APPENDIX E

NMFS BIOLOGICAL ASSESSMENT AND ESSENTIAL FISH HABITAT ASSESSMENT (DRAFT)

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

May 25, 2022

Penny Ruvelas
Long Beach Office Branch Chief
Protected Resources Division
National Marine Fisheries Service, West Coast Region
National Oceanic and Atmospheric Administration

Re: Request for Concurrence under Endangered Species Act Section 7 Informal Consultation for the United States-Mexico-Canada Agreement (USMCA) Mitigation of Contaminated Transboundary Flows Project (Alternative 1)

Dear Penny Ruvelas:

The United States Environmental Protection Agency, Region 9 (EPA) would like to request the National Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS) review of the enclosed Draft Biological Assessment and Essential Fish Habitat Assessment. EPA is submitting this request to initiate informal consultation pursuant to 50 CFR § 402.13, and requests NMFS written concurrence under Section 7 of the Endangered Species Act (ESA) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) with EPA's determination that the United States-Mexico-Canada Agreement (USMCA) Mitigation of Contaminated Transboundary Flows Project (Project) "may affect, but is not likely to adversely affect" all listed species and essential fish habitat with the potential to occur within the proposed Project's Action Area.

In January 2020, Congress passed the USMCA Implementation Act, which appropriated funds to EPA for implementation of wastewater infrastructure projects at the U.S.-Mexico border and authorized EPA to plan, design, and construct wastewater treatment projects in the Tijuana River area. These projects aim to reduce transboundary flows that cause adverse public health and environmental impacts in the Tijuana River watershed and adjacent coastal areas. In accordance with the requirements of the National Environmental Policy Act, EPA has developed a draft Programmatic Environmental Impact Statement (PEIS) to support an informed decision-making process that considers and reviews the environmental impacts of reasonable alternatives to meet the purpose and need of the USMCA goals.

EPA has identified two alternatives that it has evaluated in its draft PEIS: a limited funding approach for implementation (Alternative 1) and a more comprehensive solution (Alternative 2) that would warrant additional funding. EPA has not yet identified a preferred alternative; however, EPA has completed a Draft Biological Assessment evaluating potential effects to federally-listed threatened and endangered species and essential fish habitat for the activities associated with Alternative 1, which includes four Core Projects. If implemented, and as described in the draft PEIS, most activities under the Core Projects would be located within the U.S. in the Tijuana River Valley in San Diego, California. Though

Alternative 1 also includes actions in Mexico, the Draft Biological Assessment does not include analysis for international activities occurring in Mexico except when transboundary flows could be affected.

EPA's evaluation of the ESA-listed and candidate listed species with potential to occur in the Action Area and potential effects associated with the construction and operations of Alternative 1 is detailed in the enclosed Draft Biological Assessment. In addition to the evaluation of ESA-listed and candidate listed species, EPA has incorporated an essential fish habitat assessment into the document. The analysis in the Biological Assessment supports a determination that the Project "may affect, but is not likely to adversely affect" listed species and the essential fish habitat assessment determines that the project has no likelihood of adverse effects to essential fish habitat. This determination applies to the following species and essential fish habitat:

Marine Mammals:

1. Blue whale *(Balaenoptera musculus)*
2. Humpback whale, Central America DPS *(Megaptera novaeangliae)*
3. Humpback whale, Mexico DPS *(Megaptera novaeangliae)*
4. Fin whale *(Balaenoptera physalus)*
5. Gray whale, Western North Pacific DPS *(Eschrichtius robustus)*
6. Guadalupe fur seal *(Arctocephalus townsendi)*
7. Sperm whale *(Physeter macrocephalus)*
8. Sei whale *(Balaenoptera borealis)*
9. North Pacific right whale *(Eubalaena japonica)*

Sea Turtles:

1. Green sea turtle, East Pacific DPS *(Chelonia mydas)*
2. Leatherback sea turtle *(Dermochelys coriacea)*
3. Loggerhead turtle, North Pacific DPS *(Caretta caretta)*
4. Pacific olive ridley turtle, Mexico Pacific breeding population DPS *(Lepidochelys olivacea)*
5. Pacific olive ridley turtle, remaining range *(Lepidochelys olivacea)*

Marine Invertebrates:

1. White abalone *(Haliotus sorenseni)*
2. Sunflower sea star *(Pycnopodia helianthoides)*

Fishes:

1. Shortfin mako or bonito shark *(Isurus oxyrinchus)*
2. Gulf grouper *(Mycteroperca jordani)*
3. Giant manta ray *(Manta birostris)*
4. Scalloped hammerhead shark *(Sphyrna lewini)*
5. Oceanic whitetip shark *(Carcharhinus longimanus)*
6. Steelhead, Southern California DPS *(Oncorhynchus mykiss irideus)*

Essential Fish Habitat:

1. Groundfish EFH *(Pacific Coast Groundfish FMP)*
2. Coastal Pelagic EFH, including krill EFH *(Coastal Pelagic Species FMP)*
3. Dorado EFH *(Highly Migratory Species FMP)*
4. Common Thresher Shark EFH *(Highly Migratory Species FMP)*
5. Rocky Reef HAPC, Imperial Beach Kelp Forest *(Pacific Coast Groundfish FMP)*
6. Canopy Kelp HAPC, Imperial Beach Kelp Forest *(Pacific Coast Groundfish FMP)*
7. Estuarine HAPC, TJRE *(Pacific Coast Groundfish FMP)*

We are hereby requesting NMFS written concurrence with EPA's determination that the Project "may affect, but is not likely to adversely affect" the listed species and has no likelihood of an adverse effect to essential fish habitat identified above. If you have questions or need additional information, please contact me (415-947-4187, lee.lily@epa.gov) or Mimi Soo-Hoo of my staff (415-972-3500, soo-hoo.mimi@epa.gov).

Sincerely,

LILY LEE Digitally signed by LILY LEE Date: 2022.05.25 15:01:36 -07'00'

Lily Lee
Manager, Infrastructure Section

Enclosures (1):

1. *Draft Biological Assessment and Essential Fish Habitat Assessment, USMCA Mitigation of Contaminated Transboundary Flows Project,* prepared by Tenera Environmental, Inc. under subcontract to Eastern Research Group, Inc. (May 24, 2022)

cc: (with enclosures)

Bryant Chesney

Biological Assessment and Essential Fish Habitat Assessment

USMCA Mitigation of Contaminated Transboundary Flows Project

Prepared for:

United States Environmental Protection Agency
Office of Wastewater Management
1200 Pennsylvania Avenue, NW
Washington DC 20460

Prepared by:

Eastern Research Group, Inc.

Tenera Environmental, Inc.

24 May 2022
Draft Report

Work Performed Under EPA Contract No. 68HERH19D0033
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ABBREVIATIONS, ACRONYMS, AND SYMBOLS

ACS/LA	American Cetacean Society Los Angeles Chapter
ADCP	acoustic doppler current meter
APTP	advanced primary treatment plant
BA	Biological Assessment
BIAs	Biologically Important Areas
BOD	biochemical oxygen demand
CA-OR-WA	California-Oregon-Washington
CALCOFI	California Cooperative Oceanic Fisheries Investigations
CBD	Center for Biological Diversity
CDFW	California Department of Fish and Wildlife
CDOM	colored dissolved organic matter
CEC	Contaminant of Emerging Concern
CFR	Code of Federal Regulations
CILA	Comisión International de Limites y Aguas
cm	centimeter(s)
COAWST	Coupled Ocean-Atmosphere-Wave-Sediment-Transport
CoSD	City of San Diego
CPS	Coastal Pelagic Species
DDT	dichloro-diphenyl-trichloroethane
DPS	Distinct Population Segment
EFH	Essential Fish Habitat
EID	Environmental Information Document
ENP	Eastern North Pacific
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FIB	fecal indicator bacteria
FMC	Fishery Management Councils
FMP	Fishery Management Plans
FR	Federal Register
GIS	Geographical Information System
HAB	harmful algal blooms
HAPC	Habitat Areas of Particular Concern
HMS	Highly Migratory Species
ITP	South Bay International Wastewater Treatment Plant
IUCN	International Union for Conservation of Nature
km	kilometer(s)
m	meter(s)
MGD	million gallons per day
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPFW	North Pacific Fin Whale
PB1-A	Pump Station 1A
PB-CILA	Planta de Bombeo CILA

(Continued)

PBDE	polybrominated diphenyl ether
PCB	polychlorinated biphenyls
PCG	Pacific Coast Groundfish
PCS	Pacific Coast Salmon
PEIS	Programmatic Environmental Impact Statement
PFMC	Pacific Fishery Management Council
PLOO	Point Loma Ocean Outfall
POP	persistent organic pollutant
PSP	paralytic shellfish poisoning
RNKSC	Region Nine Kelp Survey Consortium
ROV	remotely operated vehicle
RTOM	real-time oceanographic mooring system
SAB	San Antonio de los Buenos
SABTP	San Antonio de los Buenos Wastewater Treatment Plant
SBOO	South Bay Ocean Outfall
SBWRP	South Bay Water Reclamation Plant
SCB	Southern California Bight
SD RSMP	San Diego Regional Sediment Management Plan
TBT	tributyltin
TCEP	tris(chloroethyl) phosphate
TCPP	tris(chloropropyl) phosphate
TDCPP	tris(1,3-dichloro-2-propyl) phosphate
TJRE	Tijuana River Estuary
TSS	total suspended solids
UME	Unusual Mortality Event
U.S.	United States
USFWS	United States Fish and Wildlife Service
USIBWC	United States International Boundary and Water Commission
USMCA	United States–Mexico–Canada Agreement
WNP	Western North Pacific
WWTP	wastewater treatment plant

1. BACKGROUND

1.1 Project Background and Overview

Transboundary flows of untreated wastewater (sewage), trash, and sediment routinely enter the United States (U.S.) from Mexico via the Tijuana River, its tributaries, and across the maritime boundary along the San Diego County coast. Transboundary flows crossing into the U.S. from Mexico have raised water quality and human health concerns since at least the 1930s. These transboundary flows impact public health and the environment and have been linked to beach closures along the San Diego County coast.

In January 2020, Congress passed the U.S.–Mexico–Canada Agreement (USMCA) Implementation Act, which appropriated $300 million to the U.S. Environmental Protection Agency (EPA) under Title IX of the Act for architectural, engineering, planning, design, construction, and related activities in connection with the construction of high-priority wastewater facilities in the U.S.-Mexico border area. Subtitle B, Section 821 of the Act authorized EPA to plan, design, and construct wastewater (including stormwater) treatment projects in the Tijuana River area.

EPA established the Eligible Public Entities Coordinating Group, consisting of federal, state, and local stakeholders, and solicited their input on the set of project options to be considered for evaluation in a Programmatic Environmental Impact Statement (PEIS) consistent with requirements of the National Environmental Policy Act (NEPA). EPA and the U.S. International Boundary and Water Commission (USIBWC) are joint lead agencies, in accordance with 40 Code of Federal Regulations (CFR) 1501.7, for preparation of the PEIS. EPA and USIBWC have identified three alternatives for evaluation in the PEIS: no disbursement of funding and continuation of current wastewater management practices (No-Action Alternative), a limited funding approach for implementing the Proposed Action (Alternative 1), and a more comprehensive solution for implementing the Proposed Action (Alternative 2). Full implementation of Alternative 1 identified in the PEIS is the proposed Federal Action and the subject of this combined Biological Assessment (BA) and Essential Fish Habitat (EFH) Assessment report. Further details are provided in Section 1.7 (Projects Proposed for Funding under the USMCA) below.

1.2 Consultation History

On February 26, 2021, members of the EPA-led NEPA planning team provided a joint presentation to the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) that included information on the planning effort underway as part of the USMCA Mitigation of Contaminated Transboundary Flows Project. At this point in the project cycle, the EPA-led team had developed 10 project alternatives that were under consideration in an Environmental Information Document (EID).

On July 7, 2021, once the draft EID was near completion, the NEPA planning team gave a second presentation to NMFS that provided an update on three tentative project alternatives that would be brought forward to the PEIS.

On August 4, 2021, the NEPA planning team provided a technical memorandum to NMFS. The technical memorandum intended to further facilitate early discussions between the EPA and NMFS in relation to marine wildlife listed under the Endangered Species Act (ESA) and EFH that may be affected by the project. The technical memorandum described the Action Area that could be affected based on the proposed suite of project options under consideration for evaluation in the NEPA process. The memorandum also contained a list of species that the EPA had determined could occur within this Action Area, although the memorandum did not determine if those species were likely to be adversely affected by any of the projects under consideration at that time. In addition to the species list, a table of key references, primarily related to management milestones for ESA-listed species, was also provided. These references were compiled in order to inform the basis of a comprehensive summary of life history information and current management status under the ESA in the BA. Lastly, the technical memorandum included a discussion of potential EFH in the Action Area identified during the development of the EID. EPA requested feedback from NMFS on the species list, EFH resources considered, and references table in the technical memorandum.

On August 25, 2021, NMFS provided an email response with comments relating to the technical memorandum. In addition to a correction on the name of the Western North Pacific (WNP) Distinct Population Segment (DPS) for gray whale, NMFS provided information on two candidate species not included in the technical memorandum—specifically, the shortfin mako shark and the sunflower sea star, noting that both of these species may occur in the Action Area and so should be included in the species list. NMFS also advised that impacts to species protected under the Marine Mammal Protection Act (MMPA) should also be considered. These include all marine mammals, which are managed according to MMPA stocks. While several species listed under the ESA are also protected under the MMPA, the respective management units may differ. Subsequently, marine mammals protected under the MMPA, including ESA-listed and candidate marine mammals, are considered in the PEIS. Lastly, NMFS pointed to an updated status review for Guadalupe fur seal and a new NOAA website hosting information on Biologically Important Areas (BIAs) for cetaceans. Some of these BIAs occur close to, or may overlap, the Action Area described in the memo and should be considered in any future assessment.

Since these discussions, EPA completed the Alternative Analysis which identified the Alternatives 1 and 2 considered in the Draft PEIS. The consultation with NMFS includes only Alternative 1 (i.e., the Core Projects). ESA compliance for Supplemental Projects would be conducted at the time of the subsequent tiered NEPA analyses for those projects.

The following BA describes the potential for adverse effects to species listed under the ESA due to full implementation of Alternative 1 of the Proposed Action in the NEPA PEIS (the proposed Federal Action). This assessment also considers the potential for adverse effects to EFH.

1.3 Transboundary Flows

Transboundary flows consist of untreated wastewater, trash, and sediment that enters the U.S. via the Tijuana River, via tributaries that flow north through canyons to the Tijuana River Valley and Estuary, and via coastal waters of the Pacific Ocean. These polluting transboundary flows are due to deficiencies in the treatment, piping, and pump station network in Tijuana.

Tijuana River Transboundary Flows

The Tijuana River originates in Mexico and flows northwest, crossing into the U.S. before ultimately discharging to the Pacific Ocean via the Tijuana River Estuary (TJRE).

In the U.S., flows in the Tijuana River mainly occur during the rainy season, which begins as early as October and ends as late as April. During this period, intermittent but very large flows occur following storm events that typically result in a surge of peak flow that flushes through the estuary and out to the ocean, followed by days with sustained and subsiding flow. Based on USIBWC flow gage data collected just downstream of the U.S.-Mexico border since 2000, an average wet season features approximately 96 days with river flows (53 percent of wet-season days) totaling approximately 9,000 million gallons (MG) of flow over the course of the season. However, flows fluctuate greatly from season to season, with wet-season flows since 2000 ranging from less than 1,000 MG to greater than 25,000 MG. The two-, five-, and 10-year flood events are estimated to have peak flows of approximately 1,300; 5,400; and 11,000 cubic feet per second, respectively (PG Environmental, 2022).

However, for most of the year, conditions in the Tijuana River in the U.S. are characterized by prolonged dry periods of very low to zero surface water flows—particularly during the dry season commonly defined as spanning from Memorial Day to Labor Day. A typical dry season features fewer than 10 days with river flows (less than 10 percent of dry-season days) totaling less than 100 MG of flow over the course of the season. However, failures of the river diversion system in Tijuana (described below) can result in extended periods of flow, such as in 2020 when transboundary river flows occurred on nearly every day of the dry season.

The Planta de Bombeo (PB)-Comisión International de Limites y Aguas (CILA) diversion system was designed and built in the 1990s to divert river water from the Tijuana River during low-flow conditions—typically "dry-weather flows"[1]—before the river crossed the border into the U.S. PB-CILA is designed to divert river water into the Tijuana sewer system. However, malfunctions of the PB-CILA diversion system currently result in dry-weather transboundary river flows. When PB-CILA is unable to divert dry-weather flows from the river to the distribution and treatment network as intended, between 20 to 30 million gallons per day (MGD) crosses into the U.S. via the Tijuana River. These river transboundary flows are estimated to consist of approximately 10 MGD of treated effluent from La Morita wastewater treatment plant (WWTP) and Arturo Herrera WWTP and 4 to 5 MGD of flows from the Alamar River. The remaining 10 MGD consists of untreated wastewater and "urban drool" (i.e., unnatural, unpermitted, non-exempted dry-weather flows) that escapes the Tijuana metropolitan area wastewater collection system and flows into the Tijuana River, primarily because of sewer system deterioration and pump station mechanical failures (PG Environmental, 2021a). This includes sanitary wastewater generated by unsewered communities whose wastewater flows directly into the river.

Canyon Transboundary Flows

Two major canyons and several minor canyon and drainage features drain from Mexico to the U.S. The westerly major canyon is referred to as Goat Canyon in the U.S. and Los Laureles Canyon in Mexico. The second major canyon lies to the east of Goat Canyon/Los Laureles Canyon. This is referred to as Smuggler's Gulch in the U.S. and Matadero Canyon in Mexico. In addition to these two canyons, several other drainages that cross the border from Mexico deliver transboundary flows to the U.S. These include Stewart's Drain, Silva Drain, and Cañón del Sol.

Smuggler's Gulch/Matadero Canyon has a subwatershed area of 3,762 acres, including the portions in Mexico (HDR, 2020a). The ephemeral wash system that flows through Smuggler's Gulch collects stormwater and wastewater flows from parts of the City of Tijuana and receives drainage from the surrounding mesas. The canyon flow diversion structure intercepts dry-weather transboundary flows and conveys them to the South Bay International Wastewater Treatment Plant (ITP). During

[1] The term "dry-weather flow" does not have a standard definition but generally refers to flows that persist following a period of several days with minimal to no precipitation. These flows can occur at any time of year, not just during the dry season.

wet-weather flow conditions, the pump diversion is turned off and transboundary flows continue north through a natural channel and a culvert under Monument Road instead, ultimately discharging into the Tijuana River pilot channel.

Goat Canyon is located to the west of Smuggler's Gulch and is referred to as Los Laureles Canyon south of the U.S.-Mexico border. It has a subwatershed area of 2,941 acres, including the portions in Mexico, and is formed from Goat Canyon Creek, which is fed predominantly by runoff and other water sources in Mexico. The canyon flow diversion structure intercepts dry-weather transboundary flows and conveys them to the ITP. Wet-weather flows bypass the diversion structure and continue northwest into two sediment basins, which capture sediment and trash and are also intended to reduce flooding in downstream areas, including Monument Road (HDR, 2020). Outflow from the sediment basins enters the TJRE. In Goat Canyon, transboundary wastewater flows during dry weather have increased in the last two years, possibly due to increased leaks from the wastewater collection system in Los Laureles Canyon in Tijuana.

Transboundary flows through Goat and Smuggler's Gulch canyons include runoff and sediment from overdeveloped, unpaved areas in the canyons south of the border. Trash from residential areas is also washed through the canyons across the border along with stormwater runoff. Flows can also include untreated wastewater due to breaks or leaks in the Tijuana sewer system and wastewater from "disconnected" facilities that drain directly into the canyons.

Coastal Ocean Transboundary Flows

In addition to the wastewater crossing the border via the Tijuana River and adjacent canyons, approximately 35.5 MGD of mixed Tijuana River water and untreated wastewater is collected from Tijuana and transferred via a network of collector pipes and pump stations to San Antonio de los Buenos (SAB) Creek, either directly or after passing through the San Antonio de los Buenos Wastewater Treatment Plant (SABTP). Current operations at the SABTP do not effectively improve water quality prior to discharge. SAB Creek, including this wastewater, discharges directly to the Pacific Ocean at Punta Bandera. Approximately 28.2 MGD of this effluent is untreated wastewater. The remainder (7.3 MGD) is diverted Tijuana River water that includes the Arturo Herrera WWTP effluent, the La Morita WWTP effluent, and river water from the Alamar River. Seasonal marine currents cause these coastal discharges of largely untreated wastewater (sewage) to migrate north along the Pacific Ocean coast into U.S. coastal waters.

1.4 Existing Facilities and Operation

Wastewater from the Tijuana region is collected and treated at three WWTPs in Mexico. Two of these facilities, the La Morita and Arturo Herrera WWTPs, discharge treated effluent, with reportedly high water quality (BOD_5[2] concentration under 10 mg/L) (IBWC, 2020), into the Tijuana River. The design capacities for these plants are 5.8 MGD and 10.5 MGD, respectively. The third facility, the SABTP, has a design capacity of 25 MGD and discharges effluent into the Pacific Ocean via SAB Creek. SAB Creek is located 9.9 kilometers (km) downcoast of the international border. Current operations at the SABTP do not effectively improve water quality prior to discharge.

[2] BOD_5, the biochemical oxygen demand (BOD) of microorganisms over a five-day period, is an indicator of the amount of organic pollution in wastewater.

The ITP is a U.S.-based facility that treats wastewater from Tijuana. The ITP is designed to treat an average daily flow of 25 MGD of wastewater from Mexico. However, when certain infrastructure failures occur in Mexico, the ITP may receive (and treat) flows that exceed the plant's design average daily flow capacity of 25 MGD. The existing plant is a primary and secondary treatment system, and effluent from the plant is discharged to the Pacific Ocean via the South Bay Ocean Outfall (SBOO). The ITP is owned by USIBWC, operated by a contract operator (Veolia), and regulated under the National Pollutant Discharge Elimination System (NPDES) Permit #CA 0108928.

Wastewater from Mexico arrives at the ITP from two sources. It is collected in Mexico and transferred across the international border to the ITP by the International Collector and from a canyon collector system located in the U.S. close to the international border.

The International Collector consists of about 1.5 miles of 72-inch reinforced concrete pipe with a design flow capacity of about 103 MGD. A diversion box directs about 25 MGD of wastewater from the International Collector to the ITP and the remainder of the wastewater is sent to the SABTP. The International Collector receives wastewater from two sources; untreated wastewater from downtown Tijuana and the portion of diverted Tijuana River water from PB-CILA that is not sent to Pump Station 1A (PB1-A).

The PB-CILA pump station is located along the Tijuana River channel just south of the U.S.-Mexico border and is owned and operated by CILA. When the PB-CILA river diversion system is functioning properly, all dry-weather flow (up to 23 MGD) in the Tijuana River is diverted before transboundary flows occur. The diverted flow is routed to PB1-A or into the International Collector. The PB-CILA river diversion system was upgraded in 2021 with a new river intake, new bar screens, a new vortex desander, and new pumps to improve reliability and provide the capability to divert up to 35 MGD of river flows.

The canyon collector system in the U.S. collects wastewater during dry-weather periods from five canyon flow diversion structures[3]. The total average design flow rate from all five structures is 9.67 MGD (Arcadis, 2019). However, actual flows from the canyon collector system to the ITP average approximately 0.6 MGD (PG Environmental, 2021a). This wastewater is conveyed through pipelines to the ITP. If flows exceed the capacity of the canyon collectors, they are not diverted for treatment anywhere and instead flow untreated to the north towards the Tijuana River Valley to be discharged into the Tijuana River and ultimately the Pacific Ocean.

During wet-weather, flows through Goat Canyon and Smugglers Gulch flow past the canyon diversion structures, eventually entering the Tijuana River and/or Estuary. Wet-weather flows from Cañón del Sol are conveyed to the Tijuana River via underground piping with an outfall located immediately northwest of the ITP. Wet-weather flows from Silva Drain flow overland into Stewart's Drain, which discharges to the Tijuana River immediately east of the ITP.

In Mexico, canyon pump stations include the Matadero Pump Station in Matadero Canyon (i.e., the portion of Smuggler's Gulch in Mexico) and the Los Laureles 1 and Los Laureles 2 Pump Stations in Los Laureles Canyon (i.e., the portion of Goat Canyon in Mexico). When the pump stations are

[3] The canyon flow diversion structures along the U.S.-Mexico border consist of culverts, concrete approach pads, and grated intakes that drain to the ITP headworks via subsurface gravity piping. These are also referred to as "canyon collectors" in HDR (2020).

operating properly, dry-weather wastewater flows in the canyons (other than "disconnected" flows that drain directly into the canyons) are conveyed via the Tijuana sanitary sewer system to the SABTP. The current wastewater flow from these canyon pump stations in Mexico is 6.3 MGD.

A second facility, the South Bay Water Reclamation Plant (SBWRP), also discharges effluent via the SBOO. The SBWRP currently treats wastewater collected from U.S. communities only. It was constructed in 2002 by the City of San Diego (CoSD) on a 22-acre site adjacent to the ITP. The existing SBWRP is designed to treat an average daily flow of 15 MGD and a peak daily flow of 35 MGD. The treatment process consists of preliminary, primary, and secondary treatment for discharged effluent, plus tertiary treatment and disinfection of effluent for beneficial reuse. This facility combines its effluent with the ITP prior to discharge to the Pacific Ocean but has no bearing on the Federal Action assessed for this report.

1.5 South Bay Ocean Outfall

SBOO is the pipe structure used to discharge treated effluent from the ITP and the SBWRP to the Pacific Ocean. The main barrel of the pipeline runs offshore (west) and terminates approximately 5.5 km in approximately 25 meters (m) of water. The pipeline terminates as a wye-diffuser. An engineering drawing depicting the configuration of the SBOO wye diffuser and terminal end of the main barrel is shown in Figure 1-1. The wye diffuser consists of two 'legs' that contain 82 vertical diffuser risers containing four ports on each leg and one additional diffuser riser at the end of the main barrel near the junction with the wye diffuser (165 risers; 660 ports).

Each leg runs roughly 0.6 km (0.4 miles) to the south and northwest. Each leg of the wye diffuser features a sealed offshore terminus structure designed to provide access to the pipe. Cylindrical diffuser risers are interspersed along the pipeline at regular intervals. Excepting outfall risers and maintenance hatches, the pipeline itself is obscured by rocky rip-rap armoring.

Currently, each riser is either open, capped, or blind flanged. There are currently 18 open risers. These include the single riser located on the main barrel and 17 risers located along the south leg of the wye diffuser. A further 16 risers along the southern leg of the wye diffuser are capped. Capped risers consist of a riser pipe head with four temporarily closed ports. The remaining 49 risers on the southern leg of the wye diffuser, and all 82 risers on the northern leg of the wye diffuser are sealed closed with a blind flange. In the case of a blind flanged riser, there is no head on the riser and a blind flange is bolted to the upper flange of the riser assembly.

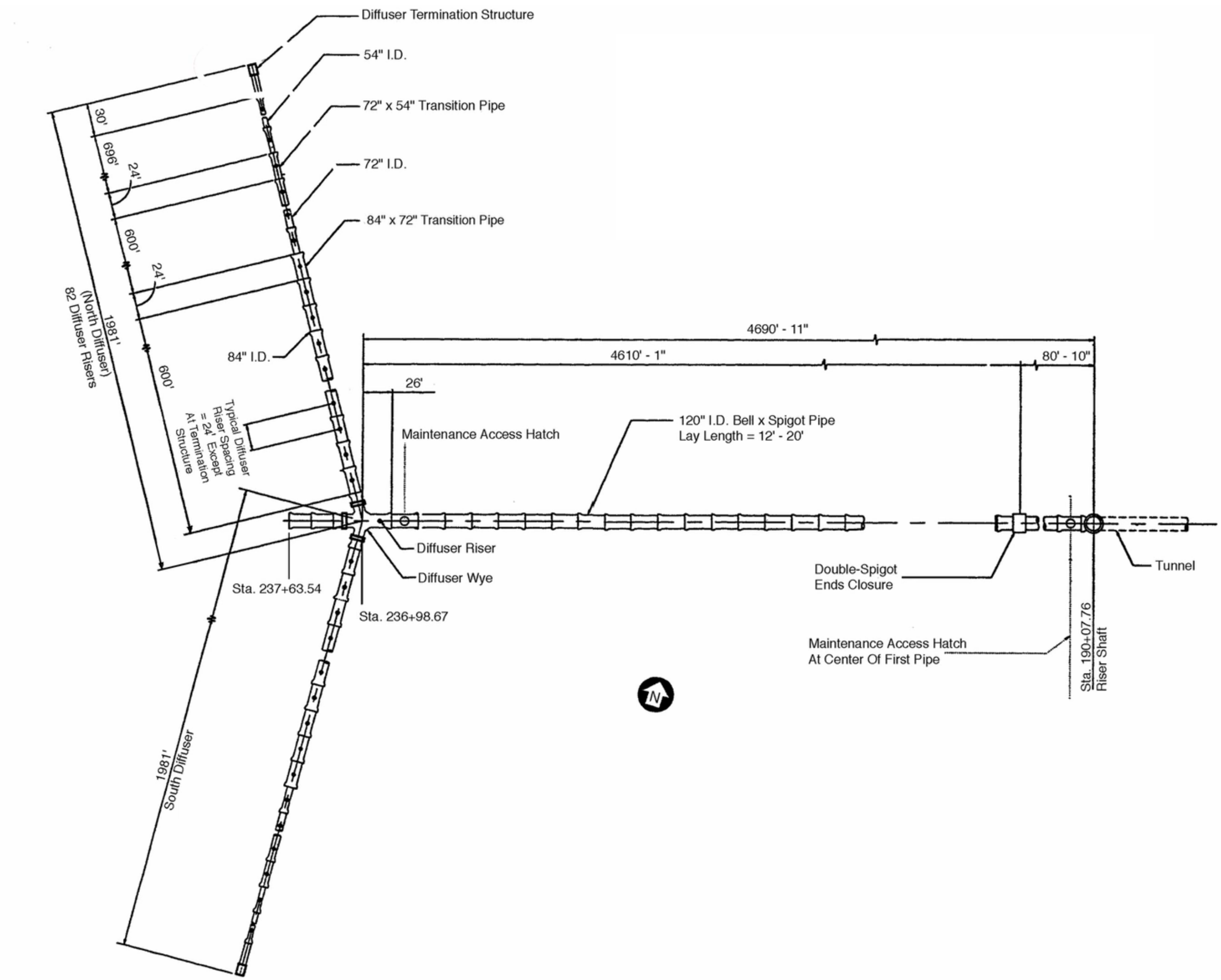

Figure 1-1. Engineering drawings of the terminal end of the SBOO and wye diffuser array.

The SBOO is designed to handle an average flow of 174 MGD and a maximum daily flow of 233 MGD. Table 1-1 shows the actual discharge flows from the SBOO for each facility from 2016 through 2019 based on data collected as part of the NPDES monitoring programs at each facility. The average discharge of effluent through the SBOO in 2020 was ~31 MGD, including 4 MGD of secondary and tertiary treated effluent from the SBWRP, and 27 MGD of secondary treated effluent from the ITP (CoSD, 2020).

Table 1-1. Plant design capacity and actual discharge flows (MGD) from 2016 through 2019 for effluent discharged from the SBOO based on data collected as part of NPDES monitoring programs.

Component	Design Capacity (MGD)		Actual Discharge (MGD) (2016–2019)	
	Peak Daily	Average Daily	Peak Daily	Average Daily
SBWRP (to SBOO)	35	15	8	7
ITP (to SBOO)	30	25	37	25
Total to SBOO	**65**	**40**	**45**	**32**

Currently, the USIBWC is responsible for maintenance and operation of the land outfall east of a drop shaft approximately 1 mile inland from the ocean. This section of pipeline includes an anti-intrusion structure and two valves, which are located on top of the drop shaft hatch cover. The City is responsible for maintenance and operation of the drop shaft and everything west of this structure, including all of the offshore components.

1.6 Proposed Federal Action

The proposed Federal Action evaluated in this BA and EFH Assessment is the issuance of U.S. appropriations (including but not limited to USMCA Implementation Act appropriations) for, and implementation (i.e., design and construction) of, water infrastructure projects to address impacts from transboundary flows in the Tijuana River watershed and adjacent coastal areas.

Because of the programmatic nature of the decisions to be made, only certain projects (those identified as Core Projects in the PEIS) will be able to be implemented by USIBWC at the completion of the initial NEPA process. Other projects (those identified as Supplemental Projects in the PEIS) would require additional tiered review before USIBWC would be able to implement them. Therefore, for purposes of this BA and EFH Assessment, the Federal Action is the funding and implementation of the four projects identified as Core Projects in the PEIS. This corresponds with the scope of PEIS Alternative 1.

1.7 Projects Proposed for Funding under the USMCA

Funding under the USMCA will be made available for a suite of projects proposed to address contaminated transboundary flows by achieving one or more of the following:

- Reducing the generation and/or discharge of contaminated flows from point and nonpoint sources of pollution in the Tijuana region;
- Improving the collection and/or treatment of contaminated flows in the Tijuana region before they reach the U.S.-Mexico border; and/or
- Improving the collection and/or treatment of contaminated transboundary flows in the U.S.

Through the NEPA process, EPA and USIBWC have identified multiple projects that form the Core Projects. These projects are as follows:

A. Expand the ITP from its current capacity of 25 MGD to 60 MGD.[4]

B. Install a wastewater conveyance system from Matadero Canyon and Los Laureles Canyon in Mexico that conveys dry-weather flows to the expanded ITP for treatment.

C. Rehabilitate or replace targeted sewer collectors in Tijuana that currently leak into the Tijuana River.

D. Construct and operate a 35-MGD Advanced Primary Treatment Plant (APTP) for advanced primary treatment of diverted water from the existing PB-CILA diversion in Mexico.

Project A: Expanded ITP

Project A includes expansion of the ITP from 25 MGD to 60 MGD[5] to allow for untreated wastewater currently sent to the SABTP in Mexico to instead be sent to a facility maintained and regulated in the U.S. Currently, the SABTP directly discharges large volumes (~28.2 MGD) of untreated wastewater (primarily raw sewage) to the Pacific Ocean at Punta Bandera via SAB Creek. From this coastal creek mouth, this heavily polluted plume is coastally trapped and transported upcoast where it crosses the U.S.-Mexico border resulting in extensive pollution of U.S. coastal waters and beaches (Feddersen et al., 2021).

The primary purpose of expanding the ITP is to receive and treat additional wastewater from the International Collector in Mexico that otherwise would be discharged to the Pacific Ocean via SAB Creek. The expanded ITP may also reduce untreated wastewater overflows from the sanitary sewer to the Tijuana River caused by mechanical failures at Pump Station 1B. The expanded ITP will also provide treatment for wastewater collected in the canyons (Project B) and will provide capacity to accommodate additional wastewater flows produced by the future population of Tijuana (based on 2050 projections).

Expansion of the ITP will allow for primary and secondary treatment of this untreated wastewater prior to discharge via the SBOO, resulting in a reduction in the nearshore pollution currently impacting water quality and marine ecology in the southern San Diego marine region.

Influent to the ITP will undergo the following sequential primary and secondary treatment processes; screening, grit removal, the addition of ferric chloride and advanced primary settling (for primary sludge removal), biological reactors, and finally secondary settling. The treated effluent will then be discharged to the Pacific Ocean via the SBOO. Sludge will undergo dissolved air

[4] average daily flow

[5] Project A, as evaluated in the PEIS, includes three capacity options that will expand the 25-MGD ITP to an average daily capacity of 40 MGD (Option A1), 50 MGD (Option A2), or 60 MGD (Option A3). For purposes of this BA and EFH consultation, the proposed Federal Action includes expanding the ITP to 60 MGD (Option A3). This approach ensures that the consultation is based on a scope that reflects the maximum potential changes in environmental impacts that could occur under the proposed Federal Action.

flotation unit thickening, anaerobic digestion, dewatering, and solids loading before being trucked for disposal in Mexico.

Project B: Tijuana Canyon Flows to ITP

Project B includes the installation of a wastewater conveyance system from Matadero Canyon (i.e., Smuggler's Gulch) and Los Laureles Canyon (i.e., Goat Canyon) in Mexico to the expanded ITP for treatment (see Project A for details on the ITP expansion). Once complete, this pipeline system will allow for the decommissioning of the existing Matadero pump station in Matadero Canyon, and the Los Laureles 1 and 2 pump stations in the Los Laureles Canyon. These pump stations currently convey wastewater from the canyons to the SABTP, where the untreated wastewater is typically discharged to the Pacific Ocean.

Up to 12.7 MGD (peak daily) of wastewater from the canyons will be collected by the new conveyances and transported to the ITP for treatment. The current wastewater flow from the canyons to the SABTP is 6.3 MGD, so the new conveyances will have available capacity to accommodate flow increases over time. Following treatment at the ITP, these flows will be discharged to the Pacific Ocean through the SBOO as described for Project A.

The primary purpose of the proposed canyon conveyance system is to reduce the amount of dry-weather wastewater flows that are currently discharged with little to no treatment to the Pacific Ocean via SAB Creek. As a secondary benefit, Project B will potentially reduce the volume and frequency of dry-weather transboundary flows in Goat Canyon and Smuggler's Gulch by eliminating the reliance on pump stations whose mechanical issues may cause occasional wastewater overflows into the canyons in Mexico.

Project C: Tijuana Sewer Repairs

Project C includes the rehabilitation or replacement of targeted sewer collectors in the Tijuana metropolitan area. Sewage that leaks from the damaged sewer system enters the Tijuana River, crossing the border into the U.S. By reducing wastewater leaks to the river in Tijuana, Project C will improve downstream water quality in the Tijuana River Valley and Estuary by both 1) reducing overall river flow volumes, and thus reducing the frequency of dry-weather transboundary flows caused by river flow rates that exceed the PB-CILA diversion capacity, and 2) ensuring that more wastewater in the Tijuana sewer system is successfully conveyed to the expanded ITP for treatment (see Project A) rather than entering the U.S. as a transboundary flow. Project C sewer repairs are aimed to reduce the amount of untreated wastewater in the Tijuana River down to 5 MGD.

Project D: Advanced Primary Treatment Plant (APTP) Phase 1

Project D includes the construction and operation of a 35-MGD APTP for advanced primary treatment of diverted water from the existing PB-CILA diversion, rehabilitation and extension of the existing force main from PB-CILA to the new APTP, installation of other new supporting facilities, and associated site modifications. This will provide additional capacity in the U.S. for treating diverted river water from Mexico that would otherwise be pumped to SABTP and discharged to the Pacific Ocean. The project will be designed for potential future expansion to 60 MGD. For example, concrete pads for ballasted flocculation, sludge storage, and other process units will be large enough to accommodate the potential installation of additional process units under a later phase, and piping and stub-outs to convey flows between the units will be sized to accommodate the flow rates of a 60-MGD plant. However, this potential future expansion is not part of the proposed Federal Action.

In order to convey river water to the new APTP, the existing PB-CILA diversion (which will operate when the instantaneous river flow rate is 35 MGD or less) will convey diverted river flows through an existing force main across the border to the APTP headworks. Project D will include the rehabilitation and extension of this existing force main from PB-CILA in Mexico to the new APTP in the U.S. This will reduce the frequency of transboundary river flows by eliminating the use of a pump station (PB1-A) whose mechanical issues indirectly cause occasional shutdowns of the PB-CILA diversion. Because PB-CILA will not be capable of operating when the instantaneous river flow rate exceeds 35 MGD, no treatment at the APTP will occur during these river flow conditions.

The APTP will operate independently of the existing ITP and will consist of the following treatment processes: screening, aerated grit removal, grit dewatering, a ballasted flocculation process, and sludge handling. Preliminary treatment will remove large solid waste and 25 percent suspended solids ("grit"). The ballasted flocculation process is estimated to achieve total suspended solids (TSS) and BOD_5 removals of 85 percent and 50 percent, respectively. Effluent from the APTP will be discharged to the Pacific Ocean via the SBOO. Sludge will be gravity thickened, belt press dewatered, undergo solid loading, and then be trucked for disposal in Mexico.

1.8 Action Area

The proposed Federal Action will result in projects that will affect the marine environment in U.S. Territorial waters through changes in nearshore pollution from transboundary flows and due to a change in the quality and quantity of treated effluent discharged from the SBOO. Subsequently, the Action Area assessed in this BA and EFH Assessment encompasses coastal waters affected by the transboundary flows from Mexico and the area likely to encompass the effluent plume discharged from the SBOO. Because some marine species consistently affected within the boundaries of these areas may move in and out of this extent, the Action Area has been extended beyond the likely extent to encompass adjacent areas.

Models by Feddersen et al. (2021), aerial imagery compiled and analyzed by Ocean Imaging (2020), and monitoring by CoSD as part of their ongoing NPDES permit-related monitoring program related to operation of the SBOO indicate that both sources of wastewater effluent influence waters as far north as the Coronado Embayment. Fishes and other marine life potentially affected by the plume may move offshore as far as the continental shelf break. On this basis, the Action Area is determined as extending from Point Loma to the U.S.-Mexico border and between the coastline and the approximate location of the shelf break as shown in Figure 1-2. The area also includes the TJRE. Effluent effects are also likely in Mexico, but these are not considered in this assessment.

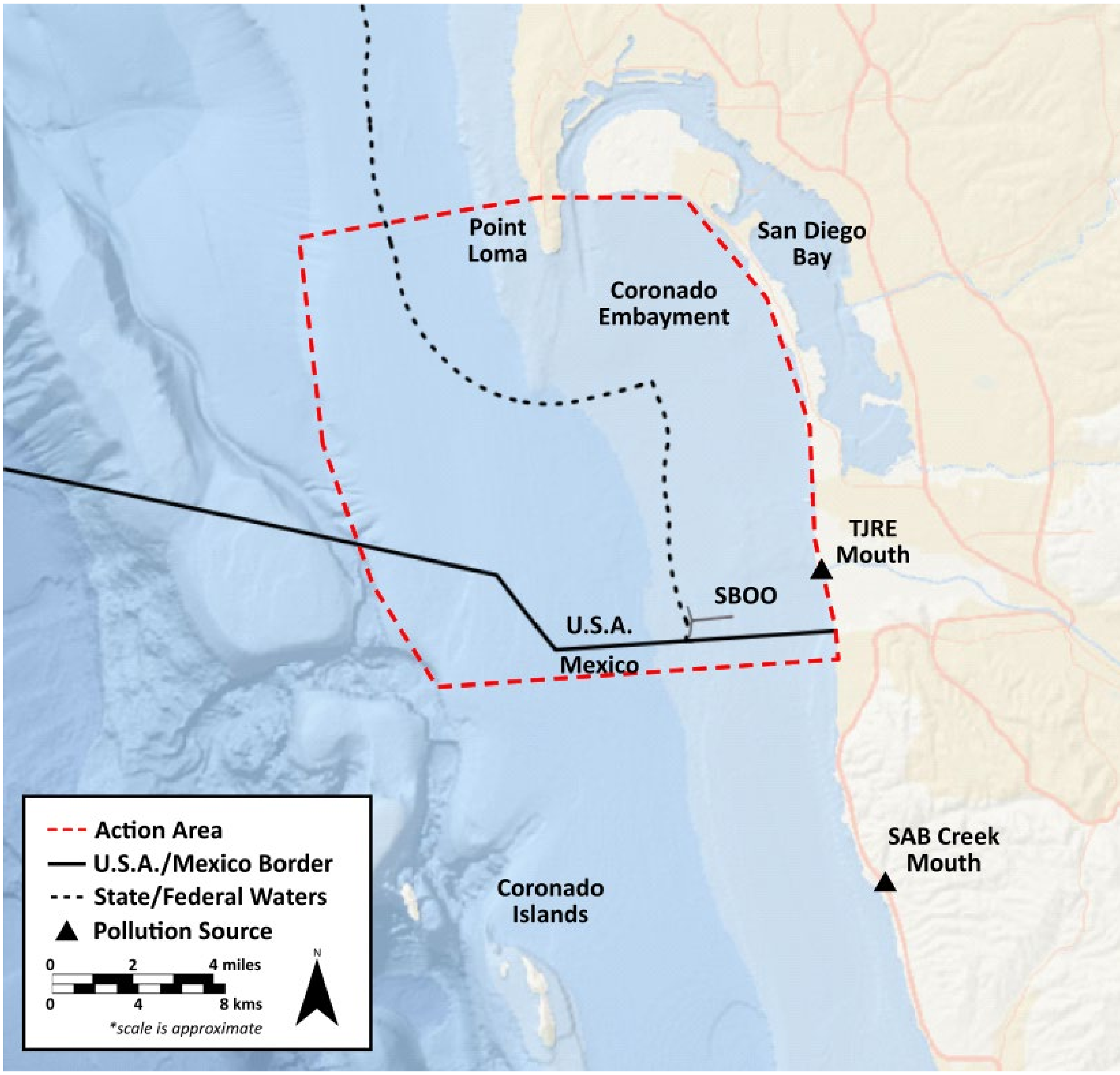

Figure 1-2. Action Area as defined for purposes of this Biological Assessment and EFH Assessment.

2. ENVIRONMENTAL BASELINE

2.1 Oceanography and Ocean Habitat

The SBOO is situated approximately 0.6 miles north of the U.S.-Mexico border and extends approximately 3.5 miles offshore to a depth of approximately 90 feet below the surface. The SBOO discharge plume monitoring program (CoSD, 2020) has detected the influence of the discharge at stations located approximately 6.6 miles upcoast and 4.9 miles downcoast of the SBOO. Point Loma is approximately 10 miles to the north of the SBOO discharge and the continental shelf extends from the shoreline to the shelf break approximately 10 miles offshore (west) of the coastline.

The Action Area is located near the southern limit of the geographic region known as the Southern California Bight (SCB). The SCB extends from Point Conception to the U.S.-Mexico border, encompassing an area characterized by a broad continental borderland consisting of a series of islands, shallow banks, basins, canyons, and troughs. The dramatic shift in coastline south of Point Conception affects ocean currents, resulting in a biogeographic transition zone in the SCB between cool-temperate water in the north and warm sub-tropical water in the south. In the ocean adjacent to and including the Action Area, warm sub-tropical waters are entrained northward from the equator by the oceanography of the region throughout most of the year. Subsequently, the region experiences warmer water conditions relative to the remainder of the SCB region. Horn et al. (2006) refer to the warm-temperate ecology in the SCB, which extends into coastal Baja Mexico, as the San Diegan Province.

Current water quality conditions within the Action Area are affected by ongoing and seasonally variable pollution events originating from untreated and partially treated discharges of wastewater from Mexico. Nitrogen is a limiting factor in the abundance of phytoplankton in the oceans. Treated or untreated effluent can contribute high volumes of nutrients relative to natural nutrient inputs at a local scale in coastal waters, particularly ammonia (NH_3) and ammonium (NH_4^+). While upwelling contributes most of the nitrogen to coastal waters in California, a study by Howard et al. (2014) indicated that effluent and riverine discharges may contribute more than 82 percent of the annual nitrogen input in the San Diego area.

In addition to ongoing monitoring by the CoSD, two comprehensive reviews of the oceanography by Largier et al. (2004) and Terrill et al. (2009) have described the circulation and oceanographic character of the area. The coastal waters off Imperial Beach become strongly stratified in summer. During this period cool, deep water is separated by a sharp temperature boundary (thermocline) from solar-heated warm surface waters. During the winter these shallow waters are typically well mixed with no or limited thermocline present. Circulation patterns within the Action Area are heavily influenced by coastal topography. A large eddy system consistently establishes upcoast of the SBOO in the lee of the Point Loma headland (feature **f** in Figure 2-1). South of this eddy system, ocean currents circulate in a clockwise manner (feature **g** in Figure 2-1). These flows represent the offshore circulation patterns visible in high-frequency radar data, which is capable of mapping surface flows away from the immediate shoreline. Feddersen et al. (2021), who incorporated nearshore transportation into their model of the region, accommodate wave-driven transport that influences the nearshore environment that is not necessarily represented in Figure 2-1 but plays an important role in the transport of shoreline discharges such as the TJRE mouth and SAB Creek mouth. Circulation patterns in the region cycle according to tides, winds, and larger-scale remote forcing.

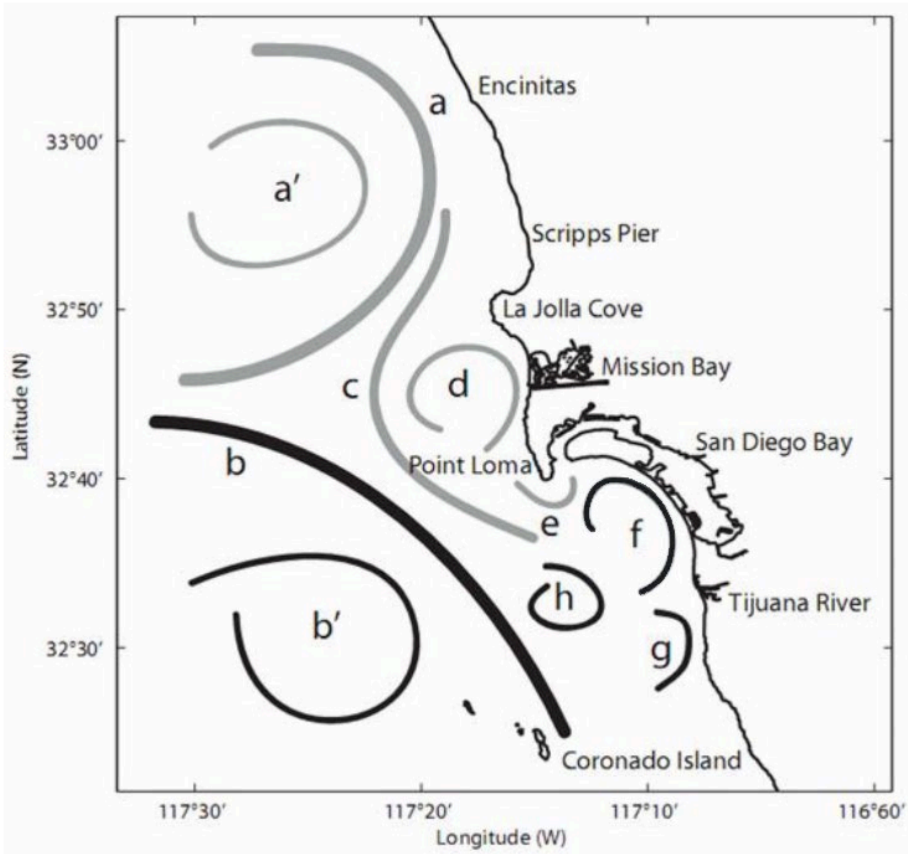

Figure 2-1. Patterns of offshore ocean circulation in the San Diego region from Terrill et al. (2009). Flow strength is represented by line thickness. Black flows have consistent direction, gray features have periodic direction reversals. b has a southeastward flow. b′, g, and h are clockwise flows. f is counterclockwise.[6]

2.2 Existing SBOO Discharge Characteristics

Although the ITP and SBWRP are regulated under separate NPDES permits, both facilities discharge via the SBOO. Therefore, a combined monitoring program for the SBOO is used to evaluate potential environmental effects associated with the SBOO discharge. The monitoring program is implemented by the CoSD, which reports the results of the monitoring annually. According to the most recent biennial monitoring report for 2018–2019 (CoSD, 2020), multiple sources of bacterial contamination exist in the Point Loma and South Bay monitoring regions. These include outflows from the San Diego River, San Diego Bay, the Tijuana River, and SAB Creek. Storm water discharges and terrestrial runoff from local watersheds during storms, or other wet weather events, can also flush sediments and contaminants into nearshore coastal waters. Separating any impact that may be associated with wastewater discharge from other point, or non-point, sources of contamination is often challenging.

[6] In the original publication, Terrill et al. (2009) drew feature 'f' as grey but described it in the text as counterclockwise. The gyre depicted as feature 'f' has been adjusted to black in Figure 2-1.

Based on the 2020 monitoring year, core monitoring of receiving waters for the SBOO discharge includes 53 stations ranging from shore to depths of around 61 m (CoSD, 2021). Weekly sampling for fecal indicator bacteria (FIB) are collected at eight shore stations from Coronado to the U.S.-Mexican border. In 2020, compliance rates at shore stations declined from January to the monthly minimum in April and increased incrementally from May, obtaining 100 percent compliance as the year progressed through December. A similar pattern was observed at kelp stations, although this was considerably less pronounced, with lowest compliance values in January, incrementally increasing to 100 percent compliance by June. Offshore stations had 100 percent compliance throughout 2020 (CoSD, 2021). This pattern of shoreline pollution progressing to less severe pollution at the kelp and negligible FIB detection at the offshore stations is indicative of a coastal source of contamination rather than issues from the treated effluent discharged from the SBOO. Based on evidence presented in Feddersen et al. (2021), the pollution source is most likely transboundary flows originating from the TJRE or SAB Creek.

Weekly sampling is also completed for a suite of water quality parameters at seven relatively nearshore stations within the Imperial Beach Kelp Forest and inshore areas between 18 m and 9 m deep. Additional water quality sampling occurs quarterly at 33 offshore stations from Coronado to the U.S.-Mexico border. In addition to these SBOO stations, several stations occur in the Action Area that are formerly associated with the Point Loma Ocean Outfall monitoring program. CoSD includes results from these monitoring stations in their most recent annual reports. Data collected at the offshore and kelp stations includes FIB at three to five discrete depths and a suite of oceanographic parameters. These include conductivity-temperature-depth data, dissolved oxygen, pH, transmissivity, chlorophyll *a* fluorescence, and colored dissolved organic matter (CDOM). Oceanographic data are sampled at 1 m depth intervals. A real-time oceanographic mooring system (RTOM) is deployed at the end of the SBOO at a depth of approximately 30 m just west (offshore) of the southern diffuser leg terminus. The RTOMS measures temperature, conductivity (salinity), total pH, DO, dissolved carbon dioxide (xCO_2), nitrogen (nitrate + nitrite), chlorophyll *a*, CDOM, BOD, and current direction and velocity. These water quality criteria were used to detect potential plume positions throughout the station array and then DO, pH, and transmissivity were assessed for stations potentially within the plume at the time of sampling relative to stations outside of the potential plume extent at the time of sampling. Using this approach, potential plume conditions are detected as far as 6.3 nautical miles (nm) from the wye diffuser.

Aerial and satellite (remote sensed) imagery are compiled each year as part of the SBOO monitoring to determine the potential behavior of the plume in relation to phytoplankton blooms, turbidity plumes, and circulation patterns visible in the imagery. Aerial imagery does not detect plume activity from the Point Loma Ocean Outfall (PLOO), presumably because this discharge is located in much deeper water (~100 m) than the SBOO (~30 m) and therefore the PLOO discharge plume rarely surfaces where it can be seen in remote sensed imagery. The SBOO plume is regularly visible in aerial imagery and provides context for the extent of the discharge relative to other features throughout the Action Area. The plume was observed in 34 of the 133 images collated in 2020 (Ocean Imaging, 2021). Imagery of the plume shows linear bands discharging from the southern leg of the wye diffuser. When visible, these plumes are typically no more than 0.5 nm long and vary in orientation. On two occasions in 2020, the plume was observed extending as far as 4 km (~2.2 nm). The plume is less likely to surface when the ocean water is stratified because the plume remains trapped below the pycnocline (the depth layer where the density gradient is greatest). Therefore, the plume is generally observed more frequently in aerial imagery in the winter period when the pycnocline is less common or absent.

Studies completed by Largier et al. (2004) and Terrill et al. (2009) (Scripps Studies) provided detailed data and analysis on the current SBOO plume distribution. The findings of these studies indicate that the plume surfaces ~27 percent of the year. Surfacing was seasonal, with the plume surfacing 100 percent of the time in the wet season when the ocean was not stratified. Stratification typically maintained the plume at a depth of 8 m below the surface. When surfacing, the plume may reach the shoreline up to 25 percent of the time. However, there was no evidence that this results in water quality exceedances in the Scripps Studies.

2.3 Nearshore Pollution from TJR and SAB Creek

The visual plume features from the SBOO evident in remote sensed imagery are small in scale and infrequent compared with other phytoplankton and turbidity features visible in the reported imagery. Phytoplankton blooms regularly establish within eddies approximately the size of the Action Area. Plumes of phytoplankton and turbidity emanating from the TJRE mouth are also regularly observed in the imagery. These river plumes often reach well over 3 nm from the shoreline. Headlands like Point Loma form southward-facing coastal embayments throughout the west coast of the continental U.S. The coastal topography interacts with water currents to commonly form retention zones. These retention zones can have a positive influence on the abundance of plankton blooms (Largier, 2020; Trautman and Walter, 2021; Woodson et al., 2009; Ryan et al., 2008). In addition to satellite derived imagery, the aerial imagery reports (e.g., CoSD 2021b) examine circulation patterns in the region derived from high-frequency (HF) radar instruments that measure ocean surface current patterns. The patterns of movement of these river plumes and eddy features visible in the aerial imagery align closely with patterns of ocean surface currents measured by these HF radar instruments. Figure 2-2 provides an example of aerial imagery overlaid with HF radar data (direction and magnitude arrows). Turbid eddies and plumes are clearly visible in the imagery, which is typical for the Action Area according to CoSD (2021b). The turbid conditions are often seen inshore of the Point Loma headland, which appears to interact with ocean circulation in the region causing these eddies and forming a retention zone in the Action Area. River plumes are undoubtedly also related to wet-weather flows caused by rain storms, particularly in the winter. However, based on the modelled dispersion of the SAB Creek plume described in Feddersen et al. (2021), it is also likely that river plumes and subsequent turbid conditions originating from SAB Creek contribute to the increased turbid conditions.

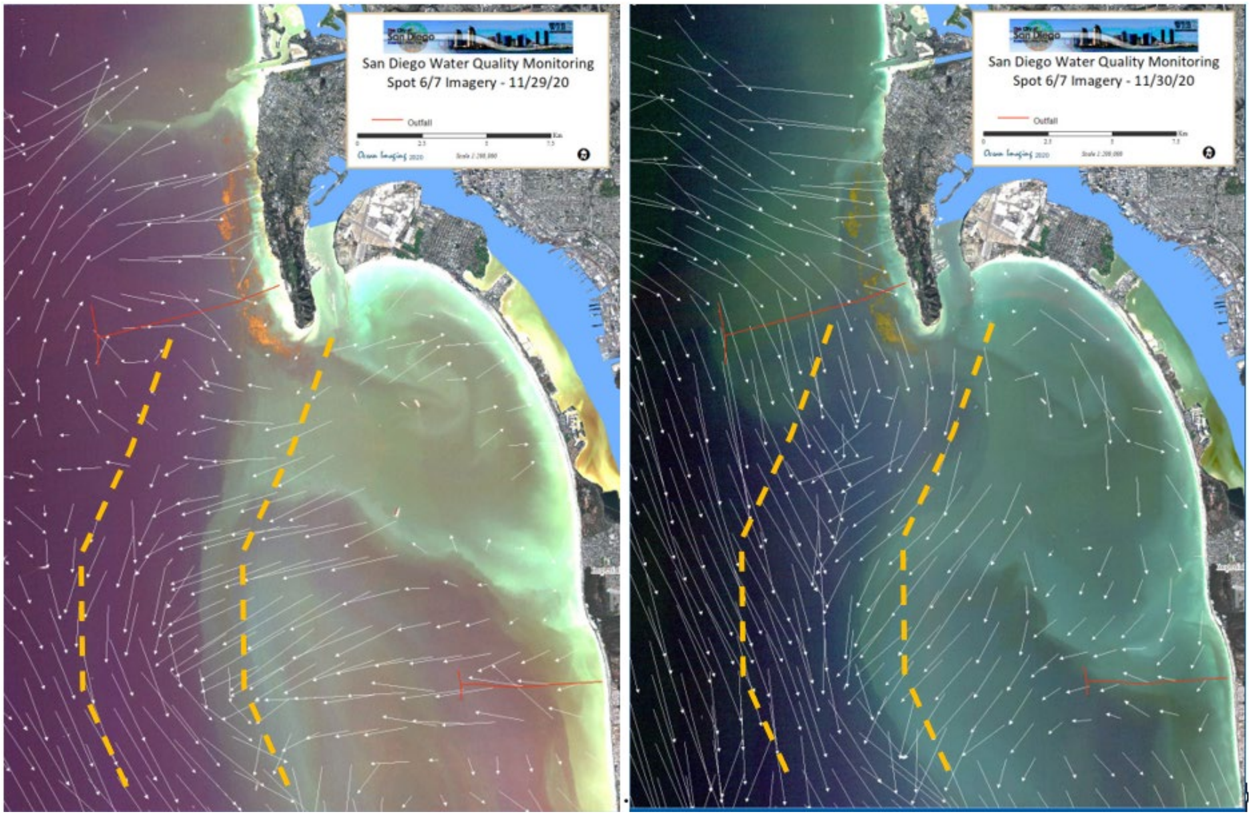

Figure 2-2. Aerial imagery and overlaid surface current vectors (white arrows) from CoSD (2021b). Lighter and greener areas are light reflectance caused by turbid conditions in the surface of the water resulting from a mixture of phytoplankton blooms and turbidity. Phytoplankton levels are clearly elevated south and inshore of Point Loma headland. The transition from the zone of elevated phytoplankton and offshore waters corresponds with a pattern of surface currents indicative of a convergent front between retention zone circulation and offshore circulation (indicated by yellow dashed lines). Plumes from the Tijuana River, San Diego Bay, and Mission Bay are clearly visible.

Feddersen et al. (2021) presented modelled pollution dispersal from the Tijuana River and SAB Creek using a Coupled Ocean-Atmosphere-Wave-Sediment-Transport (COAWST) model system.[7] The model spans the Action Area and extends into Mexico to the SAB Creek outfall at the shoreline of Punta Bandera. While their model assessed the transport of norovirus pathogen, which has a decay constant that may differ from other pollutants of concern in transboundary flows, the advection processes illuminated by the model indicate pollution plumes for these other pollutants and illuminate the scale of the Tijuana River and SAB Creek pollution plumes in the nearshore environment. The model was run for a full year to provide an indication of seasonal changes in the plume behaviors. Modelled baseline scenarios show that, during wet season outflows from the TJRE mouth, the dominant source of pollution within the Action Area is due to the Tijuana River. However, during the dry season when river flows are limited or absent, the Action Area is still

[7] The COAWST model couples a Regional Ocean Modeling System with the Simulating WAves Nearshore model to capture offshore and nearshore wave-driven transport respectively.

heavily impacted by coastally trapped pollution originating from SAB Creek. This is particularly pronounced during periods of south swell.

2.4 Seabed Communities

Seabed habitat throughout California is dominated by sandy and muddy substrate. This is also true in the Action Area, where historical surveys have indicated that at least 80 percent of the surveyed seabed consists of soft sediment habitat. The remainder of seabed habitat consists of rocky reef habitat, portions of which support kelp forest habitat. An approximately 4.2-square-mile area of kelp forest lies inshore to the north of the SBOO discharge pipeline at the mouth of the TJRE.

Surveys throughout the Action Area of the infaunal community, fishes, and macro invertebrates inhabiting the soft sediment habitat are completed annually as part of the ongoing monitoring of the SBOO outfall. These surveys are conducted using non-targeted sampling methods (e.g., grab sampling and net tows) and therefore the data describe species that dominate the community assemblage. Benthic macrofauna has typically consisted of worms, crabs, clams, brittle stars, and other small invertebrates. These organisms play important ecological roles in coastal marine ecosystems off southern California, including as primary and secondary consumers that support higher trophic organisms such as fishes, larger invertebrates, and even marine mammals and other vertebrates such as birds.

Many of these species respond to environmental stressors associated with pollution. These relationships are increasingly well understood in southern California where extensive monitoring of species for the purposes of determining polluted marine habitats has been conducted for many decades (Schiff et al., 2001; Smith et al., 2001). For example, minor organic enrichment due to wastewater discharge may result in increases in species richness and abundance while more severe pollutant loading may result in decreases in the overall number of species and increases in abundance of a few pollution-tolerant species. Annual monitoring since 1991 has not detected differences in benthic infauna or macrofauna assemblages associated with proximity to the SBOO.

Historical surveys have indicated that annelid polychaete worms have been the dominant infaunal taxonomic group, constituting more than 80 percent of the total organisms collected in the region. They have been followed in abundance by crustaceans, mollusks, and echinoderms. Dominant polychaete species have included *Spiophanes norrisi* and *S. duplex*, the capitellid *Mediomastus* sp, the amphinomid *Pareurythoe californica*, and the sigalionid *Pisione* sp. Cluster analysis has identified two primary groups (Group C and D) in the Action Area. Group C has been generally associated with high proportions of medium and coarse sand and contained the highest proportion of the dominant annelid *S. norrisi*. Group D has been found at the stations closest to the SBOO, within the Zone of Initial Dilution where effluent mixing with ambient waters occurs most rapidly. Stations clustered with Group D have been generally to the north of the SBOO and sediments at these stations have been more dominated by fine and very fine sand relative to other grain sizes and other groups.

Trawl samples have been undertaken as part of the PLOO and SBOO monitoring. Within the Action Area, trawl samples have been restricted to the 28 m bathymetry contour. At the PLOO stations to the north of the Action Area trawls have been taken at the 100 m depth contour. Fish and invertebrate assemblage between these regions are unlikely to be very different, as seabed habitat at 100 m adjacent to the PLOO are likely to be similar to habitat at this depth in the Action Area. Speckled and longfin sanddab have constituted 50 percent of all fishes collected in 28 m stations in the SBOO region. California lizardfish have also been abundant in trawl samples. Other common species have included California tonguefish and white croaker. These fishes have been abundant sandy-seabed associated fishes in southern California. Northern anchovy and Pacific sardine have also been captured in trawls. These have been midwater and pelagic schooling fishes not typical of seabed habitat. However, they can occur in large schools and have been one of the most abundant species in California waters. Other species captured in trawl nets have included flatfishes such as California halibut, hornyhead turbot, English sole, fantail sole and spotted turbot. Seabed-associated round fishes have included yellowchin sculpin, longspine combfish, roughback sculpin, plainfin midshipman, queenfish, and California scorpionfish. Elasmobranchs have included round stingray, California skate, and shovelnose guitarfish.

At the deeper, 100 m stations adjacent to the PLOO, Pacific sanddab have also been the most abundant fishes caught. Other flatfishes collected at the deeper stations also found in the 28 m stations have included English sole, hornyhead turbot, California tonguefish, and fantail sole. The flatfishes Dover sole, slender sole, bigmouth sole, and curlfin sole have also been observed at the deeper stations. Several rockfishes have been collected in the 100 m trawls. Halfbanded rockfish have been highly abundant, ranking second in most frequently collected of all fishes at these deeper stations. The other rockfish species collected have been stripetail, squarespot, vermillion, greenstriped, rosethorn, flag, greenspotted, cowcod, and rosy rockfishes. Other seabed associated round fishes have included species observed in the 28 m trawls, such as yellowchin sculpin, longspine combfish, roughback sculpin and plainfin midshipman. Other bottom associated roundfish species collected have include pink seaperch, blacktip poacher, Pacific Argentine, spotted cusk-eel. California skate has been the only elasmobranch collected at the deeper trawl stations.

The deepest third of the submerged portions of the SBOO is covered by rock armoring. Footage from a remotely operated vehicle (ROV) survey of the SBOO wye diffuser and part of the main pipeline was completed in 2019 and provides additional information on the seabed community associated with this artificial reef feature. The SBOO is covered with small- to medium-sized rock boulders placed as protection of the pipeline. This rock armoring, the vertical risers that constitute the diffuser ports, and several access points along the pipeline provide hard-substrate on which rocky reef-associated marine wildlife are established. Based on seabed habitat data from the San Diego Regional Sediment Management Plan (SD RSMP) developed in 2009 (SD RSMP, 2022), rock armoring along the main barrel is approximately 1.5 km long. Rock armoring along the northern and southern legs of the wye-diffuser is approximately 600 m long on each leg. The rock armoring is approximately 80 m wide. This equates to approximately 50 acres of rocky reef.

Regionally abundant marine algae, fish, and invertebrate communities are apparent in the ROV footage associated with the rock-armoring reef. The rock-armoring reef indicates a healthy reef community of invertebrates, understory seaweeds, and associated fishes. Encrusting organisms such as anemone and gorgonian corals were more abundant on open diffuser risers and areas surrounding these risers than other areas. It was particularly notable that the northern leg of the wye diffuser, which has no open risers, contained less biological life than the southern leg. It is likely that the effluent contributes nutrients that enhances organisms on the southern diffuser leg. This included encrusting macroinvertebrates, algal species, and associated fishes. Figure 2-3 shows screen captures from the ROV footage of a capped riser on the northern leg that is largely barren of marine life and an open port on the southern leg heavily encrusted in anemones and other benthic invertebrates.

A large natural reef occurs inshore and to the north of the SBOO. This reef area constitutes EFH Habitat Areas of Particular Concern (HAPC). It is known as the Imperial Beach Kelp Forest and is discussed in Section 4.2.2 (Imperial Beach Kelp Forest).

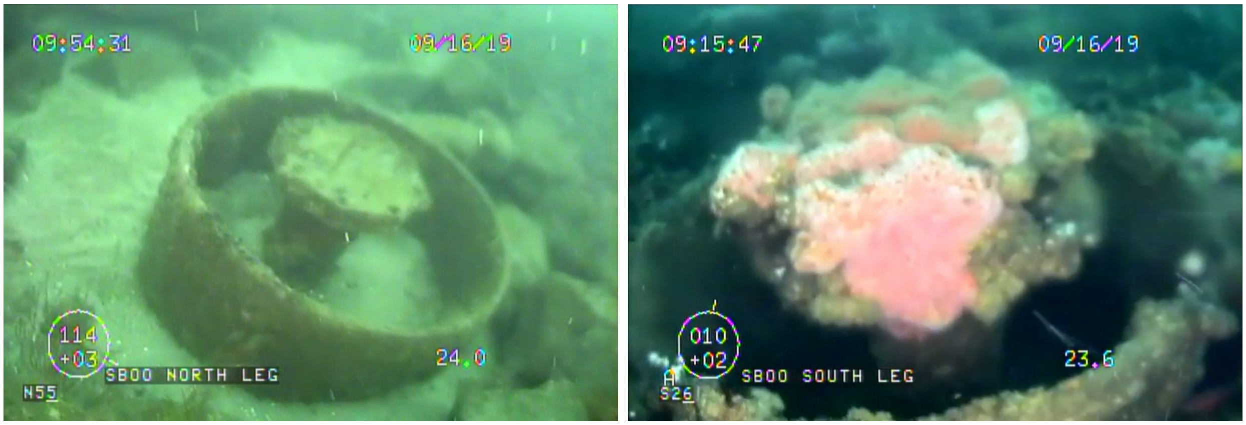

Figure 2-3. ROV footage of (left) a capped diffuser riser on the north leg and (right) an open diffuser riser on the southern leg. Note the abundance of sea life living on the open riser relative to the capped riser.

3. ENDANGERED SPECIES ACT - LISTED SPECIES AND CRITICAL HABITAT

Species that are listed or are candidates for listing under the ESA are included in this BA on the basis that the project may affect the species. The criterion used to determine whether the project may affect a species is whether the typical distribution of the species overlaps the Action Area. This criterion is not a determination of whether the project may adversely affect or jeopardize the species.

Twenty species listed under the ESA and managed by NMFS have been identified as having a typical distribution that overlaps the Action Area. These species, their listing status (threatened or endangered), and their relevant ESA management units (DPS) are included in Table 3-1. No designated critical habitat occurs in the Action Area.

Table 3-1. Species Listed Under the ESA and their Likelihood of Occurrence in the Action Area

Species and Management Unit (DPS) [a]	Scientific Name	ESA	Likelihood of Occurrence [b]
Marine Mammals [c]			
Blue whale	*Balaenoptera musculus*	FE	High
Humpback whale (Central America DPS)	*Megaptera novaeangliae*	FE	High
Humpback whale (Mexico DPS)		FT	High
Fin whale	*Balaenoptera physalus*	FE	High
Gray whale (Western North Pacific DPS)	*Eschrichtius robustus*	FE	Medium
Guadalupe fur seal	*Arctocephalus townsendi*	FT	Medium
Sperm whale	*Physeter macrocephalus*	FE	Low
Sei whale	*Balaenoptera borealis*	FE	Very Low
North Pacific right whale	*Eubalaena japonica*	FE	Unlikely
Sea Turtles			
Green sea turtle (East Pacific DPS)	*Chelonia mydas*	FT	High
Leatherback sea turtle	*Dermochelys coriacea*	FE	Medium
Loggerhead turtle (North Pacific DPS)	*Caretta caretta*	FE	Low
Pacific olive ridley turtle (Mexico Pacific breeding population DPS)	*Lepidochelys olivacea*	FE	Unlikely
Pacific olive ridley turtle (Remaining range)		FT	Unlikely
Marine Invertebrates			
White abalone	*Haliotus sorenseni*	FE	Low
Sunflower sea star	*Pycnopodia helianthoides*	FPL	Very Low
Fishes			
Shortfin mako or bonito shark	*Isurus oxyrinchus*	FPL	High
Gulf grouper	*Mycteroperca jordani*	FE	Very Low
Giant manta ray	*Manta birostris*	FT	Very Low
Scalloped hammerhead shark	*Sphyrna lewini*	FE	Very Low
Oceanic whitetip shark	*Carcharhinus longimanus*	FT	Unlikely
Steelhead (Southern California DPS) [d]	*Oncorhynchus mykiss irideus*	FE	Unlikely

Abbreviations: NL = not listed; T = threatened; E = endangered; F = federal; C = California; PL: petition to list.

a – DPS: Distinct Population Segment.

b – Likelihood of occurrence considers the absolute frequency of occurrence relative to other species in the table. Effects from the proposed Federal Action that may occur over a long period of time may affect any species in this table, while short term effects may not. This is considered elsewhere in the impact assessment. If the Action Area represents a location within a species' range that is more frequently utilized than other parts of its

range the likelihood of occurrence is revised upward, and *vice versa*. Determination is based on preparer's review of available information and best judgement.
c – All marine mammal DPS listed under ESA are also 'depleted' stocks under the MMPA.
d – Steelhead are managed under several DPSs. Steelhead from the Southern California DPS are most likely to occur in the marine Action Area based on proximity to spawning watersheds. Steelhead from other DPSs are not likely to occur as they migrate rapidly north and offshore after leaving rivers, and therefore have not been included in this table.

The following sections describe life history information pertinent to each species listed in Table 3-1. Emphasis is given to information specifically relevant to the Action Area. Most of the information presented is compiled from key Federal Register Publications related to the listing of each species and subsequent management actions, species' Status Reviews, Recovery Plans, and (in the case of marine mammals) stock assessments. In addition to these key references, data on observations in southern California have been compiled and assessed from two broad sources. Firstly, data from several Agency-led surveys have been summarized. These surveys were identified from two key sources. The CCE LTER Datazoo[8] was queried for marine mammal data sets. This identified a data set that includes mammal observations aboard two research cruise programs:

- California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruises.
- NMFS cruises.

The CalCOFI cruises are conducted quarterly off the coast of southern and central California. NMFS cruises are a part of the Rockfish Recruitment Survey off the coast of southern and central California. Annual data were available from CalCOFI surveys from 1987 through 2006 and from NMFS surveys from 2004 through 2015 (except for 2009 and 2011).

In addition to these two cruises, several Agency-led surveys used for stock assessments under the MMPA are included. These surveys are available through the OBIS-Seamap project.[9] The surveys include:

- 1991 CAMMS Survey (CAMMS91).
- 1993 PODS Survey (PODS93).
- 1996 ORCAWALE Survey (ORCA96).
- 2001 ORCAWALE Survey (ORCA01).
- 2005 CSCAPE Survey (CSCAPE05).
- 2008 ORCAWALE Survey (ORCA08).
- 2014 CalCurCEAS Survey (CALCUR14).
- 2018 CCES Survey (CCES18).

Data were restricted to a region encompassing waters adjacent to southern California from latitude 32°N to 35°N, and from longitude 122°W to 117°W. The data set includes nearly 680 observations of ESA species within southern California. These surveys include areas from near to the shore to

[8] https://oceaninformatics.ucsd.edu/datazoo/catalogs/ccelter/datasets

[9] http://seamap.env.duke.edu/

several tens of nm offshore throughout southern California and therefore provide a regional overview of the distribution and timing of species over an area much larger than the Action Area. However, they are still valuable in describing regional distributions of these wide-ranging animals.

Secondly, data from the Happywhale[10] project were accessed via the OBIS-Seamap project. These data include observations of three ESA-listed whales made by a mixture of dedicated volunteer scientists and amateur observers. Data include pictures of the animals that can be independently verified by the Happywhale project. There are 15 years of blue whale observations, 45 years of humpback whale observations, and 19 years of fin whale observations in southern California. Most observations are made relatively close to shore from whale watching boats operating out of the major harbors of Santa Barbara/Ventura, Santa Monica, Long Beach, and San Diego. Because they are close to shore compared to the Agency-led survey data, they provide a convenient compliment describing nearshore distributions. They also better represent within-year variation as they typically include near-continuous effort throughout the year, rather than discrete seasonal surveys such as many of the stock assessments. While survey effort within this data set is not continuous throughout the southern California region, many observations occur in the San Diego region. Effort is generally not species biased, therefore observations of marine mammals can be compared relative to one another to provide some indication of the nearshore distribution and animals over time and space. For comparisons, an additional 10 species of marine mammals are included in the data set. The data set includes nearly 7,000 observations of ESA-listed marine mammals in southern California, however the majority (~88 percent) of these are humpback whales. Humpback whales were the initial focus of the project and therefore these have been removed from the inter-species comparisons as they overestimate effort.

3.1 Marine Mammals

3.1.1 Blue Whale

Blue whales (*Balaenoptera musculus)* are listed as endangered under the ESA throughout their range. The following information is primarily summarized from the most recent NOAA stock assessment for the Eastern North Pacific Stock (NMFS, 2020a), and information included in the Federal Register publication (83 FR 51665) associated with the most recently revised Recovery Plan (NMFS, 2020b) and 5-Year Status Review (NMFS, 2020c), unless otherwise indicated.

Blue whales are the largest known animal. They are a baleen whale found in all oceans except for the Arctic Ocean. Like most baleen whales, blue whales migrate annually between northern-latitude feeding areas and equatorial winter breeding grounds. Blue whales feed almost exclusively on krill (euphausiids) from the surface to depths of up to 985 feet. The largest individuals, which approach 110 feet in length, may consume upwards of 6 tons of krill per day.

Although blue whales are managed as one global population under the ESA, three geographically separate populations are recognized: the North Pacific, North Atlantic, and Southern Hemisphere populations. Within the North Pacific, two stocks are recognized under the MMPA: the western/central North Pacific stock and eastern north Pacific (ENP) stock. Large concentrations of blue whales have been documented by biological surveys in California and Baja California since the 1970s. Blue whales in southern California are part of the ENP stock. The most recent estimate of the

[10] www.happywhale.com

ENP stock size based on mark-recapture studies completed in 2018 estimated the population at 1,898 blue whales (Carretta et al., 2021). The global population of blue whales is estimated at less than 10,000 individuals. Prior to the 20th century whaling industry, the global population was estimated at over 200,000 blue whales.

Blue whales from the ENP stock feed in the Gulf of Alaska, along the U.S. West Coast, and in the eastern tropical Pacific, although much of their feeding activity is concentrated off California. ENP blue whales migrate to Baja California, the Gulf of California, and an oceanographic feature known as the Costa Rica Dome[11] off the coast of Costa Rica during winter and spring to breed and calve.

Blue whales may occur in waters off California year-round, however they are abundant in California from July through October. A small number of whales have been documented migrating north in the fall from California to feed in areas off Oregon and Washington, the Alaska Gyre, and Aleutian Islands during the winter season. Between the 1920s and 1960s blue whales were harvested off British Columbia, southeast Alaska, the Gulf of Alaska, and south of the eastern Aleutian Islands. However, there have been few documented sightings of blue whales during biological surveys in those areas since the 1970s.

Central and southern California are likely to be the most important feeding areas for ENP blue whales. Critical habitat has not been designated for the blue whale. However, based on small boat surveys completed from 1986 through 2011, Calambokidis et al. (2015) identified BIAs where blue whales aggregate to feed. Nine BIAs were identified, and all occur off California. Six of these occur in southern California. The southern-most BIA includes 984 km^2 of ocean habitat from Carlsbad to south of Point Loma. The inshore edge of the southern half of this BIA closest to the Action Area begins approximately 5 miles offshore of Point Loma, reflecting a generally offshore distribution of feeding blue whales observed near San Diego. Subsequently, only a small portion of this BIA overlaps the north-western edge of the SBOO Action Area. Peak feeding activity in this BIA occurs from June through October. This is the same feeding period for the remaining five southern California BIAs.

Observation data from Agency-led Surveys indicate that blue whales are the most frequently observed whale species throughout the year in the southern California region. The stock estimate for blue whales indicates the species is less abundant than humpback whales and considerably less abundant than fin whales. Based on GPS tracking data described in Szesciorka et al. (2020) many of the blue whales that calve and breed in the Costa Rica Dome region feed in the southern California region from May through December. Agency-led survey data reflect this pattern, showing higher abundance of blue whale observations in southern California from May through October with peaks in July.

Based on whale call studies described in Sirovic et al. (2015), some blue whales remain in southern California over the winter period. A small number of whales are observed in the southern California region in February in Agency-led survey data. Happywhale observations (Figure 3-1) indicate that whales arrive into the nearshore areas in southern California as early as march, with substantial arrivals occurring in April and May. The peak abundance in southern California is during June and

[11] The Costa Rica Dome is an area of ocean off the western coast of central America (centered at 9°N, 90°W) characterized by a shallowing of the thermocline driven by cyclonic circulating wind and ocean currents. The feature delivers productive, nutrient-rich waters to the surface and supports a high level of biodiversity.

July. Whales are also present in central California, but few whales are recorded north of central California.

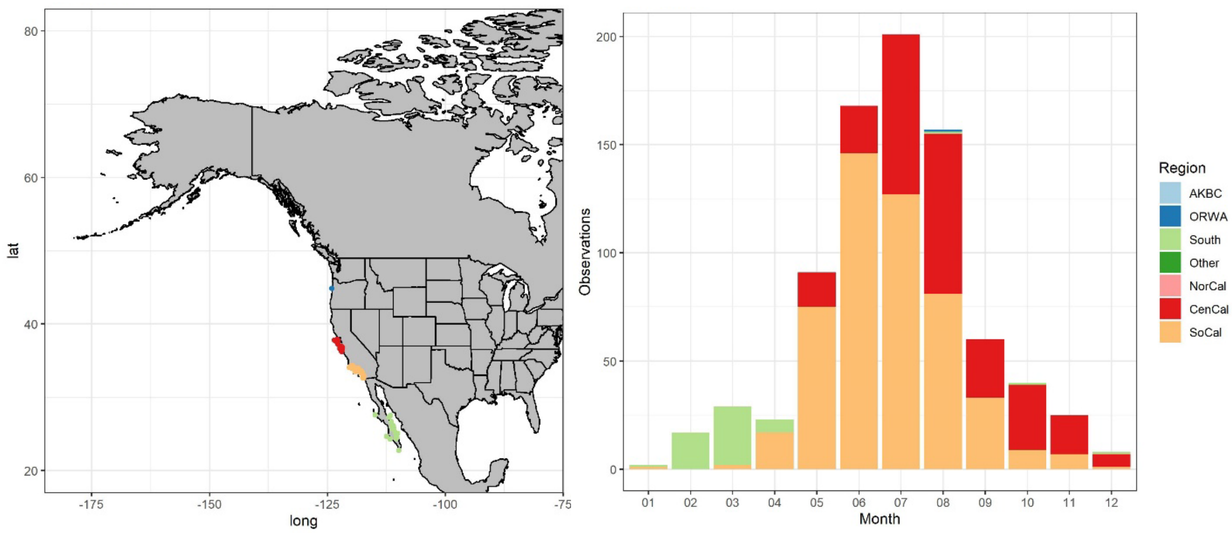

Figure 3-1. Observations of blue whales recorded by the Happywhale project. Left panel. Map of all observations throughout the northeast Pacific Ocean, colored by region. Right panel. Monthly observations, colored by region. SoCal = southern California; CenCal = central California; NorCal = northern California; ORWA = Oregon and Washington, AKBA = Alaska and British Columbia; South = South of 32°N; Other = all other sightings.

Blue whales are assessed as having a high likelihood to occur in the Action Area for several reasons. Firstly, blue whales are abundant in southern California relative to much of the remainder of their eastern Pacific Ocean range. Secondly, within the southern California region, they are especially abundant at several locations (BIAs) and one of those is offshore of Point Loma and Mission Beach, just a few nautical miles to the north of the Action Area.

3.1.2 Humpback Whale

Under the ESA, humpback whales (*Megaptera novaeangliae*) are separated into fourteen DPSs that occur throughout the world's oceans. These DPSs are primarily defined by the associated winter breeding area of the whales, although feeding areas were also considered. Whales off California primarily belong to the Central America DPS and the Mexico DPS. Whales from the Hawaii DPS have infrequently been observed feeding in California waters, however these whales primarily feed in Southeast Alaska, Northern British Columbia, northern Gulf of Alaska, and the Bering Sea.

The following information on the ESA DPSs is from the DPS designation publication in the Federal Register by NMFS (81 FR 62259) and U.S. Fish and Wildlife Service (USFWS) (81 FR 93639) and the supporting technical review on these DPSs by Bettridge et al. (2015) and Fleming and Jackson (2011). Information on humpback whale critical habitat designated under the ESA is from 86 FR 21082. Additional information on life history and distribution is from the 2020 draft California-Oregon-Washington stock assessment (Carretta et al., 2021).

Humpback whales may occur in waters off California year-round. However, they typically migrate to equatorial waters to breed from November and begin returning to California waters in March. Humpback whales from the Mexico DPS breed off mainland Mexico (including the Baja California

Peninsula) and the Revillagigedo Islands. While the humpback whales belonging to the Central America DPS may breed in areas as far north as southern Mexico, the typical breeding areas for these whales range from Guatemala in the north to Panama in the south. Panama is also a breeding area for humpback whales from the Southeastern DPS that migrate south to feed near Antarctica. Although these Southeastern DPS whales feed in Antarctica during the northern hemisphere winter breeding period, genetic evidence indicates that the Central America DPS may interbreed with whales from this southern hemisphere DPS. The population of the Mexico DPS is between 5,000 and 6,000 individuals, while the population of the Central American DPS is much smaller, maybe as few as 500 individuals.

Humpback whales from the Mexico DPS population feed in waters from California to the Aleutian Islands, with concentrations in four locations: California-Oregon, northern Washington-southern British Columbia, northern and western Gulf of Alaska, and the Bering Sea. Humpback whales from the smaller Central America DPS population preferentially feed in waters off California and Oregon and the highest proportion of these whales feed in southern California (Calambokidis et al., 2015).

ESA critical habitat was designated for Central America DPS and Mexico DPS humpback whales in 2021. In California, the critical habitat areas for both these DPSs are identical. The southern boundary of the California portion of critical habitat extends southwest from Oxnard, CA through the Santa Cruz Basin and out to 3,700-m depth contour. The SBOO wye diffuser is more than 160 miles downcoast of the critical habitat boundary. The area encompassing the SBOO (Unit 19) was considered in the critical habitat designation process, but the final draft excluded this area, largely as a reflection of the relatively lower abundance of humpback whale feeding activity in this area compared with other areas.

The critical habitat areas encompass humpback whale BIAs identified in Calambokidis et al. (2015). BIAs are areas humpback whales are more frequently observed on the Pacific coast of north America. Four of these BIAs occur in California with slight variations in seasonal occurrence noted as part of their definition. One of the BIAs occurs in the southern California region, encompassing the Santa Barbara Channel between Santa Barbara and the northern Channel Islands. This BIA is included in the Unit 18 portion of recently designated critical habitat, but no BIA for humpback whales overlaps or lies adjacent to the Action Area.

Agency-led survey data compiled for this assessment indicate that humpback whales are the most frequently encountered large baleen whale in California waters during these surveys, although they are more frequently observed along the northern and central California coastline, particularly off the San Francisco Bay entrance. Within the southern California region, they are more frequently found in the Santa Barbara channel and north of Point Conception. Humpback whales are commonly observed in California waters from fall to the beginning of winter but are most abundant in southern California in April and May.

Many humpback whale sightings are recorded in the Happywhale dataset for the northeast Pacific compared to other marine mammals in the dataset. The sightings are also largely contiguous along the North American coast. The seasonal migration of these animals is clearly shown in Figure 3-2, with an abundance of whales south of California (predominantly in Mexico) from December through April, shifting to an abundance of whales in California, Oregon, Washington, British Columbia, and Alaska regions beginning in May and continuing through November. Most whales are in Central California and the Alaska-British Columbia regions during this period. Whales peak in southern California in July with a second peak in October. It is likely that this pattern of two seasonal peaks reflects northbound and southbound migrations through the southern California region, although humpback whales also remain to feed in southern California throughout the year.

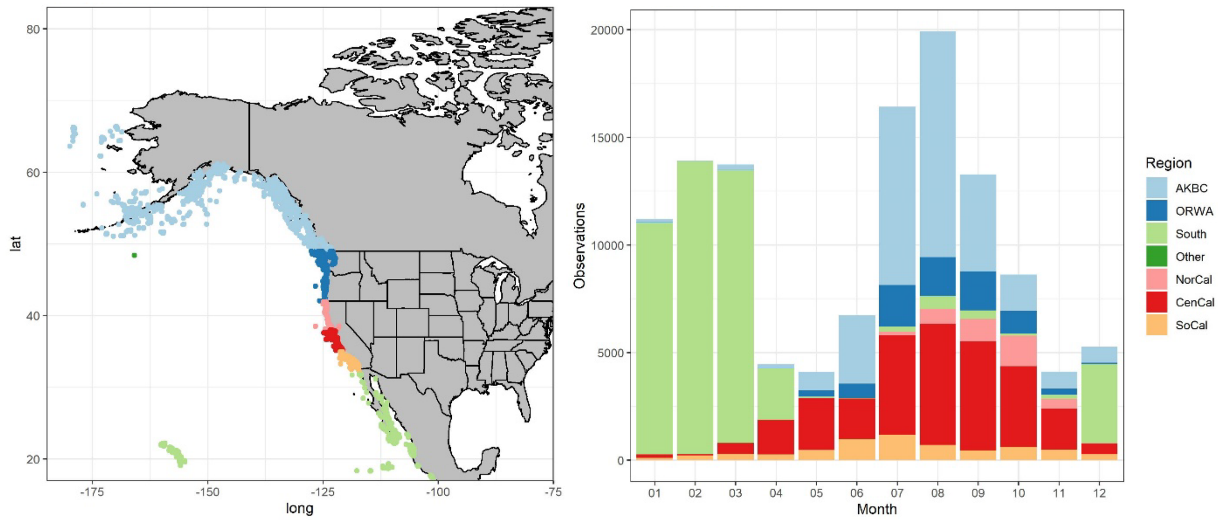

Figure 3-2. Observations of humpback whales recorded by the Happywhale project. Left panel. Map of all observations throughout the northeast Pacific Ocean, colored by region. Right panel. Monthly observations, colored by region. SoCal = southern California; CenCal = central California; NorCal = northern California; ORWA = Oregon and Washington, AKBA = Alaska and British Columbia; South = South of 32°N; Other = all other sightings.

Humpback whales are highly abundant large whales in California compared to other species of large whale and therefore are identified as having a high likelihood to occur in the Action Area. However, they are more typically abundant in northern portions of southern California, as evidenced by the designation of BIA and critical habitat in these areas. Humpback whales are more likely (but not exclusively) to be observed in the Action Area in the southern parts of the Southern California Bight region during the 'shoulder' periods of their feeding season; from late May through August and again in October and November.

3.1.3 Fin Whales

Fin whales that occur at the project site are members of the north Pacific subspecies of fin whale (*Balaenoptera physalus velifera*). There are three other subspecies of fin whale, none of which occur in the north Pacific; north Atlantic (*B. p. physalus*), southern (*B. p. quoyi*), and the pygmy fin whale (*B. p. patachonica*) (Archer et al., 2019). Fin whale is listed as endangered under the ESA throughout its range. No DPS or critical habitat has been designated for this species. The information provided below is compiled from the most recent NMFS recovery plan (NMFS, 2010), status review (NMFS, 2019a), and stock assessment (Carretta et al., 2021), unless otherwise indicated.

Three MMPA stocks are recognized for north Pacific fin whale (NPFW). These are the California-Oregon-Washington stock, the Hawaii stock, and the northeast Pacific stock. NPFW that may occur in the Action Area are considered part of the California-Oregon-Washington stock. It is estimated that before the era of industrial whaling the north Pacific Ocean supported between 42,000 and 45,000 fin whales. This was reduced to between 13,620 and 18,680 by 1973. The best current estimate for the California-Oregon-Washington stock is 9,029 whales, with a lower 20th percentile minimum population estimate of 8,127. This population stock saw an average annual rate of increase of 7.5 percent from 1991 to 2014, but this may represent immigration into these waters from adjacent population stocks, or actual growth; most likely, some combination of these two factors is involved.

Information on distribution and habitat use reviewed in the 2010 Recovery Plan describes peak abundance of fin whales in southern California in summer and fall and Sirovic et al. (2015 and 2017) describes a decline in the number of observations and call frequency in southern California during winter months. However, there is a substantial body of evidence pointing to a resident NPFW population in southern California. Compared to other large whales such as humpback, gray, and blue whales, fin whales are more streamlined and faster swimmers. They occasionally hunt in a large foraging guild with other whale and dolphin species. While similar in size to blue whales, fin whales have a more diverse diet than blue whales, consuming krill, copepods, cephalopods, and small schooling fish such as sardines, herring and anchovies. This is thought to allow these whales to remain resident in southern California year-round (Scales et al., 2017; Campbell et al., 2015; Mizroch et al., 1984).

NPFW call detection frequency increased markedly in December at a hydrophone located close to Point Vicente in Sirovic et al. (2015). Analysis by Scales et al. (2017) indicates that NPFW spend more time along the mainland coast and in the northern Catalina basin in winter and then disperse offshore and further north in spring and summer. Kernel utilization distribution maps generated from observation and GPS tracking data showing a concentration of fin whales occurring close to shore at the San Pedro shelf during fall, winter, and spring that moves further offshore during summer. This analysis is supported by Campbell et al. (2015), who analyzed data from the CalCOFI surveys and noted that during winter and spring, the majority of sightings occurred in continental shelf waters within the southern half of the study area, whereas summer and fall sightings were more widely distributed with the greatest concentrations offshore and in the northern portion of the study area along the northern-most survey line. Falcone et al. (2018) built on the analysis completed in Scales et al. (2017). Utilizing resighting data, they show that 22 percent of whales observed in southern California were seen repeatedly between years in the region. These individuals tend to frequent the nearshore waters, particularly in winter, where they are regularly sighted by whale watching operators that contribute photos to this study and have been observed year-round. A lack of sightings in fall in these data is consistent with satellite telemetry work from non-El Niño years, which indicates animals move offshore in the SCB during summer and fall. Some individual whales are resighted in the winter, spring, and summer period in an approximately 30 km stretch of water along the shelf break on the southwestern edge of the San Pedro shelf (Falcone et al., 2018).

Data from Happywhale includes 318 NPFW sightings in the southern California region from 2014 through 2021. NPFW observations in these data are mainly in the Santa Barbara Channel and over the San Pedro shelf offshore of Long Beach, with a smaller cluster of sightings off San Diego. These data indicate the majority of NPFW occur during winter, spring and summer in southern California and a sharp reduction in NPFW observations occurs from July through October where Happywhale data are typically recorded (Figure 3-3). This data aligns with findings in Falcone et al. (2018), Scales et al. (2017), and Campbell et al. (2015) that NPFW are abundant along the San Pedro shelf until July through October, when they likely move offshore or migrate to other areas outside of the Southern California region.

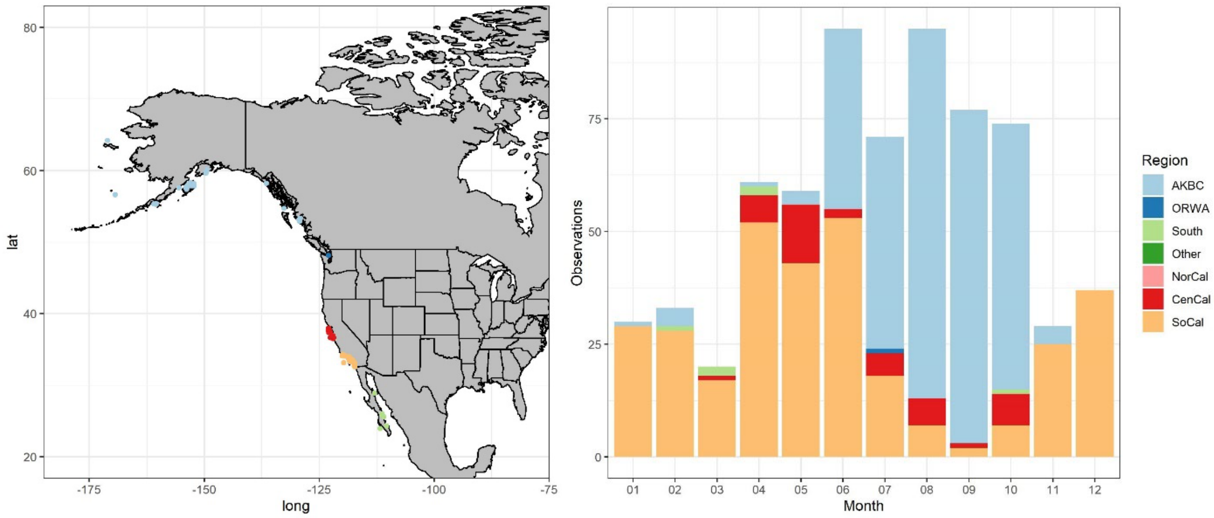

Figure 3-3. Observations of north Pacific fin whales recorded by the Happywhale project. Left panel. Map of all observations throughout the northeast Pacific Ocean, colored by region. Right panel. Monthly observations, colored by region. SoCal = southern California; CenCal = central California; NorCal = northern California; ORWA = Oregon and Washington; AKBC = Alaska and British Columbia; South = coastal sightings south of California; Other = all other sightings.

Fin whales are commonly seen in southern California throughout the year and therefore have a high likelihood to occur in the Action Area. They appear to decline in abundance in the late summer, at least in the near shore areas that include the Action Area, from July through October. It is unclear why, but this is unlikely to be an artifact of the Happywhale data set, which provides the strongest signal of this decline, as this is also a period where whale watching expeditions are highly active.

3.1.4 Gray Whale (Western North Pacific DPS)

Gray whales (*Eschrichtius robustus*) only occur in the northern Pacific Ocean. Two populations of gray whale are recognized under the ESA: the WNP and the ENP DPS. Gray whales in the WNP DPS are designated as Endangered under the ESA and no critical habitat has been designated for the gray whale. Gray whales from the ENP DPS were previously designated as Threatened under the ESA but were delisted in 1994 after the population successfully recovered. The following information is summarized for WNP gray whales from the most recent Western North Pacific Stock Assessment (NMFS, 2019b) and Technical Memorandum on eastern gray whale abundance (Stewart and Weller 2021).

Gray whales from the WNP DPS typically spend summer months feeding in the western north Pacific along the continental shelf of Eurasia and adjacent northern north Pacific waters, particularly within the Sea of Okhotsk on the eastern shores of Russia, but also in waters to the east of the Kamchatka Peninsula and the western extent of the Aleutian Islands.

Gray whales from the WNP DPS are thought to primarily calve and breed in waters off Japan and China during the northern hemisphere winter. However, some WNP gray whales have been observed migrating to the eastern tropical Pacific, although it is unclear what proportion of whales from the WNP migrate to the eastern Pacific to breed. The most recent stock estimate for WNP gray whales is 100 whales based on Cooke (2017) cited in Carretta et al. (2020).

The majority of whales that migrate through California are members of the robust ENP gray whale population. The most recent stock estimate for ENP gray whales is 26,960 whales (Carretta et al., 2021) and the population is generally considered a healthy size. While only a very small proportion of gray whales that migrate through California are likely to be members of the WNP DPS that is listed under the ESA, Cooke et al. (2020) estimate 48-80 percent of WNP DPS gray whales may migrate into eastern north Pacific waters to breed. If the migratory estimates of Cooke et al. (2020) are correct, waters of the eastern Pacific are likely to represent important migratory and breeding areas for this population. Interbreeding between the small WNP population and the ENP population is likely to be important because it will contribute to greater genetic diversity within the WNP population.

Gray whales typically migrate close to shore along the continental U.S. However, between Point Conception and the Mexican border gray whales are regularly observed migrating between the Channel Islands, apparently 'cutting the corner' that constitutes the southern California bight. Subsequently, the gray whale migration route in the southern California region is spread over a much wider area offshore than along many other coastal areas of California. Observations of gray whale in agency-led survey data occur mostly inside of the Channel Islands (within 20 miles of the mainland shore), however some whales are also observed as far out as San Nicholas Island, approximately 60 miles offshore. Northward-migrating mother and calf pairs, which are more likely to occur at the end of the migratory period between January and April are more likely to remain closest to shore and therefore occur in the Action Area.

The most comprehensive information available on gray whale numbers close to shore in southern California come from the American Cetacean Society Los Angeles Chapter (ACS/LA) Gray Whale Survey. These counts during the winter migration through southern California record animals passing the Palos Verdes Peninsula, which is over 96 miles upcoast of the Action Area. However, these data are likely to be indicative of gray whale abundance in the San Diego region, as these whales almost certainly also pass this location.

Observations made by the ACS/LA gray whale migration survey show that southbound gray whale migration peaks around the last week of January through the second week of February. The northbound migration peaks from the middle through the end of March. On average, over 1,000 gray whales will migrate south, and around 2,000 whales will migrate north past this location each winter season. More whales are observed migrating north in part because they include new-born calves, but also because gray whales travelling on the northbound migration generally remain closer to shore.

The migratory seasons of 2018–2019 and 2019–2020 overlapped a designated Unusual Mortality Event (UME) for gray whales that was initiated on January 1st, 2019 and is currently ongoing. A UME is defined under the MMPA as "a stranding that is unexpected; involves a significant die-off of any marine mammal population; and demands immediate response". The UME was declared due to a marked increase in gray whale strandings throughout the Pacific coast of the U.S. beginning in 2019 and continuing through 2020 and 2021. While many stranded whales that have been necropsied were emaciated and scientific teams are investigating potential causal links with recent ocean and ecosystem perturbations, the cause of the UME has not yet been determined. In the 2019–2020 migratory season, 440 gray whales were observed travelling south and 882 were observed travelling north past the Palos Verdes peninsula. The average annual count from the 2014–2015 season through the 2017–2018 season (non-UME seasons) was 1,379 southbound whales and 2,151 northbound whales.

Agency-led survey data includes areas much further offshore than the ACS/LA survey. Gray whales are the most frequently observed whale species and the third most frequently observed marine mammal after California sea lion and short-beaked common dolphin from January through April in the agency-led survey data.

Gray whales from the WNP DPS occur in the Action Area only when they are migrating between feeding grounds in the north-western Pacific Ocean and breeding grounds in Mexico. These whales are very rare and may infrequently migrate to the eastern north Pacific, potentially more frequently migrating to breeding grounds in the western Pacific. Therefore, they are likely to have a very low frequency of occurrence at the project site. However, because the population of these whales is so small, even a few migrations may represent a significant proportion of migrations. Because mixing between ENP and WNP whales may be critical to ensuring a diverse gene pool in the critically endangered ENP population, WNP DPS gray whales are assessed as having a medium (rather than low) likelihood to occur. Furthermore, it is very difficult to determine whether gray whales in the Action Area are from the abundant and frequently observed ENP gray whales or the ESA-listed WNP DPS. In this instance, this factor has also informed the likelihood of occurrence assessment.

3.1.5 Guadalupe Fur Seal

Guadalupe fur seals (*Arctocephalus townsendi*) are a member of the eared seal family (Otariidae). The species is designated as endangered under the ESA and no critical habitat is designated for this species. The information that follows is summarized from the most recent Status Report produced by NOAA (McCue et al., 2021). The 2021 Status Report compiles life history information that was previously included in the most recent stock assessment for the species, prior Federal Register publications, and the most recent research studies for the species.

Guadalupe fur seals breed almost exclusively on a few islands off the northwest Pacific coast of Baja California, Mexico. The most numerically abundant breeding colony occurs at Guadalupe Island and a smaller number of pups are also born at the San Benito Archipelago. Some pups have been born in U.S. territory at the northern Channel Islands, most notably San Miguel Island off the coast of Santa Barbara. It is likely that at least some of these pups are hybrids between Guadalupe fur seals and California sea lions (*Zalophus californianus*).

Females arrive in May at the breeding colonies and dominant males arrive and establish territories at the colonies in June. Mating peaks in July and continues until early August when males leave the colonies to forage. Pregnant females give birth at the colony and pups rely on their mother’s milk for up to nine months before weaning. During the nine-month nursing period, pups remain on land at the breeding colony while mothers alternate between a few days nursing and a few days foraging at sea. New mothers enter estrous within one week of birthing pups and then may mate with territorial males.

Less is known about Guadalupe fur seal distribution and behavior at sea than at breeding grounds. However, the species is recognized as breeding, feeding, and travelling throughout the California Current system. GPS satellite tracking data of pups and adults tagged at Guadalupe Island indicate the animals typically travel north into waters offshore of California, Oregon, and Washington. A small number of adult males have been tagged and observed travelling south into the Gulf of California. The tag data indicates the species rarely occurs in continental shelf waters (less than 200 m deep), although they remain within 800 km of the shore. Agency-led survey observations are very few and were made more than 100 miles offshore.

Average recorded dive depths of female Guadalupe fur seals are 7-27 m lasting between approximately one and four minutes. Physiological information indicates that Guadalupe fur seal have a lower capacity for breath holding than other similar pinnipeds such as California sea lions. Their diet is believed to consist mainly of squid, but also small fish such as anchovies, sardines, myctophids, and mackerels. They feed more often at night.

Guadalupe fur seals were believed to have been driven to extinction by the fur trade along the west coast of North America in the 18th and 19th centuries. Pre-exploitation numbers are believed to have been as high as 200,000 animals. In the 1950s a small breeding colony estimated at 200-500 animals was rediscovered inside a sea cave on Guadalupe Island. Following a decades-long successful conservation effort, today's minimum population abundance has been approximated at 31,000 individuals, though it is still considered threatened throughout its range. From 1984–2013 the population stock increased 5.9 percent annually, despite the various threats that this species faces, including entanglement in marine debris and shootings, though these only represent a reported mortality of 2.6 animals per year on average. This average, however, is certain to represent only a minimum due to the high likelihood of unreported mortality events. Beginning in January 2015, strandings of Guadalupe fur seal increased greatly along the California coast. The stranding event was declared an UME. The UME was declared over in September 2021.

This species is not considered to have a high likelihood to occur in the Action Area because of the relative rarity of this species and its generally offshore distribution when at sea. However, considering this species ranges to and from its breeding grounds in Mexico and oceanic feeding areas throughout the California Current, this species is considered to have a medium likelihood to occur in the Action Area.

3.1.6 Sperm Whale

Sperm whales (*Physeter macrocephalus*) are the world's largest toothed whale. They are listed as Endangered throughout their range. Critical habitat has not been designated for sperm whale. The following information is sourced from the most recent NMFS Status Review (NMFS, 2015) and the MMPA stock assessment for the California-Oregon-Washington stock (Carretta et al., 2020).

Sperm whales are one of the most widely distributed marine mammals in the open ocean. Sperm whales are found circumglobally and across all latitudes not infringed by polar pack ice. While sperm whales are managed under the ESA as a global population, several stocks are recognized under the MMPA. Sperm whales that are most likely to occur in waters off California are members of the California-Oregon-Washington (CA-OR-WA) stock. The CA-OR-WA stock is estimated to contain just under 2,000 animals (Carretta et al., 2020). According to the most recent NMFS Status Review, the best estimate for the global population is between 300,000 and 450,000 sperm whales, although the estimate is described as 'not necessarily accurate' by NMFS. It is based on extrapolation from surveyed areas and therefore may be an overestimate.

Sperm whales live in two disparate social units; adult females with their immature offspring and separately, a "bachelor group" consisting of young males that have left their mother's social unit. Male sperm whales remain within a bachelor group until they reach prime breeding age, at which point they become almost entirely solitary except for when they reunite with mature females to breed. Males mature at around 20 years of age and female ovulation begins between seven and 13 years of age. Gestation lasts well over a year for sperm whales, and calving intervals range anywhere from four to 6.5 years. The lactation period lasts for two years.

Sperm whales demonstrate a high degree of socialization. For example, calves may be cared for by females that are not the calf's mother, including nursing of calves. This is a process called alloparental care and allonursing. Sperm whales also exhibit a high degree of specialization and complexity of sounds when communicating. For example, sperm whales are known to produce a sound that is distinct to their social unit, known as a coda. Aggregations of many thousands of female sperm whales occasionally occur in the Pacific Ocean, though it is not understood why this takes place.

Sperm whales are observed throughout the year in agency-led surveys in offshore areas, typically beyond the Channel Islands. There is a minor increase in the frequency of observation during July through October in these data, which may be an artifact of increased sampling effort during this period rather than a seasonal pattern. Because of their oceanic distribution and typically offshore occurrence in the southern California region they are rarely observed in Happywhale data, which is generally closer to shore. However, a small number (five observations) of sperm whale are recorded in these nearshore areas. A single observation of a sperm whale in 2020 was made off Mission Beach San Diego around 15 nm south of the San Diego site alternative. Three of the five sightings are recorded on the same day between the San Pedro shelf break and Catalina Island, so may be the same whale.

These whales have a low likelihood to occur in the Action Area based on their more typically offshore, deep water distribution and the rarity of sighting of these whales in southern California, despite the occasional nearshore observations.

3.1.7 Sei Whale

Sei whales (*Balaenoptera borealis*) are baleen whales found circumglobally and across all latitudes not infringed by polar pack ice. No critical habitat has been designated for sei whales. The information that follows is summarized from the most recent NMFS 5-Year Status Review (NMFS, 2012a), Recovery Plan (NMFS, 2011), and eastern North Pacific Stock Assessment (Carretta et al., 2020).

Sei whales are managed as one global species under the ESA and the International Whaling Commission currently recognizes one stock. However, four stocks are designated under the MMPA, two of which occur in the north Pacific. These are the eastern north Pacific stock and the Hawaiian stock. Sei whales that may occur off California's coast most likely belong to the eastern north Pacific stock of sei whales, which is estimated to number around 519 whales. Estimates for the pre-whaling abundance of North Pacific sei whales range from 58,000 to 42,000 individuals. Sei whales experienced peak whaling efforts late in the history of commercial whaling as the industry shifted to the species having depleted populations of other baleen whale species. Barlow (1994) reports that between 1947 and 1987, 61,500 sei whales were killed in the North Pacific.

Sei whales are typically distributed far out to sea in temperate waters worldwide and do not appear to be associated with coastal features. They are typically found in deeper waters than baleen whales more commonly observed off California such as fin, humpback, blue, and minke whales. Sei whales near California are more typically observed in offshore waters of the central and northern California coast and are very rarely observed south of Point Conception. Fourteen sei whales were recorded in the southern California region in agency-led data compiled for this report. All observations are made far from the coast, with the closest observation more than 30 nm offshore of the Palos Verdes peninsula. Five observations of sei whale are recorded in Happywhale data, four of these occur in southern California. However, at least three of these observations are recorded as tentative Sei whale identifications, as the species is difficult to distinguish from other species such as Bryde's whale. One tentative observation occurred within 10 nm of the SBOO.

Sei whales tend to feed around oceanographic features that concentrate prey such as eddies. They are most common over the continental slopes throughout their range. Compared to most other baleen whales, the sei whale is likely to be restricted to more temperate waters. In the north Pacific, the diet of Sei whales is diverse, including copepods, euphausiids, and gregarious species such as pelagic squid and mackerel.

These whales have a very low likelihood to occur in the Action Area based on their very low numbers. They are also generally thought to have a more offshore distribution than other large whales that may occur in the region.

3.1.8 North Pacific Right Whale

North Pacific right whales (*Eubalaena japonica*) are one of three species of right whale that exist globally, but the only species that may range into California waters. The following information is summarized from the most recent stock assessment (Muto et al., 2021), status review (NMFS, 2017), recovery plan (NMFS, 2013), and the associated Federal Register publication (73 FR 19000) pertaining to critical habitat designation.

North Pacific right whales are one of the rarest of all large whale species. Historically, tens of thousands of North Pacific right whales lived throughout their range in the northern Pacific Rim. Current stock estimates place this population between 28 and 31 animals. Animals typically feed in either the Okhotsk Sea or the Gulf of Alaska and Bering Sea. Winter calving grounds are not known. Historical records indicate North Pacific right whale were less common below 35°N, although animals were observed as far south as 20°N. The Action Area is located at approximately 32.8°N.

Observations of this species in California are very rare. No records of this species occur in the agency-led surveys or Happywhale data reviewed for this study in southern California. However, several reliable observations of North Pacific right whales do occur in publicly available information. The most recent siting of this species in California identified in publicly available information occurred in May 2017. A whale was observed and extensively photographed near Anacapa Islands in the northern Channels Islands by a sailing vessel on a pleasure cruise. Prior to that another sighting of a different animal occurred in April 2017 offshore of La Jolla Shores, San Diego.[12] NOAA scientist Dr. Jeff Moore was quoted as stating one other record of a north Pacific right whale sighting off La Jolla occurred in 1988.[13] In January 2015 a shore-based scientist conducting pinniped surveys recorded a potential sighting from San Miguel Island of a North Pacific Right Whale approximately 2 miles offshore.[14] However, despite these remarkable observations,

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[12] https://www.cbs8.com/article/news/rare-right-whale-sightings-in-southern-california/509-7deb92df-3b8c-487c-a467-355b288ed419#.Wea4JuhHAL0.facebook Accessed January 2022

[13] https://www.cbs8.com/article/news/biologists-say-whale-seen-off-la-jolla-was-extremely-rare/509-ca500ccc-ece8-4367-97cc-7fd0d5b58d98

[14] https://www.petethomasoutdoors.com/2015/02/north-pacific-right-whales-likely-spotted-off-san-miguel-island.html?fbclid=IwAR1hqQImy_ovyqMpkhoS-zFADt7gqNMr872MUlnC_pGXhqaQfnykqqkCPbg Accessed January 2022.

these very rare whales are considered unlikely to occur in the Action Area because very few of these whales currently exist and they are spread over a very large area of ocean.

3.2 Sea Turtles

3.2.1 Green Sea Turtle

Green sea turtles (*Chelonia mydas*) are distributed throughout the world's tropical, subtropical, and to a lesser extent, temperate waters. Under the ESA, NOAA recognizes 11 DPS based on the status review by Seminoff et al. (2015). The East Pacific DPS, which encompasses green sea turtles that may occur in California, extends from 41°N (near the Oregon/California border) to 40°S (central Chile). The offshore extent of the area encompassing this DPS is 145°W at the most northern latitude and 96°W at the most southern latitude. This area encompasses waters from the coast of southern California to a boundary nearly 950 nm offshore. The East Pacific DPS includes the Mexican Pacific coast breeding population, which was listed as endangered in the original 1978 listing (43 FR 32800). No satellite-tagged adults have dispersed to areas outside the DPS, nor have satellite-tracked turtles from elsewhere migrated into the East Pacific. Green sea turtles from the East Pacific DPS are listed as threatened under the ESA and no critical habitat has been designated for the East Pacific DPS. The information below is summarized from the Recovery Plan (NMFS and USFWS, 1998a), the most recent 5-Year Status Review (Seminoff et al., 2015), and the associated Federal Register publication (81 FR 20057) unless otherwise indicated.

Green sea turtles, like all other marine turtles that occur in the region, lay eggs on tropical nesting beaches. Green sea turtles migrate long distances between foraging areas and egg laying beaches. A female may nest three to 11 seasons over the course of her life. The primary nesting sites for the East Pacific DPS of the green sea turtle are at Michoacán in Mexico, a complex of beaches in Costa Rica, and at the Galapagos Islands off Ecuador. No nesting beaches occur in California. Nesting beaches are characterized by sandy, ocean-facing mainland and island beaches with intact dune structures and native vegetation. Eggs must remain within a biologically-tolerable range from 26 to 32 degrees Celsius.

Hatchlings emerge from their terrestrial nests en masse almost exclusively at night. They immediately disperse to the surf zone and then swim offshore. This period of their life cycle is generally considered a discrete 'oceanic stage'. Knowledge of the diet and behavior of the oceanic stage is limited. Once in the oceanic zone, they navigate using magnetic field orientation. During this initial phase, green turtle juveniles are oceanic, feeding on the drifting algae *Sargassum* spp., and associated hydroids, bryozoans, polychaetes, gastropods, as well as cnidarians and other pelagic invertebrates, fish eggs, and debris. *Sargassum* spp. is an abundant marine algae in tropical and sub-tropical waters that is often found in highest densities where surface water currents converge to form local downwellings.

After several years in this oceanic phase, potentially between one and seven years, green sea turtles transition to nearshore coastal (neritic) environments. Green sea turtles at this transition stage in the east Pacific have a carapace length of between 35 and 40 centimeters (cm). After migrating to the neritic zone, juveniles continue maturing until they reach adulthood. Many green sea turtles maintain residency in specific foraging grounds once settled, although some may periodically move between the neritic and oceanic zones. Neritic stage juvenile and adult green sea turtles are primarily herbivorous, foraging on seagrasses and/or marine algae. Most green sea turtles spend the rest of their lives in coastal foraging grounds along open coastline or in protected bays and lagoons.

While in these nearshore foraging grounds, green sea turtles rely on marine algae and seagrass as their primary diet constituents, although some populations also forage heavily on invertebrates. In the eastern Pacific Ocean, which includes the California region, green sea turtles reportedly forage on a greater proportion of invertebrate foods than in other regions. This may be because the continental shelf north of Point Conception is narrow compared to other continental margins of the Pacific and Atlantic oceans. Areas such as the continental shelves of the U.S. experience unusually cool waters relative to other areas of similar latitude. The limited shelf areas also contribute to this region's nearly complete lack of seagrasses, a primary habitat and diet component of green sea turtles in many other regions.

A persistent population of green sea turtles occurs in San Diego Bay (Madrak et al., 2016). These animals historically associated with the warm water discharge of a power plant until it was shut down in 2010. They forage on eelgrass beds in the south end of the bay. A second foraging aggregation is recognized at Seal Beach National Wildlife Refuge and the adjacent San Gabriel River. This site is the northern-most, year-round foraging aggregation for the East Pacific DPS (Crear et al., 2017). Green sea turtles are also known to forage among shallow water habitats at La Jolla Shores. This location is popular with ocean recreation users and resident green sea turtles have habituated to human contact at this site (Hanna et al., 2021). While these animals likely spend most of their time close to shore or within San Diego Bay and the San Gabriel River, these animals will periodically migrate outside of these areas to breeding grounds in the tropics. The San Diego Bay foraging population has been shown to originate from nesting sites at the Revillagigedo Archipelago and on the coast of Michoacán, Mexico. Satellite tracking of at least one female from this population showed migration from San Diego Bay to Socorro Island (18.8°N) in the Revillagigedo. Another animal was tracked to Tres Marias Islands (~21.5°N) (Dutton et al., 2019).

Green sea turtles in the East Pacific DPS are subject to several factors that continue to threaten the population. These include harvest of eggs and turtles for food and non-food uses, bycatch in coastal and offshore marine fisheries gear, coastal development, beachfront lighting, and heavy foot traffic. Green turtle interactions and mortalities with coastal and offshore fisheries in the eastern Pacific region are of concern and are considered an impediment to green turtle recovery in the East Pacific DPS.

Decades of egg harvest have impacted many nesting subpopulations in the East Pacific DPS. Mortality of turtles in foraging habitats continues to be problematic for recovery efforts. This mortality includes active hunting and incidental fishery bycatch. It is suspected that there are substantial impacts from illegal, unreported, and unregulated fishing, which cannot be mitigated without additional fisheries management efforts and international collaborations. The nearshore gill net fishery is likely to the largest contributor to bycatch mortality, but also longlines, drift nets, set nets, and trawl fisheries for species including tunas (*Thunnus* spp.), sharks (class Chondrichthyes), sardines (*Sardinella* spp.), swordfish (*Xiphias gladius*), and mahi mahi (*Coryphaena hippurus*).

East Pacific DPS nesting beaches are generally less affected by coastal development than green sea turtles in other regions around the Pacific. Coastal habitats of the eastern Pacific are relatively pristine, although green sea turtles in San Diego Bay, at the north edge of their range, have high levels of contaminants. However, nesting beaches are still subject to development throughout the region. Nesting trends are either stable or increasing throughout the DPS. Although trend information is lacking for most sites. However, data are available for Michoacán, Mexico—the largest nesting aggregation in the East Pacific DPS—that indicate green turtle nesting has increased since the population's low point in the mid-1980s. Other data from the Galapagos Archipelago and Costa Rica also indicate stable or increasing trends in nesting.

These turtles have a high likelihood of occurring in the Action Area because populations are resident in areas of San Diego Bay and around La Jolla. These areas are not within the Action Area, but it is assumed that green sea turtles from these populations at least migrate through the Action Area when travelling between feeding and breeding areas. They may also make forays out of San Diego Bay on occasion outside of their breeding migration, although this is more likely to be between coastal foraging areas north of the Action Area.

3.2.2 Leatherback Sea Turtle

Leatherback sea turtles (*Dermochelys coriacea*) are listed as Endangered under the ESA and no critical habitat is designated offshore of southern California. The following information is summarized from the most recent 5-Year Status Review (NMFS and USFWS, 2020a), Recovery Plan (NMFS and USFWS, 1998b) for the leatherback turtle and associated Federal Register publication (77 FR 4169).

Leatherback sea turtles are a species of marine turtle found in the Pacific Ocean, across the Caribbean, the Atlantic Ocean, and the Gulf of Mexico. Leatherback sea turtles that occur in California waters migrate here to feed from nesting areas in both the western Pacific and Central America. Potentially half the global population of adult females nest on the west coast of Mexico. Leatherback sea turtles are estimated to be the most common sea turtle in U.S. Pacific waters. Sightings along the coast of California peak in August. This is assumed to be due to the southward migration of individuals to breeding areas in Mexico, where the nesting season occurs from November to February. Data from telemetry studies (Benson et al., 2011) indicate leatherback sea turtles from U.S. Pacific waters that nest in the western Pacific use beaches in the eastern and central north Pacific, the western south Pacific, the South China Sea, and the Sea of Japan during the North American (boreal) summer period.

Leatherback sea turtles are assessed as having a medium likelihood to occur in the Action Area based on their known distribution patterns throughout California and their wide-ranging distribution in the ocean. Because these animals are seasonal migrants to the region, they are not likely to frequently occur in the Action Area. Furthermore, their primary foraging habitat appears to be on the central coast of California (particularly in and around Monterey Bay). However, they have also been observed foraging in waters in southern California, including off the coast of San Diego (Figure 3-4).

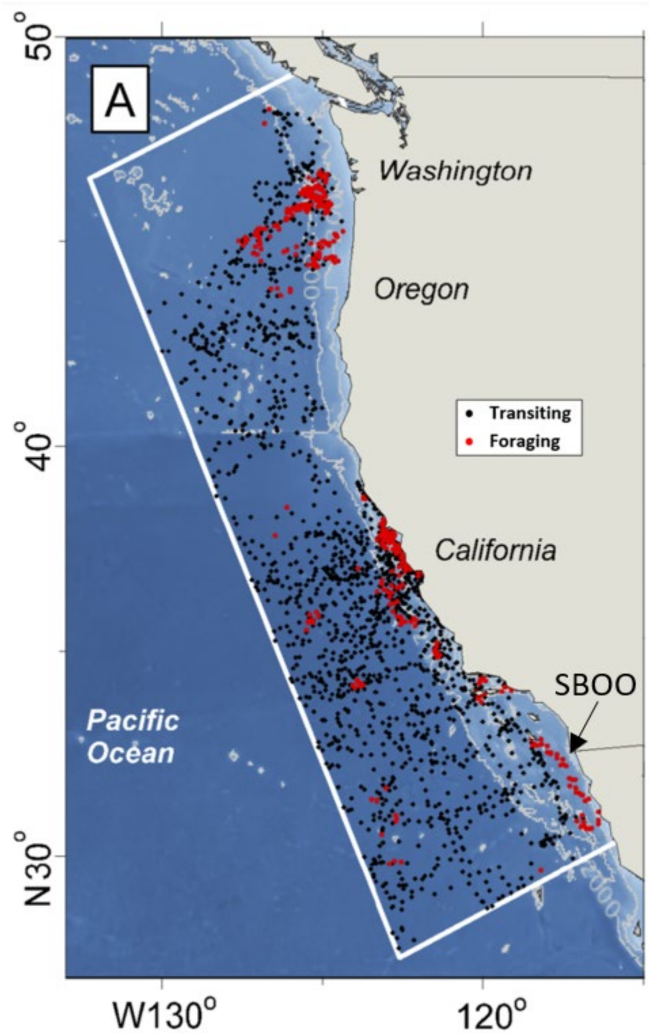

Figure 3-4. Transiting and foraging leatherback sea turtle telemetry locations in U.S.-adjacent Pacific Ocean waters. Adapted from Benson et al. (2011)

3.2.3 Loggerhead Sea Turtle

Loggerhead sea turtles (*Caretta caretta*) are divided into nine DPSs under the ESA. The North Pacific Ocean DPS encompasses all loggerhead sea turtles that may occur in Pacific waters of the U.S. Turtles in this DPS are listed as endangered under the ESA. Critical habitat has not been designated for loggerhead sea turtle in the Pacific Ocean. The following information is summarized from the most recent 5-Year Status Review (NMFS and USFWS, 2020b), Recovery Plan (NMFS and USFWS, 1998c), associated Federal Register publication (79 FR 39855), and information specific to southern California loggerhead sea turtles summarized in Eguchi et al. (2018).

Loggerhead sea turtles range throughout the world's tropical and temperate waters. In the north Pacific Ocean, loggerheads nest exclusively in Japan. Following hatching, juvenile loggerheads display a short (weeks to months) neritic stage (nearshore in waters less than approximately 660 feet) before progressing to an oceanic stage where they continue their development to maturity for several years. During this neritic stage, juvenile loggerhead sea turtles disperse eastward following the Kuroshio water current and its extensions, and eventually disperse throughout the central north Pacific Ocean. Some juveniles transition to foraging areas in the eastern Pacific Ocean, particularly along the west coast of the Baja California Peninsula. However, the most important foraging areas for loggerhead sea turtles are in the oceanic western Pacific Ocean region. This area includes the East China Sea and Kuroshio Extension Bifurcation Region. Foraging juveniles remain in these areas for decades until they mature. At maturity they leave the foraging areas and return to natal nesting sites in Japan to breed, where they remain for the rest of their lives. Therefore, loggerhead sea turtles found in the eastern Pacific, including animals in southern California, are most likely to be juveniles. In the eastern Pacific, loggerhead presence has been reported from Alaska to Sinaloa, Mexico with a major foraging hotspot identified along the Baja California Peninsula. Occasional presence of loggerheads off southern California has been reported with more sightings noted during El Niño conditions.

To determine the distribution and density of loggerhead sea turtles in the southern California region, Eguchi et al. (2018) conducted aerial surveys during September and October of 2011 and 2015 and compiled opportunist sightings from private citizens and scientists for the species in the region. The opportunist sightings included some shipboard surveys in 2006 and 2014. Some of these data are presented in Figure 3-5. There were 419 certified observations of loggerhead sea turtles in this data set in the southern California region. However, very few occurred close to the Action Area and none occurred within the Action Area. In general, observations were more common in the southern parts of the southern California region, far offshore beyond the Channel Islands.

Loggerhead sea turtles are assessed as having a low likelihood of occurrence in the Action Area primarily because their core distribution is further south than the Action Area in Baja California and south into the tropics. Furthermore, they are generally observed much further offshore than the Action Area in the southern California region. However, turtles do occur in southern California and are more likely to occur in the southern reaches of southern California such as the Action Area.

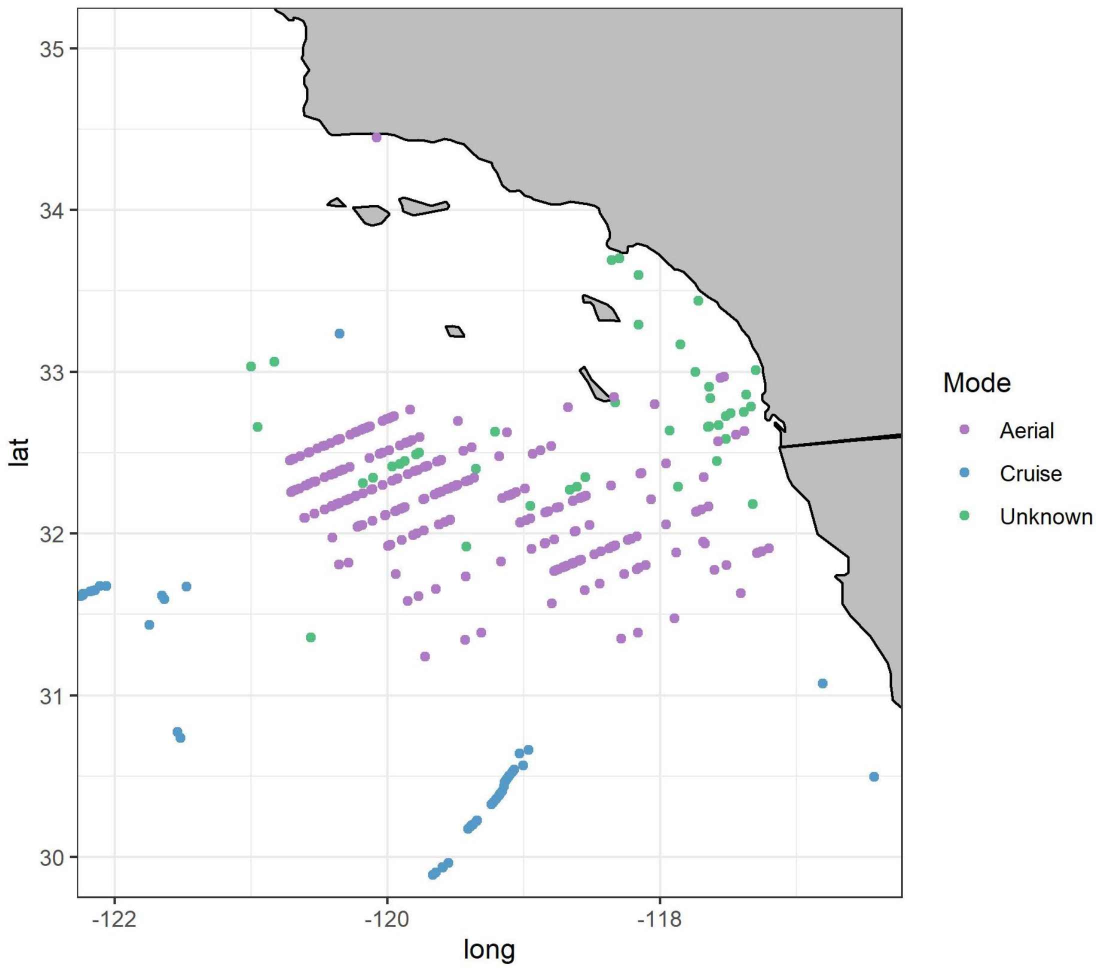

Figure 3-5. Observations of loggerhead sea turtles from Eguchi et al. (2018) in the southern California and adjacent regions. Source: Dr J. Seminoff (NMFS) pers. comms. January 2022.

3.2.4 Olive Ridley Sea Turtle

Olive ridley sea turtles (*Lepidochelys olivacea*) are the smallest and most abundant sea turtle species with a mature carapace length of approximately 60 to 70 cm. Olive ridley sea turtles that nest on Mexico's Pacific coast are listed as Endangered under the ESA and no critical habitat has been designated for this species. The following information has been summarized from the most recent 5-Year Status Review (NMFS and USFWS, 2014) and Recovery Plan (NMFS and USFWS, 1998d) for the olive ridley sea turtle.

NMFS and USFWS (2014) indicates an eastern Pacific range from Peru to California, with "occasional sightings as far north as Alaska". However, olive ridley sea turtles very rarely occur in California. A review by McAlpine et al. (2007) identified three documented sightings from California between the 1950s through the 1970s. All information in NMFS and USFWS (2014) on the ecology and distribution of at-sea olive ridley turtles is focused on subtropical waters west of Central America.

Olive ridley sea turtles nest in the eastern Pacific on sandy beaches from Mexico to Costa Rica. Six beaches in Mexico constitute the main beaches for large-scale synchronized nesting (arribada beaches) of Olive ridley sea turtles listed as endangered under the ESA; Mismaloya, Tlacoyunque, Moro Ayuta, Ixtapilla, La Escobilla, and Chacahua, although solitary nesting occurs over a wider area. Oceanic distributions suggest an offshore nomadic feeding distribution with aggregations of turtles observed feeding at oceanic features such as upwelling currents in water offshore of Central America. The foraging biology of this species remains poorly understood, but preliminary data appears to paint a generalist picture, at least in the eastern Pacific, where adults were seen foraging on fish, salps, crustaceans, and mollusks.

The direct harvest of both adult turtles and eggs represents a substantial threat to this species. In the latter half of the 20th century commercial exploitation of this species led to a decline in global population numbers. It is estimated that at least 1 million olive ridleys were harvested in Mexican waters in the year 1968 alone. The harvest of marine turtles and their eggs has been made illegal in most of the countries of the eastern Pacific Ocean where this species is known to nest, but enforcement has proven exceedingly difficult. In Costa Rica eggs may be harvested during the 'first wave' of the annual arribada. This is allowed because many first wave eggs are naturally destroyed by subsequent laying efforts. By providing a regulated harvest instead of a complete ban the regulations seek to maintain a sustainable harvest that supports the local economy reliant on egg harvesting. Coastal construction and beachfront light pollution pose a threat to the quality of nesting habitat and must be regulated around beaches of local nesting importance; however, no nesting is known to take place within U.S. territory.

While olive ridley sea turtles do occasionally occur in California they are primarily a subtropical and tropical species. They are considered unlikely to occur in the Action Area based on the very limited number of accounts of this species throughout the Pacific coast of north America and their natural distribution to be south of the U.S.-Mexico border. Observations of turtles on the Pacific coast of North America, the majority of which are stranded animals, are likely to be unwell turtles that may have passively drifted on ocean currents.

3.3 Marine Invertebrates

3.3.1 White Abalone

White abalone (*Haliotus sorenseni*) are herbivorous marine gastropods found along the west coast of North America from Point Conception, California to Punta Abreojos, Baja California, which includes the Action Area. White abalone are listed as endangered under the ESA and no critical habitat has been designated for this species. The following information is summarized from the most recent 5-Year Status Review (NMFS, 2018), and Recovery Plan (NMFS, 2008).

The historical range of white abalone extended from Point Conception, California to Punta Abreojos, Baja California, Mexico, with the historical population center located at the California Channel Islands. This species is found from 5 to 60 m deep, but current remnant populations are most common from 30 to 60 m depth. Survey data indicate the highest densities of white abalone occur from 40 to 50 m depth. It is the deepest dwelling abalone species in California.

Adult white abalone occur in open, low relief rocky reefs or boulder habitat surrounded by sand. Observations in the field indicate that white abalone prefer the edges of reefs at the sand-rock interface. White abalone associate with flat, moderate complexity habitats consisting of deformed (faulted or folded) rocks and sand and the presence of brown algae such as *Agarum fimbriatum* and

Laminaria spp. It feeds upon benthic drift kelp and other algal sources. Suitable habitat is patchy, thus it is assumed that the distribution of white abalone is naturally also patchy.

Two rocky reef areas occur within the Action Area that may be affected by discharge from the SBOO. Rocky reef occurs at the Imperial Beach Kelp Forest, although this kelp forest is intermittent in nature and the seabed consists of predominantly cobble habitat, that may be intermittently covered by sand. Therefore, the Imperial Beach Kelp Forest does not represent high quality white abalone habitat. The rip-rap structure protecting the emergent portions of the SBOO provide rocky habitat at suitable depths for white abalone. The jumbled rock structure may offer reasonably good structure for white abalone to inhabit, but it is unclear if this area supports extensive and consistent kelp that could provide food to white abalone. Because white abalone are so rare and the habitat in the Action Area is low quality it is unlikely white abalone occur in the Action Area. Therefore, they are assessed as having a low likelihood of occurrence in the Action Area.

3.3.2 Sunflower Sea Star

Sunflower sea stars (*Pycnopodia helianthoides*) are currently under consideration for listing under the ESA by NMFS. During this time, the sunflower sea star is considered a candidate species under the ESA. The species was petitioned for listing by Center for Biological Diversity (CBD) in December 2021 and NMFS determined that the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted (86 FR 73230). The following information is compiled from the original petition (CBD, 2021), the International Union for Conservation of Nature (IUCN) Red List entry (Gravem et al., 2021), and the 90-day petition finding (86 FR 73230).

Sunflower sea stars occur from the Aleutian Islands, Alaska to at least the Southern California Bight. There is some data indicating that the species may range as far southwestern Baja and San Ignacio Lagoon, Mexico. It is most common from the Salish Sea to the Aleutian Islands. The species is more commonly found in waters less than 25 m deep, although it may range as deep as 300 m. The species reproduces by broadcast spawning; eggs and sperm are released into the water column and fertilize in the plankton. Larval sunflower sea stars are planktonic for between 50 and 146 days. Individuals then settle as juveniles and grow, typically living for 15 years and up to 68 years. Between 2013 and 2017 the population of sunflower sea star was severely depleted by sea star wasting syndrome. The population is believed to have declined more than 90 percent and the area over which it occupies has decreased by more than 50 percent. The species appeared to be locally extinct at the Channel Islands from 2014–2017. It is unclear if the population has shown any signs of recovery. Because the southern California population appears to have experienced such a dramatic decline it is unlikely this species occurs at the project site, although its presence cannot be ruled out. Therefore, it is assessed as having a low likelihood of occurrence in the Action Area.

3.4 <u>Fishes (Including Elasmobranchs)</u>

3.4.1 Shortfin Mako

Shortfin mako sharks (*Isurus oxyrinchus*) are currently under consideration for listing under the ESA by NMFS. During this time, the shortfin mako shark is considered a candidate species under the ESA. The species was petitioned for listing by Defenders of Wildlife in January 2021 and NMFS determined that the petition presents substantial scientific or commercial information indicating that the petitioned action may be warranted (86 FR 19863). The following information is compiled from the original petition (Defenders of Wildlife, 2021), the 90-day petition finding (86 FR 19863), and Ebert (2003).

Shortfin mako sharks are found in all temperate and tropical oceans. Tagging data suggest shortfin mako sharks in the Pacific Ocean are separated into north and south populations. Within the northern Pacific Ocean, the tagging data also indicates an east-west divide. These divisions are supported by genetics data. According to Ebert (2003), shortfin mako sharks are an extremely active-swimming species famed for its jumping ability. Like many large epipelagic shark species, shortfin mako sharks follow warm waters that move seasonally north and south. Shortfin mako sharks are found in waters above 60 degrees Fahrenheit and prefer waters 63 to 72 degrees Fahrenheit. Juveniles are described by Ebert (2003) as "fairly abundant" off southern California in the summer months. Adults are less abundant and are more common on the outer banks of the Southern California Bight, particularly around the Channel Islands during late summer. Tagging studies off the U.S. and Mexico indicate that shortfin mako sharks move offshore in the winter and spring (Defenders of Wildlife, 2021). Shortfin mako sharks are protected under the Magnuson-Stevens Fishery Conservation and Management Act by way of the Highly Migratory Species (HMS) Fishery Management Plan (FMP). The HMS FMP identifies EFH areas for this species as beyond the 100-fathom (600-foot) depth limit, which is more than 11 km offshore of the end of the SBOO and outside of the Action Area. The July 2018 stock assessment presented for this species for a period up to 2016 indicated the fishery was sustainable. However, the IUCN Red List assessment of the trend over three generations (72 years) indicated a median decline of 36.5 percent. Additionally, data from the Western and Central Pacific Fisheries Commission indicate that longline catch rates of shortfin and longfin mako sharks (*Isurus paucus*) combined in the North Pacific declined significantly by an average of 3 to 11 percent annually between 1995 and 2010 (Clarke et al., 2013). Subsequently, NMFS is undertaking a detailed review of the status of this species globally under its ESA-remit.

This shark has historically been a relatively common shark species in southern California, particularly juveniles. Therefore, it is assessed as having a high likelihood to occur in the Action Area, particularly during summer and fall months before the sharks are believed to move into deeper (offshore) water through winter and spring. No data indicating a decline in the species was found in this assessment for the region encompassing the Action Area other than ocean basin-wide fisheries-dependent information in the fisheries stock assessments described in the 90-day petition finding (86 FR 19863).

3.4.2 Gulf Grouper

Gulf groupers (*Mycteroperca jordani*) are large predatory fish native to the eastern Pacific. They range from La Jolla, California to Sinaloa, Mexico including the gulf of California. The species is designated as Endangered under the ESA and no critical habitat has been designated for this species. The following information is summarized from the most recent Status Review of the gulf grouper (Dennis, 2015).

Gulf groupers, like many other groupers, are large, reef-associated fish found in tropical and sub-tropical oceanic waters. They can grow to 150 cm, can weigh up to 91 kilograms and may live up to 48 years. Gulf groupers inhabit waters less than 100 m depth and are more typically found in depths less than 30 to 45 m deep around seamounts and reefs. Juveniles may be found in tidepools. They are mostly solitary fish but seasonally aggregate to breed. While the northern distribution of the species is La Jolla, San Diego, there have been no known records of gulf groupers at the site since the 1930s. Recent records are almost exclusively within the Gulf of California, with a limited number of reports of the fish from Bahia Magdalena, over 600 miles south of the project.

Once considered abundant, their relative ease of harvest meant a rapid exhaustion of the resource across its range, with the species now reduced to less than 1 percent of its original abundance. Gulf groupers may not be caught in the U.S. but take continues in Mexican waters, albeit at a greatly reduced rate compared to historical rates. The predictable nature of gulf grouper spawning aggregations made this species easy to capture compared to many other large fishes. Furthermore, the species is slow to reach sexual maturity; young fish become sexually mature females at six years of age. Males transition from females, a process not uncommon in fishes known as protogynous hermaphrodism. The relatively slow maturation of gulf groupers compared with other fishes means population recovery in gulf groupers following a decline is relatively slow. Males are typically less common than females and typically larger than females and are therefore selectively fished, further reducing the ratio of males to females. These characteristics make gulf groupers particularly vulnerable to fishery-driven extinction compared with many other fishes.

Because the Action Area is at the northern extent of this species range and the species is relatively rare throughout its range, other than discrete aggregations in Mexico, this species is considered to have a very low likelihood of occurrence in the Action Area.

3.4.3 Giant Manta Ray

Giant manta rays (*Manta birostris*) are very large species of the order Myliobatiformes. The species is designated as threatened under the ESA throughout its range and no critical habitat is designated for this species. The following information is summarized from the most recent Status Review (Miller et al., 2017) and associated Federal Register publication (84 FR 66652) concerning critical habitat determination.

No critical habitat has been designated for this species because no physical or biological features essential to the conservation of the giant manta ray have been identified by NMFS within areas under U.S. jurisdiction. According to Ebert (2003), the giant manta ray occurs in tropical, subtropical, and warm-temperate waters around the globe. They prefer water temperatures greater than 68 F and like many large warmer water sharks, will migrate into California when the water warms and retreat as it cools. Therefore, they are more likely to occur in southern California during El Niño summers. They have been found as far north as Santa Barbara and around the Channel Islands. Ebert (2003) states that they are very common offshore of Baja, Mexico and throughout the tropical eastern Pacific to Peru and the Galapagos Islands.

They are a highly migratory species that may travel distances up to 1,500 km, although some populations of giant manta rays do not migrate. Giant manta rays spend more time in the open ocean than near the coast compared to closely related rays such as the reef manta ray (*Manta alfredi*). Giant manta rays are slow-growing, long-lived animals with low reproductive rates. Like all members of the order Myliobatiformes, giant manta rays give birth to live young. Females reach sexually maturity between eight and 13 years of age or approximately 90 percent of their maximum body size. They give birth to a single pup after a gestation period that lasts approximately one year. Some research suggests that an individual female living upwards of 40 years will only produce about 5 to 15 offspring in her lifetime, due to late sexual maturation and biannual pregnancies for the remainder of her life. These life history traits make the giant manta ray highly susceptible to over-harvesting, which remains the primary threat this species faces today.

Information on the frequency of occurrence of giant manta rays in California was not available, however based on accounts of their rare occurrence as far north as the Santa Barbara Channel this species is given a very low, but not unlikely, assessment for their likelihood to occur in the Action

Area. The core distribution of this species is tropical, open ocean and island regions of the Pacific Ocean, which does not include the Action Area.

3.4.4 Scalloped Hammerhead Shark

Scalloped hammerhead sharks (*Sphyrna lewini*) occur circumglobally throughout the world's warm temperate and tropical seas. This species is divided into six DPSs: Northwest Atlantic & Gulf of Mexico DPS, Central & Southwest Atlantic DPS, Eastern Atlantic DPS, Indo-West Pacific DPS, Central Pacific DPS, and Eastern Pacific DPS. Scalloped hammerhead sharks that may occur in California are from the Eastern Pacific DPS. Scalloped hammerhead sharks from the Eastern Pacific DPS are listed as endangered under the ESA. No critical habitat is designated for scalloped hammerhead shark. The following information is summarized from the most recent Status Review (Miller et al., 2014), 5-Year Review (NMFS, 2020d), associated Federal Register publication (80 FR 71774), and Ebert (2003).

Scalloped hammerhead sharks from the Eastern Pacific DPS includes coastal waters from southern California to Ecuador. Ebert (2003) reports that scalloped hammerhead sharks are rarely seen in California. A few confirmed records of the species are noted by Ebert (2003) from fishing catches (either bottom gill net or anglers). Each catch was observed in summer months when warm waters extend into southern California, particularly during or following El Niño periods. The species typically prefers waters warmer than 72 degrees F. According to Ebert (2003) they are commonly confused with smooth hammerhead sharks (*Sphyrna zygaena*), a more temperate species that is far more common in California.

Of the six DPSs identified under the ESA Status Review (Miller et al., 2014), the Eastern Pacific DPS, alongside the Eastern Atlantic DPS, was at the highest risk of extinction. This species is described as "extremely abundant in the Gulf of California" by Ebert (2003). Global population stock information is lacking, but it is assumed that downward trends observed in the Northwest Atlantic and Gulf of Mexico DPSs are reflected in the other DPSs.

Scalloped hammerhead sharks migrate to nursery areas to give birth to live young. Newborn scalloped hammerhead sharks typically remain in the nursery habitats where they will live for up to a year before dispersing. Adult scalloped hammerhead sharks are commonly found in coastal feeding habitat as individuals or in pairs but also form schooling aggregations, including during migrations.

Although little abundance data was available at the time of the review by Miller et al. (2014), commercial and artisanal fishery pressure and a lack of effective regulatory mechanisms were determined as a significant threat to scalloped hammerhead sharks.

Based on accounts that describe this species as rarely seen in southern California, its known distribution to be in subtropical and tropical waters in the eastern Pacific, this species is considered to have a very low likelihood of occurrence in the Action Area.

3.4.5 Oceanic Whitetip Shark

Oceanic whitetip sharks (*Carcharinus longimanus*) are large oceanic sharks. The species is listed as threatened under the ESA throughout its range and no critical habitat is designated for this species. The following information is summarized from the most recent oceanic whitetip shark Status Review (Young et al., 2018), the Federal Register publication (85 FR 12898) concerning the critical habitat determination, and Ebert (2003).

Oceanic whitetip sharks occur over the outer continental shelf, around oceanic islands in the tropics and subtropics, and in open ocean basins. They feed primarily upon fish and cephalopods and may reach between 25 and 36 years of age. Ebert (2003) states the species is most common between 20ºN and 20ºS and may move beyond these latitudes following the movement of warm water masses. It is one of the most common oceanic sharks in tropical and warm-temperate seas. Young et al. (2018) and the current IUCN Red List entry describe the distribution of this shark as occurring below 30ºN from approximately Punta Colonet, Mexico. This is ~150 miles downcoast of the U.S. - Mexico maritime boundary. The species is typically found swimming in waters deeper than 200 m, occasionally entering inshore waters as shallow as 40 m. This species is more commonly found in water temperatures greater than 68 degrees Fahrenheit and like many large warmer water sharks, will migrate into California when the water warms and retreat as it cools. Oceanic whitetip sharks are found in at least the top 150 m of the water column, although may dive deeper. According to Ebert (2003) this is a rare species in California waters but is occasionally seen around the Channel Islands during warm-water years, with unconfirmed reports of an individual seen off central California.

Prior to the peak of commercial fishery harvests these sharks grew to 3.5 m but currently maximum sizes are rarely more than 2.7 m. Population estimates for oceanic whitetip sharks are uncertain, but data suggest substantial declines in global oceanic whitetip shark populations. For example, the oceanic whitetip shark population in the western and central Pacific Ocean is estimated to have declined by ~93 percent from its natural biomass in the region. These declines are driven primarily by commercial fisheries supplying the international fin trade, as well as accidental bycatch, and illegal, unreported, and unregulated fishing.

Even though this species is, on rare occasions, observed in offshore waters in California, the oceanic nature of this species and its core distribution no further north than ~30°N means this species is unlikely to occur in the Action Area.

3.4.6 Steelhead Trout

Steelhead trout (*Oncorhynchus mykiss irideus*) spawn and develop as juveniles in freshwater rivers before migrating to the ocean, where they spend several years growing before returning to rivers to spawn. Steelhead trout in the eastern Pacific Ocean are divided into 15 DPSs (Busby, 1996). Twelve of these are protected under the ESA. Steelhead that spawn in southern California rivers are members of the Southern California DPS, which is listed as endangered under the ESA. The Tijuana River is one of the southernmost watersheds that historically supported the federally endangered Southern California steelhead DPS (NMFS, 2012).

Steelhead would have historically migrated in the main channel of the Tijuana River to move between perennial tributaries and the ocean. There is little historical or current information on steelhead in the Tijuana River watershed; surveys indicate the potential presence of resident *O. mykiss irideus* populations in upstream perennial tributaries (NMFS, 2012), but barriers prevent these fish from migrating between ocean and freshwater. Despite the lack of information, specific recovery actions for steelhead are outlined within the NMFS Southern California Steelhead Recovery Plan (2012).

Steelhead trout spawn in rivers in the winter and spring, beginning in late December in California and ending in May. Steelhead trout are generally understood to migrate to subarctic ocean waters in spring approximately two years after hatching in freshwater. Studies of the oceanic phase of steelhead trout are limited to fishes from rivers to the north of the southern California region and the life history of steelhead in the ocean is not as well understood (Light et al., 1989).

Tagging studies and coastal net sampling indicate that, once in the ocean, steelhead trout exit the coastal shelf quickly, dispersing across the Pacific Ocean, and rarely use coastal environments. Younger age class steelhead trout concentrate in the Gulf of Alaska with a southern extent of ~42°N. Older age classes extend south as low as 40°N and west as far as 150°E from this area towards Asia (Hayes and Kocik, 2014; Hayes et al., 2012). For example, purse seining and tagging work in Oregon and Washington rivers reported in Hartt and Dell (1986 *cited in* Pearcy et al. [1990]) indicate that most steelhead trout migrate directly and far offshore during their first summer in the ocean, rather than along a coastal belt where other juvenile salmonids typically migrate. Pearcy et al. (1990) report very low abundance of juvenile and adult steelhead trout inshore of 9.3 km caught by systematic purse seine net trawls off the coast of Oregon and Washington (from Cape Blanco, OR to Cape Flattery, WA). The highest number of steelhead trout caught in these surveys were approximately 37 to 46 km from the coast.

Despite the evidence that steelhead trout may leave rivers and rapidly migrate offshore and towards subarctic feeding grounds far north of their natal streams, some very limited evidence indicates alternative patterns of oceanic behavior. Everest et al. (1973) tagged ~17,400 steelhead trout in the Rogue River watershed. Although just eight fish were caught, all were caught downcoast of the Rogue River. Together with reports of steelhead trout landed at Fort Bragg that resembled Klamath River steelhead fish, Everest et al. (1973) propose this as evidence that Rogue River steelhead trout rear in ocean waters south of the Rogue River. Pearcy et al. (1990) speculate some oceanic phase steelhead trout may reside in the strong upwelling zone off northern California and southern Oregon rather than migrate to subarctic ocean waters. Teo et al. (2011) tagged and successfully monitored two adult steelhead trout that had completed spawning (called 'kelts') on the Sacramento River. One of these two fish left the Sacramento Estuary and San Francisco Bay, but remained relatively close to the continental U.S., never migrating farther than 41°N (Figure 3-6). Despite this evidence for the potential for steelhead trout to occasionally remain close to shore in central and northern California, it is highly unlikely that the ocean environment in southern California provides habitat for steelhead trout other than when migrating rapidly to and from spawning river mouths. Because the Tijuana River is unlikely to support steelhead trout it is highly unlikely that they will occur in the Action Area and be affected by the proposed Federal Action.

Steelhead trout are unlikely to occur in the Action Area. The Tijuana River is not believed to support migrating steelhead trout and most steelhead trout migrating out of rivers are generally believed to travel away from the river mouths relatively quickly. It is unlikely that the warmer waters of southern California, particularly in the Action Area, would be conducive to supporting steelhead trout, even if they occur in rivers close to San Diego.

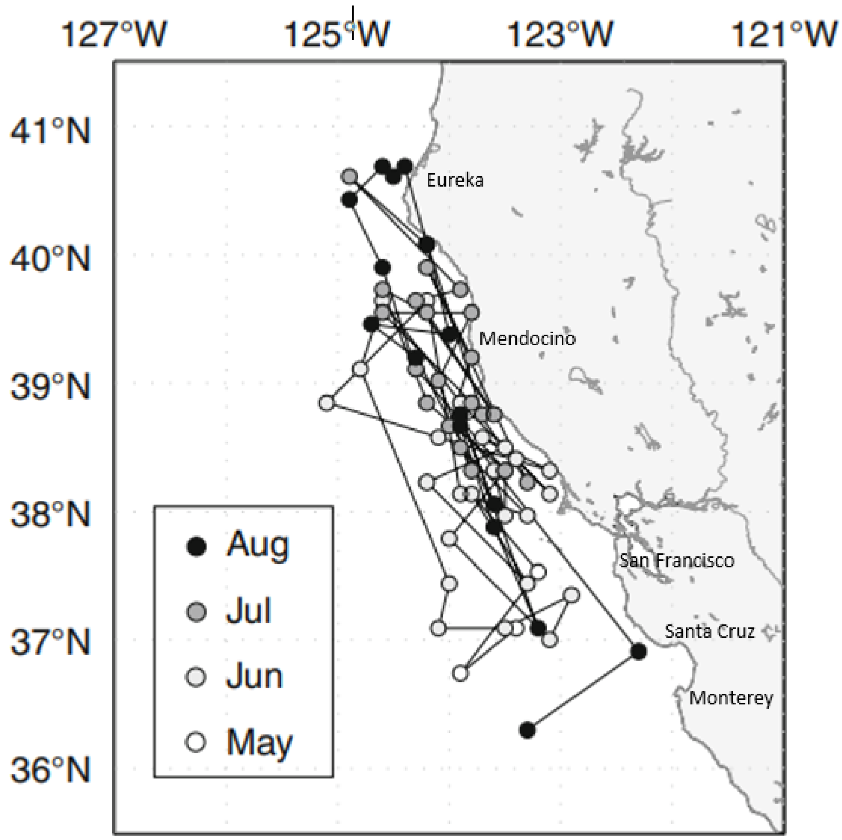

Figure 3-6. Estimated marine movements of tagged steelhead trout 'kelt' by month from May to August 2008. From Teo et al. (2011).

4. ESSENTIAL FISH HABITAT (EFH)

4.1 Determination of EFH

The location of areas of EFH in the Action Area and their character is described below. EFH is designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976 (Public Law 104-267). The MSA established jurisdiction over marine fishery resources in the U.S. The MSA was reauthorized and amended by the Sustainable Fisheries Act (SFA) of 1996 (Public Law 104-297) to include the EFH mandate. The SFA set forth a number of new directives for NMFS, regional Fishery Management Councils (FMCs), and other federal agencies to identify and protect important marine, estuarine, and anadromous fish habitat. The MSA requires that all federal agencies consult with NMFS on all proposed actions permitted, funded, or undertaken by the agency that may adversely affect EFH.

Congress defined EFH to mean those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. In 2002, NMFS further clarified EFH with the following definitions:

- "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate.
- "Substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities.
- "Necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10).

The SFA requires that regional FMCs prepare Fishery Management Plans (FMPs) for the identification, protection, and enhancement of EFH for federally "managed species". There are four FMPs on the Pacific coast of North America that include managed species with designated EFH that may occur in the evaluated area. These FMPs are the Coastal Pelagic Species (CPS) FMP, the Pacific Coast Groundfish (PCG) FMP, the Pacific Coast Salmon (PCS) FMP, and the HMS FMP.

Two FMPs—the PCG and CPS FMPs—provide very broad definitions of EFH area. Subsequently, most of the Pacific coastline of North America is encompassed by PCG, CPS, and krill EFH. The entire submerged portion of the evaluated area occurs within the groundfish EFH under the PCG FMP; however, it is noted within the PCG FMP (Pacific Fishery Management Council [PFMC], 2020) that this very broad definition of EFH is "precautionary." All marine and estuarine waters from the shoreline along the California coast to the limits of the U.S. Exclusive Economic Zone (200 nm) and above the thermocline where sea surface temperatures range between 50 and 79 degrees Fahrenheit are designated as coastal pelagic EFH under the CPS FMP. The EFH designated for krill extends to the 1,000 fathoms depth contour and from the surface to a depth of 1,300 feet (PFMC, 2019). Therefore, the entire submerged portion of the Action Area also occurs within CPS EFH. Two species of fishes protected under the HMS FMP, dorado and common thresher shark, have EFH that extends inshore to the 6 fathoms depth contour, overlapping the evaluated area, SBOO, effluent discharge, and areas likely affected by the ongoing nearshore pollution via SAB Creek. No PCS FMP EFH is designated in the Action Area.

4.2 Habitat Areas of Particular Concern

Within the category of EFH, regional FMCs are entitled to identify HAPCs. These subsets of EFH are either spatially explicit areas or habitat types that have been identified by regional FMCs as having high priority for conservation, management, or research. The PCG FMP designates several habitat-types as HAPCs. These are estuaries, canopy kelp, seagrass, rocky reefs, and areas of interest such as seamounts, banks, and canyons.

Three categories of HAPC are known to occur in the Action Area: canopy kelp, rocky reefs, and estuary. An area of submerged rocky reef occurs to the northeast of the SBOO. The rocky reef provides benthic habitat for the establishment of giant kelp plants (*Macrocystis pyrifera*) that intermittently result in the second HAPC that occurs in the area, canopy kelp. This rocky reef and intermittent canopy kelp-forming kelp forest area is referred to in this report as the Imperial Beach Kelp Forest. The third and final area of identified HAPC in the Action Area is the TJRE, which is an estuarine HAPC.

Seagrass habitat is an HAPC and there is potential for eelgrass (*Zostera marina*), a species of seagrass, to occur within the TJRE. Geographic Information System (GIS) data layers held by California Department of Fish and Wildlife (CDFW) that delimit known eelgrass areas throughout California do not indicate eelgrass in the TJRE, despite extensive areas in the wider San Diego region. However, it is unclear from these data whether the area was surveyed as part of the data compiled for this GIS layer so these data cannot rule-out the occurrence of eelgrass in the estuary. Zedler et al. (1992), which reviewed the natural history of the marine portions of the TJRE, indicated that this habitat-forming species is absent from the estuary. On the basis that Zedler et al. (1992) states that eelgrass is not present in the estuary and supported by the absence of eelgrass in the CDFW eelgrass data layer, it is considered unlikely that eelgrass occurs in the estuary and therefore this habitat is not considered further in this analysis.

Surfgrasses (*Phyllospadix* spp.) are also considered a member of the seagrasses. Surfgrasses in California grow on shallow subtidal and intertidal hard substrate habitat. The seashore and shallow subtidal seabed in the Action Area is predominantly sandy and therefore is not likely to support surfgrass habitat. Furthermore, CDFW surfgrass data available through the CDFW MarineBIOS website does not indicate seagrass in the Action Area. It is unlikely that surfgrass occurs in the Action Area and highly unlikely that sufficient acreage of surfgrass occurs to constitute 'habitat' and therefore form EFH. Therefore, this habitat is not considered further in this analysis.

Although ROV footage shows that this rocky reef supports a diverse rocky reef community that includes reef-associated fishes, invertebrates, understory algae, and temperate corals, artificial rocky reef substrate is not considered to be EFH (communication from C. Bryant NOAA-NMFS). Therefore, potential effects of the proposed Federal Action on this habitat are not considered in this EFH Assessment. Potential impacts to the SBOO rock-armoring reef are considered in the NEPA PEIS.

4.2.1 Tijuana River Estuary

The Tijuana River empties into the Pacific Ocean via the mouth of the TJRE. The TJRE mouth is a tidal inlet that forms through the unconsolidated sand beach barrier that intermittently isolates the TJRE from the open ocean. The precise location and configuration of the inlet vary over time. The western side of the TJRE is bounded by a barrier beach and dune complex that varies in width from 100 to 500 feet. A system of four main tidal sloughs extends from the tidal inlet into the north and central part of the estuary. Oneonta Slough extends northward from the tidal inlet, parallel to the barrier beach, and connects with the tidal marsh in the northern arm of the estuary. The Tijuana River main channel enters the estuarine environment in the northern portion of the valley along what is called the Tijuana River Slough. In addition to the Tijuana Slough, two more slough channels extend through the lower Tijuana River floodplain. These include the Mid-Valley Slough, and Old River Slough. South Slough extends south from the tidal inlet and is parallel to the barrier beach south of the mouth.

The TJRE is a highly variable system. During the winter wet season, waters in the estuary are diluted by rainfall and streamflow. During the remainder of the year, the estuary is essentially a partially or fully enclosed extension of the ocean. Classical characterizations of estuarine systems, such as salt wedge, partially mixed, or vertically homogenous brackish water estuaries do not apply well to the TJRE. As a result, Zedler et al. (1992) argue the TJRE may best be termed an "intermittent estuary". Tidal influence historically extended inland as far as 1.5 miles. However, the area of tidal influence has decreased in the late 20th century due to a number of factors including sediment deposition from the Tijuana River and tributaries. The estuary transitions to upland and riparian habitat along ecological transition zones, which predominantly consist of Alkali Meadow complex and High Marsh vegetation zones. These transition zones generally occur in areas to the south of the Naval Outlying Landing Field Imperial Beach and not any farther east (SFEI, 2017a).

Despite the non-canonical, intermittent estuarine status of the TJRE, the estuary does provide biological ecosystem services relevant to EFH HAPC under the PCG FMP. Predominant fish species present in the estuary include topsmelt (*Atherinops affinis*), longjaw mudsucker (*Gillichthys mirabilis*), arrow goby (*Clevelandia ios*), California killifish (*Fundulus parvipinnis*), and striped mullet (*Mugil cepalus*) (Zedler et al., 1992; USIBWC, 2016). The estuary also provides nursery habitat for species caught for recreational fishing, such as the diamond turbot (*Hypsopetta guttulate*), California halibut (*Paralichthys californicus*), surfperches, anchovies, plueronectids, croakers, and sea bass (Zedler et al., 1992; USIBWC, 2008). Based on analysis of a long-term monitoring data set from the estuary, Desmond et al. (2002) found that seasonal changes in water temperature most strongly correlated with changes in fish assemblage observed in the estuary, but discharge was also important. Peak abundance was in summer/fall when discharge was low. Interannual trends showed that periods of increased sewage input affected fish assemblage with more rapidly maturing fish (e.g., arrow goby) being more dominant under increased sewage inputs (Desmond et al., 2002).

4.2.2 Imperial Beach Kelp Forest

As part of the SD RSMP developed in 2009, data was compiled on geological seabed habitat from hydroacoustic surveys (SD RSMP, 2022). This data clearly identifies an area of cobble seabed to the northeast of the SBOO. This cobble habitat provides hard substrate on which algal and invertebrate communities can attach and numerous other reef species can associate. This rocky reef also provides substrate for the attachment and growth of giant kelp (*Macrocystis pyrifera*). Given the correct ocean conditions, giant kelp plants can reach the sea surface and form a canopy structure. Canopy kelp and rocky reef habitat are two related but separate forms of HAPC recognized under the PCG FMP. This area is referred to in this report as the Imperial Beach Kelp Forest HAPC. Data showing the location of the Imperial Beach rocky reef and kelp forest in relation to the Point Loma kelp forest and other features in the region are shown in Figure 4-1.

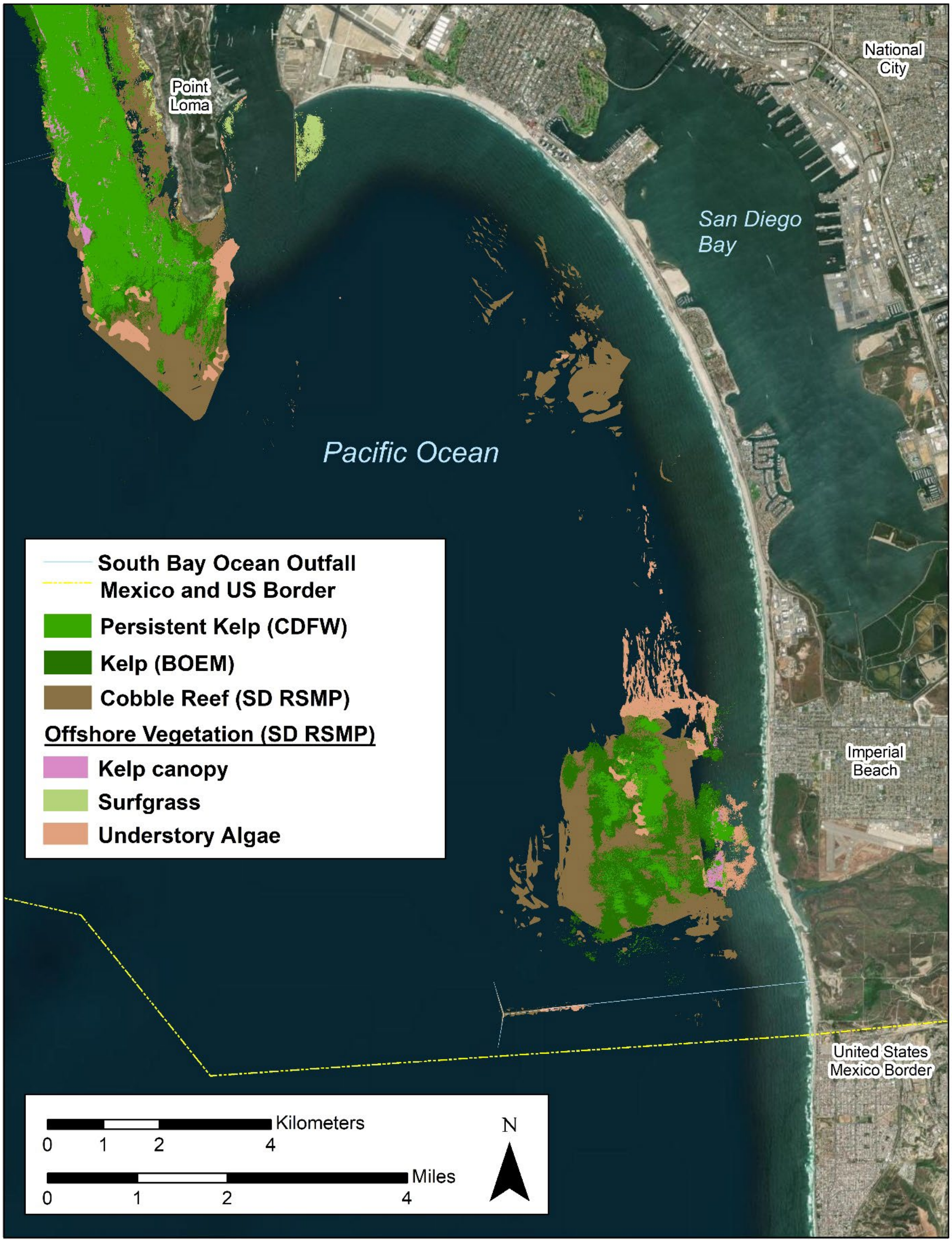

Figure 4-1. Location of rocky reef and kelp habitat in the Action Area.

The cobble reef area identified in the SD RSMP seabed habitat data encompasses approximately 1,400 hectares from approximately 5 m to 25 m below mean sea level. The southern limit of this bed is approximately 1,200 m directly north from the main barrel of the SBOO pipeline and approximately 1,100 m north-east of the closest diffuser port, which is the northern tip of the wye-diffuser. All diffuser ports on the northern arm of the wye-diffuser are currently closed.

The PCG FMP describes canopy kelp HAPC as including those waters, substrate, and other biogenic habitat associated with canopy-forming kelp species. Giant kelp, the species of algae that forms the majority of kelp canopy HAPC in southern California, is a fast-growing, perennial brown alga that attaches to and grows on hard seafloor substrate. While giant kelp plants can grow in waters as deep as 50 m in ideal conditions, giant kelp plants typically establish canopy forming kelp forests over areas of hard substrate between 5 and 30 m along the mainland coast of southern California.

As described in Schiel and Foster (2015), giant kelp communities are highly productive relative to other habitats typical of the southern California region, including wetlands, shallow and deep sand bottoms, and rock-bottom artificial reefs. Canopy-forming kelp plants provide vertically-structured habitat throughout the water column consisting of a canopy of tangled blades from the surface to a depth of 10 feet, a mid-water stipe region, and the holdfast region at the seafloor. This structure provides nurseries, feeding grounds, and shelter to a variety of groundfish species and their prey. Furthermore, the kelp itself is a source of food as living tissue on attached plants, as drift in the form of whole plants or detached pieces, and as dissolved organic matter exuded by attached and drifting plants.

Canopy kelp data used to map persistent canopy kelp typically involves aerial imagery (photographs from an airplane). Some kelp beds, such as the Point Loma kelp bed approximately 15 km to the north of the SBOO, maintain canopy kelp at some point in the year every year. However, many kelp beds are intermittent year-to-year, therefore multiple years of observations are necessary to determine areas where canopy kelp is likely to form over the lifecycle of a project.

Six sources of information on the formation of canopy kelp at the Imperial Beach Kelp Forest have been identified that use aerial imagery to determine canopy kelp from multiple years of observation data:

1. Persistent Kelp Canopy data from the CDFW MarineBIOS GIS tool[15] provides frequency of occurrence over eight years in aerial photographs from 1989, 1999, 2002 through 2006, and 2008. These data indicate that kelp canopy was detected in one to two years throughout much of the persistent kelp canopy area, but no more than three years during this period.

2. A series of maps (GIS shapefiles) showing kelp canopy for 15 discrete years is available on the publicly accessible CDFW GIS server.[16] A GIS shapefile representing kelp canopy from 1989 is the earliest year of data in this series. This shapefile is described as hand-drawn maps from aerial imagery. The next earliest year is described in associated metadata as produced in 1999. However, the metadata describes this layer as a digitally remeasured version of the 1989 maps. Based on this description it is assumed that the 1999 data is from

[15] "Kelp Canopy (Persistence)" Available at https://apps.wildlife.ca.gov/marine/. Accessed in February 2022

[16] Available at https://filelib.wildlife.ca.gov/Public/R7_MR/BIOLOGICAL/Kelp/. Accessed in February 2022.

the same survey years as the 1989 maps. Subsequent maps include the years 2002 through 2016, not including 2007. Kelp canopy is detected in 10 of the 16 shapefiles included in this data series. Kelp canopy was detected at the Imperial Beach Kelp Forest in the years 1989 (including in the 1999 shapefile), 2002, 2003, 2004, 2005, 2006, 2008, 2009, 2014, and 2015. Canopy kelp was not detected at the Imperial Beach Kelp Forest in 2010, 2011, 2012, 2013, and 2016.

3. Data from the Bureau of Ocean Energy Management Marine Cadastre National Viewer GIS tool[17] provides maximal extent of canopy kelp surveyed over a period of 26 years from 1989 through 2014. These data do not indicate how many years, or which years, canopy kelp formed at the Imperial Beach Kelp Forest, but they do indicate the number of years surveys were completed and the maximal extent of canopy kelp when it occurred. The area encompassing the Imperial Beach Kelp Forest includes surveys for at least 18 years during this period and the maximal extent is very similar to the maximal extent identified in the CDFW MarineBIOS data described above.

4. Data collated as part of the SD RSMP[18] includes both the CDFW Persistent Kelp layer as described above and an Offshore Vegetation layer. The offshore vegetation layer includes kelp canopy, understory algae, and surfgrass derived from acoustic data (high-resolution multibeam acoustic backscatter) collected in 2002 as part of the development of the SD RSMP.

5. Giant kelp (*Macrocystis pyrifera*) beds along most of the southern California mainland coast have been mapped quarterly by the Region Nine Kelp Survey Consortium (RNKSC) since 1983.[19] The most recently reported surveys were completed in 2020. These surveys include aerial and vessel surveys of kelp beds from the U.S.-Mexico border to northern Laguna Beach in Orange County, CA. The Imperial Beach Kelp Forest is included in these surveys.

6. Ocean Imaging Corp. compiled multi-spectral aerial imagery of kelp bed areas throughout southern California as part of a Sea Grant funded project (Ocean Imaging, 2015). GIS shapefiles for this project were not available, but a report describing the results of this study was accessible. The data products include kelp canopy extents derived using digital image classification algorithms that incorporate ground-truth sampling to verify and improve the classification process. The Imperial Beach Kelp Forest included aerial imagery data from 1999, 2003 through 2006, 2008, and 2009.

During the RNKSC surveys no canopy kelp was observed at Imperial Beach Kelp Forest beginning in 2017 and continuing through the most recently reported surveys in 2020. Prior to 2017, canopy kelp had been observed at this site each year since 1998. Dive surveys in 2020 to survey subsurface conditions at the reef found no kelp individuals on the bottom. The cobble and boulder reef covered

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[17] "West Coast Canopy-Forming Kelp, 1989-2014" Available at www.marinecadastre.gov/nationalviewer. Accessed in February 2022

[18] Available at https://cespl.maps.arcgis.com/apps/webappviewer/index.html?id=32c6af0af6644d0891c566a9ecaf1c74 Accessed in February 2022

[19] Accessed at https://www.mbcaquatic.com/reports/southern-california-bight-regional-aerial-kelp-surveys and http://kelp.sccwrp.org/reports.html. Accessed in February 2022.

5 percent of the seafloor observed during diver surveys and divers noted observing purple and white urchins and bat stars. The median acreage for canopy kelp based on 42 years of aerial surveys between 1967 and 2020 is 0.11 acres (~445 m^2). This is relatively small compared to Point Loma (median = 3.16 acres) and La Jolla (1.24 acres) kelp forests, which are the next closest kelp forests in California waters. These two adjacent kelp forests are the largest kelp forests in southern California. All kelp forests monitored in the RNKSC combined have a median canopy kelp of 6.273 acres. The occurrence of canopy kelp at the Imperial Beach Kelp Forest is variable between years compared with the La Jolla and Point Loma beds, reflecting the bed's somewhat intermittent nature. The largest extent recorded for Imperial Beach Kelp Forest during the RNKSC surveys were during 2008 where the bed was 1.895 acres.

Ocean Imaging (2015) note that the Imperial Beach Kelp Forest is unusually intermittent. During the 1999–2009 timeframe of their analysis, kelp bed extents mapped in the aerial imagery shifted locations and changed in acreage between years considerably more than any other kelp beds examined in their study. Their study encompassed the majority of kelp beds in the southern California region.

According to life history information compiled in Schiel and Foster (2015), an adult plant may grow between 10 and 50 cm day^{-1}, which allows a kelp plant (the sporophyte phase) to readily establish canopy kelp within a calendar year. While individual fronds on an adult kelp plant usually live no more than four to nine months, individual plants can live up to nine years. To reproduce, adult giant kelp plants produce planktonic spores that become male and female gametophytes. Both these phases can be transported as far as a few kilometers from the adult plants by ocean currents before settling and growing to become adult plants.

Many factors may contribute to variation in persistence and subsequent establishment of giant kelp canopy in southern California according to Schiel and Foster (2015) and the extensive literature reviewed therein. Subtidal cobble, and to a lesser extent boulder, substrate can be moved by wave action, particularly during major storm activity. Cobble reefs such as the Imperial Beach Kelp Forest can be severely reduced and sometimes lost entirely during large storms. Kelp plants established on low-relief rocky reefs are likely to be subject to sand scour and sedimentation, which can deteriorate or destroy existing plants and also inhibit recruitment.

Nitrate, an important nutrient for algae, is typically a limiting factor on the growth of giant kelp. Nitrate concentration in ocean water is negatively correlated with ocean temperature (warmer water = lower nitrate availability). During warm-water years, particularly related to climatic drivers indicated by the El Niño/Southern Oscillation (three- to seven-year cycles) and the Pacific Decadal Oscillation (20- to 30-year cycles), kelp canopy acreage along the California coast is significantly depressed. The largest changes in giant kelp forest seen over the past century are correlated with temperature, nutrient, and severe storms due to climactic periods indicated by the El Niño/Southern Oscillation. Marginal kelp beds throughout southern California may not form canopy kelp during warm temperature years.

Low light conditions can lead to deterioration of existing kelp and limit the recruitment to hard substrate on the seafloor. Typically, low light conditions relate to either depth or increased turbidity in the water column. Turbidity from particles suspended in the water column can be caused by many factors in the ocean, including:

- Suspension and transport of seabed material by storms, waves, and ocean currents.
- Surface runoff from the land through natural drainage such as creeks, rivers, and coastal canyons or man-made gutters, culverts, and drainpipes that end on the coast.
- Coastal landslides.
- Ocean discharge pipes from facilities like waste-water treatment or power plants.
- Plankton blooms related to localized nutrient enrichment from natural or man-made sources.

Grazing of kelp plants, particularly by sea urchins, is a major factor determining kelp canopy distribution. Urchins can reduce the size of existing kelp beds and limit the recruitment of replacement adult plants. In some cases, local urchin populations may establish dense aggregations and the subsequent intense grazing causes ‘urchin barrens’, areas devoid of non-crustose algae including canopy-forming kelps like giant kelp.

5. POTENTIAL ENVIRONMENTAL EFFECTS

5.1 Effects Summary

The purpose of the proposed Federal Action, as previously described, is to fund and implement infrastructure projects to address ongoing transboundary flows that are currently impacting the natural environment, including the marine environment and species in the Action Area. Subsequently, the net effect of this project will have a positive impact on the marine environment. However, components of the project may have short-term negative effects on ESA-listed species and EFH.

The matrix below (Table 5-1) summarizes interactions between project activities or consequences (Project Components) and the marine biological resources in the Action Area (Resources) identified and described in this combined BA and EFH (Sections 3 and 4). Project Components are divided into construction and operation phases. A blank cell indicates a no-effect determination, where no interactions between Project Components and Resources will occur. A black dot indicates the Project Component is not likely to adversely affect the indicated Resource. No Resources have been assessed as likely to be adversely affected by any Project Components. Effects due to the decrease in nearshore pollution are identified in this matrix, however these effects are expected to have a net positive effect on Resources. A determination indicated for a group of listed species indicates at least one species in the group is affected. It does not indicate that all listed species in the group are affected. The following section provides a narrative assessment of the potential interactions between Project Effects and Resources.

Table 5-1. Matrix identifying interactions between project activities or consequences (Project Components) and marine biological resources in the Action Area (Resources). A block dot indicates an interaction. See text above for details.

	Resources									
Project Components	**Listed Marine Mammals**	**Listed Turtles**	**Listed Marine Invertebrates**	**Listed Fishes**	**Tijuana River Estuary HAPC**	**Imperial Beach Kelp Forest HAPC**	**HMS EFH**	**PCG EFH**	**CPS EFH**	**Krill EFH**
Re-commissioning of Diffusers (Marine Construction)										
Vessel- and diver-disturbance from noise generation and other related activity	•	•	•	•						
Collision risk due to vessel traffic	•	•								
Anchor deployment for construction barge	•	•	•	•						
Spill or grounding risk due to vessel accident					•	•	•	•	•	•
Facility Operation										
Increase in SBOO discharge volume	•	•	•	•		•	•	•	•	•
Decrease in nearshore pollution	•	•	•	•	•	•	•	•	•	•

5.2 Effects of Marine Construction

Most of the Project Components that will be required to construct project elements considered for funding under the proposed Federal Action will occur on the Mainland of U.S. and Mexico. These construction activities will have no direct or indirect effect on the marine environment. However, to accommodate the increase in effluent discharge volume for Projects A (Expanded ITP) and Project D (APTP Phase 1), up to 55 diffuser risers currently blind flanged on the southern leg of the SBOO wye diffuser are anticipated to be recommissioned. Currently, 18 of the 165 diffuser ports are open. A further 16 diffuser ports are installed but are currently capped/plugged. The remaining 131 diffuser ports are blind flanged and will require the installation of a diffuser head to be operational. The new plants under Projects A and D will be constructed and come online independently (i.e., not necessarily on the same schedule), and full treatment capacity for Project A will be reached in multiple phases up to 2050 in response to population growth in Tijuana. Therefore, it is assumed that ports on the wye-diffuser will be opened in a similar phased manner over the course of several years.

It is anticipated that the recommissioning of a capped/plugged or a blind-flanged diffuser port will result in minor disturbance to marine wildlife and habitat. Specifically, divers would likely disturb or remove a relatively small area of habitat and species on and around a diffuser head that requires modification. At each modified diffuser head, it is assumed that this may result in the disruption of no more, and in most circumstances considerably less, than a 6-foot by 6-foot area of artificial reef habitat. This disturbance will be necessary to allow divers to access bolts, blind flanges, and other parts of the diffuser ports with hand tools to make the modifications likely to be required to recommission these features. Following completion of the diver activity, natural ecological-succession processes are highly likely to gradually replace the lost habitat over time.

During the recommissioning activities, boats will be required to transport divers and equipment to the site. At this stage it is unclear what size of vessel will be used or whether this vessel will require anchoring. If the vessel does require anchoring, it will be necessary for that vessel to safely deploy the anchor to avoid damaging the wye diffuser and associated structures on the seabed. It is assumed that anchors will be deployed onto sandy seabed and may be adjusted by divers once they are deployed. Alternatively, a permanent mooring may be positioned to allow divers to return over a series of days

5.2.1 Potential Effects on ESA-listed species

Vessels used to transport the divers to and from the project site will generate noise that has the potential to disturb marine mammals, sea turtles and potentially other species. Marine mammals are highly sensitive to noise from vessels. Subsequently, it is expected that standard guidelines for vessel operation around marine mammals on construction projects will be applied. These include vessel operators and crew being aware of the potential for marine mammals and sea turtles to occur in the Action Area. Vessel operators will also be required to remain aware of their surrounding with respect to marine mammals and turtles. This will require that at least one crew, most likely the vessel operator, maintains a constant watch of the ocean surface in front and adjacent to the vessel at all times. If marine animals are observed distant to the vessel, vessel operators should adjust their course as necessary to ensure they do not disturb the natural behavior of these animals. If animals are observed within close limits of the vessel such that the vessel may disturb those animals, vessels are advised to follow close observation guidelines available through NMFS.[20] These include the following recommendations:

- Slow down and operate at a no-wake speed.
- Stay out of the path of the animal's direction of travel.
- Do not put your vessel between whales, especially mothers and calves.
- Do not chase or harass animals, and do not approach the animals head-on, from directly behind them, or from the side (t-bone). If animals are following a trajectory closely parallel to the direction of vessel travel, gradually steer the vessel to be parallel to the animals from the side and stay at least 100 yards away—i.e., the length of a football field.

Because diving activities are likely to involve hand tools and will not include noisy activities like cutting or hammering, the area of disturbance will be within 20 feet of the activity on each riser and is most likely to be less than 12 feet from the risers. Direct disturbance of marine mammals, sea turtles, or marine fishes such as the shortfin mako shark by diver activity is highly unlikely because these species are unlikely to remain in the Action Area while divers are working. While movement of these animals away from divers and other marine construction activity represents a disturbance risk, the likelihood of disturbance occurring is very low because the activity will occur over a relatively short period of time (a few hours each day for a few weeks) and is likely to occur in phases over the course of several years as described above. Animals are not likely to regularly occur in the immediate vicinity of the SBOO wye diffuser and if an animal is disturbed these animals will easily move a short distance away. Therefore, this disturbance is highly unlikely to cause the animal any tangible harm.

Anchor deployment carries some risk of collision with marine mammals, sea turtles, and benthic invertebrates. However, it is highly unlikely that an anchor will strike an animal. The most likely ESA-listed animals to occur beneath the boat during anchor deployment are blue whales, because they commonly feed in the area offshore of Point Loma. Gray whales are also likely to occur in the Action Area during their winter annual migration, although WNP gray whales are very rare and therefore considerably less likely to occur than ENP gray whales. The other whale species and Guadalupe fur seal are very unlikely to occur in the Action Area. Marine turtles are also unlikely to be struck by anchors because they are generally migrating through the Action Area. In warm shallow waters green sea turtles may rest on the seafloor and frequently remain stationary on the seafloor while feeding. However, there is no likelihood of marine turtles remaining stationary on the seafloor at the types of depths anchors will be deployed. White abalone are unlikely to occur in the Action Area, but if they do occur, they will be amongst the rocks that constitute the artificial reef around the SBOO. As recommended in the PEIS, if the vessel needs to deploy any anchors, the vessel operators will check for reef with onboard sonar equipment and anchors will be deployed over sandy seabed at least 10 feet away from the edge of the rocky reef surrounding the SBOO and therefore any potential white abalone habitat. Sunflower sea star may range onto the sandy seabed. However, they are also unlikely to occur in the Action Area due to their marked decline and possible extirpation in southern California. The likelihood of an anchor striking a sunflower sea star is so small that the risk of an adverse effect is negligible.

[20] Available at https://www.fisheries.noaa.gov/west-coast/marine-mammal-protection/safe-whale-watching-west-coast-be-whale-wise

5.2.2 Potential Effects on EFH

Vessel activities bring a small risk of grounding or oil spill. However, spilled fluids from a grounded or stricken vessel can have serious environmental consequences for marine habitats and associated species. Vessels are likely to carry hydraulic fluids and fuel that would be toxic to marine life if spilled. Most marine vessel groundings or spills are the result of mechanical failures or pilot negligence. The most vulnerable EFH to oil spill effects are the TJRE and Imperial Beach Kelp Forest. Grounding is unlikely to occur at either of these locations, however a vessel that loses control at sea and cannot be rescued by U.S. Coast Guard or other resources may wash up on the beach and result in some oil spill risk that could reach these EFH HAPCs.

Therefore, vessel grounding and spill risk due to project construction activities is assessed as a potential impact. It is assumed that construction vessel operators will follow best practice by maintaining their vessels to a high standard. Furthermore, vessel operators should maintain industry standard health, safety, and environmental standards that apply specifically to the intended construction operations. This is likely to include the storage and maintenance of spill kits appropriate to dealing with small vessel-based spills such as sand buckets, absorbent pads and cloths, and other emergency containment devices to stop small spills of hydraulic fluids and other polluting fluids from entering the water if they are accidentally spilled on deck. Vessels must be maintained to a standard that eliminates the likelihood of diesel or hydraulic oil spills during normal operation. As recommended in the PEIS, in the case of a catastrophic loss of engine power that may result in a grounding, vessel captains must have procedures in place to raise coastguard support rapidly. As long as these measures are in place, the likelihood of adverse impacts to EFH from oil spill or grounding is negligible and therefore considered not likely to adversely affect EFH.

5.3 Effects of Facility Operation

The only potential operational phase impact that may result in adverse effects to marine biological resources from the projects that are proposed for funding is the increase in SBOO effluent discharge volume. The projects will also result in reductions in nearshore pollution caused by the current failure of wastewater treatment infrastructure to treat wastewater from Tijuana. Projects proposed for funding are intended to reduce this pollution and therefore represent a positive effect on marine wildlife, which is also discussed in this section.

Implementation of the projects funded through the proposed Federal Action will immediately lead to significant reductions in discharges of untreated wastewater to the Pacific Ocean via SAB Creek, as summarized in Table 5-2. The majority of these improvements will be accomplished through Projects A (Expanded ITP), B (Tijuana Canyon Flows to ITP), and C (Tijuana Sewer Repairs) by improving the collection and treatment of wastewater in Tijuana.

Implementation of the Core Projects will also reduce (by up to 93 percent) the portion of sediment loads via SAB Creek that come from untreated wastewater or river water. These projects will not affect sediment loads to the Pacific Ocean resulting from stormwater and erosion within the SAB Creek watershed.

Table 5-2. Impacts on Discharges to the Pacific Ocean via SAB Creek (Initial Operations) Under the Proposed Federal Action

Projects	Untreated Wastewater Flow Volume		BOD_5 Load		Nutrient Load	
	MGD	Percent Change	Tons/yr	Percent Change	Tons/yr	Percent Change
Current conditions [a]	28.2	N/A	17,200	N/A	3,916	N/A
Proposed Federal Action [b]	2.2	-92%	1,340	-92%	275	-93%

a – Current conditions were calculated using Tijuana River flow data from January 2016 through January 2022, during a period when PB-CILA capacity was 23 MGD.
b – Reflects changes in discharges and loadings that will be achieved upon startup of new treatment facilities (i.e., before the full treatment capacity comes into service in response to population growth in Tijuana).

Table 5-2 identifies the improvements that will occur upon startup of the new treatment facilities. However, expansion of the ITP to 60 MGD under Project A will provide additional treatment capacity to accommodate projected population growth in Tijuana through the year 2050, assuming Tijuana canyon flows are treated at the ITP (Project B). The full water quality benefits of this project will be realized once this additional treatment capacity comes into service in response to population growth. To estimate these future improvements relative to baseline conditions, EPA and USIBWC projected 2050 baseline conditions for discharges to SAB Creek (i.e., assuming no infrastructure improvements are made) and estimated the impacts of the proposed Federal Action on this projected baseline. Table 5-3 summarizes these projected (2050) reductions in discharges of untreated wastewater to the Pacific Ocean via SAB Creek.

Table 5-3. Impacts on Discharges to the Pacific Ocean via SAB Creek (Projected 2050 Conditions) Under the Proposed Federal Action

Projects	Untreated Wastewater Flow Volume		BOD_5 Load		Nutrient Load	
	MGD	Percent Change	Tons/yr	Percent Change	Tons/yr	Percent Change
Projected 2050 baseline conditions [a]	44.6	N/A	27,200	N/A	5,980	N/A
Proposed Federal Action [b]	5.4	-88%	3,310	-88%	674	-89%

a – Projected conditions in 2050 reflect estimates of additional wastewater generated due to projected population growth in Tijuana with no corresponding improvements to wastewater treatment infrastructure.
b – Reflects projected operations in 2050, when the 60-MGD expanded ITP will be operating at full capacity based on estimated population growth in Tijuana.

As shown above, implementation of Project A will be projected to substantially reduce future discharges of untreated wastewater to the Pacific Ocean via SAB Creek. The added capacity will help prepare for projected conditions in 2050 and provide additional coastal water quality improvements through 2050. Projects A and D will also be projected to reduce (by up to 88 percent) the portion of projected sediment loads via SAB Creek that will come from untreated wastewater or river water. These projects will not affect sediment loads to the Pacific Ocean resulting from stormwater and erosion within the SAB Creek watershed.

To assess the potential for adverse effects, the magnitude of change in SBOO discharge extent has been estimated using a mixing model. Modeling was performed with the UM3 model from the

Visual Plumes software suite (Plumes20 edition[21]). The nearfield dilution estimates for the two scenarios using the May 2019 ambient profile were linked to results from the Brooks Far Field model in Visual Plumes to estimate pollutant transport phenomena within a 20-km radius of the SBOO under the assumption of no shoreline interactions. The modeling effort was structured into two scenarios:

- Baseline Scenario: Based on current permitted wastewater sources (assumed average daily flow of 35 MGD) and discharge characteristics.
- Alternative Scenario: Addition of new permitted flows from new or existing plants (assumed average daily flow of 110 MGD, a net 75-MGD increase over baseline).[22]

Under the Baseline scenario, the model assumed that 72 southern leg diffuser ports were open. Under the Alternative scenario the model assumed all 332 southern leg diffuser ports and the 4 main barrel diffuser ports were also open. This is likely to represent a conservative model construction.[23]

Under each model scenario, a series of nearfield dilution estimates were computed based on a series of ambient depth profiles for density, current speed, and current direction over the period of record. The ambient profile corresponding to May 2019 produced the median nearfield density estimate. Long-term average effluent salinity and temperature for the ITP and SBWRP were modeled based on monitoring data collected from 2015 through 2020. The San Diego Regional Water Board (Water Board) provided PG Environmental with ambient monitoring data (salinity and temperature) for Station I16 that is located over the junction between the main barrel and the wye diffuser of the SBOO. Quarterly depth profiles for salinity and temperature (collected in February, May, August, and November) collected between August 2018–November 2020 were used in the model to characterize ambient density stratification conditions in the nearfield. The quarterly ambient monitoring data had relevant data for depths ranging from 0 to 27 m at 1-m intervals.

Depth profiles for ambient current speed and direction were estimated for the period of records using data collected from two acoustic doppler current profilers (ADCP) deployed in the vicinity of the SBOO diffuser. The ADCP devices collected high frequency time series current speed and direction data which was aggregated by calendar monthly average for the period of record (August

[21] Visual Plumes is a free outfall modeling software suite developed by EPA and currently distributed in partnership between the State Water Resources Control Board and Walter Frick, the lead software developer/maintainer. Plumes20 edition retrieved on January 5, 2021, from: https://www.waterboards.ca.gov/water_issues/programs/ocean/

[22] This modeled alternative scenario of 110 MGD represents a 214 percent increase in average daily flow above the assumed baseline of 35 MGD. After the completion of model runs under this effort, EPA refined its estimate of current SBOO discharges to 28.8 MGD (instead of 35 MGD) and refined its estimate of projected 2050 discharges under the proposed Federal Action to 84.5 MGD (instead of 110 MGD). This refined estimate represents a 193 percent increase in projected average daily flow above the baseline. The modeled scenarios therefore represent a conservative model construction that likely overestimates the expected changes in the SBOO effluent plume under the proposed Federal Action.

[23] After the completion of model runs under this effort, the City of San Diego estimated that 288 open ports (rather than the assumed 332 open ports) will be optimal based on the operating conditions described in the Alternative scenario. This restricted number of port openings (44 fewer open ports) is expected to result in an increase in the rate of nearfield mixing and therefore reduce the size of the far field dilution plume in comparison to the modeled results under this effort.

2018–November 2020). To estimate potential far-field transport processes over a longer time-period, current speed and direction from the ADCP devices for the period of record were visualized (Figure 5-1) and the predominant direction of flow was identified. North-south currents predominate, with weaker east-west currents present. Monthly visualizations were also made that show currents during the period of record would switch between northerly and southerly current patterns. An average current speed was used for flows traveling in each of four directions: north, east, south, and west. These speeds were:

- North (0/360 degrees): 0.124 m/s
- East (90 degrees): 0.105 m/s
- South (180 degrees): 0.146 m/s
- West (270 degrees): 0.102 m/s

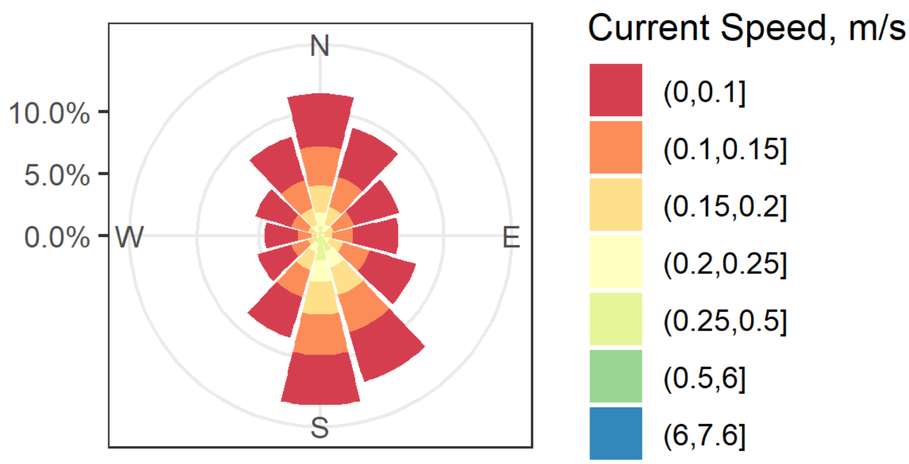

Figure 5-1. Current speed and direction measurements at the SBOO. Radius represents fraction of measurements within that speed and direction category.

Results of the far-field plume modelling are shown in Figure 5-2. The model predicts that an increase in volume of effluent from 35 MGD to 110 MGD will result in an approximate doubling in the overall modeled plume extent, with less of an increase in the plume extent in areas closer to the SBOO where concentrations are higher. The change in plume extent was smallest at higher concentrations closest to the SBOO (mean increase in distance at 75 percent dilution was ~85.5 percent), with the extent of some of the lower dilution rates (i.e., >80 percent dilution) skewing the average increase in plume size upwards. It is important to consider that these results reflect a highly idealized comparison between two discharge volume scenarios. The contours in Figure 5-2 are not expected to represent actual plume positions in relation to the SBOO terminus. Instead, this is presented to demonstrate the approximate change in magnitude of the discharge in relation to dispersal potential. Differences due to rates of decay for two pollutants (Aldrin and polychlorinated biphenyls [PCBs]) showed negligible differences in modelled plume extents.

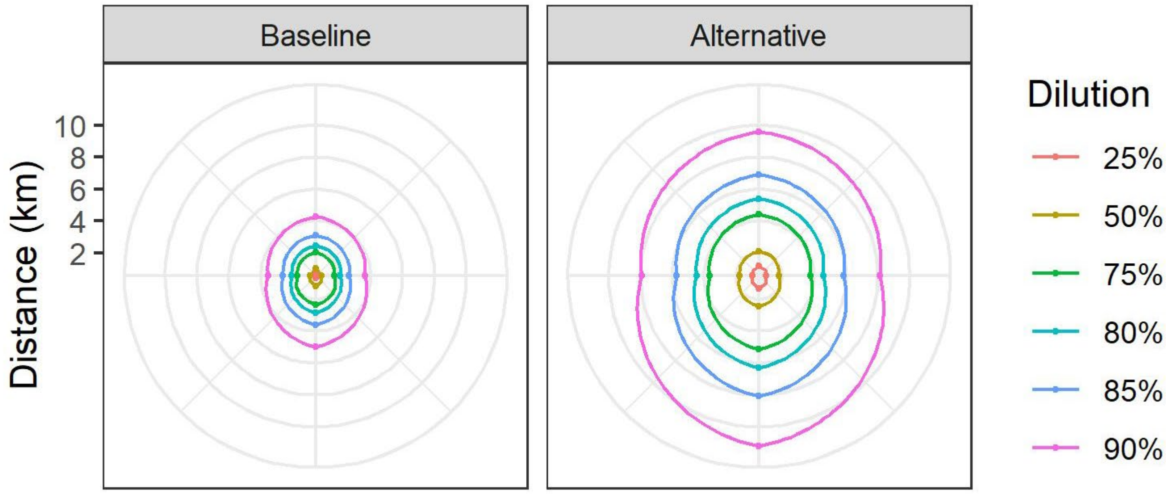

Figure 5-2. North, south, east, and west distances for percent dilution of pollutants based on coupled near-field far-field model. Far field model results are highly idealized and are not expected to represent actual plume positions. Lines connecting points are provided as a visual aid and do not necessarily represent mapped contours.

Similar to modelling of the plume dispersion, quantifying the magnitude of reduction in nearshore pollution is complicated by the unpredictable nature of marine environments and the fate of pollutants. However, Feddersen et al. (2021) provide modelled predictions of reductions in nearshore pollution based on several scenarios. While their modelled scenarios differ from the projects proposed for funding under the Federal Action, the results of their model can be used to infer the likely improvements that will be achieved under the proposed Federal Action.

During most of the year from April through November (dry-season), lack of rainfall means transboundary flows into the Tijuana River Valley do not generally reach the ocean. However, large discharges of untreated wastewater are released into the ocean at the SAB Creek mouth. Dry-season model runs for the baseline model scenario in Feddersen et al. (2021) represent summer-time (tourist season) effects of the SAB Creek pollution plume. The left panel in Figure 5-3, which represents the discharge of 35 MGD of untreated wastewater via SAB Creek,[24] shows that the model predicts elevated untreated wastewater concentrations within 1 km of the coastline from SAB/PTB to the north of Hotel del Coronado (HdC). The model scenario shown in the left panel in Figure 5-3 represents conditions following a strong and long-lived period of wave action from the south-southwest (south-swell). South-swell conditions result in northward nearshore currents that advect the pollutant plume from SAB Creek along the coastline, impacting the nearshore habitat throughout the Action Area. The retention of northward-advected water is also apparent in the diffusion of the plume throughout the semi-enclosed bay in the lee of Point Loma. This advected plume results in high levels of contaminated inshore waters, and also likely contributes large amounts of nutrients to the waters in the lee of Point Loma, potentially driving blooms of

[24] EPA and USIBWC now estimate that, on average, approximately 28.2 MGD of untreated wastewater is discharged to the Pacific Ocean via SAB Creek. The left panel of Figure 5-3, which represents the discharge of 35 MGD of untreated wastewater, therefore likely represents a slight overestimate of the baseline plume extent due to discharges via SAB Creek.

phytoplankton that include Harmful Algal Blooms (HABs) and accumulations of other pollutants in the Action Area.

Feddersen et al. (2021) also present a model run that assumes 1) diversion of the Tijuana River under river flow conditions of up to 35 MGD, similar to what will be achieved under the proposed Federal Action, and 2) 95 percent reduction in pollutant loadings to the Pacific Ocean via SAB Creek, which slightly overrepresents the estimated 92 percent reduction that will be achieved under the proposed Federal Action (see Table 5-2). Baseline conditions during dry-season and wet-season conditions are shown alongside the results of this reduction in the right panel in Figure 5-3. The sharp reduction in nearshore pollution between SAB Creek and the TJRE, and the elimination of the accumulation of plume in the retention zone in the lee of Point Loma is clear in the model runs.

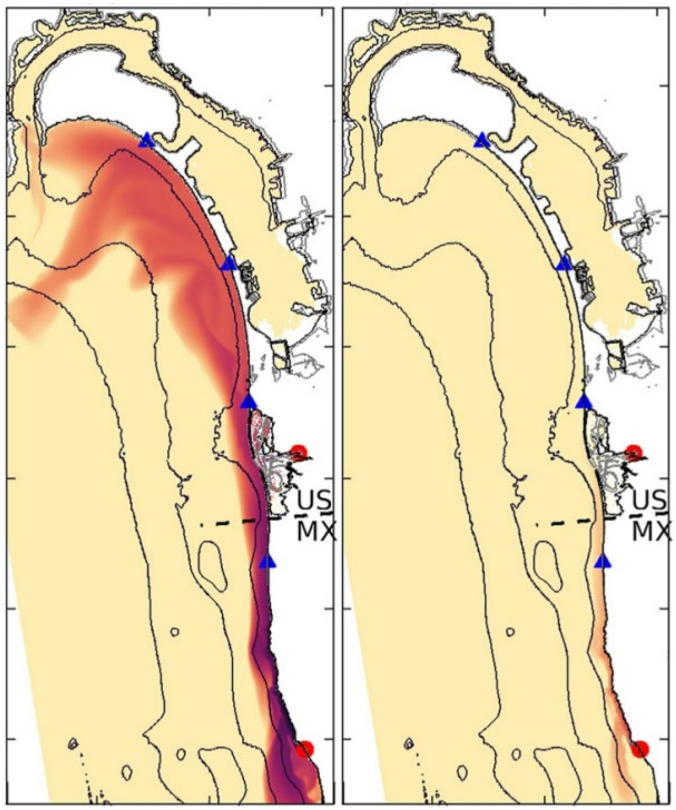

Figure 5-3. Dry-season (summer-time) modelled pollution plume during a period of south-swell. Left panel: under baseline (current conditions) and Right panel: following 95 percent reduction in pollutant loadings from SAB Creek. From Feddersen et al. (2021).

These figures illuminate the advection of the plume during a south-swell conditions in the dry-season. To better understand the behavior of the plume throughout the year, Feddersen et al. (2021) provide the images in Figure 5-4. The distribution of concentrations from the model are organized around two horizontal distances, one at approximately -3 km (south of Imperial Beach) and the second at approximately -15.5 km (south of Imperial Beach). These horizontal lines represent the mouth of the TJRE and SAB Creek, respectively. During the wet season, indicated by the horizontal yellow bar on the x-axis of the charts, the predominantly southerly distribution of the wastewater plume from both the mouth of the TJRE and SAB Creek are apparent, particularly in the baseline conditions chart (top panel). However, intermittent reversals upcoast are clearly visible during periods when there is very low, or no concentrations of wastewater detected in the model runs downcoast and increased concentrations upcoast of these two locations. Later in the year, particularly from May through the remainder of the year (including the dry season indicated by the horizontal magenta bar on the x-axis), most polluting events appear to originate from SAB Creek as upcoast incursions of the SAB Creek plume become more frequent and prolonged as compared to those during the wet season. Model results for scenarios that reduce or eliminate either SAB Creek or TJRE plumes (bottom panel) support the discrete observations described above in relation to Figure 5-3 and demonstrate some reductions from both sources (SAB Creek and TJRE) during the wet season. However, wet-season reductions from TJRE are not as pronounced as during the dry-season.

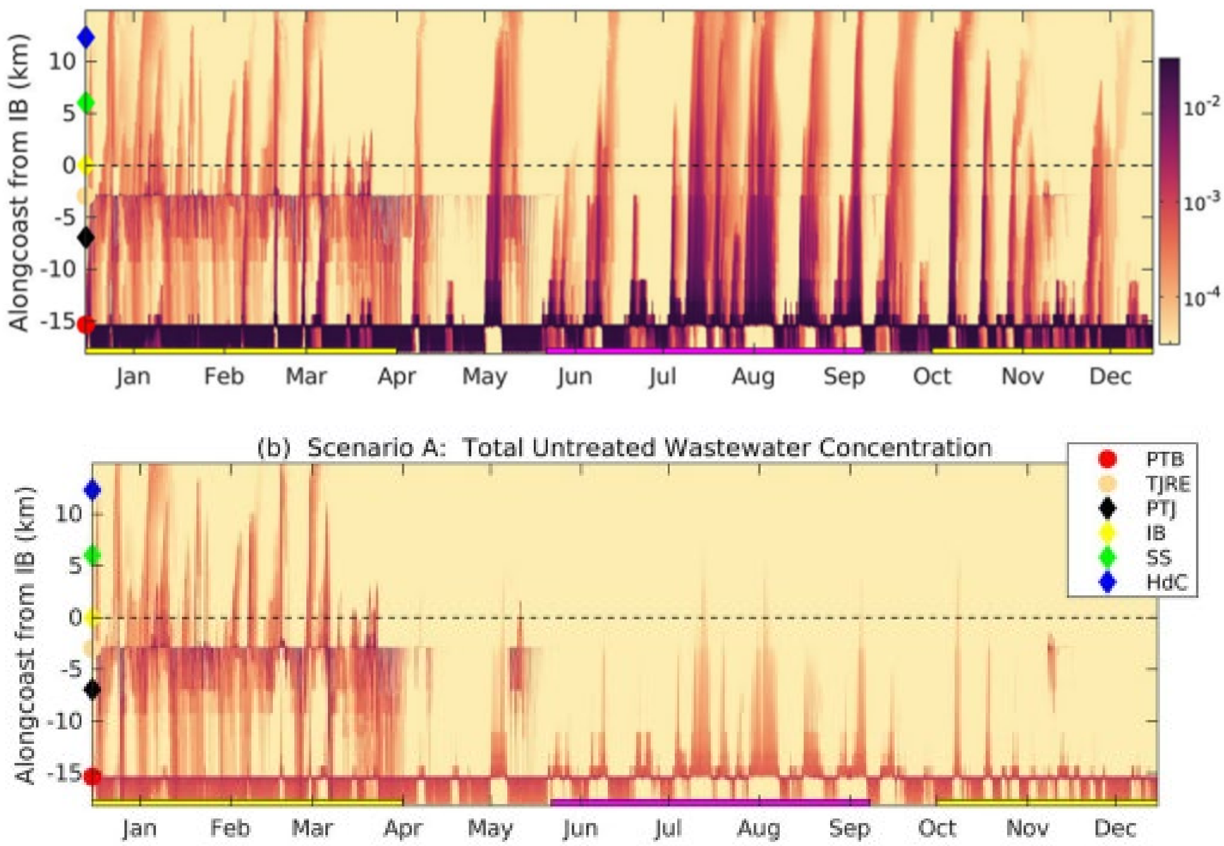

Figure 5-4. Modelled concentration of wastewater throughout the year at distances along the coast between ~1 km north of Hotel del Coronado and ~2 km south of Punta Bandera (units are scaled relative to the location of Imperial Beach [IB]). Top panel under current conditions. Bottom panel most similarly matches reductions due to projects proposed under the Federal Action. From Feddersen et al. (2021).

The relative magnitude of reduction in nearshore pollution (via SAB Creek and the TJRE) due to the implementation of the proposed Federal Action is considerably greater than the magnitude of increase in the discharge of treated effluent (via the SBOO). Therefore, the net effect of the proposed Federal Action is a positive impact on the marine environment and the species and habitats that depend on a healthy marine environment to thrive. In part, this is because the pollution loading caused by untreated transboundary flows entering the marine environment will be reduced by the increase in treatment. It is also because the ejection of a plume of wastewater from a river mouth results in considerably lower rates of mixing compared to effluent ejected from diffuser nozzles on a specially designed discharge system such as the wye diffuser array on the terminus of the SBOO. Plumes released into the nearshore can become 'coastally trapped' close to shore because of the nature of alongshore currents. These coastally trapped plumes concentrate pollutants and expose marine organisms in the areas affected to higher concentrations for longer periods compared to properly ejected effluent plumes from diffuser systems.

The following section describes potential effects to ESA-listed species and EFH are described in Sections 3 and 4, respectively.

5.3.1 Potential Effects on ESA-listed Species

In evaluating the Proposed Federal Action, EPA and USIBWC considered whether the Proposed Federal Action would result in the following potential consequences of polluted nearshore waters to ESA-listed species that could occur due to discharge of wastewater (treated and untreated) to the Pacific Ocean:

1. The direct ingestion, or indirect ingestion via prey, of chemicals toxic to the animals that occur in the polluted discharges.
2. An increase in the likelihood of HABs, which in turn produce toxins that directly harm animals or their prey, due to increased nutrient enrichment and other less direct ecological consequences of reduced water quality.

The following section discusses the Federal Action with respect to each of these consequences.

Pollutants Toxic to ESA-listed Species

To align with assessments completed in prior Section 7 consultations between NMFS and federal agencies considering actions related to WWTP operation, chemicals toxic to ESA-listed species are organized into three categories. These are metals and ammonia, well-studied Persistent Organic Pollutants (POPs), and Contaminants of Emerging Concern (CECs). CECs contain many POPs that are not well-studied.

Metals become toxic at certain exposure levels and can be concentrated to these levels in wastewater. Metals also settle to the ocean floor after a period of post-discharge dispersal and can accumulate in sediments. Ammonia is a form of nitrogen that can be toxic at high concentrations. However, the primary concern around ammonia discharge to the ocean from wastewater is the potential for nutrient enrichment increasing the incidence of HABs, which have the potential to harm ESA-listed species. Modern wastewater treatment processes reduce metals and ammonia in wastewater prior to their discharge as effluent. Furthermore, both of these constituents are among the pollutants regulated under the NPDES program, which seeks to ensure that these pollutants will not degrade marine communities. However, the continued discharge of untreated wastewater from SAB Creek and through other transboundary flows into the marine environment (if not addressed through this Federal Action) would result in a higher loading of metals, nutrients, BOD, TSS, and other potential pollutants in the marine environment of the Action Area, and therefore the implementation of projects through the funding provided by this Federal Action will result in a net decrease in the release of metals to the marine environment.

POPs are toxic chemical constituents that can accumulate in the food chain. These compounds will be found in much higher concentrations in the tissues of organisms higher in the food chain than lower in the food chain, or in the natural environment. Examples of POPs include:

- Pesticides such as dichloro-diphenyl-trichloroethane (DDT), and chlordane.
- PCBs.
- Flame retardants (polybrominated diphenyl ethers [PBDEs] and chlorinated organophosphates).
- Anti-foulant paints (e.g., tributyltins [TBTs]).

PCBs and DDT were banned in the U.S. in the 1970s and 1980s. There may be legacy PCBs still in use in Mexico. TBTs and other anti-fouling paints have been in use for a long time. However, it is unclear if this compound bioaccumulates to the extent of some other pollutants monitored for this reason.

CECs include POPs and other chemicals that are less well understood. Organophosphate esters have been identified as an increasing concern; TCEP (tris[chloroethyl] phosphate), TCPP (tris[chloropropyl] phosphate) and TDCPP (tris[1,3-dichloro-2-propyl] phosphate) are three common chemicals in this category. Organophosphate esters are frequently used as flame retardants in manufactured products such as plasticizers and electronics to meet current manufacturing regulations. Other CECs include pharmaceuticals (for humans and pets) such as prescription drugs, antibiotics, anti-fungals, and hormones. Also, personal care products can have unintended environmental consequences. These include products such as sunscreens, exfoliants containing micro-plastics, etc. Even nanomaterials such as carbon nanotubes or nano-scale particulate titanium dioxide may have harmful consequences for marine life that are yet to be well documented. Secondary treatment processes may not remove CECs from effluent discharge. For example, several TCPPs were frequently detected in the Orange County Sanitation District. These included acetaminophen, DEET, carbamazepine, ibuprofen, and other compounds.

POPs persist in animal tissue by binding to fatty cells, organs like livers and kidneys, and other tissues after animals have consumed the contaminants. Because marine mammals are warm blooded, most species maintain large fat stores to support thermoregulation. These fat stores also allow for long migrations between feeding patches within foraging grounds, between forage and breeding grounds, and for suckling their young when they are first born. POPs are likely to be absorbed into the tissue of marine mammals, sharks, and apex predatory fish like the Gulf grouper when they consume prey that have consumed the contaminants through feeding or directly across respiratory surfaces. POP levels tend to be lower in baleen whales than toothed whales and pinnipeds because toothed whales and pinnipeds consume more prey with higher levels of accumulated POPs. However, sperm whales feed on deep water species that are likely to be less affected by POPs from wastewater discharges that occur in more shallow, coastal waters. POPs may transfer between mothers and their young via suckling in marine mammals and via the eggs of marine turtles.

Blue whales are the ESA-species most likely to be affected by pollutants in the Action Area. This is based on the likelihood that blue whales are the most abundant species likely to remain in the Action Area to feed for extended periods. Shortfin mako, like most large oceanic sharks, occupy high trophic positions and so are especially vulnerable to bioaccumulation and biomagnification of pollutants like POPs. While they do not have blubber stores like many marine mammals, they do have large, lipid-rich livers which accumulate lipophilic pollutants. The other fishes identified in this BA are unlikely or have a low likelihood of occurring the Action Area so are not considered as vulnerable as shortfin mako sharks. Green sea turtles are unlikely to remain in the Action Area for extended periods. They also are unlikely to feed within the Action Area. Humpback whales typically migrate through the region that includes the Action Area, spending most of their time in southern California in the Santa Barbara channel. Gray whales also migrate rapidly through the region between their foraging and breeding areas. Like blue whales, fin whales may feed in the Action Area for much of the year. However, observation data indicate that fin whales are less common in the San Diego area than blue whales, tending to be more abundant in other parts of southern California such as around the San Pedro shelf near the Palos Verdes peninsula or offshore of the Channel Islands. Prey items of Guadalupe fur seals include small pelagic fishes and squid that are more likely to accumulate pollutants than prey items of species of whales. Therefore, although Guadalupe fur seal are less likely to remain in the Action Area than some whale species such as blue whale, they may be more vulnerable to pollutants in the Action Area if they feed in the Action Area. All these species will gain a net benefit from reductions in nearshore pollution because of the proposed Federal Action to fund infrastructure to address transboundary flows.

Effect of HABs on ESA-listed Species

Phytoplankton blooms are a common feature of all ocean systems. HABs occur when populations of usually monospecific species of toxic phytoplankton rapidly increase in numbers. These toxin-producing algal blooms cause illness and death of fish, seabirds, mammals, and other marine life. Several species contribute to the formation of HABs, however the most common phytoplankton in southern California to form HABs is *Pseudo-nitzschia*. This taxon produces domoic acid and is responsible for frequent sea lion deaths, toxic blooms and associated mammal and bird illnesses in California. Other species include *Alexandrium*, *Gymnodinium*, and *Pyrodinium*, all of which are associated with paralytic shellfish poisoning (PSP). These HABs result in concentrations of toxicants in shellfish and are a serious human health risk. The contaminated shellfish and other lower invertebrates that consume and concentrate the PSP toxins are generally unaffected. However, there is some evidence that PSPs, which transfer to higher invertebrates and vertebrates such as fishes, birds, marine mammals, and other animals, may cause harm to marine life.

In California, HABs are often related to large-scale oceanographic forcing, although studies have shown that local nutrient inputs (such as nitrification of ammonium from wastewater effluent) are important when cells reach the shore. For example, algal bloom hotspots are often associated with WWTP outfalls (Smith et al., 2018). Howard et al. (2014) evaluated the sources of nitrogen loadings to nearshore coastal ecosystems in highly urbanized areas of southern California. They reported that wastewater discharges contribute similar amounts of nitrogen as wind-driven upwelling events, with wastewater contributions in the Tijuana River coastal area being nearly an order of magnitude higher than inputs from upwelling. Howard et al. (2014) estimate that upwelling contributes approximately 2,700 tons per year of nitrogen in the San Diego area and that effluent, riverine runoff and atmospheric deposition contribute approximately 15,500 tons per year of nitrogen. It is unclear if Howard et al. (2014) included an estimate of nitrogen flux to the area from SAB Creek. SAB Creek contributes approximately 4,000 tons of nutrients to the Pacific Ocean under current conditions (Table 5-2), although this annual discharge does not enter the Action Area unless south swell conditions drive the plume northward. However, the magnitude of nitrogen enrichment suggests it is a substantial source of nitrogen to the marine environment in the region and therefore may be contributing to increased HABs.

It is unclear whether the relative increase in the SBOO discharge will increase the frequency or magnitude of HABs in the Action Area. However, it seems highly likely that contributions of coastally trapped raw effluent discharged from SAB Creek do contribute to an increased likelihood of HAB events. The proposed Federal Action seeks to reduce or eliminate this polluting feature. If the enrichment of coastal waters due to transboundary flows does result in increased frequency of HABs, there will likely be a net reduction in this negative consequence of pollution from Mexico due to the proposed Federal Action. This will benefit ESA-listed species in the Action Area.

5.3.2 Potential Effects on EFH

The extensive environmental monitoring program conducted by CoSD on the ongoing SBOO discharge has, to date, not identified any effects to EFH, including the Imperial Beach Kelp Forest. The expansion of discharge volume through the SBOO due to the proposed Federal Action will result in an increase in the likelihood that the SBOO discharge plume could impact EFH such as the Imperial Beach Kelp Forest. However, the increase in the treated effluent plume extent will be a direct result of the effort to decrease nearshore pollution from transboundary flows. The effect of ongoing transboundary flows originating from SAB Creek and the TJRE on the Imperial Beach Kelp Forest are currently uncertain. However, the sizeable, persistent flows originating at SAB Creek of untreated wastewater that includes raw sewage have been shown to envelop the Imperial Beach Kelp Forest on a regular basis and discharges from the TJRE are a major source of nearshore pollution, particular during wet-season outflows from the estuary. It is highly likely that these polluting waters impact on the quality of kelp canopy HAPC at the Imperial Beach Kelp Forest. The proposed Federal Action is intended to reduce these polluting events and therefore is likely to result in a net beneficial impact on EFH in the Action Area.

5.3.3 Summary Conclusions

As described in the narrative above, while all ESA species identified as having potential to occur in the Action Area may be exposed to effects from activities during construction and operation anticipated due to the Proposed Federal Action, these effects are not likely to adversely affect any ESA species (Table 5-4). There are also no adverse effects to EFH anticipated due to the Proposed Federal Action (Table 5-5). Furthermore, the Proposed Federal Action is expected to result in net benefits to these species and habitats during the operational phase of the proposed projects.

Table 5-4. Summary of EPA's Effects Determination by ESA Species for Construction and Operation.

Species and Management Unit (DPS)	Scientific Name	Status	Will Construction Adversely Affect?	Will Operation Adversely Affect?
Marine Mammals				
Blue whale	*Balaenoptera musculus*	FE	Not likely	Not likely
Humpback whale (Central America DPS)	*Megaptera novaeangliae*	FE	Not likely	Not likely
Humpback whale (Mexico DPS)		FT	Not likely	Not likely
Fin whale	*Balaenoptera physalus*	FE	Not likely	Not likely
Gray whale (Western North Pacific DPS)	*Eschrichtius robustus*	FE	Not likely	Not likely
Guadalupe fur seal	*Arctocephalus townsendi*	FT	Not likely	Not likely
Sperm whale	*Physeter macrocephalus*	FE	Not likely	Not likely
Sei whale	*Balaenoptera borealis*	FE	Not likely	Not likely
North Pacific right whale	*Eubalaena japonica*	FE	Not likely	Not likely
Sea Turtles				
Green sea turtle (East Pacific DPS)	*Chelonia mydas*	FT	Not likely	Not likely
Leatherback sea turtle	*Dermochelys coriacea*	FE	Not likely	Not likely
Loggerhead turtle (North Pacific DPS)	*Caretta caretta*	FE	Not likely	Not likely
Pacific olive ridley turtle (Mexico Pacific breeding population DPS)	*Lepidochelys olivacea*	FE	Not likely	Not likely
Pacific olive ridley turtle (Remaining range)		FT	Not likely	Not likely
Marine Invertebrates				
White abalone	*Haliotus sorenseni*	FE	Not likely	Not likely
Sunflower sea star	*Pycnopodia helianthoides*	FPL	Not likely	Not likely
Fishes				
Shortfin mako or bonito shark	*Isurus oxyrinchus*	FPL	Not likely	Not likely
Gulf grouper	*Mycteroperca jordani*	FE	Not likely	Not likely
Giant manta ray	*Manta birostris*	FT	Not likely	Not likely
Scalloped hammerhead shark	*Sphyrna lewini*	FE	Not likely	Not likely
Oceanic whitetip shark	*Carcharhinus longimanus*	FT	Not likely	Not likely
Steelhead (Southern California DPS) [d]	*Oncorhynchus mykiss irideus*	FE	Not likely	Not likely

Table 5-5. Summary of EPA's Effects Determination by Essential Fish Habitat for Construction and Operation.

Essential Fish Habitat	Fishery Management Plan	Will Construction Adversely Affect?	Will Operation Adversely Affect?
Groundfish EFH	Pacific Coast Groundfish FMP	Not likely	Not likely
Coastal Pelagic EFH	Coastal Pelagic Species FMP	Not likely	Not likely
Dorado EFH	Highly Migratory Species FMP	Not likely	Not likely
Common Thresher Shark EFH	Highly Migratory Species FMP	Not likely	Not likely
Rocky Reef HAPC (Imperial Beach Kelp Forest)	Pacific Coast Groundfish FMP	Not likely	Not likely
Canopy Kelp HAPC (Imperial Beach Kelp Forest)	Pacific Coast Groundfish FMP	Not likely	Not likely
Estuarine HAPC (TJRE)	Pacific Coast Groundfish FMP	Not likely	Not likely

6. REFERENCES CITED

Arcadis. 2019. Tijuana River Diversion Study: Flow Analysis, Infrastructure Diagnostic and Alternatives Development. Final Report. July 2019. Prepared for North American Development Bank. Available at https://www.nadb.org/uploads/files/tijuana_river_diversion_study_final_report_full_sm.pdf. Accessed on April 15, 2022.

Archer, F.I., Brownell Jr, R.L., Hancock-Hanser, B.L., Morin, P.A., Robertson, K.M., Sherman, K.K., Calambokidis, J., Urbán R, J., Rosel, P.E., Mizroch, S.A. and Panigada, S. 2019. Revision of fin whale *Balaenoptera physalus* (Linnaeus, 1758) subspecies using genetics. Journal of Mammalogy, 100(5), pp.1653-1670. Available at https://academic.oup.com/jmammal/article/100/5/1653/5552346?login=true Accessed on April 14, 2022.

Barlow, J. 1994. Recent information on the status of large whales in California waters (Vol. 203). US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service [Southwest Fisheries Science Center]. Available at https://books.google.com/books?hl=en&lr=&id=AXoeAQAAIAAJ&oi=fnd&pg=PA1&dq=barlow+et+al+sei+whales+%2261,500%22&ots=FR14YUQ1tE&sig=M_zP4g8ZF27L-bymMK2eC64ptMk#v=onepage&q&f=false Accessed on September 8, 2021.

Benson, S. R., Eguchi, T., Foley, D.G., Forney, K.A., Bailey, H., Hitipeuw, C., Samber, B.P., Tapilatu, R.F., Rei, V., Ramohia, P., Pita, J., and Dutton, P. H. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2(7):art84. doi:10.1890/ES11-00053.1 Available at https://pdfs.semanticscholar.org/2129/d38295406f2be52c0d92b8a0e9810153ec65.pdf?_ga=2.226954331.756085133.1649961254-1226467405.1649961254 Accessed on April 14, 2022.

Bettridge, S.O.M., Baker, C.S., Barlow, J., Clapham, P., Ford, M.J., Gouveia, D., Mattila, D.K., Pace, R.M., Rosel, P.E., Silber, G.K. and Wade, P.R. 2015. Status review of the humpback whale (*Megaptera novaeangliae*) under the Endangered Species Act. Available at https://repository.library.noaa.gov/view/noaa/4883 Accessed on August 12, 2021.

Busby, P. J., Wainwright, T.C., Bryant, G.J., Lierheimer, L.J., Waples, R.S., Waknitz, W.F., and Lagomarsino, I. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. Available at: https://www.webapps.nwfsc.noaa.gov/assets/25/5592_06172004_122523_steelhead.pdf Accessed on March 27, 2021.

Calambokidis, J., Steiger, G.H., Curtice, C., Harrison, J., Ferguson, M.C., Becker, E., DeAngelis, M., and Van Parijs, S. M. 2015. Biologically Important Areas for Selected Cetaceans Within U.S. Waters – West Coast Region. Aquatic Mammals 2015, 41(1), 39-53, DOI 10.1578/AM.41.1.2015.39 Available at http://crc.marinemammalbiology.org/files/publications/Calambokidisetal2015BIAs.pdf Accessed on March 29, 2021.

Campbell, G.S., Thomas, L., Whitaker, K., Douglas, A., Calambokidis, J., and Hildebrand, J.A. 2015. Inter-annual and seasonal trends in cetacean distribution, density and abundance in waters off southern California. Deep-Sea Res II 112: 143–157

Carretta, J. V., Oleson, E. M., Forney, K.A., Muto, M.M., Weller, D. W., Lang, A. R., Baker, J., Hanson, B., Orr, A.J., Barlow, J., Moore, J.E., and Brownell Jr, R. L. 2020. U.S. Pacific Marine Mammal Stock Assessments: 2020, U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-646.

Carretta, J. V., Oleson, E. M., Forney, K.A., Muto, M.M., Weller, D. W., Lang, A. R., Baker, J., Hanson, B., Orr, A.J., Barlow, J., Moore, J.E., and Brownell Jr, R. L. 2021 Draft U.S. Pacific Marine Mammal Stock Assessments: 2021, U.S. Department of Commerce, NOAA Technical Memorandum NOAA-TM-NMFS-SWFSC-XXX

City of San Diego (CoSD). 2020. Biennial Receiving Waters Monitoring and Assessment Report for the Point Loma and South Bay Ocean Outfalls, 2018-2019, Addenda 1-9 Visual Observations and Raw Data. June 2020. Environmental Monitoring and Technical Services. Available at https://www.sandiego.gov/sites/default/files/2018_2019_biennial_ad_new.pdf Accessed on April 13, 2022.

CoSD. 2021. Interim Receiving Waters Monitoring Report for the Point Loma and South Bay Ocean Outfalls 2020. Available at https://www.sandiego.gov/public-utilities/sustainability/ocean-monitoring/reports. Accessed April 14, 2022.

Clarke, S.C., Harley, S.J., Hoyle, S.D., Rice, J.S. 2013. Population trends in Pacific oceanic sharks and the utility of regulations on shark finning. Conservation Biology 27:197–209. doi: 10.1111/j.1523-1739.2012.01943.x.

Cooke, J.G., Weller, D.W., Bradford, A.L., Sychenko, O., Burdin, A.M., Lang, A.R. and Brownell Jr, R.L. 2017. Population assessment update for Sakhalin gray whales, with reference to stock identity. Rep. Int. Whal. Commn. SC/67a A, 17. Available at https://www.iucn.org/sites/dev/files/content/documents/wgwap_18-inf.10_cooke_et_al_2017_pop_assesment_sc_67a_nh_11.pdf Accessed on April 14, 2022.

Cooke, J., Sychenko, O., Burdin, A.M., Weller, D.W., Bradford, A.L., Lang, A.R., and Brownell, R.L. 2020. Population assessment update for Sakhalin gray whales. International Whaling Commission, pp.1-8. Available at https://www.iucn.org/sites/dev/files/wgwap21_13upd.pdf Accessed on April 14, 2022.

Crear, D.P., Lawson, D.D., Seminoff, J.A., Eguchi, T., LeRoux, R.A. and Lowe, C.G. 2017. Habitat use and behavior of the east pacific green turtle, *Chelonia mydas*, in an urbanized system. Bulletin, Southern California Academy of Sciences, 116(1), pp.17-32. Available at https://bioone.org/journals/Bulletin-Southern-California-Academy-of-Sciences/volume-116/issue-1/soca-116-01-17-32.1/Habitat-Use-and-Behavior-of-the-East-Pacific-Green-Turtle/10.3160/soca-116-01-17-32.1.short Accessed on April 14, 2022.

Defenders of Wildlife. 2021. Petition to List the Shortfin Mako Shark (*Isurus oxyrinchus*) as Endangered or Threatened Under the Endangered Species Act. Available at https://defenders.org/sites/default/files/inline-files/Petition%20to%20List%20the%20Shortfin%20Mako%20Shark%20%28Isurus%20oxyrinchus%29%20as%20Endangered%20or%20Threatened%20under%20the%20ESA_Sybmitted%20by%20Defenders%20of%20Wildlife%20%28Jan.%2025%2C%202021%29.pdf Accessed on April 14, 2022.

Dennis, M.H. 2015. Status review of the gulf grouper (*Mycteroperca jordani*). National Marine Fisheries Service – West Coast Division, Protected Resources Division. Contractor with Herrera Environmental Consultants. ARN # 151412WCR2014PR00259. Available at https://repository.library.noaa.gov/view/noaa/17115 Accessed on July 28, 2021.

Desmond, J. S., Deutschman, D. H., and Zedler, J. B. 2002. Spatial and temporal variation in estuarine fish and invertebrate assemblages: analysis of an 11-year data set. Estuaries and Coasts 25:552-569.

Dutton, P.H., LeRoux, R.A., LaCasella, E.L., Seminoff, J.A., Eguchi, T., Dutton, D.L. 2019. Genetic analysis and satellite tracking reveal origin of the green turtles in San Diego Bay. Mar. Biol. 166, 1–13. https://doi.org/10.1007/s00227-018-3446-4

Ebert, D. A. 2003. Sharks, Rays, and Chimaeras of California. Berkeley, CA: University of California Press.

Everest, F.H. 1973. Ecology and management of summer steelhead in the Rogue River. Oregon State Game Commission. Available at https://ir.library.oregonstate.edu/concern/parent/gf06g408n/file_sets/g445cf551 Accessed on April 14, 2022.

Eguchi, T., McClatchie, S., Wilson, C., Benson, S.R., LeRoux, R.A., and Seminoff, J.A. 2018. Loggerhead Turtles (*Caretta caretta*) in the California Current: Abundance, Distribution, and Anomalous Warming of the North Pacific. Front. Mar. Sci. 5:452. doi: 10.3389/fmars.2018.00452. Available at https://www.frontiersin.org/articles/10.3389/fmars.2018.00452/full Accessed on April 14, 2022.

Falcone E.A., Keene, E.L., Rone, B.K., Schorr, G.S. 2018. Distribution and demographics of fin whales in the Southern California Bight. Final Report to the US Navy Pacific Fleet Integrated Comprehensive Monitoring Program, Award No. N66604-17-P-2723. 12ppg. Available at https://policycommons.net/artifacts/1777559/falcone-ea-keene-el-rone-bk-schorr-gs/2509205/ Accessed on April 14, 2022.

Feddersen, F., Boehm, A. B., Giddings, S. N., Wu, X., and Liden, D. 2021. Modeling untreated wastewater evolution and swimmer illness for four wastewater infrastructure scenarios in the San Diego-Tijuana (US/MX) border region. GeoHealth, 5, e2021GH000490. Available at https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2021GH000490 Accessed on April 13, 2022.

Fleming, A. and Jackson, J. 2011. Global review of humpback whales (*Megaptera novaeangliae*). NOAA technical memorandum NMFS, NOAA-TM-NMFS-SWFSC-474. Available at https://repository.library.noaa.gov/view/noaa/4489 Accessed on April 14, 2022.

Gravem, S.A., Heady, W.N., Saccomanno, V.R., Alvstad, K.F., Gehman, A.L.M., Frierson, T.N., and Hamilton, S.L. 2021. *Pycnopodia helianthoides*. IUCN Red List of Threatened Species 2021. Available at https://www.reefcheck.org/wp-content/uploads/2021/10/Final_IUCNAssessment.pdf Accessed on April 14, 2022.

Hanna, M.E., Chandler, E.M., Semmens, B.X., Eguchi, T., Lemons, G.E. and Seminoff, J.A. 2021. Citizen-sourced sightings and underwater photography reveal novel insights about green sea turtle distribution and ecology in southern California. Frontiers in Marine Science, p.500.

Available at https://www.frontiersin.org/articles/10.3389/fmars.2021.671061/full?&utm_source=Email_to_authors_&utm_medium=Email&utm_content=T1_11.5e1_author&utm_campaign=Email_publication&field=&journalName=Fronti Accessed on April 14, 2022.

Hayes, S.A. and Kocik, J.F. 2014. Comparative estuarine and marine migration ecology of Atlantic salmon and steelhead: blue highways and open plains. Reviews in Fish Biology and Fisheries, 24(3), pp.757-780. Available at https://link.springer.com/article/10.1007/s11160-014-9348-8 Accessed on April 14, 2022.

Hayes, S.A., Bond, M.H., Wells, B.K., Hanson, C.V., Jones, A.W. and MacFarlane, R.B. 2011. Using archival tags to infer habitat use of central California steelhead and coho salmon. In American Fisheries Society Symposium (Vol. 76, p. 2011). Available at http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.711.7967&rep=rep1&type=pdf Accessed on April 14, 2022.

HDR. 2020. The Tijuana River Valley Needs and Opportunities Assessment. March 2020. Available at https://www.sdparks.org/content/dam/sdparks/en/pdf/Resource-Management/NOA%20Final%20Report.pdf Accessed on April 13, 2022.

Horn, M. H., Allen, L. G., and Lea, R. N. 2006. Biogeography. In: The Ecology of Marine Fishes. California and Adjacent Waters. University of California Press, Berkely and Los Angeles, CA. pp.3-25

Howard, M.D., Sutula, M., Caron, D.A., Chao, Y., Farrara, J.D., Frenzel, H., Jones, B., Robertson, G., McLaughlin, K. and Sengupta, A. 2014. Anthropogenic nutrient sources rival natural sources on small scales in the coastal waters of the Southern California Bight. Limnology and Oceanography, 59(1), pp.285-297.

IBWC. 2020. Binational Water Quality Study of the Tijuana River and Adjacent Canyons and Drains: December 2018 to November 2019. Final Report.

Largier, J., Rasmussen, L., Carter, M., and Scearce, C. 2004. Evaluation of the South Bay International Wastewater Treatment Plant Receiving Water Quality Monitoring Program to Determine its Ability to Identify Source(S) of Recorded Bacterial Exceedances. Prepared for U.S. Environmental Protection Agency, Region IX San Francisco, CA. Available at http://cordc.ucsd.edu/about/docs/SBOO_Final_Report3.pdf Accessed on April 13, 2022.

Largier, J.L. 2020. Upwelling bays: how coastal upwelling controls circulation, habitat, and productivity in bays. Annu. Rev. Mar. Sci. 12 (1), 415–447. https://doi.org/10.1146/annurev-marine-010419-011020.

Light, J.T., Harris, C.K., and Burgner, R.L., 1989. Ocean Distribution and Migration of Steelhead (*Oncorhynchus mykiss*, formerly *Salmo gairdneri*). Fisheries Research Institute School of Fisheries College of Ocean and Fishery Sciences University of Washington Seattle, Washington. Available at https://digital.lib.washington.edu/researchworks/bitstream/handle/1773/4115/8913.pdf Accessed on April 14, 2022.

Madrak, S.V., Lewison, R.L., Seminoff, J.A. and Eguchi, T. 2016. Characterizing response of East Pacific green turtles to changing temperatures: using acoustic telemetry in a highly urbanized environment. Animal Biotelemetry, 4(1), pp.1-10. Available at https://animalbiotelemetry.biomedcentral.com/articles/10.1186/s40317-016-0114-7 Accessed on April 14, 2022.

McCue, L.M., Fahy, C.C., Greenman, J., and K. Wilkinson. 2021. Status Review of the Guadalupe Fur Seal (*Arctocephalus townsendi*). 95 pp. National Marine Fisheries Service, Protected Resources Division, West Coast Region, 501 West Ocean Blvd., Long Beach, California, 90802. Available at https://media.fisheries.noaa.gov/2021-07/guadalupe-fur-seal-status-review-2021.pdf?VersionId=null Accessed on April 14, 2022.

Miller, M.H., Carlson, J., Cooper, P., Kobayashi, D., Nammack, M., and J. Wilson. 2014. Status review report: scalloped hammerhead shark (*Sphyrna lewini*). Final Report to National Marine Fisheries Service, Office of Protected Resources. March 2014.133 pp. Available at https://repository.library.noaa.gov/view/noaa/17835 Accessed on July 28, 2021.

Miller, M.H. and C. Klimovich. 2017. Endangered Species Act Status Review Report: Giant Manta Ray (*Manta birostris*) and Reef Manta Ray (*Manta alfredi*). Report to National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. September 2017. 128 pp. Available at https://repository.library.noaa.gov/view/noaa/17096 Accessed on August 4th, 2021.

Mizroch, S. A., Rice, D. W. and Breiwick, J. M. 1984. The fin whale, *Balaenoptera physalus*. Marine Fisheries Review 46, 20–24

McAlpine, D.F., James, M.C., Lien, J., Orchard, S.A., 2007. Status and conservation of marine turtles in Canadian waters. In: Seburn, C.N.L., Bishop, C.A. (Eds.), Ecology, Conservation and Status of Reptiles in Canada, vol. 2. Herp. Conserv., pp. 85–112.

Muto, M.M., Helker, V.T., Delean, B.J., Young, N.C., Freed, J.C., Angliss, R.P., Friday, N.A., Boveng, P.L., Breiwick, J.M., Brost, B.M., Cameron, M.F., Clapham, P.J., Crance, J.L., Dahle, S.P., Dahlheim, M.E., Fadely, B.S., Ferguson, M.C., Fritz, L.W., Goetz, K.T., Hobbs, R.C., Ivashchenko, Y.V., Kennedy, A.S., London, J.M., Mizroch, S.A., Ream, R.R., Richmond, E.L., Shelden, K.E.W., Sweeney, K.L., Towell, R.G., Wade, P.R., Waite, J.M., and Zerbini, A. N. 2021. Alaska marine mammal stock assessments, 2020. U.S. Dep. Commer., NOAA Tech. Memo. NMFSAFSC-421, 398 p.

NMFS. 2008. White Abalone Recovery Plan (*Haliotis sorenseni*). National Marine Fisheries Service, Long Beach, CA. Available at https://repository.library.noaa.gov/view/noaa/15980 Accessed on July 20, 2021.

NMFS. 2010. Recovery plan for the fin whale (*Balaenoptera physalus*). NMFS. Silver Spring, MD. 121 pp. Available at https://www.fisheries.noaa.gov/resource/document/final-recovery-plan-fin-whale-balaenoptera-physalus Accessed on March 18, 2021.

NMFS. 2011. Final Recovery Plan for the Sei Whale (*Balaenoptera borealis*). National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. 108 pp. Available at https://repository.library.noaa.gov/view/noaa/15977 Accessed on July 8, 2021.

NMFS. 2012a. Sei Whale (*Balaenoptera borealis*) 5-Year Review: Summary and Evaluation. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. Available at https://repository.library.noaa.gov/view/noaa/17035 Accessed on August 18, 2021.

NMFS. 2012b. Southern California Steelhead Recovery Plan. Southwest Region, Protected Resources Division, Long Beach, California. Available at https://repository.library.noaa.gov/view/noaa/15988 Accessed on August 5, 2021.

NMFS. 2013. Final Recovery Plan for the North Pacific Right Whale (*Eubalaena japonica*). NMFS. Office of Protected Resources, Silver Spring, MD. Available at https://repository.library.noaa.gov/view/noaa/15978 Accessed on March 18, 2021.

NMFS. 2015. Sperm Whale (*Physeter macrocephalus*) 5-Year Review: Summary and Evaluation, June 2015. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. Available at https://repository.library.noaa.gov/view/noaa/17032 Accessed on August 10, 2021.

NMFS. 2017. North Pacific Right Whale (*Eubalaena japonica*) Five-Year Review: Summary and Evaluation, NMFS, Office of Protected Resources Silver Spring, MD. Available at https://www.fisheries.noaa.gov/resource/document/north-pacific-right-whale-eubalaena-japonica-five-year-review-2017 Accessed on March 21, 2021.

NMFS. 2018. White Abalone (*Haliotis sorenseni*) Five-Year Status Review: Summary and Evaluation. West Coast Region Long Beach, CA. Available at https://repository.library.noaa.gov/view/noaa/18122 Accessed on July 20, 2021.

NMFS. 2019a. Fin whale (*Balaenoptera physalus*) 5-year review: summary and evaluation. NMFS Office of Protected Resources, Silver Spring, MD. Available at https://www.fisheries.noaa.gov/resource/document/fin-whale-5-year-review Accessed on March 18, 2021.

NMFS. 2019b. Gray Whale (*Eschrichtius robustus*): Western North Pacific Stock Assessment. Available at https://media.fisheries.noaa.gov/dam-migration/gray_whale_wnp_final_2018.pdf Accessed on March 29, 2021.

NMFS. 2020a. Blue whale (*Balaenoptera musculus musculus*) Eastern North Pacific Stock. Available at https://media.fisheries.noaa.gov/dam-migration/2019_sars_bluewhale_enp.pdf Accessed on March 29, 2021.

NMFS. 2020b. Recovery Plan for the Blue Whale (*Balaenoptera musculus*) - First Revision. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD.

NMFS. 2020c. Blue Whale (*Balaenoptera musculus*) 5-Year Review: Summary and Evaluation. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD.

NMFS. 2020d. Scalloped Hammerhead Shark (*Sphyrna lewini*) 5-Year Review: Summary and Evaluation. NMFS Office of Protected Resources, Silver Spring, MD. Available at https://media.fisheries.noaa.gov/dam-migration/scalloped_hammerhead_5-year_review.pdf Accessed on July 28, 2021.

NMFS and USFWS. 1998a. Recovery Plan for U.S. Pacific Populations of the East Pacific Green Turtle (*Chelonia mydas*). National Marine Fisheries Service, Silver Spring, MD. Available at https://repository.library.noaa.gov/view/noaa/15965 Accessed on July 8, 2021.

NMFS and USFWS. 1998b. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*). National Marine Fisheries Service, Silver Spring, MD. Available at https://www.adfg.alaska.gov/static/species/specialstatus/pdfs/leatherback_recovery_pacific.pdf Accessed on July 9, 2021.

NMFS and USFWS. 1998c. Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (*Caretta caretta*). National Marine Fisheries Service, Silver Spring, MD. Available at https://repository.library.noaa.gov/view/noaa/15967 Accessed on July 20, 2021.

NMFS and USFWS. 1998d. Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle (*Lepidochelys olivacea*). National Marine Fisheries Service, Silver Spring, MD. Available at https://repository.library.noaa.gov/view/noaa/15966 Accessed on July 15, 2021.

NMFS and USFWS. 2014. Olive Ridley Sea Turtle (*Lepidochelys olivacea*) 5-Year Review: Summary and Evaluation. National Marine Fisheries Service Office of Protected Resources, Silver Spring, Maryland and U.S. Fish And Wildlife Service, Southeast Region, Jacksonville Ecological Services Field Office, Jacksonville, Florida. Available at https://repository.library.noaa.gov/view/noaa/17036 Accessed on August 18, 2021.

NMFS and USFWS. 2020a. Endangered Species Act status review of the leatherback turtle (*Dermochelys coriacea*). Report to the National Marine Fisheries Service Office of Protected Resources and U.S. Fish and Wildlife Service. Available at https://repository.library.noaa.gov/view/noaa/25629 Accessed on August 18, 2021.

NMFS and USFWS. 2020b. Loggerhead Sea Turtle (*Caretta caretta*) North Pacific Ocean DPS 5-Year Review: Summary and Evaluation. National Marine Fisheries Service, Office of Protected Resources, Silver Spring, Maryland and U.S. Fish and Wildlife Service, Southeast Region, North Florida Ecological Services Office, Jacksonville, Florida. Available at https://media.fisheries.noaa.gov/dam-migration/np_loggerhead_5yr_review_final.pdf Accessed on August 18, 2021.

Ocean Imaging. 2021. Satellite & Aerial Coastal Water Quality Monitoring in the San Diego / Tijuana Region Annual Summary Report for 2020. Available at https://www.sandiego.gov/public-utilities/sustainability/ocean-monitoring/reports Accessed April 14, 2022.

Pacific Fishery Management Council. 2018. Fishery Management Plan for U.S. West Coast Fisheries for Highly Migratory Species as Amended Through Amendment 5. PFMC, Portland, OR. Available at https://www.pcouncil.org/documents/2018/04/fishery-management-plan-for-west-coast-fisheries-for-highly-migratory-species-through-amendment-5.pdf/ Accessed on April 13, 2022.

Pacific Fishery Management Council. 2019. Coastal Pelagic Species Fishery Management Plan as Amended Through Amendment 17. June 2019. Available at https://www.pcouncil.org/documents/2019/06/cps-fmp-as-amended-through-amendment-17.pdf/ Accessed on April 13, 2022.

Pacific Fishery Management Council, 2020. Pacific Coast Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. August 2020. Available at https://www.pcouncil.org/documents/2016/08/pacific-coast-groundfish-fishery-management-plan.pdf/ Accessed on April 13, 2022.

Pacific Fishery Management Council. 2021. Pacific Coast Salmon Fishery Management Plan for Commercial and Recreational Salmon Fisheries off the Coasts of Washington, Oregon, and

California as Revised through Amendment 21. PFMC, Portland, OR. 83 p. Available at https://www.pcouncil.org/documents/2016/03/salmon-fmp-through-amendment-20.pdf/ Accessed on April 13, 2022.

Pearcy, W.G., Brodeur, R.D. and Fisher, J.P. 1990. Distribution and biology of juvenile cutthroat trout *Oncorhynchus clarki clarki* and steelhead *O. mykiss* in coastal waters off Oregon and Washington. Fishery Bulletin, 88(4), pp.697-711. Available at https://www.researchgate.net/publication/312467855_Distribution_and_biology_of_juvenile_cutthroat_trout_Oncorhynchus_clarki_clarki_and_steelhead_O_mykiss_in_coastal_waters_off_Oregon_and_Washington Accessed on April 14, 2022.

PG Environmental. 2022. Aquatic Resources Delineation Report: USMCA Mitigation of Contaminated Tijuana Transboundary Flows Project.

PG Environmental. 2021. Baseline Conditions Summary, Technical Document, USMCA Mitigation of Contaminated Tijuana Transboundary Flows Project. 19 Nov. 2021.

Ryan, J. P., Gower, J., King, S., Bissett, W., Fischer, A., Kudela, R., Kolber, Z., Mazzillo, F., Rienecker, E., and Chavez, F. 2008. A coastal ocean extreme bloom incubator. Geophysical Research Letters, 35.

Safran, S.M., Baumgarten, S.A., Beller, E.E., Crooks, J.A., Grossinger, R.M., Lorda, J., Longcore, T.R., Bram, D., Dark, S.J., Stein, E.D., McIntosh, T.L. 2017. Tijuana River Valley Historical Ecology Investigation. Prepared for the State Coastal Conservancy. A Report of SFEI-ASC's Resilient Landscapes Program, Publication # 760, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA. Available at https://www.sfei.org/projects/tijuana Accessed on April 13, 2022.

San Diego Regional Sediment Management Plan (SD RSMP). 2022. San Diego Nearshore Seafloor Substrate. GIS data layer. Available at https://atlas.resources.ca.gov/arcgis/rest/services/Ocean/CSMW_San_Diego_Nearshore_Seafloor_Substrate/MapServer/0 Accessed April 15, 2022.

Scales, K.L., Schorr, G.S., Hazen, E.L., Bograd, S.J., Miller, P.I., Andrews, R.D., Zerbini, A.N. and Falcone, E.A. 2017. Should I stay or should I go? Modelling year-round habitat suitability and drivers of residency for fin whales in the California current. Diversity and Distributions, 23(10), pp.1204-1215. Available at https://onlinelibrary.wiley.com/doi/full/10.1111/ddi.12611 Accessed on April 14, 2022.

Schiel, D.R., & Foster, M.S. 2015. The biology and ecology of giant kelp forests. Berkeley, CA: University of California Press.

Seminoff, J.A., Allen, C.D., Balazs, G.H., Dutton, P.H., Eguchi, T., Haas, H., Hargrove, S.A., Jensen, M., Klemm, D.L., Lauritsen, A.M. and MacPherson, S.L. 2015. Status review of the green turtle (*Chelonia mydas*) under the Endangered Species Act. Available at https://repository.library.noaa.gov/view/noaa/4922 Accessed on August 18, 2021.

Sirovic, A., Rice, A., Chou, E., Hildebrand, J.A., Wiggins, S.M. and Roch, M.A. 2015. Seven years of blue and fin whale call abundance in the Southern California Bight. Endangered Species Research, 28(1), pp.61-76. Available at https://www.int-res.com/abstracts/esr/v28/n1/p61-76/ Accessed on April 14, 2022.

Širović, A., Oleson, E.M., Buccowich, J., Rice, A., and Bayless, A.R. 2017. Fin whale song variability in southern California and the Gulf of California. Scientific reports, 7(1), pp.1-11. Available at https://www.nature.com/articles/s41598-017-09979-4 Accessed on April 14, 2022.

Szesciorka, A.R., Ballance, L.T., Širović, A., Rice, A., Ohman, M.D., Hildebrand, J.A., and Franks, P.J. 2020. Timing is everything: Drivers of interannual variability in blue whale migration. Scientific reports, 10(1), pp.1-9.

Schiff, K.C., Brown, J.S., Weisberg, S.B. 2001. Model monitoring program for large ocean discharges in southern California. Technical Report 357. Southern California Coastal Water6-9 Research Project. Westminster, CA.

Smith, R.W., Bergen, M., Weisberg, S.B., Cadien, D., Dalkey, A., Montagne, D., Stull, J.K., Velarde, R.G., 2001. Benthic response index for assessing infaunal communities on the southern California mainland shelf. Ecological Applications 11 (4), 1073.

Smith, J., Connell, P., Evans, R.H., Gellene, A.G., Howard, M.D.A., Jones, B.H. , Kaveggia, S., Palmer, L., Schnetzer, A., Seegers, B.N., Seubert, E.L., Tatters, A.O., and Caron, D.A. 2018. A decade and a half of *Pseudo-nitzschia* spp. and domoic acid along the coast of southern California. Harmful Algae 79: 87–104.

Stewart, J. D., and Weller, D. W. 2021. Abundance of eastern North Pacific gray whales 2019/2020. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-SWFSC-639. Available at https://repository.library.noaa.gov/view/noaa/27928 Accessed on August 16, 2021.

Svejkovsky, J. 2015. Nearshore Substrate Mapping Change Analysis Using Historical and Contemporary Multispectral Aerial Imagery. Ocean Imaging Corp. Available at https://data.cnra.ca.gov/dataset/multispectral-substrate-mapping-ca-south-coast-mpa-baseline-2011-2012/resource/49fb2781-8525-4d65-81d2-4964ade2d365 Accessed on April 14, 2022.

Teo, S.L., Sandstrom, P.T., Chapman, E.D., Null, R.E., Brown, K., Klimley, A.P., and Block, B.A. 2013. Archival and acoustic tags reveal the post-spawning migrations, diving behavior, and thermal habitat of hatchery-origin Sacramento River steelhead kelts (*Oncorhynchus mykiss*). Environmental Biology of Fishes, 96(2), pp.175-187. Available at https://link.springer.com/article/10.1007/s10641-011-9938-4 Accessed on April 14, 2022.

Terrill, E., Kim, S.Y., Hazard, L., Otero, M., Pyle, R., Winslow, K., Jones, B., and Furhman, J. 2009. Final Report Coastal Observations and Monitoring in South Bay San Diego IBWC / Surfrider Consent Decree Prepared For International Boundary and Water Commission. Contract: IBM04D0005 Task Order: IBM06T0026.

Trautman, N. and Walter, R.K. 2021. Seasonal variability of upwelling and downwelling surface current patterns in a small coastal embayment. Continental Shelf Research 226: 1-12

USIBWC 2008. Final Programmatic Environmental Impact Statement Improvements to the Tijuana River Flood Control Project. Retrieved from https://www.ibwc.gov/Files/Fnl_PEIS_TJ_River_050608.pdf.

USIBWC, 2016. Draft Environmental Assessment for Rehabilitation of the Levee System in the Tijuana River Flood Control Project. Retrieved from https://www.ibwc.gov/Files/EA_Rehab_levee_system_Tijuana_Flood_Control_122116.pdf.

Woodson, C.B., Washburn, L., Barth, J.A., Hoover, D.J., Kirincich, A.R., McManus, M.A., Ryan, J.P., and Tyburczy, J. 2009. Northern Monterey Bay upwelling shadow front: observations of a coastally and surface-trapped buoyant plume. J. Geophys. Res. 114:C12013

Young, C.N., Carlson, J., Hutchinson, M., Hutt, C., Kobayashi, D., McCandless, C.T., and Wraith, J. 2018. Status review report: oceanic whitetip shark (*Carcharhinius longimanus*). Final Report to the National Marine Fisheries Service, Office of Protected Resources. December 2017. 170 pp. Available at https://repository.library.noaa.gov/view/noaa/17097 Accessed on August 2, 2021.

Zedler, J.B., Nordby, C.S., and Kus, B.E. 1992. The Ecology of Tijuana Estuary, California. A National Estuary Research Reserve. Pacific estuarine Research Laboratory, Biology Department, San Diego State University, San Diego, CA 92182.