breakwater and the nearshore reefs and eelgrass. Alternative 4 also added additional rocky reef shoal and eelgrass habitat in the nearshore zone. However, there is a substantial increase in the incremental AAC/AAHU for larger scale best buy plans.

For a plan that was reasonable in cost but provided even greater habitat value than Best Buy Plan 2, the team initially considered Best Buy Plan 4 for inclusion in the Preliminary Array. However, concerns over the high cost of the open water rocky reef measure prompted the team to propose a smaller scale of that same measure. By reducing the number of reef patches from seven (7) down to two (2), the project first cost was reduced by $100 million. This plan variation is one of the Cost Effective Plans identified by CEICA. With USACE VT concurrence, the PDT replaced Best Buy Plan 4 with a Cost Effective Plan, which is identified as Alternative 4A, a reduced-cost variation of Best Buy Plan 4. The first cost of this plan is still relatively low, at more than $ 136 million and generates 161 AAHUs. This plan has a similar incremental AAC/AAHU as Best Buy Plan 3 but provides a substantial increase in output.

Best Buy Plan 8 was selected for the Preliminary Array because it is the first plan to feature restoration measures in all five opportunity zones and includes a variety of scarce habitat types including two wetlands and a sandy island. This plan is hereinafter referred to as Alternative 8. Alternative 8 (Alt 8) was the largest scale plan carried forward. It included more comprehensive restoration with scarce habitat types including 2 wetlands, an emergent sandy island and oyster beds and larger scales of restoration. However, the addition of these measures resulted in a significant increase in cost (both in total cost and incremental AAC/AAHU).

Alternatives 2, 4A and 8, were identified as the Preliminary Array of Alternative, as illustrated in Figure 4-11. Together, the three plans represent a wide range of habitat restoration approaches. Alternative 2 provides the minimum restoration scenario, while Alternative 4A brings in a very productive habitat type, and Alternative 8 provides a maximum restoration scenario that includes imperiled habitat types. These plans range in cost from $80 million to $554 million. AACs range from $3.2 million to $26.7 million, with AAHUs ranging from 125.4 to 307.3. The No Action Plan or Alternative 1 is also included for impacts analysis.

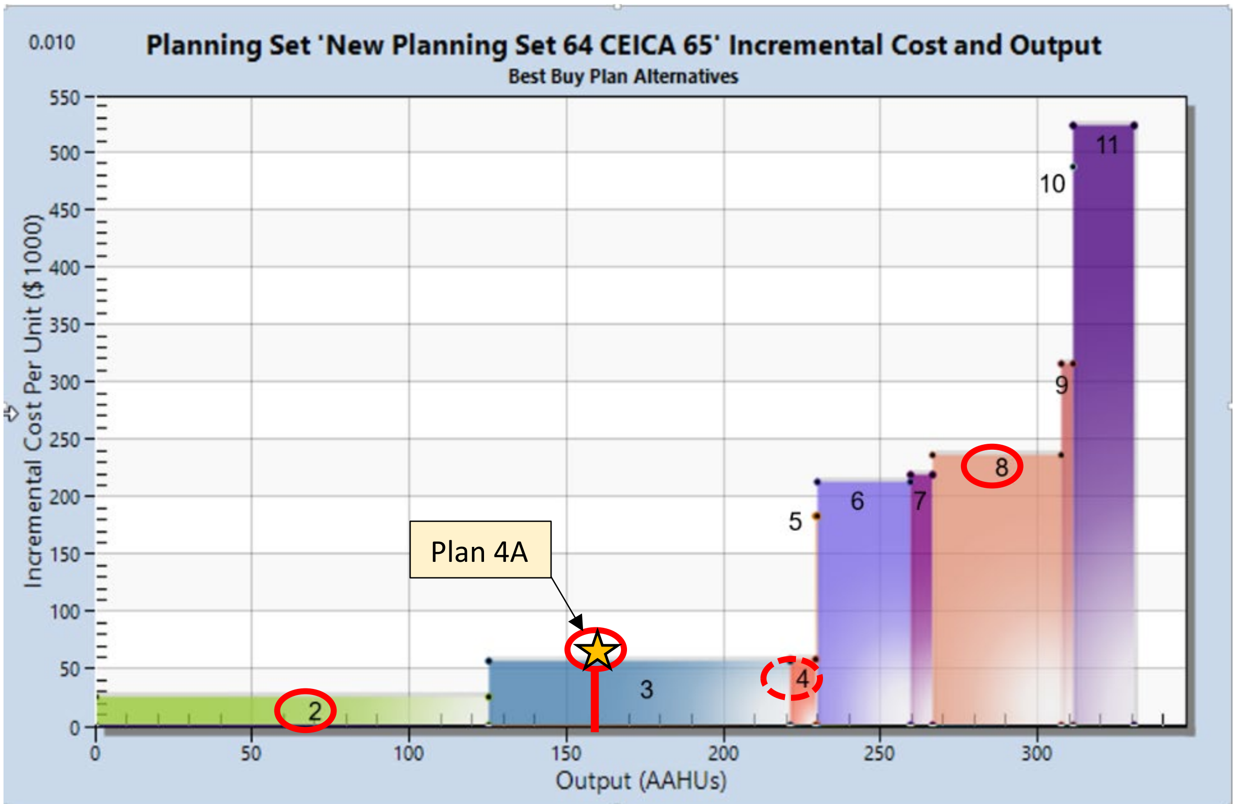


Figure 4-11: Preliminary Array of Alternatives From Best Buy Plans

4.4.4 Addition of Local (Breakwater) Plans

When it was clear that the array of alternatives up to this point would not include plans with breakwater modifications, the City requested inclusion of breakwater plans in the array of alternatives for consideration. The basis for inclusion of breakwater plans is to address the following local priorities: (1) improvements to ecosystem health; (2) improvements to water quality through increased flushing of ESPB; and (3) improvements to the recreational value of the City's beaches.

The USACE concurred with the request with the understanding that local priorities can be considered in evaluating alternatives but may not be the basis for plan selection. The NER Plan must be identified using a process centered on meeting the Study planning objectives of ecosystem restoration. As stated earlier in Section 4.3, the PDT had considered breakwater modification measures in technical evaluations, from hydrodynamic modeling to coastal modeling up through habitat evaluation modeling. Results of the habitat evaluation model show breakwater modifications having zero value or 0.0 AAHU's. As a result, breakwater measures were screened out from further consideration and excluded from CEICA analysis.

Therefore, at the City's request, the USACE included two breakwater plans into the Preliminary Array of Alternatives. The first breakwater plan they requested includes a measure to remove two 1,000' notches on the west side of the breakwater. This is referred to as the Breakwater Western Notching Plan (Alternative BW1). The second plan calls for a measure to remove one-third of the eastern end of the breakwater, referred to as the Breakwater Eastern Removal Plan (Alternative BW2).

The two breakwater measures cannot be combined in the same plan and must be in separate plans. However, breakwater measures on their own do not meet the plan evaluation criteria of "completeness" in that they fail to support the Study planning objective to restore complex habitat types. Because the Study focus is ecosystem restoration, the breakwater measures are coupled with restoration features in order to meet Study planning objectives. The City agreed to pair the breakwater measures with Best Buy Plan 2 restoration features, which minimally supports the restoration objectives. In addition, to minimize potential induced coastal storm damages, the two breakwater plans include an additional measure (not included in Best Buy Plan 2), adding one rocky reef shoal in the nearshore zone.

4.5 PRELIMINARY ARRAY OF ALTERNATIVES

The six Preliminary Array of Alternative plans are described in further detail below, after which they will be compared against each other for selection of the Final Array of Alternatives. Table 4-7 below captures all of the measures included in each of the plans in the Preliminary Array of Alternatives, as summarized in Section 4.3.5.

Preliminary Array of Alternatives

Alternative 1 (No Action Plan)

Alternative 2 (Best Buy Plan 2) – "Kelp Restoration Plan"

Alternative 4A (Cost Effective Variation of Best Buy Plan 4) – "Reef Restoration Plan"

Alternative 8 (Best Buy Plan 8) – "Scarce Habitat Restoration Plan"

Alternative BW1 (+ Best Buy Plan 2 modified) – "Breakwater Western Notching Plan"

Alternative BW2 (+ Best Buy Plan 2 modified) – "Breakwater Eastern Removal Plan"

Costs for each alternative are estimated and consider labor, materials, construction equipment and other factors. An abbreviated cost risk analysis was used to develop contingencies for the alternative cost estimates. The alternatives range in cost from $80-$994 million for the comparison of alternatives that is presented in this section of the IFR.

The contingency for a given alternative is the weighted average of all risk elements for a given measure. The contingency, per measure, is derived from USACE Cost MCX Abbreviated Risk Analysis software. The Abbreviated Cost Risk Analysis was completed in accordance with ER 1110-2-1302. The analyses provide a risk based contingency to project costs based on the likelihood and impact of a given risk element. The likelihood and impact of a given risk is determined a risk level for each risk. Appendix B Cost Engineering provides additional details. Table 4 -8 summarizes the costs and output for the five action alternatives in the Preliminary Array of Alternatives, using FY 2018 Federal discount rate of 2.75%.

Table 4-7: Measures Included in Preliminary Array of Alternatives

Zone	ALT 2	ALT 4A	ALT 8	ALT BW1	ALT BW2
Nearshore	**(5) Eelgrass Beds** (4.0-5.3 ac./ea.; 25 ac. total) **(5) Rocky Reef** (0.2-4.0 ac./ea.; 15.9 ac. total)	**(6) Eelgrass Beds** (4.0-5.3 ac./ea.; 30.3 ac. total) **(6) Rocky Reef** (0.2-4.0 ac./ea.; 19.9 ac. total)	**(7) Eelgrass Beds** (4.0-5.3 ac./ea.; 52.3 ac. total) **(6) Rocky Reef** (0.2-4.0 ac./ea.; 19.9 ac. total) **(1) Sandy Island** (23.8 ac.) **(2) Oyster Reef** (0.3 ac.)	**(6) Eelgrass Beds** (4.0-5.3 ac./ea.; 30.3 ac. total) **(6) Rocky Reef** (0.2-4.0 ac./ea.; 19.9 ac. total)	**(6) Eelgrass Beds** (4.0-5.3 ac./ea.; 30.3 ac. total) **(6) Rocky Reef** (0.2-4.0 ac./ea.; 19.9 ac. total)
Open Water	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total) **(2) Rocky Reef** (14.6 ac./ea.; 29.2 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total) **(7) Rocky Reef** (14.6 ac./ea.; 102.2 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)
LA River	N/A	N/A	**(1) Coastal Wetland** (10.0 ac.)	N/A	N/A
Port	N/A	N/A	**(1) Coastal Wetland** (42.1 ac.)	N/A	N/A
Breakwater	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total)	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total) **(2) 1,000' B/W Notches** (24 ac.) Protective Measures	**(12) Kelp Beds** (5.05 ac./ea.; 60.7 ac. total) **(1) Remove 1/3 B/W** (24 ac.) Protective Measures

Table 4-8: Preliminary Array of Alternatives – Costs and Outputs

Item	ALT 2	ALT 4A	ALT 8	ALT BW1 (West Notch)	ALT BW2 (East Removal)
First (Construction) Cost	$79,982,000	$136,477,000	$554,165,000	$993,650,000	$670,240,000
OMRR&R	$207,000	$251,000	$5,853,000	$1,692,000	$1,148,000
Average Annual Cost	$3,212,000	$5,354,000	$26,727,000	$39,289,000	$26,956,600
AAHUs	125.4	160.9	307.3	133.5	133.5
AAC/AAHU	$26,000	$33,000	$87,000	$294,000	$202,000
Restored Acres	162	201	372	171	171
First Cost/Restored Acre	$493,000	$680,000	$1,490,000	$5,811,000	$3,920,000

4.5.1 ALTERNATIVE 1: No Action Alternative

Under the No Action Alternative, existing kelp, and hard bottom habitat within ESPB would likely continue to be limited to features associated with the breakwater and other artificial hard substrates. Eelgrass beds located along a narrow band of shallow water offshore of Cherry Beach would not likely increase significantly in acreage under the No Action Alternative but may increase in density of the existing beds. Other existing habitats, such as native and non-native oysters, coastal saltmarsh, and soft bottom habitat would not substantially change. However, in light of the persistent threat from the effects of climate change, climate change-induced alteration to rainfall patterns, and sea level rise over time, it is expected that the existing habitats within the proposed Project Area will become increasingly vulnerable and less resilient to the effects of these stressors (e.g., exacerbated loss of existing habitat, decreased viability of existing increased chances of wetland/habitat type conversion, submergence of transitional habitats). Eelgrass beds located offshore of Cherry Beach could migrate shoreward with SLC, offsetting the effects of increased water depths predicted for area.

4.5.2 ALTERNATIVE 2 (Best Buy Plan 2) - Kelp Restoration Plan

Alternative 2 is the smallest, least cost Best Buy Plan as identified by CEICA and the smallest plan analyzed in the Final Array of Alternatives. Because Best Buy Plan 2 was put forward as one of the three action plans in the Final Array of Alternatives, it will be referred to as Alternative 2. This plan introduces three habitat types including extensive Giant Kelp (kelp) beds, nearshore rocky reef, and eelgrass, creating a horseshoe shaped benefit area in the bay. Total restoration area covers approximately 162 acres. The nearshore rocky reef and eelgrass are co-located and also referred to as shoals or shoal complexes. The most prevalent feature in Alternative 2 are kelp beds in the breakwater and open water zones, shown as blue circles in Figure 4-16.

Because kelp beds are the most cost effective and efficient restoration features formulated, CEICA maximized kelp beds by including the largest scale of kelp beds (Scale 4, as shown in Table 4-4: Cost and Output by Measure) in all Best Buy Plans starting with Alternative 2. The AAC/AAHU for the kelp beds added under Alternative 2 in the Open Water zone and the Breakwater Zone were only about $4,500 and $14,300, respectively.

CEICA augmented the one open water zone kelp bed from the Base Plan with seven (7) additional kelp beds, resulting in a mega complex of eight kelp beds. Offset 1,000' from this grouping is a smaller complex of four kelp beds, making a total of 12 kelp beds in the open water zone, inputted into CEICA as Scale 4. The gap between kelp beds provides boaters access between the Alamitos Bay harbors and the open ocean. In the nearby breakwater zone are 12 kelp beds along the outer edge of the breakwater. The 12 patches are spaced in small to large groupings at differing intervals to maximize variations in patch sizes for optimal habitat functions. These three large patches of habitat create a complexity of kelp forest habitat in the optimal locations for kelp to thrive. The proximity between mega-patches as well as proximity to the nearshore eelgrass/rocky reef shoals provide habitat connectivity. Each patch or bed is 5.1 acres, totaling approximately 121 acres of kelp beds.

Construction methods and materials required for Alternative 2, which provide the basis for cost estimates and environmental impacts analysis are provided in the following sections. All costs are presented in 2018 price levels with a Federal discount rate of 2.75 percent. It is anticipated to take approximately 90 months to construct Alternative 2.

Table 4-9: Alternative 2 - Restoration Areas

Habitat Type	Total Area (ac)
ALT 2 Total	**162.3 (~162)**
Eelgrass Beds	25.0 (~25)
Kelp Beds	121.4 (~121)
Nearshore Rocky Reef	15.9 (~16)

Table 4-10: Alternative 2 - Costs and Outputs Summary

Item	Cost/Unit
First (Construction) Cost	$83,587,000
OMRR&R	$207,000
Average Annual Cost	$3,407,000
AAHUs	125.4
AAC/AAHU	$27,200
Incremental AAC/AAHU	$27,200
Zones with Restoration	3
Restored Acres	162
First Cost/Restored Acre	$516,000

4.5.2.1 Alternative 2 Increments Rationale

Alternative 2 includes the same five eelgrass/rocky reef shoals as the Base Plan, and one kelp bed in the open water zone. Alternative 2 add 23 kelp beds in the open water and breakwater zones. In fact, due to being one of the most highly effective and efficient measures formulated, kelp beds are maximized as a few large patches of kelp habitat in all of the Best Buy Plans. The following sections provide rationale for how the kelp beds were added to Alternative 2.

Habitat "Node" Approach to Restoration

To explain why there are 24 kelp beds in Alternatives 2, the concept of measures groupings is detailed below. Groupings of measures were designed to provide large, connected patches of habitat for optimized habitat functions and connectivity. The groupings are based on the landscape ecology concept of habitat "nodes" and fulfill the Study planning sub-objectives.

As discussed in Appendix D (pages 1-5 and 1-6: Habitat "Node" Approach to Restoration), "The proposed Project for ESPB takes a nodal approach to habitat restoration. A habitat node is an area or patch of habitat associated with a physical location. Nodes can be isolated habitat patches or can be connected to some extent by edges between adjacent nodes." "By increasing patch sizes and reducing the distances between them, colonization among populations improves (Hanski and Thomas, 1994). Meta-populations (assemblages of local populations connected by migration) depend on propagule dispersal and movements of organisms between nodes to persist, and such dispersal is in turn dependent on the connectivity of the landscape (Schippers et al., 1996)." "Generally, nodes have a greater overall interaction when they are larger and closer together (Linehan et al., 1995)." "The connectivity of habitats and concept of nodes is germane to the determination of the habitat "benefit area" for this Project."

For USACE restoration projects, HUs based on modeling results are typically used to predict and quantify environmental benefits gained from a project. These units can be spatially distributed throughout the proposed Project Area. In the case of ESPB, the HEM is based on the placement of discrete structural elements (hardscape) that are assumed to provide ecosystem benefits (i.e., functional lift) to the proposed Project Area immediately or over time. However, the actual area of benefit is functionally much larger than this due to the increased interchange (connectivity) between adjacent habitat types as described above.

Rationale for Kelp Bed Measures Scaling

After the HEM was completed, a series of mini alternatives were crafted by grouping like measures together in preparation for CEICA. The various groupings are summarized in Table 4-3: "Crosswalk of

CEICA Measures with Original Measures Screened." Based on the concept of developing habitat nodes, these mini alternatives function as a single unit and provide synergistic habitat benefits over single, isolated measures. They were configured with a broad range of scales (small-medium-large) in suitable locations. This approach ensured a wide variety of possible combinations were considered in CEICA.

As captured in Table 4-3 and Table 4-4: "Cost and Output by Measure," kelp beds were inputted as four scales indicated by "Scale 1" through "Scale 4." Scale 1 had a minimal number of two kelp beds and Scale 4 included the maximum number of 12 beds in the same general location, for both open water and breakwater zones.

Rationale for Kelp Bed Acreage

As described in Appendix D of the IFR: "No standard sizing guidelines are available for kelp bed restoration. Five acres was used as the minimum size by for a giant kelp restoration project conducted in Laguna Beach, California (MBC Aquatic Sciences, pers. comm.). Because this project developed from an interest in the protection and preservation of giant kelp communities in the SCB, it is an appropriate regional example for the project in ESPB. A kelp bed with a canopy size of at least five acres would be likely to persist during extended periods of unfavorable conditions (e.g., ENSO events) (MBC Aquatic Sciences, pers. comm.). However, both patch size and patch isolation play into probability of extinction (Schiel and Foster 2015). Giant Kelp has relatively short spore dispersal distance(s), so distant, isolated patches may not rebound following disturbance."

As described above, the nodal restoration approach was key for the design of project alternatives as colonization and long-term sustainability via consistent colonization events were necessary for the restoration of habitats distributed across opportunity zones within ESPB. Regarding kelp, Appendix D discusses patch size as being a key factor for the survival of kelp and that "both patch size and patch isolation play into the probability of extinction (Schiel and Foster 2015)." As described previously, 5 acres of kelp reef (i.e., rocks spread out within a 5-acre area comprising each kelp reef) are expected to provide an adequate area of coverage to allow kelp to persist after ecological disturbances (ENSO events, etc.). Giant kelp has a relatively short spore dispersal distance, so more isolated patches may not rebound following ecological disturbances (ENSO events, etc.).

To increase the probability that kelp would have the greatest chance for passive recruitment within the proposed Project Area and be sustainable, multiple 5-acre patches (nodes) of kelp were designed to be placed along the outside of the breakwater and extended into the unprotected waters of the bay where cool, nutrient-rich waters are expected to enter the bay. Distances between each kelp patch are relatively short and are expected to enhance the connectivity between patches and provide kelp propagules with the greatest opportunity to find suitable habitat for attachment and growth as they travel from outside of the bay and into the proposed Project Area from patch to patch.

4.5.2.2 Alternative 2 Kelp Beds Siting and Design Considerations

FWOP considerations include likely damage to kelp habitat due to increasing temperature, which is a key factor to kelp decline. Kelp beds are expected to be susceptible to decreased productivity associated with impaired upwelling and ocean stratification resulting from increases in ocean temperature and alterations in current patterns due to climate change. As a result, die-offs may become more likely in the future if existing populations cannot be augmented and sustained by recruitment from distant kelp reefs. However, kelp abundance is expected to fluctuate over time along the California coast, a normal/natural phenomenon.

To address FWOP considerations of potential kelp die-off, and to increase kelp resiliency within the SCB and Study Area, the PDT identified kelp restoration locations that would optimize conditions for kelp to thrive. Twenty-four approximately 5-acre kelp beds totaling approximately 121 acres are included in all Final Array plans. The kelp beds are placed in two mega-groupings of approximately 60 acres each. Sixty acres of kelp beds would restore an open water kelp reef, similar to the degraded Horseshoe Kelp Reef that was historically offshore in the western part of the Study Area. Together, these beds are expected to improve the long-term resilience of kelp in the Study Area as follows.

Two kelp locations were identified in the proposed Project Area because they provide the ideal environmental conditions important for the growth and reproduction of kelp. To grow and regenerate, kelp requires appropriate light, temperature, and rocky substrate for the anchoring of its holdfast. Within the proposed Project Area, kelp can be found growing on hard substate such as the Long Beach Breakwater (breakwater) where light and water temperature is sufficient for kelp to grow and regenerate. This is evidenced by presence of lush kelp forests along the breakwater. However, rocky substrate does not exist within the proposed Project Area except at existing infrastructure locations, not designed nor located for optimal kelp growth.

Alternative 2 includes placement of 60+ acres of kelp beds, arranged in twelve, roughly five-acre patches at irregular intervals along the seaward side of the existing breakwater. Restoring kelp beds near the breakwater would augment existing kelp forests on the submerged breakwater rock. The undulating edge would break up the linear configuration of existing breakwater rock, creating an “edge effect.” This change would increase ecological complexity and value of kelp habitat. Another 60+ acres of kelp habitat in twelve, roughly five acres patches would be restored in the open water, off the eastern end of the breakwater. This location allows kelp to take advantage of beneficial and nutrient rich cold-water currents that giant kelp need to thrive. A recreational boating passageway is shown with the split configuration, which is subject to change.

Locating kelp outside the breakwater ensures unimpeded access to coldwater currents and is expected to maximize kelp forest survival and health. Mega-groupings of individual kelp beds also strengthen the synergies between each bed (5-acre circle) and between existing kelp on the breakwater. Added kelp beds ensure that a constant input of kelp propagules is available to the restored habitat in ESPB and should aid in the recovery of the habitat during times of greater environmental stress. “Research has shown that marine systems with greater connectivity tend to more easily recover than systems with less (Geist and Hawkins 2016), thus connectivity of habitat plays a key role in marine restoration success (Thrush et al., 2013).” Kelp beds located adjacent to the breakwater provide immediate access to kelp propagules, while the kelp beds located between the breakwater and the Alamitos Bay Jetties provide connectivity to kelp beds on the breakwater and jetties. These locations are also deep enough to avoid fluctuations in sedimentation that could otherwise cover up the rock and impact kelp.

Each kelp reef will be roughly circular in shape, spanning approximately 500’ in diameter, with approximately 20% total bottom coverage of substrate with only one layer of stone thickness.

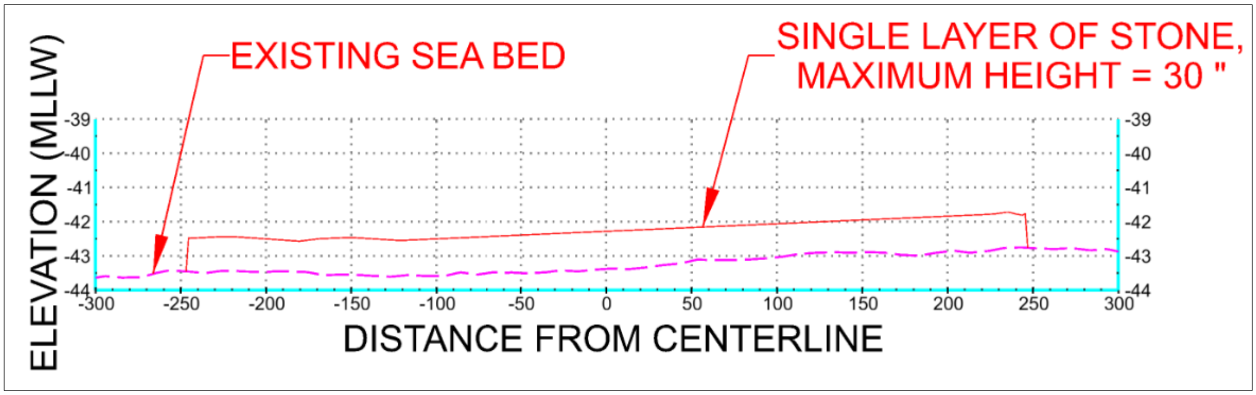


Figure 4-12: Kelp Reef Cross Section

4.5.2.3 Alternative 2 Kelp Beds Construction Considerations

To construct these kelp reefs, approximately 132,000 tons of quarry stone would be transported from either the Catalina Quarry (a.k.a. Pebbly Beach Quarry; primary quarry site) or from a secondary quarry site, 3M Quarry, located in Corona, Riverside County, California. A representative size of each stone is roughly 2' x 1.5' x 1', with a median weight of approximately 500 lb. Establishment of giant kelp on the stones would occur through passive colonization of propagules over time.

Kelp reef construction would employ the "push off" construction method. In this method, a derrick barge, held in place by six anchor locations, is tethered to a flat-deck barge. Each anchor weighs approximately 7 tons and is accompanied by either a 15-ton concrete block (three seaward anchor locations) or by a second anchor (three shoreward anchor locations) to hold the derrick barge and accompanying flat-deck barge in place. Each anchor is attached to a 2,500-foot steel cable (anchor line), which is individually controlled by a winch. This anchoring system allows for small movements in the barges to accurately maneuver the next "push off" location. A set of six winches (one per anchor line) is used to maneuver the derrick barge along a set of parallel lines along which the quarry rock is placed in the water. Two differential GPS (DGPS) receivers would be mounted on the derrick barge to keep the barge accurately positioned as it moves along the lines. A front-end track loader is lowered via crane from the derrick barge to the flat-deck barge so that boulders can be pushed over the side. The winch operator maneuvers the edge of the flat-deck barge to the required position (e.g., at the first line) by winching "in" or "out" on the six anchor cables connected to their respective anchors. The derrick-barge winch operator uses a computer monitor displaying the triangulated data to assist in locating the edge of the flat-deck barge at the exact line of deployment. Positional accuracy of the DGPS system is estimated at 1 to 2 feet, and the software acceptance limits can be set at 6 feet, meaning that the winch operator can hold position to within a tolerance of 6 feet. Figure 4-13 shows a schematic of the construction method and equipment, including the derrick barge, flat-deck barge (labelled "supply barge" in the figure), GPS markers, anchoring points, rock placement lines, and front-end loader.

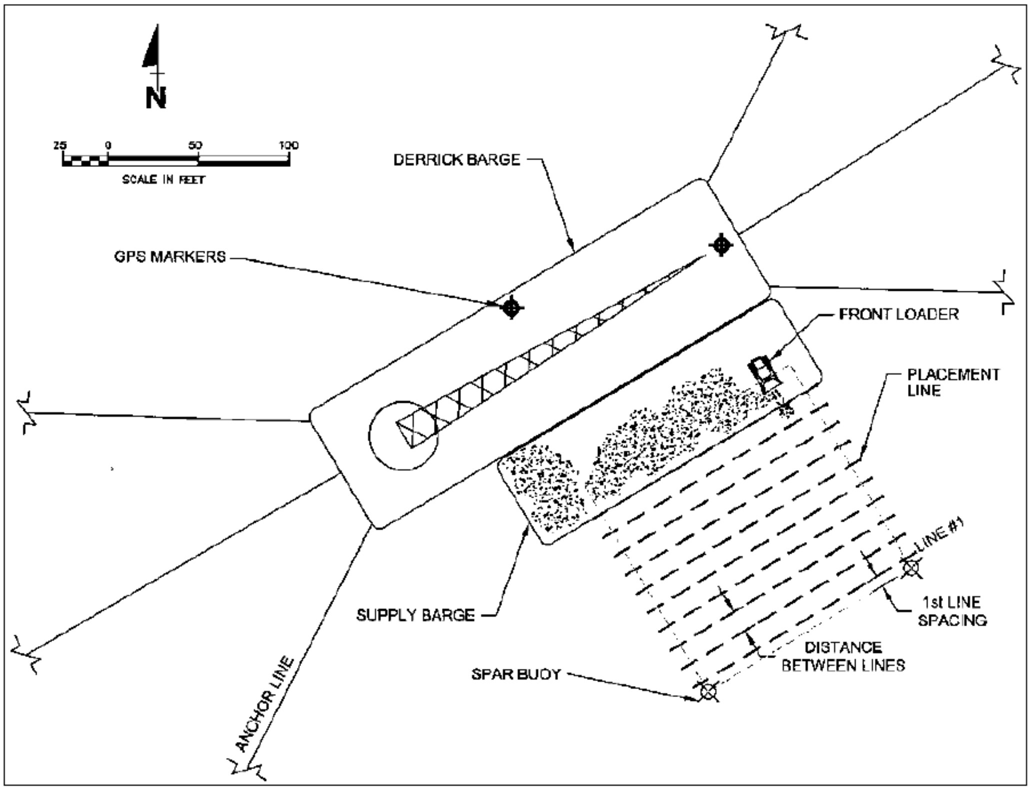


Figure 4-13: Kelp Reef Construction Method Schematic Showing Derrick Barge, Supply Barge, Front-End Loader, Rock Placement Lines, and Six-Anchor Positioning

Equipment used during construction would most likely consist of the following:

- One derrick barge
- Two tugboats
- Three flat-deck barges (supply barges) with cranes
- Two front-end track loaders (one backup)
- Eight winches
- One DGPS survey system with appropriate software

The derrick-barge crew would consist of a crane operator, foreman, crane oiler, deck engineer, and pile driver/barge-hand, along with a loader operator, superintendent to direct operations, and project manager. Construction would be conducted during daylight hours six days a week (Monday through Saturday) except on holidays and during inclement weather. Work would commence at approximately 7:00 A.M. Construction activities would be performed during daylight hours six days a week (Monday – Saturday) during a regular 8-hour day. Assuming the output of 1,725 tons of quarry rock deposited per day, the operation schedule for the tugboats would be every day for the small barges and every other day for the large barges.

4.5.2.4 Alternative 2 Nearshore Rocky Reef Siting and Design Considerations

The greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that increased sedimentation due to more frequent storm events as a result of Global Climate Change is expected to fill in rocky reef voids where species live with the possibility of burying entire reefs after periods of successive storm activity. Turbidity associated with storm events would affect water quality (*e.g.*, available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them. Multiple siting and design considerations address these FWOP concerns.

Under Alternative 2, five nearshore rocky reef shoals totaling approximately 16 acres would be placed in shallow ~15’ MLLW waters. Multiple factors influence nearshore reef site selection. With the locations shown in Figure 4-16, the nearshore rocky reef takes advantage of shallower depths, availability of light, and greater movement of water and nutrients. This shallow subtidal reef receives more light than deeper giant kelp reef and allows for other kelp and algae species to thrive. This aquatic plant variety increases coastal biodiversity within the bay. The design for these submerged reefs involves constructing sufficient voids for provision of refuges for smaller juvenile and adult fish and invertebrates.

The other purpose of these reefs, aside from directly providing subtidal zone rocky reef habitat benefits, is to reduce the velocity of the surrounding fluid in order to provide suitable eelgrass habitat conditions. The submerged structures would cause some of the incident waves to break, producing a re-distribution of sediments allowing for the calm shallow condition eelgrass needs to thrive. They also provide a localized level of protection to the shoreline from storm surges and erosive wave action. Reef locations were chosen in part based on the absence of existing eelgrass combined with factors noted previously.

All rocky reef habitats are composed of rock outcrops (e.g., granite, basalt, or other metamorphic conglomerate) of varying relief or height and configuration of stone large enough so as not to be normally moved by waves and currents. Each reef footprint is conceptually designed as a rectangle with crest limits roughly 1,000’ long by 175’ wide, running parallel to the shoreline in about -20’ MLLW depth of water. The reef by Belmont Pier is smaller. Reef crest elevations, or submerged depths below MLLW elevation, will vary from -3 to -10 feet MLLW. The stone pile height (or reef relief) would be roughly 2’ to 17’ in vertical height above the seabed. See Figure 4-14. Long-term performance and habitat output would be impacted primarily by being buried by sediment. A minimum elevation of 2’ ensures projected sediment movement will not result in burying the reefs.

Because nearshore rocky reef may potentially pose a hazard to small boats and other nearshore recreational activities, the U.S. Coast Guard will design and install “aids to navigation” or ATONs in the form of signage or buoys. ATONs will be placed at each of the four corners of the nearshore rocky reefs to ensure visibility. ATONs will be integrated with the design and construction of restoration features.

As nearshore rocky reefs are located closer to shore in shallow water and will likely not be protected by the Long Beach Breakwater, they are expected to experience greater amounts of storm surge, sedimentation, and turbidity. The key to the sustainability of nearshore rocky reefs is the restoration of 120 acres of kelp/rock complexes as described above. These complexes are expected to reduce the amount of wave energy from storms and thereby buffer the nearshore rocky reef and eelgrass beds from the predicted increases in storm frequency and intensity and reduce the sedimentation and turbidity associated with these environmental stressors.

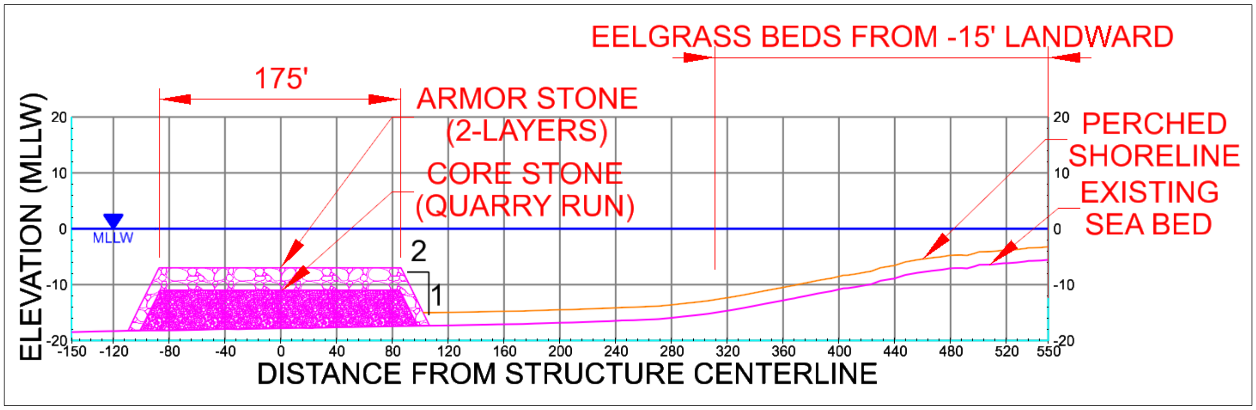


Figure 4-14: Nearshore Rocky Reef and Eelgrass Cross-Section

A pre-construction survey would be performed to document eelgrass extent in the areas of nearshore reef placement. If eelgrass is present, the location of rocky reef and sand placement would be adjusted during the detailed design phase as well as during construction to avoid impacts to existing eelgrass habitat. Further design refinements would be considered in the PED phase to determine the proper spacing and locations to better stabilize the immediate shoreline, and to consider inputs from key stakeholders and the City. For example, the western-most rocky reef/eelgrass feature from west of Belmont Pier may be adjusted to a location fronting Peninsula Beach. This could reduce potential impacts to existing eelgrass west of the pier, and potentially provide additional shoreline erosion benefits along Peninsula Beach. With the adjustment in location, habitat benefits or costs, would likely not change significantly from what currently being presented in Alternative 2.

4.5.2.5 Alternative 2 Nearshore Rocky Reef Construction Considerations

Similar equipment utilized in the construction of the open water kelp reefs would also be used for construction of the nearshore reefs. The nearshore shoals would be created by first depositing 120,000 tons of quarry run with individual stones no larger than 1 ton at the site, then finely placing 192,000 tons of filter and armor stone with individual stones ranging from 1 to 10 tons to obtain sufficient interlocking and depth profiles.

The construction of the nearshore rocky reefs would be accomplished by a barge and crane with appropriate support vessels. Core and filter stones may be dumped from a barge using a front loader or bulldozer. Armor stones must be specially placed by a crane, determining rock placement locations “by feel” using the crane, to obtain the specific armor layer thickness. Construction activities may be limited during the winter months due to large wave events, but generally, can proceed year-round. In both cases, a verification survey by full bottom coverage multibeam methods, will be required.

4.5.2.6 Alternative 2 Eelgrass Beds Siting and Design Considerations

Projected increases in the frequency and intensity of storms due to climate change are expected to significantly affect the function and distribution of eelgrass beds within the ESPB as it is sensitive to increased wave energy and disturbance. The synergy provided by the interconnectedness of the mosaic of habitats including the breakwaters, kelp reefs, open water rocky reefs, and nearshore reefs are expected to buffer restored eelgrass from intense and more frequent storm events and also aid in their recovery. Co-locating nearshore rocky reef with eelgrass beds are the primary adaptation to future increased storms.

Literature supports synergistic co-locations of habitat. “Open marine systems with a highly connected network of a mosaic of habitats allow for unassisted recolonization and natural recovery and are highly profitable restoration targets (Geist and Hawkins 2016). There is an unmeasured benefit or synergy that occurs when the diversity of habitats in proximity are restored, particularly for habitats that would naturally co-occur (Liversage, 2020)."

PDT worked with resource agency members of the TAC and configured a variety of co-located rocky reef shoals in the nearshore zone. These rocky reef-eelgrass "shoals," or complexes, would buffer wave activity and provide the shallow calm conditions needed for eelgrass to thrive. Alternative 2 includes approximately 25 acres of eelgrass in shallow, calm waters along the shoreline. Existing eelgrass is unprotected except along the western-most stretch of the proposed Project Area where existing dredge placement material and breakwaters sit offshore and protect eelgrass from strong waves and large storm events. Restored eelgrass beds bolster long-term resilience of eelgrass in the proposed Project Area.

In regard to predicted increases in depth and the reduction of available light for eelgrass due to sea level rise, eelgrass beds are expected to migrate shoreward into shallower water in order to maintain appropriate depths where adequate light is available. This is expected to offset the effects of increased water depths predicted for the proposed Project Area.

Approximately 25 acres of eelgrass habitat would be established at five locations in the nearshore zone, co-located with the nearshore rocky reefs described above. Eelgrass requires adequate light, wave energy, salinity, and substrate to grow and regenerate. Proposed locations for eelgrass restoration within the proposed Project Area have adequate light, salinity, and substrate. These beds would provide connectivity to existing eelgrass beds west of Belmont Pier, effectively doubling span of eelgrass habitat in the bay. The presence of the 16 acres of nearshore rocky shoals (see Figure 4-14) would provide the calm, shallow conditions eelgrass requires by stabilizing the bathymetry of the nearshore environment. Without the protective rocky reef shoals, wave energy is too high for eelgrass to naturally restore and recover in great abundance. Beach compatible sediment would also be placed leeward of the rocky shoal to optimize ideal conditions and depth for eelgrass growth.

4.5.2.7 Alternative 2 Eelgrass Beds Construction Considerations

For the eelgrass beds, up to 100,000 cubic yards of dredged sand material obtained from the Surfside/Sunset borrow area would be dumped on the leeward side of the five nearshore rocky reefs with the use of a split-haul scow. Dredging equipment for eelgrass bed sand placement would most likely consist of the following:

- 1 Dredge (mechanical (*e.g.*, clamshell per environmental commitment SP-3))
- 1 tug
- 2 scows

Dredging can occur 24 hours per day, 7 days per week. Expected downtime and shift changes will limit the working time to 22 hours per day but engines would remain idle during this time. Two scows can be filled and placed each day with an individual capacity of 2,000 yd^3, or 4,000 yd^3 per day. Surfside/Sunset borrow area is identified as the sand source in all alternatives due to its location and the quantity of material available; in the event other appropriate sources become available in the future, supplemental analysis would be undertaken as needed.

Donor eelgrass for transplanting would be derived from pre-approved eelgrass donor beds. These would be primarily selected based on factors related to the proximity, suitability, accessibility, and recovery potential for the donor site. In addition, the diversity of environments represented by the donor sites would be considered in order to maximize genetic diversity of plant materials. In order to prevent any adverse impacts to the donor beds, no more than 10% of the eelgrass within any donor bed would be harvested; this would allow the beds to recover quickly. Bare-root eelgrass plant material would be salvaged from the donor bed by "raking" rhizomes out of the surface sediment layers. Anchored, bare-root transplant units would be the principal transplant technique used, although other methods may be investigated. Planting would be conducted using divers working on a defined planting grid with temporary bounding lines to control planting areas.

4.5.2.8 Alternative 2 Quantity of Materials, Transportation and Staging Area

Table 4-11 shows approximate quantities of materials needed for Alternative 2.

Table 4-11: Alternative 2 Quantity of Materials

Alternative 2 Quantity of Materials				
Measure	**Material Type**	**Approximate Quantity**	**Unit**	**Representative Size**
Nearshore Reefs	Armor Stone	137,000	tons	1 - 10 tons
	Filter Stone	55,000	tons	~ 1 ton
	Core Stone	120,000	tons	~ 10 - 1000 lbs
Kelp Beds	Core Stone	132,000	tons	500 lbs
Eelgrass Beds	Sand	100,000	yd^3	0.2 mm

Quarry stone would be sourced and transported from either the Catalina Quarry (a.k.a. Pebbly Beach Quarry; primary quarry site) or from a secondary quarry site, 3M Quarry, located in Corona, Riverside County, California. The Catalina Island quarries have direct marine access for the loading of reef-building materials, there would be no need for truck hauling over public highways. The quarries are located approximately 200 yards to a quarter of one mile from the loading docks; thus, a minimal amount of trucking would be required at the quarry. Based on estimates from the construction of the Wheeler North Reef, each dump truck should hold 22 tons of quarry rock (Resource Insights, 1999). Quarry rock would be loaded onto flat-deck barges with cranes (supply barges) and front-end loaders. Tug boats would tow (one at a time or two in tandem) the flat-deck barges approximately 25 nautical miles to the project site. Two different sizes of supply barges can be used; the smaller barges can carry 2,500 tons of rock, and the larger barges can carry 4,000 tons of rock. An estimated time of 3.5 hours would be required to deliver the barges to the project site (based on an estimated average speed of 8.1 knots [9.3 miles per hour]).

The quarried stone would remain stockpiled on the transportation barges until ready to use for construction. Existing mooring locations within the Port of Long Beach would be utilized. An additional Staging and Storage area, shown in Figure 4-15 would be used for equipment and other material staging and storage, as well as a departure point for the Contractor. This 2.4-acre location has approximately 600 feet of water access, adequate for Alternative 2 and Alternative 4A. This figure also shows an enlarged area totaling 4.3 acres, which would be required for Alternative 8.

Figure 4-15: Proposed Staging and Storage Area at Pier T

4.5.2.9 Alternative 2 Monitoring/Adaptive Management and OMRR&R Considerations

Immediately following completion of construction, monitoring and adaptive management activities, including but not limited to periodic habitat surveys of kelp and eelgrass (aerial, sidescan sonar, and SCUBA), transplanting of eelgrass and kelp if necessary, monitoring and removal of invasive and non-native species, and reconfiguring of rocky reef habitat (if necessary), would take place for a period of 5-10 years, to ensure success of the ecosystem restoration project. See Appendix F: Monitoring and Adaptive Management Plan (MAMP) for more details. Once the habitat is established after the MAMP period ends, long-term OMRR&R begins. Habitat specific MAMP and OMRR&R activities are outlined below.

Kelp Beds: Under the MAMP, kelp reefs would be monitored quarterly during the performance period using true-color or multi-spectral aerial imagery taken from a small plane or drone. The images would be used to delineate and digitize the specific locations of the kelp and to measure both total lateral area (i.e., surface area of the water) that is covered by kelp and surface canopy density. Quarterly images would be used to capture seasonal maximums as well as variability during the year that may be due to project activities, disturbances, and/or seasonal variation. A reference reef would also be imaged and measured during each monitoring period. The reference site would be an existing kelp bed along the Long Beach Breakwater. In addition to the quantitative monitoring, biological communities and reef production would be qualitatively monitored during Years 3 and 5 by underwater survey.

No maintenance and OMRR&R costs are expected for kelp beds as once established under appropriate environmental conditions and during the MAMP period, kelp is expected to persist without the need for regular OMRR&R. Burial by natural sediments is not expected due to the exposed wave climate that would limit the buildup of additional fine grain sediment. Increases in beach grooming is expected due to the quantity of kelp that may become dislodged from the substrate and wash up along the shoreline.

Nearshore Rocky Reef: Under the MAMP, the nearshore rocky reef would be monitored during Years 1, 3, and 5 using acoustic survey (e.g., side-scan or multi-bean sonar). The surface area of rocky reef would be digitized from the images to provide estimates of total coverage. As a monitoring option, biological communities and reef production would be qualitatively monitored during Years 3 and 5 by underwater survey. In addition, underwater diver surveys of the kelp reef would be used to assess condition and inform corrective actions.

For nearshore rocky reef, some OMRR&R is required to maintain the design condition. Based on experience with other rubble-mound structures, it is estimated that 0.5% of the total cost per year would be required to maintain the structure. Typically, maintenance activities would be conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization.

Eelgrass Beds: Under the MAMP, the eelgrass beds would be monitored annually using a combination of field survey and visual or acoustic remote sensing methods (e.g., aerial imagery or side-scan sonar) consistent with the California Eelgrass Mitigation Policy and Implementing Guidelines (National Marine Fisheries Service 2014). Monitoring will be conducted during the peak growing period for eelgrass, which is typically March through October for southern California. A reference population of established eelgrass within the nearshore zone of the Study Area would also be imaged and measured during each monitoring period. Adaptive management results would indicate if more than one reference site in an alternative location would be needed.

No OMRR&R for eelgrass beds is expected as once established under appropriate environmental conditions and during the MAMP period, eelgrass is expected to persist without the need for regular OMRR&R.

Figure 4-16: Alternative 2

4.5.3 ALTERNATIVE 4A (Cost Effective Plan 4A) - Reef Restoration Plan

Alternative 4A (Figure 4-19) introduces a productive new habitat type of rocky reef placed along Island Chaffee (oil island). This open water placement augments existing rocky reef habitat at the oil island. The central location provides "stepping-stones" between proposed shoals and kelp beds, augmenting habitat connectivity between zones. The resultant benefit area is larger than Alternative 2, roughly forming a triangular configuration, with approximately 201 acres in restoration features. Construction methods and materials required for Alternative 4A, which provide the basis for cost estimates and environmental impacts analysis are provided in the following sections. All costs are presented in 2018 price levels with a Federal discount rate of 2.75 percent. It is anticipated to take approximately 96 months to construct Alternative 4A.

The introduction of open water rocky reef and one additional nearshore eelgrass/rocky reef shoal gives Alternative 4A additional benefits over Alternative 2. Alternative 4A directly restores approximately 201 acres of aquatic habitat and generates 161 AAHUs. It provides connectivity for productive habitats including open water rocky reef, subtidal rocky reef, eelgrass, and open water kelp. Alternative 4A provides habitat for key life stages for diverse populations of fish and other aquatic species. This benefit is realized primarily through the provision of foraging opportunities, protective shelter and critical nursery functions, which support population health and growth. The plan also provides sustainable resilience and redundancy to withstand stressors and occasional habitat loss events."

Table 4-12: Alternative 4A - Restoration Areas

Final Array Alternative	Total Area (ac)
ALT 4A Total	**200.7 (~201)**
Eelgrass Beds	30.3 (~30)
Kelp Beds	121.4 (~121)
Nearshore Rocky Reef	19.9 (~20)
Open Water Rocky Reef	29.2 (~29)

Table 4-13: Alternative 4A – Costs and Outputs Summary

Item	ALT 4A
First (Construction) Cost	$140,908,000
OMRR&R	$251,000
Average Annual Cost	$5,689,000
AAHUs	160.9
AAC/AAHU	$35,400
Incremental AAC/AAHU	$64,300
Zones with Restoration	3
Restored Acres	201
First Cost/Restored Acre	$701,000

4.5.3.1 Alternative 4A Increments Rationale

Rationale for Rocky Reef

Appendix D-1 states that, "Southern California rocky reefs are among some of the most diverse and productive marine ecosystems in the world. Rocky reefs can support giant kelp forests, providing food, shelter, and nursery grounds for many marine species. Subtidal rocky reefs, although completely submerged even at low tide, still receive enough light for photosynthesis. They are inhabited by algae, invertebrates, and groundfishes. Perennially submerged rock outcrops in the nearshore zone provide important refuges for juvenile and smaller fishes in addition to surface area for colonization of algae and invertebrates. Rocky reefs in deeper water do not generally receive enough light for photosynthesis and are dominated by sessile invertebrates and groundfishes. Most rocky reefs, regardless of the zone in which they are located, are beneficial because of the physical structure they provide to support some aspect of the marine ecosystem."

Open water rocky reef contributes to resource significance and augments the effectiveness of eelgrass and other habitats under Alternative 4A as various life history phases of many marine species inhabit different habitats over the course of their lifetime. The inclusion of complex, open water rocky reefs provides habitat for these phases and increases the connectivity between the open ocean and the nearshore environment. As a result, eelgrass, rocky reef, and kelp reefs in the SCB and San Pedro Bay are all recognized as EFH and HAPC by NMFS.

Alternative 4A restores nationally significant habitats per the planning objective in Section 2.2. and the restoration of rocky reefs fulfills the Study planning sub-objectives by increasing the extent, diversity, spatial heterogeneity, and connectivity of complex aquatic habitats within the Study Area.

As noted in Section 3.6 Biological Resources: Marine Habitat (Rocky Reef), breakwaters were designed to shelter the harbors and not for complex habitat. The linear design is similar to a wall and lacks key features of rocky reefs found along the California coastline such as varying void sizes, variation in verticality and in edges. The proposed open water rocky reef takes into account the complexity and variation in sizes, heights, and edges as well as ensure varying void spaces. While the breakwater serves as a large rocky reef, there is likely a lack of general connectivity between the breakwater and the nearshore waters of the ESPB as adults of marine species associated with the breakwater are expected to have high site fidelity and not travel great distances away from the breakwater. The restoration of rocky reef in the nearshore and the waters intermediate to the breakwater is expected to enhance connectivity between nearshore waters and those of the outer bay/breakwater and the open ocean similar to that described above.

Rationale for Rocky Reef Scaling

Per Appendix D-1: Biological Supplement, "Rocky reef habitats are comprised of rock outcrops (e.g., granite, lime/stone, basalt) of varying relief. Rocky habitat encompasses boulders to bedrock, i.e., rock that is large enough so as not to be normally moved by currents. Rocky reefs can take a variety of forms, each of which can support a different associated biological community." "Ambrose and Swarbrick (1989) suggest that a large, complex reef (i.e., 50 hectares (ha) or larger) constructed from a natural substrate, such as quarry rock, could furnish many different habitat and microhabitat types. Placed in an appropriate location, it could support a rich assemblage of algae and associated invertebrates, thereby providing food for a number of fish species."

As the first of the Best Buy alternatives to have open water rocky reef, Best Buy Plan 3 was designed to maximize the available acreage of rocky reef within the proposed Project Area. As a result, Best Buy Plan 3 included seven open water rocky reef patches of 14.6 acres each totaling 102.2 acres. This measure had the lowest incremental AAC/AAHU for plans larger than Best Buy Plan 2. Although 123 acres (50 ha) were not available within the proposed Project Area, the total acreage of rocky reef provided by Best Buy Plan 3, 102.2 acres, is significant. From Best Buy Plan 3, an incremental addition of a nearshore shoal was added west of Belmont Pier resulting in Best Buy Plan 4 that increased the acreage of eelgrass within the proposed Project Area and formed the base of what would become Alternative 4A.

Optimization from Seven (7) To Two (2) Rocky Reef

Section 4.4.3, Scaling of Best Buy Plan 4 to Alternative 4A, describes how Alternative 4 was scaled down to a lower cost variation. Even though the number of rocky reef patches had been reduced from Best Buy Plan 4 to Alternative 4A, two open water rocky reefs totaling approximately 30 acres still provide significant habitat value beyond Alternative 2. Rocky reefs are biologically productive habitats and the location of these reefs in the middle of the proposed Project Area serves as habitat "stepping-stones" that connect open water kelp beds with nearshore eelgrass/rocky reef shoals. The benefits of rocky reef that is connected with restored kelp and eelgrass beds make for a complete plan in terms of lifecycle support for improved biodiversity.

In support of the smaller reef sizes, Appendix D-1 states, "However, smaller reefs have been shown to support greater fish densities while larger reefs have higher biomass density from larger, but fewer individuals (Bohnsack et al. 1994). Multiple small reefs support more individuals and more species than one large reef of equal material. Fishes recruited by larval settlement accounted for 36% of the total resident abundance but only 2% of total biomass. As reef size increased, older juvenile or adult colonists comprised a greater percentage of total biomass (94% to 99%) (Bohnsack et al. 1994). Smaller reefs may also be better for overall species recruitment to the reef. There was a significant decline in mean total biomass of larval settlers as reef size increased (Bohnsack et al. 1994). This is evidence that mortality of larval settlers is higher on larger reefs due to increased competition and predation from larger resident populations and larger individual fishes." "Several small reefs have greater edge effect in that they offer more ecotone habitat based on a higher ratio of perimeter to reef area. Additionally, dispersing fauna may have a better chance of locating several small reefs than one large reef (Bohnsack 1991)." Further, as small reefs are expected to have higher fish densities, they have the potential to support more species by chance (Bohnsack et al. 1994). This is similar to the phenomenon described by Macarthur and Wilson (1967) for small islands.

Rationale for Additional Eelgrass/Rocky Reef Shoal in Alternative 4A

In addition to the rocky reef, CEICA identified an additional nearshore eelgrass/rocky reef shoal as a cost effective and efficient measure for Best Buy Plan 4. This measure has almost the same incremental AAC/AAHU as the additional Rocky Reef included under Alternative 4A. This sixth shoal adds approximately 5 acres of eelgrass beds and approximately 4.0 acres of subtidal rocky reef in the nearshore zone, for a total of approximately 30 acres of eelgrass and 20 acres of nearshore rocky reef. As explained in the eelgrass and nearshore reef rationale section above, adding more two-in-one habitat patches creates rich habitat due to synergies within and between the co-located habitat types, effectively meeting study objectives. Along with the resource significance, shoals provide incidental protection from localized shoreline erosion.

4.5.3.2 Alternative 4A Open Water Rocky Reef Siting and Design Considerations

As noted earlier, the greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that increased sedimentation due to more frequent storm events as a result of Global Climate Change is expected to fill in rocky reef voids where species live with the possibility of burying entire reefs after periods of successive storm activity. Turbidity associated with storm events will affect water quality (e.g., available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them. In response to these potential environmental stressors, open water rocky reefs were formulated to be located inside the breakwater in order to reduce potential exposure to sedimentation. Inside the breakwater, it is expected that the open water rocky reefs will be sheltered to some degree from storm surge (wave action) and that this will reduce the amount of sedimentation and turbidity associated with storm activity.

In addition, the restoration of approximately 121 acres of kelp reef (kelp/rock complexes) to the east of the Long Beach breakwater and throughout ESPB is expected to afford an additional level of protection for open water rocky reef. These kelp complexes are expected to reduce the amount of wave energy from storms along with the sedimentation and turbidity that generally follows. This synergy between environments that is expected to increase the sustainability of restored habitats was described as “a mosaic of habitats provides greater functional diversity, which is linked to long-term stability, as multiple functional traits (built in redundancies) increase the resilience of marine systems in the face of environmental changes (Montoya et al., 2012). There is an unmeasured benefit or synergy that occurs when the diversity of habitats in proximity are restored, particularly for habitats that would naturally co-occur (Liversage, 2020). This is particularly important in highly altered environments, such as San Pedro Bay (Milbrandt et al., 2015).” In addition, “restored habitats will also aid in storm protection and the reduction of shoreline erosion within the Study Area (Foster and Schiel, 1985; Koehl and Alberte, 1988; Larkum et al., 2006) and ultimately offset the impacts of Global Climate Change.”

In Alternative 4A, approximately 29 acres of open water rocky reef and 20 acres of nearshore rocky reef significantly increase available high quality, productive, rocky reef habitat in the proposed Project Area. Rocky reef by the Island Chaffee would increase habitat complexity due to variation in rock grouping size, rugosity, and relief, interspersed with sandy habitat for enhanced “edge effect.” These design complexities echo natural rocky reef that once existed and currently exist in degraded conditions in the western part of the Study Area. The existing rocky reef on the oil islands, hardened shoreline, and along the breakwater are not designed for optimum habitat benefit and are susceptible to climate change-induced stressors. The additional 50 acres of rocky reef are expected to bolster productivity and biomass in the proposed Project Area, ensuring healthy reef-based fish and invertebrate populations into the future.

Regarding fishing pressure, several measures have been put into place by the California Department of Fish and Wildlife along with various state and federal agencies to reduce the impact of fishing on biological communities along the California coastline. These practices include, but are not limited to, Marine Protected Areas (MPAs), size limits, quotas, seasonal windows, licensing, fines associated with violating fishing statutes, etc. It is expected that these measures would still be utilized over the period of analysis for ESPB and that they would also be modified into the future as additional data pertaining to catch rates, species abundances, species richness, etc. are further investigated.

Placing open water rocky reef patches near Island Chaffee augments existing rocky reef habitat on the existing oil island infrastructure. Co-locating two rocky reef patches adjacent to each other promotes synergies between the patches, augmenting habitat value. Soft-bottom spaces in between patches of rock add edge effect complexity, creating more biodiversity opportunities. The relatively short distances between reef patches increase exchanges and expands distribution of species, enhancing biodiversity.

Open water reefs are made up of individual rock groupings, roughly 100’ in diameter, spaced apart within a circular area. This distribution will offer a variety of habitats for different species by providing alternating rocky reefs and sandy bottom in a concentrated area. Refer to Figure 4-17. Individual patches make up a single reef complex, covering about 15 acres. Each individual rock grouping varies in height between 3 feet to 12 feet above the seabed.

The distribution of these reefs are as follows and are defined by the crest height above the existing seabed:

- 3 ft. – 20%

- 6 ft. – 25%
- 9 ft. – 35%
- 12ft. – 20%

This distribution will offer a variety of habitats for different species. Higher reefs will be placed furthest away from any marine navigation (commercial and recreational) as possible. The highest crest elevation will be set no more than -15 ft. MLLW. A medium stone weight of 10 tons will provide for sufficient stability.

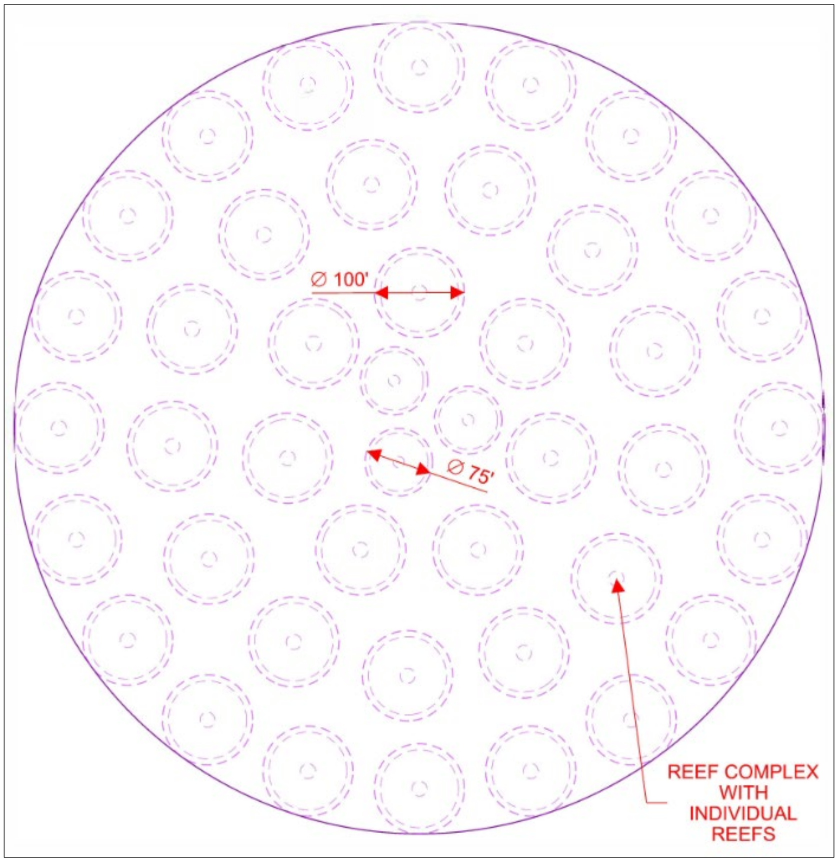


Figure 4-17: Plan View of Open Water Rocky Reef Complex

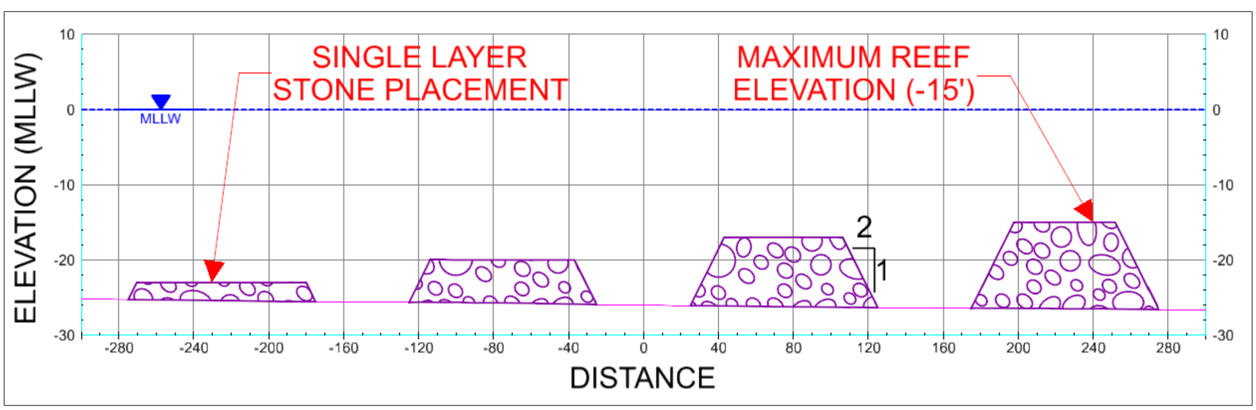


Figure 4-18: Open Water Rocky Reef Cross-Sections

4.5.3.3 Alternative 4A Open Water Rocky Reef Construction Considerations

Approximately 183,000 tons of armor stone quarry material would be needed to construct both of the offshore reef complexes. Interlocking for this type of reef is not needed due the level of submergence. All stone can be placed in a random manner to achieve the required relief and depth. Construction of the offshore reefs require more complex placement techniques. For this measure, stone cannot be dumped from a barge and must be specially placed in order to obtain the required void spaces. This technique leads to a much longer duration of construction due to the single stone placement. Construction activities may be limited during the winter months due to large wave events, but generally, can proceed year-round. In both cases, a verification survey by full bottom coverage multibeam methods, would be required. The Pier T staging area would also be the same as described under Alternative 2.

4.5.3.4 Alternative 4A Remaining Features Siting and Design Considerations

Kelp Beds: Site selection and design considerations are the same as Alternative 2.

Nearshore Rocky Reef: Site selection and design considerations including ATONs are the same as Alternative 2, plus one additional four-acre shoal (total of six), west of Belmont Pier.

Eelgrass Beds: Site selection and design considerations are the same as Alternative 2, with the addition of a sixth eelgrass bed, made possible by the additional rocky reef shoal, totaling 30 acres of eelgrass restored.

4.5.3.5 Alternative 4A Remaining Features Construction Considerations

Kelp Beds: Construction considerations such as stone types and quantities, source and transportation, staging, “push off” construction methodology and equipment are the same as Alternative 2.

Nearshore Rocky Reef: Construction considerations such as stone types and quantities, source and transportation, staging, “by feel” construction methodology and equipment are the same as Alternative 2. An additional 39,000 tons of 1 to 10 ton armor and filter stone would be required, as well as 14,000 tons of quarry run from the same sources as discussed in Alternative 2.

Eelgrass Beds: Construction considerations such as stone types and quantities, source and transportation, staging, “push off” construction methodology and equipment are the same as Alternative 2. Up to 100,000 yd³ of sand is needed.

4.5.3.6 Alternative 4A Quantity of Materials, Transportation, and Staging Area

Table 4-14 shows approximate quantities of materials needed for Alternative 4A.

Table 4-14: Alternative 4A Quantity of Materials

Alternative 4A Quantity of Materials				
Measure	**Material Type**	**Approximate Quantity**	**Unit**	**Representative Size**
Open Water Reefs	Armor Stone	183,000	Tons	10 tons
Nearshore Reefs	Armor Stone	176,000	Tons	1 - 10 tons
	Filter Stone	55,000	Tons	~ 1 ton
	Core Stone	134,000	Tons	~ 10 - 1000 lbs
Kelp Beds	Core Stone	132,000	Tons	500 lbs
Eelgrass Beds	Sand	100,000	yd³	0.2 mm

Materials source and transport would be the same as detailed under Alternative 2. The staging area for Alternative 4A would also be the same as under Alternative 2. Construction equipment needed for the nearshore reefs, kelp reefs and eelgrass, would be the same as detailed under Alternative 2. Creation of the open water reefs would be conducted using a barge mounted crane and supply barge. The 10 ton stones would be individually placed in the described mounds to obtain the required void spaces. Verification would be conducted with a multi-beam survey to obtain sufficient coverage of the seabed and constructed reefs.

Construction activities would be performed during daylight hours six days a week (Monday – Saturday) during a regular 8-hour day. Assuming the output of 1,725 tons of quarry rock deposited per day, the operation schedule for the tugboats would be every day for the small barges and every other day for the large barges. Dredging activities would be the same as described for Alternative 2.

4.5.3.7 Alternative 4A Monitoring/Adaptive Management and OMRR&R Considerations

Immediately following completion of construction, monitoring and adaptive management activities, including but not limited to periodic habitat surveys of kelp and eelgrass (aerial, sidescan sonar, and SCUBA), transplanting of eelgrass and kelp if necessary, monitoring and removal of invasive and non-native species, and reconfiguring of rocky reef habitat (if necessary), would take place for a period of 5-10 years, to ensure success of the ecosystem restoration project. See Appendix F: Monitoring and Adaptive Management Plan (MAMP) for more details. Once the habitat is established after the MAMP period ends, long-term OMRR&R begins. Habitat specific MAMP and OMRR&R activities are outlined below.

Open Water Rocky Reefs: MAMP activities are the same as those described for the nearshore rocky reef in Alternative 2. No maintenance is projected to be required. Deeply submerged open water reefs would not experience any maintenance cost due to the large armor stone size required for sufficient large void spaces and stability.

Kelp Beds: MAMP and OMRR&R activities are the same as Alternative 2.

Nearshore Rocky Reef: MAMP and OMRR&R activities are the same as Alternative 2.

Eelgrass Beds: MAMP and OMRR&R activities are the same as Alternative 2.

Figure 4-19: Alternative 4A

4.5.4 ALTERNATIVE 8 (Best Buy Plan 8) - Scarce Habitat Restoration Plan

Alternative 8 (Figure 4-23) restores three scarce habitat types, a sandy island, coastal wetlands, and oyster beds, aquatic habitat types which have been largely lost or degraded within the SCB. These are in addition to kelp beds, open water rocky reef by Islands Chaffee and Freeman, nearshore zone rocky reef and eelgrass beds which places restoration features in all five opportunity zones. These distributed restoration measures effectively create a benefit area that encompasses the entire proposed Project Area. Restoration features cover approximately 372 acres. Construction methods and materials required for Alternative 8, which provide the basis for cost estimates and environmental impacts analysis are provided in the following sections. All costs are presented in 2018 price levels with a Federal discount rate of 2.75 percent. Alternative 8 is anticipated to take approximately 113 months to complete construction of restoration features.

Table 4-15: Alternative 8 - Restoration Areas

Final Array Alternative	Total Area (ac)
ALT 8 Total	**371.9 (~372)**
Eelgrass Beds	52.3 (~52)
Sandy Island	23.8 (~24)
Kelp Beds	121.4 (~121)
Nearshore Rocky Reef	19.9 (~20)
Open Water Rocky Reef	102.2 (~102)
Oyster Reef	0.3 (~0.3)
Coastal Wetland	52.0 (~52)

Table 4-16: Alternative 8 – Costs and Outputs Summary

Item	ALT 8
First (Construction) Cost	$560,681,000
OMRR&R	$5,853,000
Average Annual Cost	$27,892,000
AAHUs	307.3
AAC/AAHU	$90,800
Incremental AAC/AAHU	$151,600
Zones with Restoration	5
Restored Acres	372
First Cost/Restored Acre	$1,507,000

4.5.4.1 *Alternative 8 Sandy Island Siting and Design Considerations*

The Study Area contains potential habitat for two federally listed shorebirds: Western snowy plover (*Charadrius alexandrinus nivosus*) and California least tern (*Sternula antillarum browni*). Sea level rise will continue limit potential nesting habitat (sandy beach and sand dunes) by inundating upland and intertidal sandy areas within the project area. Currently, potential habitat within the project area is not considered available for sensitive shorebird species due to the level of recreational use and beach grooming activities. The quality of foraging habitat for sensitive shorebirds (open water and intertidal sandy beach) is likely to be degraded to increased ocean temperatures.

Under the FWOP conditions, sensitive shorebird breeding and foraging habitat within the Study Area would be degraded by climate change related effects.

The proposed 24-acre sandy island provides much needed habitat for threatened and endangered shorebirds which are subject to disturbance from people and predators. Under Alternative 8, an approximately 24-acre sandy island would be constructed in the nearshore zone. Relatively shallow waters <20’ MLLW minimize construction material quantities and costs over locations out in deeper waters. The sandy island in this location off of Peninsula Beach may reduce shoreline erosion.

4.5.4.2 Alternative 8 Sandy Island Construction Considerations

Silt or sand would be dredged from the Surfside/Sunset borrow site and used as fill material until the desired elevation is reached. A cover layer of white sand would be placed on top of the fill material to attract birds. Slopes would consist of two layers of revetted rock armor stone and two layers of filter stone. The beach slope would be constructed with a 10 horizontal to 1 vertical slope that would eventually be re-distributed by local wave and current processes to create a more natural beach face (Figure 4-20).

The sandy island construction materials would include:

- 336,000 tons of 11 ton armor stone
- 37,000 tons of filter (quarry stone) material of approximately 1 ton
- 1,057,000 yd³ of fill material
- 276,000 yd³ of clean white sand (This would come from the upper layers of the Surfside/Sunset borrow area).

Lifts of silt or sand would be dredged until the desired elevation is reached (fill material). A cover of design material (white sand) would be placed on top of the fill material. Clean sand would be excavated from the Surfside/Sunset borrow area. Dredge equipment and operations would be the same as Alternative 2.

Sandy island construction would require a dredge plant and additional earth moving equipment. Fill material would be placed in lifts with a scow or hopper dredge (if scow is used, then a mechanical dredge required) until unfeasible to bottom dump (~ 10 ft. depth). Then fill material would be pumped out to obtain required elevation. Clean white sand is then pumped out to obtain the required elevation. The sandy beach would be built with a 10H:1V slope and would be distributed to achieve a more natural profile over time. A single scrapper and front-loader would be sufficient able to move the sand around between scow/hopper transits.

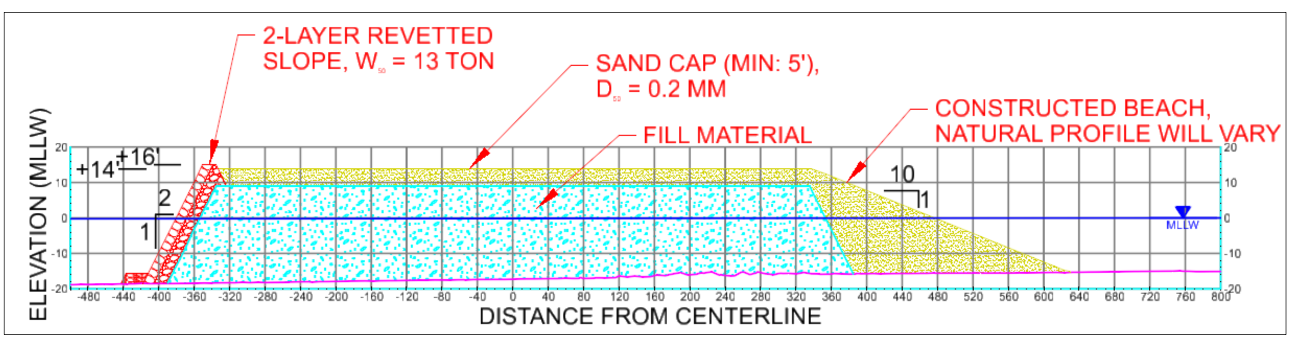


Figure 4-20: Emergent Sandy Island Cross-Section

4.5.4.3 Alternative 8 Coastal Wetlands Siting and Design Considerations

Coastal saltmarshes provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, commercial species nursery habitat, and carbon sequestration.

Coastal saltmarsh habitat within the proposed Project Area is limited to the Golden Shores Marine Reserve area, which is relatively small (approximately 6.5 acres), and isolated from other areas of similar habitat.

Under the FWOP conditions, sea level rise associated with climate change will reduce total saltmarsh area within the proposed Project Area. Inland boundaries of the existing marsh are limited by seawalls and rock armoring. Over time, sea level rise will likely cause a type shift within the created estuary from coastal saltmarsh to mudflat and open water, reducing coastal salt marsh total area and functionality within the proposed Project Area.

Two coastal tidal salt marsh wetlands are added in Alternative 8, providing transitional habitat functions where freshwater Los Angeles River flows intermixes with saltwater from the bay. Adding approximately 52 acres of this tidal salt marsh would greatly increase this rare habitat type in support of aquatic species, amphibians (land and water), shorebirds and other open water birds, and terrestrial species within the SCB.

The larger approximately 42-acre wetland would be built along an inset of Pier J, between Carnival Cruise Lines and the Pier J entrance jetties. A stretch of the Pier J shoreline was chosen due to lack of boating facilities and avoids a small dock to the south. The larger 42-acre wetland alongside Pier J would require engineering a structure to build out into the bay, not unlike the ports which were also built out into the bay. This engineered wetland would allow for water and some sediment exchange. The perimeter of the wetland would be a stone foundation of quarry run material with pre-cast concrete segments filled with ballast (rock). The interior would be sand, or silt (fill material) covered with clean sand to reach required elevation. Most likely a cofferdam would be needed. Caisson perforations would be included to absorb wave energy. Recreational fishing access would be possible with the addition of a concrete cap atop the caisson structure, along the perimeter of the wetland.

The smaller wetland is a 10-acre patch just inside the mouth of the Los Angeles River. A tentative location has been preliminarily identified between Queens Way Bridge and the Queen Mary along the southwest shoreline of the Los Angeles River surrounding Harry Bridges Memorial Park. Its proximity to the existing Golden Shores Reserve wetland would facilitate exchange of species and support nursery function. The construction would be similar to the larger Pier J wetland described above (See Figure 4-21).

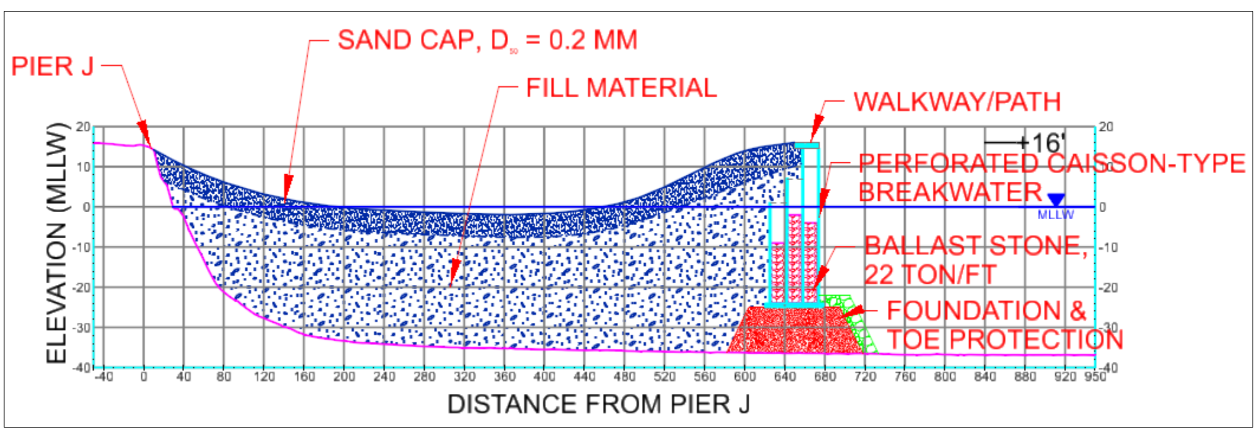


Figure 4-21: Coastal Wetland/Tidal Salt Marsh at Pier J Cross-Section

4.5.4.4 Alternative 8 Coastal Wetlands Construction Considerations

Approximate quantities of materials needed for the larger 42-acre wetland at Pier J include:

- 24,000 tons of quarry run for foundation
- 43,000 yd^3 of concrete for the pre-cast caissons
- 24,000 tons of ~2 ton quarry stone
- 1,899,000 yd^3 of fill
- 339,000 yd^3 of clean sand

Approximate quantities of materials needed for the smaller 10-acre wetland include:

- 10,000 tons of quarry run for foundation
- 5,000 yd^3 of concrete
- 3,000 tons of ~2 ton quarry stone
- 34,000 yd^3 of fill
- 81,000 yd^3 of clean sand

Wetlands construction would require a dredge plant and additional earth moving equipment. To construct the wetlands, the foundation would be placed by barge dump in random manner and leveled. Pre-cast concrete sections would be constructed off-site, floated into position then sunk by ballast stone. Fill material would be placed hydraulically until required elevation is obtained (a mechanical dredge could be used for the placement of fill material; however, it would take significantly longer and would not be considered economical). Finally, the wetland would be capped with clean sand and contoured to achieve required elevation and interior channeling with earth moving equipment. Equipment would involve 2 scrappers and 2 front loaders.

4.5.4.5 Alternative 8 Oyster Bed Siting and Design Considerations

Oyster beds contribute important functions to local ecosystems, including biodiversity, water quality, nutrient cycling, refugia and nursery habitat for commercial fish species, and to the reduction of shoreline erosion in coastal areas.

Historically, oyster beds were likely not widely distributed within the Study Area prior to the dredging and filling of the Los Angeles and San Gabriel river estuaries to create port, harbor, and marina infrastructure due to lack of natural, hard substrates in the Study Area. Currently, native and non-native oysters are limited to shoreline hard substrates associated with coastal armoring and infrastructure, including the Los Angeles River channel.

Under the FWOP conditions, oyster beds formation will continue to be depressed. Functions and overall distribution of individual oysters within the proposed Project Area may be degraded by projected increases of extreme storm events, ocean acidification, and ocean temperature. Oysters within the proposed Project Area will likely be resilient to sea level rise as appropriate hard-substrate habitat is available at higher elevations in the form of port infrastructure.

Oyster beds along the Alamitos Bay jetties would be placed in areas between -4’ and 1.5’ MLLW. They would total less than one acre (0.3 acres) but would provide important filtration as well as habitat value. Locating oyster beds at the far end of the jetties limits potential for human access.

4.5.4.6 Alternative 8 Oyster Bed Construction Considerations

A base layer of shell-hash (typical material used for oyster bed establishment) would be required, roughly 100-200 yd^3, depending on thickness with a maximum of 500 yd^3. The small amount of shell-hash required is anticipated to come from a commercial source. The design will be developed during

PED. Once the shell-hash is placed, active "seeding" of the bed with juvenile oysters would be conducted. Shell hash would be distributed within the elevation bounds along the placement areas shown using an excavator mounted on a barge. An oyster platform can also be utilized. These floating platforms are submerged to the required depth and attached to the seabed using an anchor and cable system. Seeding of juveniles would be required directly after construction of the substrate.

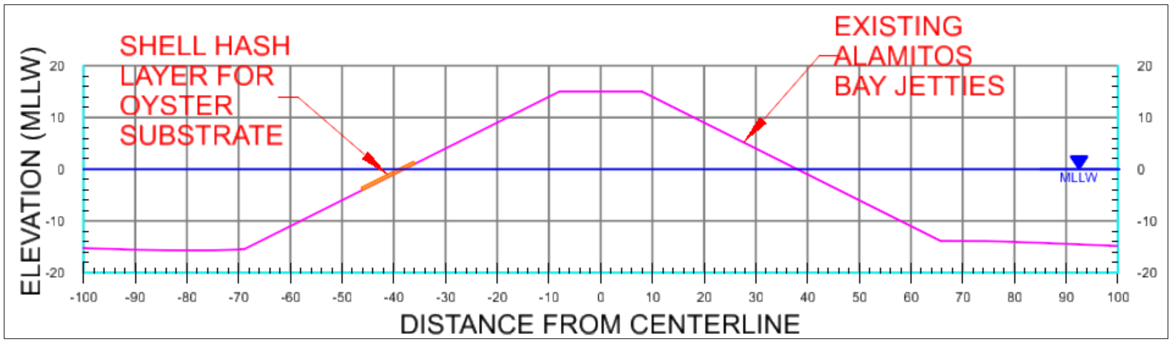


Figure 4-22: Oyster Bed Placement Cross-Section

4.5.4.7 Alternative 8 Remaining Features Siting and Design Considerations

Open Water Rocky Reef: Site selection and design considerations are the same as Alternative 4A. In addition to the 29 acres in Alternative 4A, an additional five patches, each >14 acres in size, increase the total acreage of open water rocky reef by 63 acres for a total of 102 acres.

Kelp Beds: Site selection and design considerations are the same as Alternative 2 and Alternative 4A for a total of 121 acres.

Nearshore Rocky Reef: Site selection and design considerations including ATONs are the same as Alternative 4A for a total of 20 acres.

Eelgrass Beds: Site selection and design considerations are the same as Alternative 4A. A new approximately 22-acre eelgrass bed, created by the Sandy Island, results in a total of approximately 52 acres of eelgrass beds in Alternative 8.

4.5.4.8 Alternative 8 Remaining Features Construction Considerations

Open Water Rocky Reef: Construction considerations such as materials, transportation, methodology and equipment are the same as Alternative 4A. With five additional reef patches, armor stone requirements increase by approximately 1,357,000 tons of 10 ton armor stone placed as in Alternative 4A. See Table 4-17: Alternative 8 Quantity of Materials for a complete list of materials required.

Kelp Beds: Construction considerations such as stone types and quantities, source and transportation, staging, "push off" construction methodology and equipment are the same as Alternative 2.

Nearshore Rocky Reef: Construction considerations such as stone types and quantities, source and transportation, staging, "by feel" construction methodology and equipment are the same as Alternative 2. An additional 39,000 tons of 1 to 10 ton armor and filter stone will be required as well as 14,000 tons of quarry run from the same sources as discussed in Alternative 2.

Eelgrass Beds: Construction considerations such as sand source, construction methodology and equipment are the same as Alternative 2. Approximately 100,000 yd^3 of sand is needed.

4.5.4.9 Alternative 8 Construction Materials, Transportation, Methodology, Equipment and Timeframe

Table 4-17 shows approximate quantities of stone needed for Alternative 8.

Table 4-17: Alternative 8 Quantity of Materials

Alternative 8 Quantity of Materials				
Measure	**Material Type**	**Approximate Quantity**	**Unit**	**Representative Size**
Sandy Islands	Armor Stone	336,000	tons	11 tons
	Filter Stone	37,000	tons	~ 1 ton
	Fill Material	1,057,000	yd³	N/A
	Sand	276,000	yd³	0.2 mm
Coastal Wetlands [LARE / Pier J]	Core Stone	10,000 / 24,000	tons	~ 10 - 1000 lbs
	Armor Stone	3,000 / 24,000	Tons	1 - 3 tons
	Concrete	5,000 / 43,000	yd³	N/A
	Fill Material	34,000 / 1,899,000	yd³	N/A
	Sand	81,000 / 339,000	yd³	0.2 mm
Open Water Reefs	Armor Stone	1,540,000	Tons	10 tons
Nearshore Reefs	Armor Stone	176,000	Tons	1 - 10 tons
	Filter Stone	55,000	Tons	~ 1 ton
	Core Stone	134,000	Tons	~ 10 - 1000 lbs
Kelp Beds	Quarry Stone	132,000	Tons	500 lbs
Eelgrass Beds	Sand	100,000	yd³	0.2 mm
Oyster Beds	Shell Hash	100-200	yd³	N/A

Construction activities would be performed during daylight hours six days a week (Monday – Saturday) during 10-to-12-hour days. It is anticipated to take approximately 18 months to build the reefs. Assuming the output of 1,725 tons of quarry rock deposited per day, the operation schedule for the tugboats would be every day for the small barges and every other day for the large barges. Dredging activities would be the same as described for Alternative 2. However, based on the estimated volume of sand and fill needed for restoration measures within Alternative 8, hydraulic dredging will be considered an option along with the use of clamshell (mechanical) dredging. If pursued, impacts to sensitive species (*e.g.*, Green Sea Turtles) associated with the use of hydraulic dredging would be assessed and coordination/consultation with the NMFS would be undertaken to determine if additional BMPs would be necessary to reduce potential impacts to sensitive species.

4.5.4.10 Alternative 8 Monitoring/Adaptive Management and OMRR&R Considerations

Immediately following completion of construction, monitoring and adaptive management activities, including but not limited to periodic habitat surveys of kelp, eelgrass, oyster reef, sandy island, and wetlands (aerial, sidescan sonar, SCUBA, field transects, topographic and bathymetric, mudflat and intertidal); transplanting or planting of eelgrass, kelp, wetland plants, oysters, muflat and intertidal invertebrates if necessary; addition of sand or oyster shell seeding material; monitoring and removal of invasive and non-native species, and reconfiguring of wetland hydrology or rocky reef habitat (if necessary), will take place for a period of 5-10 years, to ensure success of the ecosystem restoration project. Appendix F: Monitoring and Adaptive Management Plan (MAMP) for more details. Once the habitat is established after the MAMP period ends, long-term OMRR&R begins. See Habitat specific MAMP and OMRR&R activities are outlined below.

Sandy Island: Under the MAMP, the sandy islands will be monitored annually using true-color aerial imaging. The images would be used to digitize the boundaries of the islands, identify changes in perimeters from year to year, and measure each island's area. The images would also be used to estimate total vegetation cover on the islands and identify potential problem areas (i.e., areas where vegetation impedes nesting bird mobility and needs to be removed). Biologists would conduct qualitative vegetation surveys annually outside the breeding season to identify plant species that are present on the island. This information would be used to determine if measures are required to control non-native and/or non-target vegetation. Qualitative observations of sand movement, displacement, and erosion will be made during vegetation surveys to inform adaptive management and specific corrective actions.

Yearly maintenance would be required to clean and groom the sand along with weeding and grubbing to limit the vegetative cover and invasive species. The sand cap is expected to be lost over time through natural processes and replaced with clean white sand at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization. It is estimated that 50% of the sand material would need to be added every 10 years. Maintenance of the armored slope would occur approximately every 10 years or when needed.

Coastal Wetlands: Under the MAMP, the coastal wetland areas would be monitored annually using true-color or multi-spectral aerial photography during the peak growing season for wetland vegetation (April through June). The images would be used to digitize the boundaries of the habitat complexes (open water, mudflat, etc.) and measure the areas. Imagery would also be flown in the reference area located at Golden Shore Marine Reserve. Topography and bathymetry would be determined by topographic survey and acoustic or lead-line surveys. Wetland tidal flushing would be affected by changes in size of the inlet. The cross-sectional area of the wetland inlet(s) would be calculated during each survey (during similar tidal heights) to monitor accretion/erosion.

Mudflat and subtidal invertebrates would be surveyed annually by core tubes and/or grab samples. Individuals would be screened on 1.0-millimeter mesh screens and identified to the lowest practical taxon. Abundance, density, and biomass in each area would be reported. Sediment grain size samples would be collected concurrently from the upper two centimeters at each station. Grain size distribution would be determined using standard sieves or laser light diffraction methods.

Wetland vegetation complexes would be surveyed annually to assess vegetation cover, species diversity, and assess the overall quality of wetland habitat. High quality wetland habitat would be characterized by healthy vegetation that increases in cover each year, limited cover by non-native species, and presence of species that are appropriate to the target community. Bird species composition and abundance will be surveyed by biologists twice per year: once in winter and once in spring. Observations will be recorded every 30 minutes during each six-hour survey period, consistent with the survey methods at Golden Shore Marine Reserve (MBC 2003).

Maintenance would be required both for the tidal salt marsh interior and structural components. Maintenance of the hard structural components (caisson and foundation) will consist of repairing damages caused by large waves; such as replacing stone scoured out at the toe of the caisson or replacing individual caisson units that may have shifted during a storm event. Interior maintenance consists of monthly landscaping, cleaning and removal of unwanted species as well as replacement of the sediment lost from the system by tidal currents. For a conservative estimate, it is assumed that 25% of the sandy material would be lost and need to be replenished every 10 years to return the wetland to the design elevation.

Oyster Beds: Under the MAMP, oyster reef area and height would be monitored during Years 1, 3, and 5 using acoustic methods (i.e., side-scan or multi-beam sonar). Adult oyster density and would be monitored annually by divers at the end of the growing season (late summer or early fall). Ambient water quality parameters would be monitored in the area of the oyster reefs by either data logging instruments or regularly scheduled surveys. Construction of oyster reefs in southern California is experimental, and few efforts have been completed to date (Zacherl 2018). While there are oyster bed restoration projects in Alamitos Bay and Newport Bay, there are no oyster reefs that could be used as reference sites for this project. For all metrics, sampling should be performed at the restoration site and a control and/or natural reference site in the year prior to construction, and during post-construction monitoring (Baggett et al. 2014).

No maintenance is expected to be performed on the oyster reefs after the 5–10-year monitoring and adaptive management period.

Open Water Rocky Reef: MAMP and OMRR&R activities are the same as Alternative 4A.

Kelp Beds: MAMP and OMRR&R activities are the same as Alternative 4A.

Nearshore Rocky Reef: MAMP and OMRR&R activities are the same as Alternative 4A.

Eelgrass Beds: MAMP and OMRR&R activities are the same as Alternative 4A.

Figure 4-23: Alternative 8

4.5.5 ALTERNATIVE BW1 - Breakwater Western Notching Plan + Best Buy Plan 2 (Modified)

The Breakwater Western Notching Plan (Alternative BW1) (Figure 4-28) includes all of the ecosystem restoration measures specified for Alternative 2. This includes the approximately 121 acres of kelp beds, 16 acres of subtidal rocky reef and 25 acres of eelgrass beds. Slight modifications to Alternative 2, as requested by the non-Federal sponsor, would be necessary for this and the other Breakwater Plan BW2. These include shifting one rocky reef shoal to provide coverage for Peninsula Beach from increased wave energy. Additional measures beyond Alternative 2 include:

Breakwater Modification Measure: Under this plan, two 1,000 foot notches on the western portion of the existing Long Beach Breakwater would be removed. Removed stones would be reused to increase the size of the newly formed head sections within the breakwater, build protective structures around the Oil Islands, Pier J structures, and the parking lot near Junipero Beach. Stones would be removed by crane, cleaned, and transported by barge to reduce the quantity of imported armor stone. The remaining sand and clay core material would remain in place to be naturally transported or dredged and utilized as fill material.

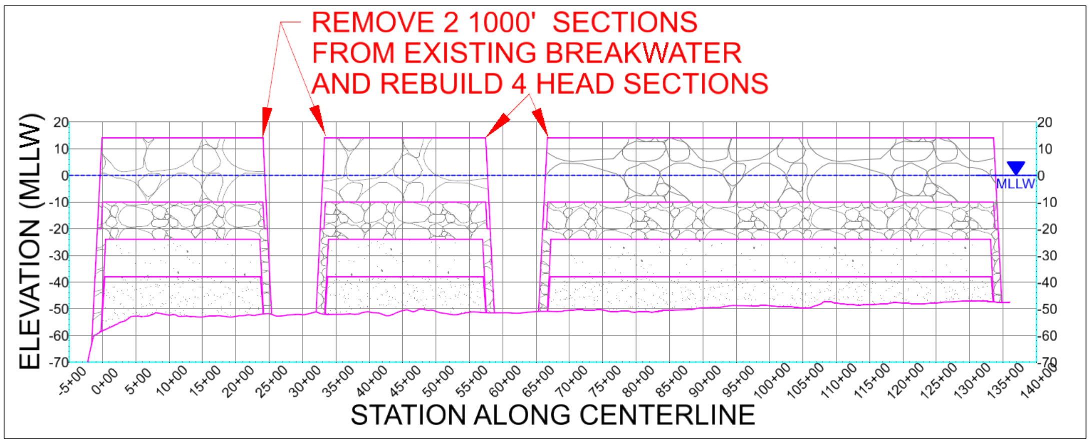


Figure 4-24: Breakwater Western Notches Modification Cross-Section

Protective Measures: Under this alternative, protective measures would be needed to limit the impacts from increased wave energy on existing infrastructure. The increase of wave heights may cause additional damage to the existing revetments from Pier J to the Queen Mary and near Shoreline Marina. To reduce the risk of failure, the revetments should be rehabilitated to withstand the new wave climate with only minor maintenance over the structural life. For this Study, the rehabilitation of the revetments was used to account for total project costs.

Protective measures would include increasing the amount of protection (armoring) of the existing oil islands and Pier J (see green lines on Figure 4-28). This would be accomplished by placing a second layer of larger stone along the existing slopes of the oil islands. A cast-in place concrete parapet wall would also be added on top of the revetment to protect against excessive overtopping. The nearshore rocky reefs would be required to increase in elevation to provide for a similar level of protection against runup and erosion from Alamitos Bay to Belmont Pier and Junipero Beach. A small emergent breakwater, about 10’ above water level, would be created to protect Belmont Pier from increased wave energy. Increases in wave heights as a result of Alternative BW1 alters the longshore sediment transport in the area of Junipero Beach and adjacent areas (but not as to threaten other structures). The increase in wave heights is not anticipated to cause damages from overtopping along the shoreline but would increase the longshore transport rates to a point where the parking lot will begin to be undermined within 10-15 years without any additional action. An offshore submerged breakwater would decrease the incident wave energy thus reducing the local sediment transport and protecting the existing infrastructure.

Protective measures described above mitigate infrastructure damage impacts but not navigation operations impacts. The cost of such additional mitigation features, as well as any costs associated with increased transportation costs which may result from navigation impacts, are not included in the cost estimate for this alternative.

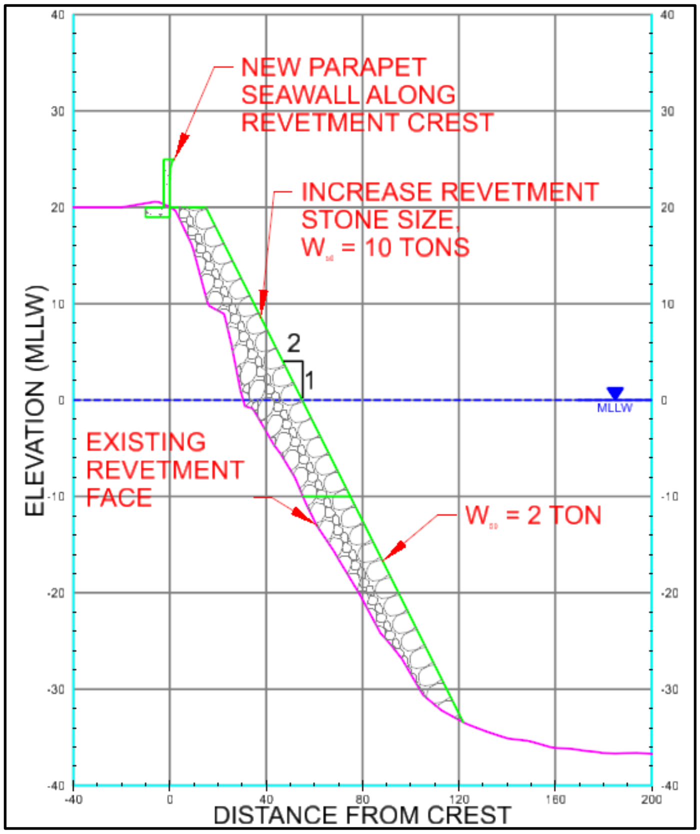


Figure 4-25: Energy Islands Cross-Section

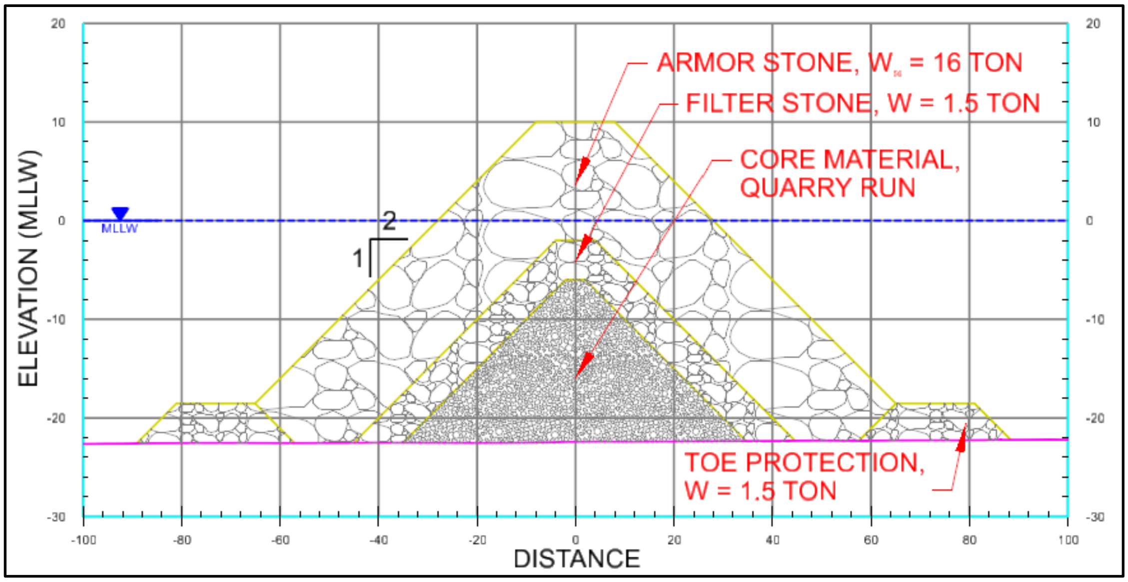


Figure 4-26: Belmont Pier Protection Cross Section

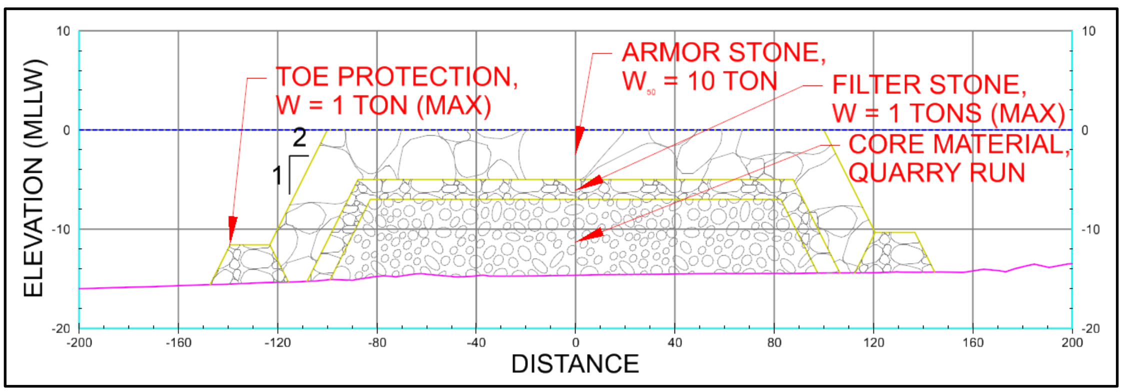


Figure 4-27: Submerged Eastern Breakwater Cross Section

Table 4-18: Breakwater Plan 1 Quantity of Materials

Breakwater Plan 1 Quantity of Materials				
Measure	**Material Type**	**Approximate Quantity**	**Unit**	**Representative Size**
Nearshore Reefs	Armor Stone	202,000	tons	12 tons
	Filter Stone	55,000	tons	~ 1 ton
	Core Stone	229,000	tons	~ 10 - 1000 lbs
Kelp Reefs	COre Stone	132,000	tons	500 lbs
Eelgrass	Sand	600,000	yd^3	0.2 mm
Breakwater Stone Reused	Armor Stone	88,000*	tons	12 tons
	Filter Stone	95,000*	tons	2 tons
Protective Measures	Armor Stone	315,000	tons	12 tons
	Filter Stone	270,000	tons	~ 1 ton
	Concrete	4,000	yd^3	N/A

* Value indicates reuse of material and reduces the total required quantity.

Table 4-19: Alternative BW1 – Costs and Outputs Summary

(2018 price levels with 2.75% Federal discount rate)

Item	ALT BW1 (notching)
First (Construction) Cost	$993,650,000
OMRR&R	$1,691,780
Average Annual Cost	$39,289,100
AAHUs	133.5
AAC/AAHU	$294,300
Restored Acres	171
First Cost/Restored Acre	$5,810,819

Figure 4-28: Alternative BW1

4.5.6 ALTERNATIVE BW2 - Breakwater Eastern Removal Plan + Best Buy Plan 2 (Modified)

As with Alternative BW1, the Breakwater Eastern Removal Plan (Alternative BW2) (Figure 4-30) includes all of the ecosystem restoration measures specified for the modified Alternative 2 with a few key differences. The primary difference is Alternative BW2 does not have a shoal west of Belmont Pier, and it requires less extensive protective measures than Alternative BW1.

Breakwater Modification Measure: Under this Breakwater Plan, approximately 1/3 (approximately 24-acres) of the existing Long Beach Breakwater would be removed. Stones removed from the breakwater would be reused to build protective structures around the Oil Islands and Belmont Pier only.

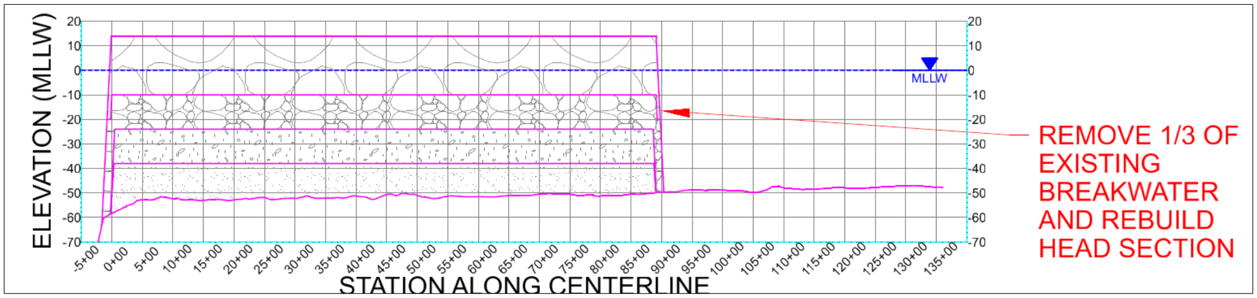


Figure 4-29: Breakwater Modification Eastern Removal Cross-Section

Protective Measures: Under this alternative, protective measures would be needed to reduce impacts to existing infrastructure and shoreline development from increased wave energy and coastal flooding. These would require increasing the amount of protection (armoring) of the existing oil islands and the creation of a small emergent breakwater to protect Belmont Pier. Additionally, the nearshore reefs would need to be constructed to a higher elevation to achieve a similar level of protection as the existing Long Beach Breakwater to the shorefront structures and limit excessive shoreline erosion along East Beach. Protective measures described above mitigate infrastructure damage impacts but not navigation operations impacts. The cost of such additional mitigation features, as well as any National Economic Development costs associated with increased transportation costs which may result from navigation impacts, are not included in the cost estimate for this alternative.

Table 4-20: Breakwater Plan 2 Quantity of Materials

Breakwater Plan 2 Quantity of Materials				
Measure	**Material Type**	**Approximate Quantity**	**Unit**	**Representative Size**
Nearshore Reefs	Armor Stone	379,000	tons	12 tons
	Filter Stone	55,000	tons	~ 1 ton
	Core Stone	357,000	tons	~ 10 - 1000 lbs
Kelp Reefs	Core Stone	132,000	tons	500 lbs
Eelgrass	Sand	600,000	yd^3	0.2 mm
Breakwater Stone Reused	Armor Stone	285,000*	tons	12 tons
	Filter Stone	620,000*	tons	2 tons
	Core Stone	383,000*	Tons	~ 100 – 1000 lbs
Protective Measures	Armor Stone	267,000	tons	12 tons
	Filter Stone	314,000	tons	~ 1 ton
	Concrete	4,000	yd^3	N/A

* Value indicates reuse of material and reduces the total required quantity.

Table 4-21: Alternative BW2 – Costs and Outputs Summary

(2018 price levels with 2.75% Federal discount rate)

Item	ALT BW2 (remove 1/3)
First (Construction) Cost	$670,240,000
OMRR&R	$1,148,430
Average Annual Cost	$26,956,600
AAHUs	133.5
AAC/AAHU	$201,922
Restored Acres	171
First Cost/Restored Acre	$3,919,532

Figure 4-30: Alternative BW2

4.5.7 Breakwater Plans Analysis Summary

All plans were evaluated in order to identify the Final Array of Alternatives, see Section 4.5.9 Identification of the Final Array of Alternatives. Because of the strong local interest in the inclusion of breakwater alternatives, these two Breakwater Plans were included in the Preliminary Array of Alternatives despite only minimally responding to planning objectives, based on a specific request by the non-Federal sponsor. On June 27, 2018, the non-Federal sponsor provided the USACE Los Angeles District a letter to include two breakwater plans in the final array of alternatives. In this letter, the NFS stated its beliefs that breakwater plans address three objectives: (1) improvements to ecosystem health, (2) improvements to water quality through increased flushing of ESPB, and (3) improvements to the recreational value of the City's beaches.

This section focuses specifically on the viability of breakwater modifications given the high costs and impacts, within the context of the Study's planning objective and constraints including:

- **Constraint 1:** Avoid negative impacts to U.S. Navy's operations including activities in support of national security and other missions.
- **Constraint 2:** Do not significantly reduce operational capacity for the ports, THUMS oil extraction islands or other existing maritime operations.

Only the breakwater modifications themselves are examined in this section including the two western notches and one-third eastern removal. Restoration features and outputs are nearly identical to Alternative 2. In Section 4.5.2, details on plan costs and outputs, as well as descriptions of habitat design, construction and post-construction assumptions can be found. The USACE Los Angeles District carefully addressed these incidental benefits separately from ecosystem restoration benefits throughout the plan formulation process.

4.5.7.1 Shoreline Impacts

Modifications to the breakwater would allow for more wave energy within the bay. This increase of energy would cause more sediments to be available for transport. Finer sediments would be mobilized and transported by the underlying tidal currents leaving more course materials than are currently not present in the top layers of sediment. Changes to the shoreline configuration is expected. Lowering of the eastern end of the breakwater would widen the zone of erosion to a more western position. Notching the western side would cause localized pockets of erosion from the Shoreline Marina to Belmont Pier. See Coastal Appendix A for more information.

4.5.7.2 Navigation Operations Impacts

Ports Working Group provided early feedback to preliminary working versions of measures and alternatives. Working group participants commented on potential impacts to operations from construction of rocky reef, kelp beds in response to the initial analysis of the breakwater modifications. They provided both verbal and written comments addressed to the City. Potential impacts to navigation operations were assumed for this Study including impacts from large wave events. It is understood that even an increase of 12" in wave height disrupts operations and increases safety risks.

At the ports, higher waves at the Pier J South terminal would result in increased time to unload vessels at berth, potential breakage to mooring lines and safety risks would also increase. Excessive wave conditions create unsafe berthing conditions for Carnival Cruise Lines. Energy islands would experience the most impacts from either breakwater plan scenario, impacting safe transfer of crew and materials. Port pilots and tug operators guide large vessels into the port complex. They have expressed concerns over increased excessive ship motions that result in safety issues and underkeel clearance risks.

In addition, the City requested online feedback from the public on potential impacts the preliminary alternatives would have on their navigation operations, based on available waves analysis. The respondents were a mix of navigation stakeholders, including port operations, an international transportation service company, ship pilots, and the general public. Of the responses, a majority responded negatively to any modification of the breakwater. The feedback for the breakwater plans included the following concerns:

- Increased Transportation Costs – Need to change itineraries, need to wait for safe transit conditions, including during potential shut down of operations for portions of the Port. Demurrage charges to shippers for delays.
- Potential need to relocate Carnival Cruise Lines operations.
- Potential damage to vessels, e.g., vessels breaking from moorings.
- Potential damages to berths, cranes, marinas, oil islands, coastal flooding.
- Inability to bunker and service vessels, including crew changes, supply deliveries, etc. Potential releases of petroleum during bunkering due to unsafe wave conditions.
- Safety – potential line breaks, wave action impacts to crane operators and dock workers resulting in potential injury or death.
- Regional Economic Development impacts – Loss in revenues, jobs, negatively impacting the Port and Long Beach city economy.

In addition to the survey responses above, more specific feedback was received on potential impacts on Navy and the THUMS Energy Island operations.

4.5.7.3 Impacts to Navy Operations

The U.S. Navy operates explosives anchorage used for transfer of ammunition inside the breakwater – these operations are required for Navy contingency operations in support of the National Defense Strategy. Because of its purpose as a strategic contingency asset, the anchorage must be available for use on short notice at any given time. The breakwater provides a protected bay environment consistent with the operating criteria to facilitate safe and efficient ordnance and fuel transfer operations. Feedback from the Navy indicates:

- Any modifications to the breakwater resulting in an increase to wave energy will impact the Navy's ability to safely perform ordnance and fuel transfer operations.
- Any modifications to the breakwater would result in an increase in dynamic vessel motion, a decrease in safety for Navy personnel conducting the operations and would hinder the ability to perform ordnance and fuel transfer operations year-round.
- Proposed modifications to the breakwater exhibit a high probability of impacting the National Defense Strategy.
- Relocation of Navy operations to alternative sites would be cost prohibitive and unlikely to be supported due to public opposition.

Impacts to the U.S. Navy's D-7 and D-8 anchorages are best visualized by the wave impacts graphics shown in Figure 4-31 and Figure 4-32. From breakwater notches to the west, the edge of anchorage D-7 would experience an additional 100 days a year of >12" wave heights. Ships can be anchored but close to the edge of the anchorage circle. Anchorage D-8 would experience severe impacts from western notches, where ships would encounter approximately 300 additional days per year of waves >12" high. For the eastern removal, anchorage D-8 receives no protection from the breakwater and is subject to open ocean wave energy. For more details of the wave analysis and impacts, see Appendix A: Coastal Engineering.

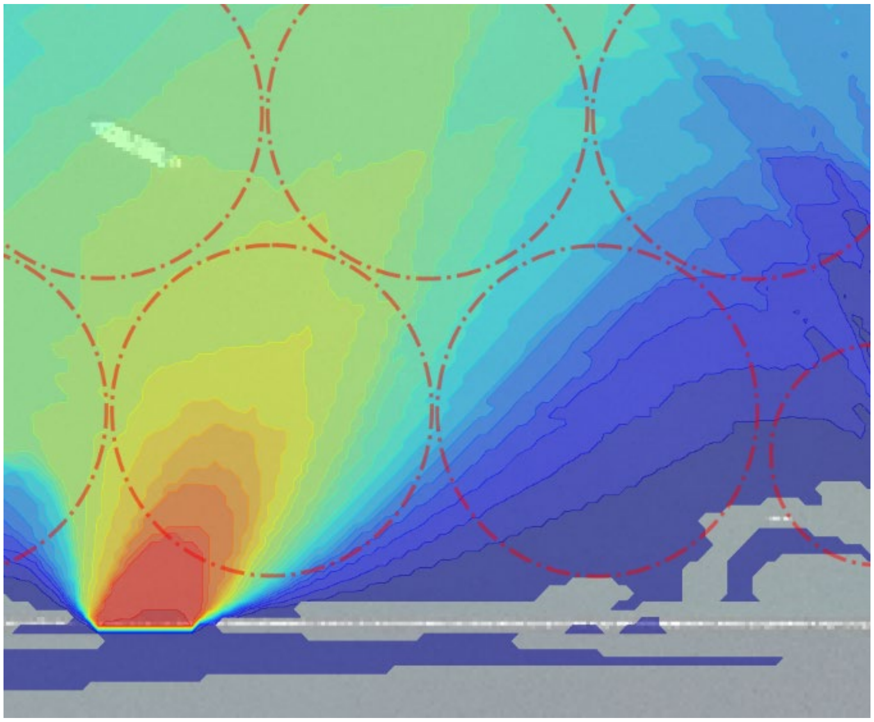


Figure 4-31: Approximate Number of Increased Days with Wave Heights >1 feet From Western Notching

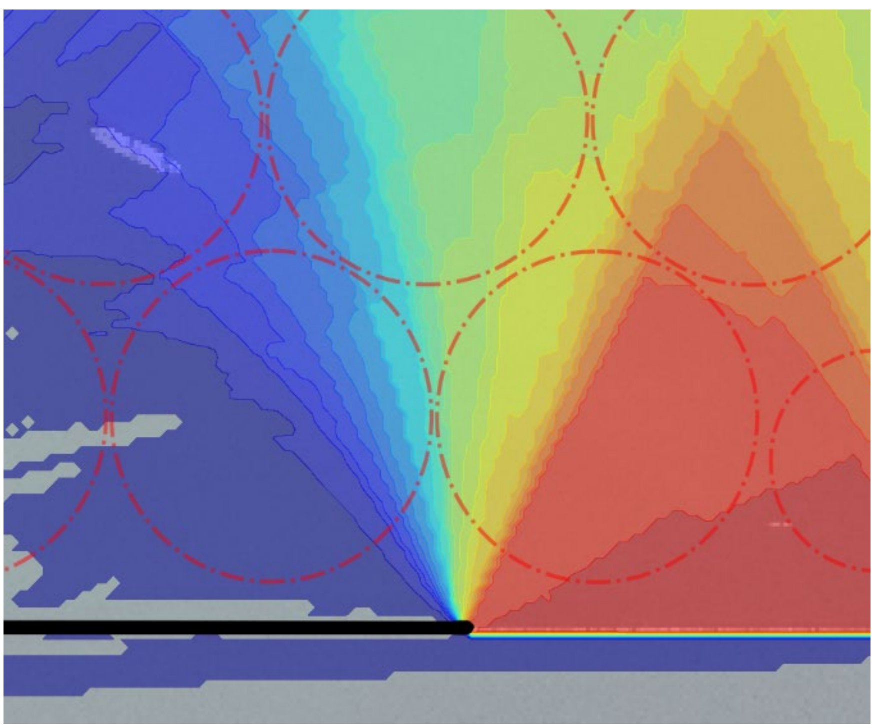


Figure 4-32: Approximate Number of Increased Days with Wave Heights >1 feet From Eastern Removal

Table 4-22: Breakwater Modification Impacts to Maritime Operations

BW Mod.	Location of Increased Down Time	Approx. # Events/Year	Increased Wave Heights Near Navy Mooring	Approx. # Increased Days
Western Notching	Pier J	18	Exceed 1 foot	135
	Carnival Cruise Terminal	34	Exceed 2 feet	5
	Island Freeman	28		
	Island Chaffee	46		
Eastern Removal	Pier J	11	Exceed 1 foot	131
	Carnival Cruise Terminal	5	Exceed 2 feet	7
	Island Freeman	25		
	Island Chaffee	253		

4.5.7.4 Impacts to THUMS Energy Island Operations

Feedback on the THUMS Energy Island operations indicates that their operation costs could increase between $12 million to $48 million per year with implementation of the breakwater modification alternatives. In addition, all crew boats, barges, and tugs would have an increased safety risk due to larger swells resulting from any removal of the breakwater. This increased risk to personnel, equipment, and the environment may require the acquisition of new vessels to mitigate this impact. New vessel costs are not included in the cost estimate.

4.5.7.5 Environmental Assessment

Removing portions of the breakwater would result in permanent loss of existing rocky reef and kelp habitat. However, the loss of breakwater habitat would be regained through relocation and reuse of breakwater rock to construct rocky reef or kelp beds. Required protective measures would result in similar temporary habitat losses on the oil islands for both plans, with additional rocky reef and kelp habitat loss at Pier J and the Shoreline Marina and nearby detached breakwater as well.

4.5.7.6 Incidental Recreation Assessment

A qualitative assessment of incidental recreation impacts from both restoration and breakwater measures were provided by the City for the following activities: beach/boardwalk visitation, near beach water activities (swimming, wading, etc.), paddle boarding (prefer calm water), surfing, and various types of boating. Breakwater modifications had a positive benefit for near beach swimming and wading as well as for surfing but had equally strong negative impacts to paddle boarding and boating activities. Kelp beds had a negative impact on boating as did nearshore rocky reef shoals and the emergent sandy island. Nearshore shoals and the sandy island had negative impacts on surfing and slight negative impacts to swimming. The sandy island and open water rocky reef had slightly positive benefits for beach, paddle boarding and some boating. For a full discussion, see Appendix C: Economic and Social Considerations, Addendum A: Incidental Recreation Impacts.

4.5.8 Evaluation of Preliminary Array of Alternative Plans

Decision criteria are applied to the Preliminary Array of Alternatives in order to determine the Final Array of Alternatives. The criteria used to evaluate and compare alternative plans to determine the Final Array of Alternatives come from the P&G and include:

- Completeness – Does the alternative plan account for all necessary investments/actions to realize the planning objectives?

- Effectiveness – Does the alternative plan contribute to achieving the planning objectives?
- Efficiency – Is the alternative plan cost effective and efficient (benefits exceed costs)?
- Acceptability – Is the alternative plan feasible from technical, environmental, economic, financial, political, legal, institutional, and social perspectives? Does the alternative plan satisfy government entities and the public?

Comparison table below summarizes key evaluation criteria and relative Low-Medium-High color-ramped weighting. This shows the degree to which each alternative meets the criteria, relative to the other plans. The darkest color represents strongest overall performance of that plan for that criterion and palest color indicated weakest performance of that plan, with respect to that criterion. For this analysis, only action Alternatives 2, 4A, 8, BW1 and BW2 are included. Alternative 1, No Action Alternative is not included in this analysis.

Table 4-23: Preliminary Array of Alternatives Comparison

COMPARISON CRITERIA	ALT 2	ALT 4A	ALT 8	BW1	BW2
COMPLETENESS – Ensures planning objectives can be realized					
EFFECTIVENESS – Planning Objective and Sub-Objectives					
EFFICIENCY – Are benefits worth the cost, given output?					
ACCEPTABILITY – Feasible from legal/policy, and satisfactory?					

4.5.8.1 Completeness

Completeness refers to the extent to which the plan provides and accounts for all necessary investments or other actions to ensure realization of planning objectives, including actions by other entities. All five action alternatives were shown to be complete.

4.5.8.2 Effectiveness

All plans considered for implementation are required by USACE policy to be compared for how well they address the national objectives. This project addresses the national objectives of NER. For NER, outputs were determined based on the output of HEM using the BEM, which provides AAHUs as shown in Table 4-24. Alternative 4A AAHUs and acreage are 20% higher than Alternative 2. AAHUs and restored acres for Alternative 8 are nearly double those of Alternative 4A. The breakwater plans have slightly higher AAHUs than Alternative 2, because there is an additional nearshore shoal. The additional 9 acres also accounts for the additional shoal.

Table 4-24: Outputs and Zones

Item	ALT 2	ALT 4A	ALT 8	ALT BW1	ALT BW2
AAHUs	125.4	160.9	307.3	133.5	133.5
Zones with Restoration	3	3+	5	3	3
Restored Acres	162	201	372	171	171

Additionally, effectiveness of a plan depends on how strongly it meets the planning objective to "Restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands and other types historically present in San Pedro Bay or sufficient quality and quantity to support diverse resident and migratory species within ESPB."

All plans meet the planning objective, but plans differ in how strongly objectives are met. Alternative 2 meets all objectives with restoration of approximately 162 acres of kelp, nearshore zone rocky reef and eelgrass, increasing total area, diversity and connectivity of habitat within the bay. Alternative 4A meets the objectives better than Alternative 2 with the introduction of high value open water rocky reef habitat, boosting diversity and spatial heterogeneity as well as connectivity. Alternative 8 most strongly meets the objectives with addition of complex habitat types of coastal wetlands, a sandy island and oyster beds.

Both breakwater plans contain the same restoration elements as Alternative 2, so they effectively meet the planning objectives to the same degree as Alternative 2, with the exception of an additional rocky reef/eelgrass shoal. They also contain an additional rocky reef/eelgrass shoal as a shoreline protective measure, which accounts for the slightly higher AAHU and 171 acres of restored habitat. With zero AAHU or habitat value, breakwater modification measures on their own fail to support the planning objective so does not add acres restored.

4.5.8.3 Efficiency

The three restoration plans, Alternatives 2, 4A, and 8, are considered efficient in that they provide habitat benefits for a range of reasonable costs. The two breakwater plans are considered inefficient in terms of costs per acre of restoration. For example, the western notching alternative BW1 had an average annual cost/average annual habitat unit value of over 10 times Alternative 2. See Table 4-25 for a comparison of costs and benefits between the alternatives. All costs are presented in 2018 price levels with a Federal discount rate of 2.75 percent. Efficiency is best characterized as AAC/AAHU. AAC/AAHU efficiency values range from $26,000 - $87,000 for the three restoration plans. Breakwater Plan BW1 is approximately 10 times the AAC/AAHU than Alternatives 2 and 4A at $294,000. Breakwater Plan BW2 efficiency is also much lower than Alternatives 2, 4A and 8 with an AAC/AAHU of $202,000. First costs per restored acre for the breakwater plans are roughly 10 times greater than the two smaller restoration plans. The dollar figures are rounded to the nearest $1,000 from what is presented in Appendix B: Cost Engineering and Appendix C: Economics.

Table 4-25: Efficiency (AAC/AAHU)

Item	ALT 2	ALT 4A	ALT 8	ALT BW1	ALT BW2
First (Construction) Cost	$79,982,000	$136,477,000	$554,165,000	$993,650,000	$670,240,000
OMRR&R	$207,000	$251,000	$5,853,000	$1,692,000	$1,148,000
Average Annual Cost	$3,212,000	$5,354,000	$26,727,000	$39,289,000	$26,957,000
AAHUs	125.4	160.9	307.3	133.5	133.5
AAC/AAHU	$26,000	$33,000	$87,000	$294,000	$202,000
Restored Acres	162	201	372	171	171
First Cost/Restored Acre	$493,000	$680,000	$1,490,000	$5,811,000	$3,920,000

4.5.8.4 Acceptability

From a technical, environmental, economic, financial, political, legal, institutional, and social perspective, the three restoration plans, Alternatives 2, 4A, and 8 are acceptable. The two breakwater plans violate two planning constraints by impacting maritime operations and the Navy, which means they are unacceptable. From a stakeholder satisfaction perspective, most, but not all, of the proposed measures are supported by a wide range of government entities, stakeholders and the public. The coastal wetlands from the Scarce Habitat Plan causes some concern due to its location at Pier J, potentially disrupting vessel movement and other uses.

Modifying the breakwater causes increased wave energy, impacting the U.S. Navy and other maritime interests, violating Study constraints. Recreational impacts have also been identified and considered also as a result of increased waves. To better understand these maritime impacts which are summarized below, abbreviated coastal modeling results are also shown below and in Appendix A.

4.6 IDENTIFICATION OF THE FINAL ARRAY OF ALTERNATIVES

After careful consideration of all five action plans, both breakwater plans were screened out primarily due to impacts to the U.S. Navy's national security and other maritime operations in violation of Study constraints:

- **Constraint 1:** Avoid negative impacts to U.S. Navy's operations including activities in support of national security and other missions.
- **Constraint 2:** Do not significantly reduce operational capacity for the ports, THUMS oil extraction islands or other existing maritime operations.

Additionally, although both plans are effective in that they address planning objectives, they both carry high construction costs with relatively low habitat output, and therefore do not meet criterion of efficiency. Along with the No Action Alternative, Alternatives 2, 4A, and 8 are included in the Final Array of Alternatives for further environmental impacts analysis. All three restoration plans are complete, and effective, and are cost-efficient given outputs and are acceptable to the broadest range of stakeholder interests.

Table 4-26: Identification of Final Array

Alternative	Comply w/Constraints	4 Evaluation Criteria – Strong Performance	Carry into Final Array of Alternatives
Alternative 1	Yes	(not evaluated)	YES
Alternative 2	Yes	(4) Mod. Strong-Strong	YES
Alternative 4A	Yes	(4) Mod. Strong-Strong	YES
Alternative 8	Yes	(4) Mod. Strong-Strong	YES
Alternative BW1	No – violates	(1) Mod. Strong-Strong	NO
Alternative BW2	No – violates	(1) Mod. Strong-Strong	NO

The Final Array of Alternatives have been identified as three action alternatives, Alternatives 2, 4A and 8, and the no action alternative.

Final Array of Alternatives

Alternative 1 (No Action Plan)

Alternative 2 (Best Buy Plan 2) – "Kelp Restoration Plan"

Alternative 4A (Cost Effective Variation of Best Buy Plan 4) – "Reef Restoration Plan"

Alternative 8 (Best Buy Plan 8) – "Scarce Habitat Restoration Plan"

These must be evaluated to determine the NER Plan. All four alternatives will be analyzed in detail for environmental impacts in Chapter 5. The three action alternatives put forward for detailed evaluation include various measures with differing scales of restoration. These alternatives represent the spectrum of reasonable alternatives that substantially respond to the restoration purpose and need statement. Agencies are obligated to evaluate a reasonable range of alternatives in enough detail so that a reader can compare and contrast the environmental effects of the various alternatives. In Chapter 6, the Final Array of Alternatives are compared and assessed against various criteria to determine the NER Plan.

5 ENVIRONMENTAL IMPACTS EVALUATION OF THE FINAL ARRAY OF ALTERNATIVES

The impact analysis sections of this chapter evaluate the environmental impacts of the No Action Alternative and the action alternatives. For each resource, the environmental effects of implementing each action alternative are compared to the No Action Alternative. Both beneficial and adverse effects are considered, including direct and indirect construction impacts and direct and indirect OMRR&R impacts. Monitoring, as well as adaptive management, if needed, would occur during the OMRR&R phase and is discussed under OMRR&R.

The basis of significance for each resource is used to evaluate the significance of any adverse effects. Mitigation Measures are proposed to avoid or reduce any significant adverse effects for each resource.

The level of significance of an impact is identified and described based on criteria established by the Los Angeles District, which were established based on NEPA regulations and USACE policy. CEQA criteria were also used to the extent that they were consistent with NEPA regulations and USACE policy. The impacts on each resource may be significant, less than significant with mitigation, or less than significant. Impacts that are significant and that cannot be reduced to a level below significance with mitigation are considered to be unavoidable.

- Significant impacts are those that would cause a substantial or potentially substantial change to the resource. Mitigation measures would be implemented where appropriate and feasible to avoid or reduce significant adverse impacts to less than significant.
- Less than significant impacts are those that would result in no substantial or potentially substantial change to the resource and would not require mitigation.
- Less than significant impacts with mitigation are those that would result in no substantial or potentially substantial change to the resource after mitigation.
- Significant and unavoidable impacts are those that would result in a substantial or potentially substantial impact on the resource and could not be reduced to a level of less than significant even with implementation of any appropriate feasible mitigation.

Significance criteria are established based on a combination of NEPA and CEQA guidelines, which are very similar. Significance criteria listed are generally for evaluation of impacts under both NEPA and CEQA except where identified as for NEPA or CEQA only.

The evaluation of impacts is based upon a comparison of conditions with and without the implementation of an alternative plan. The FWOP condition describes the condition that is expected to prevail in the future if the No Action Alternative is selected and is described for each resource. The future with project condition describes the condition that is expected to prevail in the future if a particular alternative is implemented.

Environmental Commitments are project design features that have been incorporated into the project description of each alternative and are not separately applied as mitigation measures. Where mitigation measures are identified for an alternative in a specific resource area, they are identified as such.

The following alternatives are analyzed in detail (additional information for each alternative can be found in Chapter 4):

- No Action (Future Without Project)
- Alternative 2: Features include 24 kelp beds (121.4 acres (~121 acres)), five nearshore zone subtidal rocky reefs (15.9 acres (~16 acres)), and five eelgrass beds (25.0 acres (~25 acres))

(162.3 total acres (~162 acres)). Sand for eelgrass beds (approximately 100,000 cubic yards) would be dredged from the Surfside/Sunset Borrow site; in the event other appropriate sources become available in the future, supplemental analysis would be undertaken as needed. For rocky and kelp reefs, quarry stone would be sourced from the Catalina Quarry (delivered via barge) or from a secondary quarry site, 3M Quarry, located in Corona, California (delivered via haul truck). The staging area for construction activities would be located within the Port of Long Beach at Pier T and would consist of 2.4 acres with approximately 600 feet of water access. Construction would take approximately 90 months and would not occur continuously over this time period due to the staggering of contracts and construction phasing for the various project features, pausing for the 2028 Olympic Games and associated events occurring prior to and during the games planned in Long Beach (as committed to the City of Long Beach), and stoppage periods including winter months, etc. Vessels associated with construction-related activities will be moored at the staging area and/or at established anchorages within the proposed Project Area (e.g., C, E, etc.).

- Alternative 4A (the Recommended Plan): Features include 24 kelp beds (121.4 acres (~121 acres)), six nearshore zone subtidal rocky reefs (19.9 acres (~20 acres)), six eelgrass beds (30.3 acres (~30 acres)), and two open water rocky reefs (29.2 acres (~29 acres)) (200.7 total acres (~201 acres)). Dredging for eelgrass beds would be the same as Alternative 2. Stone would be sourced from the Catalina Quarry (delivered via barge) or from a secondary quarry site, 3M Quarry, located in Corona, California (delivered via haul truck). The staging area would be the same as described under Alternative 2. Construction would take approximately 96 months and would not occur continuously over this time period due to the staggering of contracts and construction phasing for the various project features, pausing for the 2028 Olympic Games and associated events occurring prior to and during the games planned in Long Beach (as committed to the City of Long Beach), and stoppage periods including winter months, etc. Vessels associated with construction-related activities will be moored at the staging area and/or at established anchorages within the proposed Project Area (e.g., C, E, etc.).
- Alternative 8: Features include 24 kelp beds (121.4 acres (~121 acres)), six nearshore zone subtidal rocky reefs (19.9 acres (~20 acres)), seven eelgrass beds (52.3 acres (~52 acres)), seven open water rocky reefs (102.2 acres (~102 acres)), two coastal wetlands-tidal salt marshes (52.1 acres (~52 acres)), one sandy island (23.8 acres (~24 acres)), and two oyster beds (0.3 acre) (371.9 total acres (~372acres)). Dredging for eelgrass beds would be the same as Alternative 2. Dredging would also be needed for sand substrate for the sandy island and wetlands. Stones would be sourced from the Catalina Quarry (delivered via barge) or from a secondary quarry site, 3M Quarry, located in Corona, California (delivered via haul truck). For the oyster beds, shell hash would be used to create oyster beds. The Pier T staging area would be the same location as described under Alternative 2 but increased in area to a total of 4.3 acres. Construction would take approximately 113 months and would not occur continuously over this time period due to the staggering of contracts and construction phasing for the various project features, pausing for the 2028 Olympic Games and associated events occurring prior to and during the games planned in Long Beach (as committed to the City of Long Beach), and stoppage periods including winter months, etc. Vessels associated with construction-related activities will be moored at the staging area and/or at established anchorages within the proposed Project Area (e.g., C, E, etc.).

The No Action Alternative is mandated by NEPA and other laws and regulations. For purposes of this analysis, the No Action Alternative for NEPA and the No Project Alternative for CEQA are considered to be the same, although there could be differences between CEQA and NEPA baselines depending on timing of implementation. However, should the two baselines differ, significant changes within the ESPB environment are not expected to occur and all analyses provided within this chapter are expected to similarly describe impacts as a result of the three alternatives. Under NEPA and CEQA, the terms "effects" and "impacts" may be used synonymously (40 CFR § 1508.8; CEQA Guidelines Section 15358). A summary of potential effects by alternative is shown in Table 5-1. All impacts identified in the table apply to both CEQA and NEPA unless otherwise stated.

Comparison of plan alternatives is an essential step in the evaluation of the alternatives and identification of the RP, which is Alternative 4A. Based on updated and refined construction schedule for the Recommended Plan within the Final IFR, cost estimates and air quality analyses have been updated to reflect changes in construction schedule and can be found in their respective sections within the IFR and appendices. Additionally, the change in construction schedule, approximately 60 months, has been added to each alternative and is reflected in updated construction times for consistency.

Climate Change

Climate change is a significant, global threat to marine ecosystems (Doney *et al.*2012). Increased concentrations of greenhouse gasses (GHG) including CO_2, methane, and nitrous oxide are projected to increase the mean surface temperature via radiant heat trapping physical properties by 1.8 to 4.0 degrees Celsius over the next century (Solomon *et al.*2007). The increase in global temperatures is predicted to exacerbate sea level rise (via melting sea ice), storm intensity, and overall ocean temperatures. In addition, increasing levels of atmospheric CO_2 and corresponding uptake as oceanic dissolved CO_2 have been shown to be dominant factors in ocean acidification (Dore *et al.*2009). Climate change factors have been addressed in the following sections: Hydrology (Section 5.1); Air Quality (Section 5.4); Biological Resources: Marine Habitats (Section 5.6); Biological Resources: Special-Status Species (Section 5.7); Biological Resources: Essential Fish Habitat (Section 5.9); and Biological Resources: Invasive Species (Section 5.10).

Table 5-1: Comparison of Potential Impacts

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
5.1 - Hydrology (Coastal and Shoreline Resources)	No habitat restoration construction or maintenance activities or impacts would occur.	***Construction Impacts:*** Short-term, less than significant direct impacts from suspended sediments, and long-term direct and indirect beneficial impacts related to localized reduced coastal and shoreline wave heights, reduced current velocities, and reduced erosion potential. Impacts to coastal and shoreline hydrology would be **less than significant**. ***OMRR&R Impacts:*** Short-term and less impactful than construction impacts, and **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A for eelgrass, rocky reefs, and kelp reefs. Creation of the sandy island and wetlands would result in long-term direct and indirect beneficial impacts related to shoreline stabilization and storm water protection impacts to coastal and shoreline hydrology would be **less than significant**. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.2 Marine Geology and Geologic Hazards	Dredging and beach replenishment activities within the harbor would continue, with possible modifications due to anticipated sea level rise. Existing seismic faults and potential for ground movement would be expected to remain the same. No habitat restoration construction or maintenance activities or impacts would occur.	***Construction Impacts:*** Habitat features would not result in significant changes to the marine geology or create geologic hazards. Use of the proposed staging would not result in changes to geology or create geologic hazards. Impacts to marine geology and geologic hazards would be **less than significant**. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Comparable to Alternatives 2 and 4A for eelgrass, rocky reefs, and kelp reefs. The sandy island and wetlands would change the topography of the site but the relatively small area (0.66 percent of the project area) would not affect the overall marine geology. Impacts to marine geology and geologic hazards would be **less than significant**. ***OMRR&R Impacts:*** None.
5.3 Water Quality	No habitat restoration would occur under the No Action Alternative. There would be no construction or maintenance related impacts under this alternative. Benefits to water quality would not occur.	***Construction Impacts:*** Short-term localized, less than significant direct impacts during construction from suspended sediments. Minor spills or leaks of hydrocarbons from construction equipment anticipated; however, no long-term degradation or permanent new source of pollution. Long-term direct and indirect localized beneficial impacts expected in relation to the production of oxygen, improved water quality, absorbed nutrients, and storing of GHGs by eelgrass and kelp forests. Impacts to water quality would be **less than significant**. ***OMRR&R Impacts:*** Short-term, localized, and less than construction impacts, and **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A for eelgrass, rocky reefs, and kelp reefs. Sandy island and wetlands would result in localized beneficial impacts related to improved water quality by filtration of polluted runoff, absorption of excess nutrients, storage of greenhouse gases like carbon dioxide, and protection of the shoreline from erosion. Impacts to water quality would be **less than significant**. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.4 Air Quality and Greenhouse Gases	Under the No Action Alternative, air quality is anticipated to improve as additional controls are implemented. No habitat restoration construction or maintenance activities or impacts would occur.	***Construction Impacts:*** Would be below General Conformity Applicability Rates (NEPA) and SCAQMD Daily Emission Thresholds (CEQA). Emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. For GHGs, would not create significant emissions or conflict with applicable plans, policies or regulations. Impacts would be **less**	***Construction Impacts:*** Construction time would be longer than Alternative 2 with potential for increased emissions due to construction of additional	***Construction Impacts:*** Construction time would be longer than Alternatives 2 and 4A with potential for greater emissions than both alternatives due to construction of additional nearshore reef, seven open water rocky reefs, oyster reefs, and sandy island. Would be above General Conformity Applicability Rates for NO_x

Table 5-1: Comparison of Potential Impacts

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
		than significant for NEPA and CEQA. GHG impacts would be **less than significant for CEQA**. ***OMRR&R Impacts:*** Would conform to the applicable SIP and no further analysis would be required.	nearshore reef and two open water rocky reefs. Would be below General Conformity Applicability Rates (NEPA) and SCAQMD Daily Emission Thresholds (CEQA). Emissions would not substantially elevate pollutant concentrations at any sensitive receptors, nor would they create objectionable odors affecting a substantial number of people. For GHGs, would not create significant emissions or conflict with applicable plans, policies or regulations. Impacts would be comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	(NEPA). No additional mitigation to reduce impacts below significance was identified. **Impacts under NEPA would be significant and unavoidable.** Below SCAQMD Daily Emission Thresholds and impacts would be comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.5 Noise and Vibration	As port and harbor use would remain similar to existing use, no significant change in the noise environment is anticipated under the No Action Alternative. No habitat restoration construction or maintenance activities or associated noise impacts would occur with the No Action Alternative.	***Construction Impacts:*** Would be in compliance with local noise ordinances, would not generate excessive ground borne vibration in exceedance of recommended thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife, and therefore, would not result in significant impacts. Dredging activities would not result in significant adverse impacts. Noise levels may cause marine mammals to avoid the area within 1,900 feet of dredging operations but would not likely have the potential to injure a marine mammal. Noise and vibration impacts would be **less than significant**. ***OMRR&R Impacts:*** Would not result in significant adverse impacts.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A
5.6 Biological Resources: Marine Habitats	No substantial change in the type or extent of marine habitats would be expected under the No Action Alternative. No habitat restoration construction or maintenance activities, or associated impacts or benefits would occur under the No Action Alternative.	***Construction Impacts:*** ○ Direct loss of 162 acres of soft bottom habitat. Offset by creation of equivalent acreage of high-value habitats. Adverse impacts to adjacent soft bottom habitat would be short-term and **less than significant**. Beneficial impacts would be long-term and **less than significant**. ○ There would be no adverse impacts to coastal salt marsh. ○ Impacts to eelgrass donor beds would be short-term and **less than significant**. ○ Long-term beneficial impacts to eelgrass by creation of 25 acres of new habitat. Short-term and **less than significant** impacts due to turbidity from construction activities. Adverse impacts to existing eelgrass habitat would be avoidable, pending updated eelgrass surveys that would be conducted during the design phase. ○ Long-term beneficial impacts to kelp reefs by creation of 121 acres of new habitat. Impacts to existing kelp reefs would be short-term and **less than significant**. ○ Long-term beneficial impacts by the creation of 16 acres of new rocky reef habitat. ○ No impacts to oyster beds. ○ Short-term and **less than significant** impacts from turbidity on water column habitats. ○ No impacts to plankton habitat. ○ No impacts to pelagic fish habitat. ○ No impacts to water-associated birds.	***Construction Impacts:*** Impacts and benefits would be comparable to Alternative 2. Differences are as follows: ○ Increased reduction of soft bottom habitat (201 vs 162 acres). Offset by creation of equivalent acreage of high-value habitats. ○ Increase in acreage of new eelgrass habitat (30 vs 25 acres). ○ Increase in acreage of new rocky reef habitat (49 vs 16 acres). ***OMRR&R Impacts:***	***Construction Impacts:*** Impacts and benefits would be comparable to Alternatives 2 and 4A. Differences are as follows: ○ Increased reduction of soft bottom habitat (372 vs 201 acres). Offset by creation of equivalent acreage of high-value habitats. ○ Increase in acreage of new eelgrass habitat (52 vs 30 acres). ○ Increase in acreage of new rocky reef habitat (122 vs 49 acres). ○ Long-term beneficial impacts by the creation of 0.3 acre of new oyster beds. ○ Direct loss of 24 acres of open water habitat from sandy island creation and 52 acres due to wetlands creation. Sandy island and wetland creation would result **in less than significant** long-term adverse impacts to plankton, pelagic fish and water-associated birds; long-term beneficial impacts to water-associated birds from creation of new sandy island and wetland

Table 5-1: Comparison of Potential Impacts

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
		OMRR&R Impacts: No impacts to eelgrass or kelp reefs. Short-term and **less than significant** impacts from noise and turbidity to plankton, pelagic fishes, and water-associated birds.	Comparable to Alternative 2.	habitats. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.7 Biological Resources: Special-Status Species	No substantial change in the presence or population of special status species would be expected under the No Action Alternative. No habitat restoration construction or maintenance activities, or associated impacts or benefits to special status species would occur under the No Action Alternative.	***Construction Impacts:*** Short-term localized, less than significant adverse impacts to special status species from sediment suspension and turbidity during construction. Indirect impacts from noise and turbidity to Green Sea Turtles, no direct impacts expected. Construction and maintenance activities may affect, but would not likely adversely affect, Green Sea Turtles. No effect to California Least Tern, Western Snowy Plover, or abalone would occur. No direct adverse impacts to special status bird species, other sea turtles, or marine mammals. Long-term beneficial impacts to biological resources would occur from creation of kelp reef habitat, rocky reef habitat, and eelgrass habitat. Impacts would be short-term and **less than significant**. ***OMRR&R Impacts:*** Temporary increases in turbidity and noise during OMRR&R could result in temporary avoidance. Impacts would be short-term and **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.8 Significant Ecological Areas (SEAs)	No substantial change to SEAs would be expected under the No Action Alternative. No habitat restoration construction or maintenance activities, or associated impacts or benefits would occur.	***Construction Impacts:*** The Terminal Island SEA would not be impacted by of the proposed alternatives; therefore, this resource has been eliminated from further analysis. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Same as Alternative 2. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Same as Alternatives 2 and 4A. ***OMRR&R Impacts:*** None
5.9 Biological Resources Essential Fish Habitat	No substantial change in the type or extent of Essential Fish Habitat would be expected under the No Action Alternative. No habitat restoration construction or maintenance activities, or associated impacts or benefits would occur under the No Action alternative.	***Construction Impacts:*** Short-term localized, less than substantial adverse impacts on coastal pelagic, Pacific groundfish, and highly migratory species from sediment suspension and turbidity and a relatively small area of loss of soft bottom habitat (approximately 1.5 percent of the project area). The USACE determined Alternative 2 would not have a substantial, adverse impact to any species on the FMP or to their habitat. The USACE determined Alternative 2 would have an adverse, but not substantial adverse effect, to EFH and would be **less than significant.** ***OMRR&R Impacts:*** Comparable to construction and would be **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2 with an additional loss of soft bottom habitat (approximately 1.8 percent vs 1.5 percent of the project area). ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A with an additional loss of soft bottom habitat (approximately 3.3 percent vs 1.8 percent of the project area). ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.10 Biological Resources: Invasive Species	No change in the potential for invasive species would occur. No potential for introduction of invasive species due to construction or maintenance of restoration features under the No Action Alternative.	***Construction Impacts:*** The proportion of invasive species is not expected to increase as a result of construction activities. Potential impacts of the spread of invasive species would likely be short-term and **less than significant**. ***OMRR&R Impacts:*** Impacts would be short-term and less than significant.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.11 Cultural and Historical Resources	No substantial change to cultural resources would be under the No Action Alternative. No habitat restoration construction or maintenance activities, or associated impacts, would occur under the No Action alternative.	***Construction Impacts:*** Potential for inadvertent discovery of cultural resources exists; however, with implementation of environmental commitments impacts would be **less than significant**. No impacts to cultural resources would occur at the proposed Surfside/Sunset borrow area	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.

Table 5-1: Comparison of Potential Impacts

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
		since it has been used for previous projects within the Study Area. Impacts would be **less than significant**. ***OMRR&R Impacts:*** Impacts of maintenance would be short-term and less than construction impacts discussed above, and **less than significant**.		
5.12 Aesthetics and Visual Resources	Under the No Action Alternative, no substantial change would be expected to the existing aesthetic character and viewshed. No habitat restoration construction or maintenance activities, or associated impacts or benefits would occur under the No Action alternative.	***Construction Impacts:*** Short-term adverse impacts to sensitive viewers would be unavoidable during construction period, however, once construction is complete, Impacts would be **less than significant**. ***OMRR&R Impacts:*** Short-term, localized, and **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2 with slightly greater impact due to extended length of time necessary for construction of additional features (96 vs 90 months). ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A with greater impact due to extended length of time necessary for construction of additional features (113 vs 96 months). ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.13 Ground and Vessel Traffic and Transportation	As port and harbor use would remain similar to existing, no significant change in vessel traffic and transportation is anticipated under the No Action Alternative. No habitat restoration construction or maintenance activities or associated impacts would occur with the No Action alternative.	***Construction Impacts:*** Minimal impacts to local and Port traffic would occur based on the limited number of crew needed and construction activity occurring predominantly on the water. Habitat features would not likely result in an increase in recreational or other travel. Minimal short-term indirect adverse impacts to ground traffic and transportation would occur, and impacts would be **less than significant**. ***OMRR&R Impacts:*** Short-term, localized, and **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2 with slightly greater impact due to extended length of time necessary for construction of additional features (96 vs 90 months). ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A with greater impact due to extended length of time necessary for construction of additional features (113 vs 96 months). ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.14 Land and Harbor Use	Port and harbor use is not expected to significantly change under the No Action Alternative. No habitat restoration construction or maintenance activities or associated impacts would occur with the No Action alternative.	***Construction Impacts:*** Would not conflict with any local or regional plans and would not result in impacts to land use in the project area. During the construction period, short-term, minor adverse impacts to harbor use could occur due to the presence of construction equipment. Public notice of construction would be implemented to minimize impacts. Impacts would be short-term, localized, and minimal, and **less than significant**. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Comparable to Alternative 2 with slightly greater impact due to extended length of time necessary for construction of additional features (96 vs 90 months). ***OMRR&R Impacts:*** None	***Construction Impacts:*** Comparable to Alternatives 2 and 4A for eelgrass, rocky reefs, and kelp reefs with greater impact due to extended length of time necessary for construction of additional features (113 vs 96 months). The sandy island and wetlands features would be located outside shipping lanes but minor increases in time to enter or leave the harbor may occur as vessels navigate around the dredging and construction areas. Public notice of construction would be implemented to minimize impacts. Impacts would be short-term, localized, and minimal, and **less than significant**. ***OMRR&R Impacts:*** None

Table 5-1: Comparison of Potential Impacts

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
5.15 Socioeconomics	The project area and vicinity is expected to continue to experience a trend of positive growth in population, employment, and income. Under the No Action Alternative, no habitat restoration construction or maintenance activities, or associated impacts would occur.	***Construction Impacts:*** Construction activity could be readily accommodated by existing firms and workers and is not expected economic impact would result in physical impacts such as creating demand for new housing or commercial/ industrial buildings. Impacts would be **less than significant.** ***OMRR&R Impacts:*** Less impactful than construction impacts. Impacts would be **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A, ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.16 Recreation	Beach recreational activities would continue to be adversely affected by bacterial water quality issues, as well as trash and debris on beaches and within the Bay. Low wave heights and reduced wave energy would continue to limit certain recreational activities along the beach shoreline, including surfing and swimming. No habitat restoration construction or maintenance activities, or associated impacts or benefits would occur under the No Action alternative.	***Construction Impacts:*** During the construction period, localized adverse impacts to recreation could occur while equipment is operating as recreationists would avoid construction areas and equipment. Once construction is complete, habitat features may result in minor disruption of recreational activities, primarily recreational boating. Beneficial impacts to recreation would result for some activities (e.g., SCUBA diving, paddle boarding) for the restored areas and increased biological diversity. Potential adverse impacts would be localized adverse and long-term beneficial, and **less than significant**. ***OMRR&R Impacts:*** Short-term, localized, and less than construction impacts, and **less than significant**.	***Construction Impacts:*** Comparable to Alternative 2 with potential localized adverse impacts for recreational boating being somewhat greater than Alternative 2 due to the inclusion of 30 acres of open water rocky reefs. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A for eelgrass, rocky reefs, and kelp reefs. Impacts from the modification of a portion of the Pier J fishing area would be a long-term and minor adverse to recreation as other fishing opportunities are found in the project area. Potential adverse impacts would be localized adverse and greater than Alternatives 2 and 4A for boating with the inclusion of 102 acres of open water rocky reef and 0.3 acre of oyster reef, and long-term beneficial, and **less than significant**. The potential adverse impacts would be short-term and long-term, localized, and **less than significant** to fishing, and long-term beneficial to other recreational opportunities. ***OMRR&R Impacts:*** Comparable to Alternatives 2 and 4A.
5.17 Utilities &Public Services	Under the No Action Alternative, harbor capacity is expected to increase to accommodate predicted increases in commercial shipping. Under the No Action Alternative, no habitat restoration construction or maintenance activities, or associated impacts would occur.	***Construction Impacts:*** Majority of construction activity would occur on the water and no impacts to utilities on land within the project area would occur. Utilities within the bay would be avoided. Public safety agencies would likely provide short-term oversight for construction activities to minimize any potential safety issues during construction. Small-scale construction within the project area would not cause changes in human population numbers, population or housing growth, or the demand for new public services. No adverse impacts to utilities or public services would occur. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** None	***Construction Impacts:*** Comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** None

Table 5-1: Comparison of Potential Impacts

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
5.18 Public Health and Safety	Under the No Action Alternative, harbor capacity is expected to increase to accommodate predicted increases in commercial shipping. Under the No Action Alternative, no habitat restoration construction or maintenance activities, or associated impacts would occur.	***Construction Impacts:*** During construction, the operation of dredges, barges, tugboats, and other equipment could spill oil, or other hazardous material. All Federal, State, and local regulations regarding the use, transport, and disposal of hazardous materials would be adhered to during construction activities, and impacts would be avoided through adherence to procedures, conditions, and regulations. Adverse impacts would be short-term, localized, and **less than significant**. ***OMRR&R Impacts:*** Less than significant overall.	***Construction Impacts:*** Comparable to Alternative 2. ***OMRR&R Impacts:*** Comparable to Alternative 2.	***Construction Impacts:*** Comparable to Alternatives 2 and 4A. ***OMRR&R Impacts:*** Same Comparable to Alternatives 2 and 4A.

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Summary Comparisons of Alternatives 2, 4A, and 8

After environmental commitments and best management practices (BMPs), Alternatives 2, 4A, and 8 are all expected to have less than significant impacts to the environment of the San Pedro Bay and its surrounding communities. As Alternatives 4A and 8 are scaled up versions of Alternative 2, environmental impacts of these plans when compared to Alternative 2 are generally associated with larger project footprints, increased construction duration, greater amount of construction materials, and increased number of project features (*e.g.*, affected soft bottom acreage, increased emissions, open water rocky reef acreage, etc.). Because scale is a key difference between the three plans identified in the Study, the following compares the three plans from greatest size and impact to least.

Alternative 8

When compared to the No Action Alternative and Alternatives 2 and 4A, Alternative 8 is expected to have the greatest and broadest positive impact on biological resources within the proposed Project Area as the seven (7) measures included in the plan are expected to substantially increase biodiversity and biomass through the restoration of unique plan features such as sandy islands and wetlands along with the increased size of open water rocky reefs that are expected to significantly increase the population sizes of Federally and State managed fish species and invertebrates and increase connectivity throughout the proposed Project Area. Alternative 8 is the largest of the three plans, has the largest construction footprint and the longest construction duration (~372 acres and 113 months, respectively), greatest number of plan features (eelgrass beds, sandy island, kelp beds, nearshore rocky reef, open water rocky reef, oyster reef, and coastal wetland (bolded features unique to Alternative 8)), highest potential to adversely affect recreational activities throughout the proposed Project Area due to their increased footprint (primarily boating and related activities), and significantly impact air quality (plan exceeds the General Conformity Applicability Rates for NO_x).

Alternative 4A

Alternative 4A is also expected to positively impact biological resources within the proposed Project Area by increasing biodiversity and biomass, albeit on a reduced scale when compared to Alternative 8, with a smaller construction footprint and shorter construction duration (~201 acres and 96 months, respectively). Additionally, the magnitude of potentially adverse effects to commercial and recreational activities such as boating throughout the proposed Project Area is expected to be reduced due to the decreased number of features (4 measures vs 7 measures, respectively), smaller construction footprint (~201 acres vs ~372 acres, respectively), and reduction of the number and size of open water rocky reef (7 in Alternative 8 and 2 in Alternative 4A; ~102 acres in Alternative 8 and ~30 acres in Alternative 4A). Unlike Alternative 8, Alternative 4A does not significantly impact air quality and as construction duration and number and size of measures are reduced (113 months for Alternative 8 and 96 months for Alternative 4A), the amount of materials and duration of impacts to San Pedro Bay and its surrounding communities are expected to be less.

Alternative 2

Although smaller than Alternatives 4A and 8, Alternative 2 is expected to positively impact biological resources within the proposed Project Area by increasing biodiversity and biomass when compared to the No Action Alternative.

Key differences between Alternative 4A and Alternative 2 are the construction duration (96 months vs 90 months, respectively), construction footprint (~201 acres vs ~162 acres, respectively), increased number of nearshore eelgrass/rocky reef shoals (6 vs 5, respectively), and the lack of open water rocky reefs in Alternative 2. With the smallest construction footprint of the three plans, Alternative 2 is expected to have the least amount of impact on recreational activities, such as boating and kiteboarding, throughout the proposed Project Area due to the reduction in nearshore eelgrass/rocky reef shoals from six (6) to five (5) and the elimination of the open water rocky reef measure. However, all three plans feature approximately ~121 acres of kelp reef habitat that is likely to adversely affect some recreational activities (*e.g.*, sailing and recreational boating).

Please see below for a full analysis of environmental impacts associated with each of the three plans.

5.1 HYDROLOGY (COASTAL AND SHORELINE RESOURCES)

5.1.1 Relevant Regulations and Significance Criteria

- Federal Clean Water Act: Governs discharge of dredge or fill materials into the waters of the U.S. and it governs water pollution control and water quality of waterways throughout the U.S.
- Coastal Zone Management Act: Any Federal agency conducting or supporting activities directly affecting the coastal zone must demonstrate the activity is, and proceed in a manner, consistent with approved State's Coastal Zone Management Program, to the maximum extent practicable.

SIGNIFICANCE CRITERIA
The impact criteria below are adopted for NEPA and CEQA. The impacts associated with the proposed alternatives would be considered significant if one or more of the conditions described below were to occur as a result of implementation of the project.

- Substantially and adversely alter nearshore wave characteristics;
- Substantially impact nearshore currents;
- Block or substantially interfere with nearshore sediment transport

Environmental Commitments
None specific to hydrology. Consistency with Marine Geology and Geologic Hazards, Environmental Commitment GEO-2 (Section 5.2) for the reuse of dredge material from other navigation projects to the maximum extent practicable and if available would reduce dredging within ESPB, if material from other projects can be used.

5.1.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Under the No Action Alternative, rain events would continue to result in increased flood currents from the Los Angeles and San Gabriel rivers; however, these events would typically continue to be short-term and currents would return to normal after the storm event.

Under the No Action Alternative, rain events would continue to result in increased flow from rivers that cause short-term changes in ESPB circulation and water temperatures. The fresh water from the rivers is lighter than seawater and would spread far from the river mouth as a freshwater plume, carrying suspended sediments. Currents could be as high as 4 knots during storm events, sufficient to re-suspend bottom sediment and spread out over most of ESPB (Port of Los Angeles and Port of Long Beach 2009). Water circulation within ESPB would likely not change under the No Action Alternative.

Sea level is likely to increase under the No Action Alternative. The USACE ER 1100-2-8162 guidance was used to calculate potential SLC within ESPB over the next 50 years. The USACE Sea Level Change Curve Calculator (2015.46) was used to develop sea level rise curves using the Los Angeles NOAA gauge (Los Angeles Outer Harbor Station ID 9410660). From the base year of 2030 to the year 2080, the results showed that sea level would likely rise relative to local mean sea level by the following: 0.2 feet (low); 0.9 feet (intermediate); and 2.5 feet (high) (see also Air Quality and Greenhouse Gases Section 5.4 of this chapter).

The City currently conducts an annual re-nourishment program to maintain Peninsula Beach. The program is a backpassing operation that transfers sand from the wide, sheltered beaches in the lee (wind blowing into shore from the sea) of the Long Beach Breakwater to narrow, exposed shoreline of Peninsula Beach. Annual nourishment would continue under the No Action Alternative. Beach replenishment would also likely continue to occur at Seal Beach.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur.

Alternative 2

Construction Impacts

<u>*Direct Impacts*</u>

Under Alternative 2, eelgrass beds (sand placement for beds), nearshore rocky reefs, and kelp beds would cover approximately 162 acres within the proposed Project Area. The range of placement for nearshore rocky reefs would vary from -12 to -20 feet MLLW. The stone pile height (or reef relief) would be roughly 4 feet to 14 feet in vertical height above the seabed. Approximately 444,000 tons of stone quarry material, and 100,000 cubic yards of sand from the Sunset/Surfside Borrow site would be placed for these features. For rocky and kelp reefs, quarry stone would be sourced from the Catalina Quarry (delivered via barge) or from a secondary quarry site, 3M Quarry, located in Corona, California (delivered via haul truck). The nearshore reefs would be created by first depositing 252,000 tons of quarry run (individual stones no larger than 1 ton each) at the site, then finely placing 192,000 tons of filter stone (approximately 1 ton each) and armor/cap stone (stones ranging from 1 to 10 tons each) on top with use of a crane from the barge or pushed off from the barge, to obtain sufficient interlocking and depth profiles. The staging area for construction activities would be located within the Port of Long Beach at Pier T and would consist of 2.4 acres with approximately 600 feet of water access.

For the eelgrass beds, approximately 100,000 cubic yards of dredged sand material would be placed on the leeward side of the five nearshore rocky reefs from an unmanned scow (containing dredged sand material) maneuvered in place by a tugboat. Stone material would be placed using the “push off” construction method. In this method, a derrick barge, held in place by six anchor locations, would be tethered to a flat-deck barge. A front-end track loader would be lowered via crane from the derrick barge to a flat-deck barge so that base and fill stone can be pushed over the side. For the larger armor/cap stones, the crane on the derrick barge would be used to place stones in position.

For the proposed nearshore eelgrass bed and rocky reef near the Belmont Pier, based on results of eelgrass surveys, alternative locations would be considered to avoid potential impacts to existing eelgrass beds.

The placement of various sizes of stone into ocean waters of the ESPB to construct the rocky and kelp reefs would result in short-term suspension of sediments at the stone placement sites but would not affect coastal or shoreline hydrology. Typically, suspended sediments would settle within hours, likely less than one day. The eelgrass beds, nearshore rocky reefs, and kelp reefs would cover a small portion of the proposed Project Area (~162 acres of the 11,465-acre proposed Project Area) would not have a significant direct effect on nearshore wave characteristics, currents, or sediment transport within the proposed Project Area. The reflected wave height produced by these the nearshore structures would be on the order of 10 percent of the incident height.

Dredging for sand material (approximately 100,000 cubic yards) would result in minimal alterations to the bottom topography of the existing Surfside/Sunset borrow site if the reuse of dredge from other navigation projects is not available (as detailed in GEO-2 in Section 5.2). The extent of deepening would be relatively small and would not be expected to result in any changes to nearshore wave characteristics or currents and would not interfere with nearshore sediment transport. Dredging activities would not affect the coastal or shoreline hydrology of the ESPB in the proposed Project Area. Placement of the 100,000 cubic yards of dredged sand on the leeward side of nearshore rocky reefs would minimally change the coastal or shoreline hydrology of the immediate area adjacent to the reef and no changes to the proposed Project Area nearshore wave characteristics, currents, or sediment transport would occur.

Restoration of eelgrass beds would require planting be conducted using divers working on a defined planting grid with temporary bounding lines to control planting areas. Establishment of kelp on reefs would occur through passive colonization of propagules over time. These short-term activities would not affect the nearshore wave characteristics, currents, or sediment transport of the proposed Project Area.

The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 2 would not impact nearshore wave characteristics, currents, or sediment transport.

Indirect Impacts

The restoration of eelgrass beds and kelp reefs under Alternative 2 would result in beneficial indirect impacts related to coastal erosion and storm water protection in the localized area surrounding the reef beds. Eelgrass and kelp forests reduce current velocities and sediment resuspension, which help protect shorelines (Browder *et al.*2013, Reynolds 2017). The extensive root system of eelgrass, which extend both vertically and horizontally, would help stabilize the localized sea bottom in a manner similar to the way land grasses prevent soil erosion (Florida Fish and Wildlife Conservation Commission 2018). Kelp rocky reefs are also beneficial to the hydrology surrounding the kelp forest, which create a drag on ocean currents and reduce current velocities (National Oceanic and Atmospheric Administration 2018a).

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F, MAMP). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours. These activities would have no direct or indirect impacts nearshore wave characteristics, currents, or sediment transport in the proposed Project Area.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). Vegetation and wildlife surveys would not result in direct or indirect impacts to nearshore wave characteristics, currents, or sediment transport. Activities related to eelgrass transplanting and potential extension or repair of rocky reefs may result in direct impacts to coastal or shoreline hydrology, however, these activities would require fewer days and equipment use than construction activities and impacts to nearshore wave characteristics, currents, or sediment transport would be less than significant.

Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds; no further monitoring would be required specifically for adaptive management. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may rise approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements (similar to impacts analyzed above under constriction). Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment. OMRR&R activities would require fewer days and equipment use than construction activities, impacts to nearshore wave characteristics, currents, or sediment transport would be comparable to construction activities analyzed, and would be less than significant. Rocky reef OMRR&R would be short-term and result in less of a change to coastal or shoreline hydrology compared to construction impacts discussed above, would not have significant direct or indirect effects on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area, and impacts would be less than significant.

Impact Summary

Alternative 2 does not include any construction or OMRR&R activities within the Los Angeles or San Gabriel Rivers or directly within navigation channels. The eelgrass beds, nearshore rocky reefs, and kelp reefs would have a low profile and would cover a small portion of the proposed Project Area (~162 acres of the 11,465-acre proposed Project Area). These features would not have a significant direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area. Placement of the 100,000 cubic yards of dredged sand on the leeward side of nearshore rocky reefs would minimally change the coastal or shoreline hydrology of the immediate area adjacent to the reef and no changes to the proposed Project Area nearshore wave characteristics, currents, or sediment transport would occur. Activities related to restoration of eelgrass beds would be short-term and would not affect the nearshore wave characteristics, currents, or sediment transport of the proposed Project Area. The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 2 would not impact nearshore wave characteristics, currents, or sediment transport.

Construction of habitat features would result in long-term indirect beneficial impacts related to reduced coastal and shoreline wave characteristics, reduced current velocities, and reduced sediment transport potential in the localized area of the reef beds. OMRR&R activities would not have a significant direct or indirect effects on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area.

This alternative would not: substantially and adversely alter nearshore wave characteristics; substantially impact nearshore currents; or, block or substantially interfere with nearshore sediment transport. Therefore, impacts to coastal and shoreline hydrology under Alternative 2 would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct Impacts

Under Alternative 4A, eelgrass beds, nearshore and open water rocky reefs, and kelp reefs would cover approximately 201 acres within the proposed Project Area. The stone pile heights would be the same as described under Alternative 2 (low profile stone piles). Approximately 680,000 tons of core/quarry run, filter, and armor/cap stone quarry material, and 100,000 cubic yards of sand would be placed for these features. Construction methods would be the comparable to those detailed under Alternative 2. The Pier T staging area would also be the same as described under Alternative 2.

For the proposed nearshore eelgrass bed and rocky reef near the Belmont Pier, based on results of eelgrass surveys, alternative locations would be considered to avoid potential impacts to existing eelgrass beds.

The eelgrass beds, nearshore and open water rocky reefs, and kelp reefs low profile and small area (~201 acres of the 11,465-acre proposed Project Area) would not have a direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area.

Dredging for sand material (approximately 100,000 cubic yards) would result in minimal alterations to the bottom topography of the existing Surfside/Sunset borrow site, if the reuse of dredge from other navigation projects is not available (as detailed in GEO-2 in Section 5.2). Impacts would be the same as detailed for Alternative 2, dredging activities would minimally change the coastal and shoreline hydrology of the Project Area and no changes to nearshore wave characteristics, currents, or sediment transport would occur.

The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 2 would not impact nearshore wave characteristics, currents, or sediment transport.

Indirect Impacts

Methods of eelgrass and kelp restoration would be comparable to Alternative 2. Eelgrass and kelp forests can help reduce shoreline waves characteristics, localized current velocities and sediment transport, which help protect shorelines (Browder *et al.*2013, Reynolds 2017). Construction of the rocky and kelp reefs would help stabilize the sea bottom and decrease sediment transport potential in the localized area of the reef beds.

As described under Alternative 2, the restoration of eelgrass beds and kelp reefs under Alternative 4A would result in indirect beneficial indirect impacts to nearshore wave characteristics, currents, or sediment transport.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. Direct and indirect impacts would result in less of a change in nearshore wave characteristics, currents, or sediment transport compared to construction impacts discussed above, and therefore would be less than significant.

Impact Summary

Alternative 4A does not include any construction or OMRR&R activities within the Los Angeles or San Gabriel Rivers or directly within navigation channels. The eelgrass beds, nearshore rocky reefs, and kelp reefs would have a low profile and would cover a small portion of the proposed Project Area (~201 acres of the 11,465-acre proposed Project Area). These features would not have a significant direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area. Placement of the 100,000 cubic yards of dredged sand on the leeward side of nearshore rocky reefs would minimally change the coastal or shoreline hydrology of the immediate area adjacent to the reef and no changes to the proposed Project Area nearshore wave characteristics, currents, or sediment transport would occur. Activities related to restoration of eelgrass beds would be short-term and would not affect the nearshore wave characteristics, currents, or sediment transport of the proposed Project Area. The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 4A would not impact nearshore wave characteristics, currents, or sediment transport.

Construction of habitat features would result in long-term indirect beneficial impacts related to reduced coastal and shoreline wave characteristics, reduced current velocities, and reduced sediment transport in the localized area of the reef beds. OMRR&R activities would not have a significant direct or indirect effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area.

This alternative would not: substantially and adversely alter nearshore wave characteristics; substantially impact nearshore currents; or block or substantially interfere with nearshore sediment transport. Therefore, impacts to coastal and shoreline hydrology under Alternative 4A would be less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct Impacts

Under Alternative 8, eelgrass beds, nearshore and open water rocky reefs, kelp reefs, sandy island, and wetlands would cover approximately 372 acres within the proposed Project Area. The stone pile heights would be the same as described under Alternative 2 (low profile stone piles). Approximately 3,787,000 tons of core/quarry run, filter, and armor/cap stone quarry material, and approximately 100,000 cubic yards of sand would be placed for eelgrass beds, rocky reefs, kelp reefs, and protection for wetlands and sandy islands. Approximately 48,000 cubic yards of concrete would also be needed. Alternative 8 also includes 2 small oyster beds of approximately 0.3 acre using 100 to 200 cubic yards of shell hash. Construction methods would be the comparable to those detailed under Alternative 2.

For the proposed nearshore eelgrass bed and rocky reef near the Belmont Pier, based on results of eelgrass surveys, alternative locations would be considered to avoid potential impacts to existing eelgrass beds.

This alternative also includes an approximately 24-acre sandy island, an approximately 10-acre wetland, and an approximately 42-acre wetland. For the sandy island and wetlands habitats, approximately 3,787,000 cubic yards of sand and fill material, including clean white sand cover, would be dredged from the Surfside/Sunset Borrow site and approximately 48,000 cubic yards of concrete for pre-cast caissons would also be needed. A cofferdam would be used temporarily to create the wetlands. The wetlands would also include a caisson breakwater structure on the seaward side of the wetlands (included as part of the wetlands footprint) that would act as the cofferdam during construction. The Pier T staging area would be the same location as described under Alternative 2 but increased in area to a total of 4.3 acres..

Dredging for sand and fill material (approximately 3,787,000 cubic yards) would result in minimal alterations to the bottom topography of the existing Surfside/Sunset borrow site, if the reuse of dredge from other navigation projects is not available (as detailed in GEO-2 in Section 5.2). The extent of deepening would be relatively minor and would not be expected to result in any changes to nearshore wave characteristics or currents and would not interfere with nearshore sediment transport. Dredging activities would not affect the coastal or shoreline hydrology of the proposed Project Area. Placement of the 100,000 cubic yards of dredged sand on the leeward side of nearshore rocky reefs would minimally change the coastal or shoreline hydrology of the immediate area adjacent to the reef and no changes to the proposed Project Area nearshore wave characteristics, currents, or sediment transport would occur.

The eelgrass beds, nearshore and open water rocky reefs, and kelp rocky reefs low profile and small area (~297 acres of the 11,465-acre proposed Project Area) would not have a significant direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area. Construction of the caisson breakwater, wetlands, and sandy island would have higher profiles. The wetlands profile would not be at a similar elevation as the nearby pier . The sandy island profile would be above the water surface. Although these features would have an effect on the coastal and shoreline hydrology in the immediate surrounding area, due to their small size (less than 1 percent of the proposed Project Area), the larger proposed Project Area nearshore wave characteristics, currents, or sediment transport would not be affected.

The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 8 would not impact nearshore wave characteristics, currents, or sediment transport.

Indirect Impacts

Methods of eelgrass and kelp restoration would be the same as detailed for Alternative 2. Eelgrass and kelp forests can help reduce shoreline wave characteristics, localized current velocities and sediment transport, which help protect shorelines (Browder *et al.*2013, Reynolds 2017). Construction of the rocky and kelp reefs would help stabilize the sea bottom and decrease sediment transport potential surrounding these structures.

The restoration of eelgrass beds and kelp reefs under this alternative would result in indirect beneficial impacts related to increase in sediment retention, minimization of coastal and shoreline wave heights, reduction of current velocities, and filtration of pollutants in the localized area of the reef beds.

Creation of the sandy island and wetlands would result in long-term indirect beneficial localized impacts related to shoreline stabilization (coastal erosion) and storm water protection (Coastal Conservancy 2018). The sandy islands and wetland features, which would be above the water surface, would reduce the velocity of waves at and immediately adjacent to the features. Wave velocity changes surrounding the sandy island and wetland features would also affect localized sediment transport patterns as compared to existing conditions. The shoreline west of Belmont Pier would remain relatively unchanged, however, the shoreline of Peninsular Beach may experience modified erosion potential, with higher erosion potential on the western portion of the beach and lower potential on the eastern portion due to the location of the sandy island, within a localized area with essentially a minimal increase. The City's backpassing operations would continue but may need to be modified to maintain the protective shoreline in front of Peninsula Beach. These changes in nearshore wave characteristics, currents, or sediment transport would be long-term, minimal and localized, and less than significant.

Development of the sandy island and wetlands may result in localized flood and erosion protection in the area surrounding the island. However, these reductions would not reduce flooding potential in the larger proposed Project Area.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reeks under Alternative 8 would be comparable to those described for Alternative 2. OMRR&R for these features would be short-term and result in less of a change to coastal and shoreline hydrology compared to construction impacts discussed above, would not have a significant direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area, and therefore, impacts would be less than significant.

Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging, primarily from the Surfside/Sunset Borrow site, would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (e.g., vegetation replacement and invasive species management) would likely be higher during initial establishment (approximately first two years) of the wetland and would likely decrease after establishment is complete. Minor structure repairs would take place on a 10-year cycle or when needed after a large storm event. Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization. OMRR&R activities for the sandy island and wetlands, including dredging, would result in less of a change to hydrology compared to construction impacts discussed above, would not have a significant direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area, and therefore, impacts would be less than significant.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and new oyster shell hash (potentially every 5 years), extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment). OMRR&R for these activities would require fewer days and equipment use than construction activities, impacts would be comparable to construction activities analyzed, and would be less than significant.

OMRR&R and adaptive management activities under Alternative 8 would be short-term and result in less of a change to hydrology compared to construction impacts discussed above, would not have a significant direct effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area, and therefore, impacts would be less than significant.

Impact Summary

Alternative 8 construction activities would result in long-term, less than significant direct impacts on nearshore wave characteristics, currents, or sediment transport within the proposed Project Area from wave velocity changes from the sandy island and wetlands that would change localized sand transport patterns on Peninsula Beach, and long-term indirect beneficial impacts related to sediment retention, minimization of coastal and shoreline wave heights, reduction of current velocities, filtration of pollutants, shoreline stabilization, and storm water protection in the localized area of the reef beds.

Alternative 8 includes the construction of wetlands along with their requisite OMRR&R activities within or adjacent to the Los Angeles River. Feasibility-level modeling indicated that the construction of these restoration features would not significantly affect the nearshore wave characteristics, currents, or sediment transport of the proposed Project Area. Alternative 8 does not include the construction of any restoration features along with their requisite OMRR&R activities within the San Gabriel River or directly within navigation channels. The eelgrass beds, nearshore and open water rocky reefs, and kelp reefs would have a low profile and would cover a small portion of the proposed Project Area (~295 acres of the 11,465-acre proposed Project Area). Placement of the 100,000 cubic yards of dredged sand on the leeward side of nearshore rocky reefs would minimally change the coastal or shoreline hydrology of the immediate area adjacent to the reef and no changes to the proposed Project Area nearshore wave characteristics, currents, or sediment transport would occur. Activities related to restoration of eelgrass beds would be short-term and would not affect the nearshore wave characteristics, currents, or sediment transport of the proposed Project Area. The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 8 would not impact nearshore wave characteristics, currents, or sediment transport.

Construction of habitat features would result in long-term indirect beneficial indirect impacts related to reduced coastal and shoreline wave characteristics, reduced current velocities, and reduced sediment transport in the localized area of the reef beds. OMRR&R activities would not have a significant direct or indirect effect on the nearshore wave characteristics, currents, or sediment transport within the proposed Project Area.

This alternative would not: substantially and adversely alter nearshore wave characteristics; substantially impact nearshore currents; or block or substantially interfere with nearshore sediment transport. Therefore, direct and indirect impacts to coastal and shoreline hydrology under Alternative 8 would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.2 MARINE GEOLOGY AND GEOLOGIC HAZARDS

5.2.1 Relevant Regulations and Significance Criteria

- State of California Alquist-Priolo Earthquake Zoning Act: Regulates development near active faults to mitigate the hazards of surface fault-rupture.
- State of California Seismic Hazards Mapping Act: Requires the mapping of seismic hazard zones to mitigate hazards to help protect public health and safety.

Significance Criteria

The impact criteria below were taken from Appendix G of the CEQA guidelines and are also being adopted for NEPA. The impacts associated with the proposed alternatives would be considered significant if one or more of the conditions described below were to occur as a result of implementation of the project.

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
  - Strong seismic ground shaking.
  - Seismic-related ground failure, including liquefaction.
  - Landslides.

- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse.

In addition to the above CEQA criteria, a significant impact could occur from the proposed alternatives if they:

- Substantially and adversely modify any unique geologic or physical features;
- Substantially and adversely modify beach or nearshore bottom topography.

Environmental Commitments

GEO-1 The USACE will coordinate with NOAA and the Coast Guard to update marine navigation maps after construction is completed.

GEO-2 The USACE (and the non-Federal sponsor, the City of Long Beach) will beneficially reuse dredge material from other navigation projects to the maximum extent practicable. The possibility of utilizing dredged material from other navigation projects (*e.g.*, the Port of Long Beach Deep Draft Navigation Project) will be evaluated during the pre-construction engineering and design (PED) phase and a decision made based on sediment quality and the timing of construction for any such projects. No specific projects have been identified that match construction timing and include results from sediment analyses that show compatibility of dredged sediments to ESPB requirements. If beneficial use sites become available, the USACE would consider a supplemental analysis.

GEO-3 The USACE will conduct detailed bathymetric surveys during the PED phase. Information from these surveys will guide identification of areas to avoid such as areas with natural cobbles and boulders.

GEO-4 Prior to construction, the USACE will perform sediment sampling and analysis to confirm the suitability of dredged material from the surfside-Sunset borrow area for the establishment of eelgrass beds leeward of the proposed nearshore rocky reefs.

5.2.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Under the No Action Alternative, the bathymetry of the ESPB may experience ongoing minor changes due to wave action; however, these changes would not be significant due to the existing breakwater, which limits wave action. Sediment would likely continue to accumulate within the Long Beach Harbor from the Los Angeles River, San Gabriel River, and tributaries. Dredging activities within the harbor would continue, including the dredging of channels, Alamitos Bay, and harbor berths. Dredging would continue to change the ESPB topography as sediment is removed. However, sediment accumulation and dredging would be similar to past and ongoing activities within ESPB.

The proposed Project Area contains two energy island borrow pits which are currently visible in bathymetry surveys. There are currently no plans to fill and/or cap these borrow pits. These borrow pits are being held in reserve for use as confined aquatic disposal sites if needed for future dredging of sediments that are not suitable for open ocean placement/disposal.

Beach replenishment activities for Long Beach and Seal Beach would also likely continue. Beach replenishment would be ongoing with generally minor changes to beach topography in the near term. Over the next 50 years, sea level may rise approximately 2.5 feet (based on modeling). This level of sea rise may require modification to beach replenishment and changes to beach protection strategies and structures.

Existing seismic faults and potential for ground movement would be expected to remain the same under the No Action Alternative. The No Action Alternative would not result in the exposure of people or structures to potential substantial adverse effects, including the risk of loss, injury, or death. The proposed Project Area is not located on a geologic unit or soil that is unstable, or that would become unstable as a result of ongoing activities. The No Action Alternative would not result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse, nor would this alternative result in the destruction, permanent coverage, or modification of topographic features.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur.

Alternative 2

Construction Impacts

Summary of Alternative 2 Project Features: Under Alternative 2, quarry stones would be placed at specified locations within the proposed Project Area to create hard, rocky reef substrate upon which eelgrass and kelp would become established on the low relief sea bottom. In addition, sand would be placed on the leeward side of nearshore rocky reefs for eelgrass establishment. Eelgrass, rocky reefs, and kelp reefs would cover approximately 162 acres within the proposed Project Area (approximately 1.5 percent of the proposed Project Area). The stone pile elevation of the nearshore rocky reefs would range from three to 10 feet below the MLLW level and the open water kelp reefs would be no greater than 2.5 feet above the existing seabed. Approximately 444,000 tons of stone quarry material would be placed for these features. Approximately 100,000 cubic yards of sand would be dredged from the Surfside/Sunset borrow site for the eelgrass beds. The sand relief would be lower than the adjacent rocky reef. A temporary 2.4 acre staging area within the Port of Long Beach at Pier T would be used during construction.

<u>*Direct Impacts*</u>

As described in GEO-2, the practicability of beneficial reuse of dredge material from navigation projects will be evaluated. If this is not practicable, sand material would be obtained from the Surfside/Sunset Borrow site, a site that has been used regularly since 1964 (in particular for the San Gabriel River to Newport Beach Nourishment project). Dredging for sand material would result in minimal alterations of the bottom topography of the Surfside/Sunset Borrow site. Dredging would temporarily change the bottom topography of the dredged area; however, minimal material would be dredged, and normal underwater sand deposition (movement of sediment) would smooth the area within a short duration; therefore, the proposed Project would not result in substantial or adverse modification of beach or nearshore bottom topography. Dredging activities would not substantially and adversely modify any unique geologic or physical features; and would not substantially and adversely modify beach or nearshore bottom topography. No short- or long-term impact on marine geology within the Surfside/Sunset Borrow site would occur due to dredging activities.

Based on the small area (1.5 percent of the proposed Project Area) where stone quarry and sand material would be placed as well as the low relief of features within the proposed Project Area, the creation of rocky and kelp reefs would not result in significant changes to the marine geology of the area and would not create geologic hazards based on the significance criteria. The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 2 would not result in direct impacts to marine geology or geologic hazards based on the significance criteria.

Based on the above, these activities: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or nearshore bottom topography. Therefore, direct impacts to marine geology and geologic hazards under Alternative 2 would be less than significant.

Indirect Impacts

Existing seismic faults and potential for ground movement under Alternative 2 would be expected to remain unchanged compared to the existing condition. No indirect impacts to marine geology and geologic hazards based on the significance criteria would occur.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Under Alternative 2, maintenance would not be needed for kelp or eelgrass beds. Rocky reef maintenance would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization. The overall size and height of rocky and kelp reefs would not change as part of maintenance activities. No adverse direct or indirect impacts to marine geology and geologic hazards would likely occur due to maintenance activities.

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours. These activities would have no direct or indirect impacts on marine geology or geologic hazards.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). Vegetation and wildlife surveys would not result in direct or indirect impacts to marine geology or geologic hazards. Activities related to eelgrass transplanting and potential extension or repair of rocky reefs may result in direct impacts; however, these activities would require fewer days and equipment use than construction activities and impacts to beach or nearshore bottom topography would be less than significant. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds; no further monitoring would be required specifically for adaptive management. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, maintenance and monitoring would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may rise approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements (similar to construction impacts analyzed above). Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment (similar to construction impacts analyzed above).

Rocky reef maintenance and monitoring would be short-term and result in less of a change to marine geology and geologic hazards compared to construction impacts discussed above. These activities: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or nearshore bottom topography. Therefore, OMRR&R direct and indirect impacts to marine geology and geologic hazards under Alternative 2 would be less than significant.

Impact Summary

Based on the small area (1.5 percent of the proposed Project Area) where stone quarry and sand material would be placed as well as the low relief of features within the proposed Project Area, the creation of eelgrass beds, rocky reefs, and kelp reefs would not result in significant changes to the marine geology of the area and would not create geologic hazards based on the significance criteria. No indirect impacts would be anticipated. Dredging activities would not substantially and adversely modify any unique geologic or physical features; and would not substantially and adversely modify beach or nearshore bottom topography. No short- or long-term impacts on marine geology within the Surfside/Sunset Borrow site would occur due to dredging activities. The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 2 would not result in direct impacts to marine geology or geologic hazards.

OMRR&R would be short-term and result in less of a change to marine geology and geologic hazards compared to construction impacts. This alternative: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or near shores bottom topography. Therefore, impacts to marine geology and geologic hazards under Alternative 2 would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Summary of Alternative 4A Project Features: Under Alternative 4A, quarry stones would be placed at specified locations to create a hard, rocky reef substrate upon which eelgrass and kelp would become established on the low relief sea bottom. In addition, sand would be placed on the leeward side of nearshore rocky reefs for eelgrass establishment. Eelgrass, nearshore rocky reefs, open water rocky reefs, and kelp reefs would cover approximately 201 acres within the proposed Project Area (approximately 1.8 percent of the proposed Project Area). The rock pile height of the nearshore rocky reefs would be no greater than 10 feet, open water rocky reefs would be no greater than 15 feet, and the open water kelp reefs would be no greater than 2.5 feet. Approximately 680,000 tons of core/quarry run, filter, and armor/cap stone quarry material and approximately 100,000 cubic yards of dredged sand would be placed for these features. The Pier T staging area would be the same as described under Alternative 2. Dredging activities would be comparable to those described under Alternative 2.

<u>*Direct Impacts*</u>

As described in GEO-2, the practicability of beneficial reuse of dredge material from navigation projects will be evaluated. If this is not practicable, sand material would be obtained from the Surfside/Sunset Borrow site, a site that has been used regularly since 1964 (in particular for the San Gabriel River to Newport Beach Nourishment project). Dredging for sand material would result in minimal alterations of the bottom topography of the Surfside/Sunset Borrow site. Dredging would temporarily change the bottom topography of the dredged area; however, minimal material would be dredged, and normal underwater sand deposition (movement of sediment) would smooth the area within a short duration; therefore, the proposed Project would not result in substantial or adverse modification of beach or nearshore bottom topography. Dredging activities would not substantially and adversely modify any unique geologic or physical features; and would not substantially and adversely modify beach or nearshore bottom topography. No short- or long-term impacts on marine geology within the Surfside/Sunset Borrow site would occur due to dredging activities.

Based on the small area (1.8 percent of the proposed Project Area) where stone quarry and sand material and sand would be placed as well as the low relief of features within the proposed Project Area, the creation of rocky and kelp reefs would not result in significant changes to the marine geology of the area and would not create geologic hazards based on the significance criteria. The proposed staging area is currently paved and used for storage of equipment and materials, and use of the area under Alternative 4A would not result in direct changes to geology or create geologic hazards of the area based on significance criteria.

Based on the above, these activities: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or near shores bottom topography. Therefore, direct impacts to marine geology and geologic hazards under Alternative 4A would be less than significant.

Indirect Impacts

The restoration of eelgrass beds and kelp reefs under Alternative 4A would result in beneficial indirect impacts comparable to Alternative 2.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R activities under Alternative 4A would be comparable to those described for Alternative 2. No adverse direct or indirect impacts to marine geology and geologic hazards would likely occur due to OMRR&R activities under Alternative 4A. Therefore, impacts would be less than significant.

Impact Summary

Based on the small area (1.8 percent of the proposed Project Area) where stone quarry and sand material would be placed as well as the low relief of features within the proposed Project Area, the creation of rocky and kelp reefs would not result in significant changes to the marine geology of the area and would not create geologic hazards based on significance criteria. No adverse indirect impacts are anticipated. Dredging activities would not substantially and adversely modify any unique geologic or physical features; and would not substantially and adversely modify beach or nearshore bottom topography. No short- or long-term impacts on marine geology within the Surfside/Sunset Borrow site would occur due to dredging activities. The proposed staging area is currently paved and used for storage of equipment and materials, use of the area under Alternative 2 would not result in direct impacts to marine geology or geologic hazards.

OMRR&R would have short-term impacts and result in less of a change to marine geology and geologic hazards compared to construction impacts.

This alternative: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and would not substantially and adversely modify beach or near shores bottom topography. Therefore, impacts to marine geology and geologic hazards under Alternative 4A would be less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Summary of Alternative 8 Project Features: Under Alternative 8, quarry stones would be placed at specified locations to create a hard, rocky reef substrate upon which eelgrass (with sand on the leeward side) and kelp would become established on the low relief sea bottom. In addition, sand would be placed on the leeward side of nearshore rocky reefs for eelgrass establishment. Eelgrass, nearshore rocky reefs, open water rocky reefs, and kelp reefs would cover approximately 297 acres within the proposed Project Area (approximately 2.6 percent of the Project Area). The rock pile height of the nearshore rocky reefs would be no greater than 10 feet, open water rocky reefs would be no greater than minus 15 feet MLLW, and the open water kelp reefs would be no greater than 2.5 feet above the existing sea bed. Approximately 2,482,000 tons of core/quarry run, filter, and armor/cap stone quarry material and approximately 3,787,000 cubic yards of dredged sand would be placed for these features. Alternative 8 also includes 2 small oyster beds of approximately 0.3 acre using 100 to 200 cubic yards of shell hash. The Pier T staging area would be the same location as described under Alternative 2 but increased in area to a total of 4.3 acres.

<u>*Direct Impacts*</u>

Under Alternative 8, restoration features would include an approximately 24-acre sandy island and two wetlands totaling approximately 52 acres. These features would require approximately 3,787,000 cubic yards of fill and sand material. Beach compatible sand would be excavated from the Surfside/Sunset borrow site. As described in GEO-2, the practicability of beneficial reuse of dredge material from navigation projects will be evaluated. If this is not practicable, sand material would be obtained from the Surfside/Sunset Borrow site, a site that has been used regularly since 1964 (in particular for the San Gabriel River to Newport Beach Nourishment project). Dredging for sand material would result in temporary minor alterations of the bottom topography of the existing dredge site. The Surfside/Sunset Borrow site is over 1,700 acres and dredging for the sandy island and wetlands sediment would not occur within one small area in order to minimize the depth of the pit created. It is anticipated that approximately 2 million cubic yards of dredged material from the POLB would be placed within the Surfside/Sunset Borrow site. Placement of dredged material within this site may occur at approximately the same time as dredging removal for sand material for the ESPB project, although the projects would be timed to best accommodate each project. POLB material would likely be placed in different portions of the borrow site than areas that would be dredged for the ESPB project; however, sediment from placement areas may move to dredged areas, filling in the pits resulting in a flatter, more natural topography over the long-term. Over the short-term, natural sediment deposition would smooth the dredged pit topography. No significant short- or long-term changes to topography are expected.

Placement of the two small oyster beds would occur within an approximately 0.3-acre area on a breakwater within the Los Angeles River Estuary and along the sandy shoreline in this area or on an oyster platform. Oyster bed placement on the breakwater area or on an oyster platform would not result in changes to the beach or nearshore bottom topography of the area, no impacts are anticipated.

Based on the small area (3.3 percent of the proposed Project Area) where stone quarry material, oyster hash, and sand and fill material would be placed, as well as the low relief of features within the proposed Project Area, the creation of eelgrass beds, rocky reefs, kelp reefs, the sandy island, oyster beds, and wetlands as well as use of the staging area would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; the proposed Project Area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or nearshore bottom topography. The proposed staging area is currently paved and used for storage of equipment and materials and use of the area under Alternative 8 would not result in changes to geology or create geologic hazards of the area based on the significance criteria. It is not expected that dredging at the Surfside/Sunset Borrow site would result in significant short- or long-term changes to geology or create geologic hazards based on the significance criteria. Therefore, direct impacts to marine geology and geologic hazards under Alternative 8 would be less than significant.

Indirect Impacts

No indirect impacts are anticipated.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R and adaptive management activities for eelgrass beds, nearshore and open water rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. No adverse direct or indirect impacts to marine geology and geologic hazards would likely occur due to OMRR&R activities under Alternative 8 for these features.

Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging, primarily from the Surfside/Sunset Borrow site, would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (e.g., vegetation replacement and invasive species management) would likely higher during initial establishment of the wetland and would likely decrease after establishment is complete. Minor structure repairs would take place on a 10-year cycle or when needed after a large storm event or due to sea level rise. Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization. OMRR&R activities for the sandy island and wetlands, including dredging, would result in less of a change to geology compared to construction impacts discussed above, would not have a significant impact on geology or geologic hazards based on significance criteria, and impacts would be less than significant.

Adaptive management for sandy island, wetlands, and oyster beds may include additional actions such as vegetation or wildlife surveys, oyster transplanting, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment). OMRR&R activities would require fewer days and equipment use than construction activities, impacts to beach and nearshore bottom topography would be comparable to construction activities analyzed, and would be less than significant. These activities: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or near shores bottom topography. Therefore, OMRR&R and adaptive management impacts to marine geology and geologic hazards under Alternative 8 would be less than significant.

Impact Summary

Construction of the sandy island and wetlands would likely result in a minor change to the topography of the restoration sites, but the relatively small area affected (~76 acres, 0.66 percent of the proposed Project Area) as compared to the proposed Project Area (11,465 acres) as a whole would not result in significant impacts to marine geology based on significance criteria. It is not expected that dredging at the Surfside/Sunset Borrow site would result in significant short- or long-term changes to geology based on significant criteria.

Existing seismic faults and potential for ground movement under Alternative 8 would be expected to remain unchanged compared to the existing condition. Based on the small area (3.3 percent of the proposed Project Area) where stone quarry material, dredged sand material for the eelgrass beds, sandy island, and wetlands, and creation of small oyster beds would be placed as well as the low relief of features within the proposed Project Area, the creation if these features would not result in significant impacts to the marine geology of the area and would not create geologic hazards based on significance criteria. No indirect impacts are anticipated. OMRR&R would have short-term impacts and result in less of a change to marine geology and geologic hazards compared to construction impacts. This alternative: would not expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or near shores bottom topography. Therefore, impacts to marine geology and geologic hazards under Alternative 8 would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.3 WATER QUALITY

5.3.1 Relevant Regulations and Significance Criteria

- Federal Clean Water Act: Governs discharge of dredge or fill materials into the waters of the U.S. and it governs water pollution control and water quality of waterways throughout the U.S.
- State of California Porter-Cologne Water Quality Control Act: Established the State Water Board, which has the ultimate authority over state water rights and water quality policy.
- State of California Ocean Plan: The State Water Resources Control Board has adopted a Water Quality Control Plan for point source discharges to ocean waters of California called the California Ocean Plan (Ocean Plan).
- Water Quality Control Plan for the Los Angeles Region (Basin Plan): Designed to preserve and enhance water quality and protect the beneficial uses of waters in the region.
- Long Beach Municipal Code: Includes Stormwater and Runoff Pollution Control, which reinforces the requirements of the Clean Water Act and the Porter-Cologne Act within the City.

Significance Criteria

The following water quality thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the CEQA Guidelines. These criteria are also being adopted for NEPA. Water quality impacts would be considered significant if the proposed alternatives would result in:

- Release of toxic substances or impacts to water quality (*e.g.*, significant reductions in visibility, light transmittance, oxygen concentration, etc.) that would be deleterious to human, fish, or plant life

- Substantial impairment of beneficial recreational use of the project area

Environmental Commitments

WQ-1 Water quality monitoring will be conducted during dredging or sandy island/wetland construction or any activities that would result in turbidity plumes. Monitoring parameters will include percent light transmissivity, dissolved oxygen, water temperature, salinity, and pH.

WQ-2 For dredging activities, standard water quality monitoring would be conducted during construction. This consists of weekly monitoring of water quality parameters (salinity, pH, dissolved oxygen, temperature, and percent light transmissivity) with an instrument package at four stations. The four stations are sited relative to the dredge and will be 100 feet upcurrent of the dredge, 100 feet downcurrent of the dredge, 300 feet downcurrent of the dredge, and a control station located outside of any dredge plume. Twice monthly water samples will be taken from the station 300 feet downcurrent of the dredge for analysis of total suspended solids and TRPH. Similar monitoring would be conducted at the sandy island site during sediment placement activities at that location.

WQ-3 USACE Engineering Manual EM-1110-2-2302 provides minimal stone quality requirements. Guidance from this manual will be followed. Quarry materials will also meet the following:

- The materials shall be clean and free of any contaminants, especially those that could dissolve in seawater (e.g., asphalt, paint, oil, or oil stains).
- All stone used for the project must follow:
    - Purity: The materials shall be free of contamination and foreign materials.
    - Specific gravity: Shall be greater than 2.2.
    - Durability: Rocks used must remain unchanged after 30 years of submersion in seawater.

WQ-4 During construction and operation activities, all local, state and Federal regulations would be complied with regarding to the transportation, handling, and storage of hazardous substances.

WQ-5 At each work area involving the operation of heavy equipment and handling and storage of hazardous substances, a Hazardous Material Spill Prevention Plan would be prepared. The Hazardous Material Spill Prevention Plan shall contain contingency plans in the event of an accidental release into the environment.

Also applicable is **GEO-4** Prior to construction, the USACE will perform sediment sampling and analysis to confirm the suitability of dredged material from the surfside-Sunset borrow area for the establishment of eelgrass beds leeward of the proposed nearshore rocky reefs.

5.3.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Although water quality within the proposed Project Area has improved over the past several decades, it remains degraded as industrial effluents and untreated run-off from storm drains and the surrounding area continue to be discharged into ESPB. These sources of contamination result in elevated levels of trace metals and organic chemicals in some areas, as well as elevated levels of bacteria (total coliforms, fecal coliforms, and *Enterococcus*). Water quality monitoring conducted in 2008 in the region of ESPB during dry weather conditions provided evidence that the plume from the LARE frequently impacts the western portion of Long Beach’s beach from Shoreline Harbor to Belmont Pier, indicating poor flushing of plumes coming from the river (Science Applications International Corporation [SAIC] 2010). Monitoring conducted subsequent to an early season storm event provided further evidence of poor flushing in this segment of the bay. Decaying duckweed that had been discharged from the Los Angeles

River during this event remained suspended in the nearshore waters for over a week. These conditions are likely to continue under the No Action Alternative.

Based on a comparison to water quality data taken in 2000 and 2008, the results of a 2013–2014 biological resources study of the Port Complex indicated that ongoing pollution control efforts within the port have resulted in improved water quality. Oxygen in the water exceeded 5 milligrams per liter and there were fewer instances of lower-than-standard measurements than in previous years. Chlorophyll-a typically exceeded 5 milligrams per liter also, which indicated high phytoplankton concentrations. High phytoplankton concentrations help support fish and invertebrate populations of the harbor area (MBC Applied Environmental Sciences [MBC] 2016; Merkel & Associates 2015). The ongoing pollution control efforts would continue under the No Action Alternative.

Within the Los Angeles River, pollutants from dense clusters of residential, industrial, and other urban activities have impaired water quality in the middle and lower portions of the river watershed. TMDLs have been developed (as required by the Clean Water Act) for many of the impairments in the watershed. Partnerships with non-profit organizations and city governments along the Los Angeles River watershed have resulted in plans and policies that have improved green space and water quality along the river. Continued improvement of Los Angeles River water quality has led to improved water quality within San Pedro Bay. It is anticipated that the continued improvement within the Los Angeles River will continue to improve water quality in the proposed Project Area under the No Action Alternative.

Ongoing improvements to water quality and research into management of harmful algal blooms may reduce the frequency under the No Action Alternative. Surveys conducted within the bay port complexes in 2013–2014 found no toxic phytoplankton blooms (MBC and Merkel & Associates 2016). However, with the projected increase in ocean temperatures, blooms are likely to continue to occur into the foreseeable future.

Under the No Action Alternative, management efforts to improve water quality, sediment quality, and reduce trash within the area would be expected to progress. The current trend suggests that water quality would continue to improve into the future; however, improvement would likely continue to be slow and water quality issues, as presented above, would continue into the foreseeable future. There would be no adverse impacts under this alternative; however, the benefits to water quality from creation of eelgrass and kelp beds that would occur under Alternatives 2, 4A, and 8 would not occur.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur.

Alternative 2

Construction Impacts

<u>Direct Impacts</u>

During construction activities, the placement of various sizes of stone into ocean waters to create the rocky and kelp reefs, as well as the sand placement for the eelgrass beds, would result in short-term suspension of sediments (fine sands and silts) of the ocean floor at the stone and sand placement sites. Suspended sediments would result in short-term turbidity and direct adverse water quality impacts in the placement areas. Depending on local conditions, such as tidal and storm flow currents, the suspended sediments would likely settle to the ocean floor within a short duration.

Under Alternative 2, the potential for adverse effects to water quality are considered low because the rocky and kelp reef construction materials must meet the requirements in WQ-3. Once stone material is placed on the ocean floor, sand-sized particles would not remain in suspension for more than several hours. Some size-classes of sand would likely settle to the ocean floor within seconds or minutes. Finer particles that remain in suspension would likely be transported away by ocean currents and mixed with clearer water elsewhere, keeping turbidity from increasing significantly above background levels (California State Lands Commission 1999).

Dredging activities at the Surfside/Sunset Borrow site would result in short-term localized turbidity/suspension of sediments and decreases in dissolved oxygen at the dredge site. Turbidity plumes would be limited to the immediate vicinity of the dredging operations because of the sandy nature of the sediments and the lack of long-shore currents and/or a mild wave climate at the site. WQ-1 and WQ-2 would be implemented to ensure that turbidity increases, or dissolved oxygen decreases do not result in significant impacts. Stone stored at the staging area is expected to have reduced quantities if loose sediment as a result of repeated handling and transportation to the staging area prior to storage and the implementation of WQ-3. Sediment associated with stone may enter the water as a result of handling or loading of stone onto barges at the staging area for transport to construction areas; however, quantity of sediment is expected to be minimal and to quickly dissipate should it enter the water adjacent to the staging area.

Construction equipment, including dredging equipment, barges and cranes, and construction activities have the potential to result in minor accidental release of hydrocarbons if there is a spill or leak. The Hazardous Material Prevention Plan (as described under WQ-5) would be implemented and would require immediate containment and clean-up. Impacts would depend on the amount and type of materials spilled as well as specific conditions (*i.e*., currents, wind, temperature, waves, tidal stage, and vessel activity); however, only minor spills would likely occur and would likely be easily contained. In such cases, accidental spills would be cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions.

Construction and dredging activities would occur within small areas (less than 1.5 percent of the proposed Project Area) and would not disrupt recreational use. Water quality monitoring would be conducted to ensure that turbidity and/or dissolved oxygen problems do not occur and to allow for implementation of BMPs should problems occur. Short-term direct impacts would not result in impairment to beneficial recreational use of the proposed Project Area or release toxic substances that would be deleterious to humans, fishes, or plants. Impacts would be less than significant.

Indirect Impacts

The restoration of eelgrass beds and kelp reefs under Alternative 2 would result in localized beneficial impacts related to water quality. These habitats produce oxygen, improve water quality by filtering polluted runoff, absorb excess nutrients, store greenhouse gases like carbon dioxide, and help protect the shoreline in the localized area of restoration features from erosion (National Oceanic and Atmospheric Administration 2018a and 2018b). Localized beneficial indirect impacts would be long-term but would not result in larger scale water quality improvements (proposed Project Area wide). Indirect impacts would not result in impairment to beneficial recreational use of the proposed Project Area or release toxic substances that would be deleterious to humans, fishes, or plants. Impacts would be less than significant

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F, MAMP). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours for a short time. These activities would not result in turbidity or other adverse impacts to water quality, or disruption of recreation uses within the project area. These activities would occur over a short duration and would not result in the release of toxic substances that would be deleterious to human, fishes, or plant life nor result in substantial impairment of beneficial recreational use of the proposed Project Area.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). OMRR&R activities would require fewer days and equipment use than construction activities, impacts would be comparable to construction activities analyzed, and would be less than significant. Short-term turbidity may occur in eelgrass transplant areas or at rocky reef repair sites. Turbidity would be localized and would be expected to dissipate within a short duration. These activities would be short-term and would not result in the release of toxic substances that would be deleterious to human, fishes, or plant life nor result in substantial impairment of beneficial recreational use of the proposed Project Area.

Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs and eelgrass beds, no further monitoring would be required specifically for adaptive management. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, maintenance and monitoring would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may rise approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment. Short-term turbidity would occur at rocky reef repair sites; however, turbidity would be expected to dissipate quickly.

OMRR&R activities would be short-term and would not result in the release of toxic substances that would be deleterious to human, fishes, or plant life nor result in substantial impairment of beneficial recreational use of the proposed Project Area. Impacts of OMRR&R activities would be direct and short-term and would be less than significant.

Impact Summary

Alternative 2 construction and OMRR&R activities would result in short-term localized, less than significant adverse impacts on water quality from sediment suspension and turbidity within the Project Area. Water quality monitoring would be conducted to ensure that turbidity and/or dissolved oxygen problems do not occur and to allow for implementation of BMPs should problems occur. Construction activities may also result in minor accidental spills or leaks of hydrocarbons from construction equipment anticipated during implementation, however, no significant spills or long-term degradation or permanent new source of pollution would be introduced into the proposed Project Area. Habitat features would enhance water quality efforts in the project area from the localized production of oxygen, improved water quality, absorbed nutrients, and storing of greenhouse gases by eelgrass and kelp forests.

Based on the above summary, Alternative 2 would not likely result in: release of toxic substances that would be deleterious to human, fishes, or plant life; or substantial impairment of beneficial recreational use of the proposed Project Area. Therefore, impacts to water quality under Alternative 2 would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct Impacts

During construction activities under Alternative 4A, the placement of various sizes of stone into ocean waters to create the rocky and kelp reefs, as well as the sand placement for eelgrass beds, would result in short-term suspension of sediments at the stone and sand placement sites. Suspended sediments would result in short-term localized turbidity and direct adverse water quality impacts in the placement areas. Water quality monitoring would be conducted to ensure that turbidity and/or dissolved oxygen problems do not occur and to allow for implementation of BMPS should problems occur.

Dredging activities at the Surfside/Sunset Borrow site would result in short-term localized turbidity/suspension of sediments and decreases in dissolved oxygen at the dredge site. Turbidity plumes would be limited to the immediate vicinity of the dredging operations because of the sandy nature of the sediments and the lack of long-shore currents and/or a mild wave climate at the site. WQ-1 and WQ-2 would be implemented to ensure that turbidity increases, or dissolved oxygen decreases do not result in significant impacts. Stone stored at the staging area is expected to have reduced quantities if loose sediment as a result of repeated handling and transportation to the staging area prior to storage and the implementation of WQ-3. Sediment associated with stone may enter the water as a result of handling or loading of stone onto barges at the staging area for transport to construction areas; however, quantity of sediment is expected to be minimal and to quickly dissipate should it enter the water adjacent to the staging area.

Although additional construction would occur under Alternative 4A to implement additional features, the potential for construction equipment spills of hydrocarbon contaminants would be comparable to that identified under Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would extend for a longer duration (96 months as compared to 90 months under Alternative 2). Accidental spills would be contained and cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions.

Construction and dredging activities would occur within small areas (less than 1.8 percent of the proposed Project Area) and would not disrupt recreational use. Short-term direct impacts would not result in impairment to beneficial recreational use of the proposed Project Area or release toxic substances that would be deleterious to humans, fishes, or plants. Impacts would be less than significant.

Indirect Impacts

The restoration of eelgrass beds and kelp reefs under Alternative 4A would result in localized beneficial impacts related to water quality comparable to Alternative 2. Localized beneficial indirect impacts would be long-term but would not result in larger scale water quality improvements (proposed Project Area wide). Indirect impacts would not result in impairment to beneficial recreational use of the proposed Project Area or release toxic substances that would be deleterious to humans, fishes, or plants. Impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Maintenance, monitoring, and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. Short-term turbidity may occur in eelgrass transplant areas and at rocky reef repair sites. Turbidity would be localized and would be expected to dissipate within a short duration. These activities would be short-term and would not result in the release of toxic substances that would be deleterious to human, fishes, or plant life nor result in substantial impairment of beneficial recreational use of the proposed Project Area.

Impact Summary

Comparable to Alternative 2, Alternative 4A would result in short-term localized, less than significant adverse impacts on water quality from sediment suspension and turbidity and potential accidental minor spills or leaks of hydrocarbons from construction equipment within the proposed Project Area during construction and OMRR&R activities. However, no long-term degradation or permanent new source of pollution would be introduced into the proposed Project Area. Water quality monitoring would be conducted to ensure that turbidity and/or dissolved oxygen problems do not occur and to allow for implementation of BMPs should problems occur. Habitat features would enhance water quality efforts in the proposed Project Area from the localized production of oxygen, improved water quality, absorbed nutrients, and storing of greenhouse gases by eelgrass and kelp forests.

Alternative 4A would not likely result in: release of toxic substances that would be deleterious to human, fishes, or plant life; substantial impairment of beneficial recreational use of the proposed Project Area. Therefore, impacts to water quality under Alternative 4A would be less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct Impacts

The placement of various sizes of stone into ocean waters to create the rocky and kelp reefs, as well as sand placement for eelgrass beds, would result in short-term suspension of sediments at the stone and sand placement sites under Alternative 8. Dredging activities for eelgrass bed sand at the Surfside/Sunset Borrow site would result in short-term localized turbidity/suspension of sediments and decreases in dissolved oxygen at the dredge site. WQ-1 and WQ-2 would be implemented to ensure that turbidity increases or dissolved oxygen decreases do not result in significant impacts. Stone stored at the staging area is expected to have reduced quantities if loose sediment as a result of repeated handling and transportation to the staging area prior to storage and the implementation of WQ-3. Sediment associated with stone may enter the water as a result of handling or loading of stone onto barges at the staging area for transport to construction areas; however, quantity of sediment is expected to be minimal and to quickly dissipate should it enter the water adjacent to the staging area.

The creation of the approximately 24-acre sandy island and the approximately 52-acre wetland areas, including the construction of a cofferdam and caisson, would also result in short-term suspension of sediments. Alternative 8 would not result in a substantially greater amount of suspended sediments due to the additional nearshore and open water rocky reefs or small oyster bed as compared to Alternative 2. Turbidity plumes from dredging of sand for the sandy island and wetlands would be limited to the immediate vicinity of the dredging operations because of the sandy nature of the sediments and the lack of long-shore currents and/or a mild wave climate at the site. WQ-1 and WQ-2 would be implemented to ensure that turbidity increases or dissolved oxygen decreases do not result in significant impacts.

Placement of dredged materials for creation of the sandy island and wetlands has the potential to increase turbidity in the surrounding waters. Sediments suspended in the water column could be carried with the current away from the sandy island and wetlands sites, resulting in a turbidity plume in the surrounding areas. Turbidity plumes are generally short-term, as suspended sediment eventually settles back on the bay floor. Once established, wetlands have a rich natural diversity of plants and animals that act as a filtering system, improving water quality by removing sediment, nutrients, and pollutants from the water (USEPA 2006).

Although additional construction would occur under Alternative 8 to implement additional features, the potential for construction equipment spills of hydrocarbon contaminants would be comparable to that identified under Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would extend for a longer duration (113 months as compared to 90 months under Alternative 2). Accidental spills would be contained and cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions.

Construction and dredging activities would occur within small areas (less than 3.3 percent of the proposed Project Area) and would not disrupt recreational use. Short-term direct impacts would not release toxic substances that would be deleterious to humans, fishes, or plants. Impacts would be less than significant.

Indirect Impacts

The restoration of eelgrass beds, kelp reefs, sandy island, wetlands, and small oyster beds under Alternative 8 would result in localized beneficial impacts related to water quality comparable to Alternative 2. Localized beneficial indirect impacts would be long-term but would not result in larger scale water quality improvements (proposed Project Area wide). Indirect impacts would not result in impairment to beneficial recreational use of the proposed Project Area or release toxic substances that would be deleterious to humans, fishes, or plants. Impacts would be less than significant

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R and adaptive management activities for eelgrass beds, near and open water rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Short-term turbidity may occur in eelgrass transplant areas or at rocky reef repair sites. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (*e.g*., vegetation replacement and invasive species management) would likely be higher during initial establishment of the wetland and would likely decrease after establishment is complete. Minor structure repairs would take place on a 10-year cycle or when needed after a large storm event or sea level rise. Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization. Sand replenishment and dredging activities for these features would result in short-term sediment suspension and turbidity, as described under construction direct impacts above, however, less sand would be needed and, therefore, a shorter period of dredging. Turbidity would be localized and would be expected to dissipate within a short duration. Accidental spills would be contained and cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions.

OMRR&R and adaptive management activities would be short-term and would not result in the release of toxic substances that would be deleterious to human, fishes, or plant life nor result in substantial impairment of beneficial recreational use of the proposed Project Area. Impacts of OMRR&R under Alternative 8 would be short-term, localized, and less than construction impacts discussed above, and less than significant.

Impact Summary

Alternative 8 would result in short-term localized, less than significant direct adverse impacts on water quality from sediment suspension and turbidity and minimal accidental spills or leaks of hydrocarbons from construction equipment anticipated within the proposed Project Area during construction and OMRR&R activities. Water quality monitoring would be conducted to ensure that turbidity and/or dissolved oxygen problems do not occur and to allow for implementation of BMPs should problems occur. Accidental spills would be cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions. No long-term degradation or permanent new source of pollution would be introduced into the proposed Project Area. Habitat features would enhance water quality efforts from the localized production of oxygen, improved water quality, absorbed nutrients, and storing of greenhouse gases by eelgrass and kelp forests.

Alternative 8 would not likely result in: release of toxic substances that would be deleterious to human, fishes, or plant life; substantial impairment of beneficial recreational use of the proposed Project Area. Therefore, impacts to water quality under Alternative 8 would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.4 AIR QUALITY AND GREENHOUSE GASES (GHG)

5.4.1 Relevant Regulations and Significance Criteria

Relevant Regulations

Air Quality

- Federal CAA: Establishes Federal air quality standards, known as the National Ambient Air Quality Standards (NAAQS), and specifies future dates for achieving compliance. Mandates that the state submit and implement a State Implementation Plan (SIP) for areas not meeting these standards.

  Established under the CAA (section 176(c)(4)), the General Conformity Rule plays an important role in helping states and tribes improve air quality in those areas that do not meet the NAAQS. Under the General Conformity rule, Federal agencies must work with state, tribal and local governments in a nonattainment or maintenance area to ensure that Federal actions conform to the air quality plans established in the applicable state or tribal implementation plan.

  USEPA initially promulgated the General Conformity Rule in 1993. Subsequently, USEPA collected information from other Federal agencies on how to maintain the same environmental protections while streamlining the General Conformity implementation process. This information was used to revise the General Conformity Rule. After soliciting public comments, USEPA issued final rule revisions on April 5, 2010.

The purpose of the General Conformity Rule is to ensure that actions taken by the Federal agencies do not interfere with a state's plan to attain and maintain national standards for air quality.

The General Conformity Rule (40 C.F.R. §§ 93.150–93.165) ensures that Federal actions comply with NAAQS. In order to meet this CAA requirement, a Federal agency must demonstrate that every action that it undertakes, approves, permits or supports will conform to the appropriate SIP. To do so, the Federal agency must either determine that the action is exempt from General Conformity regulations or make a conformity determination consistent with the General Conformity requirements.

A Federal action is exempt from General Conformity regulations if an applicability analysis shows that total direct and indirect emissions of the criteria pollutant or precursor in a nonattainment or maintenance area caused by a Federal action would be less than any of the rates specified in 40 CFR 93.153(b)(1) on an annual basis. "Total of direct and indirect emission" means the sum of direct and indirect emissions increases and decreases caused by the Federal action; *i.e*., the "net" emissions considering all direct and indirect emissions. The portion of emissions which are exempt or presumed to conform under § 93.153 (c), (d), (e), or (f) are not included in the "total of direct and indirect emissions." The "total of direct and indirect emissions" includes emissions of criteria pollutants and emissions of precursors of criteria pollutants. Direct emissions include construction emissions. Indirect emissions mean those emissions of a criteria pollutant or its precursors:

1. That are caused or initiated by the Federal action and originate in the same nonattainment or maintenance area but occur at a different time or place as the action;
2. That are reasonably foreseeable;
3. That the agency can practicably control; and
4. For which the agency has continuing program responsibility.

"Reasonably foreseeable emissions" are projected future direct and indirect emissions that are identified at the time the conformity determination is made; the location of such emissions is known and the emissions are quantifiable as described and documented by the Federal agency based on its own information and after reviewing any information presented to the Federal agency.

If the action is determined not to be exempt and the emissions would equal or exceed the applicability rates, a conformity determination is required.

The General Conformity Applicability Analysis for this Federal action is incorporated throughout this section under the significance threshold titled: General Conformity Applicability Rates (NEPA).

- State of California CAA: Requires all areas of the state to achieve and maintain the California Ambient Air Quality Standards (CAAQS) by the earliest practical date.
- State of California Air Resources Board On-Road and Off-Road Vehicle Rules: A comprehensive plan for the purpose of reducing diesel PM (DPM) emissions.

- Regional South Coast Air Quality Management District (SCAQMD): Primarily responsible for planning, implementing, and enforcing air quality standards for all of Orange County, Los Angeles County (excluding the Antelope Valley portion), the western non-desert portion of San Bernardino County, and the western Coachella Valley and San Gorgonio Pass portions of Riverside County.
- Regional Air Quality Management Plan: The SCAQMD adopted a series of air quality management plans to meet the CAAQS and NAAQS, and has developed many rules and regulations to regulate sources of air pollution in the SCAB and to help achieve air quality standards.
- Long Beach General Plan Air Quality Element

Significance Criteria

Air Quality Significant Criteria

Disclosure of environmental impacts under NEPA and CEQA typically include defining or selecting a qualitative or quantitative threshold. Once these significance thresholds have been established, the estimated impacts can be compared to the thresholds to determine whether those impacts would be significant. The following thresholds were used to determine significance under NEPA, CEQA, or both.

General Conformity Applicability Rates (NEPA). Air quality impacts under NEPA would be significant if emissions exceed General Conformity Applicability Rates for pollutants for which the air basin is considered to be in a non-attainment or maintenance status.

The proposed action is located entirely within the SCAB. Annual emissions for the most emission intensive year were totaled and compared to the applicable general conformity rates in the SCAB. The SCAB encompasses three areas with different attainment designation for certain criteria pollutants: Los Angeles County, Orange County, and Riverside County. Criteria pollutants that are in nonattainment or in maintenance status and their associated General Conformity applicability rates are shown in Table 5-2.

Table 5-2: General Conformity Applicability Rates

	Los Angeles County		Riverside County		Orange County	
Pollutant	**Designation Category**	**Emission (tons/year)**	**Designation Category**	**Emission (tons/year)**	**Designation Category**	**Emission (tons/year)**
Ozone (VOC as precursor)	Nonattainment (Extreme)	10	Nonattainment (Extreme)	10	Nonattainment (Extreme)	10
Ozone (NOx as precursor)	Nonattainment (Extreme)	10	Nonattainment (Extreme)	10	Nonattainment (Extreme)	10
Carbon Monoxide (CO)	Maintenance	100	Maintenance	100	Maintenance	100
Nitrogen Dioxide (NO2)	Maintenance	100	Maintenance	100	Maintenance	100
Particulate Matter (PM10)	Maintenance	100	Maintenance	100	Maintenance	100
Particulate Matter (PM2.5)	Nonattainment (Serious)	70	Nonattainment (Serious)	70	Nonattainment (Serious)	70
Lead (Pb)	Nonattainment	25	Attainment	N/A	Attainment	N/A
Sources: 40 CFR 93.53(b)(1) and 40 CFR 93.53(b)(2); EPA 2021 (California Nonattainment/Maintenance Status for Each County by Year for all Criteria Pollutants https://www3.epa.gov/airquality/greenbook/anayo_ca.html) VOC = Volatile Organic Chemical						

Onsite emissions would be located within the Los Angeles County and Orange County portion of the SCAB. Emissions associated with transportation of stones from Western Riverside County would be located within the Riverside County portion of the SCAB. Emissions associated with transportation of stones from Catalina Island would be located within the Los Angeles County portion of the SCAB. Sand dredging operations are considered part of the onsite emissions.

Estimates of lead emissions were not calculated. Lead emissions from mobile sources in California have significantly decreased due to the near elimination of lead in fuels. Emission factors developed by the USEPA, the California Air Resources Board, and the SCAQMD, including those in CalEEMod, the SCAQMD-approved emission modeling software, do not provide estimated emissions for lead. Little to no quantifiable and foreseeable lead emissions would be generated by the proposed action.

The construction duration for each alternative would span multiple years ranging from approximately 90 months for Alternative 2, 96 months for Alternative 4A, and to approximately 113 months for Alternative 8. Instead of reporting annual emissions for every year of construction for each alternative, only the emissions from the most intensive construction year (when sand dredging would occur in 2034) are reported. Annual emissions for other construction years would be less. Table 5-3 shows maximum annual emissions for all alternatives.

SCAQMD Daily Emission Thresholds (CEQA). Air quality impacts under CEQA would be significant if emissions exceed SCAQMD Daily Emission Thresholds as shown in Table 5-3.

Air Toxics and Sensitive Receptors (CEQA). Air quality impacts under CEQA would be significant if emissions expose sensitive receptors to substantial pollutant concentration including air toxics.

Objectionable Odors (CEQA). Air quality impacts under CEQA would be significant if emissions create objectionable odors affecting a substantial number of people.

Compliance with Applicable Air Quality Plan (CEQA). Obstruct or conflict with the implementation of the applicable air quality plan.

Table 5-3: Significance Thresholds – South Coast Air Quality Management District

Pollutant	Mass Daily Thresholds (pounds per day)		Mass Rate Screening Thresholds (pounds per day)[1]	
	Construction	Operation	Construction	Operation
Ozone (NO_X as precursor)	100	55	179	179
Ozone (VOC as precursor)	75	55	NA	NA
Particulate Matter (PM_{10})	150	150	191	46
Particulate Matter ($PM_{2.5}$)	55	55	120	29
Sulfur Oxides (SO_X)	150	150	NA	NA
Carbon Monoxide (CO)	550	550	10,198	10,198
Lead (Pb)	3	3	NA	NA

Sources: SCAQMD 2008

[1] The source-receptor distance of 500 meters was conservatively selected based on the distance between nearshore rocky reef working areas and the nearest residences. The work area size of 5 acres was selected based on the size of nearshore rocky reef working areas.

GHG Significance Criteria

NEPA GHG Statement. There are currently no Federal GHG emission thresholds. Therefore, the USACE did not utilize the CEQA significance threshold, propose a new GHG threshold, or make a NEPA significance impact determination for GHG emissions anticipated to result from any of the alternatives.

Rather, in compliance with NEPA implementing regulations, the anticipated emissions are disclosed for each alternative without expressing a judgment as to their significance.

10,000 MT of CO_2E per Year (CEQA). The following GHG thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the *CEQA Guidelines*.

- GHG impacts would be considered significant if total GHG emissions amortized over a period of 30 years exceed 10,000 metric tons of CO_2E per year.

Pursuant to CEQA, exceedance of this threshold may result in a significant impact on the environment and may conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHG.

Amendments to *CEQA Guidelines* Section 15064.4 were adopted to assist CEQA lead agencies in determining the significance of the impacts of GHG emissions. Consistent with existing CEQA practice, Section 15064.4 gives CEQA lead agencies the discretion to determine whether to assess those emissions quantitatively or qualitatively. If a qualitative analysis is used, in addition to quantification, this section recommends certain qualitative factors that may be used in the determination of significance (*i.e*., extent to which the project may increase or reduce GHG emissions compared to the existing environment, whether the project exceeds an applicable significance threshold, and extent to which the project complies with regulations or requirements adopted to implement a reduction or mitigation of GHGs). The amendments do not establish a threshold of significance; rather, CEQA lead agencies are granted discretion to establish significance thresholds for their respective jurisdictions, including looking to thresholds developed by other public agencies, or suggested by other experts, such as the California Air Pollution Control Officers Association, so long as any threshold chosen is supported by substantial evidence (see Section 15064.7(c)). The California Natural Resources Agency has also clarified that the *CEQA Guidelines* amendments focus on the effects of GHG emissions as cumulative impacts, and that they should be analyzed in the context of CEQA's requirements for cumulative impact analysis (see Section 15064(h)(3)) (California Natural Resources Agency 2009, 11–13, 14, 16; Bryant 2009).

As stated previously, the *CEQA Guidelines* allow CEQA lead agencies to establish significance thresholds that consider thresholds of significance adopted or recommended by other public agencies or experts. For the purpose of assessing environmental impacts pursuant to CEQA, this analysis follows guidance from the SCAQMD's *Interim CEQA GHG Significance Thresholds* (SCAQMD 2008).

For proposed projects that are not exempt from CEQA and are not within the emissions budget of an approved regional GHG reduction plan, GHG emissions are assessed against Tier 3 thresholds to determine whether the project would represent a considerable contribution to cumulative impacts.

Full implementation of the Governor's Executive Order (EO) S-3-05 would reduce GHG emissions 80 percent below 1990 levels or 90 percent below current levels by 2050. Thus, SCAQMD's Tier 3 thresholds were established based on a 90 percent emission capture rate may be more appropriate to address the long-term adverse impacts. For industrial projects the Tier 3 threshold is life cycle equivalent annual emissions of 10,000 metric tons (MT) CO_2E. SCAQMD guidance states that construction emissions should be amortized over the life of the project, added to the operational emissions, and compared to the threshold.

The project does not have a definite life span; however, as CDFW Material Specification Guidelines require that materials used in the project must remain unchanged after 30 years of submersion in seawater. For the purpose of this GHG life cycle analysis the life span of the project is conservatively considered to be 30 years.

Methodology

Detailed methodology is shown in Appendix E.

Environmental Commitments

Implementation of the following environmental commitments would minimize air quality impacts associated with the proposed alternatives. These measures would minimize impacts from short-term construction emissions.

AQ-1 Diesel engine idle time would be restricted to no more than ten minutes duration.

AQ-2 Idling of heavy-duty diesel trucks during loading and unloading shall be limited to five minutes; auxiliary power units should be used whenever possible.

AQ-3 All on-road construction vehicles would meet all applicable California on-road emission standards and would be licensed in the State of California.

AQ-4 Activities and operations on unpaved road areas would be minimized to the extent feasible during high wind events to minimize dust.

AQ-5 Vehicle speeds shall be limited to 15 miles per hour on unpaved surfaces.

AQ-6 Dredging equipment utilized during construction and maintenance will be licensed in California and will meet the model year 2010 (Tier 4 Final) or newer emissions standards for sand dredging operations.

AQ-7 Diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters as certified and/or verified by the USEPA or CARB shall be installed on equipment operating onsite.

AQ-8 Keep roadways next to the proposed staging area clean and frequently remove daily project-related accumulated silt and debris.

AQ-9 Maintain all equipment as recommended by manufacturers' manuals.

AQ-10 Shut-down any equipment not in use for more than 30 minutes.

AQ-11 Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment.

AQ-12 If equipment is operating on soils that cling to wheels, use a "grizzly" or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the staging area, immediately before the pavement in order to remove most of the soil from vehicle tires.

AQ-13 Contractors will be required to use only heavy-duty trucks or engines from model year 2010 or newer that meet CARB's 2010 engine emission standards of 0.01 g/bhp-hr for particulate matter (PM) and 0.20 g/bhp-hr of NOx emissions.

AQ-14 Contractors will be required to maintain records of all heavy-duty trucks associated with the project's construction. These records will be kept current and will be made available to the USACE at any time requested within 7 calendar days of request. Additionally, contractors will be required to provide monthly reports of all heavy-duty trucks associated with the project's construction to the USACE along with any requested records of heavy-duty trucks associated with the project's construction within 7 calendar days of request and these records will be reviewed to the maximum extent feasible and practicable.

5.4.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Air Quality Direct and Indirect Impact Analysis

General Conformity Applicability Rates (NEPA). Under the No Action Alternative, there would be no construction-related air emissions. There would be no impacts under NEPA.

SCAQMD Daily Emission Thresholds (CEQA). Under the No Action Alternative, there would be no construction-related air emissions. There would be no impacts under CEQA.

Air Toxics and Sensitive Receptors (CEQA). Under the No Action Alternative, there would be no construction-related emissions that would expose sensitive receptors to substantial pollutant concentration including air toxics.

Objectionable Odors (CEQA). Under the No Action Alternative, there would be no construction-related air emissions that would result in objectionable odors affecting a substantial number of people. There would be no impacts under CEQA.

Compliance with Applicable Air Quality Plan (CEQA). Under the No Action Alternative, there would be no construction-related air emissions. There would be no obstruction or conflict with the implementation of the applicable air quality plan. There would be no impacts under CEQA.

GHG Direct and Indirect Impact Analysis

NEPA GHG Disclosure. Under the No Action Alternative, there would be no construction-related air emissions. There would be no emissions of GHGs.

10,000 MT of CO_2E per Year (CEQA). Under the No Action Alternative, there would be no construction-related air emissions. There would be no emissions of GHGs. There would be no impacts under CEQA.

Impact Summary

Under the No Action Alternative, there would be no project related construction- or operation-related air emissions. Therefore, the No Action Alternative would not result adverse air quality impacts under NEPA or CEQA. Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related GHG emission impacts under this alternative.

Alternative 2

Construction Impacts

Air Quality Direct and Indirect Impact Analysis

General Conformity Applicability Rates (NEPA). Annual emissions for Alternative 2 are summarized in Table 5-4. Emissions associated with Alternative 2, including dredging activities, would be below all applicable General Conformity Applicability Rates. Impacts would be less than significant.

Table 5-4: Alternative 2 – Comparison to General Conformity Applicability Rates

Pollutant	Project Emissions (tons/year)		Applicability Rate (tons/year)	Equals or Exceeds Applicability Rate?
	Catalina Quarry & On-Site Emissions	3M Quarry & On-Site Emissions		
Ozone (VOC as precursor)	0.2	0.2	10	***No/No***
Ozone (NO_X as precursor)	2.5	3.4	10	***No/No***
Carbon Monoxide (CO)	2.4	2.4	100	***No/No***
Nitrogen Dioxide (NO2)	2.5	3.4	100	***No/No***
Particulate Matter (PM_{10})	0.1	0.2	70	***No/No***
Particulate Matter ($PM_{2.5}$)	0.1	0.1	100	***No/No***
Sources: Appendix E				

SCAQMD Daily Emission Thresholds (CEQA). Total project emissions for Alternative 2 were compared to daily mass emission significance thresholds for regional air quality impacts. As shown in Table 5-5, emissions associated with Alternative 2, including dredging activities, would be below applicable SCAQMD significance thresholds for all pollutants and would not result in a violation of air quality standards. Impacts would be less than significant.

Table 5-5: Alternative 2 – SCAQMD Daily Emission Thresholds (CEQA)

Pollutant	Project Emissions (pounds/day)		Significance Threshold (pounds/day)	Exceeds Threshold?
	Catalina Quarry & On-Site Emissions	3M Quarry & On-Site Emissions		
Volatile Organic Compounds (VOC)	8	8	75	***No/No***
Nitrogen Oxides (NO_X)	92	92	100	***No/No***
Carbon Monoxide (CO)	118	118	550	***No/No***
Sulfur Oxides (SO_X)	<1	<1	150	***No/No***
Particulate Matter (PM_{10})	5	5	150	***No/No***
Particulate Matter ($PM_{2.5}$)	2	2	55	***No/No***
Sources: Appendix E				

Air Toxics and Sensitive Receptors (CEQA). On-site daily emissions for Alternative 2, including dredging activities, were compared to mass rate screening thresholds for localized air quality impacts. As shown in Table 5-6, emissions associated with Alternative 2 would be below the applicable SCAQMD localized significance thresholds and would not expose sensitive receptors to substantial criteria pollutant concentrations.

Table 5-6: Alternative 2 – Comparison to Local Significance Thresholds

Pollutant	On-Site Project Emissions (pounds/day)	Significance Threshold (pounds/day)	Exceeds De Minimis Level?
Carbon Monoxide (CO)	117	10,198	***No***
Nitrogen Oxides (NO_X)	92	179	***No***
Particulate Matter (PM_{10})	5	191	***No***
Particulate Matter ($PM_{2.5}$)	2	120	***No***
Sources: Appendix E			

Project toxic air contaminant emissions would include DPM emissions from materials hauling and off-road equipment including marine vessels. Cancer risk from DPM exposure is a function of concentration and duration of exposure.

Off-road equipment emissions would be generated at the project staging area (Port of Long Beach Pier T) for the full 90-month construction period and would also be generated at the construction sites for rocky reefs for part of the 90-month construction period (duration of individual sites varies). The distance between project staging area (Port of Long Beach Pier T) and the nearest sensitive receptors is approximately 1.5 miles. The distance between the proposed rocky reef and nearest sensitive receptor is approximately 1,500 feet. Due to the substantial distance between the emissions release and the nearest sensitive receptors, pollutant concentrations would largely dissipate before reaching the nearest sensitive receptors. Therefore, off-road equipment emissions would not substantially elevate pollutant concentrations at any sensitive receptor under Alternative 2.

Hauling emissions would be generated for the full 90-month construction period. Hauling emissions would be distributed, either along the 25-mile nautical waterway between Catalina Island Quarry and the project site or the 55 miles of roadways between 3M Quarry and the project site. Haul emissions would also be distributed along the 3 nautical mile waterway between the dredge site (Surfside/Sunset Borrow site) and the nearshore rocky reefs. As the emissions release for hauling emissions would be distributed over large areas, hauling emissions would not substantially elevate pollutant concentrations at any sensitive receptor.

Alternative 2 would not result in significant adverse impacts to sensitive receptors.

Objectionable Odors (CEQA). The potential for an odor impact is dependent on a number of variables including the nature of the odor source, distance between the receptor and odor source, and local meteorological conditions. During construction, potential odor sources associated with Alternative 2 include diesel exhaust associated with materials hauling, marine vessel generators, and on-deck equipment. Diesel exhaust may be noticeable within a few hundred feet with perfect climatic conditions; however, construction activities would be temporary, and—given the distance to the nearest sensitive receptors—would dissipate without affecting a substantial number of people. Alternative 2 would not create objectionable odors affecting a substantial number of people or result in significant adverse impacts due to odors.

Compliance with Applicable Air Quality Plan (CEQA). Impacts associated with the applicable air quality plan were assessed qualitatively. The regional air quality plan, the 2016 Air Quality Management Plan (AQMP), outlines measures to reduce emissions of ozone and $PM_{2.5}$. The growth forecasting for the AQMP is based in part on the land uses established by local general plans. Thus, if an action is consistent with land use as designated in the local general plan, it can normally be considered consistent with the AQMP. Actions that propose a different land use than is identified in the local general plan may also be considered consistent with the AQMP if the proposed land use is less intensive than buildout under the current designation. Alternative 2 would not involve a change in land use designation, or would result in regional growth, and would therefore be consistent with the growth assumptions used in development of the AQMP. Thus, Alternative 2 would not obstruct or conflict with implementation of the AQMP.

GHG Direct and Indirect Impact Analysis

NEPA GHG Statement. GHG emissions from construction of Alternative 2, including dredging activities, were estimated based on the methodology described in Appendix E. Total GHG was estimated for the construction period of 90 months. If stone is imported from the Catalina Quarry, Alternative 2 would result in approximately 1,609 MT CO_2E, which is the 30-year annual equivalent of 54 MT CO_2E. If stone is imported from the 3M Quarry in Corona, Alternative 2 would result in approximately 2,851 MT CO_2E, which is the 30-year annual equivalent of 95 MT CO_2E.

10,000 MT of CO_2E per Year (CEQA). GHG emissions from construction of Alternative 2, including dredging activities, were estimated based on the methodology summarized previously. Total GHG was estimated for the construction period of 90 months. If stone is imported from the Catalina Quarry, Alternative 2 would result in approximately 1,609 MT CO_2E, which is the 30-year annual equivalent of 54 MT CO_2E. If stone is imported from the 3M Quarry in Corona, Alternative 2 would result in approximately 2,851 MT CO_2E, which is the 30-year annual equivalent of 95 MT CO_2E. Under CEQA, project GHG emissions would not exceed the SCAQMD Tier 3 30-year annual equivalent threshold of 10,000 MT CO_2E, and impacts would be less than significant under Alternative 2.

OMRR&R Impacts (Including MAMP Implementation)

Air Quality and GHG Direct and Indirect Impact Analysis

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F, MAMP). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours. The frequency and number of days required to complete this monitoring effort is not known and may vary depending on the level of success of the project, however, even year-round monitoring efforts would result in air emissions well below construction emissions.

If results of the monitoring are poor and trigger adaptive management action, further monitoring may be required to determine the cause of system stress and/or project failure in order to choose the appropriate adaptive management action. Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would result in air emissions well below construction emissions.

Once ecological success has been achieved for kelp reefs or eelgrass beds, no further monitoring would be required. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may rise approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment. These activities would result in air emissions well below construction emissions.

With respect to General Conformity, emissions associated with repair of rocky reefs are considered maintenance activities which are considered exempt under 40 CFR 93.153(c)(2)(iv). Emissions associated with monitoring are exempt under 40 CFR 93.153(c)(2)(vii).

Impact Summary

Based on the above, emissions associated with construction, including dredging activities, would be below General Conformity Applicability Rates and SCAQMD Daily Emission Thresholds. Likewise, emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. Air quality impacts under both NEPA and CEQA would be less than significant. GHG impacts would be less than significant under CEQA.

Emissions associated with OMRR&R activities would be exempt from the General Conformity Rule under NEPA. Under CEQA, estimated emission would be well below SCAQMD Daily Emission Thresholds. Likewise, emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. Air quality impacts under CEQA would be less than significant. GHG impacts would be less than significant under CEQA.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Air Quality Direct and Indirect Impact Analysis

General Conformity Applicability Rates (NEPA). Annual emissions for Alternative 4A, including dredging activities, are summarized in Table 5-7. Emissions associated with Alternative 4A would be below all applicable General Conformity Applicability Rates. Impacts under NEPA would be less than significant.

Table 5-7: Alternative 4A – Comparison to General Conformity Applicability Rates

Pollutant	Project Emissions (tons/year)		Applicability Rate (tons/year)	Equals or Exceeds Applicability Rates?
	Catalina Quarry & On-Site Emissions	3M Quarry & On-Site Emission s		
Ozone (VOC as precursor)	0.5	0.4	10	***No/No***
Ozone (NO_X as precursor)	5.4	8.0	10	***No/No***
Carbon Monoxide (CO)	4.3	3.4	100	***No/No***
Nitrogen Dioxide (NO2)	5.4	8.0	100	***No/No***
Particulate Matter (PM_{10})	0.2	0.4	100	***No/No***
Particulate Matter ($PM_{2.5}$)	0.2	0.2	70	***No/No***
Sources: Appendix E				

SCAQMD Daily Emission Thresholds (CEQA). Total project emissions for Alternative 4A, including dredging activities, were compared to daily mass emission significance thresholds for regional air quality impacts. As shown in Table 5-8, emissions associated with Alternative 4A would be below applicable SCAQMD significance thresholds and would not result in a violation of air quality standards. Impacts would be less than significant.

Table 5-8: Alternative 4A – SCAQMD Daily Emission Thresholds (CEQA)

Pollutant	Project Emissions (pounds/day)		Significance Threshold (pounds/day)	Exceeds Threshold?
	Catalina Quarry & On-Site Emissions	3M Quarry & On-Site Emissions		
Volatile Organic Compounds (VOC)	8	8	75	***No/No***
Nitrogen Oxides (NO_X)	92	92	100	***No/No***
Carbon Monoxide (CO)	118	118	550	***No/No***
Sulfur Oxides (SO_X)	<1	<1	150	***No/No***
Particulate Matter (PM_{10})	5	5	150	***No/No***
Particulate Matter ($PM_{2.5}$)	2	2	55	***No/No***
Sources: Appendix E				

Air Toxics and Sensitive Receptors (CEQA). On-site daily emissions are compared to mass rate screening thresholds for localized air quality impacts in Table 5-9. Emissions associated with Alternative 4A, including dredging activities, would be below the applicable SCAQMD localized significance thresholds. Therefore, the project would not expose sensitive receptors to substantial criteria pollutant concentrations.

Project toxic air contaminant emissions would be limited to DPM emissions from dredging, materials hauling, marine vessel generators, and on-deck equipment. Cancer risk from DPM exposure is a function of concentration and duration of exposure. As equipment would only operate at each nearshore site for a brief duration, the project would not be expected to create conditions where the probability is greater than 10 in 1 million of contracting cancer for the Maximally Exposed Individual. Therefore, the project would not expose sensitive receptors to substantial DPM concentrations or expose sensitive receptors to substantial pollutant concentrations.

Table 5-9: Alternative 4A – Comparison to Local Significance Thresholds

Pollutant	On-Site Project Emissions (pounds/day)	Significance Threshold (pounds/day)	Exceeds De Minimis Level?
Carbon Monoxide (CO)	117	10,198	***No***
Nitrogen Oxides (NO_X)	92	179	***No***
Particulate Matter (PM_{10})	5	191	***No***
Particulate Matter ($PM_{2.5}$)	2	120	***No***
Sources: Appendix E			

Alternative 4A would not result in significant adverse impacts to sensitive receptors.

Objectionable Odors (CEQA). The potential for an odor impact is dependent on a number of variables including the nature of the odor source, distance between the receptor and odor source, and local meteorological conditions. During construction, potential odor sources associated with the project include diesel exhaust associated with materials hauling, marine vessel generators, and on-deck equipment. Diesel exhaust may be noticeable; however, construction activities would be temporary, and—given the distance to the nearest sensitive receptors—would dissipate without affecting a substantial number of people. Alternative 4A would not create objectionable odors affecting a substantial number of people or result in significant adverse impacts due to odors.

Compliance with Applicable Air Quality Plan (CEQA). Alternative 4A would not involve a change in land use designation, or would result in regional growth, and would therefore be consistent with the growth assumptions used in development of the AQMP. Thus, Alternative 4A would not obstruct or conflict with implementation of the AQMP.

GHG Direct and Indirect Impact Analysis

NEPA GHG Statement. GHG emissions from construction of Alternative 4A, including dredging activities, were estimated based on the methodology in Appendix E. Total GHG was estimated for the construction period of approximately 96 months. If stone is imported from the Catalina Quarry, Alternative 4A would result in approximately 5,718 MT CO_2E, which is the 30-year annual equivalent of 191 MT CO_2E. If stone is imported from the 3M Quarry in Corona, Alternative 4A would result in approximately 8,960 MT CO_2E, which is the 30-year annual equivalent of 299 MT CO_2E.

10,000 MT of CO_2E per Year (CEQA). GHG emissions from construction of Alternative 4A, including dredging activities, were estimated based on the methodology summarized in Appendix E. Total GHG was estimated for the construction period of approximately 96 months. If stone is imported from the Catalina Quarry, Alternative 4A would result in approximately 5,718 MT CO_2E, which is the 30-year annual equivalent of 191 MT CO_2E. If stone is imported from the 3M Quarry in Corona, Alternative 4A would result in approximately 8,960 MT CO_2E, which is the 30-year annual equivalent of 299 MT CO_2E. Under CEQA, project GHG emissions would not exceed the SCAQMD Tier 3 30-year annual equivalent threshold of 10,000 MT CO_2E, and impacts would be less than significant for Alternative 4A.

OMRR&R Impacts (Including MAMP Implementation)

Air Quality and GHG Direct and Indirect Impact Analysis

Air quality and GHG impacts for OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2.

Impact Summary

Based on the above, emissions associated with construction, including dredging activities, would be well below General Conformity Applicability Rates and SCAQMD Daily Emission Thresholds. Likewise, emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. Air quality impacts under both NEPA and CEQA would be less than significant. GHG impacts would be less than significant under CEQA.

Emissions associated with OMRR&R activities would be exempt from the General Conformity Rule under NEPA. Under CEQA, estimated emission would be well below SCAQMD Daily Emission Thresholds. Likewise, emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. Air quality impacts under CEQA would be less than significant. GHG impacts would be less than significant under CEQA.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

<u>*Air Quality Direct and Indirect Impact Analysis*</u>

General Conformity Applicability Rates (NEPA). Annual emissions for Alternative 8, including dredging activities, are summarized in Table 5-10. Emissions of NO_x, a precursor for ozone, associated with Alternative 8 would exceed the General Conformity Applicability rate for this criteria pollutant, if either the Catalina quarry or the 3M quarry are used for obtaining rock. Emissions of other criteria pollutants would not equal or exceed their respective rates. Impacts under NEPA would be significant and unavoidable.

Table 5-10: Alternative 8 – Comparison to General Conformity Applicability Rates

Pollutant	Project Emissions (tons/year)		Applicability Rates (tons/year)	Equal or Exceeds Applicability Rates?
	Catalina Quarry & On-Site Emissions	3M Quarry & On-Site Emissions		
Ozone (VOC as precursor)	1.3	1.2	10	***No/No***
Ozone (NO_X as precursor)	15.8	17.9	10	***Yes/Yes***
Carbon Monoxide (CO)	20.4	19.3	100	***No/No***
Nitrogen Dioxide (NO2)	15.8	17.9	100	***No/No***
Particulate Matter (PM_{10})	0.6	0.9	100	***No/No***
Particulate Matter ($PM_{2.5}$)	0.5	0.6	100	***No/No***
Sources: Appendix E				

SCAQMD Daily Emission Thresholds (CEQA). Total project emissions for Alternative 8, including dredging activities, were compared to daily mass emission significance thresholds for regional air quality impacts. As shown in 5-11, emissions associated with Alternative 8 would be below applicable SCAQMD significance thresholds and would not result in a violation of air quality standards. Impacts would be less than significant.

Table 5-11: Alternative 8 – SCAQMD Daily Emission Thresholds (CEQA)

Pollutant	Project Emissions (pounds/day)		Significance Threshold (pounds/day)	Exceeds Threshold?
	Catalina Quarry & On-Site Emissions	3M Quarry & On-Site Emissions		
Volatile Organic Compounds (VOC)	8	8	75	***No/No***
Nitrogen Oxides (NO_X)	94	94	100	***No/No***
Carbon Monoxide (CO)	120	120	550	***No/No***
Sulfur Oxides (SO_X)	<1	<1	150	***No/No***
Particulate Matter (PM_{10})	5	5	150	***No/No***
Particulate Matter ($PM_{2.5}$)	2	2	55	***No/No***
Sources: Appendix E				

Air Toxics and Sensitive Receptors (CEQA). Emissions associated with Alternative 8 are primarily due to material hauling–either by barge or by truck. The project involves import of 2,482,000 tons of stone, which is more than two and a half times the amount of stone required by any other alternative. On-site daily emissions are also greater than other alternatives due to the anticipated increase in workday duration.

On-site daily emissions, including dredging, are compared to mass rate screening thresholds for localized air quality impacts in

Emissions associated with Alternative 8 would be below the applicable SCAQMD localized significance thresholds. Therefore, the project would not expose sensitive receptors to substantial criteria pollutant concentrations.

Table 5-12: Alternative 8 – Comparison to Local Significance Thresholds

Pollutant	On-Site Project Emissions (pounds/day)	Significance Threshold (pounds/day)	Exceeds De Minimis Level?
Carbon Monoxide (CO)	118	10,198	***No***
Nitrogen Oxides (NO_X)	94	179	***No***
Particulate Matter (PM_{10})	5	191	***No***
Particulate Matter ($PM_{2.5}$)	3	120	***No***
Sources: Appendix E			

Project toxic air contaminant emissions would be limited to DPM emissions from dredging, materials hauling, marine vessel generators, and on-deck equipment. Cancer risk from DPM exposure is a function of concentration and duration of exposure. As equipment would only operate at each nearshore site for a brief duration, the project would not be expected to create conditions where the probability is greater than 10 in 1 million of contracting cancer for the Maximally Exposed Individual. Therefore, the project would not expose sensitive receptors to substantial DPM concentrations.

Alternative 8 would not expose sensitive receptors to substantial pollutant concentrations or result in significant adverse impacts to sensitive receptors.

Objectionable Odors (CEQA). The potential for an odor impact is dependent on a number of variables including the nature of the odor source, distance between the receptor and odor source, and local meteorological conditions. During construction, potential odor sources associated with the project include diesel exhaust associated with materials hauling, marine vessel generators, and on-deck equipment. Diesel exhaust may be noticeable; however, construction activities would be temporary, and—given the distance to the nearest sensitive receptors—would dissipate without affecting a substantial number of people. Alternative 8 would not create objectionable odors affecting a substantial number of people or result in significant adverse impacts due to odors.

Compliance with Applicable Air Quality Plan (CEQA). Alternative 8 would not involve a change in land use designation, or would result in regional growth, and would therefore be consistent with the growth assumptions used in development of the AQMP. Thus, Alternative 8 would not obstruct or conflict with implementation of the AQMP.

GHG Direct and Indirect Impact Analysis

NEPA GHG Statement. GHG emissions from construction of Alternative 8, including dredging activities, were estimated based on the methodology in Appendix E. Total GHG was estimated for the construction period of 113 months. If stone is imported from the Catalina Quarry, Alternative 8 would result in approximately 8,392 MT CO_2E, which is the 30-year annual equivalent of 280 MT CO_2E. If stone is imported from the 3M Quarry in Corona, Alternative 8 would result in approximately 14,907 MT CO_2E, which is the 30-year annual equivalent of 497 MT CO_2E.

10,000 MT of CO_2E per Year (CEQA). GHG emissions from construction of Alternative 8, including dredging activities, were estimated based on the methodology summarized previously. Total GHG was estimated for the construction period of 113 months. If stone is imported from the Catalina Quarry, Alternative 8 would result in approximately 8,392 MT CO_2E, which is the 30-year annual equivalent of 280 MT CO_2E. If stone is imported from the 3M Quarry in Corona, Alternative 8 would result in approximately 14,907 MT CO_2E, which is the 30-year annual equivalent of 497 MT CO_2E. Under CEQA, project GHG emissions would not exceed the SCAQMD Tier 3 30-year annual equivalent threshold of 10,000 MT CO_2E, and impacts related to GHG would not be significant for Alternative 8.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Upon completion of construction continuing activities would generally include surveys of sandy island and wetland areas (see Appendix F). These activities would be anticipated to require operation of a single boat during daylight hours. The frequency and number of days required to complete these monitoring efforts is not known and may vary depending on the level of success of the project. Under Alternative 8, maintenance would not be needed for kelp reefs or eelgrass beds. These activities would occur over a short duration and result in air emissions well below construction emissions.

Once ecological success has been achieved for kelp reefs or eelgrass beds, no further monitoring would be required. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Maintenance for new sandy Island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would be for a brief duration. The sandy island revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization. These activities would occur over a short duration and result in air emissions well below construction emissions.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities and result in air emissions well below construction emissions.

With respect to General Conformity, emissions associated with repair of rocky reefs are considered maintenance activities which are considered exempt under 40 CFR 93.153(c)(2)(iv). Emissions associated with monitoring are exempt under 40 CFR 93.153(c)(2)(vii).

Impact Summary

Based on the above, emissions associated with construction, including dredging activities, would be below SCAQMD Daily Emission Thresholds. However, annual emissions of NO_x, a precursor for ozone, would exceed the General Conformity Applicability rate for this criteria pollutant, if rock is obtained using either the Catalina quarry or the 3M quarry. Emissions of other criteria pollutants would not exceed their respective rates. Impacts under NEPA would be significant. Emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. Air quality impacts under CEQA would be less than significant. General Conformity Applicability Rates would be exceeded under NEPA for NO_x, therefore, impacts would be significant and unavoidable under NEPA. No additional mitigation measures to reduce impacts below significance were identified as available. GHG impacts would be less than significant under CEQA.

Emissions associated with OMRR&R activities would be exempt from the General Conformity Rule under NEPA. Under CEQA, estimated emission would be below SCAQMD Daily Emission Thresholds. Likewise, emissions would not substantially elevate pollutant concentrations at any sensitive receptors nor would they create objectionable odors affecting a substantial number of people. Air quality impacts under CEQA would be less than significant. GHG impacts would be less than significant under CEQA.

Level of Impact for Alternative 8

Less than significant impact under CEQA. Significant and unavoidable impacts under NEPA for exceedance of the applicable General Conformity rate for NO_x, an ozone precursor.

5.5 NOISE AND VIBRATION

5.5.1 Relevant Regulations and Significance Criteria

- Federal Noise Control Act: Legislates that each state provide for the protection of its citizens from noise.
- Federal ESA: Potential impacts (take) of aquatic species listed under the ESA.
- State of California: Requires that each local government perform noise surveys and implement noise elements as part of its general plan as guided by the General Plan Guidelines (OPR 1998).
- City of Los Angeles General Plan Noise Element: Outlines guidelines for noise and land use compatibility for development and planning purposes
- City of Long Beach Noise Element of the General Plan: Recommends criteria for maximum acceptable noise in Long Beach.
- City of Long Beach Municipal Code: City's Noise Ordinances.
- City of Seal Beach Noise Ordinance: Provides noise level limits for a percentage of an hour over a given period of time within a land use zone.

Significance Criteria

The following noise thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the CEQA Guidelines. In addition, NOAA technical guidance for marine mammal noise thresholds are also included. These criteria are also being adopted for NEPA purposes. Noise impacts would be considered significant if the proposed alternatives would result in:

- Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. In this case, the applicable noise ordinance is the City of Long Beach Municipal Code, Chapter 8.80, Noise and City of Seal Beach Noise Ordinance, Chapter 7.45.
- Exposure of persons to, or generation of, excessive groundborne vibration levels.
- Exceeding recommended thresholds identified in the Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing (NOAA 2018b)

Methodology

Noise Standards. The City of Long Beach Municipal Code, Chapter 8.80, Section 8.80.202, permit's construction noise between the hours of 7:00 a.m. and 7:00 p.m. on weekdays and Federal holidays and between 9:00 a.m. and 6:00 p.m. on Saturdays. If any work on Sunday is required, the project would be required to obtain a Sunday work permit and project construction would be limited to between the hours of 9:00 a.m. and 6:00 p.m. The construction contractor may request a variance to noise ordinance time limitations, if applicable and if needed (*e.g.*, for 24-hour dredging including placement).

Groundborne Vibration Levels. California Department of Transportation (Caltrans_ guidelines recommend that a standard of 0.2 inch per second (inch/sec) peak particle velocity (PPV) not be exceeded for the protection of normal residential buildings, and that 0.08 inch/sec PPV not be exceeded for the protection of old or historically significant structures (Caltrans 2004). For this analysis, the 0.2 inch/sec PPV is used to inform the determination of significance.

Minimizing Effects of Airborne and Waterborne Noise on Wildlife. Noise may affect marine mammals, which are dependent on the production of sounds for various biological functions including social interaction, foraging, orientation, and predator detection (NOAA 2018a). Impacts to marine wildlife are categorized as:

- (Level A Harassment) has the potential to injure a marine mammal or marine mammal stock in the wild; or,
- (Level B Harassment) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

The NOAA NMFS, prepared the *Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing* in July of 2016 and issued revisions in April 2018 (NOAA 2018a). Marine Mammal Acoustic Thresholds are adapted in Table 5-13 and Table 5-14, Level A harassment may occur above 201 decibels root mean squared (dB_{rms}) for pinnipeds and 173 dB_{rms} for cetaceans. Level B harassment may occur above 160 dB_{rms} for impulse sounds (*e.g.*, impact pile driving or explosives), and 120 dB_{rms} for continuous sounds (*e.g.*, vibratory pile driving and dredging) for both pinnipeds and cetaceans (NOAA 2018b). For airborne sound, disturbance has been documented at 100 dB (unweighted) for pinnipeds in general, and at 90 dB_{rms} (unweighted) for harbor seals (NOAA 2018b).

Table 5-13: Marine Mammal Acoustic Thresholds Level A Harassment (Hearing Damage)

Hearing Group	Generalized Hearing Range[1]	Permanent Threshold Shift Onset In-Water Acoustic Thresholds[2] (Received Level)	
		Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans (baleen whales)	7 Hz to 35 kHz	$L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz	$L_{pk,flat}$: 230 dB $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger* & L. australis)	275 Hz to 160 kHz	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (true seals) (underwater)	50 Hz to 86 kHz	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (sea lions and fur seals) (underwater)	60 Hz to 39 kHz	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

Source: NOAA 2018a

1 Represents the generalized hearing range for the entire group as a composite (*i.e.*, all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 dB threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans and PW pinniped (approximation).

2 Dual metric thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds are recommended for consideration.

Note: Peak sound pressure level ($L_{p,0\text{-}pk}$) has a reference value of 1 µPa, and weighted cumulative sound exposure level ($L_{E,p}$) has a reference value of 1µPa²s. In this Table, thresholds are abbreviated to be more reflective of International Organization for Standardization standards. The subscript "flat" is being included to indicate peak sound pressure are flat weighted or unweighted within the generalized hearing range of marine mammals (*i.e.*, 7 Hz to 160 kHz). The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The weighted cumulative sound exposure level thresholds could be exceeded in a multitude of ways (*i.e.*, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these thresholds will be exceeded.

Table 5-14: Marine Mammal Acoustic Thresholds Level B Harassment (Behavior Disruption)

Criterion	Threshold
In-Water Noise	
Behavioral disruption for impulsive noise (*e.g.*, impact pile driving)	160 dB_{rms}
Behavioral disruption for continuous noise (*e.g.*, vibratory pile driving, drilling)	120* dB_{rms}
In-Air Noise	
Behavioral disruption for harbor seals	90 dB_{rms}
Behavioral disruption for non-harbor seal pinnipeds	100 dB_{rms}

Source: NOAA 2018b

*The 120 dB threshold may be slightly adjusted if background noise levels are at or above this level.

Quarry Noise. The Catalina Island Quarry has direct marine access for the loading of stone, there would be no need for truck hauling over public highways if this site were used. Stone would be loaded onto flat-deck barges with cranes (supply barges) and front-end loaders. Equipment use would be within the boundary of Catalina Island Quarry and would be part of normal operation of the quarry.

The 3M Quarry includes equipment for loading stone onto heavy trucks. Equipment use would be within the boundary of 3M Quarry and would be part of normal operation of the quarry.

Equipment Noise. Heavy-duty equipment used for loading at quarries, staging and transferring stone at Pier T, and moving stone on the deck of barges would be similar. This equipment would include equipment such as front-end loaders and cranes. The U.S. EPA's *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances* includes a characterization of noise levels common of heavy-duty equipment. The Study indicates that front-end loaders typically generate maximum noise levels between 73 and 86 dB(A) maximum sound level (L_{Max}) at a distance of 50 feet and that cranes typically generate maximum noise levels between 75 and 88 dB(A) L_{Max} at a distance of 50 feet (U.S. EPA 1971). Subsequent studies incorporated into the Federal Highway Administration (FHWA) guidance and incorporated into FHWA's *Roadway Construction Noise Model* identify similar noise levels and further clarify the effects of the load cycle. FHWA guidance indicates that front-end loaders typically generate maximum noise levels of 80 dB(A) L_{max} at 50 feet and average noise levels of 76 dB(A) L_{eq} at 50 feet and that cranes typically generate maximum noise levels of 85 dB(A) L_{max} at 50 feet and average noise levels of 77 dB(A) L_{eq} at 50 feet (FTA 2006). Equipment noise was modeled using FHWA reference noise levels and noise propagation was modeling using standard algorithms from International Organization for Standardization method ISO 9613-2 – Acoustics, Attenuation of Sound during Propagation Outdoors.

Tugboats. Ships and boats are a highly complex series of mechanical sources within the vessel, each of which has its own amplitude and frequency. Individual ship sources include the engine, transmission, and the propellers. The amount of sound radiated from a vessel is a function of vessel speed (McKenna et al 2012).

Tugboats would move barges approximately 25 nautical miles from Catalina Island Quarry to the project site. As tugboats do not remain in any location for extended periods of time, contribution of individual tugboats to the noise environment is limited. The number of tugboats (*i.e*., number of towed barges) was estimated based on the volume of stone and capacity of barges. The number of barges towed daily was estimated based on the duration of construction and was rounded up to the nearest whole number.

Previous noise studies prepared jointly by the USACE and the Port of Los Angeles indicate that tugboat engines typically generate maximum noise levels between 87 dB(A) L_{Max} at a distance of 50 feet (California State Lands Commission 2004).

Truck Traffic. If stone is sourced from the 3M Quarry, heavy trucks would be required to haul the stone 55 miles to the project staging area. Truck traffic would contribute to cumulative traffic noise level on freeways. The total number of vehicle trips was estimated based on the volume of stone and capacity of trucks. Total trips were averaged over the duration of construction to determine the number of annual and daily truck trips.

Derrick Barge. The U.S. EPA's *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances* indicates that derrick cranes typically generate maximum noise levels between 86 and 89 dB(A) L_{Max} at a distance of 50 feet. Applying load factors from FHWA guidance, maximum noise levels of 89 dB(A) L_{Max} at 50 feet would result in average noise levels of 81 dB(A) L_{eq} at 50 feet (FHWA 2006). Noise from the derrick barge crane was modeled using a reference noise level of 81 dB(A) L_{eq} at 50 feet and noise propagation was modeling using standard algorithms from International Organization for Standardization method ISO 9613-2 – Acoustics, Attenuation of Sound during Propagation Outdoors.

Alternatives 2 and 4A Dredging. For purposes of this assessment airborne noise levels from clamshell dredging barges are assumed to be similar to noise levels associated with on-deck heavy-duty equipment (cranes and front-end loaders) on other barges. Clamshell dredge operations are expected to produce underwater noises associated with the operation of heavy equipment on the barge along with the impact of the clamshell bucket on the seafloor during the excavation of marine sediments. The USACE most recent study, Characterization of Underwater Sounds Produced by Trailing Suction Hopper Dredges during Sand Mining and Pumpout Operations, included measurements of operation of a suction hopper dredge; measured underwater source levels that were estimated to range from 161 to 177 dB(A)rms (USACE 2014). Although clamshell dredges use different technology when compared to hopper dredges, maximum sound production associated with clamshell dredges is expected to be similar to that of hopper dredges (Todd *et al.* 2015). Based on this relationship, noise from clamshell dredge operations was modeled using a reference noise level of 177 dB(A) Leq.

Alternative 8 Dredging. Based on the estimated volume of sand and fill needed for restoration measures within Alternative 8, hydraulic dredging will be considered an option along with the use of clamshell (mechanical) dredging. If pursued, impacts to sensitive species (*e.g.*, Green Sea Turtles) associated with the use of hydraulic dredging would be assessed and coordination/consultation with the NMFS would be undertaken to determine if additional BMPs would be necessary to reduce potential impacts to sensitive species. Airborne noise generated by hydraulic dredging barges would include additional sources of sound, such as the pump and suction pipe, crane, or excavator. Hydraulic dredge operations would include underwater noise from the movement of the draghead on ocean floor substrate, noise from the suction pump (suction), and noise from water and sediment flow through the suction pipe on the drag arm. The USACE's most recent study, Characterization of Underwater Sounds Produced by Trailing Suction Hopper Dredges during Sand Mining and Pumpout Operations, included measurements of operation of a suction hopper dredge; measured underwater source levels were calculated to range from 161 and 177 $dB(A)_{rms}$ (USACE 2014). Noise from dredge operations was modeled using a reference noise level of 177 dB(A) $L_{eq.}$

Underwater noise propagation was calculated on the basis of data and methods described in Washington State Department of Transportation's Advanced Training Manual, Biological Assessment Preparation for Transportation Projects Version 10-08 (WSDOT 2008). In accordance with guidance from the NMFS, this analysis used the Practical Spreading Loss Model. When linear absorption is not included, the Practical Spreading Loss Model results in a 4.5 dB reduction for each doubling of distance. NMFS acknowledges this is a simplified model that can result in unrealistically high levels at large distances. However, the range of realistic distances has not been identified by NMFS; rather, NMFS acknowledges underwater sound propagation has a large amount of uncertainty. It is known that temperature gradients, bottom topography, and currents cause sound levels to attenuate more rapidly than simple geometric spreading as indicated in the Practical Spreading Loss Model (WSDOT 2008).

Environmental Commitments

NO-1 Construction contractors would be required to use only construction equipment that has noise-reduction features, such as mufflers.

NO-2 Construction contractors would be required to comply with the City of Long Beach Municipal Code, Chapter 8, Section 8.80.202 and City of Seal Beach Noise Ordinance Chapter 7.45

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NO-3 Should hydraulic dredging be determined to be necessary, the USACE will coordinate/consult with the NMFS on impacts to sensitive species (*e.g.*, Green Sea Turtles (GST)) associated with the use of hydraulic dredging and would work with the NMFS to determine if additional BMPs would be necessary to reduce potential impacts to sensitive species.

5.5.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Expanding urbanization and increased recreational and commercial use of marine environments has led to increases in human caused noise pollution. Studies have shown that human caused noise can cause cochlear damage, changes in individual and social behavior, altered metabolism, hampered population recruitment, and subsequently affect the health and functions of marine ecosystems (Peng *et al.*2015). Within the Study Area, existing noise sources include shipping vessels, recreational vessels and activities, port activities, freeways, and local roadways. These noise conditions are not expected to change noticeably under the No Action Alternative. Population growth and increased use of the harbor and roadways within the ESPB project area may incrementally increase noise levels. However, City of Long Beach and City of Seal Beach noise ordinances would continue to ensure that ambient noise does not increase significantly over time.

Alternative 2

Construction Impacts

Direct and Indirect Impacts

Compliance with Noise Standards. Consistent with the requirements of the City of Long and the City of Seal Beach municipal codes, construction activities under Alternative 2 would be limited to between the hours of 7:00 a.m. and 7:00 p.m. on weekdays and Federal holidays, and between the hours of 9:00 a.m. and 6:00 p.m. on Saturday. If any work on Sunday is required, the construction contractor would be required to obtain a Sunday work permit and project construction would be limited to between the hours of 9:00 a.m. and 6:00 p.m. The construction contractor may request a variance to noise ordinance time limitations, if applicable and if needed (*e.g.*, 24-hour dredging and placement of eelgrass sediment). Adherence to the cities noise requirements would ensure that impacts associated with construction noise would be less than significant.

Quarry Noise. Equipment use would be part of normal operation of either Catalina Quarry or 3M Quarry. Existing operations would not result in significant adverse impacts. Therefore, no impact related to quarry noise would occur under Alternative 2.

Material Hauling – Tugboats. Under Alternative 2, if stone from the Catalina Island Quarry is used, tugboats would traverse the 25-mile nautical waterway between Catalina Island Quarry and the project site. Tugboat engines typically generate maximum noise levels between 87 dB(A) L_{Max} at a distance of 50 feet (California State Lands Commission 2004). These noise levels would attenuate to less than 70 dB(A) L_{Max} at a distance of approximately 360 feet. At any given location, tugboats would only contribute to momentary noise level increases as they pass. Ambient noise levels in harbors have been measured at between Leq 64.1 and 71.8 dBA depending on the time of day and day of the week. Typical tugboat noise source would fade into the noise background by around 100 feet. Noise levels would return to ambient conditions upon project completion.

Tugboat noise associated with Alternative 2 (considered construction noise) would occur during the hours and days specified in the cities' municipal code noise ordinances; therefore, tugboat activities would not be in excess of standards established in the local ordinance and impacts would be less than significant.

Stone material hauling noise under Alternative 2 would occur during the hours and days specified in the cities' municipal code noise ordinances; therefore, material hauling activities would not be in excess of standards established in the local ordinance and impacts would be less than significant.

Construction Activities at Long Beach Pier T. Construction activities at Port of Long Beach Pier T (construction staging area) would include a front-end loader and a crane. Front-end loaders typically generate noise levels of 76 dB(A) L_{eq} at 50 feet and cranes typically generate noise levels of 77 dB(A) L_{eq} at 50 feet. These noise levels would attenuate to less than 70 dB(A) L_{Max} at a distance of approximately 150 feet.

The distance between Port of Long Beach Pier T and the nearest sensitive receiver, Marriot Residence Inn Hotel at 600 Queensway Drive, is approximately 1.1 miles. Due to the distance between project construction activities and the nearest noise sensitive receiver, construction noise would attenuate to approximately 41 dB(A) L_{eq}.

Pier T construction activity noise under Alternative 2 would occur during the hours and days specified in the cities' noise ordinances; therefore, these activities would not be in excess of standards established in the local ordinance and impacts would be less than significant.

On-Deck Barge Construction Equipment and Derrick Barge. Construction activities at proposed rocky reef work areas would include operation of a front-end loader, a crane, and a derrick barge. Front-end loaders typically generate noise levels of 76 dB(A) L_{eq} at 50 feet, cranes typically generate noise levels of 77 dB(A) L_{eq} at 50 feet, and derrick barge cranes typically generate noise levels of 81 dB(A) L_{eq} at 50 feet. Cumulative noise levels from simultaneous operation of all three pieces of equipment would equate to approximately 83 dB(A) L_{eq} at 50 feet from the work area and would attenuate to less than 70 dB(A) L_{Max} at a distance of approximately 230 feet.

On-deck and derrick barge construction activity noise under Alternative 2 would occur during the hours and days specified in the cities' municipal code noise ordinances; therefore, these activities would not be in excess of standards established in the local ordinance and impacts would be less than significant.

Dredging and Placement. Dredging activity noise under Alternative 2 would occur outside the boundaries of the City of Long Beach and would not be required to comply with the City's noise ordinance; therefore, these activities would not be in excess of standards established in the local ordinance and impacts would be less than significant. Placement of dredged material for construction of eelgrass beds would occur within the timeframes specified by the City of Long Beach's Municipal Code (Section 8.80). If it is deemed necessary that placement of dredged material be performed outside of this timeframe, the construction contractor would be required to request a variance to noise ordinance time limitations from the City of Long Beach.

Groundborne Vibration. Notable sources of groundborne vibration include construction activities (specifically pile driving and blasting) and transit routes (such as light and heavy rail transit). Although groundborne vibration is sometimes noticeable in outdoor environments, groundborne vibration is almost never annoying to people who are outdoors (FTA 2006).

Alternative 2 is not anticipated to create substantial sources of groundborne vibration such as pile driving or blasting. Sources of groundborne vibration associated with Alternative 2 are limited to operation of construction equipment at Port of Long Beach Pier T. There are limited references for groundborne vibration levels of construction equipment. This analysis conservatively assumed project construction equipment would generate groundborne vibration levels similar to those of a large bulldozer. Thus, PPV vibration levels were assumed to be approximately 0.089 inch/sec at a distance of 25 feet (FTA 2006).

The nearest residential use, the Puerto Del Sol Apartment Complex at 745 West Third Street, is approximately 1.6 miles from the Port of Long Beach Pier. Vibration levels generated by Alternative 2 construction equipment would attenuate to 0.0001 inch/sec at this distance. Therefore, groundborne vibration levels would not exceed Caltrans's recommended threshold of 0.2 inch/sec PPV at a residential building and impacts under Alternative 2 would be less than significant.

Noise Effects on Wildlife. For airborne sound, disturbance has been documented at 100 dB for pinnipeds in general, and at 90 dB for harbor seals. Airborne noise associated with on-deck barge construction equipment; the derrick barge is not anticipated to exceed 90 dB beyond approximately 20 feet from equipment engines. As marine mammals are not anticipated to be present on the barge deck, there is minimal negligible potential for marine mammals to be present at this distance.

Underwater noise associated with Alternative 2 would include noise associated with tugboats, which would be similar to existing marine vessel traffic operating out of the Port of Long Beach. As underwater noise sources associated with Alternative 2 would be similar to existing marine vessel traffic, Alternative 2 would not have a significant effect on the existing underwater noise environment. Construction noise (placement of stones and sand) would be similar to activities occurring within the project area, such as dredging, Port Complex maintenance, and other beach and Terminal Island maintenance activities. Construction noise would not exceed recommended thresholds identified in the Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing (NOAA 2018b); therefore, impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours for a short duration. This activity would not be anticipated to generate substantial noise levels and would occur a substantial distance from noise sensitive uses.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal noise level increases.

Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds; no further monitoring would be required specifically for adaptive management. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment, similar to those analyzed under construction activities above. Rocky reef OMRR&R activities would not be anticipated to generate substantial noise levels and would occur a substantial distance from noise sensitive uses.

Noise related to OMRR&R and adaptive management activities under Alternative 2 would occur during the hours and days specified in the City of Long Beach Municipal Code noise ordinance, would not generate excessive groundborne vibration in exceedance of thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife; therefore, these activities would not be in excess of standards established in the local ordinance and impacts would be less than significant.

Impact Summary

Alternative 2 construction, OMRR&R, and adaptive management activities would be in compliance with the cities' municipal codes

, would not generate excessive groundborne vibration in exceedance of thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife, and therefore, would not result in significant impacts.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Although additional construction would occur under Alternative 4A to implement additional features, noise levels associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, generating similar noise and vibration levels, although the construction period would be extended for a longer duration (96 months as compared to 90 months under Alternative 2). Alternative 4A would also result in comparable vibration levels and effects to marine mammals and would be within thresholds for both criteria.

Construction activity noise (both airborne and underwater) under Alternative 4A would be similar to Alternative 2 and would occur during the hours and days specified in the cities' municipal code noise ordinances. These activities would not be in excess of standards established in the local ordinance and would not generate excessive groundborne vibration in exceedance of recommended thresholds and would not generate noise impacts (both airborne and underwater) that exceed thresholds for wildlife. Therefore, impacts would be less than significant.

Dredging and Placement. Dredging activity noise under Alternative 4A would occur outside the boundaries of the City of Long Beach and the City of Seal Beach and would not be required to comply with the cities' noise ordinances; therefore, these activities would not be in excess of standards established in the local ordinances and impacts would be less than significant. Placement of dredged material for construction of eelgrass beds would occur within the timeframes specified by the City of Long Beach's Municipal Code (Section 8.80). If it is deemed necessary that placement of dredged material be performed outside of this timeframe, the construction contractor would be required to request a variance to noise ordinance time limitations from the City of Long Beach.

Noise Effects on Wildlife. Airborne and underwater noise effects would be the same as discussed under Alternative 2. Clamshell dredge operations are expected to produce underwater noise associated with the operation of heavy equipment on the barge along with the impact of the clamshell bucket on the seafloor during the excavation of marine sediments. These noise sources would vary based on site conditions; however, noises may range up to 177 dB(A). Dredging operations would be anticipated to include approximately four hours per day of sediment uptake. Thus, dredging operations would contribute to daily average noise levels of 169 dB(A) 24-hour average sound level [$L_{eq(24h)}$].

Wildlife in the area may include marine mammals such as whales, dolphins, seals, and sea lions. Noise exposure would correspond to the distance between the wildlife and dredging operations; however, wildlife may be present at relatively small distances. This analysis conservatively assumes that wildlife would be present immediately adjacent to dredging operations. Therefore, wildlife could be exposed to noise levels on the order of 169 dB $L_{eq(24h)}$.

As shown in Table 5-13, potential Level A Harassment of marine mammals would only occur if noise levels exceed 173 dB $L_{eq(24h)}$. Even at relatively small distances, noise associated with dredging operation would be less than 173 dB $L_{eq(24h)}$.

As shown in Table 5-14, Level B Harassment of both pinnipeds and cetaceans may occur where continuous noise sources generate noise levels that exceed 120 dB. Noise associated with dredging operation would be anticipated to attenuate to less than 120 dB $L_{eq(24h)}$ at a distance of approximately 1,900 feet.

Project-generated noise would not likely have the potential to affect marine mammals (cause physical harm). Noise levels may cause marine mammals to avoid the area within 1,900 feet of dredging operations. Potential exposure to marine mammals is limited and temporary. Construction noise would not exceed recommended thresholds identified in the Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing (NOAA 2018b); therefore, impacts would be less than significant. Impacts to wildlife, including impacts from project construction noise, are further assessed in Section 5.7, Biological Resources.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2, would be in compliance with the cities' municipal codes, would not generate excessive groundborne vibration in exceedance of thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife, and therefore, would not result in significant impacts.

Impact Summary

Alternative 4A construction and OMRR&R activities would be in compliance with the cities' municipal codes

, would not generate excessive groundborne vibration in exceedance of recommended thresholds, and would not generate noise impacts that exceed thresholds for wildlife, and therefore, would not result in significant impacts.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Although additional construction would occur under Alternative 8 to implement additional features, noise levels associated with material hauling, staging, and placement would be comparable to those identified for Alternatives 2 and 4A. Similar numbers and types of equipment would be utilized on a daily basis (with the exception of a hydraulic dredge (discussed below)), generating similar noise and vibration levels, although the construction period would be extended for a longer duration.

Dredging and Placement. Dredging activity noise under Alternative 8 would occur outside the boundaries of the City of Long Beach and the City of Seal Beach and would not be required to comply with the cities' noise ordinances; therefore, these activities would not be in excess of standards established in the local ordinances and impacts would be less than significant. Placement of dredged material for construction of eelgrass beds would occur within the timeframes specified by the City of Long Beach's Municipal Code (Section 8.80). If it is deemed necessary that placement of dredged material be performed outside of this timeframe, the construction contractor would be required to request a variance to noise ordinance time limitations from the City of Long Beach.

Noise Effects on Wildlife. For both clamshell and hydraulic dredging, airborne and underwater noise effects would be similar to those discussed under Alternative 2. Clamshell dredge operations are expected to produce underwater noise associated with the operation of heavy equipment on the barge along with the impact of the clamshell bucket on the seafloor during the excavation of marine sediments. Similarly, hydraulic dredging will create underwater noise from the movement of the drag head on ocean floor substrate, noise from the suction pump (suction), and noise from water and sediment flow through the suction pipe on the drag arm.

Wildlife in the area may include marine mammals such as whales, dolphins, seals, and sea lions. Noise exposure would correspond to the distance between the wildlife and dredging operations; however, wildlife may be present at relatively small distances. This analysis conservatively assumes that wildlife would be present immediately adjacent to dredging operations. Therefore, wildlife could be exposed to noise levels on the order of 169 dB $L_{eq(24h)}$.

As shown in Table 5-13, potential Level A Harassment of marine mammals would only occur if noise levels exceed 173 dB $L_{eq(24h)}$. Even at relatively small distances, noise associated with dredging operation would be less than 173 dB $L_{eq(24h)}$.

As shown in Table 5-14, Level B Harassment of both pinnipeds and cetaceans may occur where continuous noise sources generate noise levels that exceed 120 dB. Noise associated with dredging operation would be anticipated to attenuate to less than 120 dB $L_{eq(24h)}$ at a distance of approximately 1,900 feet.

Project-generated noise would not likely have the potential to affect marine mammals (cause physical harm). Noise levels may cause marine mammals to avoid the area within 1,900 feet of dredging operations. Potential exposure to marine mammals is limited and temporary. Construction noise would not exceed recommended thresholds identified in the Technical Guidance for Assessing the Effects of Anthropogenic Noise on Marine Mammal Hearing (NOAA 2018b); therefore, impacts would be less than significant. Impacts to wildlife, including impacts from project construction noise, are further assessed in Section 5.7, Biological Resources.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts OMRR&R and adaptive management activities under Alternative 8 for eelgrass beds, nearshore and open water rocky reefs, and kelp reefs would be would be comparable to those described for Alternative 2, would be in compliance with the cities' municipal codes, would not generate excessive groundborne vibration in exceedance of thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife, and therefore, would not result in significant impacts.

Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours consistent with the cities' municipal codes.

Maintenance for the Sandy Island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours consistent with the cities' municipal codes.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal noise level increases (see Appendix F).

OMRR&R and adaptive management activities under Alternative 8 would be in compliance with the cities' municipal codes, would not generate excessive groundborne vibration in exceedence of recommended thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife, and therefore, would not result in significant impacts.

Impact Summary
Alternative 8 construction OMRR&R activities would be in compliance with the
cities' municipal code

, would not generate excessive groundborne vibration in exceedance of thresholds. Noise levels may cause marine mammals to avoid the area within 1,900 feet of dredging operations. Potential exposure to marine mammals would be limited and temporary.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.6 BIOLOGICAL RESOURCES: EVALUATION OF MARINE HABITATS

5.6.1 Relevant Regulations and Significance Criteria

- Federal Clean Water Act: Governs discharge of dredge or fill materials into the waters of the U.S. and it governs water pollution control and water quality of waterways throughout the U.S.
- North American Wetlands Conservation Act. Section 9 of the North American Wetlands Conservation Act directs Federal agencies to cooperate with the USFWS to restore, protect, and enhance wetland ecosystems and other habitats for migratory birds, fish, and wildlife to the extent consistent with its mission.
- Marine Protection, Research, and Sanctuaries Act of 1972. Marine Protection, Research and Sanctuaries Act of 1972, or Ocean Dumping Act, is one of several key environmental laws passed by Congress in 1972. The act has two essential aims: to regulate intentional ocean disposal of materials, and to authorize any related research.
- Federal Fish and Wildlife Coordination Act: Purpose includes recognizing the contribution of wildlife resources to the nation and ensuring that wildlife conservation receives due consideration in water resources development programs.
- Federal Marine Mammal Protection Act: Prohibits, with certain exceptions, the take of marine mammals in U.S. waters and by U.S. citizens on the high seas.
- Federal Magnuson-Stevens Fishery Conservation and Management Act: Primary law governing marine fisheries management in U.S. Federal waters.
- Federal Rivers and Harbor Act: Requires that structures or work in or affecting navigable waters of the U.S. be approved/permitted by the USACE.
- State of California Coastal Act: Applicable policies include Section 30230, Section 30231, Section 30233, and Section 30240.

- City of Long Beach General Plan Conservation Element: Wildlife Management Goals.

Significance Criteria

The following biological resources thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the *CEQA Guidelines*. These criteria are also being adopted for NEPA. Biological resource impacts would be considered significant if the proposed alternatives would:

- 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.
- Conflict with any City of Long Beach policies or ordinances protecting biological resources.

In addition to the above CEQA criteria, a significant impact could occur if the proposed alternatives resulted in:

- Substantial loss to the population or habitat of any native fish, wildlife, or vegetation. For purpose of this analysis, substantial is defined as a change in population or habitat that is detectable over natural variability for a period of five years or more.
- Substantial loss in overall diversity of the ecosystem.

Environmental Commitments

MH-1 A pre-construction survey would be performed to document eelgrass extent in the areas of nearshore reef placement. If eelgrass is present or was previously present at a site according to Merkel (2017), alternative locations of rocky reef and sand placement a minimum distance of 50 feet beyond the margin of existing and previously existing eelgrass habitat will be established during the detailed design phase as well as during construction to avoid impacts to all existing or previously existing eelgrass habitat. Per the NMFS's California Eelgrass Mitigation Plan (NMFS, 2014), eelgrass is defined "…as areas of vegetated eelgrass cover (any eelgrass within 1 m^2 quadrat and within 1 m of another shoot) bounded by a 5 m wide perimeter of unvegetated area. Unvegetated areas may have eelgrass shoots a distance greater than 1 m from another shoot and may be internal as well as external to areas of vegetated cover."

MH-2 During the creation of eelgrass habitats, no more than 10 percent of the plants from eelgrass donor beds would be harvested to minimize potential impacts to existing eelgrass beds.

Environmental Commitments for water quality and invasive species (see Water Quality Section 5.3 and Invasive Species Section 5.10) would also minimize impacts to biological resources.

Habitat Evaluation

The development and application of the HEM to provide a quantitative valuation of existing and future conditions in the ESPB ecosystem in support of the IFR is found in Appendix D. The HE provides an assessment of the bay as defined by the USACE hydrodynamic modeling. The HE assessed the numerical gains/losses in habitat value to the proposed Project Area for purposes of assisting with the incremental cost analysis and to assist in the impact assessment for the various alternatives, including the No Action Alternative. The results assisted in determining impacts and benefits of proposed habitat restoration features for development of each alternative.

5.6.2 Environmental Impacts Evaluation of Each Alternative

For all action alternatives analyzed, except the No Action Alternative, the areas of soft bottom habitat within the proposed Project Area in ESPB would decrease by 2 to 4 percent, and the areas of eelgrass, kelp bed, and rocky reef habitat would increase (Table 5-15). Additionally, an increase in oyster beds, sandy islands and wetlands would occur under Alternative 8.

Table 5-15: Change in Habitat/Resource Type by Alternative

Resource Type	Existing Condition	Alternative 2	Alternative 4A	Alternative 8
Total Acreage by Resource				
Oyster Bed	0	0	0	<0.5
Eelgrass	16.45	41.45	46.45	68.45
Kelp Bed	45.1	166.1	166.1	166.1
Rocky Reef	0	16	49	122
Sandy Island	0	0	0	24
Wetland	3.9	0	0	52
Soft Bottom	9,895.3	9,733.3	9,694.3	9,523.3
Acreage Change by Resource				
Oyster Bed	-	-	-	<0.5
Eelgrass	-	+25	+30	+52
Kelp Bed	-	+121	+121	+121
Rocky Reef	-	+16	+49	+122
Sandy Island	-	-	-	+24
Wetland	-	-	-	+52
Soft Bottom	-	-162	-200	-372
Percent Change by Resource Compared to Existing Conditions*				
Oyster Bed	-	-	-	<+400%
Eelgrass	-	+152.0%	+182.4%	+316.1%
Kelp Bed	-	+268.3%	+268.3%	+268.3%
Rocky Reef	-	+15,900%	+48,900%	+121,900%
Sandy Island	-	-	-	+23,700%
Wetland	-	-	-	+1,233.3%
Soft Bottom	-	-1.6%	-2.0%	-3.8%
* A value of 0.1 acre was used to evaluate percent change for resources not present. Calculations were based on the assumption that restored habitats would be constructed in areas presently soft bottom. Existing eelgrass would be avoided.				

No Action Alternative

Under the No Action Alternative, no habitat restoration construction or OMRR&R activities would occur.

Soft Substrate Habitats

Soft Bottom Habitat. Soft bottom habitats have the potential to provide fish and invertebrate habitat. Management efforts within the Los Angeles and San Gabriel watersheds to improve water quality, sediment quality, and reduce trash within the area would be expected to progress; however, overall improvement would likely continue to be slow in the near future. Soft bottom habitat may be impacted by hypoxia at greater depths and in pitted areas by stratification associated by with sea level rise and climate change.

Coastal Salt Marsh. Coastal salt marshes provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, commercial species nursery habitat, and carbon sequestration. Under the No Action Alternative, sea level rise associated with climate change would likely reduce total salt marsh within the proposed Project Area. Inland boundaries of the existing marsh are limited by seawalls and rock armoring. Over time, sea level rise would likely cause a type shift within the created estuary from coastal salt marsh to mudflat and open water, reducing coastal salt marsh total area and functionality within the proposed Project Area.

Eelgrass. Ecological functions associated with eelgrass beds include trapping suspended sediments, absorption of dissolved nutrients, refugia, and nursery areas for many species of commercially and ecologically important shellfish and fishes that leads to increased prey availability for piscivorous birds, primary productivity for herbivores and detritivores, and the protection of shorelines from erosion. Eelgrass beds are currently located along a narrow band of shallow water offshore of Long Beach from the Long Beach Marina breakwater to Alamitos Bay, with the highest densities in the central portion of Long Beach on either side of the Belmont Pier (See Figure 5-1).

Eelgrass beds are also found at the mouth of Anaheim Bay adjacent to the bay breakwaters. It is likely that these beds would be vulnerable to sea level rise as they are located in areas where they cannot move shoreward to maintain current water depths due to the presence of the entrance jetties. Eelgrass beds are especially vulnerable to predicted increased storm intensity and frequency associated with climate change. Extreme storm frequency has the likelihood to scour benthic sediments beneath eelgrass beds and degrade its existing distribution and functionality. Under the No Action Alternative, functions and distribution of eelgrass beds within the proposed Project Area would likely be decreased by projected extreme storm events.

Hard Substrate Habitats

Kelp reefs. Under the No Action Alternative, management efforts within the Los Angeles and San Gabriel watersheds to improve water quality, sediment quality, and reduce trash within the area would continue to progress; however, overall improvement would likely continue to be slow into the near future. In addition, water circulation issues within the ESPB proposed Project Area would continue to be affected by the existing breakwater. Impairment of water circulation and wave induced mixing would continue to concentrate pollutants and reduce water clarity within the bay. Giant kelp on the seaward side of the breakwater would face increased pressures from storm frequency and intensity. Increased average ocean temperatures and stratification associated with climate change would increase the likelihood of giant kelp die-offs. Kelp is sensitive to seawater temperature and decreases substantially during El Niño years as a result.

Under the No Action Alternative, kelp beds would be susceptible to decreased productivity associated with impaired upwelling and ocean stratification resulting from ocean temperature increases. As a result, die-off may be more likely in the future if the existing populations cannot be augmented and sustained.

Rocky Reefs. Rocky reef and other hard bottom habitat are considered to provide valuable habitat for economically important fishes and macroinvertebrates. Under the No Action Alternative, rocky reef habitat would likely remain in a static spatial extent due to the reliance of rocky reef habitat on infrastructure. Ecological functions of existing rocky reef habitat would likely be degraded due to projected ocean acidification and increased stratification events.

Oyster Beds. Oyster beds contribute important functions to local ecosystems including biodiversity, water quality, nutrient cycling, refugia and nursery habitat for commercial fish species, and to the reduction of shoreline erosion in coastal areas. Under the No Action Alternative, oyster bed formation would likely continue to be depressed. Functions and overall distribution of individual oysters within the proposed Project Area may be degraded by projected increases of extreme storm events, ocean acidification, and ocean temperature. Oysters within the proposed Project Area would likely be resilient to sea level rise as appropriate hard substrate habitat is available at higher elevations in the form of port infrastructure.

Water Column Habitats

Plankton. The proposed Project Area would continue to support phytoplankton, zooplankton, and larval fishes. Composition and concentrations of these organisms would likely change in the future as a result of changes in ocean temperature, increased stratification, and acidification. Long-term declines in phytoplankton concentrations have been tied to increased sea surface temperatures. Warming ocean temperatures and acidification are expected to result in decreases in plankton concentrations.

Pelagic Fishes. Water-column fishes would continue to inhabit the proposed Project Area. Composition and concentrations of these organisms would likely change in the future as a result of changes in ocean temperature, increased stratification, and acidification.

Essential Fish Habitat. Pacific groundfish species and other managed fish and invertebrate species that currently occur in the proposed Project Area would be expected to continue to inhabit the proposed Project Area. Composition and concentrations of these organisms would likely change in the future as a result of changes in ocean temperature, increased stratification, and acidification.

Invasive Species

The proposed Project Area would continue to support invasive species. Composition and concentrations of these organisms would likely change in the future as a result of changes in ocean temperature, increased stratification, and acidification.

Water-Associated Bird Habitat

Water-associated birds would continue to use the proposed Project Area for roosting, foraging, and nesting. Major changes in composition and abundance would likely be largely related to prey availability. For example, eelgrass serves as nursery habitat for a variety of fish species and leads to increased prey availability for piscivorous birds. Variation in eelgrass acreage can naturally change over time resulting in changes in prey for piscivorous species.

Alternative 2

Construction Impacts

Under Alternative 2, approximately 25 acres of eelgrass habitat, approximately 16 acres of associated nearshore rocky reef habitat, and approximately 121 acres of kelp reefs would be created. Approximately 100,000 cubic yards of dredge sand for the nearshore eelgrass beds would be taken from a 20-acre area of the existing Surfside/Sunset Borrow site. This borrow site is approximately 1,700 acres in size and has been dredged since approximately 1964.

Direct and Indirect Impacts Analysis

Based on review of the City of Long Beach General Plan, ordinances, and policies, construction and dredging activities under Alternative 2 would not conflict with any policies or ordinances protecting marine habitats. Therefore, impacts would be less than significant with respect to this criterion. The impact evaluation pursuant to the other three criteria are discussed together for each habitat type below.

Soft Substrate Habitats

Soft Bottom Habitat. It is recognized that soft-bottom marine habitats composed of soft sediments (*i.e.*, underwater substrates comprised of sand, silt, and mud) are an important component of the ESPB proposed Project Area and the greater SCB ecosystem. Construction activities under Alternative 2 would result in the direct loss of approximately 162 acres of soft bottom habitat through conversion to eelgrass, rocky reef, and kelp reef habitat, representing an approximately two percent loss of existing soft bottom habitat within the proposed Project Area. In general, the habitat conversions associated with proposed project activities are expected to provide a net positive impact on habitats of many fish species due to the conversion from soft bottom via the establishment of eelgrass, rocky reef, and kelp habitats (USFWS, 2021; Appendix H). Direct impacts to approximately 162 acres of soft bottom areas would involve essentially permanent trade-offs associated with specific type-conversion to other ecological community/habitat types (*e.g*., soft bottom to rocky reefs, kelp beds, and eelgrass), as proposed. This is expected to cause losses in numbers to some species and gains to others. For example, the type-conversion of soft bottom areas within the project footprint would have long-term impacts on the benthic invertebrate fauna and demersal fish communities currently found in these areas. The resultant ecological communities (rocky reefs, kelp beds, eelgrass) would be of different character and are expected to have substantially higher native biological diversity, higher biomass, and greater productivity, albeit with different species combinations adapted to these created substrates (rock versus sand or silty sand) and vegetation types (eelgrass and kelp versus unvegetated) areas (USFWS 2021; Appendix H). Although there could be some overlap in habitat use, most soft-bottom species would not be expected to utilize eelgrass, rocky reef, or kelp reef habitats.

The Surfside/Sunset Borrow site also consists of soft bottom habitat; however, this site is frequently used for sand material dredging and soft bottom habitat undergoes regular change. Under Alternative 2, approximately 20 acres of the borrow site would be dredged for the 100,000 cubic yards of sand material needed. Direct impacts to soft bottom habitat would be minimal (1.5 percent of the proposed Project Area) due to the large amount of soft-bottom habitat remaining in the proposed Project Area. Beneficial impacts from creation of high-value habitats would be long-term. The loss of a small portion of the soft bottom habitat within the proposed Project Area would not interfere substantially with movement or wildlife corridors, impede the use of native wildlife nursery sites, or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or, result in substantial loss in overall diversity of the ecosystem. Therefore, direct impacts to soft bottom habitats would be less than significant.

Stones for kelp reef and nearshore rocky reef creation would be deployed from a derrick barge, which would be held in place by six anchor locations. Each anchor would weigh approximately seven tons and would be accompanied by either a 15-ton concrete block (three seaward anchor locations) or by a second anchor (three shoreward anchor locations) to hold the derrick barge and accompanying flat-deck barge in place (Appendix A). Derrick barge anchoring has the potential to adversely affect biological resources at the construction sites by tearing up and/or crushing bottom community organisms and habitat. To the extent that anchoring would be required outside of the footprint of the newly created habitat areas to accomplish their construction, this loss would represent an adverse direct impact in addition to the direct loss of habitat discussed above. However, the area of loss of soft bottom habitat associated with derrick barge anchoring would be small, and these areas would rapidly recolonize following the completion of construction. Direct impacts to soft bottom habitats associated with derrick barge anchoring and stone placement would be short-term and would not interfere substantially with movement or wildlife corridors or impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or, result in substantial loss in overall diversity of the ecosystem. Therefore, direct impacts to soft bottom habitats would be less than significant.

Coastal Salt Marsh. Construction activities would not result in the direct loss of any existing coastal salt marsh habitat; therefore, there would be no impacts.

Eelgrass. Pre-construction eelgrass presence surveys would be conducted to determine presence of eelgrass within areas proposed for rocky reef and eelgrass bed (sand) placement (MH-1). As the current project is an ecosystem restoration project and impacts to existing or potential eelgrass habitat is counter to the goals and objectives of the Study, rocky reef and sand placement would be adjusted during the detailed design phase as well as during construction to avoid impacts to all existing and previously existing eelgrass habitat described by Merkel (2017). This environmental commitment is specific to the current project and future USACE missions will be evaluated and determination of BMPs will be tailored to each unique project as necessary. 5-1 illustrates the larger area potentially available for placement of rocky reefs and eelgrass beds based on bathymetry and project constraints. Given this flexibility, adverse impacts to existing eelgrass habitat would be avoidable, pending updated eelgrass surveys that would be conducted during the design phase.

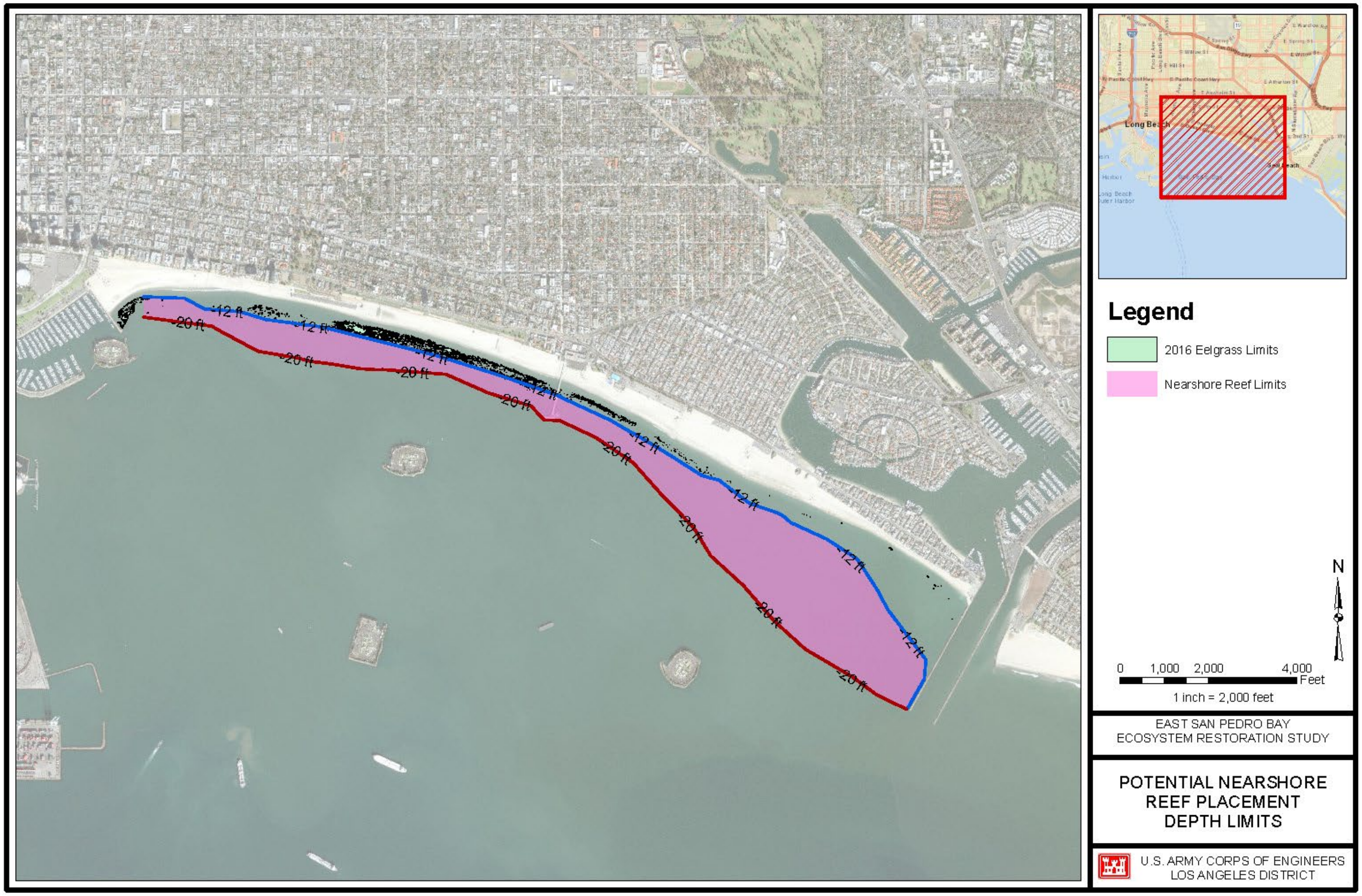

Figure 5-1: Potential Nearshore Placement Depth Limits

Construction activities would not likely result in minor indirect adverse impacts to existing eelgrass habitat due to turbidity; however, adverse impacts would be short-term.

Dredging activities at the Surfside/Sunset Borrow site would not result in impacts to eelgrass, no eelgrass habitat exists in or surrounding the borrow site.

The harvesting of bare-root eelgrass plant material from the donor bed(s) by "raking" rhizomes out of the surface sediment layers could have an adverse impact on the existing eelgrass beds. However, no more than 10 percent of the plants from the eelgrass donor bed(s) would be harvested for transplanting. Direct impacts to eelgrass donor beds would be minor and short-term.

Temporary increases in turbidity (see Water Quality Section) could hinder eelgrass growth and extent. However, due to the relatively small increases in turbidity, and the fact that water quality conditions would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected.

Based on the above, direct and indirect impacts to eelgrass habitats would be short-term and would not interfere substantially with movement or wildlife corridors or impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or, result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts to eelgrass habitat would be less than significant. Construction activities under Alternative 2 would result in long-term beneficial impacts by the creation of approximately 25 acres of new eelgrass habitat.

Hard Substrate Habitats

Kelp Reefs. Construction activities under Alternative 2 would not result in the direct loss of existing kelp habitat. Construction under Alternative 2 would result in long-term beneficial impacts to biological resources by creation of approximately 121 acres of new kelp reef habitat. Kelp establishment is expected to occur through natural dispersal of spores produced by plants present in existing nearby kelp beds.

Temporary increases in turbidity (see Water Quality Section) associated with construction of eelgrass beds, nearshore rocky reefs, and kelp reefs near existing kelp reef habitat could hinder kelp growth and extent. However, due to the relatively small increases in turbidity, and the expectation that water quality would return to previous levels after the period of construction ends, these indirect impacts would be minimal.

Based on the above, direct and indirect impacts to kelp habitats would be short-term and would not interfere substantially with movement or wildlife corridors, impede the use of native wildlife nursery sites, or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts to kelp habitats would be less than significant. Construction activities under Alternative 2 would result in long-term beneficial impacts by creation of approximately 121 acres of new kelp habitat.

Rocky Reefs. Construction would not result in the direct loss of existing rocky reef habitat; therefore, there would be no direct or indirect adverse impacts to rocky reef habitat. Construction would result in long-term beneficial impacts by the creation of approximately 16 acres of new nearshore rocky reef habitat.

Water Column Habitats

Temporary increases in turbidity (see Water Quality Section) associated with construction of eelgrass, rocky reefs, and kelp reefs could adversely impact planktonic organisms, which have limited mobility and would not be able to avoid construction areas. Construction activities and turbidity could also result in temporary avoidance of the proposed Project Area by pelagic fishes and water-associated birds. In addition, predation, foraging, and migration activities in areas immediately adjacent to construction sites may be temporarily avoided. However, due to the relatively small increases in turbidity, and the fact that water quality conditions would return to previous levels after the period of construction ends, indirect impacts to water column habitats would be short-term and 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; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or, result in substantial loss in overall diversity of the ecosystem. Therefore, indirect impacts would be less than significant.

Plankton. Construction activities would not result in the direct loss of open water habitat utilized by plankton. No substantial change in the type or extent of marine habitat would be expected that would impact plankton. Alternative 2 would not result in substantial loss of plankton populations or habitat; therefore, impacts would be less than significant.

Pelagic Fishes. Construction activities would not result in the direct loss of open water habitat for pelagic fishes. No substantial change in the type or extent of pelagic fish marine habitat would be expected. Alternative 2 would not result in substantial loss of pelagic fish populations or habitat; therefore, impacts would be less than significant. Eelgrass and kelp support a higher biodiversity of organisms and are important habitats for juveniles of many commercially important or forage fish species (NOAA 2003). Creation of eelgrass and kelp habitats would result in a beneficial indirect impact to pelagic fish in the proposed Project Area.

Water-Associated Bird Habitat

Restoration of approximately 25 acres of eelgrass under Alternative 2 is expected to increase the extent of foraging habitat for water-associated bird habitat. Creation of eelgrass habitat would result in a beneficial indirect impact to water-associated birds in the proposed Project Area. Construction activities would not result in the direct loss of habitat for water-associated birds. Alternative 2 would not result in substantial loss of water-associated bird populations or habitats, not interfere substantially with movement or migratory corridors, or result in substantial loss in overall diversity of the ecosystem; therefore, impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, kelp reefs, and adaptive management (see Appendix F). Monitoring of eelgrass beds and kelp reefs would be anticipated to require operation of a single boat during daylight hours for a short duration and indirect impacts to marine habitats would be minor and short-term.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities and impacts would be less than construction impacts. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds, no further monitoring would be required specifically for adaptive management. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, maintenance and monitoring would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Replacement of stones could cause a temporary increase in turbidity over approximately 16 acres at infrequent intervals (see Water Quality Section). During maintenance activities, turbidity and noise could result in temporary avoidance of the project area by plankton, pelagic fishes, and water-associated birds, and the use of adjacent areas for predation, foraging, and migration. However, due to the relatively small increases in turbidity and noise levels, and the fact that water quality conditions and noise levels would return to previous levels after the period of maintenance ends, indirect impacts to marine habitats would be minor and short-term.

Over the next 50 years, sea level may rise approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment, which would result in short-term direct impacts to marine habitats.

OMRR&R and adaptive management activities would be short-term and result in less of a change to marine habitats compared to construction impacts discussed above. During OMRR&R activities, minor increases in turbidity and noise could result in temporary avoidance of the proposed Project Area by plankton, pelagic fishes, and water-associated birds, and the use of adjacent areas for predation, foraging, and migration. No substantial change in the type or extent of marine habitats would be expected. OMRR&R activities 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; result in substantial loss to the population or habitat of any native fish, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts of OMRR&R would be short-term and less than significant.

Impact Summary

Alternative 2 would result in short-term localized, less than significant adverse impacts on marine habitats from sediment suspension and turbidity within the proposed Project Area during construction, including dredging activities, and a relatively small area (1.5 percent of the proposed Project Area) of loss of soft bottom habitat. Long-term beneficial impacts to biological resources would occur from creation of approximately 121 acres of new kelp reef habitat, creation of approximately 16 acres of new rocky reef habitat, and creation of approximately 25 acres of new eelgrass habitat. Eelgrass and kelp support a higher biodiversity of organisms and are important habitats for juveniles of many commercially important or forage fish species.

Construction and OMRR&R activities under Alternative 2 would be short-term (approximately 90 months), would occur in small areas (approximately 1.5 percent of the proposed Project Area), and occur within areas with existing harbor vessel traffic, recreational use, and construction activities. Based on the analysis above, construction and OMRR&R activities 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. Based on the review of local policies/ordinances, Alternative 2 would not conflict with local policies or ordinances protecting biological resources. In addition, construction activities would not result in a substantial loss to the population or habitat of any native fishes, wildlife, or vegetation nor in substantial loss in overall diversity of the ecosystem. Therefore, impacts to marine habitats under Alternative 2 would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Under Alternative 4A, approximately 30 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 29 acres of open water rocky reefs, and 121 acres of kelp reefs would be created. Approximately 100,000 cubic yards of dredge sand for the nearshore eelgrass beds would be taken from the top 3-4 feet of a 20-acre area of the existing 1,700 acre Surfside/Sunset Borrow site.

Direct and Indirect Impact Analysis

Soft Substrate Habitats

Soft Bottom Habitat. It is recognized that soft-bottom marine habitats composed of soft sediments (*i.e.*, underwater substrates comprised of sand, silt, and mud) are an important component of the ESPB proposed Project Area and the greater SCB ecosystem. Construction activities under Alternative 4A would result in the direct loss of approximately 201 acres of soft bottom habitat through conversion to eelgrass beds, nearshore and open water rocky reefs, and kelp reef representing approximately a 1.8 percent loss of existing soft bottom habitat. In general, the habitat conversions associated with proposed project activities are expected to provide a net positive impact on habitats of many fish species due to the conversion from soft bottom via the establishment of eelgrass, rocky reef, and kelp habitats (USFWS, 2021; Appendix H). Direct impacts to approximately 201 acres of soft bottom areas would involve essentially permanent trade-offs associated with specific type-conversion to other ecological community/habitat types (*e.g*., soft bottom to rocky reefs, kelp beds, and eelgrass), as proposed. This is expected to cause losses in numbers to some species and gains to others. For example, the type-conversion of soft bottom areas within the project footprint would have long-term impacts on the benthic invertebrate fauna and demersal fish communities currently found in these areas. The resultant ecological communities (rocky reefs, kelp beds, eelgrass) would be of different character and are expected to have substantially higher native biological diversity, higher biomass, and greater productivity, albeit with different species combinations adapted to these created substrates (rock versus sand or silty sand) and vegetation types (eelgrass and kelp versus unvegetated) areas (USFWS 2021; Appendix H). Although there could be some overlap in habitat use, most soft-bottom species would not be expected to utilize eelgrass, rocky reef, or kelp reef habitats.

The Surfside/Sunset Borrow site also consists of soft bottom habitat; however, this site is frequently used for sand material dredging and soft bottom habitat undergoes regular change. Under Alternative 4A, approximately 20 acres of the borrow site would be dredged for the 100,000 cubic yards of sand material needed. Direct impacts to soft bottom habitat (approximately 1.8 percent of the proposed Project Area) would be minimal due to the large amount of soft-bottom habitat remaining in the proposed Project Area. Beneficial impacts from creation of high-value habitats would be long-term. The loss of a small portion of the soft bottom habitat within the proposed Project Area would not interfere substantially with movement or wildlife corridors; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct impacts to soft bottom habitats would be less than significant.

Impacts from the placement of stones and sand for reefs, use of construction equipment, and anchoring under Alternative 4A would be comparable to Alternative 2 and result in a relatively small area of loss of soft bottom habitat. However, these areas would rapidly recolonize following the completion of construction. Direct impacts to soft bottom habitats associated with derrick barge anchoring and stone placement would be short-term and would not interfere substantially with movement or wildlife corridors; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct impacts to soft bottom habitats would be less than significant.

Coastal Salt Marsh. Construction activities would not result in the direct loss of existing coastal salt marsh habitat; therefore, there would be no adverse impacts.

Eelgrass. Pre-construction eelgrass presence surveys would be conducted to determine presence of eelgrass within areas proposed for eelgrass bed sand and rocky reef placement (MH-1). As the current project is an ecosystem restoration project and impacts to existing or potential eelgrass habitat is counter to the goals and objectives of the study, rocky reef and eelgrass sand placement would be adjusted during the detailed design phase as well as during construction to avoid impacts to all existing eelgrass habitat and previously existing eelgrass habitat described by Merkel (2017). This environmental commitment is specific to the current project and future USACE missions will be evaluated and determination of BMPs will be tailored to each unique project as necessary. Figure 5-1 illustrates the larger area potentially available for placement of rocky reefs and eelgrass beds based on bathymetry and project constraints. Given this flexibility, direct adverse impacts to existing eelgrass habitat would be avoidable, pending updated eelgrass surveys that would be conducted during the design phase.

Dredging activities at the Surfside/Sunset Borrow site would not result in impacts to eelgrass, no eelgrass habitat exists in or surrounding the borrow site.

Temporary increases in turbidity (see Water Quality Section) could result in indirect impacts by hindering eelgrass growth and extent. However, due to the relatively small increases in turbidity, and the expectation that water quality conditions would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected.

Based on the above, direct and indirect adverse impacts to eelgrass habitats would be short-term and would not interfere substantially with movement or wildlife corridors; impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts to eelgrass habitats would be less than significant. Construction activities under Alternative 4A would result in long-term beneficial impacts by creation of approximately 30 acres of new eelgrass habitat.

<u>*Hard Substrate Habitats*</u>

Kelp Reefs. Construction activities would not result in the direct loss of existing kelp reef habitat; therefore, there would be no adverse impacts. Construction under Alternative 4A would result in long-term beneficial impacts to biological resources by creation of approximately 121 acres of new kelp reefs. Kelp establishment is expected to occur through natural dispersal of spores produced by plants present in existing nearby kelp beds.

Temporary increases in turbidity (see Water Quality Section) associated with construction of eelgrass beds, nearshore and open water rocky reefs, and kelp reefs near existing kelp reef habitat could result in indirect impacts by hindering kelp growth and extent. However, due to the relatively small increases in turbidity, and the expectation that water quality would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected.

Based on the above, direct and indirect impacts to kelp habitats would be short-term and would not interfere substantially with movement or wildlife corridors; impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts to kelp habitats would be less than significant. Construction activities under Alternative 4A would result in long-term beneficial impacts by creation of approximately 121 acres of new kelp habitat.

Rocky Reefs. Construction would not result in the direct loss of existing rocky reef habitat; therefore, there would be no direct or indirect adverse impacts to rocky reef habitat. Construction would result in long-term beneficial impacts by the creation of approximately 49 acres of new nearshore rocky reef habitat.

Water Column Habitats

Temporary increases in turbidity (see Water Quality Section) associated with construction of eelgrass, rocky reefs, and kelp reefs could adversely impact planktonic organisms, which have limited mobility and would not be able to avoid construction areas. Construction activities and turbidity could also result in temporary avoidance of the project area by pelagic fishes and water-associated birds. In addition, predation, foraging, and migration activities in areas immediately adjacent to construction sites may be temporarily avoided. However, due to the relatively small increases in turbidity, and the expectation that water quality conditions would return to previous levels after the period of construction ends, indirect impacts to water column habitats would be short-term and would not interfere substantially with the movement of any native resident or migratory fishes or wildlife species; with established native resident or migratory wildlife corridors; impede the use of native wildlife nursery sites; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, indirect impacts would be less than significant.

Plankton. Construction activities under Alternative 4A would not result in the direct loss of open water habitat utilized by plankton; therefore, there would be no adverse impacts to plankton habitat and impacts would be less than significant.

Pelagic Fishes. Construction activities would not result in the direct loss of open water habitat utilized by plankton. No substantial change in the type or extent of marine habitat would be expected that would impact plankton. Alternative 4A would not result in substantial loss of plankton populations or habitat, therefore, impacts would be less than significant.

Water-Associated Bird Habitat

Restoration of approximately 30 acres of eelgrass under Alternative 4A is expected to increase the extent of foraging habitat for water-associated bird habitat. Creation of eelgrass habitat would result in a beneficial indirect impact to water-associated birds in the proposed Project Area. Construction activities would not result in the direct loss of habitat for water-associated birds. Alternative 4A would not result in substantial loss of water-associated bird populations or habitats; would not interfere substantially with movement or wildlife corridors; impede the use of native wildlife nursery sites; or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem; therefore, impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. OMRR&R and adaptive management activities would be short-term and result in less of a change to marine habitats compared to construction impacts discussed above. During OMRR&R activities, minor increases in turbidity and noise could result in temporary avoidance of the proposed Project Area by plankton, pelagic fishes, and water-associated birds, and the use of adjacent areas for predation, foraging, and migration. No substantial change in the type or extent of marine habitats would be expected. OMRR&R activities 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; impede the use of native wildlife nursery sites; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts of OMRR&R would be short-term and less than significant.

Impact Summary

Alternative 4A would result in short-term localized, less than significant adverse impacts on marine habitats from sediment suspension and turbidity within the proposed Project Area during construction, including dredging activities, and a relatively small area (1.8 percent of the proposed Project Area) of loss of soft bottom habitat. Long-term beneficial impacts to biological resources would occur from the creation of approximately 30 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 29 acres of open water rocky reefs, and 121 acres of kelp reefs.

Based on the analysis above, construction activities 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. Based on review of local policies/ordinances, Alternative 4A would not conflict with any local policies or ordinances protecting biological resources. In addition, construction activities would not result in a substantial loss to the population or habitat of any native fishes, wildlife, or vegetation nor in substantial loss in overall diversity of the ecosystem. Therefore, impacts to marine habitats under Alternative 4A would be less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Under Alternative 8, approximately 52 acres of eelgrass habitat, 20 acres of associated nearshore rocky reef habitat, 102 acres of open water rocky reefs, 167.5 acres of kelp reefs, 0.3 acre of oyster beds, a 24-acre sandy island, and 52 acres of wetlands would be created. The approximately 100,000 cubic yards of dredge sand for the nearshore eelgrass beds would be taken from a 20-acre area of the existing Surfside/Sunset Borrow site. Approximately 3,786,000 cubic yards of sandy material is required to be dredged for the sandy island and wetlands materials, which would be taken from approximately 200 acres of the 1,700-acre site Surfside/Sunset Borrow site.

<u>Direct and Indirect Impact Analysis</u>

<u>Soft Substrate Habitats</u>

Soft Bottom Habitat. It is recognized that soft-bottom marine habitats composed of soft sediments (*i.e*., underwater substrates comprised of sand, silt, and mud) are an important component of the ESPB proposed Project Area and the greater SCB ecosystem. Construction activities under Alternative 8 would result in the direct loss of approximately 372 acres of soft bottom habitat through conversion to eelgrass beds, nearshore and open water rocky reef, kelp reef, oyster bed, sandy island and wetland habitat, representing approximately a 3.3 percent loss of existing soft bottom habitat. In general, the habitat conversions associated with proposed project activities are expected to provide a net positive impact on habitats of many fish species due to the conversion from soft bottom via the establishment of eelgrass, rocky reef, and kelp habitats (USFWS, 2021; Appendix H). Direct impacts to approximately 372 acres of soft bottom areas would involve essentially permanent trade-offs associated with specific type-conversion to other ecological community/habitat types (*e.g*., soft bottom to rocky reefs, kelp beds, and eelgrass), as proposed. This is expected to cause losses in numbers to some species and gains to others. For example, the type-conversion of soft bottom areas within the project footprint would have long-term impacts on the benthic invertebrate fauna and demersal fish communities currently found in these areas. The resultant ecological communities (rocky reefs, kelp beds, eelgrass) would be of different character and are expected to have substantially higher native biological diversity, higher biomass, and greater productivity, albeit with different species combinations adapted to these created substrates (rock versus sand or silty sand) and vegetation types (eelgrass and kelp versus unvegetated) areas (USFWS 2021; Appendix H). Although there could be some overlap in habitat use, most soft-bottom species would not be expected to utilize eelgrass, rocky reef, or kelp reef habitats.

The Surfside/Sunset Borrow site also consists of soft bottom habitat; however, this site is frequently used for sand material dredging and soft bottom habitat undergoes regular change. Under Alternative 8, approximately 20 acres of the borrow site would be dredged for the 100,000 cubic yards of sand material needed. Dredging for the sandy island and wetlands materials would be taken from approximately 200 acres. Direct impacts to soft bottom habitat would be minimal (3.3 percent of the proposed Project Area) due to the large amount of soft-bottom habitat remaining in the proposed Project Area. Beneficial impacts from creation of high-value habitats would be long-term. The loss of a small portion of the soft bottom habitat within the proposed Project Area would not interfere substantially with movement or wildlife corridors or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct impacts to soft bottom habitats would be less than significant.

Impacts from the placement of stones and sand for reefs and use of construction equipment under Alternative 8 would be comparable to Alternative 2 and result in a relatively small area of destruction of soft bottom habitat. However, these areas would rapidly recolonize following the completion of construction. Direct impacts to soft bottom habitats associated with derrick barge anchoring and stone placement would be short-term and would not interfere substantially with movement or wildlife corridors; impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct impacts to soft bottom habitats would be less than significant.

Coastal Salt Marsh. Construction would not result in the direct loss of existing coastal salt marsh habitat; therefore, there would be no adverse impacts. Adding approximately 52 acres of coastal salt marsh would greatly increase this rare habitat type in support of aquatic species, amphibians (land and water), shorebirds and other open water birds, and terrestrial species along with the habitat’s ability to provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, and carbon sequestration.

Eelgrass. Pre-construction eelgrass presence surveys would be conducted to determine presence of eelgrass within areas proposed for eelgrass bed rocky reef sand placement (MH-1). As the current project is an ecosystem restoration project and impacts to existing or potential eelgrass habitat is counter to the goals and objectives of the study, rocky reef and eelgrass sand placement would be adjusted during the detailed design phase as well as during construction to avoid impacts to all existing eelgrass habitat and previously existing eelgrass habitat described by Merkel (2017). This environmental commitment is specific to the current project and future USACE missions will be evaluated and determination of BMPs will be tailored to each unique project as necessary. 5-1 illustrates the larger area potentially available for placement of rocky reefs and eelgrass beds based on bathymetry and project constraints. Given this flexibility, adverse impacts to existing eelgrass habitat would be avoidable, pending updated eelgrass surveys that would be conducted during the design phase.

Dredging activities at the Surfside/Sunset Borrow site would not result in impacts to eelgrass, no eelgrass habitat exists in or surrounding the borrow site.

Construction under Alternative 8 would result in long-term beneficial impacts to biological resources by creation of approximately 52 acres of new eelgrass habitat. In addition, Alternative 8 would harvest no more than 10 percent of the plants from the eelgrass donor bed(s) for transplanting; therefore, direct impacts to existing eelgrass would be short-term.

Temporary increases in turbidity (see Water Quality Section) could hinder eelgrass growth and extent. However, due to the relatively small increases in turbidity, and the expectation that water quality conditions would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected. Therefore, these indirect impacts would be short-term.

Based on the above, direct and indirect impacts to eelgrass habitats would be short-term and would not interfere substantially with movement or wildlife corridors; impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts to eelgrass habitats would be less than significant. Construction activities under Alternative 8 would result in long-term beneficial impacts by creation of approximately 52 acres of new eelgrass habitat.

<u>*Hard Substrate Habitats*</u>

Kelp Reefs. Construction activities, including dredging, would not result in the direct loss of existing kelp reef habitat; therefore, there would be no adverse impacts. Construction under Alternative 8 would result in long-term beneficial impacts to biological resources by creation of approximately 121 acres of new kelp reefs. Kelp establishment is expected to occur through natural dispersal of spores produced by plants present in existing nearby kelp beds.

Temporary increases in turbidity (see Section 5.3 Water Quality) associated with construction of eelgrass beds, nearshore and open water rocky reefs, kelp reefs, oyster reefs, sandy island and wetlands near existing kelp reef habitat could result in indirect impacts by hindering kelp growth and extent. However, due to the relatively small increases in turbidity, and the expectation that water quality would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected.

Based on the above, direct and indirect impacts to kelp habitats would be short-term and would not interfere substantially with movement or wildlife corridors; impede the use of native wildlife nursery sites or result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts to kelp habitats would be less than significant. Construction activities under Alternative 8 would result in long-term beneficial impacts by creation of approximately 121 acres of new kelp habitat.

Rocky Reefs. Construction activities would not result in the direct loss of existing rocky reef habitat; therefore, there would be no adverse impacts. Construction would result in long-term beneficial impacts by the creation of approximately 122 acres of new near shore and open water rocky reefs.

Oyster Beds. Construction activities would not result in the direct loss of existing oyster bed habitat; therefore, there would be no adverse impacts. Construction would result in long-term beneficial impacts by the creation of approximately 0.3acre of new oyster beds.

Temporary increases in turbidity (see Water Quality Section 5.3) associated with construction of eelgrass beds, nearshore and open water rocky reefs and kelp reefs, sandy island, and wetlands near existing oyster bed habitat could adversely affect oyster beds. Although oysters are known to colonize pier pilings in the inner harbor areas of the Port Complex, there are no known “oyster beds” in the proposed Project Area. Due to the relatively small increases in turbidity, and the distances to known oyster beds, no substantial change in the type or extent of marine habitats would be expected. Alternative 8 would not result in substantial loss of oyster populations or habitat; therefore, impacts would be less than significant.

Water Column Habitats

Temporary increases in turbidity (see Water Quality Section 5.3) associated with construction of eelgrass, rocky reefs and kelp reefs, kelp reefs, oyster reefs, sandy island, and wetlands could adversely impact planktonic organisms, which have limited mobility and would not be able to avoid construction areas. Construction activities and turbidity could also result in temporary avoidance of the proposed Project Area by pelagic fishes and water-associated birds. In addition, predation, foraging, and migration activities in areas immediately adjacent to construction sites may be avoided temporarily. However, due to the relatively small increases in turbidity, and the expectation that water quality conditions would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected. Indirect impacts to water column habitats would be short-term and 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; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, indirect impacts would be less than significant.

Plankton. Construction activities under Alternative 8 would result in the direct loss of approximately 24 acres of open water habitat due to the creation of a sandy island, and approximately 52 acres of open water habitat due to the creation of wetlands. However, this would represent a loss of less than one percent of the existing open water habitat used by plankton. No substantial change in the type or extent of marine habitat would be expected that would impact plankton. Alternative 8 would not result in substantial loss of plankton populations or habitat; therefore, impacts would be less than significant.

Pelagic Fishes. Construction activities would result in the direct loss of approximately 24 acres of open water habitat due to the creation of a sandy island, and approximately 52 acres of open water habitat due to the creation of wetlands. However, this would represent a loss of less than one percent of the existing open water habitat used by pelagic fishes. Eelgrass and kelp support a higher biodiversity of organisms and are important habitats for juveniles of many commercially important or forage fish species (NOAA 2003). Creation of eelgrass and kelp habitats would result in a long-term beneficial impact to pelagic fishes in the proposed Project Area. Alternative 8 would not result in substantial loss of pelagic fish populations or habitat, therefore, impacts would be less than significant.

Water-Associated Bird Habitat

Restoration of approximately 52 acres of eelgrass under Alternative 8 is expected to increase the extent of foraging habitat for water-associated bird habitat. Creation of eelgrass habitat would result in a beneficial indirect impact to water-associated birds in the proposed Project Area. Construction activities would result in the direct loss of approximately 24 acres of open water habitat due to the creation of a sandy island, and approximately 52 acres of open water habitat due to the creation of wetlands. However, this would represent a loss of less than one percent of the existing open water habitat used by water-associated bird species. Alternative 8 would not result in substantial loss of water-associated bird populations or habitats; therefore, impacts would be less than significant. Additionally, water-associated bird species could utilize the newly created sandy island, wetland, and eelgrass habitats for nesting, foraging and other purposes, resulting in long-term beneficial impacts.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Upon completion of construction, continuing activities associated with Alternative 8 would generally include monitoring of eelgrass beds, rocky reefs, kelp reefs, oyster reefs, wildlife surveys, and surveys of sandy island and wetland areas (see Appendix F). These activities would be anticipated to require operation of a single boat during daylight hours for a short duration and indirect impacts to marine habitats would be short-term. The frequency and number of days required to complete these monitoring efforts is not known and may vary depending on the level of success of the project. Under Alternative 8, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs, rocky reefs, oyster reefs, or eelgrass beds, no further monitoring would be required specifically for adaptive management. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may increase by approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment. Direct impacts of these activities would be short-term and less than construction activities.

Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (*e.g*., vegetation replacement and invasive species management) would likely be higher during initial establishment (approximately first two years) of the wetland and would likely decrease after establishment is complete. Minor structure repairs would take place on a 10-year cycle or when needed after a large storm event or sea level rise. Direct impacts of these activities would be short-term less than construction activities.

Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization.

Adaptive management may include additional actions such as eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment. These activities would require fewer days and equipment use than construction activities.

Replacement of stones and other maintenance activities under Alternative 8 could cause a temporary increase in turbidity and noise at infrequent intervals, resulting in temporary avoidance of maintenance areas by plankton, pelagic fishes, and water-associated birds, as well as the use of adjacent areas for predation, foraging, and migration. However, due to the relatively small increases in turbidity and noise levels, and the fact that water quality conditions and noise levels would return to previous levels after the period of maintenance ends, no substantial change in the type or extent of marine habitats would be expected. These indirect impacts would be short-term.

OMRR&R and adaptive management activities would be short-term and result in less of a change to marine habitats compared to construction impacts discussed above. During OMRR&R activities, minor increases in turbidity and noise could result in temporary avoidance of the project area by plankton, pelagic fishes, and water-associated birds, and the use of adjacent areas for predation, foraging, and migration. No substantial change in the type or extent of marine habitats would be expected. OMRR&R activities 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; result in substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; or result in substantial loss in overall diversity of the ecosystem. Therefore, direct and indirect impacts of OMRR&R would be short-term and less than significant.

Impact Summary

Alternative 8 would result in short-term localized, less than significant adverse impacts on marine habitats from sediment suspension and turbidity within the proposed Project Area during construction, including dredging activities, and a relatively small area (3.3 percent of the proposed Project Area) of loss of soft bottom habitat. Long-term beneficial impacts to biological resources would occur from the creation of approximately 52 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 102 acres of open water rocky reefs, 121 acres of kelp reefs, 0.3acre of oyster beds, a 24-acre sandy island, and 52 acres of wetlands.

Construction and OMRR&R activities under Alternative 8 would be short-term (approximately 113 months), would occur in small areas (approximately 3.3 percent of the proposed Project Area), and occur within areas with existing harbor vessel traffic, recreational use, and construction activities. Based on the analysis above, construction activities 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. Based on review of local policies/ordinances, Alternative 8 would not conflict with any local policies or ordinances protecting biological resources. In addition, construction activities would not result in a substantial loss to the population or habitat of any native fishes, wildlife, or vegetation nor in substantial loss in overall diversity of the ecosystem. Therefore, impacts to marine habitats under Alternative 8 would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.7 BIOLOGICAL RESOURCES: SPECIAL-STATUS SPECIES

5.7.1 Relevant Regulations and Significance Criteria

- Federal Endangered Species Act: The Act provides a framework to conserve and protect endangered and threatened species and their habitats.
- Federal EOs related to biological resources: EO 13112 Invasive Species; EO 13186 Migratory Birds; EO 11514 Protection and Enhancement of Environmental Quality
- State of California Endangered Species Act: Focuses on protecting all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats threatened with extinction and those experiencing a significant decline.

Significance Criteria

A significant impact could occur if the proposed alternatives resulted in:

- Population size of a threatened, endangered, or candidate species is reduced, or its designated critical habitat is adversely modified.

- Substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles.

Environmental Commitments

SP-1 Potential adverse impacts to existing marine habitats would be minimized by selection of dredging equipment and methods, turbidity control measures for dredging and disposal operations, and monitoring protocols outlined in the Los Angeles Contaminated Sediments Task Force Long-Term Management Strategy (2005) and the Los Angeles Regional Dredged Material Management Plan (2009).

SP-2 An Environmental Protection Plan would be implemented, including a Green Sea Turtle Monitoring and Avoidance Plan, Marine Mammal Monitoring and Avoidance Plan, and employee training. Monitoring plans shall be prepared by a qualified marine biologist. The plans would include the following:

- Procedures for monitoring marine mammals and sea turtles, and specifications for Marine Wildlife Observers.
- Methods for communicating with contractors to stop work if there is a risk that any marine mammals or sea turtles active in the area may move closer to construction sites.
- Procedures for Marine Wildlife Observer monitoring of barge transport, if necessary.
- Contractor personnel training
- Reporting procedures including in the event of potential take
- Methods for communicating with ship captains if there is a risk of collision with a marine mammal or sea turtle.

SP-3 The following measures will be implemented to avoid or minimize impacts to the Federally listed threatened East Pacific DPS of Green Sea Turtle and marine mammals protected under the MMPA**.**

- The USACE will utilize a clamshell dredge for all dredging associated with the East San Pedro Bay Ecosystem Restoration Project because this type of equipment has been determined to be well suited based on the quantity and the location of the work.
- Dredging is expected to occur on a 24-hour per day basis. The USACE will attempt to sequence dredging activities during winter months (November – March 31) when Green Sea Turtles (*Chelonia mydas*) (GST) are generally expected to be located within the warm waters of the San Gabriel River adjacent to and downstream of power plants (Crear *et al*. 2016). However, due to the exposure of the work area to open ocean wave conditions, adverse wave and inclement weather may preclude safe working conditions during winter months, necessitating that dredging activities extend into the non-winter months.
- When dredging and nearshore placement operations occur, a qualified biologist with experience monitoring GSTs and marine mammals will be on site to monitor for the presence of GSTs and marine mammals. The monitor will have the authority to cease or alter operations to avoid impacts to GSTs and marine mammals.
- Adequate lighting will be provided during nighttime operations to allow the monitor to observe the surrounding area effectively.
- During dredging and placement operations, the USACE will designate 30-meter monitoring zones around both the dredge site and nearshore placement sites.
- All vessels associated with the project will not exceed eight (8) knots inside the breakwater.
- Daily visual monitoring within the designated 30-meter monitoring zones will commence prior to the start of in-water construction activities and after each construction work break of more than 30 minutes.

- If a GST is observed within the vicinity of the project site during project operations, all appropriate precautions shall be implemented to avoid or minimize unintended impacts. These precautions include, but are not limited to:
  - Cessation of operation of any moving equipment that is observed within 30 meters of a GST.
  - Immediate cessation of operation of any mechanical dredging equipment if a GST is observed within 30 meters of the equipment.
  - Operations may not resume until the GST has departed the monitoring zone by its own accord or has not been observed for a 15-minute period of time.
- Biological monitors will maintain a written log of all GST and marine mammal observations during project operations. This observation log will be provided to the USACE and NMFS as an attachment to the post-construction report for the project. Each observation log will contain the following information:
  1. Observer name and title;
  2. Type of construction activity (maintenance dredging, etc.);
  3. Date and time animal first observed (for each observation);
  4. Date and time observation ended (for each observation). An observation will terminate if (1) an animal is observed exiting the monitoring zone or (2) after a 15-minute period of no observation (assumption is that animal has exited, but was not observed to do so);
  5. Location of monitor (latitude/longitude), direction of animal in relation to the monitor, and estimated distance (in meters) of animal to the monitor;
  6. Nature and duration of equipment shutdown.
- Any observations involving the potential "take" of GSTs or marine mammals will be reported to the USACE within 10 minutes of the incident and to the NMFS stranding coordinator immediately.
- The USACE and its contractors will inform all personnel associated with the construction work of the potential presence of GSTs and marine mammals and the requirement to monitor a 30-meter designated monitoring zone around all in-water equipment and vessels to avoid interactions with, or "take" of GSTs and marine mammals. Prior to the commencement of on-site construction work, all contractor personnel (including sub-contractor personnel) will be trained by a USACE biologist (or qualified biologist approved by the USACE) on GST and marine mammal identification and observation protocols to be followed in the event that GSTs or marine mammals are sighted. All construction personnel are responsible for observing and reporting the presence of GSTs and marine mammals during all water-related construction activities.
- The contractor will implement an Environmental Protection Plan that will include a GST and Marine Mammal Monitoring and Avoidance Plan and an employee training program on GST and marine mammal observation protocols, avoidance, and minimization measures.

Environmental Commitments for water quality (see Water Quality section) and Marine Habitats (see Biological Resources Marina Habitats section) would also minimize impacts to Special Status Species.

5.7.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Special Status Species and Habitats

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. See Table 5-16: Federal Threatened and Endangered Bird and Turtle Species Effects Determination Summary for referenced species below.

Birds. California Least Tern (CLT), Western Snowy Plover (WSP), and Belding's Savannah Sparrow, as well as other special status species that have the potential to occur in the proposed Project Area, would likely continue to use these areas.

Sea Turtles. GST prefer the lower San Gabriel River and Seventh Street Basin due to the warm waters from treated wastewater and cooling water discharges, and presence of submerged aquatic vegetation. They would likely continue to use these areas, and occasionally travel into the proposed Project Area. Other turtle species are rarely seen within the proposed Project Area.

Abalone. A single white abalone was reported in Los Angeles-Long Beach Harbor during the 2018 biological baseline survey (Luedy, personal communication, 2019). This specimen was subsequently removed for genetic testing. Black abalone have not been observed during more than 20 years of baseline surveys. With little suitable habitat available for these species, white and black abalone are likely to be rare or absent within the proposed Project Area.

Marine Mammals. Seals, sea lions, dolphins, and whales would likely continue to use the proposed Project Area for resting, foraging, and transit. Whales may occasionally venture into the proposed Project Area, but they are not likely to be seen in Outer Long Beach Harbor.

Sensitive Shorebird Habitat. Sea level rise would likely continue to limit potential nesting habitat (sandy beach and sand dunes) by inundating upland and intertidal sandy areas within the proposed Project Area. Currently, potential habitat within the proposed Project Area is not considered available or sensitive shorebird species due to the level of recreational use and beach grooming activities. The quality of foraging habitat for sensitive shorebirds (open water and intertidal sandy beach) is likely to be degraded as ocean temperatures increase. Under the No Action Alternative, sensitive shorebird breeding and foraging habitat within the Study Area would likely be degraded by climate change related effects.

Alternative 2

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 2, the creation of approximately 25 acres of eelgrass habitat, 16 acres of associated rocky reef habitat, and 121 acres of kelp reefs would reduce existing soft bottom habitat in the restoration areas by approximately 1.5 percent. Temporary increases in turbidity (see Water Quality Section), suspended solids, and noise associated with dredging activities at the Surfside/Sunset Borrow site and construction of eelgrass beds, nearshore rocky reefs and kelp reefs could result in indirect temporary avoidance of the proposed Project Area by marine special status species that may occur in the proposed Project Area, as well as the use of adjacent areas for predation, foraging, and migration. Mobile special status species would be expected to relocate from the construction and dredging activity areas until activities end. Marine special status species may be exposed to suspended sediment concentrations during construction activities and up to 24 hours later for a distance of approximately 100 to 500 feet. Construction activity noise would end once activities stop each day. However, due to the relatively small increases in turbidity, suspended solids, and noise levels, and the fact that water quality conditions would return to previous levels after the period of construction ends, no substantial change in the type or extent of marine habitats would be expected. Construction activities under Alternative 2 would not likely result in a substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Impacts of construction activities on overall diversity of the ecosystem would be short-term, indirect, and less than significant.

Threatened and Endangered Bird Species. Construction activities, including dredging, under Alternative 2 would not result in the direct or indirect loss of habitat for the Federally listed CLT or WSP, and would not reduce available foraging habitat for either species (Table 5-16).

Table 5-16: Federal Threatened and Endangered Bird, Turtle, and Abalone Species Effects Determination Summary

Common Name	Federal Status	Effects Determination	Summary
California Least Tern	E	No effect	Proposed staging area within Port of Long Beach Pier T is located approximately 2 miles from a documented (2014) nesting site at Maersk Terminal. Surfside/Sunset Borrow site is not near nesting sites or potential habitat. Construction activities would not occur within potential habitat. Activities would not disturb nesting or foraging activities.
Western Snowy Plover	T	No effect	Known to occur near Anaheim Bay in the proposed Project Area. Construction activities, including dredging at Surfside/Sunset Borrow site, would not occur within potential habitat and construction related noise and activities would not disturb foraging or nesting activities.
Loggerhead Sea Turtles	E	No Effect	This species has not been documented within the proposed Project Area. Staging and construction activities would not result in disturbance or other impacts to this species.
Green Sea Turtles	T	May affect, not likely to adversely affect	Indirect impacts from noise and turbidity. No direct impacts expected.
Leatherback Sea Turtles	E	No Effect	This species has not been documented within the proposed Project Area. Staging and construction activities would not result in disturbance or other impacts to this species.
Olive Ridley Sea Turtles	T	No Effect	This species has not been documented within the proposed Project Area. Staging and construction activities would not result in disturbance or other impacts to this species.
White Abalone	E	No Effect	This species is most common in deeper waters (30 to 60 meters), and suitable habitat available is not generally located within the proposed Project Area.
Black Abalone	E	No Effect	This species has not been documented within the proposed Project Area over the past 20 years and suitable habitat available is not generally located within the proposed Project Area.
Note: E = Endangered, T = Threatened Source: US Fish and Wildlife Service, Endangered Species (https://www.fws.gov/endangered/)			

The CLT is known to forage in and around the Port of Los Angeles and Port of Long Beach, or in the open ocean outside the breakwaters of the two ports during its nesting season defined as April 15-September 15. CLT have also been observed near the Los Cerritos Wetlands, the northern portion of Alamitos Bay, and near Anaheim Bay; however, no nesting activity has been reported in these areas. There are no known nesting areas within or adjacent to the proposed Project Area, the closest nesting location is a site on Pier 400 in the Port of Los Angeles, which is approximately 4 miles west of the proposed Project Area. The proposed staging area within Port of Long Beach Pier T is located over 2 miles from the Pier 400 nesting location and would not provide suitable foraging habitat. Construction activities, including dredging and habitat features under Alternative 2, would not disturb nesting or foraging activities at these distances and would not result in the reduction of the population size of this species. Additionally, construction activities would not result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for the CLT. No impacts to CLT are anticipated. Critical habitat for this species has not been designated; therefore, no impacts to critical habitat would occur.

The WSP are Infrequent or transient migratory visitors to the port area. WSP have occasionally been observed on Pier 400, Point Fermin, and outer Cabrillo Beach to the west of the proposed Project Area, and near Anaheim Bay and Sunset Beach to the east of the proposed Project Area. No nesting has been observed within these areas, nor within, or adjacent to the proposed Project Area. During bird surveys of the Study Area, there were no observations during 2007–2008 or 2013–2014. Construction activities within the proposed Project Area, dredging activities at the Surfside/Sunset Borrow site, and activities within the staging area at Pier T would not disturb nesting or foraging activities at these distances and would not result in the reduction of the population size of the WSP. Additionally, construction activities would not result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for the WSP. No impacts to WSP are anticipated.

Abalone. The individual White Abalone found within the proposed Project Area was considered an extremely rare occurrence and does not indicate species establishment within the proposed Project Area. The single specimen has been removed by the NMFS for its captive breeding program. This species is most common in deeper waters (30 to 60 meters) and there is generally not habitat available within the proposed Project Area. Construction activities, including dredging, under Alternative 2 would not result in the reduction of the population size of this species and would not result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for this species. Black abalone have not been observed during more than 20 years of baseline surveys. With little suitable habitat available for these species, white and black abalone are likely to be rare or absent within the proposed Project Area. No impacts to abalone are anticipated. No critical habitat for this species is found in or adjacent to the proposed Project Area; therefore, no impacts to critical habitat would occur.

Sea Turtles. The areas used preferentially by GST (Alamitos Bay, Seventh Street Basin, and the lower San Gabriel River) would not be affected by construction, including dredging at the Surfside/Sunset Borrow site and activities under Alternative 2. Construction activities would not result in the direct loss of habitat for sea turtles that may occur in the proposed Project Area. Construction activities may result in indirect impacts from noise, turbidity, and barge/equipment travel to and from construction sites within the bay, causing turtles to temporarily avoid activity areas; however, no substantial change in the type or extent of marine habitats would be expected. Environmental commitments SP-1, SP-2, and SP-3 would ensure that no adverse impacts would occur. Construction activities are not expected to result in direct mortality of GST. Proposed habitat restoration features would result in long-term beneficial impacts to GST by creation of approximately 25 acres of new eelgrass habitat (forage habitat). Based on the above, proposed construction activities, including dredging, under Alternative 2 related to habitat restoration features may affect, but would not likely adversely affect, GST (see Table 5-17). Construction activities and habitat features would not result in the reduction of the population size of this species and would not result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for this species. No critical habitat for these species is found in or adjacent to the proposed Project Area; therefore, no impacts to critical habitat would occur.

Special Status Bird Species. Construction activities, including dredging, would not result in the direct or indirect loss of habitat for the special-status bird species, including the state listed Belding's Savannah Sparrow that may occur in the proposed Project Area; therefore, there would be no direct or indirect adverse impact to these species. In addition, construction activities, including dredging, under Alternative 2 would not result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for this species; therefore, no impacts to special status bird species would occur.

Marine Mammals. Construction activities, including dredging, would not result in the direct loss of habitat for marine mammal species that may occur in the proposed Project Area. Marine mammals are expected to avoid construction activity areas and forage elsewhere. Marine mammals would be expected to follow forage fishes to undisturbed locations away from the construction activity noise and turbidity. Environmental commitments SP-1, SP-2, and SP-3 are included to minimize potential effects. Indirect impacts from noise and turbidity to marine mammals would be short-term and less than significant. Construction activities under Alternative 2 would not result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for marine mammals; therefore, impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

OMRR&R impacts for Alternative 2 are as described in Section 5.6.2. OMRR&R and adaptive management activities would be short-term and result in less of a change to special status species and their habitats compared to construction impacts discussed in Section 5.6.2 above. OMRR&R activities under Alternative 2 would not result in the reduction of the population size of Federally listed species or adverse modification of designated critical habitat or result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for this species. Impacts of OMRR&R activities would be less than significant.

Impact Summary

Alternative 2 would result in short-term localized, less than significant indirect adverse impacts on special status species from sediment suspension and turbidity within the proposed Project Area during construction. No abalones are known to occur and no impacts to these species are expected. No substantial change in the type or extent of marine habitats would be expected. Indirect impacts from noise and turbidity to GST and marine mammals would likely occur; however, no direct impacts to these species are expected. Direct impacts to GST, as well as all other special status species would be minimized by implementation of environmental commitments SP-1 through SP-3 and impacts would be less than significant. Construction, including dredging, and OMRR&R activities under Alternative 2 may affect, but would not likely adversely affect GST. Construction and maintenance activities would have no effect on abalone, CLT or WSP.

Long-term beneficial impacts to biological resources would occur from creation of approximately 121 acres of new kelp reef habitat, creation of 16 acres of new rocky reef habitat, and creation of 25 acres of new eelgrass habitat.

Based on the above summary, Alternative 2 would not likely result in a reduction of population size of a threatened, endangered, or candidate species or adversely modify designated critical habitat; or substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Therefore, impacts to special status species and habitats under Alternative 2 would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 4A, the creation of approximately 30 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 29 acres of open water rocky reefs, and 121 acres of kelp reefs would reduce existing soft bottom habitat in the restoration areas by approximately 1.8 percent. Temporary increases in turbidity (see Water Quality Section) and noise associated with dredging activities and construction of these habitats could result in temporary avoidance by special status species, as well as the use of adjacent areas for predation, foraging, and migration. No substantial change in the type or extent of marine habitats would be expected. Although additional construction would occur under Alternative 4A to implement additional features, the potential for disturbance of special status species would be comparable to that identified under Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would most likely extend for a longer duration (96 months as compared to 90 months under Alternative 2). Construction activities under Alternative 4A would not likely result in a substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Impacts of construction activities on overall diversity of the ecosystem would be short-term, indirect, and less than significant.

Threatened and Endangered Bird Species. Impacts to threatened and endangered bird species and critical habitat are expected to be the same or similar to those described for Alternative 2.

Abalone. Impacts to abalone are expected to be the same or similar to Alternative 2.

Sea Turtles. Impacts to GST are expected to be the same or similar to Alternative 2.

Special Status Bird Species. Impacts to special-status bird species are expected to be the same or similar to Alternative 2.

Marine Mammals. Impacts to marine mammals are expected to be the same or similar to Alternative 2.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. OMRR&R and adaptive management activities would be short-term and result in less of a change to special status species and their habitats compared to construction impacts discussed above. OMRR&R activities under Alternative 4A would not result in the adverse modification of the population size of Federally listed species or reduced designated critical habitat or result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for this species. Impacts of OMRR&R activities would be less than significant.

Impact Summary

Alternative 4A would result in short-term localized, less than significant adverse impacts on special status from sediment suspension and turbidity within the proposed Project Area during construction. Indirect impacts from noise and turbidity to GST would likely occur; however, no direct impacts to this species are expected. Environmental commitments SP-1 through SP-3 are included to minimize potential effects to GST, as well as all other special status species. Construction, including dredging, and OMRR&R activities under Alternative 4A may affect, but would not likely adversely affect, GST. Construction and OMRR&R activities would have no effect on abalone, CLT or WSP and impacts would be less than significant.

Long-term beneficial impacts to biological resources would occur from creation of approximately 30 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 29 acres of open water rocky reefs, and 121 acres of kelp reef habitat.

Based on the above summary, Alternative 4A would not likely result in a reduction of population size of a threatened, endangered, or candidate species or adversely modify designated critical habitat; or substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Therefore, impacts to special status species and habitats under Alternative 4A would be less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 8, the creation of approximately 52 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 102 acres of open water rocky reefs, 121 acres of kelp reefs, 0.3 acre of oyster beds, a 24-acre sandy island, and 52 acres of wetlands would reduce existing soft bottom habitat in the restoration areas by approximately 3.3 percent. Based on the estimated volume of sand and fill needed for restoration measures within Alternative 8, hydraulic dredging will be considered an option along with the use of clamshell (mechanical) dredging. As described in environmental commitment NO-3, if pursued, impacts to sensitive species (*e.g.*, Green Sea Turtles) associated with the use of hydraulic dredging would be assessed and coordination/consultation with the NMFS would be undertaken to determine if additional BMPs would be necessary to reduce potential impacts to sensitive species. Temporary increases in turbidity (see Water Quality Section) and noise associated with dredging at the Surfside/Sunset Borrow site and construction of these habitats could result in temporary avoidance by special status species, as well as the use of adjacent areas for predation, foraging, and migration. Although additional construction would occur under Alternative 8 to implement additional features, the potential for construction related impacts to special status species would be comparable to that identified under Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would extend for a longer duration (113 months as compared to 90 months under Alternative 2). Construction activities under Alternative 8 would not likely result in a substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Impacts of construction activities would be short-term, indirect, and less than significant.

Threatened and Endangered Bird Species. Impacts to threatened and endangered bird species and critical habitat are expected to be the same or similar to Alternatives 2 and 4A.

Abalone. Impacts to abalone are expected to be the same or similar to Alternatives 2 and 4A.

Sea Turtles. Impacts to GST are expected to be the same or similar to Alternatives 2 and 4A.

Special Status Bird Species. Impacts to special-status bird species are expected to be the same or similar to Alternatives 2 and 4A.

Marine Mammals. Impacts to marine mammals are expected to be the same or similar to Alternatives 2 and 4A.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 8 would be comparable to those described for Alternative 2 for eelgrass beds, rocky reefs, and kelp reefs. Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (*e.g*., vegetation replacement and invasive species management) would likely be higher during initial establishment (approximately first two years) of the wetland and would likely decrease after establishment is complete. Minor structure repairs would take place on a 10-year cycle or when needed after a large storm event or sea level rise.

Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities.

Replacement of stones and other OMRR&R activities under Alternative 8 could cause a temporary increase in turbidity and noise at infrequent intervals, resulting in avoidance of maintenance areas by special status species, as well as the use of adjacent areas for predation, foraging, and migration. However, due to the relatively small increases in turbidity and noise levels, and water quality conditions and noise levels would return to previous levels after the period of maintenance ends.

OMRR&R and adaptive management activities would be short-term and result in less of a change to special status species and their habitats compared to construction impacts discussed above. OMRR&R activities under Alternative 8 would not result in the adverse modification of the population size of Federally listed species or reduced designated critical habitat; or result in substantial loss in overall diversity of the ecosystem that would affect habitat suitability for this species. Impacts of OMRR&R activities would be less than significant.

Impact Summary

Alternative 8 would result in short-term localized, less than significant adverse impacts on special status species from sediment suspension and turbidity within the project area during construction. Indirect impacts from noise and turbidity to GST would likely occur; however, no direct impacts to this species are expected. Environmental commitments SP-1 through SP-3 are included to minimize potential effects to GST, as well as all other special status species. Construction, including dredging, and OMRR&R activities under Alternative 8 may affect, but would not likely adversely affect, GST. Construction and OMRR&R activities would have no effect on abalone, CLT or WSP and impacts would be less than significant.

Long-term beneficial impacts to biological resources would occur from creation of approximately 52 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 102 acres of open water rocky reefs, 167.5 acres of kelp reefs, 0.3 acre of oyster beds, a 24-acre sandy island, and 52 acres of wetlands.

Based on the above summary, Alternative 8 would not likely result in: a reduction of population size of a threatened, endangered, or candidate species or adversely modify designated critical habitat; or substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Therefore, impacts to special status species under Alternative 8 would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.8 BIOLOGICAL RESOURCES: SIGNIFICANT ECOLOGICAL AREAS

The Terminal Island Significant Ecological Area (SEA) (https://planning.lacounty.gov/sea/proposed) would not be impacted by the proposed alternatives, including construction, dredging, and OMRR&R activities under each alternative; therefore, this resource has been eliminated from further analysis. There are no SEAs near the Surfside/Sunset Borrow site.

5.9 BIOLOGICAL RESOURCES: ESSENTIAL FISH HABITAT

5.9.1 Relevant Regulations and Basis of Findings

- Magnuson-Stevens Fishery Conservation and Management Act: purpose includes prevention of overfishing and rebuilding of overfished stocks to foster long-term protection and economic sustainability of the Nation's marine fisheries out to 200 nautical miles from shore.

Impacts to EFH are typically determined based on whether a project reduces quality and/or quantity of EFH, regardless of the degree to which that impact occurs. Based on the Magnuson-Stevens Act, adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species, and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 C.F.R. 600.810(a)). By definition, the threshold to have an adverse impact to EFH is low; however, the nature of the impact can be further qualified based on the type of impact (*e.g.*, temporary or permanent).

This section analyzes effects to EFH in accordance with the Magnuson-Stevens Act; for NEPA purposes, a substantial adverse impact to EFH will qualify as a significant impact under NEPA.

Environmental Commitments

Environmental Commitments for beneficial reuse (see GEO-2 in Marine Geology and Geologic Hazards section), water quality (see Water Quality section), Marine Habitats (see Biological Resources Marine Habitats section), and invasive species (see Biological Resources Invasive Species section) would also minimize impacts to EFH.

5.9.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Under the No Action Alternative, no habitat restoration construction or OMRR&R activities would occur. There would be no construction or maintenance related impacts under this alternative.

Under the No Action Alternative, soft bottom habitat may be impacted by hypoxia at greater depths and by stratification associated with climate change, which would adversely affect EFH for species that rely upon this habitat. Sea level rise may cause a shift from coastal salt marsh to mudflat and open water habitats, which could have an adverse impact upon EFH for those species that utilize salt marsh habitat but could benefit EFH for species that rely upon soft bottom habitat. Management actions for water quality are anticipated to be low.

Eelgrass beds provide refuge and nursery areas for many shellfish and fish species. However, eelgrass beds may be vulnerable to the predicted increased storm intensity and frequency associated with climate change. Kelp beds would be susceptible to decreased productivity associated with impaired upwelling and ocean stratification resulting from ocean temperature increases associated with climate change. Rocky reef habitat would likely be degraded due to projected increases in storm frequencies resulting in increased sedimentation associated with climate change. In each case, these changes could adversely affect EFH for those species that rely upon these habitats.

Under the No Action Alternative, no habitat restoration construction or OMRR&R activities would occur. There would be no construction or OMRR&R related impacts under this alternative.

Alternative 2

Construction Impacts

Under Alternative 2, the creation of approximately 25 acres of eelgrass habitat, 16 acres of associated rocky reef habitat, and 121 acres of kelp reefs would reduce existing soft bottom habitat in the restoration areas.

The proposed Project Area is located in an area designated as EFH for Federally managed species under three Fishery Management Plans: The Coastal Pelagic Species, Pacific Groundfish, and the Highly Migratory Species Fishery Management Plans. Of the 95 species included under these plans, 24 are known to occur in the proposed Project Area (see Table 5-17).

Table 5-17: Federally managed fish species known to occur within the Study Area and proposed Project Area

		EFH							
Common Name	**Species Name**	**WC**	**EST**	**EG**	**SI**	**RI**	**SS**	**RR**	**KR**
Rockfish and Allies									
Black Rockfish	*Sebastes melanops*	L	J,A	J		J	J	J,A	J,A
Blue Rockfish	*Sebastes mystinus*	L						J	J,A
Bocaccio	***Sebastes paucipinis***	L,J,A					J,A	J,A	L,J,A
Brown Rockfish	***Sebastes auriculatus***	L	J,A	J,A				A	A
Cabezon	*Scorpaenichthys marmoratus*		J,A	A		J,A	X	J,A	J,A
Calico Rockfish	***Sebastes dalli***	L					J,A	J,A	
California Scorpionfish	***Scorpaena guttata***	E				A	A	A	J,A
Chilipepper	*Sebastes goodei*	L					X	J	L,J
Grass Rockfish	*Sebastes rastrelliger*					J		J	J,A
Halfbanded Rockfish	*Sebastes semicinctus*	L					J	J	
Kelp Greenling	*Hexagrammos decagrammus*		J,A			A		A	A
Kelp Rockfish	*Sebastes atrovirens*					J		J,A	J,A
Olive Rockfish	*Sebastes serranoides*	L	J	X		J,A		J,A	J,A

Common Name	**Species Name**	**WC**	**EST**	**EG**	**SI**	**RI**	**SS**	**RR**	**KR**
Stripetail Rockfish	***Sebastes saxicola***	L					J,A	X	J,A
Treefish	*Sebastes serriceps*							J,A	J
Vermilion Rockfish	***Sebastes miniatus***	L,A					J	J,A	L,A
Flatfishes									
California Halibut	***Paralichthys californicus***	J		X	J,A				
Curlfin Sole	***Pleuronichthys decurrens***	E					X		
Dover Sole	*Microstomus pacificus*	E							
English Sole	***Pleuronectes vetulus***		J,A	J,A	J,A		X		
Pacific Sanddab	*Citharichthys sordidus*		J,A				X		A
Rex Sole	*Errex zachirus*		J,A				X		
Sand Sole	*Psettichthys melanosticus*		J				A		
Starry flounder	*Platichthys stellatus*		X				X		
Carangids, Scombrids, Engraulids, and Clupeids									
Jack Mackerel	***Trachurus symmetricus***	J						J	J
Northern Anchovy	***Engraulis mordax***	X	L,J,A	X			X	L,J,A	
Pacific Mackerel	***Scomber japonicus***	X	J	X			X	X	J
Pacific Sardine	***Sardinops sagax***	X	X						
Elasmobranchs									
Leopard shark	***Triakis semifasciata***		X	X	J,A	X	J,A	X	X
Spiny Dogfish	*Squalus acanthias*		J,A		X		X	X	
Big Skate	***Raja binoculata***						X	X	
California Skate	***Raja inornata***		X	X			X		

WC = Water Column, EST = Estuarine, EG = Eelgrass, SI = Sandy Intertidal, RI = Rocky Intertidal, SS = Soft Subtidal, RR = Rocky Reef, KR = Kelp Reef; E = Eggs, L = Larvae, J = Juvenile, A = Adult, X = Present but life-history stage not recorded
Bolded species are commonly observed in both the Study and Project Areas.
Sources: Robbins 2006; MBC 2016; and Mike Franklin (California State University, Northridge) pers. comm.

Construction activities, including dredging, would directly and indirectly affect EFH for species managed by the three plans in the following ways: 1) temporary disturbance and displacement of fish species; 2) increased temporary sediment loads and turbidity in the water column; 3) temporary loss of food items to fisheries (temporary loss of soft bottom habitats and associated benthic invertebrates); 3) limited disruption or destruction of soft bottom habitats; 4) limited sediment transport and re-deposition; and 5) temporary degradation of water quality due to construction and dredging activities. Most of the above effects are temporary and are negligible considering the localized effect (1.5 percent of the proposed Project Area) of the actions compared to the proposed Project Area that would be unaffected. The environmental degradation resulting from the construction and dredging activities would have minor effects on designated EFH or commercial fisheries. Direct loss of fish populations, if any, are likely to be undetectable. Recovery of EFH and commercial fisheries is expected to occur quickly (one growing season) for the majority of the affected environment. In addition, soft bottom benthic communities are more resilient to temporary disturbance than other types of marine habitats (*e.g.*, rocky substrate) and are expected to recolonize to pre-project conditions within a few seasons. See also Sections 5.3 (water quality) and 5.6 (biological) of this IFR for additional relevant information. EFH impacts would be adverse, but not substantial.

EFH Habitat Areas of Particular Concern, particularly eelgrass habitat, are addressed in Section 5.6 of this chapter and Appendix G.

The USACE has determined that construction activities under Alternative 2 would have an adverse, but not substantially adverse, impact to EFH. Therefore, impacts under NEPA would be less than significant. Impacts, such as turbidity associated with construction and dredging would be insignificant. Under environmental commitment INV-1, pre-construction surveys for *Caulerpa* spp*.* would be conducted within construction areas and the Surfside/Sunset Borrow site prior to the start of construction activities. Construction shall not begin should *Caulerpa* spp*.* be identified until cleared to do so by NMFS.

OMRR&R Impacts (Including MAMP Implementation)

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, kelp reefs, and adaptive management (see Appendix F). Monitoring of eelgrass beds and kelp reefs would be anticipated to require operation of a single boat during daylight hours for a short duration during monitoring.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for each individual measure, no further monitoring would be required specifically for adaptive management.

After rocky reef success criteria are met, maintenance and monitoring would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Replacement of stones could cause a temporary increase in turbidity over approximately 16 acres at infrequent intervals (see Water Quality Section). During maintenance activities, turbidity and noise could result in temporary avoidance of the proposed Project Area by pelagic fishes and coastal pelagic species, and the use of adjacent areas for predation, foraging, and migration. However, due to the relatively small increases in turbidity and noise levels, and the expectation that water quality conditions and noise levels would return to previous levels after the period of maintenance ends.

Over the next 50 years, sea level may increase to approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require the trucking or barging of material and heavy equipment. These activities would require fewer days and equipment use than construction activities. OMRR&R and adaptive management activities would be short-term and result in less of a change to coastal pelagic and Pacific groundfish species EFH compared to construction impacts discussed above. The USACE has determined that OMRR&R activities under Alternative 2 would have an adverse, but not substantial, effect on EFH and a less than significant impact under NEPA.

Impact Summary/EFH Determination

Alternative 2 would result in short-term localized, less than substantial adverse impacts on EFH within the proposed Project Area during construction and OMRR&R activities and a relatively small area of loss of soft bottom habitat (approximately 1.5 percent of the proposed Project Area). The USACE has determined that construction activities under Alternative 2 would have an adverse, but not substantial, impact to EFH. Impacts under NEPA would thus be less than significant. Impacts, such as turbidity associated with construction and dredging, would be insignificant. Under INV-1, pre-construction surveys for *Caulerpa* spp*.* would be conducted within construction areas and the Surfside/Sunset Borrow site prior to the start of construction activities. Construction shall not begin should *Caulerpa* spp*.* be identified until cleared to do so by NMFS.

Level of Impact for Alternative 2

Less than significant impact under NEPA.

Alternative 4A

Construction Impacts

Under Alternative 4A, the creation of approximately 30 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 29 acres of open water rocky reefs, and 121 acres of kelp reefs would reduce existing soft bottom habitat in the restoration areas.

The proposed Project Area is located in an area designated as EFH for Federally managed species under three Fishery Management Plans: The Coastal Pelagic Species, Pacific Groundfish, and the Highly Migratory Species Fishery Management Plans. Of the 95 species included under these plans, 24 are known to occur in the proposed Project Area (see Table 5-17).

EFH Habitat Areas of Particular Concern, particularly eelgrass habitat, are addressed in Section 5.6 of this chapter and Appendix G.

Construction activities, including dredging, would directly and indirectly adversely affect EFH for the species managed by the three plans in the following ways: 1) temporary disturbance and displacement of fish species, 2) temporary increased sediment loads and turbidity in the water column, 3) temporary loss of food items to fisheries, 4) limited disruption or destruction of soft bottom habitats, 5) limited sediment transport and re-deposition, and 6) temporary degradation of the water quality due to construction and dredging activities. The majority of the above effects are temporary and are negligible considering the localized effect (1.5 percent of the proposed Project Area) of the actions compared to the Project Area that would be unaffected. The environmental degradation resulting from the construction and dredging activities would have minor effects on designated EFH or commercial fisheries. Direct loss of fish populations, if any, are likely to be undetectable. Recovery of EFH and commercial fisheries is expected to occur quickly (one growing season) for the majority of the affected environment. In addition, soft bottom benthic communities are more resilient to temporary disturbance than other types of marine habitats (*e.g.*, rocky substrate) and are expected to recolonize to pre-project conditions within a few seasons. See also Sections 5.3 and 5.6 of this IFR for additional relevant information for this analysis. EFH impacts would be adverse, but not substantial.

Temporary increases in turbidity (see Water Quality Section) and noise associated with construction of these habitats could result in temporary avoidance by coastal pelagic and Pacific groundfish species. Although additional construction would occur under Alternative 4A to implement additional features and occur over a longer duration (96 months as compared to 90 months under Alternative 2), the potential for disturbance of coastal pelagic and Pacific groundfish species would be comparable to that identified under Alternative 2. The USACE has determined that the adverse effect on EFH from construction and dredging activities under Alternative 4A is not substantial. Impacts would be less than significant for NEPA. Impacts, such as turbidity associated with construction and dredging would be insignificant. Under INV-1, pre-construction surveys for *Caulerpa* spp*.* would be conducted within construction areas and the Surfside/Sunset Borrow site prior to the start of construction activities. Construction shall not begin should *Caulerpa* spp*.* be identified until cleared to do so by NMFS.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. OMRR&R and adaptive management activities would be short-term and result in less of a change coastal pelagic and Pacific groundfish species compared to construction impacts discussed above. The USACE has determined that OMRR&R activities under Alternative 4A would not have a substantial, adverse impact to any species under the three Fishery Management Plans or to their habitat. Impacts, such as turbidity associated with construction and dredging would be insignificant.

Impact Summary/EFH Determination

Alternative 4A would result in adverse but not substantial effect on EFH during construction and OMRR&R activities and a relatively small area of loss of soft bottom habitat (approximately 1.8 percent of the proposed Project Area). The USACE has determined that construction activities under Alternative 4A would not have a substantial, adverse impact to any species under the three Fishery Management Plans or to their habitat. Impacts under NEPA would be less than significant. Impacts, such as turbidity associated with construction and dredging, would be insignificant. Under INV-1, pre-construction surveys for *Caulerpa* spp. would be conducted within construction areas and the surfside/Sunset Borrow site prior to the start of construction activities. Construction shall not begin should *Caulerpa* spp. be identified until cleared to do so by NMFS.

Level of Impact for Alternative 4A

Less than significant impact under NEPA.

Alternative 8

Construction Impacts

Under Alternative 8, the creation of approximately 52 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 102 acres of open water rocky reefs, 121 acres of kelp reefs, 0.3 acre of oyster beds, a 24-acre sandy island, and 52 acres of wetlands would reduce existing soft bottom habitat in the restoration areas.

The proposed Project Area is located in an area designated as EFH for Federally managed species under three Fishery Management Plans: The Coastal Pelagic Species, Pacific Groundfish, and the Highly Migratory Species Fishery Management Plans. Of the 95 species included under these plans, 24 are known to occur in the proposed Project Area (see Table 5-17).

EFH Habitat Areas of Particular Concern, particularly eelgrass habitat, are addressed in Section 5.6 of this chapter and Appendix G.

Construction impacts associated with Alternative 8 are expected to be the same or similar to those described for Alternatives 2 and 4A. Alternative 8 would have an adverse but not substantial effect on EFH, and a less than significant impact under NEPA. Temporary increases in turbidity (see Water Quality Section) and noise associated with construction of these habitats could result in temporary avoidance by coastal pelagic and Pacific groundfish species. Although additional construction would occur under Alternative 8 to implement additional feature and occur over a longer duration (53 months as compared to 90 months under Alternative 2), the potential for disturbance of coastal pelagic and Pacific groundfish species and habitat would be comparable to that identified under Alternative 2. The USACE has determined that construction and dredging activities under Alternative 8 would not have a substantial, adverse impact to any species within relevant Fishery Management Plans or to their habitat. Impacts, such as turbidity associated with construction and dredging would be insignificant. Under INV-1, pre-construction surveys for *Caulerpa* spp. would be conducted within construction areas and the surfside/Sunset Borrow site prior to the start of construction activities. Construction shall not begin should *Caulerpa* spp. be identified until cleared to do so by NMFS.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (*e.g*., vegetation replacement and invasive species management) would likely be higher during initial establishment (approximately first two years) of the wetland and would likely decrease after establishment is complete. Minor structural repairs would take place on a 10-year cycle or when needed after a large storm event or sea level rise.

Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization.

Adaptive management may include additional actions such as eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities.

Replacement of stones and other OMRR&R activities under Alternative 8 could cause a temporary increase in turbidity and noise at infrequent intervals, resulting in avoidance of maintenance areas by coastal pelagic and Pacific groundfish species, as well as the use of adjacent areas for predation, foraging, and migration. However, due to the relatively small increases in turbidity and noise levels, and the expectation that water quality conditions and noise levels would return to previous levels after the period of maintenance ends. The USACE has determined that OMRR&R activities under Alternative 8 would not have a substantial, adverse impact to EFH, and impacts under NEPA would be less than significant.

Impact Summary

Alternative 8 would result in adverse but not substantial effects to EFH. Impacts would be short-term and localized from sediment suspension and turbidity within the project area during construction and OMRR&R activities and a relatively small area of loss of soft bottom habitat (approximately 3.3 percent of the project area). Impacts, such as turbidity associated with construction and dredging, would be insignificant. Under INV-1, pre-construction surveys for *Caulerpa* spp. would be conducted within construction areas and the Surfside/Sunset Borrow site prior to the start of construction activities. Construction shall not begin should *Caulerpa* spp. be identified until cleared to do so by NMFS.

Level of Impact for Alternative 8

Less than significant impact under NEPA.

5.10 BIOLOGICAL RESOURCES: INVASIVE SPECIES

5.10.1 Relevant Regulations and Significance Criteria

- Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990: Federal program to prevent the introduction of, and to control the spread of, unintentionally introduced aquatic nuisance species.
- Federal Noxious Weed Act of 1974: Requires each Federal agency to provide for noxious week management on lands under its jurisdiction.
- Executive Order 13751 Safeguarding the Nation from the Impacts of Invasive Species: Amends EO 13112 and directs actions to continue coordinated Federal prevention and control efforts related to invasive species.

Significance Criteria

The following biological resources significance criteria are based on the CEQA Checklist as provided in Appendix G to the *CEQA Guidelines*. These criteria are also being adopted for NEPA. Biological resource impacts would be considered significant if the proposed alternatives would:

- Cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters.

Environmental Commitments

INV-1 Pursuant to the *Caulerpa* Control Protocol established by NMFS and California Department of Fish and Wildlife (CDFW), prior to construction activities that would be expected to disturb *Caulerpa* spp. should any exist within the proposed Project Area, a surveillance level survey of the Area of Potential Effect (APE) will be performed. In *Caulerpa*-free habitats, this requires 20 percent of the APE to be surveyed for the presence of *Caulerpa* spp.. In the event *Caulerpa* spp. is found, disturbing activities would be delayed until the infestation is isolated, treated, or the risk of spread is eliminated, and sightings would be reported immediately to CDFW and NMFS. Construction shall not begin until cleared to do so by the NMFS.

5.10.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Climate change is expected to change water quality and habitat conditions in the future. Increased water temperatures, ocean acidification, larger and more frequent storm events, reduced upwelling, and other consequences of climate change may favor colonization by invasive species or increases in abundance of these species under the No Action Alternative.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 2, the creation of new eelgrass, rocky reef, and kelp bed habitat offers the potential for colonization of the proposed Project Area by invasive species. Because invasive species are already present in the proposed Project Area, it is anticipated that these species could form part of the biological communities in the restored areas. However, the proportion of invasive species is not expected to increase as a result of construction activities under Alternative 2.

If present during construction, the invasive alga *Caulerpa* spp*.* could expand through disturbance and fragmentation. However, required pre-construction surveys to document the absence of this genus in the proposed Project Area should eliminate this possibility (INV-1). Any sightings of *Caulerpa* spp*.* would be reported immediately to CDFW and NMFS. Construction of new habitats on existing soft-bottom areas would not likely cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters. Therefore, impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, rocky reefs, kelp reefs, and adaptive management (see Appendix F). Monitoring of eelgrass beds and kelp reefs would be anticipated to require operation of a single boat during daylight hours for a short duration.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities and the proportion of invasive species would not be expected to increase as a result of adaptive management actions. Therefore, any impacts would be less than significant. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds, no further monitoring would be required specifically for adaptive management.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. OMRR&R of rocky reefs would not be anticipated to increase the proportion of invasive species in the project area as a result of activities under Alternative 2.

Over the next 50 years, sea level may increase by approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require the trucking or barging of material and heavy equipment. These activities would require fewer days and equipment use than construction activities and would not be anticipated to increase the proportion of invasive species in the proposed Project Area under Alternative 2.

OMRR&R and adaptive management activities would be short-term and result in less of a change compared to construction impacts discussed above, the potential for an increase in invasive species would be lower than during the construction period, would not likely cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters, and therefore, impacts would be less than significant.

Impact Summary

Construction of new habitats on a relatively small area of existing soft-bottom habitat (1.5 percent of the proposed Project Area) would be unlikely to result in the spread or introduction of invasive species. Alternative 2 construction and OMRR&R activities would not likely cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters. Therefore, potential impacts of the spread of invasive species would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 4A, the creation of approximately 30 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 29 acres of open water rocky reefs, and 121 acres of kelp reefs would reduce existing soft bottom habitat in the restoration areas. Although additional construction would occur under Alternative 4A to implement additional features, the potential for construction related increases in invasive species would be comparable to that identified under Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would extend for a longer duration (96 months as compared to 90 months under Alternative 2).

If present during construction, the invasive alga *Caulerpa* spp. could expand through disturbance and fragmentation. However, implementation of INV-1 would eliminate this possibility. Any sightings of *Caulerpa* spp. would be reported immediately to CDFW and NMFS. Construction activities under Alternative 4A would not likely cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters, and therefore, impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. OMRR&R and adaptive management activities would be short-term and result in less of a change compared to construction impacts discussed above, the potential for an increase in invasive species would be lower than during the construction period and would not be anticipated to increase the proportion of invasive species in the proposed Project Area. Therefore, impacts would be less than significant.

Impact Summary

Construction of new habitats on existing soft-bottom areas would be unlikely to result in the spread of invasive species. Alternative 4A would not likely cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters. Therefore, potential impacts of the spread of invasive species would be less than significant.

Level of Impact for Alternative 4A

Less than significant impacts under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 8, the creation of approximately 52 acres of eelgrass habitat, 20 acres of associated rocky reef habitat, 102 acres of open water rocky reefs, 121 acres of kelp reefs, 0.3 acre of oyster beds, a 24-acre sandy island, and 52 acres of wetlands would reduce existing soft bottom habitat in the restoration areas. Although additional construction would occur under Alternative 8 to implement additional features, the potential for construction related increases in invasive species would be comparable to that identified under Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would extend for a longer duration (113 months as compared to 90 months under Alternative 2).

If present during construction, the invasive alga *Caulerpa* spp. could expand through disturbance and fragmentation. However, implementation of INV-1 would eliminate this possibility. Any sightings of *Caulerpa* spp. would be reported immediately to CDFW and NMFS. Potential impacts of the spread of invasive species would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Maintenance for wetlands would consist of yearly clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (*e.g.*, vegetation replacement and invasive species management) would likely be higher during initial establishment (approximately first two years) of the wetland and would likely decrease after establishment is complete. Minor structural repairs would take place on a 10-year cycle or when needed after a large storm event or sea level rise.

Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction.

Replacement of stones and other maintenance and monitoring activities under Alternative 8 could create small areas for colonization by invasive species. However, the potential for an increase in invasive species would be lower than during the construction period and would not be anticipated to increase the proportion of invasive species in the proposed Project Area. Therefore, OMRR&R and adaptive management activity impacts would be less than significant.

Impact Summary

Construction of new habitats on existing soft-bottom areas would be unlikely to result in the spread of invasive species. Alternative 8 would not likely cause the introduction and establishment or substantial increase in the population of non-indigenous plant or animal species into California's coastal waters. Therefore, potential impacts of the spread of invasive species would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.11 CULTURAL AND HISTORIC RESOURCES

5.11.1 Relevant Regulations and Significance Criteria

- Federal NHPA: Requires Federal agencies to consider the effects of their undertakings on historic properties.
- State of California Register of Historical Resources: Used to identify the state's historical resources and to indicate what properties are to be protected from substantial adverse change.
- CEQA: Requires state lead agencies to determine if a proposed project would have a significant effect on the environment, including significant effects on historical or unique archaeological resources.

- City of Long Beach General Plan Historic Preservation Element

Significance Criteria

Determination of the significance of impacts to cultural resources associated with the proposed alternatives are based on criteria provided in Federal and state statutes and their implementing guidelines. Federal agencies must consider project impacts on cultural resources under both NEPA and the NHPA. Whereas NEPA more broadly includes review of impacts on cultural resources as part of the affected human environment, including sacred sites and non-NRHP eligible archaeological sites and collections, the NHPA only considers effects on "historic properties," defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP. State agencies must consider project impacts on "historical resources," defined as listed in or eligible for the California Register of Historical Resources, as part of the environment under CEQA.

The following cultural resources thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the *CEQA Guidelines*. Cultural resource impacts would be considered significant under CEQA if the proposed alternatives would:

- Cause a substantial adverse change in the significance of an historical resource as defined in *CEQA Guidelines* Section 15064.5.
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.
- Disturb any human remains, including those interred outside of formal cemeteries.

The USACE must comply with NHPA Section 106 and assess impacts to historic properties based on its definition of adverse effect. Under the NHPA, project alternatives impacts would be considered adverse if they affect a historic property by altering the characteristics that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property (36 CFR Section 800.5; 40 CFR Section 1508.27, subd. (b)). Integrity is the ability of a property to convey its significance, based on its location, design, setting, materials, workmanship, feeling, and association. The term "historic property" (used in NHPA) and "historic resource" (used in CEQA) are similar in concept, and the process to evaluate eligibility and to determine effects is analogous. Consequently, an adverse effect under NHPA would constitute a substantial adverse change under CEQA. Adverse effects can be direct or indirect. They include reasonably foreseeable impacts that may occur later in time, be farther removed in distance, or be cumulative.

- For purposes of this analysis, impacts to cultural resources would be considered significant under NEPA if the proposed alternatives would cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility.

Environmental Commitments

CR-1 No project construction activities shall occur within the avoidance areas included in Appendix K without reconsulting with the SHPO and Indian Tribes in accordance with Section 106 of the NHPA.

CR-2 Prior to the issuance of a notice to proceed for construction, the USACE shall provide a map of the final project enhancement feature locations to the SHPO to demonstrate that all the potential historic features have been avoided.

CR-3 In the event human remains are discovered, all ground-disturbing activities shall be halted immediately within the area of the discovery, and a USACE archaeologist and the Los Angeles County

Coroner must be notified. The coroner will determine whether the remains are of forensic interest. If human remains, funerary objects, sacred objects, or items of cultural patrimony are located on Federal or Tribal lands, the treatment and disposition of such remains will be carried out in compliance with the Native American Graves Protection and Repatriation Act (Public Law 101-601; 25 U.S.C. 3001 et seq.) and EP 1130-2-540, Chapter 6. If human remains are located on state or private lands, the USACE shall follow the steps outlined in 36 CFR 800.13, post review discoveries, and shall notify the City of Long Beach who shall ensure that the process outlined in California Public Resources Code, Section 5097.98 are carried out.

CR-4 If previously unknown cultural resources are discovered during the project, all ground-disturbing activities shall immediately cease within fifty meters of the discovery until the USACE has met the requirement of 36 CFR 800.13 regarding post-review discoveries. Work shall not resume in the area surrounding the potential historic property until USACE re-authorizes project construction.

5.11.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative. No historic properties or historic resources would be affected.

Alternative 2

Construction Impacts
Direct and Indirect Impact Analysis

Under Alternative 2, eelgrass beds, nearshore rocky reefs, and kelp beds/reefs would cover approximately 162 acres within the proposed Project Area. The stone pile height of the nearshore rocky reefs would be no greater than 10 feet above the ocean floor. Approximately 444,000 tons of stone quarry material, and 100,000 cubic yards of dredged sand from the Surfside/Sunset Borrow site, would be placed for these features. Because all features would be constructed below water, there would be no permanent visual effects.

No impacts to cultural or historic resources would occur at the previously established Surfside/Sunset borrow area. Given that the Surfside/Sunset borrow area has been used as a borrow source of sand for the San Gabriel River to Newport Bay Beach Nourishment project since 1964, it is extremely improbable that any intact submerged resources exist within the nearshore disposal area. No subsurface features are noted on the navigation chart. Further, the nearshore area is a highly energetic environment, and the ocean bottom tends to be mobile. It is unlikely that any cultural or historic resources would have persisted in this area, even if it had not been excavated for beach nourishment material.

Based on the review of literature and records, no cemeteries would be disturbed. Construction activities and restoration features would occur within the waters of the bay; no human remains are anticipated to be found within construction areas. In addition, the staging area, quarries, and dredging site are currently disturbed or developed, no human remains have been found in these areas and are not anticipated during construction activities under Alternative 2.

Establishment of kelp on reefs would occur through passive colonization of propagules over time. The harvesting of bare-root eelgrass plant material from the donor bed(s) by "raking" rhizomes out of the surface sediment layers would occur in areas with no known cultural or historic resources (based on the results of surveys and known locations of these resources).

A temporary 2.4 acre staging area within the Port of Long Beach on a paved portion of Pier T would be used during construction. There would be no ground disturbance. Thus, establishing a temporary staging area would have no effect on cultural or historic properties.

The entire 163 acres where the eelgrass beds, nearshore rocky reefs, and kelp beds/reefs are proposed were examined as part of a 900-acre presence/absence survey of ESPB in 2021. While the survey team did not find any resources that were clearly over 50 years of age, they did identify three shipwrecks and five features that were suggestive of a shipwreck but were either eroded or buried and could not be positively identified. The imagery of the shipwrecks indicates that they are modern fiberglass boats. Beyond the shipwrecks, the survey team found evidence of 20 additional buried debris features. These buried debris features are problematic in that there is not enough surface manifestation to determine what the feature is; however, these debris features do not appear to be shipwrecks. Other features that were identified were manmade reefs that appear to be composed of pilings and rubble that has fallen off the Long Beach Breakwater or one of the oil extraction platforms within ESPB. The USACE has ensured that the proposed marine enhancement features would avoid all of these potential historic resources. The proposed kelp reefs are also a feature of Alternative 4A. As part of the Section 106 consultation for Alternative 4A, the USACE has determined, in consultation with the SHPO, that with the commitment to avoid all potential historic resources, the creation of the kelp reefs would result in no historic properties affected (Appendix K).

This alternative would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility. Alternative 2 would not alter the characteristics that qualify a property for inclusion in the NRHP; would not cause a substantial change in the significance of an historical resource as defined in *CEQA Guidelines* Section 15064.5; cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5; or disturb any human remains, including those interred outside of formal cemeteries. Impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

<u>*Direct and Indirect Impact Analysis*</u>

Upon completion of construction, continuing activities associated under Alternative 2 would consist of monitoring and marine wildlife surveys. Monitoring and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours for a short duration. These activities would not be anticipated to cause direct or indirect impacts cultural or historic resources.

Maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds; no further monitoring would be required. It is not expected that additional sand material would be needed for eelgrass beds and no additional dredging would be needed for OMRR&R for these features. These activities would not be anticipated to cause direct or indirect impacts to cultural or historic resources.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment. Rocky reef maintenance and monitoring activities would occur within areas disturbed during construction and would not be anticipated to cause direct or indirect impacts cultural or historic resources.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). The City would continue to monitor features following protocols and timelines established for routine maintenance. These activities would occur within areas disturbed during construction and would not be anticipated to cause direct or indirect impacts cultural or historic resources.

OMRR&R activities would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility.

OMRR&R and adaptive management activities would not cause a substantial adverse change in the significance of an historical resource, would not cause a substantial adverse change in the significance of an archaeological resource, would not disturb any human remains, including those interred outside of formal cemeteries, or would not alter the characteristics that qualify a property for inclusion in the NRHP. OMRR&R activities would be short-term, less intensive than construction impacts, confined to the constructed habitat features as discussed above, and would not result in direct or indirect impacts to cultural or historic resources. Impacts would be less than significant.

Impact Summary

This alternative would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility. With implementation of CR-1, no project construction activities would occur within 50 meters of the potential historic properties within the proposed Project Area as noted in Appendix K. Alternative 2 construction, OMRR&R, and adaptive management activities, would not cause a substantial adverse change in the significance of an archaeological resource, would not disturb any human remains, including those interred outside of formal cemeteries, or would not alter the characteristics that qualify a property for inclusion in the NRHP, and therefore, would not result in significant impacts.

Level of Impact for Alternative 2

Impacts would be less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 4A, stones would also be placed at specified locations to create a hard, rocky reef substrate upon which eelgrass and kelp would become established on the low relief sea bottom. Under Alternative 4A, eelgrass, nearshore rocky reefs, open water rocky reefs, and kelp beds would cover approximately 201 acres within the project area (approximately 1.8 percent of the project area). Approximately 937,000 tons of stone quarry material and 100,000 cubic yards of dredged sand would be placed for these features. Sand would be dredged from a 20-acre portion of the existing 1,700 acre Surfside/Sunset Borrow site (see description of site under Alternative 2). As in Alternative 2, there would be no permanent above-water visual effects.

The Pier T staging area would be the same as described under Alternative 2, the staging area is currently paved and there would be no ground disturbance. Thus, establishing a temporary staging area would have no effect on cultural or historic properties.

Establishment of kelp on reefs would occur through passive colonization of propagules over time. The harvesting of bare-root eelgrass plant material from the donor bed(s) by "raking" rhizomes out of the surface sediment layers would occur in areas with no known cultural or historic resources (based on the results of surveys and known locations of these resources).

Based on the review of literature and records for the area of Study Area (plus one mile buffer), no cemeteries would be disturbed. Construction activities and restoration features would occur within the waters of the bay, no human remains are anticipated to be found within construction areas. In addition, the staging area, quarries, and dredging site are currently disturbed or developed, no human remains have been found in these areas and are not anticipated during construction activities under Alternative 4A.

A survey of a 900-acre area surrounding the proposed footprint of alternative 4A was completed in 2021. While the survey team did not find any resources that were clearly over 50 years of age, they did identify three shipwrecks and five features that were suggestive of a shipwreck but were either eroded or buried and could not be positively identified. The imagery of the shipwrecks indicates that they are modern fiberglass boats. Beyond the shipwrecks, the survey team found evidence of 20 additional buried debris features. These buried debris features are problematic in that there is not enough surface manifestation to determine what the feature is; however, these debris features do not appear to be shipwrecks. Other features that were identified were manmade reefs that appear to be composed of pilings and rubble that has fallen off the Long Beach Breakwater or one of the oil extraction platforms within ESPB. The USACE has ensured that the proposed marine enhancement features would avoid any of these potential historic resources. In consultation with the SHPO, the USACE has determined that with the commitment to avoid all potential historic resources, the alternative would result in no historic properties affected (Appendix K).

This alternative would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility. Alternative 4A would not alter the characteristics that qualify a property for inclusion in the NRHP; would not cause a substantial change in the significance of an historical resource as defined in *CEQA Guidelines* Section 15064.5; cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5; or disturb any human remains, including those interred outside of formal cemeteries. Impacts to would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impacts Analysis

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2, and would not cause a substantial adverse change in the significance of an historical resource, would not cause a substantial adverse change in the significance of an archaeological resource, would not disturb any human remains, including those interred outside of formal cemeteries, or, would not alter the characteristics that qualify a property for inclusion in the NRHP. OMRR&R activities would be short-term, less intensive than construction impacts, confined to the constructed habitat features as discussed above, and would not result in direct or indirect impacts to cultural or historic resources. Impacts would be less than significant.

Impact Summary

This alternative would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility. No project construction activities would occur within 50 meters of the potential historic properties within the proposed Project Area as noted in Appendix K. Alternative 4A construction, OMRR&R, and adaptive management activities would not cause a substantial adverse change in the significance of an archaeological resource, would not disturb any human remains, including those interred outside of formal cemeteries, would not alter the characteristics that qualify a property for inclusion in the NRHP, and therefore, would not result in significant impacts.

Level of Impact for Alternative 4A

Impacts would be less than significant impact under NEPA and CEQA.

Alternative 8

CONSTRUCTION IMPACTS

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 8, eelgrass beds (~52 acres), rocky reefs (nearshore and open water; ~122 acres), kelp beds/reefs (~121 acres), sandy island (~24 acres), and wetlands (~52 acres) would cover approximately 372 acres within the proposed Project Area. This alternative also includes a small (0.3 acre) oyster bed at the existing Alamitos Bay jetties. The stone pile heights would be the same as described under Alternative 2 (low profile stone piles). Approximately 2,482,000 tons of stone quarry material and 100,000 cubic yards of dredged sand would be placed for eelgrass beds, rocky reefs, and kelp beds. For the sandy island and wetlands habitats, approximately 4,287,000 cubic yards of sand and fill material would be dredged from a nearby borrow and approximately 48,000 cubic yards of concrete for pre-cast caissons would also be needed. Sand, including white sand, would be dredged from a 200-acre portion of the existing 1,700 acre Surfside/Sunset Borrow site.

The Pier T staging area would be the same as described under Alternative 2.

Based on the review of literature and records,no cemeteries would be disturbed. Construction activities and restoration features would occur within the waters of the bay, no human remains are anticipated to be found within construction areas. In addition, the staging area, quarries, and dredging site are currently disturbed or developed, no human remains have been found in these areas and are not anticipated during construction activities under this Alternative.

No impacts to cultural resources would occur at the previously established Surfside/Sunset borrow site. Given that the Surfside/Sunset borrow area has been used as a borrow source of sand for the San Gabriel River to Newport Bay Beach Nourishment project since 1964, it is extremely improbable that any intact submerged resources exist within the nearshore disposal area. No subsurface features are noted on the navigation chart. Further, the nearshore area is a highly energetic environment, and the ocean bottom tends to be mobile. It is unlikely that any cultural or historic resources would have persisted in this area, even if it had not been excavated for beach nourishment material.

The kelp, sandy islands, and portions of the rocky reef features have been surveyed for the presence of cultural resources. While the survey team did not find any resources that were clearly over 50 years of age, they did identify features that were suggestive of shipwrecks or were buried and could not be positively identified. The imagery of the shipwrecks indicates that they are modern fiberglass boatsBeyond the shipwrecks, the survey team found evidence of 20 additional buried debris features. These buried debris features are problematic in that there is not enough surface manifestation to determine what the feature is; however, these debris features do not appear to be shipwrecks. Other features that were identified were manmade reefs that appear to be composed of pilings and rubble that has fallen off the Long Beach Breakwater or one of the oil extraction platforms within ESPB. The USACE has ensured that the proposed marine enhancement features would avoid any of these potential historic resources. The proposed oyster beds, Coastal wetlands, and some of the offshore rocky reef was not included in the survey; however, the high-energy nature of the shoreline environment along the California coast makes preservation of intact submerged cultural resources very unlikely except in specific locations that are somewhat protected by natural features. This coupled with the ability to modify the locations of the habitat enhancement features makes it highly unlikely that the alternative would result in adverse effects to historic properties. Construction impacts would be less than significant.

The sandy island and wetlands would have above water features. These restoration areas would initially be barren of vegetation with native vegetation establishing over time. Because these features would have a low elevation, they would not substantially alter the visual character of the area (see Chapter 5 Aesthetics and Visual Resources Section for additional consideration of visual effects). The visual changes to the setting from the addition of these small elements within the context of constructed energy islands, a busy shipping port, and urban development along the shore would result in no direct or indirect effects to cultural or historic resources.

This alternative would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility. Based on the above, Alternative 8 would not alter the characteristics that qualify a property for inclusion in the NRHP; would not cause a substantial change in the significance of an historical resource as defined in *CEQA Guidelines* Section 15064.5; cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5; or disturb any human remains, including those interred outside of formal cemeteries. Impacts would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impact Analysis

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Maintenance for wetlands would consist of annual clearing and grubbing of invasive species to prevent the spread of these species. Sand replenishment and dredging would occur every 5 to 10 years to return the wetland to the design elevation. Wetland maintenance needs (e.g., vegetation replacement and invasive species management) would likely be higher during initial establishment (approximately first two years) of the wetland and would likely decrease after establishment is complete. Minor structure repairs would take place on a 10-year cycle or when needed after a large storm event. These activities would be short-term, less intensive than construction impacts, confined to the constructed habitat features as discussed above, and would not result in direct or indirect impacts to cultural or historic resources.

Maintenance for the sandy island would consist of yearly clearing and grubbing to remove excess vegetation. Clean sediment would need to be deposited at least every 5 years to maintain the required elevation and beach shape. The revetted slope should be maintained on a 10-year cycle, or as needed to justify the cost of mobilization. These activities would be short-term, less intensive than construction impacts, confined to the constructed habitat features as discussed above, and would not result in direct or indirect impacts to cultural or historic resources.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F, MAMP). These activities would occur within areas disturbed during construction and would not result in direct or indirect impacts to cultural or historic resources.

OMRR&R and adaptive management activities would not cause a substantial adverse change in the significance of an historical resource, would not cause a substantial adverse change in the significance of an archaeological resource, would not disturb any human remains, including those interred outside of formal cemeteries, and would not alter the characteristics that qualify a property for inclusion in the

NRHP. OMRR&R activities would be short-term, less intensive than construction impacts, confined to the constructed habitat features as discussed above, and would not result in direct or indirect impacts to cultural or historic resources. Impacts would be less than significant.

Impact Summary
This alternative would not cause a substantial adverse effect to a historic property such that the implementation of the proposed alternative would result in the destruction of a historic property or the loss of a property's eligibility. No project construction activities would occur within 50 meters of the potential historic properties within the proposed Project Area as noted in Appendix K. Alternative 8 construction, OMRR&R, and adaptive management activities, would not cause a substantial adverse change in the significance of an archaeological resource, would not disturb any human remains, including those interred outside of formal cemeteries, and would not alter the characteristics that qualify a property for inclusion in the NRHP, and therefore, would not result in significant impacts.

Level of Impact for Alternative 8

Impacts would be less than significant impact under NEPA and CEQA.

5.12 AESTHETICS AND VISUAL RESOURCES

5.12.1 Relevant Regulations and Significance Criteria

- State of California Scenic Highways: Caltrans maintains a list of routes that are "adopted" and "eligible." State Route 1 (also known as the Pacific Coast Highway), located near the proposed Project Area, is an "eligible" scenic highway but has not been designated as an Official State or County Scenic Highway.
- State of California Coastal Act Sensitive Coastal Resource Area: The proposed Project Area falls within the California Coastal Zone and would be considered a "sensitive coastal resource area," which are identifiable and geographically bounded land and water areas within the coastal zone of vital interest and sensitivity.
- State of California Coastal Act Scenic and Visual Qualities of Coastal Areas: Under Section 30251, the scenic and visual qualities of coastal areas must be considered and protected as a resource of public importance.
- City of Long Beach Municipal Code: Identifies land use categories, development standards, and other general provisions that ensure consistency between the General Plan and proposed development projects.
- City of Long Beach General Plan Southeast Area Development and Improvement Plan: Public Access to Open Space – Improve public access to the marina, waterways, wetlands, and parks.

Significance Criteria

The following aesthetics and visual thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the *CEQA Guidelines*. These criteria are also being adopted for NEPA. Aesthetic and visual impacts would be considered significant if the proposed alternatives would:

- Have a substantial adverse permanent effect on a scenic vista.
- Substantially degrade the existing visual character or quality of the site (proposed Project Area) and its surroundings permanently.
- Create a new permanent source of substantial light or glare which would adversely affect day or nighttime views of the area.

Environmental Commitments

AV-1 Prior to initiating construction and staging activities, property owners and other persons in potentially affected areas would receive notice of the construction activities, including information on timing and duration. This notice would help inform viewers of the proposed ecological restoration and point out that proposed eelgrass, kelp, and associated rocky reef restoration would be underwater features not visible from the shoreline.

5.12.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Under the No Action Alternative, potential future changes to the ESPB proposed Project Area would likely occur within existing land and water uses, such as development or improvements within the existing harbors, and housing and commercial areas within the existing urbanized beach-front and adjacent lands. Activities within the waters of the ESPB (energy islands, marinas, recreation, and dredging) would be similar to ongoing activities and would not be perceived as a noticeable change by sensitive viewers in the area. Any vegetation or habitat restoration activities within the bay or adjacent areas may be noticeable to sensitive viewers; however, vegetation and habitat restoration are typically viewed as beneficial or improvements to existing viewsheds. Beach or coastal erosion, which is likely to continue to occur, is typically considered an adverse impact to a viewshed. Beach and coastal erosion would likely continue to occur under the No Action Alternative.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 2, construction of the eelgrass beds, nearshore rocky reefs and kelp reefs would require the use of dredges, scows, barges, tugboats, front-end loaders, cranes, and winches. The majority of this equipment would be operating near the shore during eelgrass and associated rocky reef placement, and from two to three miles offshore for the kelp reef placement and sand dredging. The proposed construction activities are projected to occur over a 30-month period.

Construction equipment would be visible from the beaches, residential areas, public open space areas (such as parks and other recreation areas), nearby roadways, and watercraft within the ESPB proposed Project Area. Residents and visitors, especially those immediately adjacent to the shoreline, would have open foreground views of the proposed Project Area. Construction activities under Alternative 2 would introduce new and different activities and equipment and may temporarily interfere with direct views of scenic vistas of the bay, including the oil islands. Once construction is completed, all equipment would be removed, and the post-construction visual character would return to that characterized by the existing conditions.

Visual and aesthetic direct adverse temporary impacts would be unavoidable during the construction period. However, viewers in the proposed Project Area, such as recreationists and residential viewers within the coastal zone, are accustomed to occasional short-term offshore presence of barges, tugboats, cranes, and other equipment. Construction activities under Alternative 2 would blend in with existing activities and would not likely be noticeable as a significant change to existing views (consistent with existing views and activities). Shoreline protection projects, dredging activities, port activities, and other construction activities are routinely occurring along the southern California coastline. Viewers (ex:

residents and recreationists) in potentially affected areas would receive notice of the proposed construction activities, including information on timing and duration (AV-1). Views would be restored to their existing condition once project construction was completed. Construction activities would not have a substantial direct adverse permanent effect on scenic vistas in the proposed Project Area. In addition, construction activities would not substantially degrade the existing visual character or quality of the proposed Project Area and its surroundings. Therefore, direct impacts of construction activities would be less than significant.

The construction staging area is located in the Port of Long Beach Pier T within an industrial area that is not readily visible by sensitive viewers. The staging area is fully developed and not in an area considered to have special aesthetic value. Staging activities would not have a substantial adverse permanent effect on scenic vistas in the proposed Project Area. In addition, staging activities would not substantially degrade the existing visual character or quality of the proposed Project Area and its surroundings. Therefore, no direct or indirect impacts to visual character or quality of the proposed Project Area and its surroundings would occur from use of the staging area.

Construction activities (*e.g.*, rock work) within the proposed Project Area would occur during daylight hours. Construction equipment may use lighting during activities to place materials for restoration features; however, these activities would be short-term and equipment would be moved regularly. In addition, equipment would not create lighting or glare during nighttime hours. Eelgrass beds, nearshore rocky reefs, and kelp reefs would all be underwater features with no light or glare emitting features. Construction activities and restoration features would not create a new permanent source of substantial light or glare which would adversely affect day or nighttime views in the proposed Project Area. Construction activity direct impacts would be less than significant. No indirect impacts related to light or glare are anticipated.

Dredging activities would occur at the Surfside/Sunset Borrow site, which is an existing borrow site in regular use since 1964. Dredging activities under Alternative 2 would likely occur 22 hours per day for approximately 50 days (approximately 2,000 cubic yards of sand material can be removed per day, with approximately 100,000 cubic yards of sand need for eelgrass beds). Dredging equipment would require lighting during both day and nighttime activities. This site is located two to three miles from the shore. Dredging activities, port activities, and other construction activities are routinely occurring within the project area and vicinity along the coastline. Viewers (*e.g.*, residents and recreationists) in potentially affected areas would receive notice of the proposed construction activities, including information on timing and duration (AV-1). Views would be restored to their existing condition once project dredging activities are completed. Dredging activities would not have a substantial adverse permanent effect on scenic vistas in the proposed Project Area. In addition, dredging activities would not permanently substantially degrade the existing visual character or quality of the proposed Project Area and its surroundings, and activities would not create a new permanent source of substantial light or glare which would adversely affect day or nighttime views in the proposed Project Area. Therefore, direct impacts from dredging activities would be less than significant. No indirect impacts from dredging activities are expected.

At the same time as project construction, fixed aids to navigation (ATON) would be installed by the U.S. Coast Guard within the proposed Project Area indicating the locations of nearshore rocky reefs. Based on need (*e.g.*, for recreational boater safety), the appropriate ATON type will be determined by the U.S. Coast Guard during the PED phase of the project. ATONs may impact the aesthetics of the proposed Project Area; however, due to their distance from shore (ranging from approximately 400 – 2,200 ft) they are not expected to substantially affect the scenic vista, degrade the existing visual character or quality of the site (proposed Project Area) and its surroundings, or create a new permanent source of substantial light or glare that would adversely affect day or nighttime views of the area. Therefore, direct impacts of ATONs would be less than significant. No indirect impacts related to light or glare are anticipated from ATONs.

OMRR&R Impacts (Including MAMP Implementation)

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, and kelp reefs along with adaptive management (see Appendix F). Monitoring of eelgrass beds and kelp reefs vegetation surveys would be anticipated to require operation of a single boat during daylight hours for short duration over the monitoring period. These activities would not be anticipated to impact scenic vistas or viewers in the proposed Project Area.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal impacts to scenic vistas and viewers. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs and eelgrass beds, no further monitoring would be required.

After rocky reef success criteria are met, maintenance would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require the trucking or barging of material and heavy equipment. Rocky reef OMRR&R activities would require fewer days and equipment use than construction activities. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete.

OMRR&R activities would not have a substantial adverse permanent effect on scenic vistas in the proposed Project Area. In addition, dredging activities would not substantially degrade the existing visual character or quality of the Project Area and its surroundings, and activities would not create a new permanent source of substantial light or glare which would adversely affect day or nighttime views in the proposed Project Area. Therefore, direct impacts from dredging activities would be less than significant. No indirect impacts from OMRR&R activities are expected.

Impact Summary

Visual and aesthetic adverse impacts would be unavoidable during the construction period. Once construction is completed, the visual character would return to that characterized by the existing conditions. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. Alternative 2 construction and OMRR&R and adaptive management activities would not likely result in: a substantial adverse permanent effect on a scenic vista, substantial degradation of the existing visual character or quality of the site and its surroundings, or the creation of a new source of substantial light or glare which would adversely affect day or nighttime views of the area. Alternative 2 would not likely result in indirect impacts to aesthetics and visual resources. Therefore, impacts to visual and aesthetic resources under Alternative 2 would be short-term, localized, and less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Although additional construction would occur under Alternative 4A to implement additional features, impacts to scenic vistas and viewers associated with dredging, material hauling, staging, and placement would be comparable to those identified for Alternative 2. The addition of an additional nearshore rocky reef, eelgrass bed, and two open water rocky reefs under this alternative would not significantly increase the construction period (96 months as compared to 90 months under Alternative 2). All rocky reefs, including the two open water rocky reefs, would be submerged and not visible to viewers once construction is completed.

No impacts to visual resources would occur from use of the staging area. Alternative 4A would result in short-term adverse impacts to aesthetics and visual resources during construction. Visual and aesthetic direct adverse temporary impacts would be unavoidable during the construction period. However, viewers in the project area, such as recreationists and residential viewers within the coastal zone, are accustomed to occasional short-term offshore presence of barges, tugboats, cranes, and other equipment. Construction activities under Alternative 4A would blend in with existing activities and would not likely be noticeable as a significant change to existing views (consistent with existing views and activities). Shoreline protection projects, dredging activities, port activities, and other construction activities are routinely occurring along the southern California coastline. Viewers (*e.g.*, residents and recreationists) in potentially affected areas would receive notice of the proposed construction activities, including information on timing and duration (AV-1). Views would be restored to their existing condition once project construction was completed. Construction activities would not have a substantial direct adverse permanent effect on scenic vistas in the project area. In addition, construction activities would not substantially degrade the existing visual character or quality of the project area and its surroundings. Therefore, direct impacts of construction activities would be less than significant.

At the same time as project construction, fixed ATON would be installed by the U.S. Coast Guard within the proposed Project Area indicating the locations of nearshore rocky reefs. Based on need (*e.g.*, for recreational boater safety), the appropriate ATON type will be determined by the U.S. Coast Guard during the PED phase of the project. ATONs may impact the aesthetics of the proposed Project Area; however, due to their distance from shore (ranging from approximately 400 – 2,200 ft) they are not expected to substantially affect the scenic vista, degrade the existing visual character or quality of the site (proposed Project Area) and its surroundings, or create a new permanent source of substantial light or glare that would adversely affect day or nighttime views of the area. Therefore, direct impacts of ATONs would be less than significant. No indirect impacts related to light or glare are anticipated from ATONs.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. Views would be restored to their existing condition once project OMRR&R activities are completed. Impacts would be less than significant. Alternative 4A would not likely result in: a substantial adverse permanent effect on a scenic vista; substantial degradation of the existing visual character or quality of the site and its surroundings, or the creation of a new source of substantial light or glare which would adversely affect day or nighttime views of the area.

Impact Summary

Visual and aesthetic adverse impacts would be unavoidable during the construction period. Once construction is completed, the visual character would return to that characterized by the existing conditions. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. Alternative 4A construction, OMRR&R, and adaptive management activities would not likely result in: a substantial adverse permanent effect on a scenic vista, substantial degradation- of the existing visual character or quality of the site and its surroundings, or the creation of a new source of substantial light or glare which would adversely affect day or nighttime views of the area. Alternative 4A would not likely result in indirect impacts to aesthetics and visual resources. Therefore, impacts to visual and aesthetic resources under Alternative 4A would be short-term, localized, and less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Based on the estimated volume of sand and fill needed for restoration measures within Alternative 8, hydraulic dredging will be considered an option along with the use of clamshell (mechanical) dredging. As described in environmental commitment NO-3, if pursued, impacts to sensitive species (*e.g.*, Green Sea Turtles) associated with the use of hydraulic dredging would be assessed and coordination/consultation with the NMFS would be undertaken to determine if additional BMPs would be necessary to reduce potential impacts to sensitive species. Although additional construction would occur under Alternative 8 to implement additional features, impacts to scenic vistas and viewers associated with dredging, material hauling, staging, and placement would be comparable to those identified for Alternatives 2 and 4A. Similar numbers and types of equipment would be utilized on a daily basis, generating similar impacts to scenic vistas and viewers, although the construction period would extend for a longer duration (113 months as compared to 90 months under Alternative 2). Views would be restored to their existing condition once project construction was completed. Construction activities would not have a substantially direct adverse permanent effect on scenic vistas in the proposed Project Area. In addition, construction activities would not substantially degrade the existing visual character or quality of the proposed Project Area and its surroundings. Therefore, direct impacts of construction activities would be less than significant.

Restoration features under this alternative would also include an approximately 24-acre sandy island, two wetlands totaling approximately 52 acres, and 0.3 acre of oyster reefs. Similar equipment as described for eelgrass, kelp, and rocky reef creation would be used. Eelgrass, wetland and sandy island sand material would be dredged from the Surfside/Sunset Borrow site. Dredging may include dredging barges, pump and suction pipe, crane, and scows. Dredging would occur within a previously dredged site located approximately 5,000 feet from residential dwellings and recreation area. Short-term adverse impacts to scenic vistas and viewers may occur during dredging activities; however, impacts would be minimal as viewers in the proposed Project Area are accustomed to occasional short-term offshore presence of dredging activity.

The wetlands, sandy island, and oyster reefs would be closer to shore and more visible to beach residents and recreationists. Short-term direct adverse impacts would also occur during construction of the wetlands, sandy island and oyster reefs. Once all restoration features are completed, construction equipment would no longer be present in the proposed Project Area. As previously described under Alternatives 2 and 4A, the eelgrass, kelp, and rocky reefs would not be visible above water and would not impact scenic vistas.

The sandy island and wetlands would initially be barren of vegetation with native vegetation establishing over time. Oyster reefs would be composed of shell hash and would be positioned along the Los Alamitos Jetties where they would be visible during periods of low tide. The sandy island, wetlands, and oyster reefs would result in minor changes in the visual character of the area by providing additional visual diversity and interest. Because these features would have a low elevation, they would not substantially alter the visual character of the area. Introduction of the sandy island, wetlands, and oyster reefs would improve visual character by increasing the number of natural features in the overall viewshed.

Alternative 8 would result in short-term adverse direct visual and aesthetic impacts during construction. Viewers (*e.g.*, residents and recreationists) in potentially affected areas would receive notice of the proposed construction activities, including information on timing and duration (AV-1). Views would be restored to their existing condition once project construction is completed.

Introduction of the sandy island, wetlands, and oyster reefs would not have a substantial direct adverse permanent effect on scenic vistas in the proposed Project Area. In addition, these features would not substantially degrade the existing visual character or quality of the proposed Project Area and its surroundings. Therefore, direct impacts of construction activities would be less than significant. Introduction of these features would improve visual character by increasing the number of natural features in the overall viewshed. Therefore, impacts related to aesthetics and visual resources under Alternative 8 would be short-term and less than significant. Impacts related to light and glare would be comparable to those described under Alternatives 2 and 4A and would not create a new permanent source of substantial light or glare which would adversely affect day or nighttime views in the proposed Project Area. Construction activity direct impacts would be less than significant. No indirect impacts related to light or glare are anticipated.

At the same time as project construction, fixed ATON would be installed within the proposed Project Area indicating the locations of nearshore rocky reefs. Based on need (*e.g.*, for recreational boater safety), the appropriate ATON type will be determined by the U.S. Coast Guard during the PED phase of the project. ATONs may impact the aesthetics of the proposed Project Area; however, due to their distance from shore (ranging from approximately 400 – 2,200 ft) they are not expected to substantially affect the scenic vista, degrade the existing visual character or quality of the site (proposed Project Area) and its surroundings, or create a new permanent source of substantial light or glare that would adversely affect day or nighttime views of the area. Therefore, direct impacts of ATONs would be less than significant. No indirect impacts related to light or glare are anticipated from ATONs.

OMRR&R Impacts (Including MAMP Implementation)

Potential adverse impacts of OMRR&R activities for eelgrass, kelp, and rocky reefs under Alternative 8 would be comparable to those described for Alternative 2. Maintenance activities related to the sandy island and wetlands would occur yearly. Activities would include clearing and grubbing of invasive species, removal of excess vegetation, sand replenishment, and dredging. These activities would occur during a short duration (weeks). Oyster reefs may require the addition of shell hash periodically to maintain appropriate substrate or to offset impacts to rising sea levels. Maintenance activities would result in short-term adverse impacts to aesthetics and visual character while construction equipment is active within the proposed Project Area, and long-term beneficial impacts once activities are completed from improved site conditions and visual character of the features. Under Alternative 8, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds, no further monitoring would be required specifically for adaptive management.

Upon completion of construction, continuing activities associated with Alternative 8 would generally include monitoring of eelgrass beds and oyster reefs, wildlife surveys, and surveys of sandy island and wetland areas (see Appendix F). These activities would be anticipated to require operation of a single boat during daylight hours for a short duration during the monitoring period. The frequency and number of days required to complete these monitoring efforts is not known and may vary depending on how long it takes the project features to meet performance criteria.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require the trucking or barging of material and heavy equipment. Rocky reef OMRR&R activities would occur a substantial distance from viewers over a short duration.

Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours.

Maintenance for the sandy island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours.

Adaptive management may include additional actions such as eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). Adaptive management activities would be similar to construction activities but would require significantly less time to complete. Therefore, OMRR&R impacts to visual and aesthetic resources under Alternative 2 would be short-term, localized, and less than significant.

Impact Summary

Visual and aesthetic adverse impacts would be unavoidable during the construction period. Once construction is completed, the visual character would return to that characterized by the existing conditions. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. Alternative 8 construction, OMRR&R, and adaptive management activities would not likely result in: a substantial adverse permanent effect on a scenic vista, substantial degradation- of the existing visual character or quality of the site and its surroundings, or the creation of a new source of substantial light or glare which would adversely affect day or nighttime views of the area. Alternative 2 would not likely result in indirect impacts to aesthetics and visual resources. Therefore, impacts to visual and aesthetic resources under Alternative 8 would be short-term, localized, and less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.13 GROUND AND VESSEL TRAFFIC AND TRANSPORTATION

5.13.1 Relevant Regulations and Significance Criteria

- Federal Regulations: Federal management of transportation facilities in the area is under the authority of the FHWA and the Federal Transit Administration (FTA).
- Rivers and Harbors Act of 1899: Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable waters of the U.S. and authorizes the USACE to regulate all activities that affect the course, capacity, or condition of navigable waters of the U.S.
- Coast Guard Office of Design and Engineering Standards; Governs safe design for ships and shipboard equipment.
- State of California Regulations: State management of transportation is under the authority of Caltrans.
- City of Long Beach Mobility Element: Outlines the policies and implementation measures required to improve and enhance the City's local and regional transportation system.

Significance Criteria

The following traffic and transportation thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the *CEQA Guidelines*. These criteria are also being adopted for NEPA. Traffic and Transportation impacts would be considered significant if the proposed alternatives would:

- Conflict with City of Long Beach General Plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.
- Conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways.
- Result in inadequate emergency access.
- Present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans.

Environmental Commitments

TT-1 The contractor shall mark all associated marine equipment in accordance with U.S. Coast Guard regulations. The contractor must contact the U.S. Coast Guard two weeks prior to the commencement of construction. The following information shall be provided: the size and type of equipment to be used, names and radio call signs for all working vessels, telephone number for on-site contact with the project engineer, the schedule for completing the project, and any hazards to navigation. The contractor shall move equipment upon request by the U.S. Coast Guard and Harbor patrol law enforcement and rescue vessels.

TT-2 If the inland 3M Quarry in Corona is used, truck traffic would be scheduled during off-peak travel hours to the extent practicable in order to reduce potential traffic impacts from transporting quarry stone over public roadways.

TT-3 If the inland 3M Quarry in Corona is used, individual truck trips from 3M Quarry will be staggered, and trucks assigned to multiple routes instead of one in order to minimize truck travel on public roadways.

TT-4 If the inland 3M Quarry in Corona is used, trucks hauling stone will be covered.

TT-5 If the inland 3M Quarry in Corona is used, a Caltrans transportation permit will be pursued should oversized-transport vehicles be required to travel on State highways.

TT-6 If the inland 3M Quarry in Corona is used, a construction traffic management plan detailing expected delays on State facilities will be developed for Caltrans review.

TT-7 Every attempt will be made to reduce Vehicle Miles of Travel (VMT) from construction trips.

5.13.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

The transportation network within the ESPB proposed Project Area is expected to expand to accommodate a growing population under the No Action Alternative. In particular, highways and public transportation will continue to need expansion and upgrades.

Harbor (commercial) and recreational navigation by watercraft through ESPB is likely to increase in the future. The Port of Long Beach has continued to invest in capital improvement projects to redevelop existing terminals, build new wharfs, and improve the railway system in anticipation of forecast growth in commercial shipping and use of the port facilities.

Forecast ground and vessel traffic growth are not expected to change under the No Action Alternative.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or OMRR&R related impacts under this alternative.

Alternative 2

Construction Impacts

Direct and Indirect Impact Analysis

For the purpose of this analysis, it is assumed that stone quarry material would be brought in either from the Catalina Island quarry, which has direct marine access, or from an inland source such as the 3M Quarry located in Corona, California. If the Catalina Island quarry is used, there would be no need for truck hauling of material over public roadways. Equipment and other materials would be stored and accessed from the staging area within Pier T of the Port of Long Beach. Once equipment and material are transported to the staging area, the port would be accessed via barge and the majority of construction activity would occur from the water within the proposed Project Area. Average daily traffic within roadways adjacent to the proposed Project Area would not likely be affected by construction activities. A minimal number of construction crew would be needed (less than 25 crew per day) during the 90-month construction period. Crew would likely travel to the staging area in personal vehicles.

If the 3M Quarry is used, transportation of quarry rock from this site would be by truck. Distance to the ESPB proposed Project Area is approximately 55 miles.

Ground Traffic and Transportation

If the Catalina Island quarry is used, approximately eight construction workers for derrick barge operations would be required and these workers would travel to the staging area on local roadways, adding a maximum of 16 worker commuting trips per day to local public roadways during the 90-month construction period. An estimated 23 truck trips per hour would be added to the ground transportation network in the City of Long Beach for construction material delivery, and up to 16 trips per day for construction worker commutes to the staging area. Based on these estimates, there would be an increase in traffic to local public roadways of between 0% and 0.28% per year over the estimated annual average daily traffic of 199,690,013 (Assuming a conservative 312 workdays per year (52 weeks X 6 days per week) and the annual average daily traffic from Table 3-8 in Section 3.13 scaled to an annual total) based on either 111 or 177 days of material transport time. This additional traffic would be temporary in nature and would be distributed throughout the 90-month construction period. It is not anticipated that construction related travel would result in limitations to emergency access to the project area. Use of the Catalina Island quarry would result in minimal short-term adverse impacts to local and Port ground traffic based on the limited number of crew needed and construction activity occurring predominantly on the water. Impacts to traffic would not result in inadequate emergency access and would be less than significant.

If the 3M Quarry in Corona, California is used as the only source of stone for construction, it would take approximately 113 truck trips to haul enough stone to fill one small barge or 181 trips to fill one large barge. The trucks would travel approximately 55 miles from the quarry to the project staging area to be loaded on to the barges. Trucking of rock would occur over an 8-hour day, and therefore, a maximum of 14 to 23 truck trips per hour (in each direction, assuming empty trucks would return along the same route to be reloaded) would be added to local roadways compared to current roadway traffic. Construction traffic would occur over approximately 111 to 177 days over a six-day work week, assuming one small barge is transported per day to the in-water construction sites or one large barge every other day. Based on these estimates, there would be an increase in traffic to local public roadways of between 0% (14 truck trips per hour) and 0.5% (23 truck trips per hour) per year over the estimated annual average daily traffic of 199,690,013 (Assuming a conservative 312 workdays per year (52 weeks X 6 days per week) and the annual average daily traffic from Table 3-8 in Section 3.13 scaled to an annual total). This additional traffic would be temporary in nature and would be distributed throughout the 90-month construction period. Use of the inland 3M Quarry in Corona would result in noticeable but minor short-term impacts to local and Port ground traffic that would cease once construction was completed. In addition, truck traffic would be scheduled during off-peak travel hours, staggered, and trucks would be assigned to multiple routes instead of one to minimize truck travel on public roadways to the extent practicable (TT-2 and TT-3). Additionally, trucks hauling stone would be covered to reduce sediment spillover (TT-4), Vehicle Miles of Travel will be reduced as practicable (TT-7), a CalTrans transportation permit would be pursued should oversized-transport vehicles be required to travel on State highways (TT-5), and a construction traffic management plan detailing expected delays on State facilities would be developed for CalTrans (TT-6). Impacts to traffic would not result in inadequate emergency access and would be less than significant.

To minimize impacts to local traffic, two weeks prior to construction activities the U.S. Coast Guard would be notified of planned construction activities and during construction associated marine equipment would be marked in accordance with U.S. Coast Guard regulations (TT-1).

Based on the review of applicable City of Long Beach General Plan, traffic related ordinances, and policies, construction activities under Alternative 2 would not: conflict with City of Long Beach General Plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; or, conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways. Therefore, impacts related to traffic under Alternative 2 would be short-term and less than significant.

Vessel Traffic and Transportation

If quarry stone originates from the Catalina Island quarry, it would be transported by water using a barge and tugboat. The Catalina Island quarry has direct marine access and would require no truck hauling on public roadways to load the barges. Within the quarry, approximate dump truck trips to supply barges needed for each stone size would be as follows: 6,227 trips for the armor/cap stone; 2,500 trips for the filter stone; and 11,455 trips to load for the core/quarry run stone. A total of 177 small barge loads or 111 large barge loads would be required to transport the stone to the proposed Project Area. Assuming an output of 1,725 tons of quarry stone would be deposited per day, the operation schedule for the tugboats would be every day for the small barges and every other day for the large barges. Transport from the Catalina Island quarry would take each barge approximately 3.5 hours to travel 25 nautical miles to the proposed Project Area at a speed of approximately 8 knots. Various species of marine mammal travel within the San Pedro Channel between Catalina Island and the proposed Project Area and may be present while barges are transiting. As barges would be travelling at approximately 8 knots, a speed that is less than the 10 knots recommended by NMFS for reducing the probability of ship strikes and its associated mortality to marine mammalian species (NOAA 2008), marine mammals within the channel during barge transits are expected to have sufficient time to avoid barges and minimize the chance of strikes.

Construction of the eelgrass habitat restoration areas with associated rocky reefs along with breakwater and open water kelp reefs would involve the movement of a derrick barge and accompanying flat-deck barge with attending tugboats as well as tugboat and scow with dredged sand to the proposed Project Area. The derrick barge would likely remain in the proposed Project Area during the duration of construction. Stone would be towed by tugboat and flat-deck barge to construction sites at a rate of one small barge per day or one large barge every other day, returning to the point of origin once the barge is empty. Construction would require 177 small barge loads or 111 large barge loads to complete the reefs.

These vessels would travel primarily along existing shipping routes from Catalina Island to the proposed Project Area, if the quarry stone originates from the Catalina Island quarry. During stone placement activities, the vessels would be temporarily present (along with maker buoys) and small watercraft would transport workers from the staging area along Pier T to the construction sites. It is not anticipated that construction related water vessel travel would result in limitations to emergency access to the project area or interfere with emergency response or evacuation plans.

If the 3M quarry is used, stone material would be hauled by truck to the Pier T staging area. From the staging area, it was assumed that one large barge would deliver stone each day during construction.

For the eelgrass bed sand material, approximately 100,000 cubic yards of sand would be dredged. Sand would be placed in unmanned scows that hold 2,000 cubic yards. A tugboat would move the scow to the eelgrass bed placement sites (leeward side of each nearshore rocky reef). It is expected that two scows of sand can be delivered per day, taking 25 days to transport approximately 100,000 cubic yards of sand to the nearshore rocky reef sites. The tugboat/scow vessels would travel along existing shipping routes from the Surfside/Sunset Borrow site to the restoration areas.

Based on the limited quarry and tugboat/scow vessel traffic, the short-term duration of construction, and limited number of on-site construction vessels needed, Alternative 2 would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts would be direct short-term adverse impacts during construction and less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Ground and Vessel Traffic and Transportation

Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs or eelgrass beds, no further monitoring would be required specifically for adaptive management.

Continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours for a short duration. The addition of a single boat to the existing boat and vessel circulation within the proposed Project Area would not be noticeable and would have no impact on ground or vessel transportation.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities and would have less impact on ground or vessel transportation as compared to the construction period.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may increase by approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment. Rocky reef OMRR&R would be short-term (likely requiring only a few days) and would predominantly occur on the water, with minimal use of local roadways or highways.

Impacts of OMRR&R and adaptive management to vessel and ground transportation under Alternative 2 would be comparable to construction activities; however, they would require fewer days and equipment use than construction activities and would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts of OMRR&R would be direct and indirect, short-term adverse, would be less than construction activities, and less than significant.

Impact Summary

Alternative 2 would not include construction or modification of any existing roadway and construction and OMRR&R activities would not require street or lane closures. While use of an inland quarry would increase the amount of localized traffic, this would be temporary and is not expected to significantly increase the number of vehicles currently using these roadways. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Alternative 2 construction and OMRR&R activities would not result in: conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways; inadequate emergency access; substantial reduction of current safety levels for vessels within ESPB; or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, existing circulation systems and emergency access would not be adversely affected, and no indirect impacts to ground traffic and transportation are anticipated.

Alternative 2 would not include construction of any above surface features that would adversely affect vessel navigation within ESPB. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Alternative 2 construction and OMRR&R activities would not result in: inadequate emergency access, substantial reduction of current safety levels for vessels within ESPB or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, existing vessel circulation and emergency access would not be adversely affected and no indirect impacts to vessel traffic are anticipated.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Construction of Alternative 4A would involve similar transportation and construction methods as described under Alternative 2, except more materials would be needed. Under this alternative, approximately 480,000 more tons of armor/cap stone, 13,000 tons of core/quarry run stone, and approximately 100,000 cubic yards of sand would be used to construct the eelgrass habitat restoration areas with associated rocky reefs, breakwater and open water kelp reefs, and two open water rocky reefs.

Ground Traffic and Transportation

Although additional construction would occur under Alternative 4A to implement additional features, ground traffic levels associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, generating similar traffic levels, although the construction period would be extended for a longer duration. The addition of two open water rocky reefs under this alternative would minimally increase the construction period by approximately 7 months. Based on these estimates, there would be an increase in traffic to local public roadways of between 0.01% and 4.33% per year over the estimated annual average daily traffic of 199,690,013 (Assuming a conservative 312 workdays per year (52 weeks X 6 days per week) and the annual average daily traffic from Table 3-8 in Section 3.13 scaled to an annual total) based on either 460 or 735 days of materials transport time. The proposed restoration features would not likely result in an increase in recreational or other travel to the proposed Project Area. It is not anticipated that construction related travel would result in limitations to emergency access to the project area. Alternative 4A would result in minimal short-term adverse impacts to ground traffic and transportation during the construction period based on the limited number of crew needed and construction activity occurring predominantly on the water. Impacts to traffic would not result in inadequate emergency access and would be less than significant.

If the 3M Quarry in Corona, California is used as the only source of stone for construction, it would take approximately 113 truck trips to haul enough stone to fill one small barge or 181 trips to fill one large barge. The trucks would travel approximately 55 miles from the quarry to the project staging area to be loaded on to the barges. Trucking of rock would occur over an 8-hour day, and therefore, a maximum of 14 to 23 truck trips per hour (in each direction, assuming empty trucks would return along the same route to be reloaded) would be added to local roadways compared to current roadway traffic. These trips would occur over a longer time period than Alternative 2 (460 to 735 loading days), but the trips would still be distributed over a 6-day work week and over the 97-month construction period. Based on these estimates, there would be an increase in traffic to local public roadways of between 0.01% (14 truck trips per hour) and 7.44% (23 truck trips per hour) per year over the estimated annual average daily traffic of 199,690,013 (Assuming a conservative 312 workdays per year (52 weeks X 6 days per week) and the annual average daily traffic from Table 3-8 in Section 3.13 scaled to an annual total) based on either 460 or 735 days of materials transport time. Use of the inland 3M Quarry would result in noticeable, but minor, short-term adverse impacts to local and Port ground traffic that would cease once construction was completed. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Impacts to traffic would not result in inadequate emergency access and would be less than significant.

Based on review of applicable City of Long Beach General Plan, traffic related ordinances, and policies, construction activities under Alternative 4A would not: conflict with City of Long Beach General Plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, mass transit; or conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways. Therefore, impacts related to traffic under Alternative 4A would be short-term and less than significant.

Vessel Traffic and Transportation

Under Alternative 4A, additional construction would occur to implement additional features, however, vessel traffic levels associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would be extended by seven months. If quarry stone originates from the Catalina Island Quarry, approximate dump truck trips to supply barges needed for each stone size would be as follows: 28,045 trips armor/cap stone; 2,500 trips for filter stone; 12,045 trips for core/quarry run stone; and 40,909 trips for sand. A total of 735 small barge loads or 460 large barge loads would be required to transport the materials to the proposed Project Area. The operation schedule for the tugboats would remain the same as under Alternative 2 (every day for the small barges and every other day for large barges). Transport of materials and construction workers to the construction site would not interfere with existing waterborne traffic and would occur over 96 months. It is not anticipated that construction related water vessel travel would result in limitations to emergency access to the proposed Project Area or interfere with emergency response or evacuation plans.

If the 3M quarry is used, stone material would be hauled by truck to the Pier T staging area. From the staging area, it was assumed that one large barge would deliver stone each day during construction.

For the eelgrass bed sand material, approximately 100,000 cubic yards of sand would be dredged. Sand would be placed in unmanned scows that hold 2,000 cubic yards. A tugboat would move the scow to the eelgrass bed placement sites (leeward side of each nearshore rocky reef). It is expected that two scows of sand can be delivered per day, taking 25 days to transport approximately 100,000 cubic yards of sand to the nearshore rocky reef sites. The tugboat/scow vessels would travel along existing shipping routes from the Surfside/Sunset Borrow site to the restoration areas.

Based on the limited quarry and tugboat/scow vessel traffic, the short-term duration of construction, and limited number of on-site construction vessels needed, Alternative 4A would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts would be direct, short-term adverse during construction, and less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Ground and Vessel Traffic and Transportation

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. Impacts of OMRR&R and adaptive management to vessel and ground transportation under Alternative 4A would be comparable to construction activities; however, they would require fewer days and equipment use than construction activities and would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts of OMRR&R would be direct and indirect, short-term adverse, would be less than construction activities, and less than significant.

Impact Summary

Alternative 4A would not include construction or modification of any existing roadway, and construction and OMRR&R activities would not require street or lane closures. While use of an inland quarry would increase the amount of localized traffic, this would be temporary and not a significant increase in the number of vehicles currently using these roadways. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Alternative 4A construction and OMRR&R activities would not result in: conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways; inadequate emergency access; substantial reduction of current safety levels for vessels within ESPB; or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, existing circulation systems and emergency access would not be adversely affected and no indirect impacts to ground traffic and transportation are anticipated.

Alternative 4A would not include construction of any above surface features that would adversely affect vessel navigation within ESPB. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Alternative 4A construction and OMRR&R activities would not result in: inadequate emergency access; substantial reduction of current safety levels for vessels within ESPB; or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, existing vessel circulation and emergency access would not be adversely affected and no indirect impacts to vessel traffic are anticipated.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 8, transportation of construction materials for the nearshore eelgrass habitat restoration areas with associated rocky reefs, breakwater and open water kelp reefs, open water rocky reefs, and oyster beds would be similar to those described for Alternative 2, except the quantities of the materials differ. Under Alternative 8, approximately 1,955,000 more tons of armor/cap stone, 32,000 tons of filter stone, and 51,000 tons of core/quarry run stone, and approximately 100,000 cubic yards of dredged sand, would be used to construct the eelgrass habitat restoration areas with associated rocky reefs, kelp reefs, and oyster beds.

This alternative also includes an approximately 24-acre sandy island, an approximately 10-acre wetland, an approximately 42-acre wetland, and approximately 0.3 acre of oyster reefs. For the sandy island and wetlands habitats, approximately 4,287,000 cubic yards of sand and fill material would be dredged from the nearby Surfside/Sunset Borrow site and approximately 48,000 cubic yards of concrete for pre-cast caissons would also be needed.

Ground Traffic and Transportation

Although additional construction would occur under Alternative 8 to implement additional features, traffic levels associated with material hauling, staging, and placement would be comparable to those identified for Alternatives 2 and 4A. Similar numbers and types of equipment would be utilized on a daily basis, generating similar traffic levels, although the construction period would extend for a longer duration (113 months as compared to 90 months under Alternative 2). If stone material is obtained from Catalina, there would be an increase in traffic to local public roadways of between 0.01% and 6.61% per year over the estimated annual average daily traffic of 199,690,013 (Assuming a conservative 312 workdays per year (52 weeks X 6 days per week) and the annual average daily traffic from Table 3-8 in Section 3.13 scaled to an annual total) based on either 621 or 993 days of materials transport time. The proposed restoration features would not likely result in an increase in recreational or other travel to the proposed Project Area. It is not anticipated that construction related travel would result in limitations to emergency access to the proposed Project Area. Alternative 4A would result in minimal short-term adverse impacts to ground traffic and transportation during the construction period based on the limited number of crew needed and construction activity occurring predominantly on the water. Impacts to traffic would not result in inadequate emergency access and would be less than significant.

If the 3M Quarry in Corona, California is used as the only source of stone for construction, it would take approximately 113 truck trips to haul enough stone to fill one small barge or 181 trips to fill one large barge. The trucks would travel approximately 55 miles from the quarry to the project staging area to be loaded on to the barges. Trucking of rock would occur over an 8-hour day, and therefore, a maximum of 14 to 23 truck trips per hour (in each direction, assuming empty trucks would return along the same route to be reloaded) would be added to local roadways compared to current roadway traffic. These trips would occur over a longer time period than Alternative 2 (621 to 993 loading days), but the trips would still be distributed over a six-day work week, over a 10- to 12-hour workday, and over the 113-month construction period. Based on these estimates, there would be an increase in traffic to local public roadways of between 0.01% (14 truck trips per hour) and 11.2% (23 truck trips per hour) per year over the estimated annual average daily traffic of 199,690,013 (Assuming a conservative 312 workdays per year (52 weeks X 6 days per week) and the annual average daily traffic from Table 3-8 in Section 3.13 scaled to an annual total) based on either 621 or 993 days of materials transport time. Use of the inland

3M quarry would result in noticeable but minor short-term adverse impacts to local and Port ground traffic that would cease once construction was completed. To minimize impacts to local traffic, TT-2 through TT-7 would be implemented. Impacts to traffic would not result in: inadequate emergency access and would be less than significant.

It is not anticipated that construction related travel would result in limitations to emergency access to the proposed Project Area. The addition of a sandy island and two wetlands under Alternative 8 would result in an additional minor, short-term increase in ground-traffic during the construction period. The proposed restoration features would not likely result in an increase in recreational or other travel to the proposed Project Area over the long-term. Alternative 8 would result in minimal short-term adverse impacts to ground traffic and transportation during the construction period. Impacts to traffic would not result in: inadequate emergency access and would be less than significant.

Based on review of applicable City of Long Beach General Plan, traffic related ordinances, and policies, construction activities under Alternative 8 would not: conflict with City of Long Beach General Plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; or conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways. Therefore, impacts related to traffic under Alternative 8 would be short-term and less than significant.

Vessel Traffic and Transportation

Under Alternative 8, if quarry stone originates from the Catalina Island Quarry, approximate dump truck trips to supply barges needed for each stone size would be as follows: 95,091 trips for armor/cap stone; 3,955 trips for filter stone; and 13,773 trips for core/quarry run stone. It would take a total of 993 small barge loads or 621 large barge loads to transport the materials to the proposed Project Area. The operation schedule for the tugboats would remain the same as under Alternative 2 (every day for the small barges and every other day for the large barges). Transport of materials and construction workers to the construction site would not interfere with existing waterborne traffic and would occur over 30 to 113 months (90 months under Alternative 2, 96 months under Alternative 4A, and 113 months under Alternative 8). It is not anticipated that construction related water vessel travel would result in limitations to emergency access to the project area or interfere with emergency response or evacuation plans.

If the 3M quarry is used, stone material would be hauled by truck to the Pier T staging area. From the staging area, it was assumed that one large barge would deliver stone each day during construction.

For the eelgrass bed sand material, approximately 100,000 cubic yards of sand would be dredged. Sand would be placed in unmanned scows that hold 2,000 cubic yards. A tugboat would move the scow to the eelgrass bed placement sites (leeward side of each nearshore rocky reef). It is expected that two scows of sand can be delivered per day, taking 25 days to transport approximately 100,000 cubic yards of sand to the nearshore rocky reef sites. The tugboat/scow vessels would travel along existing shipping routes from the Surfside/Sunset Borrow site to the restoration areas.

Additionally, Alternative 8 includes the creation of two wetlands (~52 acres total) and a sandy island. Fill material needed to create the wetlands, pre-cast concrete sections (constructed off-site), and clean sand to cap the wetlands would be brought to the wetland locations by barge, along with earth moving equipment to contour the sand. Dredged sand would be transported from the Surfside/Sunset Borrow site. The sandy island would also be built up using a scow or hopper dredge, and then fill would be placed hydraulically when it becomes unfeasible to bottom dump the fill. The wetlands and sandy island would require approximately 2,034 small barge loads or 1,271 large barge loads to transport the fill and sand. Estimated trips for construction workers remain the same as under Alternative 2, although construction would occur during 10- to 12-hour days, six days a week, over a 53-month construction period.

Alternative 8 also includes the creation of 0.3 acre of oyster reefs. If needed, bathymetry of the oyster bed areas would be raised by placing additional layers of shell-hash (roughly 100-200 yd^3, depending on thickness). The small amount of shell-hash required is anticipated to come from a commercial source. Shell hash would be transported via barges and distributed within the elevation bounds along the placement areas using an excavator mounted on a barge and impacts would be similar to restoration measures described above.

Construction activities for eelgrass and kelp rocky reefs on the water would be similar to that described for Alternative 2. Based on the above limited quarry and sand vessel traffic, the short-term duration of construction, and limited number of on-site construction vessels needed, Alternative 8 would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts would be direct short-term adverse impacts during construction and less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Ground and Vessel Traffic and Transportation

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Impacts of OMRR&R and adaptive management to vessel and ground transportation for these features under Alternative 8 would be comparable to construction activities; however, they would require fewer days and equipment use than construction activities and would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts of OMRR&R for these features would be direct and indirect, short-term adverse, would be less than construction activities, and less than significant. Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Maintenance for the sandy island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would be used during daylight hours and would not be anticipated to generate a noticeable increase in ground or vessel traffic. Oyster reefs may require the addition of shell hash periodically to maintain appropriate substrate or to offset impacts to rising sea levels. Impacts of these OMRR&R activities to vessel and ground transportation would be less than construction activities.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal ground and vessel traffic increases (see Appendix F).

Impacts of OMRR&R and adaptive management to vessel and ground transportation for the sandy island and wetland features under Alternative 8 would be comparable to construction activities; however, they would require fewer days and equipment use than construction activities and would not result in: inadequate emergency access or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, impacts of OMRR&R would be direct and indirect, short-term adverse, would be less than construction activities, and less than significant.

Impact Summary

Alternative 8 would not include construction or modification of any existing roadway, and construction and OMRR&R activities would not require street or lane closures. While use of an inland quarry would increase the amount of localized traffic, this would be temporary and not a significant increase in the number of vehicles currently using these roadways. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Alternative 8 construction and OMRR&R activities would not result in: conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways; inadequate emergency access; substantial reduction of current safety levels for vessels within ESPB; or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, existing circulation systems and emergency access would not be adversely affected, and no indirect impacts to ground traffic and transportation are anticipated.

Alternative 8 would not include construction of any above surface features that would adversely affect vessel navigation within ESPB. To minimize impacts to local traffic, environmental commitments TT-2 through TT-7 would be implemented. Alternative 8 construction and OMRR&R activities would not result in: inadequate emergency access; substantial reduction of current safety levels for vessels within ESPB; or present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans. Therefore, existing vessel circulation and emergency access would not be adversely affected and no indirect impacts to vessel traffic are anticipated.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.14 LAND AND HARBOR USE

5.14.1 Relevant Regulations and Significance Criteria

- Federal Coastal Zone Management Act: Provides for management of the nation’s coastal resources and balances economic development with environmental conservation.
- Naval Weapons Station Seal Beach Integrated Resource Management Plan (NWS SBIRMP): Strategic plan for the comprehensive management of the Naval Stations resources.
- State of California Coastal Act: Established the CCC as the governing body to oversee land use and planning decisions within the coastal zone.
- Regional Southern California Association of Governments (SCAG): 2016-2020 Regional Transportation Plan and Sustainable Communities Strategy.
- Port of Long Beach Strategic Plan: Outlines the Ports mission, guiding principles, and goals.
- City of Long Beach General Plan: Contains goals, policies, and directions that guide future management.
- City of Long Beach Coastal Program: Guides development in the coastal zone.

Significance Criteria

The following land use thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the CEQA Guidelines. These criteria are also being adopted for NEPA. Land use impacts would be considered significant if the proposed alternatives would:

- Physically divide an established community.
- Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the NWS SBIRMP, Port of Long Beach Strategic Plan, City of Long Beach general plan, specific plan, and zoning ordinance, City of Long Beach Coastal Program) adopted for the purpose of avoiding or mitigating an environmental effect.

Environmental Commitments

See **AV-1** under Aesthetics and Visual Resources, public notice of construction activities.

5.14.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Control of urban growth, promotion of urban renewal, and protection of open space are components of the City of Long Beach and City of Seal Beach General Plans. Projected growth within the City of Long Beach (between 2008 and 2035) is estimated to be nearly 490,000, with similar growth anticipated within the City of Seal Beach. As the population increases within these communities over the 50-year horizon, zoning needs may change. The General Plans, as well as the Port of Long Beach Strategic Plan, will continue to evolve with population growth and harbor use, and will aid in determining the best possible land uses and zoning options for the ESPB proposed Project Area. If population grows rapidly without these protections, open space and other protected natural areas may decline, while high pressure land uses increase (e.g., high density or heavy industrial).

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 2, eelgrass, kelp and associated rocky reefs would be restored. The rocky reef habitat created by the placement of quarry stone would not change the current land use of the proposed Project Area but would enhance the biological productivity of ESPB. Construction activities would occur almost entirely on water and would not result in changes to current activities within the Naval Weapons Station Seal Beach or associated naval activities within the bay. Construction activities would not conflict with the NWS SBIRMP.

Construction activities would not affect current recreational use along the City of Long Beach parks, beaches, or other recreational areas. Nor would construction activities result in a noticeable interference with water-associated activities along beaches. Construction activities would not conflict with City plans, policies, or regulations. Construction would occur predominantly on water, with minimal roadway traffic, and would not physically divide an established community.

During the construction period, short-term construction related traffic within the Port of Long Beach (POLB) could occur while barges, tugboats, and other equipment are operating within the ESPB proposed Project Area. Commercial, private, and recreational vessels traveling to the Port might need to navigate around construction areas and equipment. Construction activities within the proposed Project

Area are not expected to result in any exclusion of vessels from the harbor or impact the mission goals of the Port Strategic Plan, and potential effects would be limited to causing minor increases in time needed to enter or leave the harbor as vessels navigate around construction areas, if needed. Construction activities would not conflict with the mission and goals of the POLB Strategic Plan. Based on the above, Alternative 2 would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the proposed Project Area. Therefore, no adverse impacts to land and harbor use would likely occur due construction activities.

OMRR&R Impacts (Including MAMP Implementation)

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds and kelp reefs along with adaptive management (see Appendix F). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours for a short duration. Monitoring would not conflict with any applicable land use plans, policies, or regulations with jurisdiction over the proposed Project Area.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal impacts to scenic vistas and viewers. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs and eelgrass beds, no further monitoring would be required. These activities would not conflict with any applicable land use plans, policies, or regulations with jurisdiction over the proposed Project Area.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment. Rocky reef OMRR&R activities would require fewer days and equipment use than construction activities. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete and would not conflict with any applicable land use plans, policies, or regulations with jurisdiction over the proposed Project Area.

The majority of OMRR&R activities would occur predominantly on water, with minimal roadway traffic, and would not physically divide an established community.

Alternative 2 OMRR&R activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the project area. No adverse impacts to land and harbor use would likely occur due to OMRR&R and adaptive management activities under Alternative 2.

Impact Summary

Alternative 2 construction and OMRR&R activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the project area. Therefore, no adverse impacts to land and harbor use would likely occur due construction and OMRR&R activities.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Although additional construction would occur under Alternative 4A to implement additional features, impacts to land and harbor use associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. The addition of two open water rocky reefs under this alternative would not significantly increase the construction period (96 months as compared to 90 months under Alternative 2). Construction activities would occur almost entirely on water and would not result in changes to current land use activities. Alternative 4A would not conflict with land use of the proposed Project Area and would be consistent with local and regional plans. Effects would be limited to causing minor increases in time needed to enter or leave the harbor as vessels navigate around construction areas, if needed.

Alternative 4A construction activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the proposed Project Area. Therefore, no adverse impacts to land and harbor use would likely occur due construction activities.

The Draft EIS/EIR served as the Coastal Consistency Determination and was reviewed by the California Coastal Commission (CCC) for their concurrence. The CCC unanimously concurred with the USACE consistency determination for the Recommended Plan on 11 December 2020.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. Alternative 4A OMRR&R activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the proposed Project Area. No adverse impacts to land and harbor use would likely occur due to OMRR&R and adaptive management activities under Alternative 4A.

Impact Summary

Alternative 4A construction and OMRR&R activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the project area. Therefore, no adverse impacts to land and harbor use would likely occur due construction and OMRR&R activities.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Although additional construction would occur under Alternative 8 to implement additional features, impacts to land and harbor use associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. Construction activities would occur almost entirely on water and would not result in changes to current land use activities. Restoration features under this alternative would also include an approximately 24-acre sandy island, two wetlands totaling approximately 52 acres, and approximately 0.3 acre of oyster reefs that would increase the construction period to 113 months. These features would also restore and enhance coastal marine biological resources. Alternative 8 would not conflict with any local or regional plans and would not result in adverse impacts to land use. Effects would be limited to causing minor increases in time needed to enter or leave the harbor as vessels navigate around construction areas, if needed. Construction activities would not result in a noticeable interference with water-associated activities along beaches. Construction would occur predominantly on water, with minimal roadway traffic, and would not physically divide an established community.

Restoration features under Alternative 8 would include an approximately 24-acre sandy island and two wetlands totaling approximately 52 acres. These features would require approximately 4,287,000 cubic yards of fill and sand material that would be excavated from the Surfside/Sunset borrow site. Commercial, private, and recreational vessels would need to navigate around the dredging area as well as the barge, tugboat, and other equipment in the construction areas for the sandy island and wetlands. These features would be located outside shipping lanes but minor increases in time to enter or leave the harbor may occur as vessels navigate around the dredging and construction areas. Construction activities would not conflict with the mission and goals of the POLB Strategic Plan.

Alternative 8 would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the project area. Therefore, no adverse impacts to land and harbor use would likely occur due construction activities.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2. Impacts of OMRR&R and adaptive management activities for these features would be similar to construction activities but would require significantly less time to complete. Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Maintenance for the sandy island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours. These OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete, and activities would not conflict with City, POLB, or NWS SDIRMP plans, policies, or regulations. OMRR&R would occur predominantly on water, with minimal roadway traffic, and would not physically divide an established community.

Adaptive management may include additional actions such as eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities.

Alternative 8 OMRR&R activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the project area. No adverse impacts to land and harbor use would likely occur due to OMRR&R and adaptive management activities under Alternative 8.

Impact Summary

Alternative 8 construction and OMRR&R activities would not: physically divide an established community; or conflict with any applicable land use plans, policies, or regulations with jurisdiction over the project area. Therefore, no adverse impacts to land and harbor use would likely occur due construction and OMRR&R activities.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.15 SOCIOECONOMICS

5.15.1 Relevant Regulations and Significance Criteria

- National Environmental Policy Act of 1969, as amended: Under NEPA (42 USC 4321 et seq.), an EIS must include an analysis of the proposed project's economic, social, and demographic effects related to effects on the natural or physical environment in the affected area, but does not allow for economic, social, and demographic effects to be analyzed in isolation from the physical environment.
- State of California: Under CEQA, Article 9(a), Section 15131, guidance for economic and social are provided.
- City of Long Beach General Plan, the City of Seal Beach General Plan, the Port of Long Beach Strategic Plan, and the Port of Long Beach Master Plan include economic elements.

Significance Criteria

The following thresholds of significance criteria are based on the CEQA Checklist for population and housing, as provided in Appendix G to the CEQA Guidelines. These criteria are also being adopted for NEPA. Impacts would be considered significant if the proposed alternatives would:

- Induce substantial growth in an area, either directly (*e.g*., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure).
- Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere.
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

<u>*Summary of Impacts*</u>

The proposed action alternatives would potentially cause the following types of socioeconomic effects in the proposed Project Area and surrounding region:

- Construction spending would support temporary (*i.e*., construction phase) business activity and employment. The direct impacts of the construction spending would also generate *indirect* economic benefits as the construction firms directly engaged in the proposed project would purchase materials, supplies and services from other firms in the region. The action alternatives would also create *induced* economic benefits in the region as the employees of affected firms would spend their payrolls for personal/household goods and services.
- In addition to construction expenditures, the action alternatives would also involve ongoing OMRR&R activity spending to maintain the physical improvements associated with the restoration effort. Although smaller in scale than the initial construction spending, these OMRR&R expenditures would be long-term (recurring on an annual or other periodic basis). Similar to the multiplier effects noted for the construction impacts, the direct OMRR&R impacts would also generate indirect and induced effects.

The socioeconomic impact assessment relies on two primary sources of quantitative information:

- The USACE Regional Economic System (RECONS), an economic impact modeling tool that quantifies the direct and indirect/induced impacts of the construction and maintenance expenditures associated with each project alternative; and
- Appendix C (Draft Economics and Social Considerations).

Table 5-18 and Table 5-19 summarize the RECONS model results for the alternatives under consideration in this EIS/EIR.

Table 5-18 summarizes temporary construction-related impacts and Table 5-19 summarizes recurring OMRR&R-related impacts. In order to assess the significance levels of the indicated project-related impacts, the tables also show the total baseline level of economic activity in the impact region, defined for purposes of the analysis as the Los Angeles-Long Beach-Santa Ana Metropolitan Statistical Area (MSA).

The following measures of economic activity are projected by the RECONS model:

- Spending: total construction and maintenance spending for each alternative, as estimated by the USACE.
- Output: the dollar value of business activity supported by the projected spending.
- Jobs: full-time equivalent employment associated with each alternative (for both temporary/construction jobs and permanent/maintenance jobs).
- Labor income: the total payroll associated with the created jobs.
- Gross regional product (GRP): a measure of the “value added” for project-related construction and maintenance activity in the impact region.

Table 5-18: Summary of Regional Economic Impacts – Project Construction (One-Time Impacts)

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
Total Spending	$0	$79,982,200	$267,959,000	$554,165,000
Direct Impact (region)				
Output	$0	$74,292,749	$263,069,669	$514,745,022
Jobs	0	685	2,524	4,746
Labor Income	$0	$36,098,064	$199,790,393	$250,109,197
GRP	$0	$42,118,827	$171,927,901	$291,824,679
Total Impact (region)				
Output	$0	$156,890,282	$501,205,195	$1,092,587,861
Jobs	0	1,183	3,715	8,194
Labor Income	$0	$65,479,292	$283,583,326	$453,680,093
GRP	$0	$91,496,732	$318,994,881	$633,944,636
Baseline (2008) Output, Los Angeles MSA	$1,307,649,000,000	$1,307,649,000,000	$1,307,649,000,000	$1,307,649,000,000
Project Output as % of Los Angeles MSA	0.00%	0.01%	0.04%	0.08%
Source: USACE Institute for Water Resources 2010				

Table 5-19: Summary of Regional Impacts – Project Maintenance (Recurring Impacts)

	No Action Alternative	Alternative 2	Alternative 4A	Alternative 8
Total Spending	$0	$207,390	$535,000	$5,852,625
Direct Impact (region)				
Output	$0	$176,087	$513,215	$4,969,238
Jobs	0	1.6	4.2	46.4
Labor Income	$0	$124,050	$386,745	$3,500,752
GRP	$0	$132,525	$389,922	$3,739,895
Total Impact (region)				
Output	$0	$378,998	$951,653	$10,695,464
Jobs	0	2.9	6.4	82.6
Labor Income	$0	$196,859	$543,746	$5,555,426
GRP	$0	$258,259	$663,089	$7,288,162
Baseline (2008) Output, Los Angeles MSA	$1,307,649,000,000	$1,307,649,000,000	$1,307,649,000,000	$1,307,649,000,000
Project Output as % of Los Angeles MSA	0.00%	0.00%	0.00%	0.00%
Source: USACE Institute for Water Resources 2010				

Based on the framework provided by the RECONS model runs (as summarized in Table 5-18 and Table 5-19), the EIS/EIR evaluates the potential socioeconomic impacts of each alternative. For all considered impacts it is critical to bear in mind that, under NEPA and CEQA, socioeconomic impacts are deemed significant only if they are projected to result in discernible, sustained changes in the physical environment (*i.e.*, physical changes that would not occur in the absence of the proposed alternatives). In this regard, the socioeconomic analysis carefully considers the backdrop of existing/ongoing regional economic trends as one basis for gauging the significance levels of projected impacts.

5.15.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

For purposes of the socioeconomic analysis, an assessment area was generated by creating a 0.5-mile buffer around the ESPB proposed Project Area and then including all census tracts that lie wholly or partially within it. There are 31 census tracts, covering approximately 36 square miles, which were used to compute census tract-level statistics. Southern California Association of Governments growth forecast for the City of Long Beach for 2040 indicates the population in the ESPB proposed Project Area may grow by between 2 and 3 percent. The number of households will likely increase by about 7 percent by 2040 and income is forecast to increase by about 18 percent (SCAG 2016). As indicated by these estimates, the ESPB proposed Project Area and vicinity are expected to continue to experience a trend of positive growth in population, employment, and income. The No Action Alternative would not likely result in constraints to the forecasted growth.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Development under Alternative 2 would involve a total construction cost of approximately $80 million. This expenditure would directly and indirectly support $156.9 million in new economic output in the region (defined for this analysis as the Los Angeles-Long Beach-Santa Ana MSA). This business volume would support a total of 1,183 construction-phase jobs and total labor income of $65.5 million.

Given that these expenditures would be temporary, spread over multiple years, and dispersed throughout a very large and dynamic region, direct and indirect impacts would be very small in terms of their potential contribution to regional economic growth. Per the RECONS model used for this analysis, the baseline (2008) level of economic output in the Los Angeles-Long Beach-Santa Ana MSA is over $1.3 trillion. The total projected output associated with Alternative 2 would represent 0.01 percent (*i.e*., one one-hundredth of one percent) of this regional baseline. As such, it is likely that project-related construction activity could be readily accommodated by existing firms and workers as part of the normal ebb and flow of the construction industry in a large region. Thus, it is not expected that the direct and indirect economic impact of construction would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of construction activities would be less than significant. Construction-related socioeconomic direct and indirect impacts under Alternative 2 would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R activities under Alternative 2 would involve total annual expenditures of approximately $207,000. This expenditure would directly and indirectly support $379,000 in new economic output in the region (defined for this analysis as the Los Angeles-Long Beach-Santa Ana MSA). This business volume would support the full-time equivalent of 2.9 permanent jobs and annual labor income of $197,000.

Continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds and kelp reefs along with adaptive management (see Appendix F). Monitoring of eelgrass beds and kelp reefs would be anticipated to require operation of a single boat during daylight hours for a short duration.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment). These activities would require fewer days and equipment use than construction activities, and would result in minimal, if any, changes in socioeconomic conditions in the proposed Project Area.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Over the next 50 years, sea level may increase by approximately 2.5 feet (based on modeling). This level of sea rise may require additional stone material on rocky reefs to maintain habitat requirements. Potential occasional repair or height increase of rocky reefs would require some trucking or barging of material and heavy equipment. These activities would require fewer days and equipment use than construction activities, and would result in minimal, if any, changes in socioeconomic conditions in the proposed Project Area.

Given that OMRR&R and adaptive management activities would be dispersed throughout a very large and dynamic region, direct and indirect impacts would be very small in terms of their potential contribution to regional economic growth. Per the RECONS model used for this analysis, the baseline (2008) level of economic output in the Los Angeles-Long Beach-Santa Ana MSA is over $1.3 trillion. The OMRR&R output associated with Alternative 2 would represent less than 0.01 percent (*i.e.*, one one-hundredth of one percent) of this regional baseline. As such, it is likely that project related OMRR&R and adaptive management activities could be readily accommodated by existing firms and workers in the region. Therefore, it is not expected that the economic impact of OMRR&R activities under Alternative 2 would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of OMRR&R activities would be less than significant.

Impact Summary

Development of the proposed project under Alternative 2 would involve a total construction cost of approximately $80 million. Construction, OMRR&R and adaptive management activities would be temporary, spread over multiple years, and dispersed throughout a very large and dynamic region, economic impacts would be very small in terms of their potential contribution to regional economic growth. Under Alternative 2, it is not expected that the direct and indirect economic impact of construction and OMRR&R activities would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of construction and OMRR&R activities would be less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Construction Phase Impacts: Development under Alternative 4A would involve a total construction cost of approximately $268 million. This expenditure would directly and indirectly support $501 million in new economic output in the region (defined for this analysis as the Los Angeles-Long Beach-Santa Ana

MSA). This business volume would support a total of 3,715 construction-phase jobs and total labor income of $283.5 million.

The total projected output associated with Alternative 4A would represent only 0.04 percent (*i.e.*, four one-hundredths of one percent) of the regional baseline. Similar to Alternative 2, construction-related socioeconomic impacts under Alternative 4A would not: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of construction activities would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R activities under Alternative 4A would involve total annual expenditures of $535,000. This expenditure would directly and indirectly support $951,653 in new economic output in the region (defined for this analysis as the Los Angeles-Long Beach-Santa Ana MSA). This business volume would support the full-time equivalent of 4.2 permanent jobs and annual labor income of $386,745.

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2, OMRR&R and adaptive management activities would be dispersed throughout a very large and dynamic region, impacts would be very small in terms of their potential contribution to regional economic growth. It is likely that project related OMRR&R and adaptive management activities could be readily accommodated by existing firms and workers in the region. Therefore, it is not expected that the economic impact of OMRR&R activities under Alternative 4A would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of OMRR&R activities would be less than significant.

Impact Summary

Development of the proposed project under Alternative 4A would involve a total construction cost of approximately $268 million. Construction OMRR&R and adaptive management activities would be temporary, spread over multiple years, and dispersed throughout a very large and dynamic region, economic impacts would be very small in terms of their potential contribution to regional economic growth. Under Alternative 4A, it is not expected that the direct and indirect economic impact of construction and OMRR&R activities would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of construction and OMRR&R activities would be less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

<u>Direct and Indirect Impact Analysis</u>

Development under Alternative 8 would involve a total construction cost of approximately $554.2 million. This expenditure would directly and indirectly support nearly $1.2 billion in new economic output in the region (defined for this analysis as the Los Angeles-Long Beach-Santa Ana MSA). This business volume would support a total of 8,847 construction-phase jobs and total labor income of $489.8 million.

The total projected output associated with Alternative 8 would represent only 0.09 percent (*i.e.*, two one-hundredths of one percent) of the regional baseline. As such, it is likely that project-related construction activity could be readily accommodated by existing firms and workers as part of the normal ebb and flow of the construction industry in a large region. Thus, it is not expected that the direct and indirect economic impact of construction would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of construction activities would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impact Analysis

OMRR&R and adaptive management activities for eelgrass beds, nearshore and open water rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2, OMRR&R and adaptive management activities would be dispersed throughout a very large and dynamic region, impacts would be very small in terms of their potential contribution to regional economic growth. Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Maintenance for the Sandy Island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools. These activities would require fewer days and equipment use than construction activities, and would result in minimal, if any, changes in socioeconomic conditions in the proposed Project Area.

Adaptive management may include additional actions such as eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities.

OMRR&R and adaptive management activities under Alternative 8 would involve total annual expenditures of $5.9 million. This expenditure would directly and indirectly support $10.7 million in new economic output in the region (defined for this analysis as the Los Angeles-Long Beach-Santa Ana MSA). This business volume would support the full-time equivalent of 83 permanent jobs and annual labor income of $5.6 million.

It is likely that project related OMRR&R and adaptive management activities could be readily accommodated by existing firms and workers in the region. Therefore, it is not expected that the economic impact of OMRR&R activities under Alternative 8 would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of OMRR&R activities would be less than significant.

Impact Summary

Development of the proposed project under Alternative 8 would involve a total construction cost of approximately $554.2 million. Construction would be temporary, spread over multiple years, and dispersed throughout a very large and dynamic region, economic impacts would be very small in terms of their potential contribution to regional economic growth. Under Alternative 8, it is not expected that the direct and indirect economic impact of construction and OMRR&R activities would: induce substantial growth in an area, either directly or indirectly; or displace substantial numbers of existing housing or people, necessitating the construction of replacement housing elsewhere. Socioeconomics impacts of construction and OMRR&R activities would be less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.16 RECREATION

5.16.1 Relevant Regulations and Significance Criteria

- State of California Coastal Act. The Recreation Policies contained in Article 3 of the Coastal Act are intended to provide protection for suitable ocean front land to be used for recreational purposes as well as maintaining upland areas to support coastal recreation uses, where feasible.
- City of Long Beach General Plan Open Space and Recreation Element: Plans for the preservation of open space and production of natural resources, open space management, open space for public health and safety, and open space for outdoor recreation.
- City of Long Beach Coastal Program: Provides policies regarding public access, marine environment, land resources, development, and industrial development.

Significance Criteria

The following threshold of significance criterion is based on the CEQA Checklist for recreation, as provided in Appendix G to the *CEQA Guidelines*. This criterion is also being adopted for NEPA. Impacts would be considered significant if the proposed alternatives would:

- Substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity

Recreation Data

The USACE document on "Economics and Social Considerations" for the proposed project (Appendix C) provides an order-of-magnitude analysis of the potential beneficial and adverse impacts that each alternative would have on various types of recreational activity levels in the proposed Project Area. The USACE analysis reflects the understanding that, depending on the alternative, some types of recreational activities would potentially be beneficially impacted, and some types of activities would potentially be reduced or otherwise adversely impacted. Because it is virtually impossible to precisely quantify these types of impacts (given the absence of definitive data on existing use/activity levels), the USACE analysis relies on the methodology outlined in Appendix C to determine the likely direction and magnitude of impacts.

Environmental Commitments

RC-1 During the pre-construction engineering and design (PED) phase, USACE will meet with boating stakeholders to identify practicable design refinements that reduce and minimize impacts to recreational boating while still meeting project objectives and avoids violating project constraints.

Also, see AV-1 under Aesthetics and Visual Resources, public notice of construction activities and ENG-1 under Public Health and Safety, including Hazardous Materials.

5.16.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Recreation opportunities involve passive and active activities such as sightseeing, sunbathing, picnicking, bicycling, sailing, swimming, shoreline and pier fishing, and general enjoyment. Shoreline and nearshore uses that depend on land-based operations include such activities as sport fishing, commercial cruises, tour boats, boating, and sailing. Within the Los Angeles and Long Beach Harbor complex, several major charter boat companies provide charter service to specialized activities, including sport fishing, SCUBA diving, whale watching, and harbor touring. Under the No Action Alternative, other recreational activities (*e.g*., sailing, boating, SCUBA diving) would continue to be enhanced by the creation of sheltered waters by the breakwaters allowing for a safer experience for less qualified individuals.

Under the No Action Alternative, it is expected that the population of Long Beach and Los Angeles areas would continue to increase, as well as the demand for recreational activities within the proposed Project Area. Although water quality would likely continue to improve, beach recreational activities would continue to be adversely affected by bacterial water quality issues, as well as trash and debris on beaches and within the bay. ESPB would continue to have low wave heights and reduced wave energy would continue to limit certain recreational activities along the beach shoreline, including surfing and swimming. Boating and SCUBA diving would not be affected over time and would be expected to increase as sea temperatures increase and increased tourism is experienced along the southern California coast.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 2, eelgrass, kelp and associated rocky reefs would be restored. Construction activities related to the nearshore eelgrass and associated rocky reefs, and open water kelp reefs, may result in a short-term, localized disruption of recreational activities due to the presence of construction equipment. Once construction activities are completed, the nearshore rocky reefs may result in negligible disruption of near beach activities, such as boating, swimming, wadding, or surfing. There is currently limited surfing within the proposed Project Area due to minimal wave action and surfing conditions would stay the same as existing conditions before waves break along the nearshore rocky reef shoals. Potential impacts would be localized to the reef areas and only cause disruption in shallow areas. Beach/boardwalk and paddle boarding would not likely be impacted by construction activities or restoration features once construction is completed.

Short-term, minor adverse impacts to recreation could occur during construction while barges, tugboats, and other equipment are operating within the ESPB proposed Project Area, causing water-based recreation such as sailing, kite surfing, and boating to avoid construction areas and equipment. Construction activities within the proposed Project Area are not expected to substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity.

Beneficial impacts to recreation would result for some activities, including SCUBA diving, snorkeling, and paddle boarding due to increased interest in the biological features of the restored habitat areas and increased biological diversity. The addition of rocky reef, kelp reef, and eelgrass within the proposed Project Area provides easy access to the public and significantly increases the access of these habitats to snorkelers and SCUBA divers (*e.g.*, Via public transportation, multiple parking locations along the nearshore in Long Beach, and a relatively short swim or boat ride to restored habitats). Traditionally, to access these natural habitats along the California coastline, the Palos Verdes Peninsula, or across the San Pedro Channel at Santa Catalina Island, the public is required to take personal watercraft, pay for ferries across the San Pedro Channel, or drive significant distances incurring costs to time and personal finances that reduce the opportunity to access these resources for much of the public. As restored habitats will be in close proximity to the nearshore in Long Beach and multiple avenues are available for providing access to a greater proportion of the public, a significant boost to recreation within the area is expected for aquatic recreation. Additionally, the predicted increase in marine mammals, marine foraging birds, and fishes using restored habitats within the proposed Project Area are expected to increase the opportunity for beneficial interactions with wildlife through marine mammal and bird observation and recreational fishing due to the relatively close proximity of the habitats to the public.

The scattered rock measures in the open water zone and breakwater zone, as well as kelp forest, are anticipated to result in some noticeable impacts to boaters, depending on the size and type of vessel. The presence of the kelp forest and rocky reef would be anticipated to require boaters to avoid such features. Speed reduction may also be employed to avoid conflicts with the restoration features, and aids to navigation may be established. Motor and sail boats with a deeper keel would be anticipated to have to avoid the features more than those boats with greater under keel clearance. Sail boats may also have to exercise greater care navigating around the kelp beds especially if they are not equipped with a motor. Boaters may also have to reduce speeds in the vicinity of these project features. The kelp beds and rocky reefs will limit the paths for vessels in and out of ESPB and in and out of Alamitos Bay, and aids to navigation may be established. While the features can be anticipated to result in some changes to specific navigation routes or practices by individual craft, the general availability or quality of boating within ESPB is not anticipated to be reduced substantially. Conservative feasibility-level estimates indicate that approximately 8.9% of useable recreational boater area (~562 acres out of an estimated 6,300 acres; Figure 5-2) is expected to be impacted by project features within the proposed Project Area. Note that the locations of kelp bed features are anticipated to be refined during the PED phase to minimize impacts to recreational boaters as much as practicable and that impacted recreational boater areas are not being completely lost as vessels with appropriately sized drafts would be capable of navigating through project features with the aid of appropriate navigation practices. Eelgrass and kelp beds, along with rocky reefs, would enhance the biological productivity of the bay and likely result in beneficial impacts due to increased interest from recreational fishers, snorkelers, and SCUBA divers. For a full discussion, see Appendix C: Economic and Social Considerations, Addendum A: Incidental Recreation Impacts.

Figure 5-2: Impacted recreational boater acreage in ESPB from Alternative 2

Project features are indicated by blue (kelp reef), orange (nearshore rocky reef), and light green (eelgrass) polygons. Cyan polygons indicate open water recreational boater areas, gold polygons indicate nearshore recreational areas (*e.g.*, boating/kiteboarding), and black shading indicates conservative buffered impact areas corresponding to approximately 200 feet beyond kelp reefs (inside the Long Beach breakwater) and 300 feet beyond nearshore rocky reefs.

Under Alternative 2, some recreation activities may be disrupted during construction activities. Individual recreation activity types would potentially be modified or reduced while others would be enhanced by habitat features. No impacts would be expected to beach/boardwalk recreational activities as construction would occur predominantly on the water within the proposed Project Area. Once construction is completed, construction activities and restoration features under Alternative 2 would not substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; therefore, impacts to recreation under Alternative 2 would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds and kelp reefs along with adaptive management (see Appendix F). Monitoring of eelgrass beds and kelp reefs would be anticipated to require operation of a single boat during daylight hours for a short duration. This activity would not be anticipated to impact recreation in the proposed Project Area.

Adaptive management may include actions such as eelgrass transplantation and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal impacts to recreational activities. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs and eelgrass beds; no further monitoring would be required.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment. Rocky reef OMRR&R activities would require fewer days and equipment use than construction activities.

Under Alternative 2, some individual recreation activity types would potentially be disrupted during OMRR&R activities. No impacts would be expected to beach/boardwalk recreational activities as OMRR&R would occur predominantly on the water within the proposed Project Area. OMRR&R activities under Alternative 2 would not substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; therefore, impacts to recreation would be less than significant.

Impact Summary

Short-term, localized disruption of water-based recreational activities may occur during construction and OMRR&R due to the presence of construction equipment and activities. Once construction is complete, habitat features may result in localized disruption of water-based recreational activities, primarily boating. The recreation analysis in Appendix C indicated that minor overall impacts to nearshore water activities and more significant negative impacts for commercial, recreational, sail boats would be possible as a result of restoration measures within the bay. Personal watercraft are also affected. The overall recreation value for beach goers increased slightly when compared to the FWOP condition. This is primarily because the losses to recreation experience to water-based recreation are counterbalanced by improvements to environmental quality associated with the ecosystem restoration project. The more substantial recreation impacts would be to boating. No impacts would be expected to beach/boardwalk recreational activities as construction would occur on the water within the proposed Project Area. OMRR&R and adaptive management activity would be less than construction activities and impacts on recreation would be short-term, localized, less intensive than construction impacts discussed above, and less than significant. Alternative 2 construction and OMRR&R activities would not result in long-term substantial restriction or reduction to the availability or quality of existing recreational opportunities in the proposed Project Area or vicinity. Therefore, potential adverse impacts to recreation under Alternative 2 would be short-term, localized, and less than significant. Beneficial impacts from restored habitat areas and increased biological diversity would be long-term and less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Although additional construction would occur under Alternative 4A to implement additional features, impacts to recreation associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. The addition of two open water rocky reefs under this alternative would not significantly increase the construction period (96 months as compared to 90 months under Alternative 2). Alternative 4A construction activities related to the nearshore eelgrass and associated rocky reefs may result in a short-term, localized disruption of water-based recreational activities. Once construction activities are completed, the nearshore rocky reefs may result in minor disruption of near beach water-based activities, such as swimming, wadding, or surfing. There is currently limited surfing within the proposed Project Area due to minimal wave action and surfing conditions would stay the same as existing conditions before waves break along the nearshore rocky reef shoals. Potential impacts would be localized to the reef areas and only cause disruption in shallow areas. Beach/boardwalk and paddle boarding would not likely be impacts by construction activities or restoration features once construction is completed.

Construction of the open water rocky reefs may also result in short-term, localized, adverse impacts to recreationists such as sailors, paddle boarders, or other recreational boaters due to the need to avoid and navigate around large equipment. Habitat features including kelp may result in slowing sailboat speed. Kelp beds would be located in a small area (~121 acres) and pathways for boats to avoid kelp and other features would continue to be available. See discussion of Alternative 2 above and Appendix C for additional information.

Beneficial impacts to recreation would result for some activities, including SCUBA diving, snorkeling, and paddle boarding due to increased interest in the biological features of the restored habitat areas and increased biological diversity. The addition of rocky reef, kelp reef, and eelgrass within the proposed Project Area provides easy access to the public and significantly increases the access of these habitats to snorkelers and SCUBA divers (*e.g.*, Via public transportation, multiple parking locations along the nearshore in Long Beach, and a relatively short swim or boat ride to restored habitats). Traditionally, to access these natural habitats along the California coastline, the Palos Verdes Peninsula, or across the San Pedro Channel at Santa Catalina Island, the public is required to take personal watercraft, pay for ferries across the San Pedro Channel, or drive significant distances incurring costs to time and personal finances that reduce the opportunity to access these resources for much of the public. As restored habitats will be in close proximity to the nearshore in Long Beach and multiple avenues are available for providing access to a greater proportion of the public, a significant boost to recreation within the area is expected for aquatic recreation. Additionally, the predicted increase in marine mammals, marine foraging birds, and fishes using restored habitats within the proposed Project Area are expected to increase the opportunity for beneficial interactions with wildlife through marine mammal and bird observation and recreational fishing due to the relatively close proximity of the habitats to the public.

Alternative 4A is expected to result in a slightly greater increase in negative recreation impacts to a subset of recreational activities. The plan adds one rocky reef shoal on the east side in the nearshore zone plus 2 rocky reef complexes near Island A in the open water zone. The added rocky reef complexes are expected to result in slightly greater negative impacts to boating over Alternative 2. Conservative feasibility-level estimates indicate that approximately 10.5% of useable recreational boater area (~664 acres out of an estimated 6,300 acres; Figure 5-3) is expected to be impacted by project features within the proposed Project Area. This represents an additional 1.6% (~102 acres) of additional direct impacts to recreational boating area when compared to Alternative 2. Note that the locations of kelp bed features are anticipated to be refined during the PED phase to minimize impacts to recreational boaters as much as practicable and that impacted recreational boater areas are not being completely lost as vessels with appropriately sized drafts will be capable of navigating through project features with the aid of appropriate navigation practices. Overall, the impacts to recreation are mixed depending on the activity desired at the bay. Alternatives 2 and 4A have generally minor negative impacts to recreation—some negative impacts are reflected in the nearshore water activities and more so for boating activities.

Figure 5-3: Impacted Recreational Boater Acreage in ESPB from the Recommended Plan

Project features are indicated by blue (kelp reef), red (open water rocky reef), orange (nearshore rocky reef), and light green (eelgrass) polygons. Cyan polygons indicate open water recreational boater areas, gold polygons indicate nearshore recreational areas (*e.g.*, boating/kiteboarding), and black shading indicates conservative buffered impact areas corresponding to approximately 200 feet beyond kelp reefs and open water rocky reefs (inside the Long Beach breakwater) and 300 feet beyond nearshore rocky reefs.

Under Alternative 4A, some individual recreation activity types would potentially be disrupted, others would be enhanced. No impacts would be expected to beach/boardwalk recreational activities as construction would occur predominantly on the water within the proposed Project Area. Construction activities, and restoration features (once construction is completed) under Alternative 4A would not substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; therefore, impacts to recreation would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2 with the inclusion of the monitoring and adaptive management of open water rocky reefs. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. Under Alternative 4A, some individual recreation activity types would potentially be limited/curtailed during OMRR&R activities. No impacts would be expected to beach/boardwalk recreational activities as OMRR&R would occur predominantly on the water within the proposed Project Area. OMRR&R activities under Alternative 4A would not substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; therefore, impacts to recreation would be less than significant.

Impact Summary

Short-term, localized disruption of water-based recreational activities may occur during construction and OMRR&R due to the presence of construction equipment and activities. Once construction is complete, habitat features may result in localized disruption of water-based recreational activities, primarily boating. The recreation analysis in Appendix C indicated that minor overall impacts to nearshore water activities and more significant negative impacts for commercial, recreational, sail boats would be possible as a result of restoration measures within the bay. Personal watercraft are also affected. The overall recreation value for beach goers increased slightly when compared to the FWOP condition. This is primarily because the losses to recreation experience to water-based recreation are counterbalanced by improvements to environmental quality associated with the ecosystem restoration project. The more substantial recreation impacts would be to boating. No impacts would be expected to beach/boardwalk recreational activities as construction would occur on the water within the proposed Project Area. OMRR&R and adaptive management activity would be less than construction activities and impacts on recreation would be short-term, localized, less intensive than construction impacts discussed above, and less than significant. Alternative 4A construction and OMRR&R activities would not result in long-term substantial restriction or reduction to the availability or quality of existing recreational opportunities in the proposed Project Area or vicinity. Therefore, potential adverse impacts to recreation under Alternative 4A would be short-term, localized, and less than significant. Beneficial impacts from restored habitat areas and increased biological diversity would be long-term and less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Nearshore eelgrass and associated rocky reefs under Alternative 8 may result in a short-term, localized disruption of recreational activities. Restoration features under this alternative would also include an approximately 24-acre sandy island, two wetlands totaling approximately 52 acres, and oyster reefs of approximately 0.3 acre. Construction activities related to these features may also result in short-term, localized disruption of water-based recreational activities.

There is currently limited surfing within the proposed Project Area due to minimal wave action and surfing conditions would stay the same as existing conditions before waves break along the nearshore rocky reef shoals. Potential impacts would be localized to the reef areas and only cause disruption in shallow areas. Beach/boardwalk and paddle boarding would not likely be impacts by construction activities or restoration features once construction is completed.

Under Alternative 8, two wetlands would be created, an approximately 10-acre wetland near the Los Angeles River and an approximately 42-acre wetland near Pier J. Construction activities related to development of these wetlands may cause recreational boaters to avoid the area or navigate around construction activities due to the presence of construction equipment.

Construction activities for the approximately 42-acre wetland near Pier J would likely result in short- and long-term loss of recreational fishing within a portion of the Pier J Fishing Spot. During construction, access would be limited to the waterfront near Pier J and would be opened once construction is completed, causing short-term impacts to recreational fishing in the area. The loss of a portion of the fishing area would result in fishermen using other nearby areas, such as Belmont Pier or Seal Beach, for similar fishing opportunities. These areas are compatible and would not require recreational fishermen to travel a significant distance. Impacts from the modification of a portion of the Pier J fishing area would be a long-term and minor adverse to recreation as other fishing opportunities are found in the proposed Project Area. In addition, habitat restoration features may result in an increase of commonly fished species, particularly near Belmont Pier, potentially leading to improved fishing in the project area. Creation of the wetland would provide a food source for some fish species in the proposed Project Area, potentially leading to an increase in fish populations, which would in turn potentially improve fishing in the area of Pier J.

Beneficial impacts to recreation would result for some activities, including SCUBA diving, snorkeling, and paddle boarding due to increased interest in the biological features of the restored habitat areas and increased biological diversity. The addition of rocky reef, kelp reef, eelgrass, and wetlands within the proposed Project Area provides easy access to the public and significantly increases the access of these habitats to snorkelers and SCUBA divers (*e.g.*, Via public transportation, multiple parking locations along the nearshore in Long Beach, and a relatively short swim or boat ride to restored habitats). Traditionally, to access these natural habitats along the California coastline, the Palos Verdes Peninsula, or across the San Pedro Channel at Santa Catalina Island, the public is required to take personal watercraft, pay for ferries across the San Pedro Channel, or drive significant distances incurring costs to time and personal finances that reduce the opportunity to access these resources for much of the public. As restored habitats will be in close proximity to the nearshore in Long Beach and multiple avenues are available for providing access to a greater proportion of the public, a significant boost to recreation within the area is expected for aquatic recreation. Additionally, the predicted increase in marine mammals, marine foraging birds, and fishes using restored habitats within the proposed Project Area are expected to increase the opportunity for beneficial interactions with wildlife through marine mammal and bird observation and recreational fishing due to the relatively close proximity of the habitats to the public.

As with Alternatives 2 and 4A, once construction activities are completed, the nearshore and open water rocky reefs may result in disruptions of near water-based beach activities, such as swimming, wadding, or surfing due to the presence of construction equipment. The sandy island may also result in disruptions of nearshore boating, surfing, and paddle boarding activities due to the need to avoid and navigate around large construction equipment. Conservative feasibility-level estimates indicate that approximately 13.4% of useable recreational boater area (~841 acres out of an estimated 6,300 acres; Figure 5-4) is expected to be impacted by project features within the proposed Project Area. This represents an additional 2.9% (~102 acres) of additional direct impacts to recreational boating area when compared to Alternative 4A. Note that the locations of kelp bed features are anticipated to be refined during the PED phase to minimize impacts to recreational boaters as much as practicable and that impacted recreational boater areas are not being completely lost as vessels with appropriately sized drafts will be capable of navigating through project features with the aid of appropriate navigation practices.

Figure 5-4: Impacted Recreational Boater Acreage in ESPB from Alternative 8

Project features are indicated by blue (kelp reef), red (open water rocky reef), orange (nearshore rocky reef), yellow (sandy island), light green (eelgrass), and dark green (wetland) polygons. Cyan polygons indicate open water recreational boater areas, gold polygons indicate nearshore recreational areas (*e.g.*, boating/kiteboarding), and black shading indicates conservative buffered impact areas corresponding to approximately 200 feet beyond kelp reefs and open water rocky reefs (inside the Long Beach breakwater) and 300 feet beyond nearshore rocky reefs and the sandy island.

Under Alternative 8, some individual recreation activity types would potentially be disrupted, others would be enhanced. No impacts to would be expected to beach/boardwalk recreational activities as construction would occur predominantly on the water within the proposed Project Area. Construction would limit fishing access at Pier J and a portion of the fishing area would be modified. Construction activities, and restoration features, once construction is completed, under Alternative 8 would not substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; therefore, impacts to recreation would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternatives 2 and 4A. Impacts of OMRR&R and adaptive management activities for these features would be similar to construction activities but would require significantly less time to complete. These activities would be less than construction activities and would not likely significantly impact recreational activities. Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Maintenance for the Sandy Island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours. OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete.

Adaptive management may include additional actions such as eelgrass and oyster transplantation, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities and would be anticipated to result in minimal impacts to water-based recreational activities.

Under Alternative 8, some individual recreation activity types would potentially be disrupted during OMRR&R activities. No impacts would be expected to beach/boardwalk recreational activities as OMRR&R would occur predominantly on the water within the proposed Project Area. OMRR&R activities under Alternative 8 would not substantially restrict or reduce the availability or quality of existing recreational opportunities in the project vicinity; therefore, impacts to recreation would be less than significant.

Impact Summary

Short-term, localized disruption of water-based recreational activities may occur during construction and OMRR&R due to the presence of construction equipment and activities. Once construction is complete, habitat features may result in localized disruption of water-based recreational activities, primarily boating. The recreation analysis in Appendix C indicated that minor overall impacts to nearshore water activities and more significant negative impacts for commercial, recreational, sail boats would be possible as a result of restoration measures within the bay. Personal watercraft are also affected. The overall recreation value for beach goers increased slightly when compared to the FWOP condition. This is primarily because the losses to recreation experience to water-based recreation are counterbalanced by improvements to environmental quality associated with the ecosystem restoration project. The more substantial recreation impacts would be to boating. No impacts would be expected to beach/boardwalk recreational activities as construction would occur on the water within the proposed Project Area. OMRR&R and adaptive management activity would be less than construction activities and impacts on recreation would be short-term, localized, less intensive than construction impacts discussed above, and less than significant. Impacts from the modification of a portion of the Pier J fishing area would be a long-term and minor adverse impact to recreation as other fishing opportunities are found in the proposed Project Area.

OMRR&R and adaptive management activity would be less than construction activities and impacts on water-based recreation would be short-term, localized, less intensive than construction impacts discussed above, and less than significant. Alternative 8 would not result in long-term substantial restriction or reduction to the availability or quality of existing recreational opportunities in the proposed Project Area or vicinity. Therefore, potential adverse impacts to recreation under Alternative 8 would be short- and long-term, localized, and less than significant. Beneficial impacts from restored habitat areas and increased biological diversity would be long-term and less than significant.

Level of Impact for Alternative 8

Less than significant impact under NEPA and CEQA.

5.17 UTILITIES AND PUBLIC SERVICES

5.17.1 Relevant Regulations and Significance Criteria

- Senate Bill 1374 – Construction and Demolition Waste Materials Diversion Requirements: Requires that jurisdictions include in their annual AB 939[1] a summary of the progress made in

[1] Assembly Bill 939: The California Integrated Waste Management Act of 1989 and the California Solid Waste Reuse and Recycling Access Act of 1991, as amended, were enacted to reduce, recycle, and reuse solid waste generated in the State to the maximum extent feasible.

diverting construction and demolition waste.

- City of Long Beach Construction and Demolition Ordinance: The City adopted an ordinance that requires certain demolition and/or construction projects to divert at least 60 percent of waste through recycling, salvage, or deconstruction.
- City of Long Beach General Plan public safety goals.

Significance Criteria

The following thresholds of significance criteria are based on the CEQA Checklist for public services, utilities, and service systems, as provided in Appendix G to the *CEQA Guidelines*. These criteria are also being adopted for NEPA. Impacts would be considered significant if the proposed alternative would:

- Result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:
    - Fire protection
    - Police protection
    - Schools
    - Parks
    - Other public facilities
- Fail to comply with Federal, State, and local statutes and regulations related to solid waste.

Environmental Commitments

UT-1 Coordination between the USACE and the City of Long Beach public safety agencies would occur prior to and during the construction period.

UT-2 Mapping of underwater utilities would be used to plan the location of rocky reefs to avoid utilities and pipelines.

5.17.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

Utilities and public services within the ESPB proposed Project Area are expected to expand to accommodate a growing population and increased harbor use under the No Action Alternative. AES Energy, energy provider in the proposed Project Area, is planning to decommission an existing power plant in the Long Beach area. The California Energy Commission has given approval for new energy facilities to be built near the existing power plant. The new plant would be natural gas-fired and would not require the use of ocean water, as does the existing plant. The new gas-fired plant would be capable of generating 1,040 megawatts of electricity.

Under the No Action Alternative, harbor capacity is expected to increase to accommodate predicted increases in commercial shipping. The Port of Long Beach currently plans to spend nearly $4 billion on planned upgrades to the port in the next 10 years. Currently, there is a proposed channel deepening project within the Port of Long Beach. The channel would be deepened to minus 80 feet and a new channel entering Pier J South would be constructed at minus 55 feet.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 2, stones would be placed at specified locations within the proposed Project Area to create a hard, rocky reef substrate, and dredged sand would be placed on the leeward side of the nearshore rocky reefs, upon which eelgrass and kelp would become established on the low relief sea bottom. Eelgrass, rocky reefs, and kelp beds would cover approximately 162 acres within the proposed Project Area. Because the majority of construction activity would occur in the water, no impacts to utilities on land within the proposed Project Area would occur. Coordination between the USACE and the City of Long Beach public safety agencies would occur prior to and during the construction period (UT-1) and utility lines found underwater would be avoided (UT-2).

The proposed habitat restoration features under Alternative 2 would not require utility services (extension of utilities lines to operate features) and no additional public services would be needed. In addition, this alternative would not likely result in changes to solid waste in the proposed Project Area. Public safety agencies would likely provide short-term oversight for construction activities to minimize any potential safety issues related to the operation of construction equipment within the proposed Project Area.

The construction under Alternative 2 would require a small crew and a small number of tugboats, barges, boats, and other readily available for-hire construction equipment. The occurrence of small-scale construction within the proposed Project Area would: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from construction activities under Alternative 2 would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours. This activity would not be anticipated to impact utilities or public services in the proposed Project Area.

Adaptive management may include actions such as additional eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction activities and would not be anticipated to impact utilities or public services in the proposed Project Area. Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs and eelgrass beds, no further monitoring would be required.

After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment. Rocky reef OMRR&R activities would require fewer days and equipment use than construction activities. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete and would not be anticipated to impact utilities or public services in the proposed Project Area.

OMRR&R activities under Alternative 2 would require a small crew and a small amount of equipment. The occurrence of small-scale OMRR&R activities within the proposed Project Area would: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from OMRR&R activities under Alternative 2 would be less than significant.

Impact Summary

Existing utilities and public services within the proposed Project Area would be expected to remain the same under Alternative 2. Underwater utilities would be avoided and no impacts to above ground utilities are expected. Alternative 2 would not result in changes to utilities or other public services during construction, OMRR&R, or adaptive management activities. Construction and OMRR&R activities under Alternative 2 would not: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from construction and OMRR&R activities under Alternative 2 would be less than significant.

Level of Impact for Alternative 2

Less than Significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 4A stones would also be placed at specified locations to create a hard, rocky reef substrate, and dredged sand would be placed on the leeward side of the nearshore rocky reefs, upon which eelgrass and kelp would become established on the low relief sea bottom. Under Alternative 4A, eelgrass, nearshore rocky reefs, open water rocky reefs, and kelp beds would cover approximately 201 acres within the proposed Project Area.

Although additional construction would occur under Alternative 4A to implement additional features, impacts to utilities and public services associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. The addition of two open water rocky reefs under this alternative would not significantly increase the construction period (96 months as compared to 90 months under Alternative 2). The proposed habitat restoration features under Alternative 4A would not require utility services (extension of utilities lines to operate features) and no additional public services would be needed. In addition, this alternative would not likely result in changes to solid waste in the proposed Project Area. Public safety agencies would likely provide short-term oversight for construction activities to minimize any potential safety issues related to the operation of construction equipment within the proposed Project Area. Coordination between the USACE and the City of Long Beach public safety agencies would occur prior to and during the construction period (UT-1) and utility lines found underwater would be avoided (UT-2).

The construction under Alternative 4A would require a small crew and a small number of tugboats, barges, boats, and other readily available for-hire construction equipment. The occurrence of small-scale construction within the proposed Project Area would: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from construction activities under Alternative 4A would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2, no changes to utilities and public services would occur. OMRR&R activities under Alternative 4A would require a small crew and a small amount of equipment. The occurrence of small-scale OMRR&R activities within the project area would: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from OMRR&R activities under Alternative 4A would be less than significant.

Impact Summary

Existing utilities and public services within the proposed Project Area would be expected to remain the same under Alternative 4A. Underwater utilities would be avoided and no impacts to above ground utilities are expected. Alternative 4A would not result in changes to utilities or other public services during construction, OMRR&R, or adaptive management activities. Construction and OMRR&R activities under Alternative 4A would not: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from construction and OMRR&R activities under Alternative 4A would be less than significant.

Level of Impact for Alternative 4A

Less than Significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 8 stones would also be placed at specified locations to create a hard, rocky reef substrate, and dredged sand would be placed on the leeward side of the nearshore rocky reefs, upon which eelgrass and kelp would become established on the low relief sea bottom. Under Alternative 8, eelgrass, nearshore rocky reefs, open water rocky reefs, and kelp beds would cover approximately 295 acres within the proposed Project Area. Restoration features under this alternative would also include an approximately 24-acre sandy island, two wetlands totaling approximately 52 acres, and oyster reefs of approximately 0.3 acre.

Although additional construction would occur under Alternative 8 to implement additional features, impacts to utilities and public services associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, generating similar traffic levels, although the construction period would be extended for a longer duration (113 months as compared to 90 months under Alternative 2). The proposed habitat restoration features under Alternative 8 would not require utility services (extension of utilities lines to operate features) and no additional public services would be needed. In addition, this alternative would not likely result in changes to solid waste in the proposed Project Area. Public safety agencies would likely provide short-term oversight for construction activities to minimize any potential safety issues related to the operation of construction equipment within the proposed Project Area. Coordination between the USACE and the City of Long Beach public safety agencies would occur prior to and during the construction period (UT-1) and utility lines found underwater would be avoided (UT-2).

The construction under Alternative 8 would require a small crew and a small number of tugboats, barges, boats, and other readily available for-hire construction equipment. The occurrence of small-scale construction within the proposed Project Area would: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from construction activities under Alternative 8 would be less than significant.

OMRR&R Impacts (Including MAMP Implementation)

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternative 2, no changes to utilities and public services would occur. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. These activities would not affect utilities and public services in the proposed Project Area. Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5- to 10-year cycle. Maintenance for the sandy island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and sand replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, it would occur during daylight hours and would not be anticipated to impact utilities or public services.

Adaptive management may include additional actions such as vegetation or wildlife surveys, eelgrass and oyster transplanting, extension or repair of rocky reefs, re-contouring of coastal wetlands, and placement of additional sand on the sandy island (which may require the use of barges and heavy construction equipment) (see Appendix F). These activities would require fewer days and equipment use than construction, activities and would not be anticipated to impact utilities or public services in the project area.

Oyster reefs may require the addition of shell hash periodically to maintain appropriate substrate or to offset impacts to rising sea levels.

OMRR&R activities under Alternative 8 would require a small crew and a small amount of equipment. The occurrence of small-scale OMRR&R activities within the proposed Project Area would: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from OMRR&R activities under Alternative 8 would be less than significant.

Impact Summary

Existing utilities and public services within the proposed Project Area would be expected to remain the same under Alternative 8. Under water utilities would be avoided and no impacts to above ground utilities are expected. Implement of additional features would be comparable to those identified for Alternative 2, similar numbers and types of equipment would be utilized on a daily basis, however, the construction period would extend for a longer duration (113 months as compared to 90 months under Alternative 2). Construction and OMRR&R activities under Alternative 8 would not: not result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; or fail to comply with Federal, State, and local statutes and regulations related to solid waste. Impacts to utilities or public services from construction and OMRR&R activities under Alternative 8 would be less than significant.

Level of Impact for Alternative 8

Less than Significant impact under NEPA and CEQA.

5.18 PUBLIC HEALTH AND SAFETY, INCLUDING HAZARDOUS MATERIALS

5.18.1 Relevant Regulations and Significance Criteria

- Comprehensive Environmental Response, Compensation, and Liability Act: Established the “Superfund” to clean up uncontrolled or abandoned hazardous waste sites, accidents, spills, and other emergency releases of pollutants and contaminants into the environment.
- Hazardous Materials Transportation Act: Authorized the U.S. Department of Transportation to regulate the transportation of hazardous materials as codified in 49 USC 5101 et seq.
- Federal Occupational Safety and Health Act: Ensures safe and healthful conditions for working men and women.
- Resource Conservation and Recovery Act of 1976: Authorizes the U.S. EPA to control hazardous wastes from “cradle-to-grave,” meaning the generation, transportation, treatment, storage, and disposal of hazardous waste.
- Toxic Substances Control Act of 1976: Provides the U.S. EPA with the authority to administer reporting, record-keeping, testing requirements, and restrictions on to chemical substances that may pose unreasonable risks of injury to human health of the environment.
- EO 12088, Federal Compliance with Pollution Control Standards: Federal agencies are responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and activities under control of the agency.
- State of California Occupational Safety and Health Act: Addresses California employee working conditions, enables the enforcement of workplace standards, and provides for advancements in the field of occupational health and safety.
- State of California Hazardous Materials Storage and Handling: Includes specific requirements for the safe storage and handling of hazardous materials.

- Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program): Provides for local implementation of the following six regulatory programs.
- Port of Long Beach: Enforces various standards and/or restrictions regarding vessel discharge, sediment dredge and fill, and water quality within the Port.
- City of Long Beach Storm Water Management Program: Reinforces the Construction Permit Stormwater Pollution Prevention Plan requirements for projects disturbing more than one acre.
- City of Long Beach General Plan: Includes a Public Safety Element and Conservation Element.

Significance Criteria

The following thresholds of significance criteria are based on the CEQA Checklist for public services, utilities, and service systems, as provided in Appendix G to the CEQA Guidelines. These criteria are also being adopted for NEPA. Impacts would be considered significant if the proposed alternatives would:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material.
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.
- Emit hazardous emissions or includes the handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site.

Environmental Commitments

ENG-1 During placement of all restoration measures, project limits will be established by GPS coordinates and marked by buoys in-place before the start of construction.

PH-1 Coordination between the USACE and the City of Long Beach would occur to ensure that recreational and commercial users within the project area are aware of construction equipment at the start and termination of activities to minimize any potential hazards related to construction equipment and activities.

PH-2 Publication of advance notice in the U.S. Coast Guard (USCG) Local Notice to Mariners as another form of public information resulting in enhanced recreation as well as safety notification.

PH-3 All Federal, State, and local regulations regarding the use, transport, and disposal of hazardous materials would be adhered to during construction activities. Human health and safety impacts would be avoided through adherence to these procedures, conditions, and regulations.

5.18.2 Environmental Impacts Evaluation of Each Alternative

No Action Alternative

The No Action Alternative would have the same level of public assurances of health and safety as the existing conditions. Risks for earthquakes, excessive heat, severe weather, and tsunami situations would not likely change. Under the No Action Alternative, ongoing improvements to water quality and research into management of Harmful Algal Blooms may reduce the frequency; however, with the projected increase in ocean temperatures, blooms are likely to continue to occur into the foreseeable future without more significant water quality and nutrient input improvements within the ESPB area.

Hazardous and toxic wastes and materials may continue to be present in the ESPB proposed Project Area into the future, including PCB and DDT. Ongoing efforts to mitigate the Palos Verdes Superfund site (PVS), located outside of the proposed Project Area to the west with currents at depth that travel to the northwest along the Palos Verdes Peninsula and that releases DDT and PCB contamination off the Palos Verdes Peninsula, have resulted in reduced levels of contamination. The ongoing mitigation for contamination in the area is likely to continue to decrease PCB and DDT levels under the No Action Alternative.

Additional hazardous materials may also be introduced as a result of ongoing port and bay activities. However, remediation of existing hazardous wastes is ongoing, and in the future, it is anticipated that conditions would improve with these efforts. Federal, State, and local protection protocols would assist in preventing new sources of hazardous and toxic wastes and materials from entering the system.

Shoreline and beach erosion are likely to continue at similar rates under the No Action Alternative. Sea level rise is likely to submerge beaches and further erode shore bluffs and rocky areas. Shoreline erosion can result in public safety issues as well as loss of recreational beach areas. Shoreline protective structures and beach replenishment would likely continue under the No Action Alternative to mitigate erosion. Sea level rise would likely require additional protective and adaption measures to mitigate shoreline loss.

Under the No Action Alternative, no habitat restoration construction or maintenance activities would occur. There would be no construction or maintenance related impacts under this alternative.

Alternative 2

Construction Impacts

Direct Impacts

Under Alternative 2, eelgrass, kelp and associated rocky reefs would be restored within the proposed Project Area. All construction activities would occur on the water within the proposed Project Area, including dredging activities at the Surfside/Sunset Borrow site, and no activities would occur near sensitive areas, such as schools, hospitals, and senior centers, or within residential or commercial public use areas. The transport of dredged sand and fill material via barge is not expected to result in hazardous emissions that would pose a human health concern.

Construction activities may result in minor spills or leaks of hydrocarbons from construction equipment during implementation. Impacts would depend on the amount and type hydrocarbons spilled as well as specific conditions (*i.e*., currents, wind, temperature, waves, tidal stage, and vessel activity). In such cases, accidental spills would be cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions. Construction activities under Alternative 2 would not result in handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. Construction equipment would not transport or dispose of hazardous materials. Minimal increases in vessel and roadway traffic would occur due to construction activities and no impairment of implementation of or physical interference with an adopted emergency response plan or emergency evacuation plan would be expected to occur.

During the construction period, the operation of barges, tugboats, and other equipment operating within the ESPB proposed Project Area could spill oil or other hydrocarbons; however, as detailed above, spills would be cleaned immediately per measure WQ-1 and no long-term degradation or permanent new source of hazardous material would be introduced into the proposed Project Area. All Federal, State, and local regulations regarding the use, transport, and disposal of hazardous materials would be adhered to during construction activities. Human health and safety impacts would be avoided through adherence to these procedures, conditions, and regulations.

There are two existing hazard material cleanup sites in the proposed Project Area; however, construction activities would not occur near these sites and proposed restoration of habitat features, and placement of stones for rocky reefs, would not interfere with cleanup activities. Construction activities and habitat features are not located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment. The PVS site is located approximate eight (8) miles to the west and is not expected to impact restoration measures due to its distance from the proposed Project Area, its distance from the Palos Verdes Peninsula coastline (approximately one (1) mile where PCB/DDT deposits are observed), and the prevailing direction of subsurface currents to the northwest away from the proposed Project Area. Additionally, Alternative 2 is not expected to alter or impact the successful implementation of PVS remediation actions recommended by the U.S. EPA.

Construction of habitat features under Alternative 2, including nearshore rocky reefs, would not substantially alter the existing drainage pattern in the area, nor alter the course of the Los Angeles or San Gabriel rivers as they enter the proposed Project Area, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site.

Construction activities within the proposed Project Area are not expected to mobilize contaminants, nor expose workers or the public to contaminated or hazardous materials. Construction activities under Alternative 2 would not likely result in risk of long-term exposure of humans, wildlife, wildlife habitat, and the general environment to hazardous materials.

Based on the above, Alternative 2 construction activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impact Analysis

Upon completion of construction, continuing activities associated with Alternative 2 would consist of monitoring of eelgrass beds, wildlife surveys, and adaptive management (see Appendix F). Monitoring of eelgrass beds and marine wildlife surveys would be anticipated to require operation of a single boat during daylight hours for a short duration. This activity would not be anticipated to result in direct impacts public health and safety nor release hazardous materials in the proposed Project Area.

Adaptive management may include actions such as eelgrass transplanting and extension or adjustment of rocky reefs (which may require the use of barges and heavy construction equipment) (see Appendix F). Under Alternative 2, maintenance would not be needed for kelp reefs or eelgrass beds. Once ecological success has been achieved for kelp reefs and eelgrass beds; no further monitoring would be required. After rocky reef success criteria are met, OMRR&R would consist of activities conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization and replacement of material. Potential occasional repair of rocky reefs would require some trucking or barging of material and heavy equipment. Rocky OMRR&R activities would require fewer days and equipment use than construction activities.

OMRR&R activities would require fewer days and equipment use than construction activities and would not be anticipated to result in direct impacts to public health and safety. Equipment operating within the proposed Project Area could spill oil, or other hydrocarbons; however, spills would be cleaned immediately per measure WQ-1. Alternative 2 OMRR&R activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

Impact Summary

Construction, OMRR&R and adaptive management activities under Alternative 2 would not occur in or near sensitive areas. Construction equipment could spill oil, or other hydrocarbons; however, spills would be cleaned immediately per measure WQ-1 and no long-term degradation or permanent new source of hazardous material or release of hazardous materials are anticipated. All Federal, State, and local regulations would be followed, and Environmental Commitments would be implemented to avoid and minimize potential impacts to public health and safety. Alternative 2 construction and OMRR&R activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

Level of Impact for Alternative 2

Less than significant impact under NEPA and CEQA.

Alternative 4A

Construction Impacts

Direct and Indirect Impact Analysis

Under Alternative 4A, eelgrass, kelp and associated rocky reefs would also be restored within the proposed Project Area. Although additional construction would occur under Alternative 4A to implement additional features, impacts to public health and safety associated with dredging, material hauling, staging, and placement would be comparable to those identified for Alternative 2. The addition of two open water rocky reefs under this alternative would not significantly increase the construction period (96 months as compared to 90 months under Alternative 2).

Construction activities within the proposed Project Area are not expected to mobilize contaminants, nor expose workers or the public to contaminated or hazardous materials. The PVS site is located approximate eight (8) miles to the west and is not expected to impact restoration measures due to its distance from the proposed Project Area, its distance from the Palos Verdes Peninsula coastline (approximately one (1) mile where PCB/DDT deposits are observed), and the prevailing direction of subsurface currents to the northwest away from the proposed Project Area. Additionally, Alternative 4A is not expected to alter or impact the successful implementation of PVS remediation actions recommended by the U.S. EPA.

Alternative 4A would not likely result in: a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites; or, impairment of or physical interference with an adopted emergency response plan or emergency evacuation plan. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impact Analysis

OMRR&R and adaptive management activities under Alternative 4A would be comparable to those described for Alternative 2. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete. Alternative 4A OMRR&R activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

Impact Summary

Construction, OMRR&R and adaptive management activities under Alternative 4A would not occur in or near sensitive areas. Construction equipment could spill oil, or other hazardous material; however, spills would be cleaned immediately per measure WQ-1. All Federal, state, and local regulations would be followed, and environmental commitments would be implemented to avoid and minimize potential impacts to public health and safety. Alternative 4A construction and OMRR&R activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

Alternative 8

Construction Impacts

<u>*Direct and Indirect Impact Analysis*</u>

Under Alternative 8, eelgrass, kelp and associated rocky reefs would be restored within the proposed Project Area. In addition, Alternative 8 would also include an approximately 24-acre sandy island, two wetlands, and approximately 0.3 acre of oyster reefs. Construction of the sandy island and wetlands would require additional dredged fill material. These features would require approximately 4,287,000 cubic yards of fill and sand material. Clean sand would be excavated from the Surfside/Sunset Borrow site, and transported via barge to the sandy island and wetland areas. The transport of dredged sand and fill material via barge is not expected to result in hazardous emissions that would pose a human health concern. If necessary, bathymetry of the oyster bed areas would be raised by placing additional layers of shell-hash. The small amount of shell-hash required is anticipated to come from a commercial source. Shell hash would be transported via barges and distributed within the elevation bounds along the placement areas using an excavator mounted on a barge and impacts would be similar to restoration measures described above.

Although additional construction would occur under Alternative 8 to implement additional features, impacts to public health and safety associated with material hauling, staging, and placement would be comparable to those identified for Alternative 2. Similar numbers and types of equipment would be utilized on a daily basis, although the construction period would be extended for a longer duration (113 months as compared to 90 months under Alternative 2).

Construction activities may result in minor spills or leaks of hydrocarbons from construction equipment during implementation. Impacts would depend on the amount and type of materials spilled as well as specific conditions (*i.e.*, currents, wind, temperature, waves, tidal stage, and vessel activity). In such cases, accidental spills would be cleaned immediately per measure WQ-5. A larger spill that could have significant impacts on water quality is not expected to occur, even under reasonable worst-case conditions. Construction activities under Alternative 2 would not result in handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. Construction activities within the proposed Project Area are not expected to mobilize contaminants, nor expose workers or the public to contaminated or hazardous materials. The PVS site is located approximate eight (8) miles to the west and is not expected to impact restoration measures due to its distance from the proposed Project Area, its distance from the Palos Verdes Peninsula coastline (approximately one (1) mile where PCB/DDT deposits are observed), and the prevailing direction of subsurface currents to the northwest away from the proposed Project Area. Additionally, Alternative 8 is not expected to alter or impact the successful implementation of PVS remediation actions recommended by the U.S. EPA.

Based on the above, Alternative 8 construction activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

OMRR&R Impacts (Including MAMP Implementation)

Direct and Indirect Impact Analysis

OMRR&R and adaptive management activities for eelgrass beds, rocky reefs, and kelp reefs under Alternative 8 would be comparable to those described for Alternatives 2 and 4A. Impacts of OMRR&R and adaptive management activities would be similar to construction activities but would require significantly less time to complete and would not be anticipated to result in direct impacts to public health and safety. Equipment operating within the proposed Project Area could spill oil or other hydrocarbons, however, spills would be cleaned immediately per measure WQ-1 and no long-term degradation or permanent new source of hazardous material, or release of hazardous materials are anticipated. Any potential indirect adverse impacts to public health and safety during OMRR&R activities would be short-term, localized, and less than significant.

Maintenance for new wetlands near the Los Angeles River (~10 acres) and near Pier J (~42 acres) would involve annual clearing and grubbing to stop the spread of invasive species and san replenishment on a 5- to 10-year cycle. Maintenance for the sandy island (~24 acres) would also involve annual clearing and grubbing to stop the spread of invasive species and san replenishment on a 5-year cycle. Clearing and grubbing would likely be limited to hand tools; if heavy equipment is necessary, similar measures outlined for construction activities would be in place.

OMRR&R activities would require fewer days and equipment use than construction activities and would not be anticipated to result in direct impacts to public health and safety. Equipment operating within the proposed Project Area could spill oil, or other hydrocarbons; however, spills would be cleaned immediately per measure WQ-1. Alternative 8 OMRR&R activities would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to California Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

Impact Summary

Implement of additional features would be comparable to those identified for Alternative 2, similar numbers and types of equipment would be utilized on a daily basis; however, the construction period would be extended for a longer duration (113 months as compared to 90 months under Alternative 2). Construction, OMRR&R and adaptive management activities under Alternative 8 would not occur in or near sensitive areas. Construction equipment could spill oil or other hydrocarbons; however, spills would be cleaned immediately per measure WQ-1 and no long-term degradation or permanent new source of hazardous material or release of hazardous materials are anticipated. All Federal, State, and local regulations would be followed, and Environmental Commitments would be implemented to avoid and minimize potential impacts to public health and safety. Alternative 8 construction and OMRR&R would not: create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would not create a significant hazard to the public or the environment; impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or, substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface in a manner which would result in flooding on- or off-site. Any potential adverse impacts to public health and safety would be short-term, localized, and less than significant.

Level of Impact for Alternative 4A

Less than significant impact under NEPA and CEQA.

5.19 CUMULATIVE IMPACTS FOR ALL ENVIRONMENTAL RESOURCES

The *CEQA Guidelines* and the regulations implementing NEPA require that the cumulative effects be assessed (40 CFR Parts 1500–1508; 14 California Code of Regulations Section 15130). A cumulative effect is an “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions” (40 CFR Section 1508.7), regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Under CEQA, they are defined as “two or more individual effects, which, when considered together, are considerable or which compound or increase other environmental impacts” (Section 15355 of the CEQA Guidelines). Cumulative effects can result from individually minor but collectively significant actions taking place over time (40 CFR Section 1508.7). Council on Environmental Quality's guidance for considering cumulative effects states that NEPA documents "should compare the cumulative effects of multiple actions with appropriate national, regional, state, or community goals to determine whether the total effect is significant" (CEQ 2010). The following sections discuss local and regional growth trends and projects that may result in cumulative effects when combined with effects from the actions discussed above.

In general, past, present, and reasonably foreseeable future projects are assessed by resource area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects. Interactive effects may be countervailing, where the adverse cumulative effect is less than the sum of the individual effects, or synergistic, where the net adverse cumulative effect is greater than the sum of the individual effects (CEQ 2010). The factors considered in determining the significance of cumulative effects are similar to those presented for each resource earlier in Chapter 5.

An integral part of the cumulative effects analysis involves determining whether effects from the project would contribute to ongoing or foreseeable resource trends. Where effects from the project contribute to regional resource trends, there is a potential for a cumulative effect. The cumulative effects analysis does not assess all expected environmental impacts from regional projects but only those resulting from the project and other past, present, and reasonably foreseeable future actions.

The timeframe for analysis of cumulative effects can be described as the reasonable and foreseeable estimate for implementation of cumulative projects, in addition to the proposed action. For purpose of this analysis and discussion of existing, ongoing, or planned projects, this timeframe would extend from the present to approximately 2050, a period of time comprised of the projected completion of the project and ten years of monitoring and adaptive management.

5.19.1 Existing and Ongoing or Planned Projects

In accordance with NEPA and CEQA, past, present, and reasonably foreseeable future projects are assessed by resource area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects. The factors considered in determining the significance of cumulative effects are similar to those presented for each resource. Identification of relevant projects entailed the following:

1. Consultation with appropriate entities including: City of Long Beach, County of Los Angeles, Heal the Bay, USACE, USFWS, NOAA, CDFW, Municipal Water District, Caltrans, TAC, and other relevant stakeholders.
2. Review of adopted planning documents such as SCAG, local, and regional general plans designed to project regional or area-wide conditions and future growth.
3. Review of USACE Regulatory Division database for Regulatory actions within the Study Area.

Table 5-20 presents the list of projects that were identified as potentially contributing to cumulative effects. The majority of the projects in Table 5-21 are located within the cities of Long Beach and Los Angeles (Figure 5-5). Cumulative projects include: residential, commercial, industrial, beach access and beach improvements, marina rebuild, breakwater repairs, dredging, and harbor expansion. The area of cumulative analysis is defined for each resource area in the issue area sub-sections. In regard to dredging-related activities, all dredging projects have uniquely tailored Environmental Assessments/Environmental Impact Statements that incorporate environmental safeguards based on adherence to Federal and State laws and coordination with numerous Federal, State, and local agencies. These documents ensure that direct and indirect adverse impacts to restored habitats from ongoing and future dredging operations are avoided.

Table 5-20: Cumulative Project List

Project Name	Brief Description	Location	Status
Carnival Cruise Terminal Expansion	Dredging, landside expansion of the cruise terminal and new parking structure spaces	Long Beach Harbor	Planned 2020-2030.
Los Angeles Harbor Dredging	Maintenance of ~8 miles of channel at various depths	Los Angeles Harbor	Last dredging in 2014. Ongoing dredging expected.
San Pedro Breakwater Repairs	O&M of structure	Los Angeles Harbor	Construction started in 2016. Completed in 2018. OMRR&R expected as needed.
Long Beach Harbor Dredging	Maintenance of ~7 miles of channel at various depths	Long Beach Harbor	Completed in 2020. Next dredging expected in 2030.
Middle Breakwater Repairs	O&M of structure	Long Beach Harbor	Emergency repair in 2014. Repairs completed in 2018. OMRR&R expected as needed.
Port of Long Beach Deep Draft Navigation Feasibility Study	Deep draft navigation deepening project	Port of Long Beach	Planned 2025-2027.
Long Beach Breakwater Repairs	O&M of structure	Long Beach Harbor	Repairs completed in 2018. OMRR&R expected as needed.
Los Angeles River Estuary Dredging	Maintenance of ~5000 feet of channel at various depths	Long Beach Harbor	Dredging completed in 2020. Next dredging expected in 2026.
Naval Weapons Station, Seal Beach Dredging	Maintenance of ~9000 feet of channel at various depths	Anaheim Bay	Last dredged in 2018. Next dredging expected in 2028.
Naval Weapons Station, Seal Beach Harbor Expansion	Construction of new pier/wharf. Realignment of Navy's channel and construction of new public channel.	Anaheim Bay	Ongoing construction expected to be completed in 2024.
Surfside/Sunset Storm Damage Reduction	Beach nourishment of ~1,000,000 yd^3 every 10 years.	Surfside/Sunset	Planned for 2022.

Figure 5-5: Areas where cumulative impacts described in Table 5-20 are located within the Study Area and proposed Project Area.

5.19.2 Cumulative Impacts Analysis

This section discusses the impacts of the alternatives when considered cumulatively with impacts of other past, present, and reasonably foreseeable future actions. The geographic scope for each resource is provided as part of the discussion.

Hydrology (Coastal and Shoreline Resources)
The cumulative study area for hydrology (coastal and shoreline resources) includes the Los Angeles River Watershed and the San Gabriel River Watershed, and small portions of the Dominguez Channel Watershed and the Seal Beach Watershed. The No Action Alternative would not result in significant changes to the current condition of coastal and shoreline resources within the proposed Project Area. Construction and OMRR&R activities would not have a significant direct effect on nearshore wave characteristics, currents, or sediment transport within the proposed Project Area. The proposed alternatives would not affect the nearshore wave characteristics, currents, or sediment transport of the proposed Project Area. Construction of habitat features would result in long-term indirect beneficial impacts related to reduced coastal and shoreline wave heights, reduced current velocities, and reduced erosion potential in the localized area of the reef beds.

In addition to the various restoration measures in the action alternatives, other past, present, or reasonably foreseeable future projects include dredging activities within and near the proposed Project Area (within approximately 2 miles), and maintenance of the Ports and other infrastructure. Most of these are related to dredging activities or infrastructure repairs.

Dredging activities can collectively influence hydrology issues within the harbors, rivers and tributary channels by removing accumulated sediments and deepening channels and harbor areas. Dredging activities within the study area and vicinity have occurred regularly since the development of the Ports and Naval Station, and these activities would continue to occur as needed to maintain the harbors, ports, and channels as sediment deposits continue to accumulate. The Port of Long Beach (POLB) Deep Draft Navigation project located in the area between the Middle and Long Beach Breakwaters and the Port of Long Beach (Figure 5-5) may begin at approximately the same time as the East San Pedro Bay Ecosystem Restoration project (approximately 2025). The POLB Deep Draft Navigation project would include dredging to remove sediment material to improve terminal and channel depths. Approximately 2 million cubic yards of dredged material from the POLB would be placed within the Surfside/Sunset Borrow site. Placement of dredged material within this site may occur at approximately the same time as dredging removal for sand material for the ESPB project, although the projects would be timed to best accommodate each project. POLB material placement would likely occur in different portions of the borrow site than areas that would be dredged for the ESPB project. In regard to dredging-related activities, all dredging projects have uniquely tailored Environmental Assessments/Environmental Impact Statements that incorporate environmental safeguards based on adherence to Federal and State laws and coordination with numerous Federal, State, and local agencies. These documents ensure that direct and indirect adverse impacts to restored habitats from ongoing and future dredging operations are avoided.

Although planned dredging within the study area and vicinity may occur during proposed habitat restoration construction under the proposed alternatives, it is not likely that more than one dredging project would occur during the same period. The proposed alternatives and ongoing dredging activities would not: expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; project area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or near shores bottom topography. The proposed alternatives in combination with past, present, and future projects would not result in cumulative effects to hydrology, therefore, cumulative impacts would be less than significant.

Marine Geology and Geologic Hazards

The study area for cumulative impacts for marine geology and geologic hazards includes the Los Angeles River Watershed and the San Gabriel River Watershed, and small portions of the Dominguez Channel Watershed and the Seal Beach Watershed. The potential for cumulative impacts related to marine geology and geologic hazards is minimal under the action alternatives and the No Action Alternative because no significant issues related to these resources or hazards were identified. Most of the area is in a low potential liquefaction zone, and the San Andreas, Palos Verdes (which branches from the THUMS-Huntington Beach fault), Newport-Inglewood, and Wilmington Blind-Thrust faults exist within or in the vicinity of the project area (Figure 5-6). The presence of past, current, and future projects in the cumulative study area would have no effect on either the severity or the probability of geotechnical challenges associated with seismicity and/or the character of underlying soils within the proposed Project Area and as a result would not combine to create a cumulatively significant impact. The proposed alternatives and ongoing activities would not: expose people or structures to rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, or landslides; the proposed Project Area is not located on a geologic unit that is unstable, or that would be unstable as a result of the project; would not substantially and adversely modify any unique geologic or physical features; and, would not substantially and adversely modify beach or nearshore bottom topography.

Soil erosion is not expected to occur as all action alternatives would occur within water; therefore, cumulative impacts would be considered less than significant.

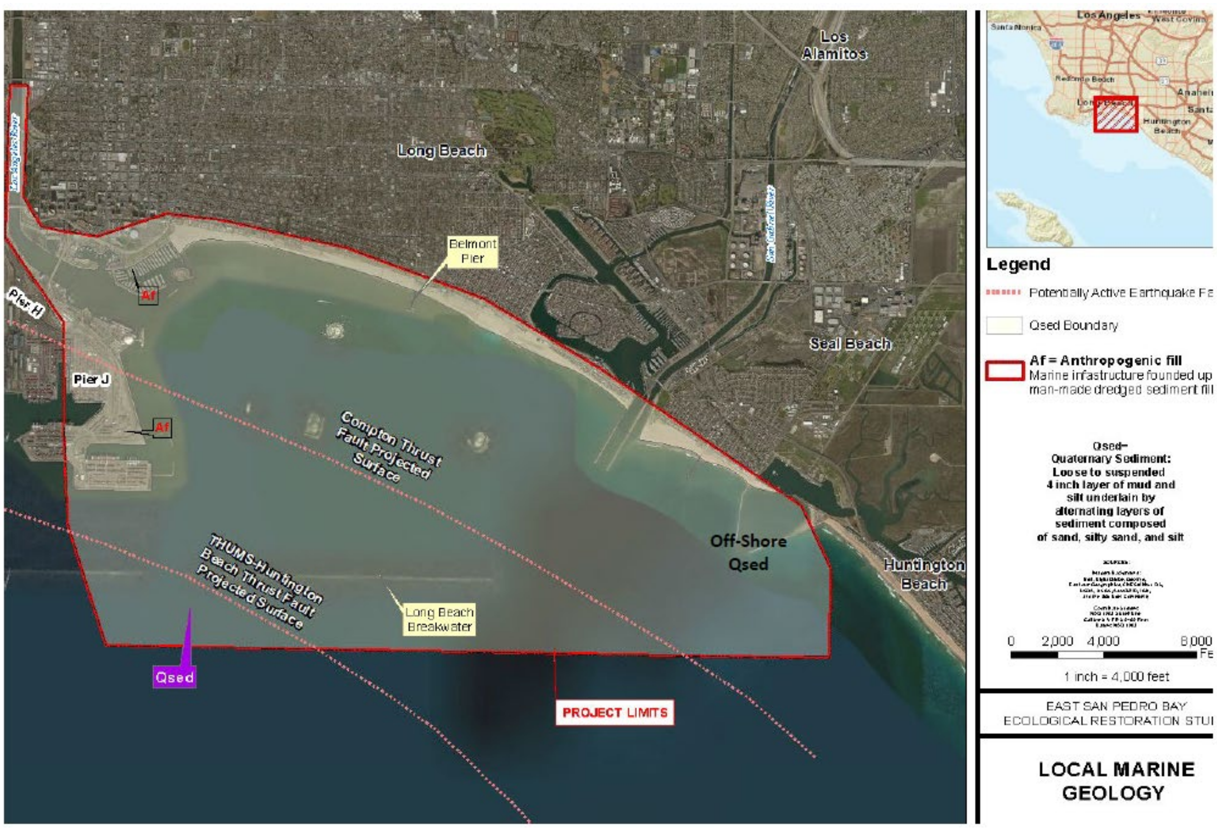

Figure 5-6: Geologic faults located within the proposed Project Area.

Water Quality

The cumulative analysis area for water quality includes ESPB and the Los Angeles and San Gabriel River lower watersheds. The No Action Alternative would not result in changes to existing water quality. Impacts on water quality associated with the action alternatives are mainly confined to short-term, localized, less than significant adverse impacts from sediment suspension and turbidity during the construction phase. The restoration of eelgrass beds, rocky reefs, and kelp reefs under all action alternatives, as well as creation of the sandy island, wetlands, and oyster reefs under Alternative 8, would result in localized beneficial impacts related to production of oxygen, improved water quality by filtration of polluted runoff, absorption of excess nutrients, storage of greenhouse gases like carbon dioxide, and are expected to help protect the shoreline from erosion.

During construction there is the potential for temporary turbidity and suspended sediments to occur over the duration of the construction period for each of the action alternatives as described in detail in Section 5.3. Long-term localized indirect beneficial impacts to water quality would occur once habitat features are established. Adverse and beneficial impacts under the action alternatives would be less than significant. Other projects in the area, primarily dredging activities, may result in short-term turbidity and suspended sediments, but sediments would settle within a short duration and Environmental Commitments would be implemented for most projects. In regard to dredging-related activities, all dredging projects have uniquely tailored Environmental Assessments/Environmental Impact Statements that incorporate environmental safeguards based on adherence to Federal and State laws and coordination with numerous Federal, State, and local agencies. These documents ensure that direct and indirect adverse impacts to restored habitats from ongoing and future dredging operations are avoided. The proposed alternatives and ongoing activities would not: release toxic substances that would be deleterious to human, fishes, or plant life; or result in the substantial impairment of beneficial recreational use of the project area. Therefore, the action alternatives would not result in a significant cumulative impact to water quality in conjunction with other past, present, and reasonably foreseeable projects.

Air Quality and Greenhouse Gases

The cumulative analysis area for air quality includes the area within the Southwest Los Angeles County Coastal, South Los Angeles County Coastal, and North Orange County Coastal Source-Receptor Areas as defined by the SCAQMD, under CEQA. This cumulative analysis area is also considered for NEPA. Several projects, as identified in Table 5-22, could occur during the same period as the proposed action alternatives and could contribute to cumulative effects to air quality. The No Action Alternative would not result in air quality impacts, and therefore, would not contribute to cumulative significant effects.

The significance thresholds developed by the SCAQMD serve to evaluate if a proposed project could either (1) cause or contribute to a new violation of a CAAQS or NAAQS in the study area or (2) increase the frequency or severity of any existing violation of any standard in the area. Therefore, if an alternative would produce air quality impacts that are individually significant, then the alternative would also be cumulatively considerable.

For GHG, there are currently no Federal GHG emission thresholds. Therefore, the USACE did not utilize the CEQA significance threshold, propose a new GHG threshold, or make a NEPA significance impact determination for GHG emissions anticipated to result from any of the alternatives. Rather, in compliance with NEPA implementing regulations, the anticipated emissions were disclosed for each alternative without expressing a judgment as to their significance.

As described in Section 5.4, construction activities associated with alternatives 2 and 4A would be below General Conformity applicability levels and would conform to the applicable SIP. Alternative 8 exceeds

General Conformity applicability levels for annual emissions of NO_x and a general conformity determination would need to be prepared to ensure the alternative conforms to the applicable SIP. Action alternatives would: not result in significant adverse air quality impacts to regional air quality; would not equal or exceed general conformity applicability rates (with the exception of annual emissions of NO_x from Alternative 8); would not expose sensitive receptors to substantial pollutant concentrations; and would not create objectionable odors affecting a substantial number of people. Air quality impacts would be less than significant, except for alternative 8 air quality impacts would be significant and unavoidable. Should construction of Alternative 8 overlap with the proposed POLB Deep Draft Navigation project, cumulative impacts to air quality are expected to be significant and unavoidable. The alternatives would not significantly affect emissions or conflict with applicable plans, policies or regulations related to GHGs. With the exception of Alternative 8, Alternatives 2 and 4A would not contribute to significant cumulative effects when considered in conjunction with other known projects in the study area.

Noise and Vibration

The cumulative analysis area for noise includes ESPB, coastal areas of the cities of Long Beach and Seal Beach, and coastal areas of Naval Weapons Station, Seal Beach (Figure 5-5). The No Action Alternative would not result in impacts from noise or vibration and therefore, would not contribute to cumulative impacts.

The proposed action alternative activities would be in compliance with local noise ordinances, would not generate excessive ground borne vibration in exceedance of recommended thresholds, and would not generate noise impacts that exceed recommended thresholds for marine mammals. Projects identified in Table 5-22 are not expected to cumulatively combine to further degrade the noise environment or contribute to vibration as completion of these projects are expected to be staggered and not all coincide with implementation of the action alternatives. Listed projects are not expected to cumulatively combine with the proposed action alternatives and result in cumulative noise and vibration impacts. The action alternatives would not incrementally contribute towards creating a cumulative long-term adverse noise and vibration impacts in conjunction with past, present, and reasonably foreseeable projects.

Biological Resources

Cumulative impacts analysis for biological resources represents the potential of the alternatives along with other projects to cause a cumulatively substantial disruption of local biological communities due to direct loss of habitat or temporary increases in turbidity and noise levels.

Marine Habitats. Construction of past projects in the ESPB proposed Project Area has caused in-water disturbances, including dredging and wharf construction projects that temporarily or permanently eliminated soft-bottom or open water habitat, and temporarily removed or permanently added hard substrate habitat (for example, through the removal or placement of pilings and rocky dikes). These activities altered the benthic habitats present, but effects on benthic communities were localized and of short duration, since benthic and invertebrate communities have been shown to recolonize areas following the completion of dredging or other construction activities. However, in areas where permanent structures or fill have occurred, benthic habitats were eliminated. Because these activities have affected a relatively small portion of ESPB during any episode, and recovery has occurred or is underway, biological communities in the proposed Project Area have not been substantially degraded.

Under the No Action Alternative, soft bottom habitat and kelp reefs are likely to benefit from management efforts within the Los Angeles and San Gabriel watersheds to improve water quality, sediment quality, and reduce trash within the area would be expected to progress. Soft bottom habitat may be impacted by hypoxia at greater depths and in pitted areas by stratification associated by with sea level rise and climate change. Under the No Action Alternative, sea level rise associated with climate change would likely reduce total salt marsh within the proposed Project Area. Inland boundaries of the existing marsh are limited by seawalls and rock armoring. Over time, sea level rise would likely cause a type shift within the created estuary from coastal salt marsh to mudflat and open water, reducing coastal salt marsh total area and functionality within the proposed Project Area. Under the No Action Alternative, functions and distribution of eelgrass beds within the proposed Project Area would likely be decreased by projected extreme storm events. Under the No Action Alternative, kelp beds would be susceptible to decreased productivity associated with impaired upwelling and ocean stratification resulting from ocean temperature increases. As a result, die-off may be more likely in the future, if the existing populations cannot be augmented and sustained. Under the No Action Alternative, rocky reef habitat would likely remain in a static spatial extent due to the reliance of rocky reef habitat on infrastructure. Oysters within the proposed Project Area would likely be resilient to sea level rise as appropriate hard substrate habitat is available at higher elevations in the form of port infrastructure.

Similar construction activities and impacts would occur for those cumulative projects that are currently underway and for some that would be constructed in the future (Table 5-20).

Because recolonization of dredged areas and new riprap and piles begins immediately and within a short time after disturbance and provides a food source for other species, such as fishes, birds, sea turtles, and marine mammals, multiple projects that occur over time and space within the ESPB proposed Project Area would not be expected to substantially disrupt benthic habitat or other marine habitats. The proposed alternatives would result in long-term beneficial impacts to biological resources from the creation of new kelp reef habitat, creation of new rocky reef habitat, creation of new eelgrass habitat, creation of a new sandy island, creation of two wetlands, and creation of two small oyster beds. Eelgrass and kelp support a higher biodiversity of organisms than soft-bottom areas within these habitats. Under Alternative 8, a sandy island, two wetlands, and two small oyster beds would also be created. These features also support a higher diversity of organisms and provide habitat for a variety of wildlife.

Construction impacts caused by the cumulative projects at specific locations in the water and at different times could cause fishes, water-associated birds, sea turtles, and marine mammals to avoid the construction area but are not expected to substantially alter the distribution and abundance of these organisms in the proposed Project Area and would not substantially disrupt biological communities. Turbidity and noise impacts can result from in-water construction activities in the immediate vicinity of the work and would last only for short durations following the completion of these activities. Any effects on marine biota would be localized to relatively small areas of ESPB and would be of limited duration for each specific project. Long-term, less than significant beneficial impacts from the creation of eelgrass and kelp habitats would occur. The proposed alternatives and ongoing activities 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; conflict with any local policies or ordinances protecting biological resources; nor result in a substantial loss to the population or habitat of any native fishes, wildlife, or vegetation; nor in the substantial loss in overall diversity of the ecosystem. Therefore, the alternatives would not result in a significant cumulative impact to marine habitats in conjunction with other past, present, and reasonably foreseeable projects.

Special-Status Species. Under the No Action Alternative, California Least Tern, Western Snowy Plover, marine mammals, Green Sea Turtles, Belding's Savannah Sparrow, as well as other special-status species that have the potential to occur in the proposed Project Area, would likely continue to use these areas. No White or Black Abalone would likely use the proposed Project Area as minimal habitat exists.

Construction of past fill projects has reduced the amount of marine surface water present in the ESPB proposed Project Area, and thus reduced foraging and nesting areas for special-status bird species, but these projects also have added more land and structures that can be used for perching near the water. Nesting habitat for the California Least Tern has been created at the southern tip of Pier 400 within nearby Los Angeles Harbor (Figure 5-5). Shallow water habitat areas to provide foraging habitat for the California Least Tern and other bird species have been constructed on the east side of Pier 300 and inside the San Pedro Breakwater as mitigation for the loss of such habitat from past projects. Established roosting areas for birds and seals occur along the breakwaters, particularly the Middle Harbor Breakwater, which is isolated from human access. Due to the availability of isolated nesting habitat and foraging areas, and the distance of the Least Tern colony from the ESPB proposed Project Area, impacts to special-status species would not occur or would be minimal.

The action alternatives may affect, but would not likely adversely affect, Green Sea Turtles. Because adequate precautions are taken on other dredging and breakwater repair projects to avoid direct impacts to this species and to minimize turbidity, and the same precautions would be adopted for the alternatives, no cumulative adverse effect would occur. The proposed alternatives and ongoing activities would not result in: a reduction of population size of a threatened, endangered, or candidate species or adversely modified designated critical habitat; or, substantial loss in overall diversity of the ecosystem that would affect its suitability for special status species, including birds, marine mammals and sea turtles. Action alternatives would not result in the direct loss of habitat for marine mammal species that may occur in the proposed Project Area. Therefore, the alternatives would not result in a significant cumulative impact to special-status species in conjunction with other past, present, and reasonably foreseeable projects.

Significant Ecological Areas. The Terminal Island SEA would not be impacted by of the proposed alternatives, including construction, dredging, and OMRR&R activities under each alternative; therefore, this resource has been eliminated from further analysis. There are no SEAs near the Surfside/Sunset Borrow site. Therefore, the alternatives would not result in a significant cumulative impact to significant ecological areas in conjunction with other past, present, and reasonably foreseeable projects.

Essential Fish Habitat. EFH has been, and would be lost, due to past, present, and future fill projects in the ESPB proposed Project Area. Construction of past projects in the proposed Project Area has caused in-water disturbances, including dredging and wharf construction projects that temporarily or permanently eliminated soft-bottom or open water areas that provide EFH, and temporarily removed or permanently added hard substrate habitat which may provide EFH.

Under the No Action Alternative, soft bottom habitat may be impacted by hypoxia at greater depths and by stratification associated with climate change, which would adversely affect EFH for species that rely upon this habitat. Sea level rise may cause a shift from coastal salt marsh to mudflat and open water habitats, which could have an adverse impact upon EFH for those species that utilize salt marsh habitat but could benefit EFH for species that rely upon soft bottom habitat.

Because recolonization of dredged areas, new riprap, and piles begins immediately, and within a short time provides a food source for fishes, multiple projects that occur in time and space within the ESPB proposed Project Area would not be expected to substantially disrupt EFH. Construction impacts caused by the cumulative projects at specific locations in the water and at different times could cause fishes to avoid the construction area but are not expected to substantially alter the distribution and abundance of these organisms in the proposed Project Area and would not substantially disrupt EFH. Turbidity and noise impacts can result from in-water construction activities in the immediate vicinity of the work and would last only for short durations following completion of these activities. Any effects on fish species and EFH would be localized to relatively small areas (1.5 percent of the proposed Project Area under Alternative 2, 1.8 percent under Alternative 4A, and 3.3 percent under Alternative 8) and would be of limited in duration for each specific project. Therefore, the alternatives would not result in a significant cumulative impact to EFH in conjunction with other past, present, and reasonably foreseeable projects. In regard to dredging-related activities, all dredging projects have uniquely tailored Environmental Assessments/Environmental Impact Statements that incorporate environmental safeguards based on adherence to Federal and State laws and coordination with numerous Federal, State, and local agencies. These documents ensure that direct and indirect adverse impacts to restored habitats (*e.g.*, such as burying eelgrass) from ongoing and future dredging operations are avoided.

Invasive Species. The invasive green alga *Caulerpa spp.* has the potential to spread by fragmentation. Per INV-1, prior to in-water work (including dredging), underwater surveys would need to be conducted to ensure this species is not present at the project construction areas. In the unlikely event that *Caulerpa* is detected during preconstruction surveys, an eradication program would be implemented per the requirements of the *Caulerpa* Control Protocol developed by the NMFS and California Department of Fish and Wildlife. Construction would commence only after the area is certified to be free of this invasive species by NMFS. Since 2008, *Caulerpa* spp. surveys have been conducted in the proposed Project Area as a standard procedure prior to sediment-disturbing activities and no *Caulerpa* spp. has been found. Given the *Caulerpa spp.* survey requirement and the absence of *Caulerpa* spp. to date, and with implementation of the aforementioned *Caulerpa* protocols, the potential for cumulative in-water activities to spread this invasive species is unlikely.

Climate change is expected to change water quality and habitat conditions in the future. Increased water temperatures, ocean acidification, larger and more frequent storm events, reduced upwelling, and other consequences of climate change may favor colonization by invasive species or increases in abundance of these species under the No Action Alternative.

Other invasive species are known to occur in the ESPB proposed Project Area. Placement of pilings and rocky dikes associated with cumulative projects that are currently underway or proposed for the future would create new habitat areas that could be colonized by invasive species. However, the most recent biological baseline study demonstrated that invasive species relative abundances are not increasing in the proposed Project Area. Therefore, the potential for cumulative in-water activities to increase the distribution and abundance of invasive species is unlikely. Therefore, the alternatives would not result in a significant cumulative impact related to the spread of invasive species in conjunction with other past, present, and reasonably foreseeable projects.

Cultural Resources

The cumulative analysis area for cultural resources includes ESPB, coastal areas of the cities of Long Beach and Seal Beach, and coastal areas of Naval Weapons Station, Seal Beach (Figure 5-5). The No Action Alternative would not result in impacts to cultural resources and therefore, would not contribute to cumulative impacts.

Under all action alternatives it is expected that impacts to historic properties and historic resources could be avoided. A cultural resource survey has been conducted of a 900-acre area that includes the footprint of Alternatives 2, 4A and portions of Alternative 8. The high-energy nature of the shoreline environment along the California coast and the high degree of previous disturbance in ESPB makes preservation of intact submerged cultural resources very unlikely. None of action alternatives would contribute to cumulative impacts with implementation of the environmental commitments.

Aesthetics and Visual Resources

The cumulative analysis area for aesthetics and visual resources includes the area within and in the vicinity of ESPB, as well as the areas proposed for development of cumulative projects identified in Table 5-20 (Figure 5-5). The No Action Alternative would not result in impacts to aesthetics or visual resources, and therefore, would not contribute towards creating a cumulative impact in conjunction with past, present, and reasonably foreseeable projects. The alternatives would result in multiple short-term aesthetic and visual impacts during construction that would temporarily degrade the public viewshed. These short-term impacts would be limited to specific sites and would be less than significant with implementation of mitigation measures. Additionally, all alternatives are expected to incorporate permanent aids to navigation in conjunction with nearshore rocky reefs that may have a minor, but not substantial impact on the aesthetics of the proposed Project Area.

Projects identified in Table 5-20 are not expected to cumulatively combine to further exacerbate degradation of views as completion of these projects are expected to be staggered and not all coincide with implementation one of the alternatives. Listed projects are not expected to cumulatively combine with the proposed alternatives and result in a cumulative aesthetic or visual resource impacts. Under Alternative 8, long-term indirect beneficial impacts to the surrounding visual character of the proposed Project Area from the natural features of the sandy island and wetlands would occur. The proposed alternatives and ongoing activities would not result in: a substantial adverse permanent effect on a scenic vista; substantial degradation- of the existing visual character or quality of the site and its surroundings; or the creation of a new source of substantial light or glare which would adversely affect day or nighttime views of the area. The alternatives would not incrementally contribute towards creating a cumulative long-term adverse impact in conjunction with past, present, and reasonably foreseeable projects.

Ground and Vessel Traffic

The study area for ground and vessel traffic includes the ESPB area vessel traffic, highways, streets, railways, and transit corridors in Los Angeles County that serve the project area vicinity.

Cumulative impacts to transportation primarily have the potential to occur if the construction periods for the projects included in Table 5-20 overlap with the alternatives. As discussed in Section 5.13, Environmental Impacts, transportation-related impacts from the alternatives would add a maximum of 23 truck trips per hour for the delivery of materials and up to 16 trips per day for worker commutes during the construction period (90 months under Alternative 2, 96 months under Alternative 4A, and 113 months under Alternative 8). The ground transportation network in the vicinity of the proposed Project Area is anticipated to be continually expanded and upgraded in order to accommodate population growth in the area; however, the alternatives would not contribute to that population growth.

In-water construction activities under the action alternatives would result in a maximum of one small supply barge and tugboat transiting from the Catalina Island quarry to the proposed Project Area per day, or one large supply barge and associated tugboat transiting from the same location every other day, and two tugboats and unmanned scow twice per day for dredge material for the eelgrass beds (for a portion of the construction period), with a small vessel being used to transport construction workers from the staging area to the proposed Project Area each day. In-water construction trips resulting from the projects listed in Table 5-20 would also be anticipated to add a nominal amount of vessel traffic during construction periods. If an overlap of construction periods were to occur, the incremental increase of trips to the ground-based and vessel transportation networks from the alternatives, in combination with the projects listed in Table 5-20, would not likely result in a significant impact to transportation. Potential delays to existing vessel traffic would be minimized through close coordination between the terminal operators, the Port, and the contractors, and the scheduling of material deliveries by truck during off-peak hours.

The alternatives would not cause a substantial increase in traffic during construction or related to post-construction area use. The proposed alternatives and ongoing activities would not result in: conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit; conflict with an applicable congestion management program, including but not limited to Level of Service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads and highways; inadequate emergency access; substantial reduction of current safety levels for vessels within ESPB; or, present a navigational hazard to boat traffic or interfere with any emergency response or evacuation plans.

The potential for cumulative impacts related to ground and vessel traffic is minimal under the alternatives because no significant issues related to traffic were identified. The alternatives would not likely contribute to cumulative impacts to ground and vessel traffic when combined with past, present, or reasonably foreseeable future projects.

Land and Harbor Use

The study area includes the applicable community plan areas within the jurisdiction of the City of Long Beach, City of Los Angeles, as well as the Seal Beach area (Figure 5-5). These cities include policies generally supporting the restoration of ESPB in their General Plans and applicable community plans. The implementation of any of the alternatives would be consistent with the applicable general plans and community specific plans of these cities. These general plans, as well as the Los Angeles and Long Beach Harbor plans, address ESPB as an asset for the region. The proposed alternatives and ongoing activities would not result in: physically dividing established communities or conflicts with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

There would be no significant cumulative land use impacts under the No Action Alternative because present land uses would continue in conformance with adopted community, harbor, and general plans. The action alternatives would be in conformance with the California Coastal Act, Naval Weapons Station Seal Beach INRMP, PMP and Strategic Plan, and local City of Long Beach plans. In addition, the action alternatives would not conflict with any other local or regional plans and would not result in impacts to land use in the proposed Project Area. The alternatives would not contribute to cumulative impacts related to land or harbor use when combined with past, present, or reasonably foreseeable future projects.

Socioeconomics

The socioeconomic analysis considers potential impacts at several levels of geography. The immediate assessment area was defined by creating a 0.5-mile buffer around the proposed Project Area and then including all census tracts that lie wholly or partially within it. This area includes 31 census tracts, covering approximately 36 square miles, which are used to compute census tract-level statistics. Given that socioeconomic impacts are typically dispersed over a much larger region than the immediate project neighborhood (*e.g.*, construction firms involved in implementation of the project will utilize workers and materials from the larger region), the socioeconomic impacts are considered in the context of the following larger areas of geography: the cities of Long Beach, Los Angeles and Seal Beach, and Los Angeles County as a whole. The proposed alternatives and ongoing activities would not: induce substantial growth in an area, either directly or indirectly; displace substantial numbers of existing housing; or displace substantial numbers of people.

Project-specific socioeconomic impacts would be less than significant under all alternatives. None of the alternatives would contribute to cumulative impacts related to socioeconomics when combined with past, present, or reasonably foreseeable future projects.

Recreation

The cumulative analysis area for recreation resources includes the City of Los Angeles, City of Long Beach, and Seal Beach. The No Action Alternative would not result in impacts to recreational resources and therefore, would not contribute to cumulative impacts. Alternatives would not result in significant adverse impacts to recreation in the analysis area. Although potentially negative impacts to certain recreational groups may be expected (*e.g.*, to recreational boating), action alternatives would result in habitat features that would enhance the biological productivity and scenic views of the bay and result in beneficial impacts due to increased interest from swimmers, snorkelers, SCUBA divers, bird watchers, recreational fishing from both shore and vessel locations as well as other recreationists such as paddle boarders. Less than significant adverse impacts under the action alternatives may occur from impacts to boating activities, which may be affected by kelp interference with boat propellers. Past, present, and reasonably foreseeable future projects include the addition of recreational facilities, such as trails, pool restoration, concessions, and marina development. These projects, in combination with habitat features proposed under the action alternatives would result in beneficial cumulative impacts in the analysis area. The proposed alternatives and ongoing activities would not result in long-term substantial restriction or reduction to the availability or quality of existing recreational opportunities in the project area or vicinity. Under Alternative 8, the modification/loss of a portion of the Pier J Fishing Spot would occur due to construction of the sandy island. However, other fishing areas would be available within two to five miles of this area, therefore, recreational fishermen in the area would not be significantly impacted. No loss of existing recreational opportunities would occur due to construction of the wetlands or oyster beds under Alternative 8. Past, present, and reasonably foreseeable projects would not likely affect fishing opportunities in the analysis area. The proposed alternatives, along with the past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts to recreation.

Utilities and Public Services

The cumulative analysis area for utilities and public services includes areas served by the city of Los Angeles, city of Long Beach, and Seal Beach. The No Action Alternative would not result in impacts to utilities and public services, and therefore would not contribute towards cumulative effects. The action alternatives would not result in the construction of structures or buildings requiring the use of utilities or need for additional public services. It is not anticipated that solid waste volumes generated during construction by past, present, and reasonably foreseeable projects in combination with the action alternatives would contribute towards exceeding the capacity of the local landfills. The proposed alternatives and ongoing activities are not expected to: result in substantial adverse physical impacts associated with the provision of, or need for, new physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the services listed under the significance criteria; fail to comply with Federal, State, and local statutes and regulations related to solid waste. Therefore, the alternatives would not incrementally contribute towards creating a significant cumulative impact, during construction or in the long-term, in conjunction with past, present, and reasonably foreseeable projects.

Public Health and Safety

The cumulative analysis area for public health and safety includes the city of Los Angeles, city of Long Beach, and Seal Beach in the vicinity of the project area (Figure 5-5). The No Action Alternative would not result in impacts to public health and safety, and therefore, would not contribute towards cumulative effects. The action alternatives would not expose people or structures to a significant risk or loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands. During the construction period, the operation of barges, tugboats, and other equipment operating within the ESPB project area could spill oil, or other hazardous material within the Bay; however, spills would be cleaned immediately per measure WQ-1 and no long-term degradation or permanent new source of hazardous material, or release of hazardous materials, are anticipated. The implementation of standard safety and hazardous material handling environmental commitments would minimize potential adverse impacts related to public health and safety. The proposed alternatives and ongoing activities would not: pose a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material; pose a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving release of hazardous materials into the environment; involve the handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school; be located on a site which is included on a list of hazardous materials sites; or, impairment of or physical interference with an adopted emergency response plan or emergency evacuation plan. It is not anticipated that past, present, and reasonably foreseeable projects in combination with the alternatives would contribute towards an increase in public health and safety issues. Therefore, the alternatives would not incrementally contribute towards creating a significant cumulative impact, during construction or in the long-term, in conjunction with past, present, and reasonably foreseeable projects.

5.20 ADDITIONAL ANALYSIS REQUIRED FOR NEPA AND CEQA

5.20.1 Growth-Inducing Impacts

An important issue in California is whether a proposed action may directly or indirectly foster population growth and the consequent growth in demand for services and utilities or may remove an obstacle that clears the path for the implementation of a separate development project. In this case, the proposed action is the restoration of offshore biological resources. The type or nature of the proposed action is such that population growth would not be an expected direct or indirect result. The proposed habitat restoration features under the action alternatives are not associated with a housing development project of any kind or with any project that would provide new services or utilities to facilitate the development of new housing. In addition, the proposed habitat restoration features are not actions that would be used as an offset or compensation measure for another proposed action. The proposed action would create new, short-term (temporary), construction employment; however, the levels of employment would not be statistically significant from the current level and as such would not result in an increase in the demand for housing or related services. For these reasons, the potential for growth inducement was considered, but eliminated from further detailed analysis.

5.20.2 Unavoidable Significant Adverse Impacts

For air quality, significant and unavoidable impacts under NEPA for exceedance of the applicable General Conformity rate for NO_x, an ozone precursor, would occur under Alternative 8 only. Significant and unavoidable impacts under CEQA for GHG. No significant impacts to air quality would occur under Alternatives 2 and 4A.

For all other resources, impacts, resulting from construction and OMRR&R activities of the proposed alternatives would result in less than significant impacts. Environmental commitments are expected to minimize impacts.

5.20.3 Relationship between Short-Term Uses of the Environment and Enhancement of Long-Term Productivity

NEPA (40 CFR 1502.16) requires that an EIS consider the relationship between short-term uses of the environment and the impacts that such uses may have on the maintenance and enhancement of long-term productivity of the affected environment. This section compares the short- and long-term environmental effects of the proposed action alternatives. The proposed action alternatives would provide minor and temporary short-term losses, while resulting in significant beneficial impacts to the long-term productivity of the affected area.

The period of construction of the proposed action alternatives represents the cause of short-term impacts. These temporary and minor impacts or losses are considered non-significant and would include increases in noise, minimal disruption to traffic and recreation in the area, placement of materials, temporary reduction in air, water, and aesthetic quality, and temporary disturbance to biological resources. With implementation of environmental commitments, impacts to cultural and historic resources would be less than significant. No significant adverse impacts would occur during construction or OMRR&R activities.

Long-term beneficial impacts would result from the restoration of the aquatic habitats within ESPB. Additional subtidal habitat would provide greater habitat for fishes and wildlife in the area, as well as provide other cumulative benefits, such as localized water attenuation for flood abatement and erosion improvements. Secondary long-term benefits of restoration efforts would include improvements to water quality and recreation access and availability. Ecological restoration would provide a long-term improvement in the condition of the ESPB for the native aquatic populations that once occurred, and in doing so, would enhance the well-being of the human population that surrounds ESPB. These long-term benefits have been envisioned and designed to outweigh the short-term adverse impacts that are necessary to achieve the restoration goals.

5.20.4 Irreversible and Irretrievable Commitment of Resources

The irreversible environmental changes that would result from implementation of the proposed action alternatives involve the consumption of material resources, energy resources, and human resources that affect the sustainability of resource use in future generations. The use of these resources is considered to be permanent because the use or destruction of the resource cannot be replaced within a reasonable timeframe.

The proposed action alternatives would result in the use of materials, energy, and human resources that would be irreversible and irretrievably lost. Losses would include loss of stone materials removed from the quarry, fill material removed, energy resources utilized, and labor hours spent. Levels of significance of these losses, both adverse and beneficial, are described in further detail in subsequent paragraphs.

For all of the proposed action alternatives, stone and fill materials would be removed in a way that would result in their irretrievable loss. Materials used for construction would also be irretrievably lost, as they would no longer be available for other projects. These needed materials are not in short supply and would not limit other unrelated construction activities. The underwater land itself would be committed to the selected restoration alternative and unavailable for use in future project.

Energy resources used would include fuels and electricity, which would be utilized during construction and continue to be used during maintenance of restoration elements. These uses would constitute an irretrievable loss of energy. However, consumption of energy would not place a significant demand on energy in the region.

Use of human resources during construction would be an irreversible loss of labor supply for other projects. However, labor opportunities are desired in the project area and this use of human resources represents beneficial employment opportunities.

Soft bottom habitat that would be altered would be irretrievably lost, though habitat restoration would increase features such as eelgrass and kelp beds. Biological resources would be protected from irretrievable loss through construction Environmental Commitments.

Construction and operation of the action alternatives could result in the loss of cultural resources. With implementation of environmental commitments, impacts to cultural resources would be less than significant.

5.21 ENVIRONMENTAL COMMITMENTS

The following is a complete list of the environmental commitments for all action alternatives documented in all sub-sections of this chapter. This comprehensive list is included here for ease of use.

AQ-1 Diesel engine idle time would be restricted to no more than ten minutes duration.

AQ-2 Idling of heavy-duty diesel trucks during loading and unloading shall be limited to five minutes; auxiliary power units should be used whenever possible.

AQ-3 All on-road construction vehicles would meet all applicable California on-road emission standards and would be licensed in the State of California.

AQ-4 Activities and operations on unpaved road areas would be minimized to the extent feasible during high wind events to minimize dust.

AQ-5 Vehicle speeds shall be limited to 15 miles per hour on unpaved surfaces.

AQ-6 Dredging equipment utilized during construction and maintenance will be licensed in California and will meet the model year 2010 (Tier 4 Final) or newer emissions standards for sand dredging operations.

AQ-7 Diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters as certified and/or verified by the USEPA or CARB shall be installed on equipment operating onsite.

AQ-8 Keep roadways next to the proposed staging area clean and frequently remove daily project-related accumulated silt and debris.

AQ-9 Maintain all equipment as recommended by manufacturers' manuals.

AQ-10 Shut-down any equipment not in use for more than 30 minutes.

AQ-11 Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment.

AQ-12 If equipment is operating on soils that cling to wheels, use a "grizzly" or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the staging area, immediately before the pavement in order to remove most of the soil from vehicle tires.

AQ-13 Contractors will be required to use only heavy-duty trucks or engines from model year 2010 or newer that meet CARB's 2010 engine emission standards of 0.01 g/bhp-hr for particulate matter (PM) and 0.20 g/bhp-hr of NOx emissions.

AQ-14 Contractors will be required to maintain records of all heavy-duty trucks associated with the project's construction. These records will be kept current and will be made available to the USACE at any time requested within 7 calendar days of request. Additionally, contractors will be required to provide monthly reports of all heavy-duty trucks associated with the project's construction to the USACE along with any requested records of heavy-duty trucks associated with the project's construction within 7 calendar days of request and these records will be reviewed to the maximum extent feasible and practicable.

AV-1 Prior to initiating construction and staging activities, property owners and other persons in potentially affected areas would receive notice of the construction activities, including information on timing and duration. This notice would help inform viewers of the proposed ecological restoration and point out that proposed eelgrass, kelp, and associated rocky reef restoration would be underwater features not visible from the shoreline.

CR-1- No project construction activities shall occur within the avoidance areas included in Appendix K without reconsulting with the SHPO and Indian Tribes in accordance with Section 106 of the NHPA.

CR-2- Prior to the issuance of a notice to proceed for construction, the USACE shall provide a map of the final project enhancement feature locations to the SHPO to demonstrate that all the potential historic features have been avoided.

CR-3- In the event human remains are discovered, all ground-disturbing activities shall be halted immediately within the area of the discovery, and a USACE archaeologist and the Los Angeles County Coroner must be notified. The coroner will determine whether the remains are of forensic interest. If human remains, funerary objects, sacred objects, or items of cultural patrimony are located on Federal or Tribal lands, the treatment and disposition of such remains will be carried out in compliance with the Native American Graves Protection and Repatriation Act (Public Law 101-601; 25 U.S.C. 3001 et seq.) and EP 1130-2-540, Chapter 6. If human remains are located on state or private lands, the USACE shall follow the steps outlined in 36 CFR 800.13, post review discoveries and shall notify the City of Long Beach who shall ensure that the process outlined in California Public Resources Code, Section 5097.98 are carried out

CR-4- If previously unknown cultural resources are discovered during the project, all ground-disturbing activities shall immediately cease within fifty meters of the discovery until the USACE has met the requirement of 36 CFR 800.13 regarding post-review discoveries. Work shall not resume in the area surrounding the potential historic property until USACE re-authorizes project construction.

ENG-1 During placement of all restoration measures, project limits will be established by GPS coordinates and marked by buoys in-place before the start of construction.

GEO-1 The USACE will coordinate with NOAA and the U.S. Coast Guard to update marine navigation maps after construction is completed.

GEO-2 The USACE (and the non-Federal sponsor, the City of Long Beach) will beneficially reuse dredge material from other navigation projects to the maximum extent practicable. The possibility of utilizing dredged material from other navigation projects (*e.g.*, the Port of Long Beach Deep Draft Navigation Project) will be evaluated during the pre-construction engineering and design (PED) phase and a decision made based on sediment quality and the timing of construction for any such projects. No specific projects have been identified that match construction timing and include results from sediment analyses that show compatibility of dredged sediments to ESPB requirements. If beneficial use sites become available, the USACE would consider a supplemental analysis.

GEO-3 The USACE will conduct detailed bathymetric surveys during the PED phase. Information from these surveys will guide identification of areas to avoid such as areas with natural cobbles and boulders.

GEO-4 Prior to construction, the USACE will perform sediment sampling and analysis to confirm the suitability of dredged material from the surfside-Sunset borrow area for the establishment of eelgrass beds leeward of the proposed nearshore rocky reefs.

INV-1 Pursuant to the *Caulerpa* Control Protocol established by NMFS and California Department of Fish and Wildlife (CDFW), prior to construction activities that would be expected to disturb *Caulerpa spp.* should it exist within the proposed Project Area, a surveillance level survey of the Area of Potential Effects (APE) will be performed. In *Caulerp*a-free habitats, this requires 20 percent of the APE to be surveyed for the presence of *Caulerpa spp.*. In the event *Caulerpa spp.* is found, disturbing activities would be delayed until the infestation is isolated, treated, or the risk of spread is eliminated, and sightings would be reported immediately to CDFW and NMFS. Construction shall not begin until cleared to do so by the NMFS.

MH-1 A pre-construction survey would be performed to document eelgrass extent in the areas of nearshore reef placement. If eelgrass is present or was previously present at a site according to Merkel *et al*. (2017), alternative locations of rocky reef and sand placement a minimum distance of 50 feet beyond the margin of existing and previously existing eelgrass habitat will be established during the detailed design phase as well as during construction to avoid impacts to all existing or previously existing eelgrass habitat. Per the NMFS's California Eelgrass Mitigation Plan (NMFS, 2014), eelgrass is defined "…as areas of vegetated eelgrass cover (any eelgrass within 1 m^2 quadrat and within 1 m of another shoot) bounded by a 5 m wide perimeter of unvegetated area. Unvegetated areas may have eelgrass shoots a distance greater than 1 m from another shoot and may be internal as well as external to areas of vegetated cover."

MH-2 During the creation of eelgrass habitats, no more than 10 percent of the plants from eelgrass donor beds would be harvested to minimize potential impacts to existing eelgrass beds.

NO-1 Construction contractors would be required to use only construction equipment that has noise-reduction features, such as mufflers.

NO-2 Construction contractors would be required to comply with the City of Long Beach Municipal Code, Chapter 8, Section 8.80.202 and City of Seal Beach Noise Ordinance Chapter 7.45.

NO-3 Should hydraulic dredging be determined to be necessary, the USACE will coordinate/consult with the NMFS on impacts to sensitive species (*e.g*., Green Sea Turtles (GST)) associated with the use of hydraulic dredging and would work with the NMFS to determine if additional BMPs would be necessary to reduce potential impacts to sensitive species.

PH-1 Coordination between the USACE and the City of Long Beach would occur to ensure that recreational and commercial users within the project area are aware of construction equipment at the start and termination of activities to minimize any potential hazards related to construction equipment and activities.

PH-2 Publication of advance notice in the U.S. Coast Guard Local Notice to Mariners as another form of public information resulting in enhanced recreation as well as safety notification.

PH-3 All Federal, State, and local regulations regarding the use, transport, and disposal of hazardous materials would be adhered to during construction activities. Human health and safety impacts would be avoided through adherence to these procedures, conditions, and regulations.

RC-1 During the pre-construction engineering and design (PED) phase, USACE will meet with boating stakeholders to identify practicable design refinements that reduce and minimize impacts to recreational boating while still meeting project objectives and avoids violating project constraints.

SP-1 Potential adverse impacts to existing marine habitats would be minimized by selection of dredging equipment and methods, turbidity control measures for dredging and disposal operations, and monitoring protocols outlined in the Los Angeles Contaminated Sediments Task Force Long-Term Management Strategy (2005) and the Los Angeles Regional Dredged Material Management Plan (2009).

SP-2 An Environmental Protection Plan would be implemented, including a Green Sea Turtle Monitoring and Avoidance Plan, Marine Mammal Monitoring and Avoidance Plan, and employee training. Monitoring plans shall be prepared by a qualified marine biologist. The plans would include the following:

- Procedures for monitoring marine mammals and sea turtles, and specifications for Marine Wildlife Observers.
- Methods for communicating with contractors to stop work if there is a risk that any marine mammals or sea turtles active in the area may move closer to construction sites.
- Procedures for Marine Wildlife Observer monitoring of barge transport, if necessary.
- Contractor personnel training
- Reporting procedures including in the event of potential take
- Methods for communicating with ship captains if there is a risk of collision with a marine mammal or sea turtle.

SP-3 The following measures will be implemented to avoid or minimize impacts to the Federally-listed threatened East Pacific distinct population segment (DPS) of Green Sea Turtle and marine mammals protected under the Marine Mammal Protection Act**.**

- The USACE will utilize a clamshell dredge for all dredging associated with the East San Pedro Bay Ecosystem Restoration Project because this type of equipment has been determined to be well suited based on the quantity and the location of the work.
- Dredging is expected to occur on a 24-hour per day basis. The USACE will attempt to sequence dredging activities during winter months (November – March 31) when Green Sea Turtles (*Chelonia mydas*) (GST) are generally expected to be located within the warm waters of the San Gabriel River adjacent to and downstream of power plants (Crear *et al*., 2016). However, due to the exposure of the work area to open ocean wave conditions, adverse wave and inclement weather may preclude safe working conditions during winter months, necessitating that dredging activities extend into the non-winter months.
- When dredging and nearshore placement operations occur, a qualified biologist with experience monitoring GSTs and marine mammals will be on site to monitor for the presence of GSTs and marine mammals. The monitor will have the authority to cease or alter operations to avoid impacts to GSTs and marine mammals.
- Adequate lighting will be provided during nighttime operations to allow the monitor to observe the surrounding area effectively.
- During dredging and placement operations, the USACE will designate 30-meter monitoring zones around both the dredge site and nearshore placement sites.
- All vessels associated with the project will not exceed eight (8) knots inside the breakwater.
- Daily visual monitoring within the designated 30-meter monitoring zones will commence prior to the start of in-water construction activities and after each construction work break of more than 30 minutes.
- If a GST is observed within the vicinity of the project site during project operations, all appropriate precautions shall be implemented to avoid or minimize unintended impacts. These precautions include, but are not limited to:

  - o Cessation of operation of any moving equipment that is observed within 30 meters of a GST.
  - o Immediate cessation of operation of any mechanical dredging equipment if a GST is observed within 30 meters of the equipment.
  - o Operations may not resume until the GST has departed the monitoring zone by its own accord or has not been observed for a 15-minute period of time.
- Biological monitors will maintain a written log of all GST and marine mammal observations during project operations. This observation log will be provided to the USACE and NMFS as an attachment to the post-construction report for the project. Each observation log will contain the following information:
  1. Observer name and title;
  2. Type of construction activity (maintenance dredging, etc.);
  3. Date and time animal first observed (for each observation);
  4. Date and time observation ended (for each observation). An observation will terminate if (1) an animal is observed exiting the monitoring zone or (2) after a 15-minute period of no observation (assumption is that animal has exited, but was not observed to do so);
  5. Location of monitor (latitude/longitude), direction of animal in relation to the monitor, and estimated distance (in meters) of animal to the monitor;
  6. Nature and duration of equipment shutdown.
- Any observations involving the potential “take” of GSTs or marine mammals will be reported to the USACE within 10 minutes of the incident and to the NMFS stranding coordinator immediately.
- The USACE and its contractors will inform all personnel associated with the construction work of the potential presence of GSTs and marine mammals and the requirement to monitor a 30-meter designated monitoring zone around all in-water equipment and vessels to avoid interactions with, or “take” of GSTs and marine mammals. Prior to the commencement of on-site construction work, all contractor personnel (including sub-contractor personnel) will be trained by a USACE biologist (or qualified biologist approved by the USACE) on GST and marine mammal identification and observation protocols to be followed in the event that GSTs or marine mammals are sighted. All construction personnel are responsible for observing and reporting the presence of GSTs and marine mammals during all water-related construction activities.
- The contractor will implement an Environmental Protection Plan that will include a GST and Marine Mammal Monitoring and Avoidance Plan and an employee training program on GST and marine mammal observation protocols, avoidance, and minimization measures.

TT-1 The contractor shall mark all associated marine equipment in accordance with U.S. Coast Guard regulations. The contractor must contact the U.S. Coast Guard two weeks prior to the commencement of construction. The following information shall be provided: the size and type of equipment to be used, names and radio call signs for all working vessels, telephone number for on-site contact with the project engineer, the schedule for completing the project, and any hazards to navigation. The contractor shall move equipment upon request by the U.S. Coast Guard and Harbor patrol law enforcement and rescue vessels.

TT-2 If the inland 3M Quarry in Corona is used, truck traffic would be scheduled during off-peak travel hours to the extent practicable in order to reduce potential traffic impacts from transporting quarry stone over public roadways.

TT-3 If the inland 3M Quarry in Corona is used, individual truck trips from 3M Quarry will be staggered, and trucks assigned to multiple routes instead of one in order to minimize truck travel on public roadways.

TT-4 If the inland 3M Quarry in Corona is used, trucks hauling stone will be covered.

TT-5 A Caltrans transportation permit will be pursued should oversized-transport vehicles be required to travel on State highways.

TT-6 If the inland 3M Quarry in Corona is used, a construction traffic management plan detailing expected delays on State facilities will be developed for Caltrans review.

TT-7 Every attempt will be made to reduce Vehicle Miles of Travel (VMT) from construction trips.

UT-1 Coordination between the USACE and the City of Long Beach public safety agencies would occur prior to and during the construction period.

UT-2 Mapping of underwater utilities would be used to plan the location of rocky reefs to avoid utilities and pipelines.

WQ-1 Water quality monitoring will be conducted during dredging or sandy island/wetland construction or any activities that would result in turbidity plumes. Monitoring parameters will include percent light transmissivity, dissolved oxygen, water temperature, salinity, and pH.

WQ-2 For dredging activities, standard water quality monitoring would be conducted during construction. This consists of weekly monitoring of water quality parameters (salinity, pH, dissolved oxygen, temperature, and percent light transmissivity) with an instrument package at four stations. The four stations are sited relative to the dredge and will be 100 feet upcurrent of the dredge, 100 feet downcurrent of the dredge, 300 feet downcurrent of the dredge, and a control station located outside of any dredge plume. Twice monthly water samples will be taken from the station 300 feet downcurrent of the dredge for analysis of total suspended solids and TRPH. Similar monitoring would be conducted at the sandy island site during sediment placement activities at that location.

WQ-3 USACE Engineering Manual EM-1110-2-2302 provides minimal stone quality requirements. Guidance from this manual will be followed. Quarry materials will also meet the following:

- The materials shall be clean and free of any contaminants, especially those that could dissolve in seawater (e.g., asphalt, paint, oil, or oil stains).
- All stone used for the project must follow:
    - Purity: The materials shall be free of contamination and foreign materials.
    - Specific gravity: Shall be greater than 2.2.
    - Durability: Rocks used must remain unchanged after 30 years of submersion in seawater.

WQ-4 During construction and operation activities, all local, state and Federal regulations would be complied with regarding to the transportation, handling, and storage of hazardous substances.

WQ-5 At each work area involving the operation of heavy equipment and handling and storage of hazardous substances, a Hazardous Material Spill Prevention Plan would be prepared. The Hazardous Material Spill Prevention Plan shall contain contingency plans in the event of an accidental release into the environment.

6 THE NATIONAL ECOSYSTEM RESTORATION (NER) PLAN AND THE RECOMMENDED PLAN

The Final Array of Alternatives have been identified as three action alternatives and the No Action alternative including Alternatives 2, 4A and 8. They have been thoroughly evaluated for environmental impacts in Chapter 5. In the following section, the Final Array of Alternatives are compared to each other based on multiple criteria as well as inputs received during the public comment review period of the Draft IFR. From this comparison, the NER Plan will be identified as the Recommended Plan. The remainder of Chapter 6 will detail the Feasibility Level Analysis of the selected plan.

Final Array of Alternatives

Alternative 1 (No Action Plan)

Alternative 2 – "Kelp Restoration Plan"

Alternative 4A – "Reef Restoration Plan"

Alternative 8 – "Scarce Habitat Restoration Plan"

6.1 COMPARISON OF THE FINAL ARRAY OF ALTERNATIVES

All plans considered for implementation are required by USACE policy to be compared for how well they address the national objective of NER. To select the NER Plan, the Final Array of Alternatives were compared against each other and evaluated first against the planning objectives, then against the four P&G criteria once again. Consideration of the four accounts, Environmental Quality (EQ), National Economic Development (NED), Regional Economic Development (RED), and Other Social Effects (OSE) were also considered. Finally, NEPA/CEQA environmental impacts detailed in Chapter 5 were also considered in the selection of the NER Plan. Public and agency inputs received on the Draft IFR are also summarized and considered in the NER Plan selection.

6.1.1 Comparison by Planning Objectives

The Study planning objectives were developed in the initial stages of the planning process. These objectives were used to identify outputs and changes in conditions that would address the problems for the national interests in water resources as the mission of the Civil Works program.

As stated in Section 2.2.2, the specific planning objective is to:

> Restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands, and other types historically present in San Pedro Bay of sufficient quality and quantity to support diverse resident and migratory species within ESPB during the period of analysis (50 years).

Also as stated in Section 2.2.2, the sub-objectives are as follows:

a. Increase the extent (total area) of complex aquatic habitats within the proposed Project Area.
b. Increase the diversity and spatial heterogeneity of complex aquatic habitat types (*e.g.*, rocky reef, kelp forest, etc.) within the proposed Project Area.
c. Increase the overall connectivity of complex aquatic habitat types within and adjacent to the proposed Project Area by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs.

The following table compares the ability of each alternative in meeting the Study planning objectives.

Table 6-1: Comparison of Alternatives to Planning Objectives for Ecosystem Restoration

	Objective / Sub-Objectives	No Action	Alternative 2	Alternative 4A	Alternative 8
	Restore and support the sustained functioning of aquatic habitats such as kelp, rocky reef, coastal wetlands, and other types historically present in San Pedro Bay of sufficient quality and quantity to support diverse resident and migratory species within ESPB	No restoration, therefore, overall, no improvements to habitat quality and quantity anticipated	Restores kelp beds, subtidal rocky reef, and eelgrass	Restores Alt 2 + open water zone rocky reef	Restores Alt 4A + two coastal wetlands, a sandy island, oyster beds, additional open water rocky reefs, and additional subtidal rocky reef and eelgrass
a.	*Increase the extent (total area) of complex aquatic habitats*	No increase in acreage	162 restored acres of 3 sensitive habitat types	201 restored acres of 3+ sensitive habitat types	372 restored acres of 6 sensitive habitat types
b.	*Increase the diversity and spatial heterogeneity of complex aquatic habitat types*	No increase in diversity	Adds kelp, subtidal rocky reef and eelgrass in new locations; 3 zones	Alt 2 plus open water rocky reef in new locations; 3+ zones	Alt 4A plus wetlands, sandy island and oysters in new locations; 5 zones
c.	*Increase the overall connectivity of complex aquatic habitat types by restoring habitat areas in a way to facilitate the movement of species between habitat nodes to support and enhance existing food webs.*	No increase in connectivity	Open water kelp beds connect existing rocky reef/kelp beds at breakwater with new nearshore shoals; "U" shape benefit area	Alt 2 plus new open water rocky reefs provide "stepping-stones" between breakwater and oil island rocky reef/kelp habitat with nearshore shoals; "Triangular" benefit area	Alt 4A plus 2 wetlands by LA River/ports and additional rocky reef by second oil island provides connectivity throughout ESPB; benefit area covers nearly all of project area

The No Action alternative does not meet Study planning objectives. All three action alternatives meet Study planning objectives to varying degrees, with Alternative 8 better meeting the objectives than Alternative 4A, which in turn meets objectives better than Alternative 2. The main reasons for the difference are based in not only increasing acreages, but also with an additional habitat type added to Alternative 4A from Alternative 2, and three additional habitat types added to Alternative 8 from Alternative 4A. The next section further compares the alternatives to each other in terms of meeting national objectives.

6.1.2 Comparison by National Objectives

Ecosystem restoration is one of the primary missions of the USACE Civil Works program. All plans considered for implementation are required by USACE policy to be evaluated on how well they contribute to the national objective of NER. Contributions to NER, NER outputs, are increases in the net quantity and/or quality of desired ecosystem resources.

Table 6-2 below summarizes how strongly each of the Final Array of Alternatives contribute to the key evaluation criteria of completeness, effectiveness, efficiency, and acceptability. Low-Medium-High color-ramped weighting shows the degree to which each alternative meets the criterion, relative to the other plans. The darkest color represents strongest overall performance of that plan for that criterion and palest color indicated weakest performance of that plan, with respect to that criterion.

Table 6-2: Evaluation of the Final Array of Alternatives

CRITERIA	ALT 2	ALT 4A	ALT 8
COMPLETENESS			
EFFECTIVENESS			
Sub-Obj. 1 – increase habitat total area			
Sub-Obj. 2 – increase habitat diversity & spatial distribution			
Sub-Obj. 3 – increase habitat connectivity with project area			
Technical Recognition: Biodiversity			
Technical Recognition: Status & Trends			
Technical Recognition: Scarcity/ Rarity			
Technical Recognition: Connectivity			
Technical Recognition: Hydrologic/Geomorphic			
Technical Recognition: Special Status Species			
Institutional and Public Recognition			
EFFICIENCY			
Is the plan a Best Buy Plan or Cost Effective Plan?			
Incremental Cost/Habitat Unit			
To what extent are the benefits worth the cost, given the output?			
ACCEPTABILITY			
To what extent is PLAN acceptable re: applicable laws, regulations & public policies?			
To what extent is the PLAN acceptable to the Sponsor?			
To what extent is the PLAN acceptable to resource agencies and science community?			
To what extent is the PLAN acceptable to maritime interests?			
To what extent is the PLAN acceptable to residents?			
To what extent is the PLAN acceptable to recreational interests?			

6.1.2.1 Completeness

As defined by ER 1105-2-100 Appendix E-3.a.(4)(a)(2), completeness "is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects." The No Action plan is a complete plan that does not meet planning objectives. All three action plans are complete and planning objectives can be realized.

6.1.2.2 Effectiveness

The No Action alternative is Ineffective in that it does not support the Study planning sub-objectives of restoring habitat and increasing biodiversity. The three action alternatives strongly meet the planning objectives, as well as the national significance criteria from Section 2.4. National significance criteria include biodiversity, status and trends, scarcity/rarity, connectivity, hydrologic/geomorphic, special status species, institutional and public recognition. Criteria are very similar to the sub-objectives, resulting in similar scoring for the action alternatives. No Action does not contribute to national significance.

Alternative 4A directly restores 200.7 acres of aquatic habitat and generates 161 AAHUs. It provides connectivity for productive habitats including open water rocky reef, nearshore zone rocky reef, eelgrass and open water kelp. These habitats have been reduced, fragmented, or eliminated by urbanization of coastal watersheds, development of ports and Federal infrastructure projects such as the three breakwaters.

As compared to Alternative 2, Alternative 4A more effectively meets the Study planning objective and sub-objectives with the addition of the rocky reef. IFR Table 6-1: Comparison of Alternatives to Planning Objectives for Ecosystem Restoration, illustrates qualitatively increased effectiveness of Alternative 4A over Alternative 2. It better meets the Study planning objective and three sub-objectives of increased habitat area by restoring 200.7 acres versus 162.3 acres. It increases habitat diversity and spatial distribution by introducing a new habitat type of open water rocky reef in a central location. Alternative 4A improves habitat connectivity over Alternative 2 with the “stepping stones” functionality of this additional productive habitat type that is lacking in Alternative 2. This results in Alternative 4A exhibiting a triangular benefit area which is effectively larger than the “U” shaped benefit area of Alternative 2.

As noted in Section 4.7, the addition of rocky reef provides habitat for key life stages for diverse populations of fish and other aquatic species. This benefit is realized primarily through the provision of foraging opportunities, protective shelter and critical nursery functions, which support population health and growth. The plan also provides sustainable resilience and redundancy to withstand stressors and occasional habitat loss events. Table 6-2: Evaluation of the Final Array of Alternatives, qualitatively visualizes how Alternative 4A better meets (National) significance criteria of biodiversity, status and trends, scarcity/rarity, connectivity, special status species and institutional and public recognition. Significance criteria of rocky reef in connection with other habitats is discussed at length in other sections of this document.

Alternative 8 is more effective than Alternative 4A at meeting the Study planning objectives due to the addition of complex habitat types including wetlands and sandy islands.

6.1.2.3 Efficiency

Efficiency refers to the extent to which a plan is the most cost effective means of achieving the objectives. In reference to the comparison above, the No Action Plan lacks provision of benefits. Alternative 2 and 8 are Best Buy Plans, while Alternative 4A is a Cost Effective Plan. Due to Alternative 8’s high cost and higher incremental AAC/AAHU than Alternatives 2 and 4A, it received a medium weight for efficiency, while the other two plans received strong weights.

Table 6-4 summarizes benefits and costs for the Final Array of Alternatives. All costs are presented in 2018 price levels with a Federal discount rate of 2.75 percent. Note also that cost estimates for the Final Array Plans were refined and include estimates of LERRD that were not included in the prior sections of the report. The changes in Project First Cost estimates for the Final Array plans are minor (less than 5%) relative to the estimates in the prior sections and do not impact the plan formulation, evaluation or selection conclusions.

Alternatives 2 and 4A have relatively lower first and OMRR&R costs than Alternative 8. Alternative 8 has roughly twice the output as Alternative 4A, but at nearly four times the first cost. Alternative 2 is the most efficient of the Final Array alternatives, as shown by its low AAC/AAHU. However, Alternative 4A has only a slightly higher AAC/AAHU while providing substantially greater output. Alternative 8, while providing a significant increase in output, is much less efficient than Alternatives 2 and 4A.

Wetlands included with Alternative 8 were considered high value habitat, but at a high cost as noted above. The cost estimates were calculated in compliance with guidance for conducting the Abbreviated Cost Risk Analysis. Suitable wetlands restoration sites simply do not exist in the heavily urbanized proposed Project Area, which is nearly completely built out with the Port of Long Beach, downtown Long Beach and developed public beaches along the coastal shoreline. As a result, the assumed design includes high risk factors, including the fact that it would be a highly engineered structure built out in open water, and includes costly specialty fabrication and equipment. As a result, wetlands costs include a high contingency.

Alternative 4A provides three productive habitat types for $141 million. This cost has been shown to be reasonable, especially with the modification to Best Buy Plan 4 to introduce a smaller scale of the open water rocky reef measure. Further, Alternative 4A is efficient as it provides output of $35,400 AAC/AAHU. Given these factors, the incremental cost of Alternative 4A is considered “worth it,” in terms of maximizing net ecosystem restoration benefits.

In terms of incremental costs per output, as the smallest Best Buy Plan, Alternative 2 (by definition) has the highest level of efficiency. Alternative 4A shows a substantial increase incremental AAC/AAHU relative to Alternative 2. However, this incremental cost is considered “worth it” in terms of the additional restoration output achieved and the greater extent to which it meets the planning objectives and sub-objectives, per discussions above. Alternative 4A provides a 28% increase in AAHUs and a 24% increase in restored acres relative to Alternative 2. While Alternative 8 does provide a significant amount of additional restoration output, it also shows a much higher incremental AAC/AAHU than Alternatives 2 and 4A, as well as a much higher overall cost. In addition, Alternative 8 has a much higher OMRR&R costs to sustain the habitat ($5.9 million vs. $251,000). The gains in output for this plan were not considered “worth it,” given reasonableness of cost considerations, in terms of incremental average annual costs, total project first costs and OMRR&R costs relative to the additional benefits achieved.

Table 6-3: Final Array of Alternatives Costs and Benefits

(2018 price levels with 2.75% Federal discount rate)

Item	ALT 2	ALT 4A	ALT 8
First Cost	$83,587,000	$140,908,000	$560,681,000
OMRR&R	$207,000	$251,000	$5,853,000
Average Annual Cost	$3,407,000	$5,689,000	$27,892,000
AAHUs	125.4	160.9	307.3
AAC/AAHU	$27,200	$35,400	$90,800
Incremental AAC/AAHU	$27,200	$64,300	$151,600
Zones with Restoration	3	3	5
Restored Acres	162	201	372
First Cost/Restored Acre	$516,000	$701,000	$1,507,000

6.1.2.4 Acceptability

Resource agencies and the science community generally support the restoration measures considered for all alternatives. Because more restoration acreage, diversity and connectivity are desired, Alternative 4A is more desirable over Alternative 2 for restoration proponents. Large vessel maritime stakeholders, including the Navy, would not be impacted by the restoration features in Alternative 4A and have expressed support for Alternative 4A. Small boats and some nearshore recreational activities may experience some impacts specifically related to kelp bed placement, which will be addressed in more detail during the pre-construction engineering and design (PED) phase. Residents and recreational stakeholders vary in their support for a plan without and with breakwater modifications. It is anticipated Peninsula Beach residents may support placement of rocky reef/eelgrass shoals offshore, possibly reducing coastal erosion. Alternative 4A adds an additional shoal, which would offer increased shoreline protection.

The Draft IFR was released November 25, 2019, and public and agency comments were received by January 27, 2020. Approximately 250 separate comments were received. To further gauge acceptability, inputs from key stakeholders including resource agencies and the science community, maritime stakeholders, residents, and recreational interests were considered.

Of the 170+ separate written comments received, resource agencies commented on support for restoration and Alternative 4A (identified in the Draft IFR as the Tentatively Selected Plan (TSP)) but were concerned about lack of wetlands in the TSP. Additionally, resource agencies had specific concerns about impacts to existing eelgrass beds and potential impacts project construction would have on Green Sea Turtles, and possible increases in non-native/invasive species within the proposed Project Area. Members of the public who provided comments included recreational stakeholders, primarily surfers and boaters, residents, ports and other navigational stakeholders. Public resource agencies, residents and the navigational stakeholders supported Alternative 4A. Surfing stakeholders were not supportive of Alternative 4A, and recreational boaters were opposed to aspects of Alternative 4A, but not totally opposed to restoration in general.

Surfing stakeholders provided numerous detailed comment letters, including a form email that was sent by 70+ individuals. Essentially their comments centered around ecosystem restoration alternatives that would improve water quality and water circulation. Their main concern was lack of modification of the breakwater from lack of emphasis on the restoration of sandy bottom, which was addressed in Section 4.5.8 Evaluation of the Preliminary Array of Alternatives. Breakwater plans would violate planning constraints and impact navigational operations, including to the U.S. Navy. Recreational boaters were concerned about locations of kelp beds impacting various boating events. The PDT met with boaters in January 2020 to obtain further clarification of their original comments, and it was determined that subsequent discussions would ensue during the pre-construction engineering and design or PED phase following conclusion of the study. During PED, options to refine the design could be explored with the boating stakeholders, while maintaining habitat outputs.

Below are summary characterizations of the level of support based on public and agency comments received on the Draft IFR:

- No Action Alternative – Little support for this alternative.
- Alternative 2 – Little support for this alternative.
- Alternative 4A – Support for this alternative from resource agencies, residents and navigational interests; Opposition to the whole or parts of the plan by recreational stakeholders.
- Alternative 8 – Support for this alternative due to presence of wetlands and the sandy island.

Those who oppose Alternative 4A desired breakwater modifications which would violate planning constraints at a significant cost with no habitat output from that cost. They coupled breakwater modifications with restoration of sandy bottom habitat, which is abundant and not a complex habitat type and was therefore screened out during the plan formulation process. As a result of these areas of misalignment to Study planning objectives and USACE plan formulation guidance, no other feasible alternative existed that was considered under this Study. Those who had concerns about boating impacts from Alternative 4A wanted those impacts acknowledged, which is addressed in Section 5.16. These stakeholders desire another opportunity to discuss design refinements, which is expected to take place during PED.

Alternative 2 meets objectives, is complete, effective and efficient, but didn’t receive any support in the public review process. Although Alternative 8 most strongly meets restoration objectives, and received resource agency support, it is not an efficient plan as costs four times as much as Alternative 4A. In addition, the wetlands and sandy island features are not self-sustaining and are in fact, highly engineered structures that would require costly annual maintenance in perpetuity. Both Alternative 2 and 4A have low annual maintenance costs.

6.1.3 Comparison of Potential Environmental Effects

From the detailed environmental impacts assessment in Chapter 5, the table below summarizes the potential effects under each of the alternatives, including the No Action Alternative.

Table 6-4: Potential Effects under Each Alternative

Resource Category	Alternatives			
	No Action	**2**	**4A**	**8**
Hydrology (Coastal and Shoreline Resources)	N	I	I	I
Marine Geology and Geologic Hazards	N	I	I	I
Water Quality	N	I	I	I
Air Quality and Greenhouse Gases	N	I	I	S
Noise and Vibration	N	I	I	I
Biological Resources: Marine Habitats	N	I	I	I
Biological Resources: Special-Status Species	N	I	I	I
Biological Resources: Significant Ecological Areas	N	N	N	N
Biological Resources: Essential Fish Habitat	N	I	I	I
Biological Resources: Invasive Species	N	I	I	I
Cultural and Historic Resources	N	I	I	I
Aesthetic and Visual	N	I	I	I
Ground and Vessel Traffic and Transportation	N	I	I	I
Land and Harbor Use	N	I	I	I
Socioeconomics	N	I	I	I
Recreation	N	I	I	I
Utilities and Public Services	N	I	I	I
Public Health and Safety	N	I	I	I
S=Significant impacts I=Insignificant impacts (Less than Significant) M=Insignificant impacts with mitigation N=No impact - No Action Alternative is not evaluated for Significance				

6.1.3.1 Cumulative Impacts

NEPA requires that cumulative impacts be analyzed and disclosed. Cumulative impacts are impacts on the environment that would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or Non-Federal) 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 C.F.R. § 1508.7).

California guidelines for implementing the CEQA require a discussion of significant impacts resulting from incremental effects considered significant when viewed in combination with the effects of "past, present, and probable future projects", or in relation to "a summary of projections contained in an adopted general plan or related planning document" (Cal. Code. Regs, Title 14, § 1506(c) and § 15130(b)(1)(A)(B)).

Cumulative projects considered in this analysis included nearby ongoing or proposed dredge projects, capital improvement or development projects, and other reasonably foreseeable future actions. The results of this analysis concluded that there are no significant cumulative impacts that would occur as a result of implementing any of the action alternatives, except for cumulative impacts to air as a result of implementing Alternative 8.

6.1.3.2 Effects Found Not To Be Significant

Issues that were brought forward for the proposed East San Pedro Bay Ecosystem Restoration project for further analysis and included in this IFR included the following resource categories for which impacts were found to be less than significant: Hydrology (Coastal and Shoreline Resources), Marine Geology and Geologic Hazards, Water Quality, Greenhouse Gases, Noise and Vibration, Biological Resources: Marine Habitats, Biological Resources: Special-Status Species, Significant Ecological Areas (SEAs), Biological Resources: Essential Fish Habitat, Biological Resources: Invasive Species, Cultural and Historical Resources, Aesthetics and Visual Resources, Ground and Vessel Traffic and Transportation, Land and Harbor Use, Socioeconomics, Recreation, Utilities & Public Services, and Public Health and Safety. The details of this analysis are found in Chapter 5.

6.1.3.3 Growth-Inducing Impacts

An important issue in California is whether a proposed action may directly or indirectly foster population growth and the consequent growth in demand for services and utilities or may remove an obstacle that clears the path for the implementation of a separate development project. In this case, the proposed action is the restoration of offshore biological resources. The type or nature of the proposed action is such that population growth would not be an expected direct or indirect result. The proposed habitat restoration features under the action alternatives are not associated with a housing development project of any kind or with any project that would provide new services or utilities to facilitate the development of new housing. In addition, the proposed habitat restoration features are not actions that would be used as an offset or compensation measure for another proposed action. The proposed action would create new, short-term (temporary), construction employment, however, the levels of employment would be not statistically significant and as such would not result in an increase in the demand for housing or related services. For these reasons, the potential for growth inducement was considered, but eliminated from further detailed analysis.

6.1.3.4 Significant Unavoidable Adverse Effects

For air quality, significant and unavoidable impacts under NEPA for exceedance of the applicable General Conformity rate for NO_x, an ozone precursor, would occur under Alternative 8 only. No significant impacts to air quality would occur under Alternatives 2 and 4A.

6.1.4 Comparison of Four Accounts

The USACE uses a system of accounts as a way to keep track of effects of alternative plans in support of identifying the Recommended Plan. These were originally put forward by the U.S. Water Resources Council, in the 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, commonly referred to as the Principles and Guidelines (P&G). These include Environmental Quality (EQ), National Economic Development (NED), Regional Economic Development (RED), and Other Social Effects (OSE). Consideration is given to the four accounts for a more holistic and acceptable approach to account for national, regional, and local stakeholder interests.

To comply with the January 2021 “Policy Directive – Comprehensive Documentation of Benefits in Decision Document,” benefits associated with the four account categories were evaluated. Further qualitative and quantitative analysis for EQ can be found within Chapter 5, and for OSE and RED accounts in Appendix C: Economic and Social Considerations. Most of the comparisons are between Alternatives 2 and 4A because they have the most similarities. Alternative 8 can be expected to have overall greater benefits to all four accounts due it being a larger plan as compared to Alternatives 2 and 4A. However, due to its high costs and lack of sustainability of features, it lacks efficiency as compared to Alternatives 2 or 4A.

6.1.4.1 Environmental Quality (EQ)

In addition to the ecosystem outputs calculated by the HEM, Alternatives 2, 4A, and 8 produce qualitative benefits that contribute both nationally and regionally to the EQ account. Incidental benefits associated with the three alternatives such as carbon sequestration, coastline stabilization, and improving water quality are included in the comprehensive benefits of the alternatives and are further described below.

- Restore nationally recognized EFH and HAPC (eelgrass, rocky reef, and kelp) to the U.S. West Coast.
- Increase available habitat and forage for the ESA-federally listed Green Sea Turtle East Pacific DPS (threatened), and Western Snowy Plover (threatened) and California Least Tern (endangered), birds recognized as Birds of Conservation Concern by the USFWS, as well as abalone species identified as Species of Concern by the NMFS.
- All restored habitats support federally managed species within the Coastal Pelagics and Groundfish Fishery Management Plans (especially open water rocky reef for rockfishes).
- Climate Resilience. Restored acreage of kelp and eelgrass is expected to sequester carbon and mitigate the impact of global climate change. Eelgrass is a key habitat of the Blue Carbon Initiative.
- Restored habitats have the potential to aid in the stabilization of the coastline within the SPB which would result in potential lowering or removal of the protective berm which is a visual eyesore.
- Eelgrass is expected to provide regional goods and services (*e.g.*, improving water quality) within the SPB.
- Kelp is expected to stabilize ecological communities within the SPB resulting in enhanced local biomass and biodiversity.
- Rocky reef and kelp are regionally recognized as important by the USFWS. “Rocky reefs and kelp beds are highly important fish habitats of the project region (*e.g.*, the Palos Verdes Shelf) that have been reduced in most of southern California.” (Appendix H).
- Increase numbers of regionally important commercial and recreationally fished species that are managed by the California Department of Fish and Wildlife (*e.g.*, California Spiny Lobster, Barred Sand Bass, Giant Sea Bass).
- Enhance population connectivity throughout the SCB for regionally important fishes (*e.g.*, Kelp Bass, Barred Sand Bass, Giant Sea Bass) and invertebrates (*e.g.*, California Spiny Lobster).
- Coastal saltmarshes are expected to provide high value ecological functions including nutrient cycling, nutrient retention, sediment retention, and commercial species nursery habitat.

6.1.4.2 National Economic Development (NED)

Per the P&G, contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct benefits that accrue in the planning area and the rest of the nation. Alternative 4A, has incidental impacts to the NED including existing recreation resources and activities. In addition, shoreline stabilization from the nearshore reefs has the potential to reduce the City's operations and maintenance expenditures. Alternative 2 would also produce these incidental benefits, but Alternative 4A would produce greater incidental benefits over Alternative 2 due to the addition of open water rocky reef habitat. The inclusion of open water rocky reefs is expected to provide added recreational opportunities to snorkelers, divers, and fishers (commercial and recreational) and the inclusion of an additional nearshore shoal is expected to reduce wave energy to reduce shoreline erosion. Because the project purpose for this Study is NER, the NER benefits are captured above in the NER justification as well as in the discussion of EQ account benefits.

6.1.4.3 Regional Economic Development

As described above in NED, Alternative 4A is expected to positively impact the regional economy with an overall addition construction-related jobs being supported. Overall, the construction of Alternative 4A is expected to add value added in goods and services to the region and provide increased labor income. Because Alternative 2 is a smaller plan, RED benefits are expected to be lower due to reduced construction period and reduced construction spending. RED is discussed further in Section 6.6, and in Appendix C, Addendum C.

6.1.4.4 Other Social Effects

When compared, there are expected to be only minor differences in the OSE effects for Alternative 4A relative to Alternative 2 due to the key difference of increased habitat restoration including an additional nearshore shoal and two open water rocky reefs. Primary differences would be some minor impacts to recreation with the added features, which positively influence some types of recreation uses and negatively impact others, *e.g.,* rocky reef and associated marine life could attract scuba divers and snorkelers and may increase fishing, while there could be reduced visitation for those who prefer more waves. Economic Vitality could be more positively impacted with Alternative 4A than Alternative 2 due to greater job creation from construction and presence of contractors to spend locally. Alternative 4A could impact Community Cohesion and Identity/Well-Being by a small amount, with anticipated mixed impacts in terms of beach and near-beach based recreation.

6.1.5 Sustainability Considerations

The alternatives were developed with layers of sustainability and long-term climate resilience considerations built in. The focus of this Study is to restore highly productive habitat types in their most suitable and optimal locations (e.g., open ocean currents for kelp beds) to ensure sustained functioning long-term. The team integrated sustainability considerations into every phase of plan formulation of the alternatives. Habitat structures, functions, locations and temporal considerations all contribute to long-term sustainability of the NER Plan. Most project features are designed as self-sustaining habitat structures without any operations and maintenance requirements. The habitat structures can be adapted to fully function even with anticipated climate change scenarios such as sea level changes and increased storm activity. Per ER 1100-2-8162, sea level change (SLC) was factored into the plan formulation process and considered in the identification of the NER Plan. This is detailed throughout Appendix A, including in Section 3.3.2 "Sea Level Change" and Section 5.1 "Description of Measures and Basis for Design." As covered in Section 4.3.4, anticipated FWOP conditions for the 50-year period of analysis for both the Study Area and proposed Project Areas include assumptions about increased storms, kelp die-off, increased sediment-loading of rocky reef, and SLC. The team considered habitat types, locations, layouts, proximities, and potential stressors under future without project (FWOP) conditions are designed to ensure project success.

Synergistic considerations within the proposed Project Area and between restoration nodes contribute to the long-term sustainability of the specific habitats in the alternatives. Placement of habitat restoration features in the alternatives is based on numeric modeling results and analysis to determine the most suitable restoration locations within the proposed Project Area. Sections 4.2.4 Opportunity Zones and 4.2.5 Future Without Project Considerations for Target Habitat Restoration Types introduced "opportunity zones" as a plan formulation strategy to identify different measures more likely to be sustainable within particular zones based on conditions needed for that habitat type to thrive. Section 4.5.2.1 describes the nodal restoration approach as a key project design concept. The layout of habitat features took into consideration species colonization, as consistent colonization events were necessary for the restoration of habitats distributed across opportunity zones within ESPB, which will aide in sustainability of the project as a whole.

6.2 IDENTIFICATION OF NATIONAL ECOSYSTEM RESTORATION (NER) PLAN

After evaluation of the three action plans in the Final Array of Alternatives, and consideration of all of the criteria identified above, the USACE VT identified Alternative 4A as the NER Plan. This decision was endorsed by the USACE VT at the TSP Milestone held in August 2019, where vertical alignment was achieved with Alternative 4A as the NER Plan. Following the Agency Decision Milestone, the NER Plan was subsequently endorsed by the USACE VT to be carried forward as the Recommended Plan in this Final IFR.

Alternative 4A has been identified as the NER Plan because it best meets ecosystem restoration objectives as well as planning objectives and reasonably maximizes environmental benefits compared to cost while passing tests of cost effectiveness and increment cost analysis. The NER Plan meets all Study planning objectives including the three sub-objectives to increase the footprint, complexity and connectivity of habitats with national and regional resource significance. The NER Plan is the Preferred Alternative.

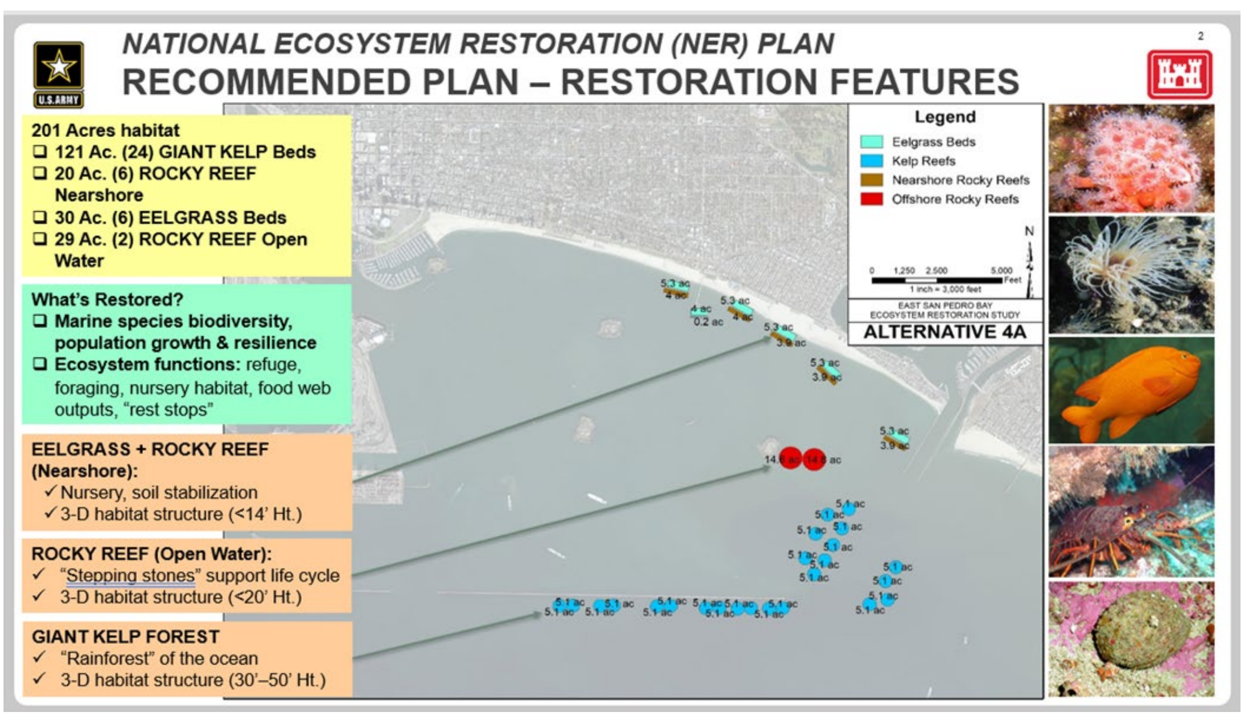

Figure 6-1: Recommended Plan

6.2.1 NER Plan Evaluation Criteria Summary

The NER Plan meets the four PGN evaluation criteria as summarized below.

6.2.1.1 Completeness

Alternative 4A is complete in that it accounts for all necessary investments and actions to realize the planning objectives and does not require substantial additional activities by others to achieve full benefits.

6.2.1.2 Effectiveness

Alternative 4A strongly meets the planning objectives, as well as the national significance criteria, detailed in Section 2.4. National significance criteria include biodiversity, status and trends, scarcity/rarity, connectivity, hydrologic/geomorphic, special status species, institutional and public recognition. Criteria are very similar to the sub-objectives, resulting in similar scoring for the action alternatives.

Alternative 4A directly restores 200.7 acres of aquatic habitat and generates 161 AAHUs. It provides connectivity for productive habitats including open water rocky reef, nearshore zone rocky reef, eelgrass and open water kelp. These habitats have been reduced, fragmented, or eliminated by urbanization of coastal watersheds, development of ports and Federal infrastructure projects such as the three breakwaters.

6.2.1.3 Efficiency

Alternative 4A provides three productive habitat types for $141 million. This cost has been shown to be reasonable, especially with the modification to Best Buy Plan 4 to introduce a smaller scale of the open water rocky reef measure. Further, Alternative 4A is efficient as it provides output of $35,400 AAC/AAHU. Given these factors, the incremental cost of Alternative 4A is considered “worth it,” in terms of maximizing net ecosystem restoration benefits.

6.2.1.4 Acceptability

Alternative 4A is acceptable with regards to applicable laws, regulations and public policies. The non-Federal sponsor supports the NER Plan. Resource agencies and the science community generally support the restoration measures considered for all alternatives.

6.2.2 National and Regional Resource Significance

Alternative 4A is a plan that will restore habitat with national and regional resource significance. As noted in Section 2.4 National Significance, kelp forest, eelgrass beds, and rocky reef are recognized by NMFS as being important EFH for many management plans including the Groundfish and Coastal Pelagic Fishery Management Plans. Furthermore, NMFS has included these habitat types as components of the goals and objectives of the 2016-2020 NOAA Fisheries Habitat Enterprise Strategic Plan that is used to help prioritize NOAA’s habitat conservation activities around the Nation. The proposed EFH restoration within the ESPB is expected to provide habitat and resources for several federally ESA listed species, special-status species, marine mammals that are protected under the MMPA, migratory seabirds of the Pacific Flyway, and Gray Whales that filter feed on sediment-dwelling arthropods within Study Area sediments in Los Angeles Harbor during their migration from Baja California to Alaska. In addition, biological resources within the Study Area and proposed Project Areas are connected to the surrounding waters of the SCB and the remainder of the U.S. west coast where they provide energy (in the form of biomass) and migrants to these regions.

In contrast to restoration projects that target a single habitat type, the restoration of multiple habitat types within a subsection of the San Pedro Bay ecosystem, the ESPB, is expected to improve the delivery of important ecosystem goods and services (e.g., increased biomass, forage, breeding and nursery areas, etc.) with benefits that could be enhanced by the presence of the other habitats (increased connectivity, synergism, etc.). As a result, this systems approach could enhance/amplify potential outcomes of the restoration project and serve as a Nationally Significant example of an improved restoration approach.

Specifically, Alternative 4A, the NER Plan, includes valuable southern California rocky reef habitat considered among some of the most diverse and productive marine ecosystems in the world. Rocky reef provides habitat for a multitude of marine fishes, invertebrates, and plants. In general, hard-bottom or reef habitat is one of the most important but least abundant habitats in the southern California coastal marine environment (Cross and Allen 1993). The displacement of the sandy or muddy bottom habitat with a hard-bottom substrate would increase the diversity and may increase the number of the animal and plant biota in the area.

Rocky reefs are a versatile habitat type, providing support for giant kelp forests as well as provide food, shelter, and nursery grounds for many marine species. Reefs act as nursery and spawning habitat for a variety of species native to the SCB. Reefs also act as a substrate for the recruitment and growth of giant kelp, which are also an important component of critical nursery habitat for many fish and invertebrate species. In addition, the fish productivity of rocky reef habitat has been estimated to be between 9 and 23 times that of sandy bottom habitat (MEC Analytical Systems 1991). Many hard-bottom fish species derive their food via pelagic or kelp-based food webs (Cross and Allen 1993) and therefore are typically lower in contamination than species associated exclusively with and feeding from soft-bottom habitats (LACSD 2002).

The presence of a large rocky reef complex in Alternative 4A has significant implications for the connectivity of habitats within ESPB (sub-objective 3). Connectivity as an ecological concept has become a defining characteristic of marine ecosystems (Carr et al. 2003). Any restoration feature or process or that facilitates linkages between larval and nursery connectivity could therefore have a considerable effect on the population dynamics of many marine species.

6.3 RECOMMENDED PLAN

The NER Plan (Alternative 4A) is the Recommended Plan detailed in this section. Following the publication of the Draft IFR, feasibility level analysis resulted in refinements to the NER Plan (Alternative 4A) from the TSP to the Recommended Plan. Refinements include updated costs and construction assumptions, updated monitoring and adaptive management assumptions, and refined OMRR&R assumptions. The quantities, locations and sizes of the restoration features of the NER Plan are unchanged from the Draft IFR to this Final IFR.

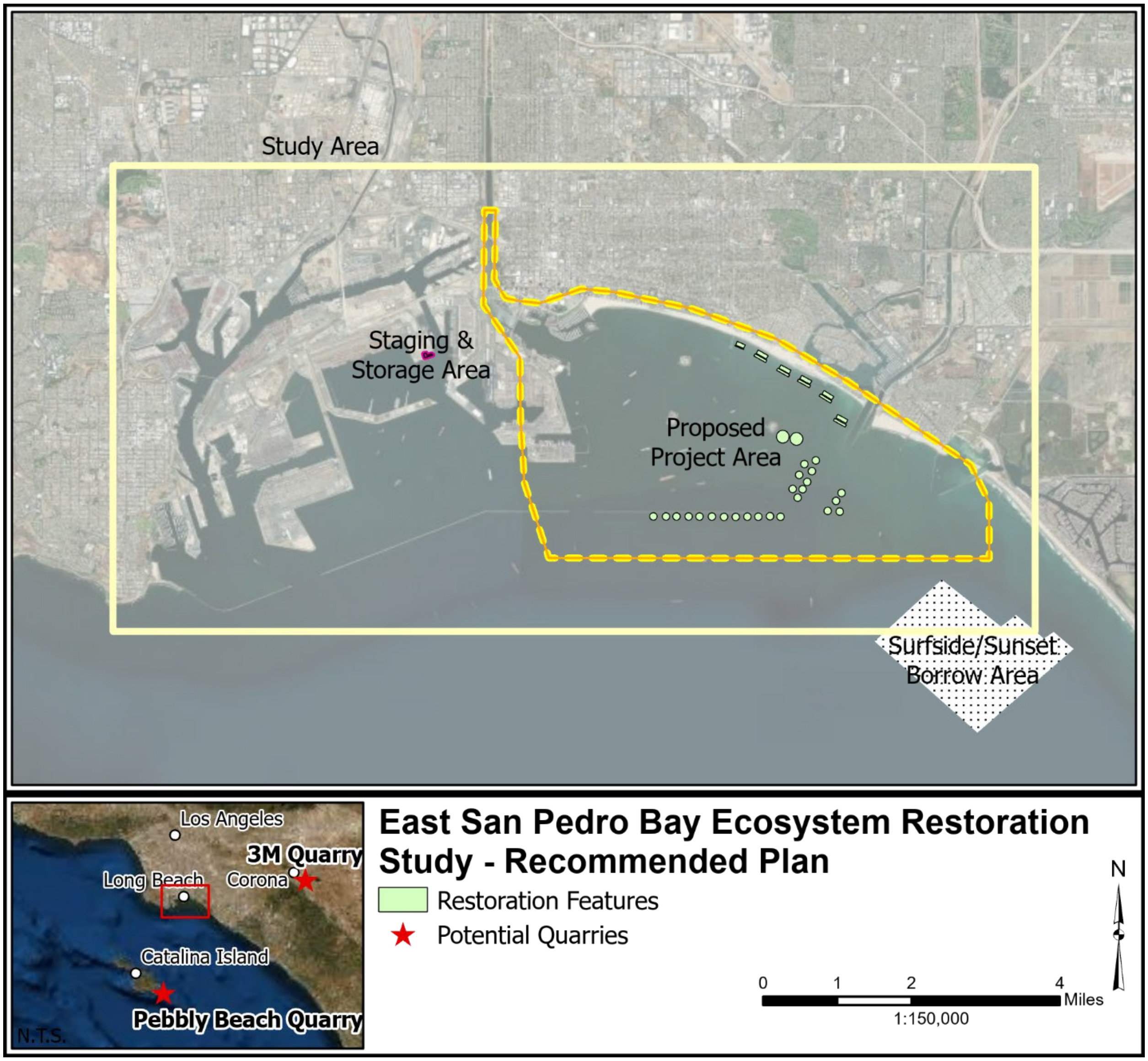

Figure 6-2: Recommended Plan With Restoration Features, Borrow Site and Potential Quarries

Restoration features for rocky reef, kelp beds and eelgrass are detailed below in terms of their ecosystem structure, function, and national benefits as well as likely marine inhabitants and visitors. See Figure 6-2: Recommended Plan With Restoration Features, Borrow Site and Potential Quarries, for locations of all restoration features and related sites, including the temporary staging area to be used during construction of the project. Additionally, the following sections describe siting, design, construction considerations as well as monitoring and adaptive management and OMRR&R activities.

Framing the restoration project are the refined construction assumptions. Construction would take place from approximately Fall 2026 to Spring 2039 for a total construction timeframe/duration of approximately 12.5 years. Active construction is expected to take about 96 months, or roughly 8 years total due to blackout periods. Construction would cease during the Olympics between Fall 2027 and Spring 2029. Each year, blackout months are assumed from November through March to account for potential winter storms.

No project construction activities shall occur within 50 meters of the potential historic properties within the proposed Project Area as noted in Appendix K. Exact placement could vary from the conceptual plan shown in Figure 6-1 due to additional analysis conducted during PED.

The following provides an overview of the benefits of each restoration feature of the Recommended Plan along with siting, design, and construction considerations.

6.3.1 Kelp Beds Restoration Features

6.3.1.1 Kelp Bed Potential Inhabitants and Visitors

Kelp forests host many of the invertebrates and fish species as rocky reef (see next section) as well as mammal species found throughout the Pacific Ocean. Some common animals include Pacific Harbor Seal, Two-Spot Octopus, California Spiny Lobster, Horn Shark, Leopard Shark, Swell Shark, California Moray, Xantus' Swimming Crab, Shovelnose Guitarfish, California Halibut, Giant Sea Bass, Northern Anchovy, California Sheephead, Lingcod, Bay Ray, Kelp Perch, Northern Kelp Crab, Abalone, and many others.

One species that depends entirely on kelp forests is the kelp bass (*Paralabrax clathratus*). They are found almost exclusively in this habitat type and occupy several different micro-habitats within the complex three-dimensional structures of kelp communities. For example, individuals will feed and take shelter in different and separate areas within the forest. Immature kelp bass nestle among kelp blades and seaweed in intertidal rocky areas, while adults may move further away from the kelp forest and venture deeper into rocky habitats, as they are less susceptible to predation. Adults typically prefer rock/boulder and artificial habitats because these environments offer high vertical relief, shade, and large holes in which to shelter. Mature kelp Bass can be found at depths of up to 200 ft. (61 m) but are most common in shallower waters (8 – 69 ft. (2.4-21 m)). (Froese and Luna, 2013; Goodson, 1998; Iwamoto, et al., 2010; Love, et al., 1996; Young, 1963)

Some keystone species include sea urchins, which are central in structuring marine benthic communities, both as grazers and prey, and are economically valuable in fisheries. Their grazing limits algal biomass, and they are preyed upon by many predators (Pearce 2006). Garibaldi (*Hypsypops rubicundus*), designated as the official marine fish of California in 1995, occupy shallow rocky reefs near where the intertidal and subtidal zones meet. These kelp forests are a critical habitat element as they provide potential protection from predators and are important for reproductive success (Allen and Robertson, 1994; Nelson, 1994). This species eats sponges and algae that grow around their rocky homes as well as small animals such as tubeworms, nudibranchs and bryozoans. Their diet of sponges may contribute to their bright colors.

6.3.1.2 Kelp Bed Siting and Design Considerations

The Recommended Plan includes 121 acres of giant kelp beds restored in the breakwater and open water zones. As indicated earlier in Chapter 4, FWOP considerations include likely damage to kelp habitat due to increasing temperature, susceptibility to decreased productivity and die-offs. To address FWOP considerations and to increase kelp resiliency within the SCB and Study Area, kelp restoration locations were identified that would optimize conditions for kelp to thrive. Placement of kelp is designed to maximize the optimal conditions kelp need to thrive, cool temperatures, abundant nutrient flows, wave motion and clean waters. The bed locations have been optimized outside of the breakwater, away from the mouth of the Los Angeles and San Gabriel Rivers. Their locations ensure the kelp is minimally impacted by pollutants that may flow from the river mouths into ESPB. Water quality off Long Beach beaches continues to improve due to better water quality management over time.

Half of the kelp beds, about 60 acres, are arranged in twelve, roughly five-acre patches at irregular intervals along the seaward side of the existing breakwater. Restoring kelp beds near the breakwater would augment existing kelp forests on the submerged breakwater rock. The undulating edge would break up the linear configuration of existing breakwater rock, creating an "edge effect." This change would increase ecological complexity and value of kelp habitat. The other half of the kelp, another 60+ acres, are arranged in twelve, roughly five acres patches off the eastern end of the breakwater. This location allows kelp to take advantage of beneficial and nutrient rich cold-water currents that giant kelp need to thrive. Sixty (60) acres of kelp beds would restore an open water kelp reef, similar to the degraded Horseshoe Kelp Reef that was historically offshore in the western part of the Study Area. Together, these beds are expected to improve the long-term resilience of kelp in the Study Area as follows.

Locating kelp outside the breakwater ensures unimpeded access to coldwater currents and is expected to maximize kelp forest survival and health. Mega-groupings of individual kelp beds also strengthen the synergies between each bed (5-acre circle) and between existing kelp on the breakwater. Added kelp beds ensure that a constant input of kelp propagules is available to the restored habitat in ESPB and should aid in the recovery of the habitat during times of greater environmental stress. "Research has shown that marine systems with greater connectivity tend to more easily recover than systems with less (Geist and Hawkins 2016), thus connectivity of habitat plays a key role in marine restoration success (Thrush et al., 2013)." Kelp beds located adjacent to the breakwater provide immediate access to kelp propagules, while the kelp beds located between the breakwater and the Alamitos Bay Jetties provide connectivity to kelp beds on the breakwater and jetties. A recreational boating passageway is shown with the split configuration, which is subject to change. These locations are also deep enough to avoid fluctuations in sedimentation that could otherwise cover up the rock and impact kelp.

Each kelp reef would be roughly circular in shape, spanning approximately 500' in diameter, with approximately 20% total bottom coverage of substrate with only one layer of stone thickness. Each five-acre patch of kelp is assumed to be the minimum size based on prior studies approved by NMFS. A kelp bed with a canopy size of at least five acres would likely persist during extended periods of unfavorable conditions (e.g., El Niño events). Kelp forests may aide in dispersing short period wave energy to help protect beaches from erosion (Schoenherr, 1992). Wave energy from distantly generated swells will not be affected by the kelp forests.

The kelp beds overall impact on port operations are minimal and have been located to avoid existing anchorages. However, there is a chance that navigation can impact kelp as vessels would travel through kelp beds and potentially damage it at the surface. The depth within the proposed Project Area where kelp is sited should be sufficient to allow the majority of the kelp stipe to remain intact should it be impacted by vessels. Additionally, kelp grows quickly and if established and healthy it would be expected to grow back fairly rapidly. Also, with kelp being established throughout kelp restoration sites, plentiful kelp propagules would be expected during the reproductive period to reestablish kelp that are impacted.

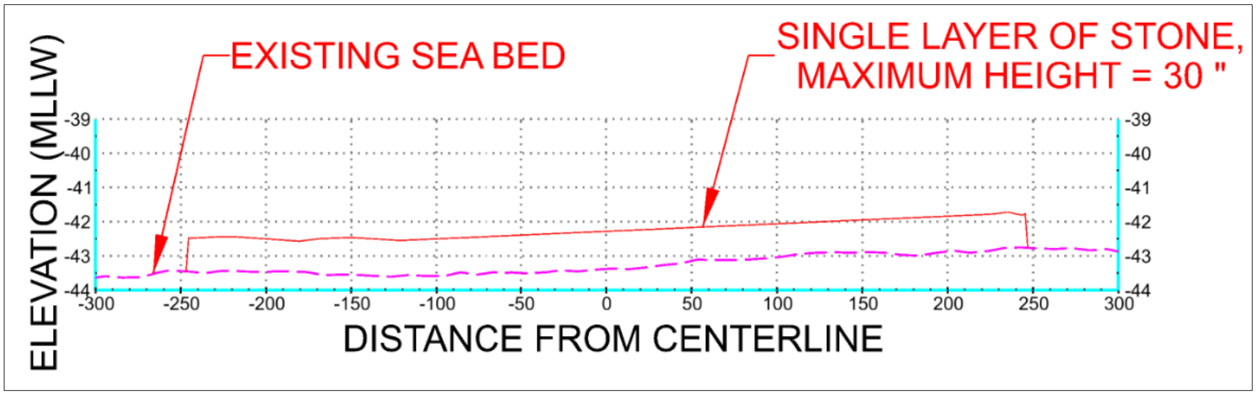

Figure 6-3: Kelp Reef Cross Section

6.3.1.3 Kelp Bed Construction Considerations

To construct these kelp reefs, approximately 132,000 tons of quarry stone would likely be transported from either the Catalina Quarry (a.k.a. Pebbly Beach Quarry; primary quarry site) or from a secondary quarry site, 3M Quarry, located in Corona, Riverside County, California. A representative size of each stone is roughly 2' x 1.5' x 1', with a median weight of approximately 500 lb. Establishment of giant kelp on the stones would occur through passive colonization of propagules over time.

Kelp reef construction would employ the “push off” construction method. In this method, a derrick barge, held in place by six anchor locations, is tethered to a flat-deck barge. Each anchor weighs approximately 5 to 10 tons and is accompanied by either a larger concrete block (three seaward anchor locations) or by a second anchor (three shoreward anchor locations) to hold the derrick barge and accompanying flat-deck barge in place. Each anchor is attached to a long steel cable (anchor line), which is individually controlled by a winch. This anchoring system allows for small movements in the barges to accurately maneuver the next “push off” location. A set of six winches (one per anchor line) is used to maneuver the derrick barge along a set of parallel lines along which the quarry rock is placed in the water. Two differential GPS (DGPS) receivers would be mounted on the derrick barge to keep the barge accurately positioned as it moves along the lines. A front-end track loader is lowered via crane from the derrick barge to the flat-deck barge so that boulders can be pushed over the side. The winch operator maneuvers the edge of the flat-deck barge to the required position (e.g., at the first line) by winching “in” or “out” on the six anchor cables connected to their respective anchors. The derrick-barge winch operator uses a computer monitor displaying the triangulated data to assist in locating the edge of the flat-deck barge at the exact line of deployment. Positional accuracy of the DGPS system is estimated at 1 to 2 feet, and the software acceptance limits can be set at 6 feet, meaning that the winch operator can hold position to within a tolerance of 6 feet. Figure 6-4 shows a schematic of the construction method and equipment, including the derrick barge, flat-deck barge (labelled “supply barge” in the figure), GPS markers, anchoring points, rock placement lines, and front-end loader. Additional information can be found in Appendix A: Coastal Engineering.

Equipment used during construction would most likely consist of the following:

- One derrick barge
- Two assist tugboats
- Three flat-deck barges (supply barges)
- Two front-end track loaders (one backup)
- Eight winches
- One DGPS survey system with appropriate software

The derrick-barge crew would consist of a crane operator, foreman, crane oiler, deck engineer, and pile driver/barge-hand, along with a loader operator, superintendent to direct operations, and project manager. Construction would be conducted during daylight hours six days a week (Monday through Saturday) except on holidays and during inclement weather. Work would commence at approximately 7:00 A.M. Assuming the output of 1,400 tons of quarry rock deposited per day, the operation schedule for the tugboats would be every day for the small barges and every other day for the large barges.

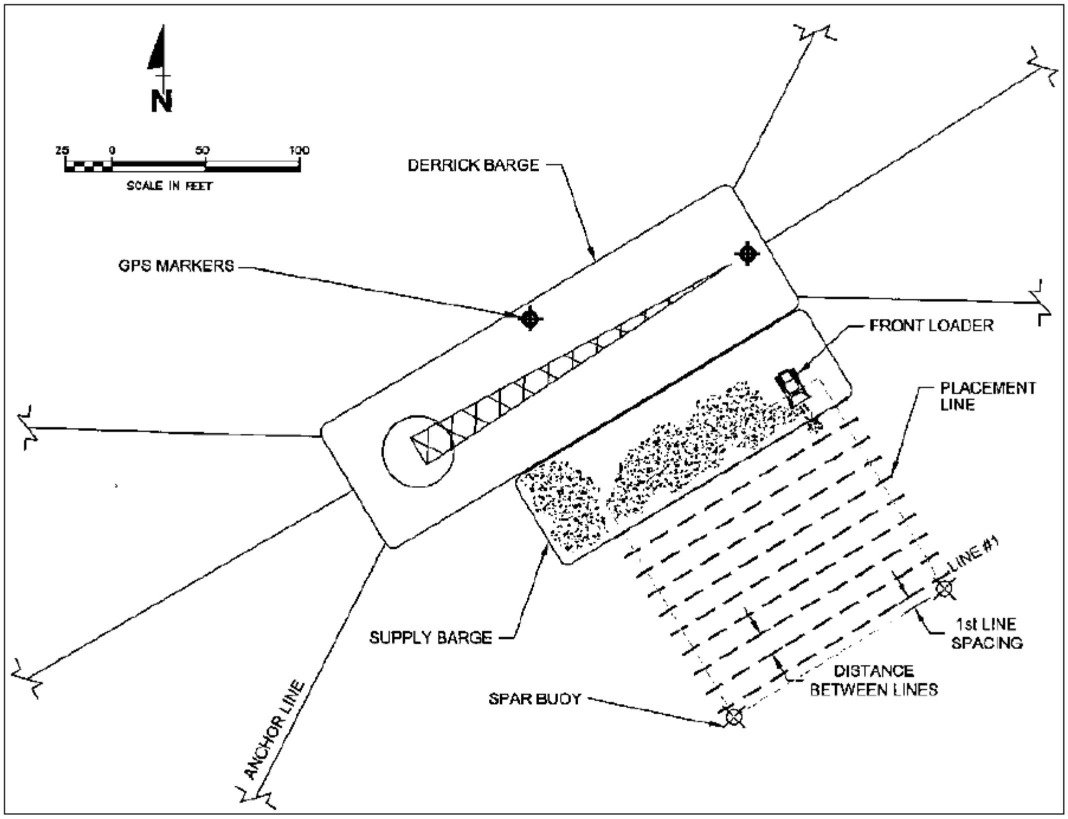

Figure 6-4: Kelp Reef Construction Method Schematic Showing Derrick Barge, Supply Barge, Front-End Loader, Rock Placement Lines, and Six-Anchor Positioning

(Source: Army Corps Palos Verdes Marine Artificial Reef Restoration Project Public Notice, January 2017)

6.3.2 Rocky Reef Restoration Features

6.3.2.1 Rocky Reef Ecosystem Structure, Function and Benefits

Southern California rocky reefs are among some of the most diverse and productive marine ecosystems in the world. The fish productivity of rocky reef habitat has been estimated to be between 9 and 23 times that of sandy bottom habitat (MEC Analytical Systems 1991). Rocky reefs can also provide food, shelter, and nursery grounds for a variety of species native to the SCB, such as bottom-dwelling fish and invertebrate suspension feeders. Reefs also act as a substrate for the recruitment and growth of kelp and algae, providing additional habitat structure for increased biodiversity. As a “mixed use development” habitat, the rock surfaces, crevices and associated plants, form the structures for species to thrive on, under and over. As important as they are, they are also one of the least abundant habitats in the southern California coastal marine environment (Cross and Allen 1993).

Multiple small reefs support more individuals and more species than one large reef of equal material. Several small reefs have greater edge effect in that they offer more ecotone habitat based on a higher ratio of perimeter to reef area. Additionally, dispersing fauna may have a better chance of locating several small reefs than one large reef (Bohnsack 1991). Further, because small reefs have higher fish density, they could have more species by chance (MacArthur and Wilson 1967).

Rocky reefs can take a variety of forms and support different associated biological communities depending on location, proximity to other habitat types and depth. Two types of rocky reef are included in the Recommended Plan, nearshore zone or subtidal rocky reef (typically referred to as "nearshore rocky reef") located in shallow waters just offshore, and open water rocky reef in deeper waters near the oil islands. The shallow water nearshore zone rocky reef receives more light than deeper giant kelp reef, allowing for different kelp and algae species to thrive. This aquatic plant variety increases coastal biodiversity within the bay, increasing opportunities for reproduction, protection and foraging.

For the Recommended Plan, a distinction is made between rocky reef and kelp habitats, which are both rocky substrate habitat types. It is likely that the open water rocky reef would eventually host a kelp forest but the PDT did not account for kelp habitat benefits with open water rocky reef since the optimum locations for kelp bed placement are outside the breakwater. But because kelp is anchored on rock substrate, many of the same species that inhabit rocky reef, are also found in kelp habitat. However, rocky reef is designed to have vertical 3-D relief with crevices and caves, unlike the single layer kelp beds.

6.3.2.2 Rocky Reef Potential Inhabitants and Visitors

Rocky reef support numerous invertebrates and fish species, concentrating food sources in one location for larger resident and migrating species. See Chapter 3 and Appendix D-1 for additional information. One of rocky reefs most prevalent inhabitants are invertebrates, animals without backbones. On land and in the oceans, they account for over 90 percent of animal species. Rocky reefs host nearly all of the most common invertebrates including sea stars, sea urchins, sponges, jellyfish, lobsters, crabs, snails, clams, and squid. Important invertebrates that live on and in between the rocks include the California spiny lobster (*Panulirus interruptus*), abalone (all species), and California mussel (*Mytilus californianus*).

The California spiny lobster is an important coastal nearshore predator that regulates the population of several key invertebrate species such as purple urchins and the mussel species *Mytilus californianus*. They also act as hosts to sponges, hydroids, barnacles, serpulida, krill-like amphipods and nemertean (Carcinonemertes wickhami) (Eminike, et al., 1990; Lafferty, 2004; Lindberg, 1955). The species is highly sought in both commercial and recreational fisheries (Barsky 2001). Abalones live on intertidal and subtidal rocky substrate. Depending on the species, this habitat may include bare rock, surf grass, kelp forest, or deep, sub-canopy-forming kelps. Mussel beds play several important roles within marine ecosystems. Mussels are filter feeders. They draw in large amounts of seawater to trap phytoplankton, their food source. One mussel can filter 2-3 liters/hour (up to 350 litres of seawater daily) – equivalent to three full bathtubs. As the mussels filter the water, they also remove sediments and other substances that make the water murky. Mussel beds provide a habitat for other marine organisms, such as juvenile fish invertebrates. For example, *M. californianus* beds provide structural habitat used by many small crustaceans and other invertebrates and fish (Paine and Suchanek 1983).

6.3.2.3 Open Water Rocky Reef Siting and Design Considerations

Open water rocky reef provides high habitat value due to the ability to support of a wide variety of aquatic species and have vertical as well as horizontal habitat benefits. Placing open water rocky reef patches near Island Chaffee augments existing rocky reef habitat on the existing oil island infrastructure. Co-locating two rocky reef patches adjacent to each other promotes synergies between the patches, augmenting habitat value. Soft-bottom spaces in between patches of rock add edge effect complexity, creating more biodiversity opportunities. The relatively short distances between reef patches increase exchanges and expands distribution of species, enhancing biodiversity.

Open water reefs are made up of individual rock groupings, roughly 100' in diameter, spaced apart within a circular area. This distribution will offer a variety of habitats for different species by providing alternating rocky reefs and sandy bottom in a concentrated area. The individual patches make up a single reef complex, covering about 15 acres. Each individual rock grouping varies in height between 3 feet to 12 feet above the seabed. The maximum structure crest elevation would be no higher than -15 feet (MLLW).

As noted earlier, the greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that increased sedimentation due to more frequent storm events as a result of Global Climate Change may fill in rocky reef voids where species live with the possibility of burying entire reefs after periods of successive storm activity. Due to the large size and the relief of the reef complex, sedimentation is not expected to be a problem. Turbidity associated with storm events will affect water quality (e.g., available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them. In response to these potential environmental stressors, open water rocky reefs were formulated to be located inside the breakwater in order to reduce potential exposure to sedimentation. Inside the breakwater, it is expected that the open water rocky reefs will be sheltered to some degree from wave action. A similar level of sedimentation and turbidity that is currently experienced near the oil islands is expected.

In addition, the restoration of 120 acres of kelp reef (kelp/rock complexes) to the east of the Long Beach breakwater and throughout ESPB may afford an additional level of protection for open water rocky reef. These kelp complexes are expected to reduce the amount of wave energy from storms along with the sedimentation and turbidity that generally follows. This synergy between environments that is expected to increase the sustainability of restored habitats was described as "a mosaic of habitats provides greater functional diversity, which is linked to long-term stability, as multiple functional traits (built in redundancies) increase the resilience of marine systems in the face of environmental changes (Montoya et al., 2012). There is an unmeasured benefit or synergy that occurs when the diversity of habitats in proximity are restored, particularly for habitats that would naturally co-occur (Liversage, 2020). This is particularly important in highly altered environments, such as SPB (Milbrandt et al., 2015)." In addition, "restored habitats will also aid in storm protection and the reduction of shoreline erosion within the Study Area (Foster and Schiel, 1985; Koehl and Alberte, 1988; Larkum et al., 2006) and ultimately offset the impacts of Global Climate Change."

In the Recommended Plan, 30 acres of open water rock reef and 20 acres of nearshore rocky reef significantly increase available high quality, productive, rocky reef habitat in the proposed Project Area. Rocky reef by the Island Chaffee would increase habitat complexity due to variation in rock grouping size, rugosity, and relief, interspersed with sandy habitat for enhanced "edge effect." These design complexities echo natural rocky reef that once existed and currently exist in degraded conditions in the western part of the Study Area. The existing rocky reef on the oil islands, hardened shoreline, and along the breakwater are not designed for optimum habitat benefit and are susceptible to climate change-induced stressors. The additional 50 acres of rocky reef are expected to bolster productivity and biomass in the Project Area, ensuring healthy reef-based fish and invertebrate populations into the future.

Regarding fishing pressure, several measures have been put into place by the CDFW along with various state and federal agencies to reduce the impact of fishing on biological communities along the California coastline. These practices include, but are not limited to, Marine Protected Areas (MPAs), size limits, quotas, seasonal windows, licensing, fines associated with violating fishing statutes, etc. It is expected that these measures will still be utilized over the period of analysis for ESPB and that they will also be modified into the future as additional data pertaining to catch rates, species abundances, species richness, etc. are further investigated.

The distribution of these reefs are as follows and are defined by the crest height above the existing seabed:

- 3 ft. – 20%
- 6 ft. – 25%
- 9 ft. – 35%
- 12ft. – 20%

This distribution will offer a variety of habitats for different species.

The reefs' overall impact on port operations are minimal. The reefs are located to avoid existing anchorages. Higher reefs will be placed furthest away from any marine navigation (commercial and recreational) as possible. The highest crest elevation would be set no more than -15 ft. MLLW. A medium stone weight of 10 tons would provide for sufficient stability. As noted in Appendix A: Coastal Engineering, "there would be a small reflection from the open water reef complexes that may increase wave heights near the "D" anchorages within the project area. This reflection will be limited to no more than 15 percent of the incident wave height."

The bed locations are minimally impacted by pollutants that may flow from the river mouths into ESPB. By being away from the mouth of the Los Angeles and San Gabriel Rivers and exposed to open ocean currents beyond the breakwater, the location optimizes physical water quality conditions for rocky reef.

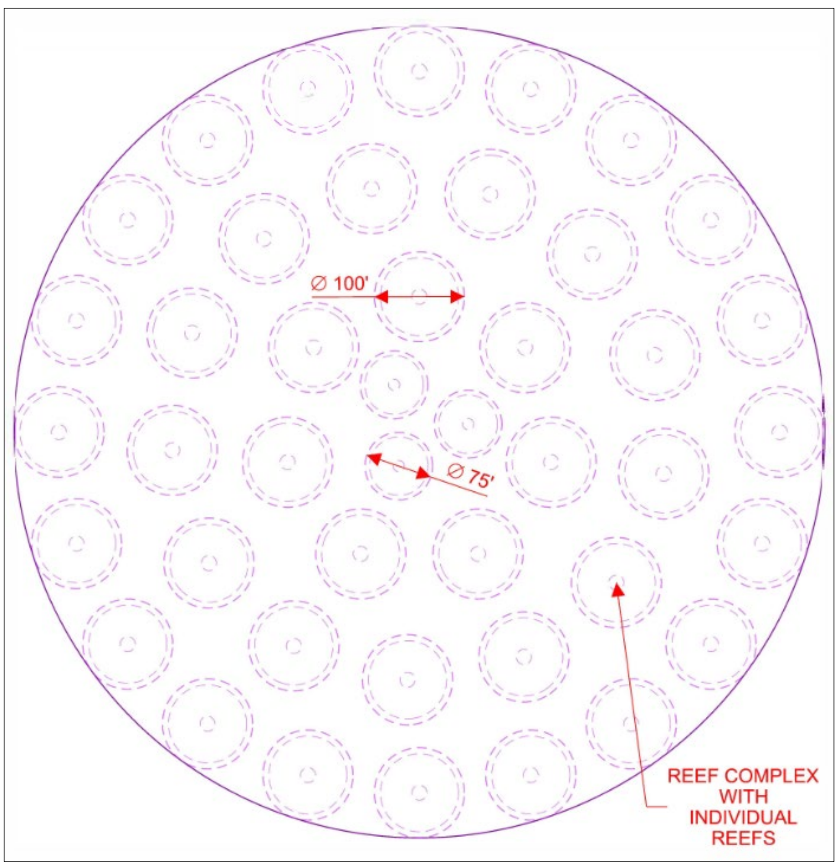

Figure 6-5: Plan View of Open Water Rocky Reef Complex

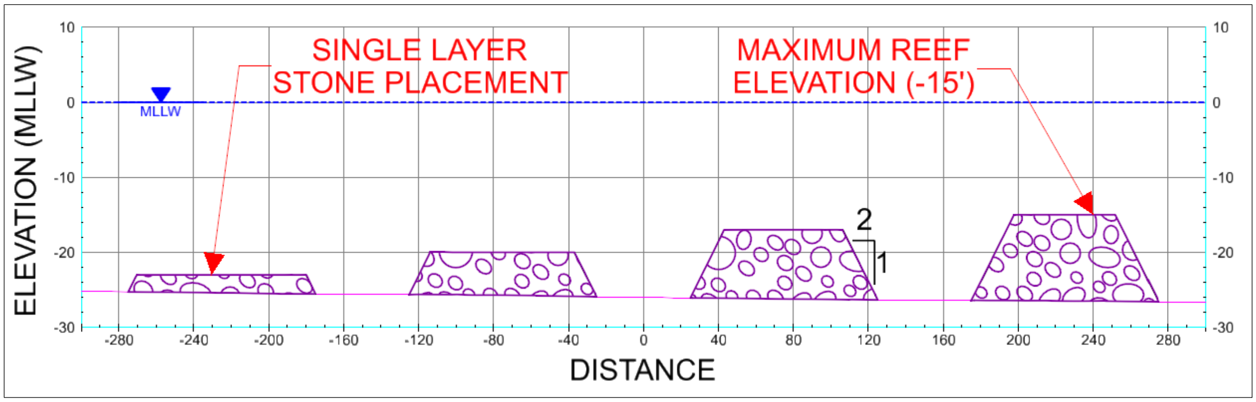

Figure 6-6: Open Water Rocky Reef Cross-Sections

6.3.2.4 Open Water Rocky Reef Construction Considerations

Approximately 183,000 tons of armor stone would be needed to construct both of the offshore reef complexes. Interlocking for this type of reef is not needed due the level of submergence. All stone must be specially placed to achieve the required relief and depth. Construction of the offshore reefs require more complex placement techniques. For this measure, stone cannot be dumped from a barge and must be specially placed in order to obtain the required void spaces. This technique requires a longer duration of construction as compared to the earlier discussed kelp reefs. Construction activities would be limited during the winter months due to large wave events. Verification surveys would need to be conducted to ensure full bottom coverage methods throughout the construction phase.

6.3.2.5 Nearshore Rocky Reef Siting and Design Considerations

The greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that increased sedimentation due to storm events may fill in rocky reef voids where species live with the possibility of burying entire reefs after periods of successive storm activity. Turbidity associated with storm events will affect water quality (*e.g.*, available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them. Multiple siting and design considerations address these FWOP concerns.

Under the Recommended Plan, six nearshore rocky reef shoals totaling 20 acres would be placed in shallow ~15' MLLW waters. Multiple factors influence nearshore reef site selection. The nearshore rocky reef takes advantage of shallower depths, availability of light, and greater movement of water and nutrients. This shallow nearshore zone reef receives more light than deeper giant kelp reef and allows for other kelp and algae species to thrive. This aquatic plant variety increases coastal biodiversity within the bay. The design for these submerged reefs involves constructing sufficient voids for provision of refuges for smaller juvenile and adult fish and invertebrates.

The purpose of these reefs, aside from directly providing subtidal rocky reef habitat benefits, is to reduce the velocity of the surrounding fluid in order to provide suitable eelgrass habitat conditions. The submerged structures will cause some of the incident waves to break, producing a re-distribution of sediments allowing for the calm shallow condition eelgrass needs to thrive. They also provide a localized level of protection to the shoreline from storm surges and erosive wave action. Reef locations were chosen in part based on the absence of existing eelgrass combined with factors noted previously.

Refinements to reef locations would be made during the PED phase. The western-most rocky reef/eelgrass feature from west of Belmont Pier may be adjusted to a location fronting Peninsula Beach. This could reduce potential impacts to existing eelgrass west of the pier, and potentially provide additional shoreline erosion benefits along Peninsula Beach. With the adjustment in location, habitat benefits or costs, would likely not change significantly from what is currently being presented in the Recommended Plan.

All rocky reef habitats are composed of rock outcrops (e.g., granite, basalt or other metamorphic conglomerate) of varying relief or height and configuration of stone large enough so as not to be normally moved by waves and currents. Each reef footprint is conceptually designed as a rectangle with crest limits roughly 1,000’ long by 175’ wide, running parallel to the shoreline in about -20’ MLLW depth of water. The reef by Belmont Pier is smaller. Reef crest elevations, or submerged depths below MLLW elevation, will vary from -3 to -10 feet MLLW. The stone pile height (or reef relief) would be roughly 2’ to 17’ in vertical height above the seabed. Long-term performance and habitat output would be impacted primarily by being buried by sediment but also displacement of stone due to large wave events. A minimum elevation of 3’ ensures projected sediment movement will not result in burying the reefs.

The multifunctional reefs could reduce shoreline erosion rates and provide incidental coastal storm damage protection.

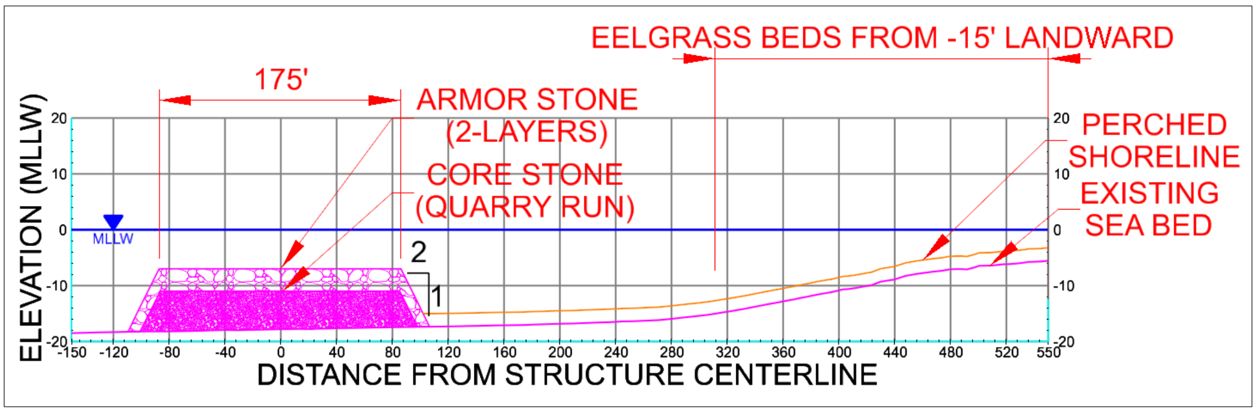

Figure 6-7: Nearshore Rocky Reef and Eelgrass Cross-Section

Because nearshore rocky reef may potentially pose a hazard to small boats and other nearshore recreational activities, the U.S. Coast Guard will design and install “aids to navigation” or ATONs in the form of signage or buoys. ATONs will be placed at each of the four corners of the nearshore rocky reefs to ensure visibility. ATONs will be integrated with the design and construction of restoration features. A pre-construction survey would be performed to document eelgrass extent in the areas of nearshore reef placement. If eelgrass is present, the location of rocky reef and sand placement would be adjusted during the detailed design phase as well as during construction to avoid impacts to existing eelgrass habitat. Further design would be performed in the PED phase to determine the proper spacing and locations to better stabilize the immediate shoreline, and to consider inputs from key stakeholders and the City. For example, the western-most rocky reef/eelgrass feature from west of Belmont Pier may be adjusted to a location fronting Peninsula Beach. This could reduce potential impacts to existing eelgrass west of the pier, and potentially provide additional shoreline erosion benefits along Peninsula Beach. With the adjustment in location, habitat benefits or costs, would likely not change significantly from what is currently being presented in the Recommended Plan.

6.3.2.6 Nearshore Rocky Reef Construction Considerations

Similar equipment utilized in the construction of the open water kelp reefs would also be used for construction of the nearshore reefs. The nearshore shoals would be created by first depositing 134,000 tons of quarry run with individual stones no larger than 1 ton at the site, then specially placing 231,000 tons of filter and armor stone with individual stones ranging from 1 to 10 tons to obtain sufficient interlocking and depth profiles.

The construction of the nearshore rocky reefs would be accomplished by a barge and crane with appropriate support vessels. Fill material may be dumped using the "push-off" method from a barge using a front loader or bulldozer. Armor stones must be specially placed by a crane, determining rock placement locations "by feel" using the crane and to obtain the specific armor layer thickness. Construction activities may be limited during the winter months due to large wave events. Verification surveys would ensure the design template is being met.

6.3.2.7 Rocky Reef Post-Construction Considerations

Coordination with the U.S. Coast Guard will ensure public safety and reef restoration sustainability. As noted in Section 5.2 Environmental Commitment GEO-1, "The USACE will coordinate with NOAA and the Coast Guard to update marine navigation maps to chart potential hazards." As noted in Section 5.12.1, following construction, "fixed aids to navigation (ATON) would be installed within the proposed Project Area indicating the locations of nearshore rocky reefs. Based on need (*e.g.*, for recreational boater safety), the appropriate ATON type will be determined by the U.S. Coast Guard during the PED phase of the project."

6.3.3 Eelgrass Restoration Features

6.3.3.1 Eelgrass Ecosystem Structure, Function and Benefits

Eelgrass is a community structuring plant that forms expansive meadows or smaller beds in both subtidal and intertidal habitats in shallow coastal bays and estuaries, as well as within semi-protected shallow soft bottom environments of the open coast. Eelgrass beds constitute a critical habitat in nearshore ecosystems, serving as a nursery ground for many fishes and invertebrates. In addition, they provide numerous ecosystem services, including sediment stabilization, filtration of pollutants, and carbon storage (Larkumet al., 2006). Eelgrass forms highly productive beds that function as important nursery habitats for a diverse variety of organisms (Beck et al., 2001), including economically important fishes and invertebrates in southern California (Allen et al., 2002; Hoffman, 1986).

6.3.3.2 Eelgrass Potential Inhabitants and Visitors

A key indicator species for eelgrass is the Bay Pipefish (*Syngnathus leptorhynchus*), a relative of the seahorse. Bay pipefish is dependent on eelgrass and is a common resident and plays an important role in the production of organic detritus of eelgrass beds (Fritzsche 1980, de Graaf 2006). Black surfperch were shown to have a greater association with eelgrass habitat. Eelgrass presence increased the occurrence of certain fish species among oyster reef structures (bay pipefish, shiner surfperch, and saddleback gunnel), suggesting that restoring the two habitats in proximity to each other can increase the richness of species present (Boyer et al. 2017). Sea turtle have been known to forage for food in eelgrass beds.

6.3.3.3 Eelgrass Bed Siting and Design Considerations

Projected increases in the frequency and intensity of storms due to climate change are expected to significantly affect the function and distribution of eelgrass beds within the San Pedro Bay as it is sensitive to increased wave energy and disturbance. The synergy provided by the interconnectedness of the mosaic of habitats including the breakwaters, kelp reefs, open water rocky reefs, and nearshore reefs are expected to buffer restored eelgrass from intense and more frequent storm events and also aid in their recovery. Co-locating nearshore rocky reef with eelgrass beds are the primary adaptation to future increased storms.

PDT worked with resource agency members of the TAC and configured a variety of co-located rocky reef shoals in the nearshore zone. These rocky reef-eelgrass "shoals," or complexes, would buffer wave activity and provide the shallow calm conditions needed for eelgrass to thrive. The Recommended Plan includes 30 acres of eelgrass in shallow, calm waters along the shoreline. Existing eelgrass is unprotected except along the western-most stretch of the proposed Project Area where existing dredge placement material and breakwaters sit offshore and protect eelgrass from strong waves and large storm events. Restored eelgrass beds bolster long-term resilience of eelgrass in the proposed Project Area.

In regard to predicted increases in depth and the reduction of available light for eelgrass due to sea level rise, eelgrass beds are expected to migrate shoreward into shallower water in order to maintain appropriate depths where adequate light is available. This is expected to offset the effects of increased water depths predicted for the proposed Project Area.

Thirty acres of eelgrass habitat would be established at five locations in the nearshore zone, co-located with the nearshore rocky reefs described above. Eelgrass requires adequate light, wave energy, salinity, and substrate to grow and regenerate. Proposed locations for eelgrass restoration within the proposed Project Area have adequate light, salinity, and substrate. These beds would provide connectivity to existing eelgrass beds west of Belmont Pier, effectively doubling span of eelgrass habitat in the bay. The presence of the 20 acres of nearshore rocky shoals (see Figure 6-7: Nearshore Rocky Reef and Eelgrass Cross-Section) would provide the calm, shallow conditions eelgrass requires by stabilizing the bathymetry of the nearshore environment. Without the protective rocky reef shoals, wave energy is too high for eelgrass to naturally restore and recover in great abundance. Beach compatible sediment would also be placed leeward of the rocky shoal to optimize ideal conditions and depth for eelgrass growth.

As noted in Section 5.6 Biological Resources: Evaluation of Marine Habitats, Environmental Commitment MH-1, "A pre-construction survey would be performed to document eelgrass extent in the areas of nearshore reef placement. If eelgrass is present or was previously present at a site according to Merkel (2017), alternative locations of rocky reef and sand placement a minimum distance of 50 feet beyond the margin of existing and previously existing eelgrass habitat will be established during the detailed design phase as well as during construction to avoid impacts to all existing or previously existing eelgrass habitat."

6.3.3.4 Eelgrass Bed Construction Considerations

For the eelgrass beds, up to 100,000 cubic yards of dredged sand material obtained from the Surfside/Sunset Borrow area would be dumped on the leeward side of the five nearshore rocky reefs with the use of a split-haul scow. Dredging equipment for eelgrass bed sand placement would most likely consist of the following:

- 1 Dredge (clamshell)
- 2 assist tugboats
- 2 scows

Dredging can occur 24 hours per day, 7 days per week. Expected downtime and shift changes will limit the working time to 22 hours per day but engines would remain idle during this time. Dredging would progress with a rate of 4,000 yd^3/day. The Surfside/Sunset Borrow area is identified as the sand source due to its location and the quantity of material available; in the event other appropriate sources become available in the future, supplemental analysis would be undertaken as needed.

Donor eelgrass for transplanting would be derived from pre-approved eelgrass donor beds. These would be primarily selected based on factors related to the proximity, suitability, accessibility, and recovery potential for the donor site. In addition, the diversity of environments represented by the donor sites would be considered in order to maximize genetic diversity of plant materials. In order to prevent any adverse impacts to the donor beds, no more than 10% of the eelgrass within any donor bed would be harvested; this would allow the beds to recover quickly. Bare-root eelgrass plant material would be salvaged from the donor bed by "raking" rhizomes out of the surface sediment layers. Anchored, bare-root transplant units would be the principal transplant technique used, although other methods may be investigated. Planting would be conducted using divers working on a defined planting grid with temporary bounding lines to control planting areas.

6.3.4 Recommended Plan Quantity of Materials, Transportation, and Staging Area

Table 6-5 shows approximate quantities of materials needed for the Recommended Plan.

Table 6-5: Quantity of Materials

Quantity of Materials				
Measure	**Material Type**	**Approximate Quantity**	**Unit**	**Representative Size**
Open Water Reefs	Armor Stone	183,000	tons	10 tons
Nearshore Reefs	Armor Stone	176,000	tons	1 - 10 tons
	Filter Stone	55,000	tons	~ 1 ton
	Core Stone	134,000	tons	~ 10 - 1000 lbs
Kelp Beds	Core Stone	132,000	tons	500 lbs
Eelgrass Beds	Sand	100,000	yd^3	0.2 mm

Quarry stone would likely be sourced and transported from either the Catalina Quarry (a.k.a. Pebbly Beach Quarry; primary quarry site) or from a secondary quarry site, 3M Quarry, located in Corona, Riverside County, California. The Catalina Island quarries have direct marine access for the loading of reef- building materials, there would be no need for truck hauling over public highways. The quarries are located approximately 200 yards to a quarter of one mile from the loading docks; thus, a minimal amount of trucking would be required at the quarry. Based on estimates from the construction of the Wheeler North Reef, each dump truck should hold 22 tons of quarry rock (Resource Insights, 1999). Quarry rock would be loaded onto flat-deck barges with cranes (supply barges) and front-end loaders. Tug boats would tow (one at a time or two in tandem) the flat-deck barges approximately 25 nautical miles to the project site. Two different sizes of supply barges can be used; the smaller barges can carry 2,500 tons of rock, and the larger barges can carry 4,000 tons of rock. An estimated time of 3.5 hours would be required to deliver the barges to the project site (based on an estimated average speed of 8.1 knots [9.3 miles per hour]).

The quarried stone would remain stockpiled on the transportation barges until ready to use for construction. Existing mooring locations within the Port of Long Beach would be utilized. An additional Staging and Storage area, shown in Figure 6-8 would be used for equipment and other material staging and storage, as well as a departure point for the contractor. This 2.4-acre location has approximately 600 feet of water access, adequately sized to support construction of the Recommended Plan.

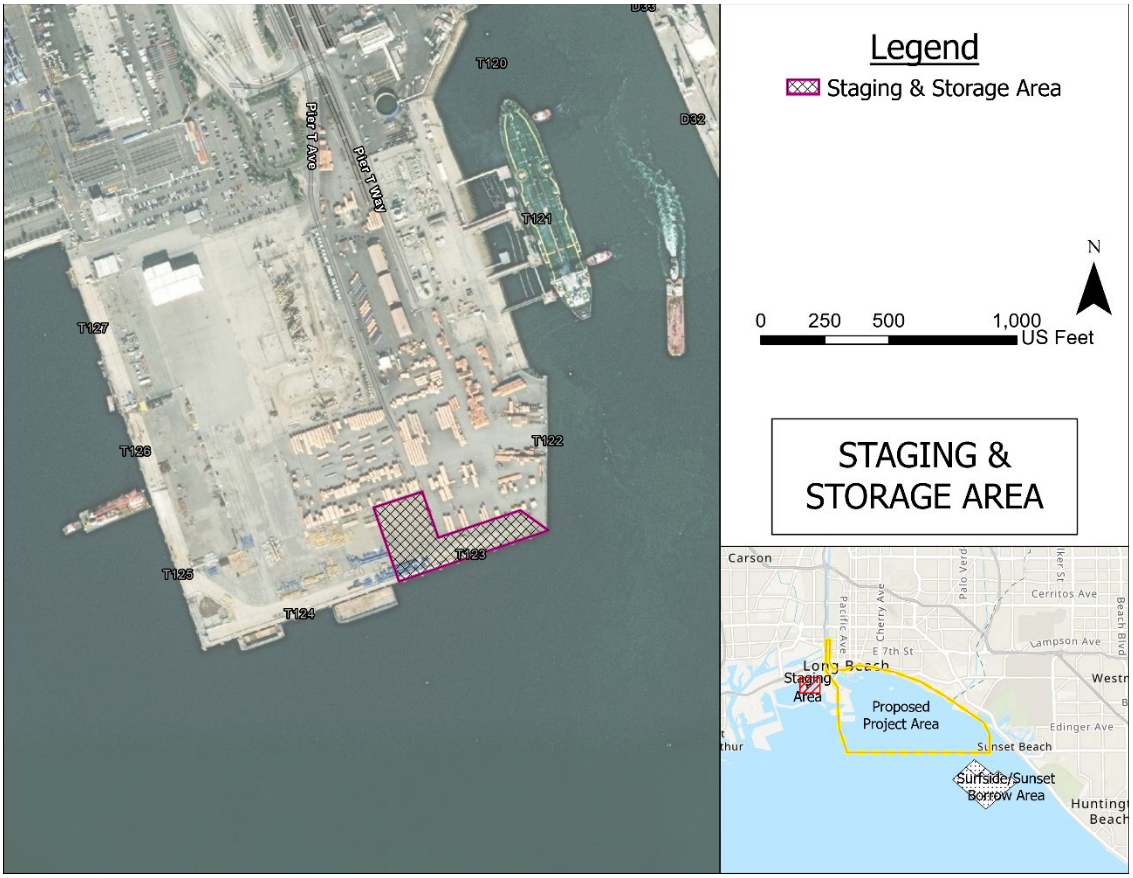

Figure 6-8: Proposed Staging and Storage Area at Pier T

6.4 PRE- AND POST-CONSTRUCTION CONSIDERATIONS

This section highlights the pre-construction and post-construction activities of the Recommended Plan. Prior to construction, real estate rights must be acquired before construction could begin. Active construction is expected to take about 96 months, over a period of 12.5 years. This timeframe is due to blackouts from the Olympics (estimated from September 2027 – April 2029), and November – March winter conditions each year, and to the need for an estimated seven contracts, limited in part due to availability of stone material year-to-year. When construction is complete, the USACE must continue to monitor and adaptively manage the restoration features until performance objectives are met. As construction of each functional portion of the project is completed, the non-Federal sponsor begins OMRR&R.

6.4.1 Lands, Easements, Rights of Way, Relocations, and Disposal Sites Considerations

The requirements for Lands, Easements, Rights-of-Way, Relocations and Disposal Sites (LERRD) are necessary to support construction, operation, and maintenance for the proposed project. Prior to awarding the construction contract, it is the responsibility of the non-Federal sponsor to have acquired all temporary and permanent real estate interests required for the project. Restoration features would be constructed in submerged lands (water areas), jurisdictionally within the City of Long Beach. During construction, a temporary staging area will be needed. A proposed staging area has been identified, located at Pier "T" within the Port of Long Beach. Borrow will be required, proposed to come from the established Surfside/Sunset borrow area. The borrow site is within submerged lands under the jurisdiction of the CSLC. The non-Federal sponsor will be required to obtain temporary rights to utilize the borrow site.

Several underwater utilities are within the proposed Project Area. These are primarily subsea oil and gas lines connecting service for the THUMS oil islands, operated by the THUMS Long Beach Company. As part of the plan formulation process, one of the planning considerations was, *"Consideration 1: Minimize impacts to known major utilities or navigation channels and anchorages."* As a result, measures were located to avoid impacts to known major utility corridors. No utilities or facilities are anticipated to be affected by the Recommended Plan construction, operation, or maintenance.

No project construction activities shall occur within 50 meters of the potential historic properties within the proposed Project Area as noted in Appendix K.

6.4.2 Environmental Commitments of the Recommended Plan

AQ-1 Diesel engine idle time would be restricted to no more than ten minutes duration.

AQ-2 Idling of heavy-duty diesel trucks during loading and unloading shall be limited to five minutes; auxiliary power units should be used whenever possible.

AQ-3 All on-road construction vehicles would meet all applicable California on-road emission standards and would be licensed in the State of California.

AQ-4 Activities and operations on unpaved road areas would be minimized to the extent feasible during high wind events to minimize dust.

AQ-5 Vehicle speeds shall be limited to 15 miles per hour on unpaved surfaces.

AQ-6 Dredging equipment utilized during construction and maintenance will be licensed in California and will meet the model year 2010 (Tier 4 Final) or newer emissions standards for sand dredging operations.

AQ-7 Diesel catalytic converters, diesel oxidation catalysts, and diesel particulate filters as certified and/or verified by the USEPA or CARB shall be installed on equipment operating onsite.

AQ-8 Keep roadways next to the proposed staging area clean and frequently remove daily project-related accumulated silt and debris.

AQ-9 Maintain all equipment as recommended by manufacturers' manuals.

AQ-10 Shut-down any equipment not in use for more than 30 minutes.

AQ-11 Substitute electric equipment whenever possible for diesel- or gasoline-powered equipment.

AQ-12 If equipment is operating on soils that cling to wheels, use a "grizzly" or other such device using rails, pipes, or grates to dislodge mud, dirt, and debris from the tires and undercarriage of vehicles on the road exiting the staging area, immediately before the pavement in order to remove most of the soil from vehicle tires.

AQ-13 Contractors will be required to use only heavy-duty trucks or engines from model year 2010 or newer that meet CARB's 2010 engine emission standards of 0.01 g/bhp-hr for particulate matter (PM) and 0.20 g/bhp-hr of NOx emissions.

AQ-14 Contractors will be required to maintain records of all heavy-duty trucks associated with the project's construction. These records will be kept current and will be made available to the USACE at any time requested within 7 calendar days of request. Additionally, contractors will be required to provide monthly reports of all heavy-duty trucks associated with the project's construction to the USACE along with any requested records of heavy-duty trucks associated with the project's construction within 7 calendar days of request and these records will be reviewed to the maximum extent feasible and practicable.

AV-1 Prior to initiating construction and staging activities, property owners and other persons in potentially affected areas would receive notice of the construction activities, including information on timing and duration. This notice would help inform viewers of the proposed ecological restoration and point out that proposed eelgrass, kelp, and associated rocky reef restoration would be underwater features not visible from the shoreline.

CR-1- No project construction activities shall occur within the avoidance areas included in Appendix K without reconsulting with the SHPO and Indian Tribes in accordance with Section 106 of the NHPA.

CR-2- Prior to the issuance of a notice to proceed for construction, the USACE shall provide a map of the final project enhancement feature locations to the SHPO to demonstrate that all the potential historic features have been avoided.

CR-3- In the event human remains are discovered, all ground-disturbing activities shall be halted immediately within the area of the discovery, and a USACE archaeologist and the Los Angeles County Coroner must be notified. The coroner will determine whether the remains are of forensic interest. If human remains, funerary objects, sacred objects, or items of cultural patrimony are located on Federal or Tribal lands, the treatment and disposition of such remains will be carried out in compliance with the Native American Graves Protection and Repatriation Act (Public Law 101-601; 25 U.S.C. 3001 et seq.) and EP 1130-2-540, Chapter 6. If human remains are located on state or private lands, the USACE shall follow the steps outlined in 36 CFR 800.13, post review discoveries and shall notify the City of Long Beach who shall ensure that the process outlined in California Public Resources Code, Section 5097.98 are carried out.

CR-4- If previously unknown cultural resources are discovered during the project, all ground-disturbing activities shall immediately cease within fifty meters of the discovery until the USACE has met the requirement of 36 CFR 800.13 regarding post-review discoveries. Work shall not resume in the area surrounding the potential historic property until USACE re-authorizes project construction.

ENG-1 During placement of all restoration measures, project limits will be established by GPS coordinates and marked by buoys in-place before the start of construction.

GEO-1 The USACE will coordinate with NOAA and the U.S. Coast Guard to update marine navigation maps after construction is completed.

GEO-2 The USACE (and the non-Federal sponsor, the City of Long Beach) will beneficially reuse dredge material from other navigation projects to the maximum extent practicable. The possibility of utilizing dredged material from other navigation projects (*e.g.*, the Port of Long Beach Deep Draft Navigation Project) will be evaluated during the pre-construction engineering and design (PED) phase and a decision made based on sediment quality and the timing of construction for any such projects. No specific projects have been identified that match construction timing and include results from sediment analyses that show compatibility of dredged sediments to ESPB requirements. If beneficial use sites become available, the USACE would consider a supplemental analysis.

GEO-3 The USACE will conduct detailed bathymetric surveys during the PED phase. Information from these surveys will guide identification of areas to avoid such as areas with natural cobbles and boulders.

GEO-4 Prior to construction, the USACE will perform sediment sampling and analysis to confirm the suitability of dredged material from the Surfside/Sunset borrow area for the establishment of eelgrass beds leeward of the proposed nearshore rocky reefs.

INV-1 Pursuant to the *Caulerpa* Control Protocol established by NMFS and California Department of Fish and Wildlife (CDFW), prior to construction activities that would be expected to disturb *Caulerpa spp.* should it exist within the proposed Project Area, a surveillance level survey of the Area of Potential Effects (APE) will be performed. In *Caulerp*a-free habitats, this requires 20 percent of the APE to be surveyed for the presence of *Caulerpa spp.*. In the event *Caulerpa spp.* is found, disturbing activities would be delayed until the infestation is isolated, treated, or the risk of spread is eliminated, and sightings would be reported immediately to CDFW and NMFS. Construction shall not begin until cleared to do so by the NMFS.

MH-1 A pre-construction survey would be performed to document eelgrass extent in the areas of nearshore reef placement. If eelgrass is present or was previously present at a site according to Merkel *et al*. (2017), alternative locations of rocky reef and sand placement a minimum distance of 50 feet beyond the margin of existing and previously existing eelgrass habitat will be established during the detailed design phase as well as during construction to avoid impacts to all existing or previously existing eelgrass habitat. Per the NMFS's California Eelgrass Mitigation Plan (NMFS, 2014), eelgrass is defined "…as areas of vegetated eelgrass cover (any eelgrass within 1 m^2 quadrat and within 1 m of another shoot) bounded by a 5 m wide perimeter of unvegetated area. Unvegetated areas may have eelgrass shoots a distance greater than 1 m from another shoot and may be internal as well as external to areas of vegetated cover."

MH-2 During the creation of eelgrass habitats, no more than 10 percent of the plants from eelgrass donor beds would be harvested to minimize potential impacts to existing eelgrass beds.

NO-1 Construction contractors would be required to use only construction equipment that has noise-reduction features, such as mufflers.

NO-2 Construction contractors would be required to comply with the City of Long Beach Municipal Code, Chapter 8, Section 8.80.202 and City of Seal Beach Noise Ordinance Chapter 7.45.

PH-1 Coordination between the USACE and the City of Long Beach would occur to ensure that recreational and commercial users within the project area are aware of construction equipment at the start and termination of activities to minimize any potential hazards related to construction equipment and activities.

PH-2 Publication of advance notice in the U.S. Coast Guard Local Notice to Mariners as another form of public information resulting in enhanced recreation as well as safety notification.

PH-3 All Federal, State, and local regulations regarding the use, transport, and disposal of hazardous materials would be adhered to during construction activities. Human health and safety impacts would be avoided through adherence to these procedures, conditions, and regulations.

RC-1 During the pre-construction engineering and design (PED) phase, USACE will meet with boating stakeholders to identify practicable design refinements that reduce and minimize impacts to recreational boating while still meeting project objectives and avoids violating project constraints.

SP-1 Potential adverse impacts to existing marine habitats would be minimized by selection of dredging equipment and methods, turbidity control measures for dredging and disposal operations, and monitoring protocols outlined in the Los Angeles Contaminated Sediments Task Force Long-Term Management Strategy (2005) and the Los Angeles Regional Dredged Material Management Plan (2009).

SP-2 An Environmental Protection Plan would be implemented, including a Green Sea Turtle Monitoring and Avoidance Plan, Marine Mammal Monitoring and Avoidance Plan, and employee training. Monitoring plans shall be prepared by a qualified marine biologist. The plans would include the following:

- Procedures for monitoring marine mammals and sea turtles, and specifications for Marine Wildlife Observers.
- Methods for communicating with contractors to stop work if there is a risk that any marine mammals or sea turtles active in the area may move closer to construction sites.
- Procedures for Marine Wildlife Observer monitoring of barge transport, if necessary.
- Contractor personnel training
- Reporting procedures including in the event of potential take
- Methods for communicating with ship captains if there is a risk of collision with a marine mammal or sea turtle.

SP-3 The following measures will be implemented to avoid or minimize impacts to the Federally-listed threatened East Pacific distinct population segment (DPS) of Green Sea Turtle and marine mammals protected under the Marine Mammal Protection Act**.**

- The USACE will utilize a clamshell dredge for all dredging associated with the East San Pedro Bay Ecosystem Restoration Project because this type of equipment has been determined to be well suited based on the quantity and the location of the work.
- Dredging is expected to occur on a 24-hour per day basis. The USACE will attempt to sequence dredging activities during winter months (November – March 31) when Green Sea Turtles (*Chelonia mydas*) (GST) are generally expected to be located within the warm waters of the San Gabriel River adjacent to and downstream of power plants (Crear *et al*., 2016). However, due to the exposure of the work area to open ocean wave conditions, adverse wave and inclement weather may preclude safe working conditions during winter months, necessitating that dredging activities extend into the non-winter months.
- When dredging and nearshore placement operations occur, a qualified biologist with experience monitoring GSTs and marine mammals will be on site to monitor for the presence of GSTs and marine mammals. The monitor will have the authority to cease or alter operations to avoid impacts to GSTs and marine mammals.
- Adequate lighting will be provided during nighttime operations to allow the monitor to observe the surrounding area effectively.
- During dredging and placement operations, the USACE will designate 30-meter monitoring zones around both the dredge site and nearshore placement sites.
- All vessels associated with the project will not exceed eight (8) knots inside the breakwater.
- Daily visual monitoring within the designated 30-meter monitoring zones will commence prior to the start of in-water construction activities and after each construction work break of more than 30 minutes.
- If a GST is observed within the vicinity of the project site during project operations, all appropriate precautions shall be implemented to avoid or minimize unintended impacts. These precautions include, but are not limited to:
  - Cessation of operation of any moving equipment that is observed within 30 meters of a GST.
  - Immediate cessation of operation of any mechanical dredging equipment if a GST is observed within 30 meters of the equipment.

  - o Operations may not resume until the GST has departed the monitoring zone by its own accord or has not been observed for a 15-minute period of time.
- Biological monitors will maintain a written log of all GST and marine mammal observations during project operations. This observation log will be provided to the USACE and NMFS as an attachment to the post-construction report for the project. Each observation log will contain the following information:
  1. Observer name and title;
  2. Type of construction activity (maintenance dredging, etc.);
  3. Date and time animal first observed (for each observation);
  4. Date and time observation ended (for each observation). An observation will terminate if (1) an animal is observed exiting the monitoring zone or (2) after a 15-minute period of no observation (assumption is that animal has exited, but was not observed to do so);
  5. Location of monitor (latitude/longitude), direction of animal in relation to the monitor, and estimated distance (in meters) of animal to the monitor;
  6. Nature and duration of equipment shutdown.
- Any observations involving the potential “take” of GSTs or marine mammals will be reported to the USACE within 10 minutes of the incident and to the NMFS stranding coordinator immediately.
- The USACE and its contractors will inform all personnel associated with the construction work of the potential presence of GSTs and marine mammals and the requirement to monitor a 30-meter designated monitoring zone around all in-water equipment and vessels to avoid interactions with, or “take” of GSTs and marine mammals. Prior to the commencement of on-site construction work, all contractor personnel (including sub-contractor personnel) will be trained by a USACE biologist (or qualified biologist approved by the USACE) on GST and marine mammal identification and observation protocols to be followed in the event that GSTs or marine mammals are sighted. All construction personnel are responsible for observing and reporting the presence of GSTs and marine mammals during all water-related construction activities.
- The contractor will implement an Environmental Protection Plan that will include a GST and Marine Mammal Monitoring and Avoidance Plan and an employee training program on GST and marine mammal observation protocols, avoidance, and minimization measures.

TT-1 The contractor shall mark all associated marine equipment in accordance with U.S. Coast Guard regulations. The contractor must contact the U.S. Coast Guard two weeks prior to the commencement of construction. The following information shall be provided: the size and type of equipment to be used, names and radio call signs for all working vessels, telephone number for on-site contact with the project engineer, the schedule for completing the project, and any hazards to navigation. The contractor shall move equipment upon request by the U.S. Coast Guard and Harbor patrol law enforcement and rescue vessels.

TT-2 If the inland 3M Quarry in Corona is used, truck traffic would be scheduled during off-peak travel hours to the extent practicable in order to reduce potential traffic impacts from transporting quarry stone over public roadways.

TT-3 If the inland 3M Quarry in Corona is used, individual truck trips from 3M Quarry will be staggered, and trucks assigned to multiple routes instead of one in order to minimize truck travel on public roadways.

TT-4 If the inland 3M Quarry in Corona is used, trucks hauling stone will be covered.

TT-5 A Caltrans transportation permit will be pursued should oversized-transport vehicles be required to travel on State highways.

TT-6 If the inland 3M Quarry in Corona is used, a construction traffic management plan detailing expected delays on State facilities will be developed for Caltrans review.

TT-7 Every attempt will be made to reduce Vehicle Miles of Travel (VMT) from construction trips.

UT-1 Coordination between the USACE and the City of Long Beach public safety agencies would occur prior to and during the construction period.

UT-2 Mapping of underwater utilities would be used to plan the location of rocky reefs to avoid utilities and pipelines.

WQ-1 Water quality monitoring will be conducted during dredging or any activities that would result in turbidity plumes. Monitoring parameters will include percent light transmissivity, dissolved oxygen, water temperature, salinity, and pH.

WQ-2 For dredging activities, standard water quality monitoring would be conducted during construction. This consists of weekly monitoring of water quality parameters (salinity, pH, dissolved oxygen, temperature, and percent light transmissivity) with an instrument package at four stations. The four stations are sited relative to the dredge and will be 100 feet upcurrent of the dredge, 100 feet downcurrent of the dredge, 300 feet downcurrent of the dredge, and a control station located outside of any dredge plume. Twice monthly water samples will be taken from the station 300 feet downcurrent of the dredge for analysis of total suspended solids and TRPH. Similar monitoring would be conducted at the sandy island site during sediment placement activities at that location.

WQ-3 USACE Engineering Manual EM-1110-2-2302 provides minimal stone quality requirements. Guidance from this manual will be followed. Quarry materials will also meet the following:

- The materials shall be clean and free of any contaminants, especially those that could dissolve in seawater (e.g., asphalt, paint, oil, or oil stains).
- All stone used for the project must follow:
  - Purity: The materials shall be free of contamination and foreign materials.
  - Specific gravity: Shall be greater than 2.2.
  - Durability: Rocks used must remain unchanged after 30 years of submersion in seawater.

WQ-4 During construction and operation activities, all local, state and Federal regulations would be complied with regarding to the transportation, handling, and storage of hazardous substances.

WQ-5 At each work area involving the operation of heavy equipment and handling and storage of hazardous substances, a Hazardous Material Spill Prevention Plan would be prepared. The Hazardous Material Spill Prevention Plan shall contain contingency plans in the event of an accidental release into the environment.

6.4.3 Monitoring and Adaptive Management

After the project is built, a monitoring program is required post-construction to determine if the project outcomes are consistent with original project objectives. Monitoring must be closely integrated with adaptive management components because it is the key to the evaluation of project objectives and adaptive management needs. This program is outlined within the Monitoring and Adaptive Management Plan (MAMP), in Appendix F. The MAMP identifies and describes the monitoring and adaptive management activities proposed and estimates the costs and durations for the Recommended Plan. The general purpose of the MAMP is to provide a systematic approach for improving resource management outcomes and a structured process for recommending decisions, with an emphasis on uncertainty about resources response to management actions and the value of reducing that uncertainty to improve management.

More specifically, this MAMP establishes:

- a framework for effective monitoring, assessment of monitoring data, and establishment of project performance standards in the areas of habitat restoration;
- a process for decision-making related to implementation of adaptive management activities in the Study Area;
- suggested adaptive management actions if the monitoring demonstrates that restoration measures are not achieving established performance standards in the Study Area; and
- estimated cost and duration of monitoring and adaptive management measures.

This plan will be reviewed and revised as needed during PED as specific design details are made available. It will adhere to guidelines provided in The Application of Adaptive Management to ecosystem restoration projects, technical notes provided by the USACE Research and Development Center (Fischenich and Vogt 2012).

6.4.3.1 Monitoring Period

Upon completion of construction of each phase or feature of the project, cost-shared monitoring for ecological success and adaptive management will be initiated and will continue for a period of up to 10 years, depending on the restoration measure, until restoration success is achieved. Although WRDA 2016 allows for up to ten years of cost-shared monitoring when necessary, this plan anticipates that five years of monitoring and adaptive management would be required for successful establishment of aquatic habitats and abatement and control of non-native species. However, once the USACE determines that ecological success for a measure has been fully achieved, even if this occurs in less than five years, no further monitoring will be performed. If the performance criteria are not met within the ten-year period of cost-shared monitoring allowed by law, any additional monitoring and management will be a non-Federal sponsor responsibility. The general monitoring identified under the MAMP for each habitat type is summarized below. Adaptive management actions are identified in Appendix F.

Kelp Beds: Under the MAMP, kelp reefs would be monitored quarterly during the performance period using true-color or multi-spectral aerial imagery taken from a small plane or drone. The images would be used to delineate and digitize the specific locations of the kelp and to measure both total lateral area (i.e., surface area of the water) that is covered by kelp and surface canopy density. Quarterly images would be used to capture seasonal maximums as well as variability during the year that may be due to project activities, disturbances, and/or seasonal variation. A reference reef would also be imaged and measured during each monitoring period. The reference site would be an existing kelp bed along the Long Beach Breakwater. In addition to the quantitative monitoring, biological communities and reef production would be qualitatively monitored during Years 3 and 5 by underwater survey.

Open Water and Nearshore Rocky Reef: Under the MAMP, the nearshore rocky reef would be monitored during Years 1, 3, and 5 using acoustic survey (e.g., side-scan or multi-bean sonar). The surface area of rocky reef will be digitized from the images to provide estimates of total coverage. As a monitoring option, biological communities and reef production would be qualitatively monitored during Years 3 and 5 by underwater survey. In addition, underwater diver surveys of the kelp reef would be used to assess condition and inform corrective actions.

Eelgrass Beds: Under the MAMP, the eelgrass beds would be monitored annually using a combination of field survey and visual or acoustic remote sensing methods (e.g., aerial imagery or side-scan sonar) consistent with the California Eelgrass Mitigation Policy and Implementing Guidelines (National Marine Fisheries Service 2014). Monitoring will be conducted during the peak growing period for eelgrass, which is typically March through October for southern California. A reference population of established eelgrass within the nearshore zone of the Study Area will also be imaged and measured during each monitoring period.

Adaptive management actions are identified in Appendix F.

6.4.4 OMRR&R

As detailed in IFR Chapter 10, Recommendation, paragraph f, the non-Federal sponsor will "operate, maintain, repair, rehabilitate and replace the project, or functional portions of the project, including any mitigation features, except as limited by Section 1161 of the Water Resources Development Act of 2016, Public Law 114-322 (33 U.S.C. 2330a(e)), at no cost to the federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations and any specific directions prescribed by the federal government." The non-Federal sponsor will begin OMRR&R upon notice of the completed project or functional portion thereof. The non-Federal sponsor will undertake OMRR&R while the USACE undertakes monitoring for performance criteria.

Recurring, annual OMRR&R activities are not anticipated for the restoration project, with one exception. OMRR&R activities are assumed to take place periodically only for the nearshore rocky reef. Following a strong storm event, the nearshore rocky reef may require repairs if the storm event was strong enough to have displaced enough stones to justify the cost of mobilization. The USACE estimates the cost of ongoing OMRR&R to total approximately $26,750,000 over the 50-year period of analysis, annualized at $535,000. To ensure their long-term OMRR&R obligations are met as outlined in Chapter 10, Recommendation, and as part of the completion of this feasibility study report, the non-Federal sponsor will be asked to provide both a letter of support for the Recommended Plan and a "Non-Federal Sponsor's Self-Certification of Financial Capability" letter.

To comport with Section 2039 of Water Resources Development Act of 2007, as amended by section 1161 of Water Resources Development Act of 2016, and the relevant implementation guidance, structural measures are required to be maintained in perpetuity by the non-Federal sponsor, while nonstructural measures are required to be maintained only for 10 years after the determination of ecological success.

Habitat-specific OMRR&R assumptions and activities are outlined below.

Kelp Beds: These are structural measures and therefore are required to be maintained by the non-Federal sponsor in perpetuity. However, for kelp beds, no OMRR&R is expected as they're a deeply submerged habitat. Burial by natural sediments is not expected due to the exposed wave climate that will limit the buildup of additional fine grain sediment. Increases in beach grooming is expected due to the quantity of kelp that may become dislodged from the substrate and wash up along the shoreline.

Open Water Rocky Reef: These are structural measures and therefore are required to be maintained by the non-Federal sponsor in perpetuity. However, for open water rocky reefs, no OMRR&R is expected as they're a deeply submerged habitat. Deeply submerged open water reefs will not experience any maintenance cost due to the large armor stone size required for sufficient large void spaces and stability.

Nearshore Rocky Reef: These are structural measures and therefore are required to be maintained by the non-Federal sponsor in perpetuity. Some OMRR&R is required to maintain the design condition.

Based on experience with other rubble-mound structures, it is estimated that 0.5% of the total cost per year would be required to maintain the structure. Typically, maintenance activities would be conducted every 10 years or after a strong storm event that has displaced enough stones to justify the cost of mobilization.

Eelgrass Beds: These are non-structural measures. No OMRR&R for eelgrass beds is expected.

6.4.5 Sustainability of Project Features

As noted in Section 6.1.5 Sustainability considerations, the Recommended Plan was developed with layers of sustainability and long-term climate resilience considerations built in. Most project features are designed as self-sustaining habitat structures without any operations and maintenance requirements, as noted in Section 6.4.3, OMRR&R. The habitat structures can be adapted to fully function even with anticipated climate change scenarios such as sea level changes and increased storm activity. The layout of habitat features took into consideration species colonization, as consistent colonization events were necessary for the restoration of habitats distributed across opportunity zones within ESPB, which will aide in sustainability of the project as a whole.

Habitat-specific features integrated in the plan formulation process are described below with text adapted from Section 4.5 Preliminary Array of Alternatives, siting and design considerations sub-sections 4.5.2 Alternative 2 and 4.5.3 Alternative 4A. SLC projections per ER 1100-2-8162 are also noted where appropriate.

There are two timescales that need to be considered when looking at effects of climate change; short-term and long-term. SLC, rising ocean and atmospheric temperatures are considered long-term effects. These forcings will increase over time and continually stress the habitats. Short-term effects, such as increases in local storm intensity and frequency, act over short time scales.

Due to the relative short particle duration within the bay, freshwater flows and their associated short-term changes are not expected to influence the habitats in the recommended plan. For example, modeling suggests that background levels of salinity and suspended sediments are expected to return within 1 – 2 days, as shown in Figure 4.24 and 4.25 in Appendix A-1. This brief departure from background levels of salinity and suspended sediments is not expected to be detrimental to the target habitats.

Potential climate change risks to the Recommended Plan are identified and qualitatively assessed in the Table below, per Engineering and Construction Bulletin (ECB) 2018-14 Guidance for Incorporating Climate Change Impacts to Inland Hydrology In Civil Works Studies, Designs and Project. Following the Table, short-term and long-term potential climate change risks to each habitat type are summarized.

Table 6-6 Potential Climate Change Risks

Habitat Type	Risk to Potential Climate Change						
	Sea Level Change	Ocean Temperatures	Atmospheric Temperatures	Extreme Storms			
				Frequency (Ocean)	Frequency (Local)	Intensity (Local)	Drought
Eelgrass	Medium	Medium	Low	High	Medium	Medium	Low
Nearshore Reef	Low	Low	Low	Low	Low	Low	Low
Open Water Reef	Low	Low	Low	Low	Low	Low	Low
Kelp	Low	Medium	Low	High	Medium	Low	Low

Potential Climate Change Risks (Long-Term)

- Sea Level Change - Higher water levels would cause eelgrass to migrate to keep optimal depth. The receding shoreline would allow this as long as the shoreline is not hardened and fixed. Higher water levels may make nearshore rocky reefs less efficient at breaking waves and protecting eelgrass. There would be little impact from sea level changes on open water rocky reef and kelp beds.
- Ocean Temperatures - Increasing temperatures may cause slower growth of eelgrass and kelp. There would be little impact to nearshore and open water rocky reef from changes in temperature.
- Atmospheric Temperatures – There would be little impact to any of the Recommended Plan habitat. The ocean provides a buffer to the habitats.

Potential Extreme Storm Risks (Short-Term)

- Frequency (Ocean) - Distantly generated storm events are expected to increase in frequency but due to the sheltering effects of the SCB, intensity of these events is not expected to increase. More wave events per year would reduce the time the eelgrass and kelp habitat has to regrow and rebound from previous disturbances. There would be little impact to rocky reef from extreme storm events. Higher frequency of extreme storm events does not increase the intensity which is expected to remain similar due to sheltering effects of the SCB.
- Frequency (Local)/Intensity (Local) - Local storm events, generated by atmospheric conditions near the Study Area are expected to increase in frequency and intensity. This increase includes precipitation, wind and pressure effects. Increases in sedimentation from the Los Angeles and San Gabriel Rivers may be experienced due to more frequent and intense storm events, which may be detrimental to growth of eelgrass beds. However, due to channelization of the upper watershed, this risk is minimal and sediment loading will remain similar to that of today. There would be little impact from freshwater flows to nearshore and open water rocky reefs due in part to their proximity away from the river mouths. Sediment loading may cause temporary covering of nearshore rocky reefs but natural wave processes will aid in uncovering the rocks after an event. Sediment loading is expected to be less of a problem for kelp beds than for eelgrass beds due to open water locations away from river mouths.
- Drought - Aside from the increasing intensity and frequency of local storm events. Long term cycles may limit the amount of precipitation between extreme events leading to longer periods of drought currently experienced. This factor will allow a greater number of wildfires within Southern California. Sediment from wildfire areas may alter the sediment chemistry which may potentially impact eelgrass. However, short residence times will limit the effects. Since the project area watersheds are highly urbanized, this a low risk. There would be little impacts to rocky reefs and kelp beds.

Kelp Beds

To address FWOP considerations of potential kelp die-off, and to increase kelp resiliency within the SCB and Study Area, the PDT identified kelp restoration locations. Placement of kelp is designed to maximize the optimal conditions kelp need to grow and regenerate. To grow and regenerate, kelp requires appropriate light, temperature, and rocky substrate for the anchoring of its holdfast. Specifically, these locations allow kelp to take advantage of beneficial and nutrient rich cold-water currents that giant kelp need to thrive. Locating kelp at the outer edge of the influence of the breakwater ensures unimpeded access to cold-water currents and is expected to maximize kelp forest survival and health.

Twenty-four (24) approximately 5-acre kelp beds totaling approximately 121 acres are included in the Recommended Plan. To increase the probability that kelp would have the greatest chance for passive recruitment within the project area and be sustainable, multiple 5-acre patches (nodes) of kelp were designed to be placed along the outside of the breakwater and extended into the unprotected waters of the bay where cool, nutrient-rich waters are expected to enter the bay. Presence of these kelp beds in the vicinity of the breakwater ensure that a constant input of kelp propagules are available to the restored habitat in ESPB and should aid in the recovery of the habitat during times of greater environmental stress. "Research has shown that marine systems with greater connectivity tend to more easily recover than systems with less (Geist and Hawkins 2016), thus connectivity of habitat plays a key role in marine restoration success (Thrush et al., 2013)." Kelp beds located adjacent to the breakwater provide immediate access to kelp propagules, while the kelp beds located between the breakwater and the Alamitos Bay Jetties provide connectivity to habitats further within ESPB. These locations are also deep enough to avoid fluctuations in sedimentation that could otherwise cover up the rock and impact kelp.

The kelp beds are placed in two mega-groupings of approximately 60 acres each. Mega-groupings of individual kelp beds also strengthen the synergies between each bed (5-acre circle) and between existing kelp on the breakwater. Together, these beds are expected to improve the long-term resilience of kelp in the Study Area. The bed locations have been optimized outside of the breakwater, away from the mouth of the Los Angeles and San Gabriel Rivers. Their locations ensure the kelp is minimally impacted by pollutants that may flow from the river mouths into ESPB. Placing kelp beds out beyond the breakwater provides connectivity between breakwater kelp and rocky reef with the nearshore subtidal zone rocky reef and eelgrass shoals.

The kelp beds overall impact on port operations are minimal and have been located to avoid existing anchorages. However, there is a chance that navigation can impact kelp as vessels would travel through kelp beds and potentially damage it at the surface. The depth within the proposed Project Area where kelp is sited should be sufficient to allow the majority of the kelp stipe to remain intact should it be impacted by vessels. Additionally, kelp grows quickly and if established and healthy it would be expected to grow back fairly rapidly. Also, with kelp being established throughout kelp restoration sites, plentiful kelp propagules would be expected during the reproductive period to reestablish kelp that are impacted.

Kelp reefs will not be affected by sea level rise.

Open Water Rocky Reef

The greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that increased sedimentation due to more frequent storm events as a result of Global Climate Change is expected to fill in rocky reef voids where species live. Turbidity associated with storm events would affect water quality (e.g., available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them. In response to these potential environmental stressors, open water rocky reefs were formulated to be located inside the breakwater in order to reduce potential exposure to sedimentation. Inside the breakwater, it is expected that the open water rocky reefs would be sheltered to some degree from wave action and that this would reduce the amount of sedimentation and turbidity associated with storm activity. The channelization of the upper watersheds feeding the San Gabriel and Los Angeles Rivers would limit the sedimentation within the bay to a level similar to the present.

In addition, the restoration of approximately 121 acres of kelp reef (kelp/rock complexes) to the east of the Long Beach breakwater and throughout ESPB is expected to afford an additional level of protection for open water rocky reef. These kelp complexes are expected to reduce the amount sedimentation and turbidity that generally follow storm events. This synergy between environments that is expected to increase the sustainability of restored habitats was described as "a mosaic of habitats provides greater functional diversity, which is linked to long-term stability, as multiple functional traits (built in redundancies) increase the resilience of marine systems in the face of environmental changes (Montoya et al., 2012). There is an unmeasured benefit or synergy that occurs when the diversity of habitats in proximity are restored, particularly for habitats that would naturally co-occur (Liversage, 2020). This is particularly important in highly altered environments, such as SPB (Milbrandt et al., 2015)." In addition, properly designed rocky reefs may aid in storm protection and the reduction of shoreline erosion within the Study Area (Foster and Schiel, 1985; Koehl and Alberte, 1988; Larkum et al., 2006).

Regarding fishing pressure, several measures have been put into place by the CDFW along with various state and federal agencies to reduce the impact of fishing on biological communities along the California coastline. These practices include, but are not limited to, Marine Protected Areas (MPAs), size limits, quotas, seasonal windows, licensing, fines associated with violating fishing statutes, etc. It is expected that these measures will still be utilized over the period of analysis for ESPB and that they will also be modified into the future as additional data pertaining to catch rates, species abundances, species richness, etc. are further investigated.

The overall impact of rocky reefs on port operations are expected to be minimal. The reefs are located to avoid existing anchorages. Higher reefs will be placed furthest away from any marine navigation (commercial and recreational) as possible. The highest crest elevation will be set no more than -15 ft. MLLW. A medium stone weight of 10 tons will provide for sufficient stability. As noted in Appendix A Coastal Engineering, "there would be a small reflection from the open water reef complexes that may increase wave heights near the "D" anchorages within the project area. This reflection will be limited to no more than 15 percent of the incident wave height."

Open water reefs would not experience the same issues as the nearshore reefs relating to sea level rise. As the water level potentially rises, these measures would become more deeply submerged and would cause less of a navigation impact, since more vessels can transit directly over the reefs.

Nearshore Rocky Reef

As noted earlier, the greatest threats to rocky reef habitat are sedimentation along with turbidity and overexploitation due to fishing. Sedimentation is a threat in that increased sedimentation due to more frequent storm events as a result of Global Climate Change is expected to fill in rocky reef voids where species live. Turbidity associated with storm events would affect water quality (*e.g.*, available light for photosynthesis) and impact algae and kelp along with the organisms that depend on them. Multiple siting and design considerations address these FWOP concerns. To minimize these risks, a minimum elevation ensures projected sediment movement would not result in burying the reefs.

As nearshore rocky reefs are located closer to shoreline and in shallow water greater levels of wave action, sedimentation, and turbidity would be experienced. The key to the sustainability of nearshore rocky reefs is the restoration of 120 acres of kelp/rock complexes as described above. These complexes are expected to buffer the nearshore rocky reef and eelgrass beds from the predicted increases in storm frequency and reduce the sedimentation and turbidity associated with these environmental stressors.

As noted earlier, in addition, properly designed rocky reefs may aid in storm protection and the reduction of shoreline erosion within the Study Area.

The nearshore and open water reefs will respond differently to the increase in water level due to potential sea level rise, with the nearshore reefs being more susceptible to changes. Because the function of the nearshore reefs is to break waves and produce areas of calm for additional habitats to thrive an increase in water level would make them less effective. A specific submergence is required to break a portion of the waves while as allowing for transmission so as to not completely stop the sediment transport on the lee of the structures, so proactive measures to provide for water level increases cannot be performed during initial construction. Instead, during times of maintenance, when equipment is already mobilized, additional stone can be added to raise the height of the structures to obtain the required submergence. The relatively wide structure of 175 ft would provide a stable base for the expansion.

Eelgrass Beds

Eelgrass requires adequate light, wave energy, salinity, and substrate to grow and regenerate. Proposed locations for eelgrass restoration within the Project Area have adequate light, salinity, and substrate. These beds would provide connectivity to existing eelgrass beds west of Belmont Pier, effectively doubling span of eelgrass habitat in the bay. The presence of the 16 acres of nearshore rocky shoals (see Figure 4-14) would provide the calm, shallow conditions eelgrass requires by stabilizing the bathymetry of the nearshore environment. Without the protective rocky reef shoals, wave energy is too high for eelgrass to naturally restore and recover in great abundance. Beach compatible sediment would also be placed leeward of the rocky shoal to optimize ideal conditions and depth for eelgrass growth.

Projected increases in the frequency and intensity of storms due to climate change are expected to significantly affect the function and distribution of eelgrass beds within the San Pedro Bay as it is sensitive to increased wave energy and disturbance. The synergy provided by the interconnectedness of the mosaic of habitats including the breakwaters, kelp reefs, open water rocky reefs, and nearshore reefs are expected to buffer restored eelgrass from intense and more frequent storm events and also aid in their recovery. Co-locating nearshore rocky reef with eelgrass beds are the primary adaptation to future increased storms.

In regard to predicted increases in depth and the reduction of available light for eelgrass due to sea level rise, eelgrass beds are expected to migrate shoreward into shallower water in order to maintain appropriate depths where adequate light is available. This is expected to offset the effects of increased water depths predicted for the proposed Project Area.

6.5 PROJECT COST ESTIMATES AND BENEFITS

This section presents a summary of benefits, costs, and Federal and non-Federal sponsor responsibilities for implementing the Recommended Plan.

6.5.1 Project Costs, Benefits and Cost Apportionment

Table 6-7 provides a summary of Project First Costs, as well as average annual benefits and costs for the Recommended Plan. Investment Cost includes interest during construction, based upon a 96-month period of construction. Total annual costs include annualized investment costs plus annual OMRR&R costs and are estimated at $10.2 million. These costs were updated from the Draft IFR to reflect current cost estimates for stone material and transportation (the bulk of the construction cost), equipment, temporary staging area, PED phase planning engineering and design, construction management, monitoring and adaptive management, and a cost contingency.

Table 6-7: Economic Table for Project Costs and Benefits

Project First Cost (FY 2022 Price Levels)	
Total Project First Cost + Associated Cost	$263,701,000
LERRD – Lands & Damages	$9,703,000
Construction	$143,937,000
Monitoring and Adaptive Management	$5,870,000
Planning Engineering & Design (PED)	$17,655,000
Construction Management	$9,355,000
Associated Cost – ATONs by U.S. Coast Guard	$1,290,000
Contingency	$75,891,000
Average Annual Costs & Benefits Summary (FY 2022 Price Levels, 2.25% Discount Rate 2022	
Interest during Construction	$24,659,000
Investment Cost	$288,360,000
Annualized Investment Cost	$9,665,000
OMRR&R	$535,000
Total Average Annual Cost (AAC)	$10,200,000
Average Annual Habitat Units (AAHU)	160.9
AAC/AAHU	$63,400
Zones with Restoration	3
Restored Acres	200.7
First Cost/Restored Acre	$1,313,900

As the non-Federal sponsor for the Study, the City is responsible for project implementation in partnership with the USACE. The total project first cost is just over $262 million, which would be cost-shared between the federal government (65%) and City of Long Beach (35%). Project first costs include the PED costs, construction costs of restoration features, monitoring, and adaptive management, LERRD values, and contingencies. The cost sharing requirements for the Recommended Plan are provided in Table 6-8. Project contingency estimates for construction costs were determined through the Abbreviated Risk Analysis (see Appendix B: Cost Engineering). Associated costs of $1.29 million include aids to navigation, which are fully borne by the U.S. Coast Guard, bring total construction costs to $263.7 million.

Table 6-8: Project Costs and Cost Apportionment Table

Category	TOTAL	FED (65%)	NON-FED (35%)
Construction of Restoration Features			
Construction	**143,937,000**	93,559,050	50,377,950
Monitoring and Adaptive Management	**5,870,000**	3,815,500	2,054,500
Planning Engineering & Design (PED)	**17,655,000**	11,475,750	6,179,250
Construction Management	**9,355,000**	6,080,750	3,274,250
Contingency	**75,891,000**	49,329,150	26,561,850
Sub-Total Project Construction-Only First Costs	**252,708,000**	**164,260,200**	**88,447,800**
Non-Federal Sponsor LERRDS	9,703,000		9,703,000
TOTAL PROJECT FIRST COST	**262,411,000**	**164,260,200**	**98,150,800**
Associated Costs (ATONS by U.S. Coast Guard)	1,290,000	1,290,000	
TOTAL PROJECT CONSTRUCTION COST	**263,701,000**	**165,550,200**	**98,150,800**

6.5.2 Non-Federal Sponsor's Capabilities

The non-Federal sponsor has submitted a self-certification of financial capability for the project.

6.5.3 View of Non-Federal Sponsor

The non-Federal sponsor supports this project. The letter of support can be found in Appendix N.

6.6 SUMMARY OF THE TOTAL BENEFITS OF THE RECOMMENDED PLAN

Consideration is given to the four accounts including EQ, NED, RED and OSE for a more holistic and acceptable approach to account for national, regional, and local stakeholder interests. Much of the detailed analysis for NED, RED and OSE came from Appendix C: Economic and Social Considerations. Details of EQ are derived from Chapter 5. A summary of the four accounts and their effects for the Recommended Plan are presented below.

6.6.1 National Economic Development (NED)

The Recommended Plan is anticipated to have some incidental impacts to the NED account, primarily associated with existing recreation resources and activities.

For general recreation, Appendix C, Addendum A: Incidental Recreation Impacts, summarizes qualitative recreational analysis. Depending on the type of recreation, the value increased slightly due to the inclusion of open water rocky reefs which are expected to provide enhanced environmental quality and added recreational opportunities to snorkelers, SCUBA divers, and fishers (commercial and recreational). However, analysis and public input revealed minor overall impacts to near beach water activities and more negative impact for commercial, recreational, sail boats from restoration measures within the bay. Personal watercraft is also affected. The more substantial recreation impacts would be to boating.

For general recreation and recreational boating, the estimated annual recreation value under without project conditions is about $2,398,641 million and the estimated annual recreation value under with-project conditions have been updated to new estimate of about $2,214,455 million. The reduction in the annual recreation value with the Recommended Plan is estimated at about $120,186. The reduction in value accounts for not only the negative impacts to boating but also the improvements of boating activities such as recreational fishing and recreational diving. The estimated reduction in annual recreation value provided in the Draft Report was approximately $64,000.

6.6.2 Regional Economic Development (RED)

The RED account registers changes in the distribution of regional economic activity that result from the Recommended Plan (P&G). It is closely related to the NED account but captures those economic effects that have regional, not national, implications. Regional perspectives are important to the non-Federal partners and stakeholders as it answers the question what they are getting for their money. The implementation of the Recommended Plan is also expected to positively impact the regional economy. For more detail on RED refer to Appendix C.

Table 6-9: RED Impacts from the Recommended Plan

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$263,069,669	2,524.4	$199,790,393	$171,927,801
Secondary Impact		$238,135,526	1,191.5	$83,792,933	$147,067,080
Total Impact	$263,069,669	$501,205,195	3,715.8	$283,583,326	$318,994,881
State					
Direct Impact		$265,062,914	2,613.7	$206,235,603	$174,759,943
Secondary Impact		$311,669,565	1,449.5	$106,606,357	$187,591,215
Total Impact	$265,062,914	$576,732,480	4,063.2	$312,841,961	$362,351,159
US					
Direct Impact		$266,111,754	2,880.9	$211,295,111	$175,300,436
Secondary Impact		$548,285,751	2,564.4	$172,393,350	$297,561,950
Total Impact	$266,111,754	$814,397,506	5,445.3	$383,688,461	$472,862,386
* Jobs are presented in full-time equivalence (FTE)					

In addition to construction impacts, post-construction operation and maintenance (O&M) expenses will also increase output, jobs, labor income, and added value of the local economy annually (as shown below in Table 6-10). These increases are in addition to the increases displayed in Table 6-9.

Table 6-10: RED from Operations and Maintenance Expenditures (Annual)—Recommended Plan

Area	Local Capture	Output	Jobs*	Labor Income	Value Added
Local					
Direct Impact		$513,215	4.2	$386,745	$389,922
Secondary Impact		$438,439	2.2	$157,001	$273,168
Total Impact	$513,215	$951,653	6.4	$543,746	$663,089
State					
Direct Impact		$525,805	4.4	$393,928	$397,723
Secondary Impact		$548,886	2.6	$192,613	$336,898
Total Impact	$525,805	$1,074,690	7.0	$586,541	$734,621
US					
Direct Impact		$532,426	4.8	$414,507	$401,047
Secondary Impact		$947,703	4.5	$304,589	$523,724
Total Impact	$532,426	$1,480,130	9.4	$719,096	$924,771
* Jobs are presented in full-time equivalence (FTE)					

Additionally, potential incidental shoreline stabilization benefits from the nearshore shoals have been identified but not quantified. The nearshore shoals have the potential to reduce the City's operations and maintenance expenditures by anticipated reductions in wave energy which would likely reduce shoreline erosion.

6.6.3 Environmental Quality (EQ)

Beneficial effects in the EQ account are favorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources. Adverse effects in the EQ account are unfavorable changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources and are detailed in Chapter 5. In addition to the ecosystem outputs calculated by the HEM, the NER Plan produces qualitative benefits that contribute both nationally and regionally to the EQ account. Beneficial effects associated with the NER Plan such as carbon sequestration, coastline stabilization, and improving water quality are further described below.

- Restores nationally recognized EFH and HAPC (eelgrass, rocky reef, and kelp) to the U.S. West Coast.
- Increases available habitat and forage for the federally listed Green Sea Turtle East Pacific DPS (threatened), and Western Snowy Plover (threatened) and California Least Tern (endangered), birds recognized as Birds of Conservation Concern by the USFWS, as well as abalone species identified as Species of Concern by the NMFS.
- All restored habitats support federally managed species within the Coastal Pelagics and Groundfish Fishery Management Plans (especially open water rocky reef for rockfishes).
- Restored acreage of kelp and eelgrass is expected to sequester carbon and mitigate the impact of global climate change. Restored EFH (kelp and eelgrass) acreage in the proposed Project Area has the potential to reduce approximately 760 tons of atmospheric carbon annually. Eelgrass is a key habitat of the Blue Carbon Initiative.
- Restored habitats have the potential to aid in the stabilization of the coastline within the San Pedro Bay which would result in potential lowering or removal of the protective berm which is a visual eyesore.

- Eelgrass is expected to provide regional goods and services (e.g., improving water quality) within the San Pedro Bay.
- Kelp is expected to stabilize ecological communities within the San Pedro Bay resulting in enhanced local biomass and biodiversity.
- Rocky reef and kelp are regionally recognized as important by the USFWS. "Rocky reefs and kelp beds are highly important fish habitats of the project region (e.g., the Palos Verdes Shelf) that have been reduced in most of southern California." (Appendix H).
- Increase numbers of regionally important commercial and recreationally fished species that are managed by the CDFW (e.g., California Spiny Lobster, Barred Sand Bass, Giant Sea Bass).
    - From the additional Rocky Reef Habitat alone (nearshore, open water, and kelp reef rock), there is potential for an increase of approximately over 30 million average annual fishes in the proposed Project Area with many species that are managed by the NMFS.
    - This does not consider potential increases in fishes and invertebrates associated with kelp and eelgrass habitats. It is likely that numbers of fishes and invertebrates will be much greater overall from all restored habitats.
- Enhance population connectivity throughout the SCB for regionally important fishes (e.g., Kelp Bass, Barred Sand Bass, Giant Sea Bass) and invertebrates (e.g., California Spiny Lobster).

6.6.4 Other Social Effects (OSE)

Appendix C: Economics, Addendum B presents detailed OSE analysis, which is summarized below. OSE characterizes the highly complex set of relationships and interactions between inputs and outputs of a plan within the social cultural setting of the proposed Project Area. The OSE analysis focuses on the social impact induced by plans with a focus on the Recommended Plan relative to the No Action Plan in the Study Area. Five dimensions of interest are considered including public health and safety, environmental justice, economic vitality, community cohesion, and identity/well-being.

Table 6-11: Dimensions of Interest Summary

Category	Current Level within proposed Project Area Without Project Condition	The Beneficial or Negative Effects from the Recommended Plan
Public Health	Moderate	Small Positive or No change
Environmental Justice	Moderate	Very Small Negative or No change
Economic Vitality	Moderate	Small to Moderate Positive
Community Cohesion	Moderate	Small Positive
Identity/Wellbeing	Moderate	Small Positive

- Public health: The project may result in an increase in recreation visitation for some users, which could encourage individuals who are less active to become more active in these recreational areas. However, the Recommended Plan will likely result in a decline in recreation visitation for other users (e.g., surfers and others who prefer more waves).
- Environmental justice: Many social groups are represented in the city and surrounding areas. The Recommended Plan would restore key areas along the coastline. This may benefit homeowners with real estate appreciation but could negatively impact home renters who could face higher rents. These impacts may disproportionately impact minorities or other disadvantaged groups. However, these impacts, if realized, are anticipated to be very small.
- Economic vitality: Economic vitality is strong within the Los Angeles County area. Many economic sectors are represented. The construction of the Recommended Plan would

encourage the contractors to spend money and support jobs within the County. These expenditures within the area would generate multiplicative effect of indirect and induced spending, helping the local economy.

- Community Cohesion: The sense of community is moderately facilitated by the many existing recreational facilities within the proposed Project Area. The Recommended Plan is not anticipated to have a significant impact on community cohesion in the Study Area.
- Identity/wellbeing: The many existing recreational activities available at the bay encourage youths, adults, and seniors to recreate there. These recreational facilities to support these activities may even help to reduce crime. The Recommended Plan could impact community cohesion and identity by a small amount. There are likely mixed impacts in terms of beach and near-beach based recreation, so the overall impact associated with beach recreation on these OSE factors is not anticipated to be significant.

6.7 SUMMARY OF ENVIRONMENTAL IMPACTS

Under Alternative 4A, no impacts are expected to occur to Significant Ecological Areas or Utilities and Public Services. Potential impacts of construction and maintenance of the Alternative 4A habitat restoration features, detailed in Chapter 5, are summarized below.

6.7.1 Hydrology (Coastal and Shoreline Resources)

<u>Construction Impacts:</u> Short-term, less than significant direct adverse from suspended sediments, and long-term direct and indirect beneficial impacts related to localize reduced coastal and shoreline wave heights, reduced current velocities, and reduced erosion potential. Impacts to coastal and shoreline hydrology would be **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Short-term and less impactful than construction impacts, and **less than significant.**

6.7.2 Marine Geology and Geologic Hazards

<u>Construction Impacts:</u> Habitat features would not result in significant changes to the marine geology or create geologic hazards. Use of the proposed staging would not result in changes to geology or create geologic hazards. Impacts to marine geology and geologic hazards would be **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> None.

6.7.3 Water Quality

<u>Construction Impacts:</u> Short-term localized, less than significant direct adverse impacts during construction from suspended sediments. Minor spills or leaks of hydrocarbons from construction equipment could occur; however, no long-term degradation or permanent new source of pollution. Long-term direct and indirect localized beneficial impacts expected in relation to the production of oxygen, improved water quality, absorbed nutrients, and storing of GHGs by eelgrass and kelp forests. Impacts to water quality would be **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Short-term, localized, and less than construction impacts, and **less than significant.**

6.7.4 Air Quality and Greenhouse Gases

<u>Construction Impacts:</u> Would be below General Conformity Applicability Rates (NEPA) and SCAQMD Daily Emission Thresholds (CEQA). Emissions would not substantially elevate pollutant concentrations at any sensitive receptors (CEQA), nor would they create objectionable odors affecting a substantial

number of people (CEQA). For GHGs, would not create significant emissions or conflict with applicable plans, policies or regulations (CEQA). Air quality impacts would be **less than significant for NEPA and CEQA**. GHG impacts would be **less than significant under CEQA**.

<u>Maintenance and Monitoring Impacts:</u> Would be exempt from General Conformity and no further analysis would be required for NEPA. Air quality impacts under CEQA would be less than significant. GHG impacts would be less than significant under CEQA.

6.7.5 Noise and Vibration

<u>Construction Impacts:</u> Would be in compliance with local noise ordinances, would not generate excessive groundborne vibration in exceedance of recommended thresholds, and would not generate noise impacts that exceed recommended thresholds for wildlife, and therefore, would not result in significant impacts. Dredging activities would not result in significant adverse impacts. Noise levels may cause marine mammals to avoid the area within 1,900 feet of dredging operations but would not likely have the potential to injure a marine mammal. Noise and vibration impacts would be **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Would not result in significant adverse impacts under NEPA or CEQA.

6.7.6 Biological Environment – Essential Fish Habitat

<u>Construction Impacts:</u> The USACE determined Alternative 4A would have an adverse, but not substantial adverse, effect to Essential Fish Habitat due to temporary increases in turbidity associated with construction. Impacts would be **less than significant**.

<u>Maintenance and Monitoring Impacts: Impacts</u> would be **less than significant**.

Biological Environment – Special Status Species

Short-term localized, less than significant adverse impacts to special status species from sediment suspension and turbidity during construction. Indirect impacts from noise and turbidity to Green Sea Turtles, no direct impacts expected. Environmental commitments would be incorporated to minimize potential impacts to Green Sea Turtles, as well as all other special status species. Construction and maintenance activities may affect, but would not likely adversely affect, Green Sea Turtles. No effect to California Least Tern, Federally-listed abalone species, Western Snowy Plover, loggerhead turtles, leatherback sea turtles, olive ridley sea turtles, or Federally-listed marine mammal species would occur. No direct adverse impacts to special status bird species, other sea turtles, or marine mammals. Long-term beneficial impacts to biological resources would occur from creation of 121 acres of new kelp reef habitat, creation of 16 acres of new rocky reef habitat, and creation of 25 acres of new eelgrass habitat. Any adverse impacts would be short-term and **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Temporary increases in turbidity and noise during construction could result in temporary avoidance. Impacts would be short-term and **less than significant**.

6.7.7 Biological Environment – Marine Habitat

<u>Construction Impacts:</u> Direct loss of 201.53 acres of soft bottom habitat. Offset by creation of equivalent acreage of high-value habitats. Adverse impacts to soft bottom habitat would be short-term and **less than significant**. Beneficial impacts would be long-term and **less than significant**.

- There would be no adverse impacts to coastal salt marsh.
- Impacts to eelgrass donor beds would be short-term and **less than significant**.

- Long-term beneficial impacts to eelgrass by creation of 30 acres of new habitat. Short-term and **less than significant** impacts due to temporary and short-term turbidity from construction activities. Adverse impacts to existing eelgrass habitat would be avoidable, pending updated eelgrass surveys that would be conducted during the design phase.
- Long-term beneficial impacts to kelp reefs by creation of 122 acres of new habitat. Impacts to existing kelp reefs would be short-term and **less than significant**.
- Long-term beneficial impacts by the creation of 49.2 acres of new rocky reef habitat.
- No impacts to oyster beds.
- Short-term and **less than significant** impacts from turbidity on water column habitats.
- No impacts to plankton habitat.
- No impacts to pelagic fish habitat.
- No impacts to water-associated birds.

<u>Maintenance and Monitoring Impacts:</u> No impacts to eelgrass or kelp reefs. Short-term and **less than significant** impacts from noise and turbidity to plankton, pelagic fishes, and water-associated birds.

6.7.8 Biological Environment – Invasive Species

<u>Construction Impacts:</u> The proportion of invasive species is not expected to increase as a result of construction activities. Potential impacts of the spread of invasive species would likely be short-term and **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Impacts would be short-term and **less than significant.**

6.7.9 Cultural and Historic Resources

<u>Construction Impacts:</u> A survey of a 900-acre area surrounding the proposed footprint of Alternative 4A was completed in 2021. While the survey team did not find any resources that were clearly over 50 years of age, they did identify three shipwrecks and five features that were suggestive of a shipwreck but were either eroded or buried and could not be positively identified. Beyond the shipwrecks, the survey team found evidence of 20 additional buried debris features. These buried debris features are problematic in that there is not enough surface manifestation to determine what the feature is; however, these debris features do not appear to be shipwrecks. Other features that were identified were manmade reefs that appear to be composed of pilings and rubble that has fallen off the long beach breakwater or one of the oil extraction platforms within ESPB. The USACE has ensured that the proposed marine enhancement features would avoid any of these potential historic resources. In consultation with the SHPO, the USACE has determined that with the commitment to avoid all potential historic resources, the alternative would result in no historic properties affected (Appendix K). Impacts would be **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Impacts of maintenance would be short-term and less than construction impacts discussed above, and **less than significant.**

6.7.10 Aesthetics and Visual Resources

<u>Construction Impacts:</u> Short-term adverse impacts to sensitive viewers during construction period. Impacts would be **less than significant**.

<u>Maintenance and Monitoring Impacts:</u> Short-term, localized, and **less than significant**.

6.7.11 Ground and Vessel Traffic and Transportation

Construction Impacts: Minimal impacts to local and Port Complex traffic would occur based on the limited number of crew needed and construction activity occurring predominantly on the water. Habitat features would not likely result in an increase in recreational or other travel. Minimal short-term indirect adverse impacts to ground traffic and transportation would occur, and impacts would be **less than significant**. Would not conflict with any local or regional plans and would not result in impacts to land use in the project area. During the construction period, short-term, minor adverse impacts to harbor use could occur due to the presence of construction equipment. Impacts would be short-term, localized, and minimal, and **less than significant**.

Maintenance and Monitoring Impacts: Short-term, localized, and **less than significant** impacts to traffic and transportation. No impacts to Land and Harbor Use.

6.7.12 Socioeconomics

Construction Impacts: Construction activity could be readily accommodated by existing firms and workers and is not expected economic impact would result in physical impacts such as creating demand for new housing or commercial/ industrial buildings. Impacts would be **less than significant.**

Maintenance and Monitoring Impacts: Less impactful than construction impacts. Impacts would be **less than significant**.

6.7.13 Recreation

Construction Impacts: During the construction period, short-term, minor adverse impacts to recreation could occur while equipment is operating as recreationists would need to avoid construction areas and equipment. Once construction is complete, habitat features may result in localized disruption of recreational activities, primarily recreational boating. Beneficial impacts to recreation would result for some activities, including SCUBA diving and snorkeling, recreational fishing, and paddle boarding, for the restored areas and increased biological diversity. The potential adverse impacts would be localized, there would be long-term beneficial impacts, and all impacts would be **less than significant**.

Maintenance and Monitoring Impacts: Short-term, localized, and less than construction impacts, and **less than significant**.

6.7.14 Public Health and Safety

Construction Impacts: Majority of construction activity would occur on the water and no impacts to utilities on land within the proposed Project Area would occur. Utilities within the bay would be avoided. Public safety agencies would likely provide short-term oversight for construction activities to minimize any potential safety issues during construction. Small-scale construction within the proposed Project Area would not cause changes in human population numbers, population or housing growth, or the demand for new public services. No adverse impacts to utilities or public services would occur. Any potential adverse impacts to public health and safety would be short-term, localized, and **less than significant**.

Maintenance and Monitoring Impacts: Adverse impacts to public health and safety would not likely occur during maintenance activities, or would be negligible, and **less than significant** overall.

6.8 RISK AND UNCERTAINTY

Risk and uncertainty exist in the project benefits projected and in the cost estimates. Technical risks and uncertainties were identified during the study process using a risk register to document how the team applied a risk-based decision-making approach throughout the Study. The register highlighted areas of Study risks and identified ways to address those risks to buy down risks throughout the feasibility study process. Risks were identified for the various stages of the project lifecycle including the Study phase, PED phase, construction/implementation phase, and the longer-term post-construction/O&M phase.

The benefits are a function of habitat values captured as a numerical representation of habitat suitability and the area that habitat covers. The value was derived from a certified habitat evaluation model to address relative suitability and habitat value. Adaptive management will partly offset potential risks to success of habitat output by relying on monitoring data to identify underperformance and by adjusting as needed to the adaptive management strategy in order to provide projected benefits.

One of the high risks identified is whether or not the targeted quarries can produce the required stone for restoration. It is for this reason the cost contingency is at 51%, partly based on high level of uncertainty with material source availability and pricing especially for the large quantities of specialized large rock required to build rocky reef and kelp bed substrate. Sufficient quantities of rock may not be available when required to build the reefs. Total Project Cost Summary (TPCS) level cost estimates have been updated, taking latest increased stone pricing into account. The team has chosen to accept risk through Final Report and revisit this risk during PED.

The other high risk identified was the potential that Recommended Plan impacts to recreational boating were incorrectly assessed, which could affect PED costs and schedules as well as project costs. Boaters disagreed with the Draft IFR's assessment that impacts from Alternative 4A, the Recommended Plan, are "less than significant." The team bought down risk during the feasibility-level design by performing a sensitivity analysis of the Recommended Plan to determine potential configurations that could lessen boater impacts with minimal impacts to habitat output. After a discussion with recreational boating stakeholders, it was agreed that additional analysis and stakeholder coordination would take place during PED.

Several medium risk events were identified at the end of the feasibility study as PED phase risks to be addressed at that time.

- Real Estate/LERRD - Identification of LERRDs is reliant on non-Federal sponsor. Real estate risks (LERRDs) are a typical risk, but in this case the non-Federal sponsor already possesses jurisdictional oversight for the underwater restoration areas. In addition, the team avoided existing underwater/underground utilities in siting restoration features.
- Staging Area - There was close coordination with port stakeholders to identify all potential staging area costs and requirements. However, the space could be occupied by the time construction is ready to begin, which would require identifying another location within the port complex.
- Borrow Area – Risks are low since Surfside-Sunset has been used in the past and is considered a good source of material. Sampling will be conducted to confirm grain size and for potential toxic substances, but that is typical for this type of work and sampling has occurred in the past. Sampling results would be presented to the Dredge Materials Management Team for concurrence.
- Existing Eelgrass Beds – Presence of eelgrass identified in PED would result in needing to alter the Recommended Plan. The team has coordinated this possibility closely with resource agencies and have agreed to discuss reconfiguring nearshore reef and eelgrass complexes to avoid existing eelgrass.
- Construction Duration - Construction duration is estimated at 96 months over a period of over 12 years due to the need for seven contracts. Consideration was given to limits of quantity rock

that would be made available at any given time, air quality exceedance thresholds, blackout dates that account for winter storms and for the Olympics.

- Cost Increases – One potential project cost risk was the possibility that during PED, geotechnical exploration could reveal that subsurface soils/sediment conditions would require additional improvements or a phased construction approach.
- Sea Level Change - The Recommended Plan with-project condition is not expected to cause a change in wave energy transmission from the exterior to inner ESPB. There is expected to be no decrease in wave attenuation or protection provided by the Middle and Long Beach Breakwaters. Adaptive management may be required for the nearshore (eelgrass and reefs) to maintain the design condition but can be accomplished during times of regular maintenance with no additional mobilization. No proposed habitat measures will exacerbate the effects of sea level rise; the increase of 0.14, 0.7 and 2.5 feet for the low, intermediate, and high curves, respectively after 50 years will lead to increased rates of overtopping throughout the bay that would occur regardless of the proposed project. The effect of the nearshore reefs that break the waves before impacting the shoreline will cause additional sediments to settle in the lee, thus locally reducing the effects of the sea level induced shoreline erosion in those areas. CEICA Alternatives - As noted in Appendix C, Economics, Sensitivity Analysis of Risks in Best Buy Plans and Final Array Selection, "even given uncertainties in both cost and output, there appears to be very limited risk in terms of whether a larger scale plan would be identified as the NER Plan when considering the high incremental cost per output for Plan 5. For Plans 2 through 4, there is a possibility that the CEICA ranking could change the order of these plans, but it is unlikely that the difference would substantially change the conclusion that the measures included within these plans are all highly cost effective and efficient, and much more so than the measures in larger scale plans."

6.9 ENVIRONMENTAL OPERATING PRINCIPLES

The USACE Environmental Operating Principles (EOPs) have been taken into consideration throughout the Study process and will continue into the construction and operation phases of the Recommended Plan. Below are the USACE EOPs:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all USACE activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.

In coordination with the agencies and other stakeholders, the USACE will proactively consider the environmental consequences of the proposed project. Avoidance and minimization measures were evaluated, and mitigation will be provided, where necessary. In accordance with the mandate of this designation and the EOPs, the USACE has proposed a Recommended plan that supports economic and environmentally sustainable solutions.

6.10 USACE CAMPAIGN PLAN

USACE Vision: A great engineering force of highly disciplined people working with our partners through disciplined thought and action to deliver innovative and sustainable solutions to the Nation's engineering challenges.

USACE Mission: Provide public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risks from disasters.

Commander's Intent: The USACE will be one disciplined team, in thought, word, and action. We will meet our commitments, with and through our partners, by saying what we will do and doing what we will say. Through execution of the Campaign Plan, the USACE will become a GREAT organization as evidenced by the following in all mission areas: delivering superior performance; setting the standard for the profession; making a positive impact on the Nation and other nations; and being built to last by having a strong "bench" of educated, trained, competent, experienced, and certified professionals.

This Final IFR is consistent with these themes. The USACE VT has jointly applied, and will continue to apply, the latest policy and planning guidance and worked closely with federal, State and local stakeholders and professionals familiar with the problems, opportunities and resources of ESPB to evaluate the feasibility of ecosystem restoration.

7 COMPLIANCE WITH FEDERAL, STATE, AND LOCAL ENVIRONMENTAL STATUTES

The status of the project's compliance with applicable Federal, State, and local environmental requirements is summarized below. Prior to initiation of construction, the project will be in compliance with all applicable laws, regulations, and Executive Orders.

7.1 FEDERAL ENVIRONMENTAL REGULATIONS

7.1.1 National Environmental Policy Act

This IFR has been prepared in accordance with the requirements of NEPA and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 C.F.R. Parts 1500-1508), as well as USACE's NEPA regulations at 33 C.F.R. Part 230 (also ER 200-2-2). The NOI to prepare an EIS was published before the effective date of the CEQ updated NEPA implementing regulations (September 14, 2020); therefore, this document adheres to prior CEQ NEPA implementing regulations. The USACE did not identify any cooperating agencies for the Study.

7.1.2 Endangered Species Act of 1973, as Amended

This IFR served as the biological assessment for consultation and was provided to the NMFS as part of our request to initiate informal consultation. Coordination with respect to Federal endangered and threatened species has occurred with both the USFWS and NMFS in the development of this IFR. Federally endangered or threatened species that inhabit the proposed Project Area are listed and discussed in Chapters 3 and 5 of this IFR. No designated or proposed critical habitat occurs in the proposed Project Area.

The USACE has determined that the NER Plan [Alternative 4A, which is also the Recommended Plan] would have no effect on the California least tern, western snowy plover, white or black abalone, loggerhead turtles, leatherback sea turtles, olive ridley sea turtles, or any of the Federally listed marine mammals that may occur in the area. The USACE has determined that the Recommended Plan may affect, but would not adversely affect, the East Pacific DPS of the green sea turtle. There was a recent sighting of a dead loggerhead sea turtle in the proposed Project Area; however, this species is rare in the proposed Project Area and the USACE has determined that there would be no effect to this species. Construction activities may result in indirect impacts to green sea turtles from localized noise and turbidity, which may cause turtles to temporarily avoid activity areas. Environmental Commitments would be implemented to minimize ensure that there is no potential for direct or indirect impacts. Proposed habitat restoration features would result in long-term beneficial impacts to green sea turtles by creation of approximately 25 acres of new eelgrass habitat (forage habitat). The USACE has determined that the Recommended Plan would not affect any other Federally listed species. The USACE determination that the Recommended Plan "May Affect, Not Likely to Adversely Affect" green sea turtles was concurred with by the NMFS on May 1, 2020, which concluded informal consultation on the project (Appendix H). As a result of the conclusion of informal consultation with the NMFS, this project is in compliance with the Endangered Species Act.

7.1.3 Clean Water Act of 1972, as amended

The Clean Water Act (CWA) governs discharge of dredge or fill materials into the waters of the United States, and it governs water pollution control and water quality of waterways throughout the U.S.

The potential effects of the proposed project on water quality have been evaluated and are discussed in Section 5.3 of the IFR. Those sections of the CWA most relevant to this project are described as follows:

Sections 404 and 401 of the CWA pertain directly to the proposed project. Section 404 of the CWA governs the discharge of dredged or fill material into waters of the U.S. Although the USACE does not process and issue itself a permit for its own activities, the USACE authorizes its own discharges of dredged or fill material by applying all applicable substantive legal requirements. A Section 404(b)(1) evaluation is prepared and included in this IFR as Appendix G. The 404(b)(1) evaluation demonstrates the Recommended Plan complies with the 404(b)(1) guidelines. The Recommended Plan is the least environmentally damaging practicable alternative (LEDPA).

The USACE will ensure that this project, as proposed, is consistent, or otherwise in compliance with, the USEPA's Section 404(b)(1) guidelines (40 CFR Part 230). Unless exempted under Section 404(r) of the CWA, the 404(b)(1) guidelines prohibit the USACE from undertaking a project unless it is the LEDPA. If exempted under 404(r) specifically during project authorization, the USACE can implement a plan that is not the LEDPA and would also be exempt from Section 401 CWA compliance. In the absence of a Section 404(r) exemption, during PED the USACE will request water quality certification, along with information and data demonstrating compliance with state water quality standards, from the Los Angeles RWQCB, pursuant to 33 CFR 336.1(a)(1) and (b)(8). Information to be developed during PED includes the testing of sediments and making suitability determinations for the placement of sediment obtained at the Surfside/Sunset Borrow Site within the nearshore eelgrass restoration areas. The RWQCB has provided a letter of support for the project dated June 1, 2021, a copy of which can be found in Appendix G. The IFR contains sufficient information regarding water quality effects, including consideration of Section 404(b)(1) guidelines, to meet EIS content requirements of Section 404(r), should that exemption be invoked.

7.1.4 Coastal Zone Management Act of 1972, as amended

Section 307(c) of the Coastal Zone Management Act of 1972, as amended, called the "Federal consistency" provision, requires that Federal actions, within and outside the coastal zone, which have reasonably foreseeable effects on any coastal use (land or water) or natural resource of the coastal zone be consistent with the enforceable policies of a state's Federally approved coastal management program. Federal agency activities must be consistent to the maximum extent practicable with the enforceable policies of a state coastal management program. The term "consistent to the maximum extent practicable" means fully consistent with the enforceable policies of management programs unless full consistency is prohibited by existing law applicable to the Federal agency. 15 C.F.R. 930.32(a)(1). The Federal government certified the California Coastal Management Program (CCMP) in 1977. The enforceable policies of that document are Chapter 3 of the California Coastal Act of 1976. All consistency documents are reviewed for consistency with these policies. Appendix M indicates where each element of the required consistency determination content and provisions are addressed in this IFR (for instance, project authority, objectives, project descriptions, public access, recreation, marine resources, etc.). The USACE has determined, based on the evaluation of potential impacts, that the proposed project is consistent to the maximum extent practicable with the enforceable policies of the CCMP and sought concurrence from the California Coastal Commission (CCC). On December 11, 2020, the CCC unanimously concurred with the USACE consistency determination for the project and a letter dated December 15, 2020, detailing this concurrence from the CCC was received by the USACE; copy of letter can be found in Appendix M. The project is in compliance with the Coastal Zone Management Act of 1972.

7.1.5 Clean Air Act of 1972, as amended

The Clean Air Act (CAA) regulates emissions of air pollutants to protect the nation's air quality. The CAA is applicable to permits and planning procedures related to the disposal of dredged materials onshore and in open waters within 3 miles of the nearest shoreline. Section 118 of the CAA (42 U.S.C. § 7418) requires all Federal agencies engaged in activities that may result in the discharge of air pollutants to comply with Federal requirements regarding control and abatement of air pollution. Section 176(c) requires all Federal projects to conform to U.S. Environmental Protection Agency(USEPA)-approved or promulgated State Implementation Plans (SIPs). The CAA was considered in the evaluation of consequences of the alternatives. CAA General Conformity Analysis is addressed in Section 5.4 and Appendix E of this IFR. No General Conformity *applicability rates* would be met or exceeded by the Recommended Plan, and the project is in compliance with applicable SIPs. As a result, preparation of a General Conformity Determination is not required for the Recommended Plan.

7.1.6 National Historic Preservation Act of 1966, as amended

The impacts of Federal undertakings on cultural resources are formally assessed through a process mandated by the National Historic Preservation Act (NHPA) of 1966, as amended (54 U.S.C. Section 300101), and its implementing regulation, Protection of Historic Properties (36 CFR 800). Section 106 of the NHPA describes the process for identifying and evaluating historic properties, for assessing the effects of Federal undertakings on historic properties, and for consulting to avoid, reduce, or minimize adverse effects. Historic properties are cultural resources that are either included in, or are eligible for inclusion in, the National Register of Historic Places (NRHP). The Section 106 process does not require historic properties to be preserved but ensures that the decisions of Federal agencies concerning the treatment of these properties result from meaningful consideration of cultural and historic values and the options available to protect the properties.

As part of the USACE historic property identification efforts, the USACE requested a sacred lands search for the proposed Project Area from the Native American Heritage Commission (NAHC). The results were negative; however, the NAHC stated that the area is sensitive for cultural resources and provided a list of non-Federally recognized tribes who are culturally affiliated with the area. Letters requesting assistance identifying any known traditional cultural properties were sent to the Gabrieleno Band of Mission Indians – Kizh Nation, Gabrieleno/Tongva San Gabriel Band of Mission Indians, Gabrielino /Tongva Nation, Gabrielino Tongva Indians of California Tribal Council, and the Gabrielino-Tongva Tribe in November of 2017. No response was received. In December of 2019, the USACE sent follow up letters to the aforementioned tribes as well the Soboba Band of Luiseno Indians (collectively tribes). While not on the NAHC list, the USACE had been informed by the Port of Los Angeles that the Soboba Band of Luiseno Indians had requested to consult on any activities in ESPB. The Gabrieleno Band of Mission Indians - Kizh Nation responded to the USACE 2019 consultation letters. They are supportive of efforts to improve the ecosystem within ESPB. No project specific concerns were raised but the importance or the water and the villages that were once located near ESPB were discussed.

In addition to the tribes, the USACE invited the Historical Society of Long Beach, the Wilmington Historical Society, the Long Beach Heritage, and the San Pedro Bay Historical Society to consult on the undertaking via letters dated December 12, 2019. None of the historical societies responded to the USACE invitation to consult.

A records search of the proposed Project Area with a one-mile buffer was also requested from South Central Coastal Information Center (SCCIC) in 2017 to determine if there are historic properties within the proposed Project Area. A total of 12 cultural resources were located within the proposed Project Area and none of these projects are located within the APE.

The USACE initiated consultation with the SHPO on June 29, 2018. At that time the USACE provided the SHPO a description of the ESPB Study, sought comments on the APE, transmitted the results of our initial historic property identification efforts (record search and tribal consultation) and requested their participation in a programmatic agreement (PA). By letter dated July 31, 2018, the SHPO concurred with the USACE APE and agreed that at PA would be appropriate.

At the time of the USACE 2018 letter, the USACE believed that they would have to defer cultural resource surveys until they had final engineering designs and knew the exact location of the proposed aquatic habitat features. Since 2018 letter, the USACE undertook a presence/absence survey of approximately 900-acres where the aquatic habitat features for the preferred alternative may be constructed, and it was determined that a PA is no longer necessary. By letter dated June 23, 2021, the USACE re-consulted with the SHPO, explaining why a PA was no longer needed, described historic property identification efforts, transmitted the results of recent presence/absence marine cultural survey, and provided the USACE finding that the project would result in *no historic properties affected.* The tribes and historical societies were concurrently provided the same information and were provided an opportunity to comment of the USACE finding of effect.

By letter dated July 28, 2021, the USACE received a response from the SHPO requesting that the USACE scale down the APE to more accurately reflect the limits of possible disturbance associated with the preferred alternative and requesting more information about the proposed habitat enhancement features and their spatial relationship to the unevaluated potential historic properties. By letter dated July 30, 2021, the USACE agreed with the SHPO's recommendation and redefined the APE as the staging area and the Recommended Plan's 900-acre proposed Project Area; provided the requested information; and again made their finding that the undertaking would result in *no historic properties affected.* The SHPO concurred with the USACE findings on August 17, 2021. Consultation letters can be found in Appendix K. On January 26, 2021, the USACE provided clarification to the SHPO that the Surfside/Sunset Borrow site is part of the APE. While the Surfside/Sunset Borrow site was specifically discussed in the consultation letter as being the material source for the eel grass beds and potential impacts to historic properties within the borrow site were considered as part of the USACE's finding of effect, the borrow site had been inadvertently been left off the APE map.

7.1.7 Native American Graves Protection and Repatriation Act of 1990, as amended

This Act establishes rights of Indian tribes and Native Hawaiian organizations to claim ownership of certain cultural items, including human remains, funerary objects, sacred objects, and objects of cultural patrimony in Federal possession or control; or in the possession or control of any institution or State or local government receiving Federal funds; or discovered on Federal or tribal lands. The Recommended Plan would not occur on Federal or tribal lands. Therefore, this Act does not apply.

7.1.8 Fish and Wildlife Coordination Act

This Act requires Federal agencies to coordinate with the USFWS and local State agencies when any stream or body of water is proposed to be impounded, diverted, or otherwise modified. The intent is to give fish and wildlife conservation equal consideration with other purposes of water resources development projects. In response to the requirements of this Act, USACE has coordinated with the USFWS and the CDFW during the initial and current stages of planning. The USACE has coordinated extensively with the USFWS, NMFS, and CDFW in the development of the proposed alternatives, habitat evaluation, and potential avoidance and minimization measures.

USFWS prepared a Planning Aid Letter (PAL) on May 24, 2018 and provided a Draft Coordination Act Report (CAR) on February 5, 2021. The USACE provided comments and responses to USFWS recommendations provided in the Draft CAR on May 7, 2021 and received the Final CAR on June 21, 2021. The PAL, Final CAR, and the USACE response to the Final CAR are provided in Appendix H of this IFR. The project is in compliance with the Fish and Wildlife Coordination Act.

7.1.9 Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended

Federal agencies must consult with NMFS on actions that may adversely affect EFH. EFH is defined as those "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NMFS encourages streamlining the consultation process using review procedures under NEPA, Fish and Wildlife Coordination Act, CWA, and/or FESA provided that documents meet requirements for EFH assessments under 50 CFR Section 600.920(g). EFH assessments must include (1) a description of the proposed action, (2) an analysis of effects, including cumulative effects, (3) the Federal agency's views regarding the effects of the action on EFH, and (4) proposed mitigation, if applicable. Descriptions of EFH and EFH assessments are included in Chapters 3 and 5 of this IFR. Results of the consultation including the USACE response to NMFS's conservation recommendations have been included in the IFR, letters are provided in AppendixH, and the project is in compliance with Magnuson-Stevens Fishery Conservation and Management Act.

7.1.10 Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act (MMPA) protects marine mammals and establishes a marine mammal commission to regulate such protection. The requirements of the MMPA were considered in the evaluation of environmental consequences of the alternatives. The MMPA was considered and evaluated in the development of this IFR in Section 5.7. The proposed project would not result in take or incidental harassment of marine mammals; therefore, this project is in compliance with the MMPA.

7.1.11 Migratory Bird Treaty Act (MBTA)

The Migratory Bird Treaty Act (1916), agreed upon between the United States and Canada; the Convention for the Protection of Migratory Birds and Animals (1936), agreed upon between the United States and Mexico; and subsequent amendments to these Acts, collectively referred to as the MBTA, provide legal protection for almost all breeding bird species occurring in the United States. These Acts restrict the killing, taking, collecting, and selling or purchasing of native bird species or their parts, nests, or eggs. Certain game bird species are allowed to be hunted for specific periods determined by Federal and state governments. The intent of the Act is to eliminate any commercial market for migratory birds, feathers, or bird parts, especially for eagles and other birds of prey. The MBTA was considered and evaluated in the development of this IFR in Section 4.2.2. The proposed project will not violate the MBTA's prohibition against "taking" of protected migratory birds. The project is in compliance with the Migratory Bird Treaty Act.

7.1.12 Rivers and Harbors Act of 1899; as amended

Section 10 of the Rivers and Harbors Act, 33 USC 403, prohibits the unauthorized obstruction or alteration of any navigable waters of the United States, and authorizes the USACE to regulate all activities that affect the course, capacity, or coordination of waters of the U.S. Navigable waters of the U.S. are defined in 33 CFR Part 329 as those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. USACE has complied with section 10 of the Riverd and Harbors Act in the development of this IFR.

7.1.13 Federal Noise Control Act

The Federal Noise Control Act legislates that each state provides for the protection of its citizens from noise. The proposed project would not result in significant noise impacts to nearby receptors and would therefore be in compliance with the Federal Noise Act.

7.1.14 North American Wetlands Conservation Act

Section 9 of the North American Wetlands Conservation Act directs Federal agencies to cooperate with the USFWS to restore, protect, and enhance wetland ecosystems and other habitats for migratory birds, fish, and wildlife to the extent consistent with its mission. The proposed project would not affect wetlands and would restore kelp, eelgrass, and rocky reef habitat. Therefore, the project would be in compliance with the North American Wetlands Conservation Act.

7.1.15 Marine Protection, Research, and Sanctuaries Act of 1972, as amended

Marine Protection, Research, and Sanctuaries Act of 1972, as amended, has two essential aims: to regulate intentional ocean disposal of materials, and to authorize any related research. The proposed project would not result in ocean disposal of materials. The project is in compliance with the Marine Protection, Research, and Sanctuaries Act.

7.1.16 Nonindigenous Aquatic Nuisance Prevention and Control Act

Federal program to prevent the introduction of, and to control the spread of, unintentionally introduced aquatic nuisance species. The proposed project includes invasive species management under maintenance and monitoring of the proposed project and would be in compliance with the Nonindigenous Aquatic Nuisance Prevention and Control Act.

7.1.17 Federal Noxious Weed Act of 1974

Requires each Federal agency to provide for noxious weed management on lands under its jurisdiction. The proposed project includes invasive species management under maintenance and monitoring of the proposed project and is in compliance with the Federal Noxious Weed Act.

7.1.18 Federal Water Project Recreation Act

This Act requires that any Federal water project must give full consideration to opportunities afforded by the project for outdoor recreation and fish and wildlife enhancement. The proposed project has considered recreation in the IFR analysis; therefore, the project is in compliance with the Federal Water Project Recreation Act.

7.1.19 Executive Order 11514 Protection and Enhancement of Environmental Quality

Under this EO, the Federal Government must provide leadership in protecting and enhancing the quality of the Nation’s environment to sustain and enrich human life. Federal agencies must initiate measures needed to direct their policies, plans and programs so as to meet national environmental goals. The objective of the proposed project is the restoration of rare habitats that will enhance the quality of the environment in the project area; therefore, the project is in compliance with Executive Order 11514.

7.1.20 Comprehensive Environmental Response, Compensation, and Liability Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) established the Federal “Superfund” to clean up uncontrolled or abandoned hazardous waste sites, accidents, spills, and other emergency releases of pollutants and contaminants into the environment. The proposed project incorporates hazardous material control measures to avoid and minimize the potential release of hazardous materials; therefore, the project is in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act.

7.1.21 Hazardous Materials Transportation Act

The Hazardous Materials Transportation Act authorized the U.S. Department of Transportation to regulate the transportation of hazardous materials as codified in 49 USC 5101 *et seq*. The proposed project incorporates hazardous material control measures to avoid and minimize potential release of hazardous materials; therefore, the project is in compliance with the Hazardous Materials Transportation Act.

7.1.22 Federal Occupational Safety and Health Act

The Federal Occupational Safety and Health Act ensures safe and healthful conditions for working men and women. The proposed project considers public health and safety in the IFR analysis, specifically in Section 5.18; therefore, the project is in compliance with the Federal Occupational Safety and Health Act.

7.1.23 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act authorizes the U.S. EPA to control hazardous wastes from the generation, transportation, treatment, storage, and disposal of hazardous waste (*i.e.*, from "cradle to grave"). The proposed project incorporates hazardous material control measures to avoid and minimize potential release of hazardous materials; therefore, the project is in compliance with the Resource Conservation and Recovery Act.

7.1.24 Toxic Substances Control Act

The Toxic Substances Control Act provides the USEPA with the authority to administer reporting, record-keeping, testing requirements, and restrictions on chemical substances that may pose unreasonable risks of injury to human health or the environment. The proposed project incorporates hazardous material control measures to avoid and minimize the potential release of hazardous materials; therefore, the project is in compliance with the Toxic Substances Control Act.

7.1.25 Executive Order 11990 Protection of Wetlands

Executive Order 11990 requires that governmental agencies, in carrying out their responsibilities, provide leadership and "take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands." This Executive Order was considered in the development of project alternatives. The proposed project will have no permanent adverse effect on wetlands and is in compliance with Executive Order 11990.

7.1.26 Executive Order 11988

Executive Order 11988 requires Federal agencies to recognize the significant values of floodplains and to consider the public benefits that would be realized from restoring and preserving floodplains. It is the general policy of the USACE to formulate projects that, to the extent possible, avoid or minimize adverse impacts associated with use of the base floodplain and avoid inducing development in the base floodplain unless there is no practicable alternative that meets the project purpose. There are no floodplains within the proposed Project Area. The NER Plan would not cause significant changes in future with-project flood conditions compared to the No Action Alternative. The project is in compliance with Executive Order 11988.

7.1.27 Executive Order 11991

Executive Order 11991 is related to protection and enhancement of environmental quality. Section 1 of this Order directs the CEQ to issue guidelines to Federal agencies for implementing procedural provisions of NEPA. The guidelines recommend early EIS preparation and preparation of impact statements that are concise, clear, and supported by evidence that agencies have made the necessary analyses. Guidelines within Executive Order 11991 (ER 200-2-2, 33 CFR 230 March 1988) were followed in the preparation of this IFR. Executive Order 12088

Executive Order 12088, Federal Compliance with Pollution Control Standards, mandates that Federal agencies are responsible for ensuring that all necessary actions are taken for the prevention, control, and abatement of environmental pollution with respect to Federal facilities and activities under control of the agency. Guidelines within Executive Order 12088 were followed in the preparation of this IFR.

7.1.28 Executive Orders 12898 and 14008

Executive Order 12898 requires the USEPA and all other Federal agencies (as well as state agencies receiving Federal funds) to develop strategies to address the issue of Environmental Justice as part of the NEPA process. The agencies are required to identify and address, as appropriate, any disproportionately high and adverse human health or environmental impacts of their programs, policies, and activities on minority and low-income populations. The order makes clear that its provisions apply fully to programs involving Native Americans. The CEQ has oversight responsibility for the Federal government's compliance with E.O. 12898 and NEPA. The CEQ, in consultation with the USEPA and other agencies, has developed guidance to assist Federal agencies with their NEPA procedures so that environmental justice concerns are effectively identified and addressed. According to the CEQ's Environmental Justice Guidance Under the National Environmental Policy Act (published December 10, 1997), agencies should consider the composition of the affected area to determine whether minority populations or low-income populations are present in the area affected by the proposed action, and if so whether there may be disproportionately high and adverse human health or environmental impacts (Council on Environmental Quality 1997). Additionally, Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad", amends Executive Order 12898 (effective January 27, 2021) and has updated Federal agencies' responsibilities for assessing environmental justice consequences of their actions. Currently, no, or very minimal guidance has been provided for EO 14008. The IFR is in compliance with the directives and objectives of Executive Orders 12898 and 14008.

Methodology. EO 12898 defines a minority as an individual belonging to one of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. A minority population or a low-income population, for the purposes of this environmental justice analysis, is identified when either population within the potentially affected area is greater than 50% or the population is meaningfully greater than the general population or other appropriate unit of geographic analysis. Meaningfully greater analysis value greater than the 50th percentile is indicative of the presence of a minority or low-income population relative to the appropriate unit of geographic analysis. The geographic scope of reference for the meaningfully greater analysis are the cities of Long Beach and Seal Beach. Exceedance of 50% for the Fifty Percent analysis or exceedance of the 50th percentile for the Meaningfully Greater analysis would indicate the presence of either population.

Minority Population

Fifty Percent analysis. The USEPA EJScreen mapping and screening tool was used to obtain minority population data from the Project Area as well as the cities of Long Beach and Seal Beach (Appendix L). For the EJScreen analysis, a 0.5-mile buffer around the project area, a distance expected to capture immediate area impacts, was used, and included all census tracts that lie wholly or partially within it for a total of 31 census tracts. The percent minority indicator in the EJScreen tool is defined as the percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. The minority population for the analyzed area is 48 percent.

Meaningfully Greater analysis. The minority populations in the surrounding cities of Long Beach and Seal Beach are 72 percent and 28 percent, respectively. Within this array, relative to the percentage of minority populations within the geographic scope of analysis, the Project Area is at the 50th percentile.

Based on the Fifty Percent analysis and the Meaningfully Greater analysis, a minority population is not present within the surrounding the Project Area.

The EO does not provide criteria to determine if an affected area consists of a low-income population. The USEPA EJScreen mapping and screening tool was used to obtain low-income data from the project area as well as the cities of Long Beach and Seal Beach (Appendix L). The percent low-income indicator in the EJScreen tool is defined as the percent of a block group's population in households where the household income is less than or equal to twice the Federal poverty level.

Low-Income Population

Fifty Percent analysis. The low-income population for the analyzed area is 30 percent.

Meaningfully Greater analysis. The low-income populations in the surrounding cities of Long Beach and Seal Beach are 39 percent and 16 percent, respectively. Within this array, relative to the percentage of minority populations within the geographic scope of analysis, the analyzed area is not at the 50th percentile.

Based on the Fifty Percent analysis and the Meaningfully Greater analysis, a low-income population is not present within the analyzed area.

7.1.29 Executive Order 13045

Executive Order 13045 addresses "Environmental Health and Safety Risks to Children." This Executive Order is designed to focus Federal attention on actions that affect human health and safety conditions that may disproportionately affect children. Consistent with Executive Order 13045, the proposed project would not disproportionately impact children in the region of influence.

As shown in Table 7-1, approximately 24 percent of the state's population is made up of children (those under 18 years old). Approximately 23 percent of the population in Los Angeles County was under 18 years of age. Within the 31 census tracts located within the 0.5-mile buffer of the socioeconomic assessment area, approximately 17 percent of the population was under 18 years of age and there are 5 schools, 8 parks, 15 daycare centers, and 7 miscellaneous facilities (arcade, community centers, etc.) where children are expected to be present. The closest of these facilities is located approximately one quarter of a mile from the nearest project construction area, eelgrass restoration and nearshore rocky reef construction, and adjacent to a major road that runs along the Long Beach shoreline within the Project Area, East Ocean Blvd. For most site-specific resources, impacts would be confined to areas affected by construction and within the confines of the aquatic and benthic environment. As trucks and heavy equipment will be operating in the Port Complex away from residential and recreational areas, all the project construction will be located offshore, and any sound, vibration, and air quality impacts associated with construction are all expected to dissipate with increasing distance, activities associated with the project will not disproportionately effect children within the assessment area.

Table 7-1: Socioeconomic Assessment Area Youth Under 18 Years of Age (Percentage)

Area	Under 18
California	23.9%
Los Angeles County	23.1%
Socioeconomic Assessment Area Tracts	**16.8%**
Source: U.S. Census Bureau 2010	

7.1.30 Executive Order 13112 Invasive Species

Executive Order 13112 states that each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law, use relevant programs and authorities to: (1) prevent the introduction of invasive species; (2) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (3) monitor invasive species populations accurately and reliably; (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (5) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (6) promote public education on invasive species and the means to address them. The proposed project includes invasive species management under maintenance and monitoring of the proposed project and is in compliance with Executive Order 13112.

7.1.31 Executive Order 13175 Consultation and Coordination with Indian Tribal Governments

Executive Order 13175 reaffirmed the Federal government's commitment to a government-to-government relationship with Indian Tribes and directed Federal agencies to establish procedures to consult and collaborate with tribal governments when new agency regulations would have tribal implications. The USACE has a government-to-government consultation policy to facilitate the interchange between decision makers to obtain mutually acceptable decisions. In accordance with this Executive Order, the USACE has engaged in regular and meaningful consultation and collaboration with the relevant tribes throughout the course of the IFR process.

7.1.32 Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds

Executive Order 13186 directs Federal agencies that take actions that either directly or indirectly have an effect on migratory birds to develop a Memorandum of Understanding (MOU) and to work with the U.S. Fish & Wildlife Service along with other Federal agencies to promote the conservation of migratory bird populations. The Council for the Conservation of Migratory Birds was established to help implement the Executive Order. It is comprised of representatives from various offices within 20 member agencies. This IFR has considered impacts to migratory bird species and determined that the project would not adversely affect migratory bird species. Therefore, the project is in compliance with Executive Order 13186.

7.1.33 Executive Order 13751 Safeguarding the Nation from the Impacts of Invasive Species

Executive Order 13751 calls upon executive departments and agencies to take steps to prevent the introduction and spread of invasive species and to support efforts to eradicate and control invasive species that are established. This project includes invasive species management under maintenance and monitoring of the project and is in compliance with Executive Order 13751.

7.2 STATE ENVIRONMENTAL LAWS

The following laws are applicable to the project's non-Federal sponsor.

7.2.1 California Clean Air Act

In California, the CARB is designated as the responsible agency for all air quality regulations. The CARB, which became part of the California Environmental Protection Agency (Cal/EPA) in 1991, is responsible for implementing the requirements of the Federal Clean Air Act (CAA), regulating emissions from motor vehicles and consumer products, and implementing the California Clean Air Act of 1988 (CCAA). The CCAA outlines a program to attain the California Ambient Air Quality Standards (CAAQS) for O3, NO2, SO2, and CO by the earliest practical date. Air Quality is addressed in Section 5.4 and Appendix E of this IFR. The proposed project would be in compliance with applicable SIPs and is in compliance with the California Clean Air Act.

7.2.2 California Environmental Quality Act (Public Resources Code, Sections 21000-21177)

The California Environmental Quality Act (CEQA) requires that State and local agencies consider environmental consequences and project alternatives before a decision is made to implement a project requiring State or local government approval, financing, or participation by the State of California. In addition, CEQA requires the identification of ways to avoid or reduce environmental degradation or prevent environmental damage by requiring implementation of feasible alternatives or mitigation measures. The City of Long Beach prepared the EIR component of the IFR in accordance with the California Environmental Quality Act.

7.2.3 California Coastal Act of 1976, as amended

The California Coastal Act (CCA) specifies basic goals for coastal conservation and development related to protection, enhancement and restoration of coastal resources, giving priority to “coastal-dependent” uses and maximizing public access to California residents and visitors. The CCA defines the “coastal zone” of California, which generally extends 3.0 mi out to sea and inland generally 1,000 yards. It may be extended further inland in certain circumstances. It is also less than 1,000 yds wide in some urban areas. Each city and county in California located along the California coast must prepare a Local Coastal Program (LCP) for all areas within the coastal zone. The LCP includes Land Use Plans (LUPs), zoning ordinance amendments and map changes to reflect the Coastal Act and LCP goals and policies at the local level. The City of Long Beach adopted their LCP in February 1980. The proposed project is in compliance with relevant policies and guidance within that LCP, including those related to protection of beach access, recreation, boating, fishing, visual resources and coastal resources.

7.2.4 Porter-Cologne Water Quality Control Act of 1969 (California Water Code §§ 13000-13999.10)

This Porter-Cologne Water Quality Control Act mandates that activities that may affect waters of the State shall be regulated to attain the highest water quality. The RWQCB provides regulations for a “nondegradation policy” that are especially protective of waters with high quality. This Act was considered in the evaluation of consequences of the alternatives. This project expects to achieve full compliance with the Porter-Cologne Water Quality Control Act by achieving compliance with RWQCB certification mandates for Section 401 of the CWA, California Endangered Species Act (Cal. Fish and Game Code §§ 2050-2116).

Per the California Endangered Species Act, effects of the Proposed Action on State-listed species would be addressed in consultations by the City of Long Beach with the CDFW, if necessary. Previous coordination with the CDFW on other cost-shared projects indicated that neither CESA nor a Streambed Alteration Agreement are generally required when construction will be overseen by the Federal Government, and routine OMMR&R conducted by the non-Federal sponsors would not result in additional effects to State-listed species or State-jurisdictional waters. The same situation exists for the

Proposed Action. Any non-routine OMMR&R conducted by the non-Federal sponsors that may result in additional effects to State-listed species would require them to first consult with the CDFW before taking action, except in emergency situations. The project is or would be in compliance with the California Endangered Species Act.

7.2.5 California Alquist-Priolo Earthquake Zoning Act

The California Alquist-Priolo Earthquake Fault Zoning Act, enacted in 1972, regulates development near active faults to mitigate the hazards of surface fault-rupture. Under the act, the State Geologist is required to delineate special study zones along known active faults. The act also requires that prior to approval of a project within a mapped active fault zone, a geologic study is required to be prepared to define and delineate any hazards from surface fault rupture. A 50-foot setback for building structures from any known trace of an active fault is required. The EIR was prepared in accordance with the California Alquist-Priolo Earthquake Fault Zoning Act.

7.2.6 Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (SHMA) of 1990 (Public Resources Code, Chapter 7.8, Section 2690-2699.6) directs the Department of Conservation, California Geological Survey to identify and map areas prone to earthquake hazards of liquefaction, earthquake-induced landslides, and amplified ground shaking. The purpose of the SHMA is to reduce the threat to public safety and to minimize the loss of life and property by identifying and mitigating these seismic hazards. The SHMA was passed by the legislature following the 1989 Loma Prieta earthquake. The EIR was prepared in accordance with the Seismic Hazards Mapping Act.

7.2.7 Construction and Demolition Waste Materials Diversion Requirements – Senate Bill 1374

Senate Bill 1374 requires that jurisdictions include in their annual AB 393 report a summary of the progress made in diverting construction and demolition waste. The EIR was prepared in accordance with Senate Bill 1374.

7.2.8 State of California Ocean Plan

The State of California Ocean Plan establishes water quality objectives for California's ocean waters and provides the basis for regulation of wastes discharged into the State's coastal waters. The plan applies to point and nonpoint source discharges. Both the State Water Board and the six coastal Regional Water Quality Control Boards (Regional Water Boards) implement and interpret the California Ocean Plan. The EIR was prepared in accordance with the State of California Ocean Plan.

7.2.9 State of California Occupational Safety and Health Act

The State of California Occupational Safety and Health Act addresses California employee working conditions, enables the enforcement of workplace standards, and provides for advancements in the field of occupational health and safety. The EIR was prepared in accordance with the State of California Occupational Safety and Health Act.

7.3 LOCAL ENVIRONMENTAL REGULATIONS

The following regulations are applicable to the project's non-Federal sponsor.

7.3.1 South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) is primarily responsible for planning, implementing, and enforcing air quality standards for all of Orange County, Los Angeles County (excluding the Antelope Valley portion), the western non-desert portion of San Bernardino County, and the western Coachella Valley and San Gorgonio Pass portions of Riverside County. The SCAQMD adopted a series of air quality management plans to meet the CAAQS and NAAQS and has developed many rules and regulations to regulate sources of air pollution in the SCAB and to help achieve air quality standards. Air quality analysis for the EIR was based, in part, on the CAA requirements and guidance from the SCAQMD for assessing air quality impacts.

7.3.2 Water Quality Control Plan for the Los Angeles Region

The Water Quality Control Plan for the Los Angeles Region (Basin Plan) is designed to preserve and enhance water quality and protect the beneficial uses of all regional waters. Specifically, the Basin Plan (1) designates beneficial uses for surface and ground waters, (2) sets narrative and numerical objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy, and (3) describes implementation programs to protect all waters in the Region. In addition, the Basin Plan incorporates (by reference) all applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations. Those of other agencies are referenced in appropriate sections throughout the Basin Plan. This IFR is consistent the Water Quality Control Plan for the Los Angeles Region.

7.3.3 City of Long Beach General Plan

The project area falls within the Long Beach General Plan. General plan goals, objectives, and directions were considered in IFR proposed project analyses.

7.3.4 City of Long Beach Municipal Code

City of Long Beach Municipal Codes relevant to the project area and proposed actions were considered in IFR proposed project analyses.

7.3.5 City of Los Angeles General Plan

City of Los Angeles General Plan goals, objectives, and directions were considered, where relevant, in IFR proposed project activities.

7.3.6 City of Seal Beach Municipal Code

City of Seal Beach Municipal Codes relevant to the proposed Project Area and proposed actions were considered in IFR proposed project analyses.

8 PUBLIC INVOLVEMENT, AGENCY COORDINATION, AND TRIBAL CONSULTATION

The goal of public involvement and agency coordination is to ensure a wide variety of inputs are received from members of the public and government agencies. This chapter covers public, stakeholder, and agency engagement efforts. To identify the Recommended Plan, the team addressed a broad spectrum of perspectives, including conflicting ideas. The planning process integrates these various perspectives plus technical analysis to develop the federally justifiable RECOMMENDED PLAN presented in this report. The Recommended Plan is intended to satisfy most stakeholders, recognizing dissatisfaction may still exist.

8.1 PUBLIC INVOLVEMENT PROCESS

Public involvement and stakeholder input was obtained and considered at key points throughout the study. When the study kicked off in early 2016, the USACE and City held Public Scoping Meetings and received many ideas and comments for consideration. This meeting was closely followed by a measures brainstorming workshop. Scoping comments and the many ideas from the workshops were incorporated early in the alternatives development phase. Public scoping meeting transcripts and stakeholder workshop notes can be found in Appendix N: Public Involvement.

The Draft IFR was released for a 60-day public review period from November 25, 2019 through January 27, 2020. The Draft IFR was released November 25, 2019 and public and agency comments were received by January 27, 2020.

In addition to correspondence from ports stakeholders and Surfrider Foundation, the following public outreach efforts took place during the study:

- April 2016: Public Scoping Meetings (U.S. Army Corps of Engineers) – Two identical back-to-back public scoping meetings were held at Bixby Park Community Center. Over 120 individuals attended the meetings, including residents, business owners, stakeholder group and agency representatives. Full transcripts of the meetings can be found in Appendix N.
- April 2016: Measures Brainstorming Measures Workshop (City of Long Beach and USACE) – At this facilitated, interactive workshop, nearly 80 participants worked in small groups to brainstorm problems and restoration opportunities.
- October 2016: Community Update Meeting (City of Long Beach)
- June 2017: Public Meeting for Surfrider Foundation’s Breakwater Month (Surfrider Foundation)
- June 2018: Public Meeting for Surfrider Foundation’s Breakwater Month (Surfrider Foundation)
- October 2018: Community Update Meeting (City of Long Beach)
- October 2018: Public Input Online (City of Long Beach) – The City conducted online outreach to identify specific impacts to maritime operations.
- June 2019: Public Meeting for Surfrider Foundation’s Breakwater Month (Surfrider Foundation)
- December 2019: Two Public Meetings held during the public comment period for the Draft IFR (USACE and City of Long Beach). Two identical back-to-back public meetings were held at the Aquarium of the Pacific in Long Beach. Approximately 80 residents, boating and navigation representatives, agency representatives, and other stakeholders attended the meetings. The purpose was to provide an overview of the Draft IFR and summarize the plan formulation

process, technical analysis and describe the Tentatively Selected Plan. Full transcripts of the meetings can be found in Appendix N.

- Public Comments: In addition to the public comments received during the December 2019 meetings noted above, approximately 30 distinct written comment letters or emails were received from public resource agencies and members of the public. In total, about 250 separate comments were received and processed for consideration in updating the Final IFR. The USACE has provided written responses to each distinct comment, which can be found in Appendix N.
- January 2021: Recreational Boater Stakeholder Meeting (USACE). Based on written and verbal boater impact comments received from recreational boating stakeholders during the public comment period, it was determined that a follow-on meeting was warranted. Boaters provided further clarification on potential impacts from the Tentatively Selected Plan. The team considered the inputs received in updating the Final IFR. The overall Recreational impacts (Section 5.16) remain the same, but the team acknowledges opportunities exist for refinements to the Recommended Plan. It was agreed that during the pre-construction engineering design phase, further discussions would be held on design refinements to address boater concerns while maintaining anticipated habitat outputs.

8.2 STAKEHOLDER PERSPECTIVES AND DIFFERENCES

Stakeholder perspectives vary on the East San Pedro Bay Ecosystem Restoration Feasibility Study. Some of the most prominent topics expressed by key stakeholders, including during the concurrent public and agency review of the Draft IFR, are presented below.

Breakwater Modifications (Support) - One of the primary areas of conflict is over whether or not to remove or modify the breakwater. Surfrider Foundation advocates for lowering the entire breakwater as part of the "Surfrider Alternative," as discussed in Chapter 4. Modifying the breakwater would result in more waves at beaches, an outcome desired by many residents and other shoreline visitors, as expressed at past public meetings. Proponents link restoration benefits to breakwater modifications as explained below.

Breakwater Modifications (Opposition) - Concerns about wave impacts from breakwater modifications by the Navy and ports stakeholders were confirmed through technical analysis. The Navy's operations and port operations in anchorages located just inside the breakwater cannot tolerate wave height increases. Appendix A Coastal Engineering analysis shows breakwater modifications would greatly increase the number of days when wave heights would exceed safe thresholds. The study process considered breakwater modifications until screening those measures and plans out were shown to be justified through violation of study constraints. Specifically, any modification would violate planning Constraint 1: Avoid negative impacts to U.S. Navy's operations including activities in support of national security and other missions. Numerous navigation, ports, and vessel pilot stakeholders supported the NER Plan and keeping the breakwater intact.

Sandy or Soft-Bottom Restoration - The Surfrider Alternative includes a suggestion to restore sandy bottom habitat, as the original habitat type that existed within the bay. Subsequent Surfrider Foundation comments noted alternatives should have been reanalyzed due to importance of sandy bottom habitats. They suggest that both sandy bottom and water column habitats were "preemptively" excluded, causing breakwater alternatives to fail in the alternatives comparison. As detailed in Appendix N, under General Responses to Public and Agency Comments, GR-6: Sandy/Soft-Bottom and Water Column Habitats In the Plan Formulation Process acknowledges that "Soft (Sandy) Bottom Habitat is an important habitat type but not complex. While sandy bottom habitat types were recognized by the study team as an important component of the ESPB project area, the study area, and the greater SBC ecosystem, sandy bottom habitat types are abundant. Because the study objective is to restore complex habitat types, sandy bottom habitats were not a target of restoration for this study."

Resource Agencies Concerns – Multiple resource agencies were engaged throughout the planning process, both through the Habitat Evaluation Technical Advisory Committee, and as needed to meet environmental compliance requirements. NOAA/NMFS expressed concerns regarding avoidance and minimizing impacts to existing eelgrass and Green Sea Turtles, which are captured in the environmental commitments to do pre-construction surveys. Some agencies expressed support for inclusion of wetlands in the NER Plan. As expressed in Appendix N, GR-2: Why Wetlands Measures Are Not in the NER Plan, wetlands were extremely beneficial, but due to the overdeveloped shoreline, restoration sites do not exist. Therefore, wetlands would have to be highly engineered and built out into the open water, which drove the costs very high.

8.3 AGENCY COORDINATION

Throughout the study process, the team coordinated with a host of Federal, State, and local agencies and interest groups.

- Resource agency representatives participated in the TAC, providing input on planning objectives, existing and historic conditions, potential restoration measures, and development of the habitat evaluation model. TAC members participated in a 2-day workshop with USACE ERDC to identify key measurable parameters for each of the target habitat types. TAC members were presented with habitat modeling results and given an opportunity to provide comments. TAC members also provided inputs into the Base Plan and preliminary alternatives at key stages of the study. See Section 1.3.1 for a full listing of participants.
- U.S. Fish and Wildlife Service (USFWS) coordination pursuant to the Fish & Wildlife Coordination Act (FWCA) is documented in Appendix H.
- National Marine Fisheries Service consultation under Section 7 of the Endangered Species Act on potential effects to green sea turtles is also documented in Appendix H.
- National Marine Fisheries Service consultation under the Magnuson-Stevens Fishery Conservation and Management Act for potential effects to essential fish habitat (EFH) is also documented in Appendix H.
- Section 106 consultation concluded with concurrence from the SHPO that the recommended plan would result in no historic properties affected.
- Immediately following construction of the project, the Monitoring and Adaptive Management Plan (MAMP, Appendix F) will begin implementation. Part of the MAMP process includes convening the Adaptive Management Team (AMT), detailed in Appendix F, Section 1.2. Participating agencies will include: USACE, City of Long Beach, USFWS, California Department of Fish & Wildlife (South Coast Region 5 and Marine Region 7), California Regional Water Quality Control Board (Los Angeles Region 4), and the U.S. Geological Survey, Western Ecological Research Center.

8.4 TRIBAL GOVERNMENT-TO-GOVERNMENT CONSULTATION

As part of the USACE historic property identification efforts under Section 106 of the NHPA, the USACE requested a sacred lands search for the study area from the Native American Heritage Commission (NAHC). The results were negative; however, the NAHC stated that the area is sensitive for cultural resources and provided a list of non-Federally recognized tribes who are culturally affiliated with the area. Letters requesting assistance identifying any known traditional cultural properties were sent to the Gabrieleno Band of Mission Indians – Kizh Nation, Gabrieleno/Tongva San Gabriel Band of Mission Indians, Gabrielino /Tongva Nation, Gabrielino Tongva Indians of California Tribal Council, and the Gabrielino-Tongva Tribe in November of 2017. No response was received. In December of 2019, the USACE sent follow up letters to the aforementioned tribes as well the Soboba Band of Luiseno Indians (collectively tribes). While not on the NAHC list, the USACE had been informed by the Port of Los Angeles that the Soboba Band of Luiseno Indians had requested to consult on any activities in ESPB. The Gabrieleno Band of Mission Indians - Kizh Nation responded to the USACE 2019 consultation letters. They are supportive of efforts to improve the ecosystem within ESPB. No project specific concerns were raised but the importance or the water and the villages that were once located near ESPB were discussed.

9 REMAINING REVIEWS, APPROVALS, IMPLEMENTATION, AND SCHEDULE

In addition to completion of the study phase of this project, there are several steps the City and the USACE must take prior to physical construction. The simplified diagram below, Figure 9-1, outlines the key steps to project construction. As noted in Chapter 1, after completion of the Final IFR, the Chief of Engineers' Report is prepared, endorsing the recommended plan for authorization by Congress. The signing of the Chief's Report is anticipated to take place by August 2021. The amount of time before completion of project construction depends on many factors, including the length of time before the project is authorized for construction by Congress, the timing and amount of funds appropriated to design and construct the project, and engineering, design, and construction complexities, as well as other factors.

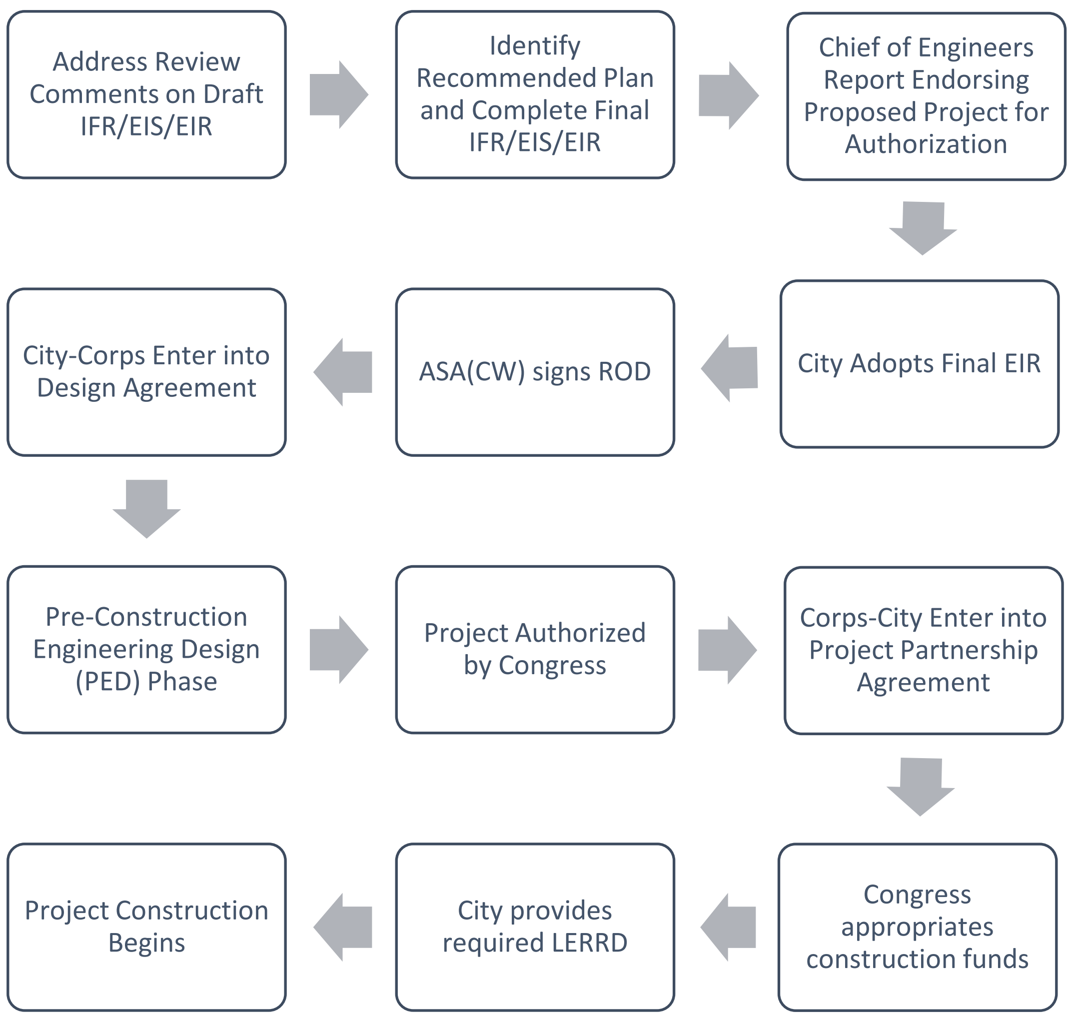

Figure 9-1: Steps to Implement A USACE Ecosystem Restoration Project

9.1 REVIEWS, APPROVALS, AND IMPLEMENTATION STEPS DURING CIRCULATION OF THE DRAFT IFR

The necessary reviews and activities that followed circulation of the Draft IFR of the Tentatively Selection Plan are listed below:

a. Review comments on the Draft IFR were accepted from the public, local, state, and Federal agencies, and others for a period of 60 days.
b. Professional peer reviews, including the USACE ATR and the IEPR occurred within this same time period to validate the sufficiency of the feasibility report analyses and conclusions.
c. Concurrent policy and legal compliance review by HQUSACE and South Pacific Division review team members also occurred during the 60-day public review period to support the final Agency Decision on the project.
d. A Review Summary was prepared that highlighted significant comments and potential risks associated with agency endorsement of the Recommended Plan in preparation for the Agency Decision Milestone, at which the Recommended Plan was identified.
e. A Final IFR has been prepared (this document), which addresses review comments on the Draft IFR-EIS/EIR and includes more detailed, feasibility level analysis of the Recommended Plan. Final IFR will be circulated for state and agency review. Any comments received will be addressed as needed .

9.2 REVIEWS, APPROVALS, AND IMPLEMENTATION STEPS AFTER COMPLETION OF FINAL REVIEWS

The necessary reviews and activities leading to approval after reviews of the Final IFR of the Recommended Plan are listed below:

a. Environmental Impact Statement Filing – after circulation of the Final IFR state and agency review, the USACE District will file the Final IFR with EPA, prior to release of the proposed Report of the Chief of Engineers (Chief’s Report).
b. Environmental Impact Report Certification (City) – The Final IFR will be circulated for public and agency review and comment a minimum of 10 days before consideration by City. At a public hearing, the City will decide whether to recommend approval of the EIR and forward the document to City for certification. If adopted, a Notice of Completion is filed with City.
c. Chief of Engineers Report – Chief of Engineers signs the Chief’s Report signifying approval of the project recommendation and submits the following to the Assistant Secretary of the Army (Civil Works) (ASA (CW)): The Chief’s Report, the Final IFR, and the unsigned Record of Decision (ROD).
d. ASA (CW) Approval – The ASA (CW) will review the documents to determine the level of administration support for the Chief of Engineers recommendation. The ASA (CW) will formally submit the report to the Office of Management and Budget (OMB). OMB will review the recommendation to determine its relationship to the program of the President. OMB may clear the release of the report to Congress.
e. Project requires congressional authorization for construction.
f. Funds could be provided, when appropriated in the budget, for PED, upon issuance of the Division Commander’s public notice announcing the completion of the final report and pending project authorization for construction. Surveys, model studies, and detailed engineering and

design for PED studies will be accomplished first, and then plans and specifications will be completed, upon receipt of funds.

g. City, as the Non-Federal Sponsor, needs to acquire Lands, Easements, Rights-of-Way, Relocations and Disposal Areas for real estate certification by the USACE Los Angeles District Chief of Real Estate prior to advertisement of project.

h. Construction would be performed with Federal and Non-Federal funds once the construction project is advertised and awarded.

10 RECOMMENDATION

I concur with the findings presented in this IFR. The Recommended Plan is the NER Plan (Alternative 4A), which consists of restoring coastal aquatic habitat in East San Pedro Bay, off the coast of Long Beach, California. The Recommended Plan is anticipated to generate significant aquatic ecosystem restoration benefits, including 200.7 acres of restored habitat with 161 average annual habitat units (AAHUs). The USACE recognizes that the non-Federal sponsor, City of Long Beach, supports the Recommended Plan.

I recommend that the Recommended Plan be authorized for implementation as a Federal project with such modifications thereof as in the discretion of the Chief of Engineers, U.S. Army Corps of Engineers, may be advisable. The estimated total project first cost of the Recommended Plan referenced to October 2022 price levels is $262,411,000 including an estimated federal share of $164,260,200, and an estimated non-Federal share of $98,150,800. The non-Federal share includes $88,447,800 in cash and $9,703,000 in lands, easements, rights-of-way, relocations, and disposal areas (LERRDs). Based on a 2.25 percent Federal discount rate and a 50-year period of analysis, the total equivalent average annual costs of the project are estimated to be $10,200,000, including OMRR&R. The total project cost includes implementation and a 10-year monitoring and adaptive management phase following construction completion of the various restoration features.

Aids to navigation (ATONS), which have an estimated cost of $1,290,000, would be provided at 100 percent Federal cost (U.S. Coast Guard). Project cost apportionment after inclusion of ATONS costs brings the estimated cost share to $165,550,200 Federal and $98,150,800 non-Federal for a total project construction cost of $263,701,000 (FY 2022 Price Level).

The Recommended Plan conforms to the essential elements of the U.S. Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and complies with other Administration and legislative policies and guidelines on project development. Project costs are shared with the non-Federal sponsor in accordance with amended Section 103(c)(7) of WRDA 1986, 33 U.S.C. 2213(c) (as amended by WRDA 1996, Section 210) which sets the environmental protection and restoration cost share. Federal implementation is contingent upon the non-Federal sponsor agreeing to comply with applicable federal laws and policies. Prior to implementation, the non-Federal sponsor shall agree to:

a. Provide 35 percent of total project costs as further specified below:

   (1) Provide 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;

   (2) Provide, all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;

   (3) Provide, during construction, any additional funds necessary to make its total contribution equal to 35 percent of total project costs;

b. Shall not use funds from other federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the federal agency providing the funds verifies in writing that the funds are authorized to be used to carry out the project;

c. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the project, hinder operation and maintenance of the project, or interfere with the project's proper function;

d. Shall not use the project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;

e. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

f. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, except as limited by Section 1161 of the Water Resources Development Act of 2016, Public Law 114-322 (33 U.S.C. 2330a(e)), at no cost to the federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable federal and state laws and regulations and any specific directions prescribed by the federal government;

g. Give the federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project. No operation, maintenance, repair, rehabilitation, or replacement by the government shall relieve the non-Federal sponsor of its obligations, or preclude the government from pursuing any other remedy at law or equity to censure faithful performance;

h. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

i. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of three years after final accounting, to the extent and in such detail as will properly reflect total project costs.

j. Comply with all the requirements of applicable federal laws and implementing regulations, including, but not limited to: Section 601of the Civil Rights Act of 1964, Public Law 88-352, as amended (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; the Age Discrimination Act of 1975 (42 U.S.C. 6102); the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Army Regulation 600-7 issued pursuant thereto; and all applicable federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (labor standards originally enacted as the Davis-Bacon Act , the Contract Work Hours and Safety Standards Act, and the Copeland Anti-Kickback Act);

k. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the federal government determines to be required for construction, operation, and maintenance of the project. However, for lands that the federal government determines to be subject to the navigation servitude, only the federal government shall perform such investigations unless the federal government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction; Assume, as between the federal government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights of way that the federal government determines to be required for construction, operation, and maintenance of the project;

l. Agree, as between the federal government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and

m. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project, or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

The recommendation contained herein reflects the information available at this time and current departmental policies governing formulation of individual projects. It does not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program or the perspective of higher review levels within the Executive Branch. Consequently, the recommendation may be modified before it is transmitted to the Congress as a proposal for authorization and implementation funding. However, prior to transmittal to the Congress, the State of California, the City of Long Beach (the non-Federal sponsor), interested Federal agencies, and other parties will be advised of any significant modifications and will be afforded an opportunity to comment further.

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