Biological Assessment of Impacts to Federally Listed Species Under the National Marine Fisheries Service's Jurisdiction

San Onofre Nuclear Generating Station, Units 2 and 3

Decommissioning Under Existing Facility Operating License Nos. NPF-10 and NPF-15

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Docket Nos. 50-361 and 50-362

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Abbreviations, Acronyms, and Symbols

ac	acre(s)
ADAMS	Agencywide Documents Access and Management System
CCC	California Coastal Commission
CDP	Coastal Development Permit
CEQA	California Environmental Quality Act
CFR	*Code of Federal Regulations*
cm	centimeter(s)
CSLC	California State Lands Commission
CSTSN	California Sea Turtle Stranding Network
D&D	deactivation and decommissioning
dB_{rms}	decibels Root Mean Square
DECON	decontamination and dismantlement
Diablo Canyon	Diablo Canyon Nuclear Power Plant, Units 1 and 2
DOE	U.S. Department of Energy
DPS	distinct population segment
EIR	environmental impact report
ESA	Endangered Species Act of 1973, as amended
fps	feet per second
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
FWS	U.S. Fish and Wildlife Service
gpm	gallons per minute
ha	hectare(s)
Holtec	International
in.	inch(es)
ISFSI	independent spent fuel storage installation
ITS	incidental take statement
kg	kilogram(s)
km	kilometer(s)
lb	pound(s)
LOED	large organism exclusionary device
LTP	license termination plan
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mgd	million gallons per day
mi	mile(s)
MMO	marine mammal observer
m/s	meters per second

NEPA	National Environmental Policy Act of 1969, as amended
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
PG&E	Pacific Gas and Electric Company
ppt	parts per thousand
PSDAR	post-shutdown decommissioning activities report
RPM	reasonable and prudent measure
SCE	Southern California Edison Company
SDRWQCB	San Diego Regional Water Quality Control Board
SDS	SONGS Decommissioning Solutions
SONGS	San Onofre Nuclear Generating Station, Units 2 and 3
SWRCB	State Water Resource Control Board
T&C	term and condition

1.0 Introduction

The U.S. Nuclear Regulatory Commission (NRC) staff prepared this biological assessment to comply with the provisions of Section 7 of the Endangered Species Act of 1973, as amended (ESA), in support of the NRC's request to reinitiate formal consultation with the National Marine Fisheries Service (NMFS) in connection with the shutdown and decommissioning of San Onofre Nuclear Generating Station (SONGS), Units 2 and 3, under its existing NRC licenses, in San Clemente, California.

As explained below, reinitiation of consultation is required because the activities associated with the shutdown and decommissioning of SONGS were not considered in NMFS's 2006 biological opinion for the continued operation of SONGS. Additionally, in its Section III, "Description of the Proposed Action," that biological opinion provides that it is only valid through 2022.

This assessment evaluates the impacts of the proposed action on federally listed species and designated critical habitat under NMFS's jurisdiction. These species include several species of sea turtles,[1] whales,[2] black abalone (*Haliotis cracerodii*), white abalone (*H. sorenseni*), California steelhead (*Oncorhynchus mykiss irideus*), and green sturgeon (*Acipenser medirostris*).

Data incorporated into and analyzed in this assessment includes all incidental takes reported at SONGS through August 31, 2021. In preparing this assessment, the NRC used the best scientific and commercial data available to evaluate the potential effects of the proposed action on federally listed species and designated critical habitat.

Prior to finalizing this assessment, the NRC staff provided Southern California Edison Company (SCE) the opportunity to review the assessment and to affirm the accuracy of the information presented herein. SCE provided comments on the assessment, which the NRC staff incorporated into the assessment, as appropriate.

2.0 Background/History

NMFS (2006) issued a biological opinion for the continued operation of SONGS on September 18, 2006. The incidental take statement (ITS) included in that opinion exempts from the prohibitions of ESA Section 9, subject to compliance with certain reasonable and prudent measures (RPMs) and terms and conditions (T&Cs), the capture or impingement of specified numbers of:

- loggerhead sea turtle,
- green sea turtle,
- leatherback sea turtle, and
- olive ridley sea turtle.

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[1] These include loggerhead sea turtles (*Caretta caretta*), green sea turtles (*Chelonia mydas*), leatherback sea turtles (*Dermochelys coriacea*), and olive ridley sea turtles (*Lepidochelys olivacea*).

[2] These include blue whale (*Balaenoptera musculus*), sperm whale (*Physeter macrocephalus*), fin whale (*B. physalus*), humpback whale (*Megaptera novaeangliae*), and sei whale (*B. borealis*).

NMFS's biological opinion applies to the continued operation of SONGS under the terms of the existing facility operating licenses issued by the NRC on February 16, 1982 (Unit 2) and November 15, 1982 (Unit 3). These licenses authorize SCE to operate SONGS through February 16, 2022 (Unit 2) and November 15, 2022 (Unit 3). However, SCE permanently ceased power operations at SONGS on June 7, 2013, and began the active decommissioning of SONGS in February 2021.

NMFS's biological opinion applies to both the continued operation of SONGS as well as the continued operation of Diablo Canyon Nuclear Power Plant, Units 1 and 2 (Diablo Canyon). Diablo Canyon is in Avila Beach, California, approximately 200 mi (320 km) northwest of SONGS. Diablo Canyon is authorized to operate under NRC Facility Operating License Nos. DPR-80 and DPR-82 issued by the NRC on November 2, 1984 (Unit 1), and August 26, 1985 (Unit 2) through November 2, 2024 (Unit 1), and August 26, 2025 (Unit 2), respectively. Pacific Gas and Electric Company (PG&E), the owner and operator of Diablo Canyon, plans to permanently cease power generation at Diablo Canyon on the license expiration date of each unit. The NRC will address the potential impacts of the shutdown and decommissioning of Diablo Canyon under its existing NRC licenses on federally listed species in a separate biological assessment.

The ESA Section 7 regulations at Title 50 of the *Code of Federal Regulations* (50 CFR) Section 402.16 require Federal agencies to reinitiate consultation where discretionary Federal involvement or control over the action has been retained or is authorized by law and, among other things, the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence. This biological assessment supports the NRC's request to reinitiate consultation.

3.0 Proposed Action

The proposed action for the requested reinitiated consultation is the shutdown and decommissioning of SONGS under its existing NRC licenses.

SONGS is located on the Pacific coast of southern California in San Clemente in northern San Diego County. The approximate coordinates are latitude 33° 22' 10" N and longitude 117° 33' 30" W. The site is entirely within the boundaries of the Marine Corps Base Camp Pendleton near the northwest end of its 18-mi (29-km) shoreline. SCE obtained an easement from the United States Navy to build and operate SONGS on this parcel of land. The easement expires on May 11, 2024 (SCE 2016).

The SONGS site lies on the southern California coast within the Peninsular Range Province. Northwesterly trending elongate mountain ranges and valleys are characteristic of this region. The mouth of San Mateo Creek lies approximately 2 mi (3.2 km) northwest of the site. The physiography of the area is typical of the region, with a rather narrow, gently sloping, coastal plain extending seaward from the uplands. The plain terminates at the beach and forms a line of sea cliffs, which have been straightened over long distances by marine erosion. Sea cliffs in the immediate vicinity of SONGS rise to 60 to 100 ft (18 to 30 m) above sea level and are separated from the ocean by a narrow band of beach sand. In places, ephemeral streams are actively eroding gullies into the seaward portions of the coastal plain, and several deeply incised barrancas have formed. The site contains minimal natural vegetation. Sparse coastal

strand vegetation occurs along the sandy beach at the base of the San Onofre bluffs. The upload terrace supports coastal sage scrub and grasslands. (SCE 2016)

The site is approximately 4,500 ft (1372 m) long and 800 ft (244 m) wide, comprising 84 ac (34 ha). The reactors occupy 52.8 ac (21.4 ha), the power block and site switchyard cover 27.7 ac (11.2 ha), and parking, access, and miscellaneous structures occupy the remaining area. Section 3 of Enercon's Environmental Impact Evaluation (Enercon 2014) contains a detailed description of the SONGS facility, its configuration, and its operation. Figure A1 in Appendix A is an aerial map of the SONGS site, and Figure A2 depicts the site layout with labels of the major facility structures and the exclusion area boundary.

The facility's cooling system withdraws water from and discharges effluent to the Pacific Ocean. This system is described below in detail in the section titled "Water Withdrawal and Discharge."

Decommissioning Overview

SCE has chosen a method of decommissioning called decontamination and dismantlement (DECON). Under this method, SCE will remove or decontaminate the equipment, structures, and portions of the facility that contain radioactive contaminants to a level that permits termination of the existing NRC licenses. SCE has completed the planning period and is currently performing active decommissioning. During the planning period, SCE (2020) accomplished the following:

- permanently ceased power operations on June 7, 2013;
- selected DECON method of decommissioning;
- added additional independent spent fuel storage installation (ISFSI) capacity to meet the site's needs for spent fuel storage;
- completed initial site characterization activities;
- isolated the spent fuel pools (referred to as "islanding");
- completed other necessary actions to facilitate safe system abandonment and removal; and
- completed State permitting activities necessary to allow dismantlement to begin.

Additionally, SCE (2020) has completed the following activities associated with the active deactivation and decommissioning (D&D) period:

- Initial Activities (June 2013 – December 2016): SCE obtained necessary NRC license amendments and exemptions, began the expansion of the ISFSI, and procured a decommissioning general contractor, SONGS Decommissioning Solutions (SDS).
- Transition and Pool Storage (January 2017 – December 2019): SCE transitioned D&D responsibility to SDS, completed the California Environmental Quality Act (CEQA) process with California State Lands Commission (CSLC), and obtained

a Coastal Development Permit (CDP) from the California Coastal Commission (CCC). Holtec International (Holtec), a separate contractor, continued with the ISFSI expansion and began transferring spent fuel from the spent fuel pools adjacent to the reactors into ISFSI dry storage.

- D&D and Pool Storage (January 2020 – December 2020): SDS abated frigid asbestos in the containments and planned segmentation and packaging of the reactor vessels and reactor internals. Holtec completed the transfer of all spent fuel from the spent fuel pools into ISFSI dry storage, and SCE sought and received amendments to the SONGS licenses that allow only the operation of the ISFSI.

The decommissioning periods that remain consist of the following (SCE 2020):

- D&D and Dry Storage (January 2021 – December 2028): SDS will decontaminate, dismantle, demolish, remove, and dispose of SONGS to approximately 3 ft (0.9 m) below grade except for the ISFSI and its associated security facilities and the switchyard area.

- Dry Storage (January 2029 – December 2045): The primary activity during this period will be the ongoing maintenance and security of the ISFSI and the transfer of all spent fuel to the U.S. Department of Energy (DOE). SCE assumes that, based on most recently available information, the DOE will begin accepting spent fuel nationally no sooner than 2028, although this date remains uncertain. During this period, the Navy would also undertake a National Environmental Policy Act of 1969, as amended (NEPA), review associated with amending the SONGS real estate authorization to establish the site restoration or “end state” requirements for SCE to return the property to the Navy.

- Civil Works Projects (January 2046 – December 2049): A decommissioning general contractor would remove all onshore below-grade man-made structures except for the North Industrial Area where the ISFSI is located. Dewatering of the site to support substructure removal would begin in this phase and continue into the next phase. The DOE would complete the removal of the remaining spent fuel from the ISFSI.

- ISFSI Demolition and Final Site Restoration (January 2050 – December 2051): SDS would dismantle and dispose of the ISFSI and complete final site restoration work, including excavation and removal of the offshore intake and outfall conduits. SCE would obtain NRC approval to terminate the remaining licenses covering the site and return the property to the Navy.

Section II of SCE’s Post-Shutdown Decommissioning Activities Report (PSDAR), Revision 1 (SCE 2020) describes SONGS decommissioning activities in more detail.

With respect to the aquatic environment, SONGS will continue to withdraw water from and discharge water to the Pacific Ocean at reduced volumes for a period. Other decommissioning activities that could affect the aquatic environment involve the removal of offshore components, including intake and discharge structure components, the fish return system, and navigational and environmental monitoring buoys, as described below.

Water Withdrawal and Discharge

SONGS withdraws water from the Pacific Ocean from two offshore intake structures located approximately 3,200 ft (980 m) offshore. The intake structures are 660 ft (200 m) apart and are in water approximately 33 ft (10 m) deep. The submerged end of each conduit is fitted with a velocity cap to minimize the entrainment of motile fish into the system. The caps convert the vertical flow to lateral flow, which triggers a flight response from fish. The onshore portion of each intake consists of six vertical traveling screens fitted with 3/8-in. (0.95-cm) mesh panels. Through-screen velocity is 2.8 fps (0.85 m/s). The screens are angled approximately 30° to incoming flow to guide fish to a quiet zone at the far end of the intake structure. A fish elevator periodically empties captured fish into a 4-ft (1.2-m)-diameter conduit that returns fish by gravity flow to a submerged location approximately 1,900 ft (579 m) offshore. (Tetra Tech 2008)

The traveling screens automatically rotate based on pressure differential between the upstream and downstream faces of the screen, although SCE can also manually rotate the screens. A high-pressure spray removes debris and any aquatic organisms that were not guided to the quiet zone. Captured debris is collected in a dumpster and disposed of offsite at a landfill. (Tetra Tech 2008)

Four circulating water pumps lie downstream of the intake screens. Each pump is rated at 207,000 gpm (298 mgd), and each unit has a design pump capacity totaling 828,000 gpm (1,192 mgd) for a facility total of 1,656,000 gpm (2,384 mgd). The intake structures terminate at the plant in open air forebays. (Tetra Tech 2008)

During operations, a portion of the intake flow was used for the saltwater cooling system, which removed heat from auxiliary reactor systems and the turbine plant. Water for this system was withdrawn from and returned to the main condenser flow. (Tetra Tech 2008)

Cooling water returns to the Pacific Ocean via the Unit 2 discharge conduit, which extends into the ocean approximately 8,400 ft (2.6 km). The last 2,500 ft (0.8 km) (offshore end) of the discharge conduit consists of a diffuser containing 63 discharge nozzles, each 2 ft (0.6 m) in diameter, that are evenly spaced at 40-ft (12-m) intervals. The nozzles are oriented at a vertical angle of 20° above the horizontal and direct the discharge offshore alternatively at angles of 25° to the right and 25° to the left of the diffuser section centerline. (SCE 2016)

Surface water withdrawals and discharges for both units are regulated by National Pollutant Discharge Elimination System (NPDES) permit no. CA0109282. The permit is implemented by an order administered by the San Diego Regional Water Quality Control Board (SDRWQCB): R9-2015-0073. SCE filed a permit renewal application in July 2020, 180 days prior to the expiration of the current permit in January 2021. SCE expects to receive a renewed permit in mid-2022.

Since SONGS ceased power operations in June 2013, SCE has greatly reduced ocean water withdrawal rates. Currently, SONGS withdraws approximately 7,500 gpm (11.5 mgd) of water from the Pacific Ocean 24 hours per day, 7 days per week, at each of the two offshore intake structures (SCE 2021). This equates to a total of 16,000 gpm (23 mgd), or approximately 2 percent of the volume of water that the facility withdrew

during power operations.[3] Velocity in the intake conduit associated with this change in flow has dropped from 7.42 fps (2.26 m/s) to 0.14 fps (0.04 m/s) under current conditions. Water is no longer chlorinated, and it is discharged back to the ocean at roughly the same temperature at which it was withdrawn. Water withdrawal and discharge would continue throughout the decommissioning period, which could be through 2035. However, as SCE refines the engineering and design of its decommissioning activities, the use of ocean water could cease earlier. (SCE 2021)

Approximately five years ago, SCE installed large organism exclusionary devices (LOEDs) at the primary offshore intake structures and at the auxiliary offshore intake structures. The State Water Resource Control Board (SWRCB) required SCE to install these devices to prevent large marine organisms from entering the plant intake structures. The LOEDs consist of a 9-in. by 9-in. (23-cm by 23-cm) Dyneema netting around the circumference of each intake. Since the installation of the LOEDs and the above-described reduction in intake flow, no sea turtles have been entrained in the intakes. (SCE 2016, 2021)

Offshore Activities

The intake and discharge conduits on the seabed are subject to the terms of the CSLC easement lease for the offshore land. The easement lease calls for removal of structures, building, pipelines, machinery, and facilities placed or erected by the lessee and restoration as nearly as possible to the conditions existing prior to their erection or placement (Enercon 2014). These removal and restoration activities would occur within a 21-ac (0.4-ha) area of tidal and submerged lands in the Pacific Ocean southwest of the SONGS facility. During decommissioning and subject to the lease agreement, SCE would remove the following:

- two primary offshore intake structures (one for each unit),
- two auxiliary intake structures (one for each unit),
- 12 diffuser structures (6 for each unit),
- 23 manhole access port structures (11 for Unit 2 and 12 for Unit 3),
- one fish return system, and
- three environmental monitoring buoys, two navigational buoys, and their associated water quality instruments and anchor blocks.

SCE would remove all structures to 4 ft (1.2 m) below the seabed except for the intake and discharge conduits, which would be abandoned in place. SCE would cut off the fish return conduit at its terminus and cap it with an exclusion barrier. Removal and any necessary restoration would occur over the course of the decommissioning period (through 2035). However, the dispositioning of conduits, which would involve the highest concentration of activity within the action area, would occur over a one-year

[3] During power operations, SONGS withdrew over 1,600,000 gpm (2,304 mgd) of water from the Pacific Ocean.

period. As SCE refines the engineering and design of its decommissioning activities, offshore activities could be completed sooner than 2035. (SCE 2021)

4.0 Action Area

The implementing regulations for ESA Section 7 define “action area” to mean all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area effectively bounds the analysis of federally listed species and critical habitats because only species and habitats that occur within the action area may be affected by the Federal action.

The action area for the shutdown and decommissioning of SONGS under its existing NRC licenses includes the intake and discharge structures and the area immediately surrounding these structures. Because discharged water is no longer warmed or chlorinated, the proposed action results in no thermal or effluent plume.

The action area also includes a 21-ac (0.4-ha) area of tidal and submerged lands in the Pacific Ocean southwest of the facility. This is the area over which conduits would be dispositioned, where dredging may occur, and where barges or other watercraft may be used to transport materials. This area is authorized by CSLC Lease No. PRC 6785.1 and is referred to in this assessment as the “CSLC Lease Facilities.” Within this area are the two primary offshore intake structures (one for each unit), two auxiliary intake structures (one for each unit), 12 diffuser structures (6 for each unit), 23 manhole access port structures (11 for Unit 2 and 12 for Unit 3), one fish return system, and three environmental monitoring buoys, two navigational buoys, and their associated water quality instruments and anchors, all of which would be removed during decommissioning, as described previously. (SCE 2021)

Figure A1 in Appendix A is an aerial photograph of the SONGS site, and Figure A2 in Appendix A depicts the SONGS site layout with labels of the major buildings and structures and the exclusion area boundary.

The ocean floor in the vicinity of SONGS is an extensive shelf of soft sediments, consisting of both coarse and fine sands occasionally interrupted by areas of hard substrate. Ocean depths in the vicinity of SONGS vary from about 4 ft (1.2 m) along inshore areas to 118 ft (36 m) at 2 mi (3.2 km) offshore. Maximum water depth in the action area is approximately 50 ft (15 m). The ocean floor slopes evenly away from the shore, and ocean depth is about 30 ft at the SONGS offshore intakes. Just west of the intakes, the ocean floor drops off steeply, with depths exceeding 200 ft (60 m) in some areas. (Enercon 2014)

Ocean salinity is relatively constant in the action area. It ranges from 32 to 35 parts per thousand (ppt) with localized temporary variations attributable to runoff and precipitation (Enercon 2014).

Ocean temperatures in the action area range from approximately 57 °F (14 °C) in January to 68 °F (20 °C) in August. The increase in ocean temperatures from January to August is relatively slow, whereas temperatures drop more rapidly from autumn to early winter. SCE records temperatures at monitoring stations in compliance with the SONGS NPDES permit and produces an annual report.

Pacific Ocean currents north of the equator generally flow in a clockwise direction so that most waters flow north-to-south down the California coast (Barnes and Hughes 1988). However, because of the shape of the shoreline from Point Conception (approximately 150 mi (240 km) north of SONGS) southward, circulation adjacent to the SONGS site is directed by the Southern California Counter Current (CSU-LB 2021), which creates a dominant southeast-to-northwest current. However, more shoreward currents in the vicinity tend to flow in a south and southeast direction (Enercon 2014). Ocean current velocities offshore of SONGS typically range from 0.1 to 0.7 fps (0.03 to 0.2 m/s) in most seasons (Enercon 2014). Localized eddies and upwelling may be caused by local geomorphology and tidal effects, though the ocean floor surrounding the intake and discharge structures is flat and not affected by currents (Enercon 2014).

The below descriptions of the plankton, macroinvertebrate, fish, marine mammal, and aquatic plant communities are summarized from Enercon's *SONGS Units 2 and 3 Environmental Impact Evaluation, Decommissioning Supplemental Environmental Analysis* (Enercon 2014) unless otherwise cited.

Aquatic Plants

The richest area of marine flora near the action area is the shallow subtidal zone approximately 1,300 ft (400 m) up the coast from SONGS. This area supports a biological community dominated by surfgrass (*Phyllospadix* spp.) and feather boa kelp (*Egregia menziesii*), which grows as an annual or perennial depending upon the depth of the holdfast. Giant kelp can form dense beds that provide an intricate three-dimensional habitat that attracts numerous invertebrates and fish. The presence of kelp forests can have significant influence on the structure and density of the local fish community (Holbrook et al. 1990).

The closest stand of giant kelp is the San Onofre kelp bed, which lies 656 ft (200 m) down the coast from the SONGS Unit 2 diffusers at a depth of about 40 to 50 ft (12 to 15 m). In 1990, canopy measurements of the San Onofre kelp bed varied from zero to 189 ac (76.3 ha); however, since 1966, canopy measurements have averaged much smaller at 67.8 ac (27.4 ha) annually for the period 2003–2016 (MBC 2017). Because kelp can be annual or perennial, kelp bed canopy cover is highly variable. For instance, in 2013, the San Onofre kelp bed was 190 ac (76.7 ha), which represented a four-fold increase from the previous year (MBC 2017). In 2015, the bed decreased in size by 93 percent to 10.6 ac (4.3 ha), and in 2016, it tripled in size and covered an area of 30 ac (12.0 ha) (MBC 2017). This area contains cobble and boulder substrates, which are the preferred habitat for the attachment of giant kelp.

Plankton

Plankton are small and often microscopic organisms that drift or float in the water column. Phytoplankton are single-celled plant plankton and include diatoms (single-celled yellow algae) and dinoflagellates (a single-celled organism with two flagella). Phytoplankton live suspended in the water column and occur in the limnetic (open water) zone. Zooplankton are animals that either spend their entire lives as plankton (holoplankton) or exist as plankton for a short time during development (meroplankton). Zooplankton include rotifers, isopods, protozoans, marine gastropods, polychaetes, small crustaceans, and the eggs and larval stages of insects and other aquatic animals.

As part of Clean Water Act Section 316(b) requirements, SCE undertook plankton studies at SONGS to determine the composition and abundance of ichthyoplankton and shellfish larvae entrained by SONGS. Researchers collected samples from inside the plant and at various depths near the offshore intakes every two weeks from March 2006 through April 2007. The most abundant larval fish taxa collected in all offshore samples were northern anchovy (*Engraulis mordax*); California grunion (*Leuresthes tenuis*); unidentified silversides (Atherinopsidae); and jacksmelt (*Atherinopsis californiensis*). Shoreline surface samples were dominated by grunion, silversides, jacksmelt, and kelpfishes (Clinidae).

Over 15 fish species appeared in offshore surface samples. Grunion, jacksmelt, silversides, and northern anchovy were the dominant species. Total larval fish densities (measured as the number of individuals collected per 1,000 m^3) were a half to a third of total inshore surface densities. Fish larvae in the offshore water column were dominated by white croaker (*Genyonemus lineatus*) and anchovies (Engraulidae). Northern anchovy, unidentified gobies (Gobiidae), white croaker, and bay goby (*Lepidogobius lepidus*) were the most abundant larval taxa in the suprabenthos zone. Densities of total larvae collected from the offshore suprabenthos were about twice as high as larval densities at the surface and about eight times higher than water column densities.

These findings paralleled those found in an earlier study performed from 1974 through 1976 in the Southern California Bight (Gruber et al. 1982), which found that anchovies accounted for 83 percent of all larvae collected. Lavenberg et al. (1986) also found that the northern anchovy dominated ichthyoplankton samples taken in nearshore areas of southern California. More recent findings by Suntsov et al. (2012) support the profile of larvae species and density found during SCE's 2006–2007 study. Suntsov et al. (2012) found the Southern California Bight to be structured by larval jack silverside, northern anchovy, croakers, combtooth blennies, pipefishes, silversides, clinids, labrisomids, and clingfishes (*Gobiesox* spp.).

SCE selected five species of invertebrate larvae for monitoring during the demonstration study: the brown rock crab (*Cancer antennarius*); yellow crab (*C. anthonyi*); red rock crab (*C. productus*); slender crab (*C. gracilis*); and the California spiny lobster (*Panulirus interruptus*). The most abundant selected invertebrate larvae collected offshore during the same studies were slender crab megalops, yellow crab megalops, and brown rock crab megalops. Densities were very low compared with fish eggs and larvae, and there was no clear distributional pattern.

<u>Macroinvertebrates</u>

Intertidal habitat in the vicinity of SONGS is comprised primarily of sand and cobble with occasional rocky areas. Subtidal areas are characterized by softer sand sediments composed of both coarse and fine particles with occasional areas of hard substrate. This intertidal habitat supports a diversity of marine worms, crustaceans, and some bivalves and gastropods. Macroinvertebrate groups identified in the offshore benthos between 1963 and 1975 primarily included mollusks and polychaete worms, with some crustaceans, ectoprocts, cnidarians, and echinoderms.

The California Department of Fish and Wildlife (CDFW) identifies the following commercially important and sport harvest invertebrate species in southern California (CDFW 2013):

- Rock crabs whose commercial harvest is most active in southern California.
- Sheep crabs (*Loxorhynchus grandis*), also known as spider crabs.
- Seven species of abalone that feed on giant kelp (*Macrocystis pyrifera*) and bull kelp (*Nereocystis luetkeana*) and that are preyed upon by rays and sea otters.[4] Most California abalones are found in boulder and rock habitat associated with kelp forests. Abalone abundance is highest where physical conditions allow good kelp growth and where drift kelp is available.
- Red sea urchin (*Strongylocentrotus franciscanus*) is commercially harvested and preyed upon by sea otters.
- Purple sea urchin (*Strongylocentrotus purpuratus*) is not as commercially popular as the red urchin. It is a voracious kelp pest and is also preyed upon by sea otters.
- Spiny lobster, which occurs in shallow, rocky coastal areas from Point Conception to the U.S.-Mexico border and off southern California islands. During their first two years, juveniles inhabit surfgrass beds from the lower intertidal to depths of about 16 ft (4.8 m). Juveniles and adults are considered benthic and occur from the intertidal zone to about 262 ft (80 m).

Fish

The offshore habitat in the action area consists of a mixture of sand, cobble, and isolated areas of exposed rock, which are generally less biologically productive than solid substrate outcropping but more productive than sandy bottoms. Bottom substrates shift from stable cobble and boulders at the San Mateo Point area, northwest of SONGS, to mostly sand with isolated patches of cobble and rock at Don Light, southeast of SONGS. The area of richest marine productivity in the immediate vicinity of the plant site is the shallow subtidal zone that lies approximately 1,300 ft (396 m) up the coast from SONGS. This area contains beds of surfgrass and feather boa kelp (*Egregia menziesii*).

The local benthic fish community is generally dominated by queenfish (*Seriphus politus*), northern anchovy, white croaker, and speckled sanddab (*Citharichthys stigmaeus*). These species account for 77 percent of the long-term trawl sampling conducted in association with NPDES permitting requirements since 1979.

The San Onofre kelp bed, down the coast from SONGS, supports a diverse assemblage of fish. Prevalent species include señorita (*Oxyjulis californica*), salema (*Xenistius californica*), halfmoon (*Medialuna californiensis*), kelp bass (*Paralabrax clathratus*), jack mackerel (*Trachurus symmetricus*), Pacific barracuda (*Sphyraena argentea*), and kelp perch (*Brachyistius frenatus*). The benthic kelp forest community is dominated by señorita, rock wrasse (*Halichoeres semicinctus*), kelp bass, black perch (*Embiotoca jacksoni*), barred sand bass (*Paralabrax nebulifer*), pile perch (*Rhacochilus vacca*), white seaperch (*Phanerodon furcatus*), and California sheephead (*Semicossyphus pulcher*).

[4] NatureServe Explorer (2021) reports no populations of southern sea otters (*Enhydra lutris nereis*) closer than Ventura County.

Although rocky intertidal and subtidal habitats are not present in the immediate vicinity of SONGS, areas of low-relief cobble substrate are present in the vicinities of both the San Onofre and San Mateo kelp beds. Reef-associated fish communities of this region include kelp bass, garibaldi *(Hypsypops rubicundus*), barred sand bass, giant sea bass (*Stereolepis gigas*), kelp blennies (*Gibbonsia* spp.), and sargo (*Anisotremus davidsonii*).

During a 2012 demersal fish trawl survey associated with SONGS, researchers collected 5,856 fish representing 41 species with an overall species diversity of 2.08. Summer sampling resulted in the highest abundance (2,131 fish), while the spring survey recorded the most species (29 species). Species diversity was highest in the fall (1.81). White croaker, northern anchovy, and queenfish were the most abundant species. Catches at the control stations of San Mateo and Don Light alternated as the most and least abundant, while survey stations offshore of SONGS were in the middle except in winter. In association with this effort, SCE researchers reviewed 17 years of quarterly trawl survey data and determined that there is a high level of similarity among the deepest survey stations, while stations along the two shallowest isobaths exhibited more variation.

The region near SONGS is an important barred sand bass fishing area. This species became very popular by the mid-1950s and has consistently ranked among the top ten in the southern California marine sportfish catch since the late 1970s.

Kelp bass are one of the most important nearshore recreational species of southern California. This species has been targeted by southern California anglers since the early 1900s. The most productive fishing areas for kelp bass in recent years have been off the Coronado Islands in Baja California, Mexico; Point Loma and La Jolla in San Diego County; Dana Point and Huntington Beach in Orange County; Horseshoe Kelp in Los Angeles County; and around the Channel Islands.

Ocean whitefish (*Caulolatilus princeps*) are found in loosely aggregated schools near high-relief seafloor structures such as shallow banks, rocky reefs, and kelp beds. Ocean whitefish are diurnally active and range from sand areas during the day and areas of high relief at night. They prefer offshore islands to the mainland coast and are abundant at Santa Rosa, Santa Barbara, Santa Catalina, and San Clemente Islands. They are frequently found in association with members of the rockfish family (Scorpaenidae) and California sheephead. The ocean whitefish supports both a recreational and commercial fishery.

Eighteen species of surfperches (family Embiotocidae) are identified in California coastal waters. According to the CDFW (2013), there is a significant recreational fishery for many of these species in southern California. Over half of the barred (*Amphistichus argenteus*), black (*Embiotoca jacksoni*), sharpnose (*Phanerodon atripes*) and walleye surfperch (*Hyperprosopon argenteum*), and significant percentages of the total calico (*Amphistichus koelzi*), pile (*Rhacochilus vacca*), rubberlip (*Rhacochilus toxotes*), silver surfperch (*Hyperprosopon ellipticum*), and white seaperch (*Phanerodon furcataus*) caught in California are caught south of Point Conception.

California halibut (*Paralichthys californicus*) is an important flatfish species in both the commercial and recreational fisheries of central and southern California, though landings have dropped substantially over the last 40 years. Historically, the fishery has been centered off southern California and Baja California, Mexico, but over the past 30 years, the greatest landings have oscillated between ports in southern and central California.

Most of the halibut landings in central California occurred in the San Francisco area. A limited amount of fishing occurs around the Channel Islands of southern California, which yield substantially larger halibut than those caught in the nearshore mainland fishery.

Marine Reptiles

Four species of federally listed sea turtles occur off the coast of southern California: loggerhead sea turtle; green sea turtle; leatherback sea turtle; and olive ridley sea turtle. Sea turtles are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes. Sea turtles are described in detail in Section 5.0 of this assessment.

Marine Mammals

Several marine mammals inhabit or are known to visit coastal waters of southern California. Six whales and two pinnipeds are federally listed as threatened or endangered for California. Blue, sperm, fin, humpback, sei, and killer (*Orcinus orca*) whales transit the region from their calving grounds to the south and feeding grounds farther north. Two federally listed pinnipeds that occur in southern California are Guadalupe fur seal (*Arctocephalus townsendii*) and stellar sea lion (*Eumetopias jubatus*).

Four other pinniped species occur in southern California: California sea lions (*Zalophus californianus*), northern fur seals (*Callorhinus ursinus*), northern elephant seals (*Mirounga angustirostris*), and Pacific harbor seals (*Phoca vitulina richardsi*). While all prefer offshore islands for birthing and rookeries, some have mainland haul-outs. San Miguel Island, off Santa Barbara, appears to be the southernmost extent of the northern fur seal range. The Guadalupe fur seal is only seen occasionally at islands in the Southern California Bight and the Farallon Islands by San Francisco. Of the six pinniped species that inhabit southern California, only California sea lions and harbor seals have been recorded as occurring in the vicinity of the SONGS site.

5.0 Federally Listed Species

The NRC staff evaluated the potential for federally listed marine species to occur in the action area based on a combination of habitat preferences, life history characteristics, survey data, incidental take reports, scientific literature, and other relevant information. Table A1 summarizes the results of the staff's evaluation. Based on its review, the staff determined that the following species are unlikely to occur in the action area:

- green sturgeon, Southern distinct population segment (DPS),
- California steelhead, South Central California DPS and Southern California DPS,
- Guadalupe fur seal,
- sei whale,
- blue whale,
- fin whale,

- humpback whale, Central American and Mexico populations,
- sperm whale,
- black abalone, and
- white abalone.

The NRC staff determined that these species are unlikely to occur in the action area because there are either no records of the species in the action area, the action area lacks suitable habitat, or both. Therefore, these species are excluded from further analysis in this biological assessment. The NRC staff concludes that the proposed action would have no effect on these species.

The NRC staff determined that the following species have a moderate likelihood of occurring in the action area because the species was documented in the vicinity of the action area in past or historic surveys or scientific literature or because suitable habitat is found in action area within the species' known geographic range:

- loggerhead sea turtle, North Pacific Ocean DPS,
- green sea turtle, East Pacific DPS,
- leatherback sea turtle, and
- olive ridley sea turtle.

The remainder of this section describes the life history, identification, range, habitat associations, and diet of these species. Section 7.0 of this assessment analyzes the potential impacts of the proposed action on these species.

5.1 Sea Turtle Life History

The life history of all sea turtle species is similar. Mature, breeding females migrate from foraging grounds to nesting beaches, which may be nearby or a significant distance away. Turtles mate some time during the migration, usually in the spring, when mature males and females congregate off nesting beaches. Females return to land to nest. Gravid females usually crawl up on a dark beach to above the high-tide point at night. Females generally deposit from 1 to 10 egg clutches per season at intervals of 10 to 20 days, and a female will only nest every two to four years. Once females deposit their eggs, they return to the ocean. Olive ridleys exhibit slightly different nesting behavior. Females congregate during the day and nest in groups called arribada, and females of this species tend to nest every year.

Eggs incubate for about two months. Hatchlings emerge from the nest on a single night, travel over the beach and enter the ocean as a group, and swim to offshore waters within the first 24 to 48 hours. There they spend the next several years feeding in sargassum beds, upwellings, and convergence zones of the open ocean.

Juveniles of most species move into bays and estuaries of the coastal zone, where they spend more years feeding and growing to maturity. Each species reaches sexual maturity at different ages, and maturity also varies among populations within the same

species. For instance, loggerheads reach maturity in 12 to 30 years, and green turtles reach maturity in 20 to 50 years. Once mature, sea turtles join the adult populations in nesting and foraging grounds.

5.2 Loggerhead Sea Turtle

The loggerhead sea turtle is the most common nesting sea turtle found in U.S. coastal waters. NMFS initially listed the species as federally threatened in 1978 (43 FR 32800). In 2011, NMFS issued a final rule that designates nine DPSs of the species (76 FR 58868). The DPS that occurs in the action area, the North Pacific Ocean DPS, remains federally endangered. NMFS and the U.S. Fish and Wildlife Service (FWS) jointly issued Revision 1 to the species recovery plan, *Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle*, in 1998 (NMFS and FWS 1998a).

Identification

Adult, subadult, and juvenile loggerheads have reddish-brown carapaces and dull brown to yellowish plastrons. Loggerheads have more than one pair of prefrontal scales between the eyes and five lateral scutes on the carapace. Hatchlings and juveniles have sharp keels on the vertebral scutes, which recede with age. Hatchlings are mostly dark brown, their flippers have white to white-gray margins, and the bottom shell is generally yellowish to tan. (NMFS 2021a)

Range

Loggerheads are found worldwide primarily in subtropical and temperate regions of the Atlantic, Pacific, and Indian Oceans, and in the Mediterranean Sea. Along the Atlantic coast, the species' range extends from Newfoundland to Argentina. Along the Pacific coast, loggerheads range from the Gulf of Alaska southward but are most frequently seen off the western Baja Peninsula. Nesting occurs in the northern and southern temperate zones and subtropics. The North Pacific Ocean DPS only nests on the coasts of Japan. (NMFS 2021a)

Habitat

Loggerheads are a nearshore species. Juveniles and adults may be found in a variety of habitats from turbid, muddy-bottomed bays and bayous to sandy bottom habitats, reefs, and shoals. Hatchlings and juveniles are associated with sargassum and pelagic drift lines of convergence zones. (NMFS 2021a)

Diet

Loggerheads are carnivores and only occasionally consume plant material. During their open ocean phase, they feed on a wide variety of floating items. Juveniles and adults in coastal waters eat mostly bottom-dwelling invertebrates such as whelks, other mollusks, and crabs, especially horseshoe crabs. (NMFS 2021a)

5.3 Green Sea Turtle

The green turtle is the largest hard-shelled marine turtle and the second most common nesting turtle in U.S. waters. NMFS initially listed the species as federally threatened in 1978 (43 FR 32800). In 2016, NMFS issued a final rule that designates 11 DPSs of the

species (81 FR 20058). The DPS that occurs in the action area, the East Pacific Ocean DPS, remains federally threatened. NMFS and the FWS jointly issued a recovery plan, *Recovery Plan for U.S. Pacific Population of the East Pacific Green Turtle*, in 1998 (NMFS and FWS 1998b).

Identification

Adult green turtles are 3 to 4 ft (0.9 to 1.2 m) long and weigh 300 to 350 lbs (136 to 159 kg). This species has a dark brown, gray, or olive colored shell and a much lighter, yellow-to-white underside. Shells have five scutes running down the middle and four scutes on each side. Other distinct characteristics of the green turtle are their serrated beak on the lower jaws and two large scales located between the eyes. (NMFS 2021b)

Range

Green turtles are found worldwide primarily in subtropical and temperate regions of the Atlantic, Pacific, and Indian Oceans, and in the Mediterranean Sea. In U.S. waters, green turtles are found in inshore and nearshore waters from Texas to Maine, the U.S. Virgin Islands, and Puerto Rico. In the eastern North Pacific, green turtles have been sighted as far north as southern Alaska, but most commonly occur from southern California to northwestern Mexico. Elsewhere in the U.S. Pacific, green turtles occur in Hawaii, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. Major nesting areas are in Costa Rica, Australia, Ascension Island, and Surinam. Smaller numbers nest in Florida, the U.S. Virgin Islands, and Hawaii. Culebra Island, Puerto Rico, is an important foraging area for juveniles. (NMFS 2021b)

Habitat

Hatchlings and juveniles inhabit open ocean convergence zones, and subadults and adults inhabit nearshore benthic foraging areas consisting primarily of seagrass and algae beds. Subadults and adults can also be found over coral and worm reefs and rocky bottoms. In the U.S., important foraging areas include Florida estuaries, such as the Indian River Lagoon, and the French Frigate Shoals in Hawaii. (NMFS 2021b)

Diet

Green turtles are the only herbivorous marine turtle. The diet of adults mainly consists of algae and seagrasses, although they may also forage on sponges, invertebrates, and discarded fish, especially in the juvenile stage. (NMFS 2021b)

5.4 Leatherback Sea Turtle

The leatherback sea turtle is the largest marine turtle species and the only species that lacks scales and a hard shell. The species is federally listed as endangered throughout its range. The FWS initially listed the leatherback under the Endangered Species Preservation Act of 1966, the predecessor to the ESA (35 FR 8491). The species was then designated as endangered under the ESA, once promulgated. In 2020, NMFS considered whether to list DPSs of the species, but NMFS ultimately determined that this action was not warranted (85 FR 48332). NMFS and the FWS jointly issued a recovery

plan, *Recovery Plan for U.S. Pacific Population of the Leatherback Turtle*, in 1998 (NMFS and FWS 1998c).

Identification

The leatherback has a primarily black, rubbery skin with pinkish-white coloring on its underside. The species lacks scales; rather, the carapace consists of small, interlocking dermal bones beneath the skin that overlie a supportive layer of connective tissue and fat and the deeper skeleton. The carapace has seven ridges along its length and tapers to a blunt point. The front flippers are proportionally longer than in other sea turtles and the back flippers are paddle shaped. Both their rigid carapace and their large flippers make the leatherback uniquely equipped for long distance foraging migrations. (NMFS 2021c)

Range

Leatherbacks occur in the Atlantic, Pacific, and Indian Oceans. Nesting beaches are primarily located in tropical latitudes around the world. The largest remaining nesting aggregations occur in Trinidad and Tobago, West-Indies (Northwest Atlantic) and Gabon, Africa (Southeast Atlantic). Leatherbacks occupy U.S. waters in the Northwest Atlantic, West Pacific, and East Pacific. Within the U.S., most nesting occurs in Puerto Rico, and the U.S. Virgin Islands, and a small number of females also nest each year in Florida. (NMFS 2021c)

Habitat

Leatherbacks are primarily pelagic, deep-diving animals. They are occasionally seen in coastal waters, typically within the nesting season. (NMFS 2021c)

Diet

Leatherbacks lack the crushing, chewing plates characteristic of other sea turtles that feed on hard-bodied prey. Instead, they have pointed tooth-like cusps and sharp-edged jaws adapted for a diet of soft-bodied open ocean prey, such as jellyfish and salps. They may also feed on colonial tunicates (pyrosomas) found in the pelagic zone. (NMFS 2021c)

5.5 Olive Ridley Sea Turtle

The olive ridley is the smallest marine turtle species. It likely the most numerous marine turtle globally, but it is rare in U.S. waters. NMFS initially listed the species under the ESA in 1978 (43 FR 32800). Mexico's Pacific coast breeding populations are federally endangered, and all other populations are federally threatened. NMFS and the FWS

jointly issued Revision 1 to the species recovery plan, *Recovery Plan for U.S. Pacific Populations of the Olive Ridley Turtle*, in 1998 (NMFS and FWS 1998d).

Identification

Adult olive ridleys have a nearly round dark gray carapace. Hatchlings are gray-brown. Olive ridleys have two claws on each limb, more than one pair of prefrontal scales, and six or more lateral scutes.

Range

Olive ridleys are found in Pacific and South Atlantic waters and may occasionally be found in the tropical North Atlantic. Along the Pacific coast, the species ranges from the Gulf of Alaska to Central America and is most common in the southern portion of this range. Large arribadas occur at two sites on Costa Rica's Pacific coast, one arribada occurs on Mexico's Pacific coast, and two or three occur in northeastern India. Smaller nesting sites occur in Nicaragua and other tropical mainland shores. The species does not nest in the U.S. (NMFS 2021d)

Habitat

Olive ridleys are primarily a pelagic species and can be found as far as 2,400 mi (3,900 km) off the coast. The species is associated with relatively deep, soft-bottomed habitats inhabited by crabs and other crustaceans. They are sometimes also found in shallower benthic habitats near estuaries. (NMFS 2021d)

Diet

Olive ridleys are omnivorous and consume a variety of algae, lobster, crabs, tunicates, and mollusks. Individuals can dive to depths of 500 ft (150 m) to forage on benthic invertebrates. (NMFS 2021d)

6.0 Federally Designated Critical Habitat

Critical habitat represents the habitat that contains the physical or biological features essential to the conservation of the listed species and that may require special management considerations or protection. Critical habitat may also include areas outside the geographical area occupied by the species if NMFS determines that such areas are essential for the conservation of the species. No designated critical habitat exists in the action area.

7.0 Effects of the Proposed Action

SONGS ceased power operations in June 2013. As such, the only remaining effects are those associated with the shutdown and decommissioning of SONGS under its existing NRC licenses. Generally, the effects of a proposed action are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the proposed action may occur

later in time and may include consequences occurring outside the immediate area involved in the proposed action.

The effects of the proposed action of the shutdown and decommissioning of SONGS under its existing NRC licenses are the consequences of water withdrawal, water discharge, and removal of offshore structures. All other activities would occur on land with no identified pathways of effects to listed sea turtles. All activities associated with the shutdown and decommissioning of the facility are anticipated to be completed no later than the end of 2035.

7.1 Effects Associated with Water Withdrawal

Sea turtles can become entrained at SONGS by entering one of the intake velocity caps and subsequently being drawn through one of the intake pipes. Because the intake structures begin approximately 3,200 ft (980 m) offshore, turtles are not observed entering the velocity caps. A sea turtle may swim into the space between the intake riser and velocity cap either out of curiosity, in search of prey, or for shelter. Once past the velocity caps, a sea turtles would encounter the intake structures. The intake structures draw cooling water inward in a horizontal direction and then redirect the flow downward through the cooling water intake pipes. During plant operation, a sea turtle would have experienced an increased flow rate as it approached the center vertical riser shaft, which connects to the intake conduit. The increase in velocity and downward flow, along with the lack of light and confined space, may have caused the turtle to become disoriented and prevent it from swimming back out of the intake structure. Because the animal could not exit the intake structure, it would have been drawn through the intake pipe and ended up in the plant's forebay. However, under current conditions, the flow velocity of water entering the intake pipe is approximately 0.14 fps (0.04 m/s). This velocity is too low to affect a sea turtle's ability to swim out of the intake structure to escape entrainment.

Once water enters the intake pipes, it takes close to eight minutes for the water to reach the forebay. Thus, in the extremely unlikely event that a sea turtle travels through one of the intake pipes, it would have to hold its breath until it reaches the station's forebay. The amount of time a turtle can hold its breath depends on the size, condition, and species of turtle. Typical dive times for turtles under normal conditions varies by species. For example, leatherback sea turtles routinely dive for 4 to 14 minutes, while green turtles have common dive times averaging 9 to 23 minutes (NMFS 2006). Even under stressed conditions, a turtle would most likely be able to survive the 8 minutes of submergence through the SONGS intake pipe (NMFS 2006).

Both SONGS intake pipes terminate at a central forebay. The forebay is about 26 ft (8 m) deep and 66 ft (20 m) across, so sea turtles can move about freely in this area. The forebay area contains traveling screens that prevent turtles and other debris from progressing further into the facility.

When SONGS personnel discover a live turtle inside the forebay, the animals are lured towards the fish return system with the use of vanes and louvers to the fish return elevator. From there, personnel retrieve the turtle with a large net, examine the animal, and report it to NMFS via a NMFS Stranding Report. If the animal is healthy and uninjured, personnel tag it on both front flippers with tags supplied by NMFS and release it back into the ocean. SCE turns over animals with visible injuries to one of the animal

rescue organizations in the California Marine Mammal and Sea Turtle Stranding Network, as specified by NMFS. If the animal is dead, SCE disposes of the carcass after completing required reporting to NMFS and NRC.

During the operational period, SONGS entrained a total of 50 sea turtles into its intake structure (see Table A2). By species, 43 were green turtles, 3 were loggerheads, 3 were leatherbacks, and 1 was an olive ridley. Of the 50 turtles, 46 were alive and healthy enough to be released back to the ocean. Two of these turtles, both green turtles, had minor abrasions and were turned over to an animal rescue organization for veterinary care. Both were eventually released.

Four turtles (2 green turtles and 2 leatherbacks) were in various stages of decomposition when discovered in the forebay. None of the four animals had obvious signs of external trauma that might indicate whether the animal was injured or dead prior to being drawn into the intake structure. Both green turtle carcasses had been dead for at least a few days. Both leatherback carcasses were extremely decomposed and had probably been dead for weeks. While it is possible that a turtle may drown or sustain fatal injuries while transiting the intake pipes, SCE personnel check the intake structures daily for animals, so it is unlikely that a dead turtle could have remained in the forebay long enough to decompose. In its 2006 biological opinion, NMFS (2006) concluded that these four turtles were most likely dead prior to entrainment.

In the 2006 biological opinion, NMFS anticipated certain levels of incidental take for the period from September 2006 through November 2022 (see Table 1). However, because SONGS ceased power operations early, it only entrained a small portion of these estimates. Based on the allowable ITS numbers, NMFS anticipated that SONGS would entrain an average of 2.6 sea turtles per year (43 total sea turtles/195 months). During the operational period (from September 2006 through June 2013), SCE reported the entrainment of 16 sea turtles, which equates to approximately 2.3 sea turtles per year (16 total sea turtles/82 months). No sea turtles have been entrained since the plant ceased operations in June 2013.

Table 1. Allowable and Actual Sea Turtle Entrainment, 2006–Present

Species	Allowable Entrainment, Sept 2006–Nov 2022[(a)(b)]	Actual Entrainment, Sept 2006–Present[(a)(c)]
green	34 (4,2)	13 (0,0)
leatherback	3 (1,1)	0 (0,0)
loggerhead	3 (1,1)	1 (0,0)
olive ridley	3 (1,1)	2 (1,0)

[(a)] Entrainment is stated as x (y, z) where x = total entrainment, y = mortality, and z = serious injury. y and z are a subset of x.

[(b)] Allowable levels of incidental take are specified in the ITS in Section X of the biological opinion (NMFS 2006).

[(c)] No sea turtles have been entrained since the plant ceased operations in June 2013.

During power operations, SONGS withdrew over 1,600,000 gpm (2,304 mgd) of water from the Pacific Ocean. Currently, SONGS withdraws only 16,000 gpm (23 mgd). This withdrawal rate is anticipated to continue through 2035, at which time withdrawals will cease. The NRC used actual sea turtle entrainment numbers for the period from September 2006 through June 2013 combined with intake flow rates to calculate anticipated annual entrainment during the decommissioning period (see Table 2).

Table 2. Annual Sea Turtle Entrainment Rates During Power Operations (Actual) and Decommissioning (Estimated)

	Actual Annual Entrainment Rate During Power Operations[a]			Estimated Annual Entrainment Rate During Decommissioning[b]		
Flow Rate	**2,304 mgd**			**23 mgd**		
Condition	**Total**	**Dead**	**Severely Injured**	**Total**	**Dead**	**Severely Injured**
green	1.90	0	0	0.019	0	0
leatherback	0	0	0	0	0	0
loggerhead	0.15	0	0	0.001	0	0
olive ridley	0.29	0.15	0	0.002	0.001	0

[a] Based on incidental take data over the period from September 2006–June 2013.

[b] Calculated by multiplying the actual annual entrainment rate during power operations by the percentage of intake flow being withdrawn during the decommissioning period (e.g., 1.9 green sea turtles per year x (23 mgd/2,304 mgd) = 0.019 green sea turtles per year).

From the estimated annual entrainment rates during decommissioning, the NRC staff calculated the estimated total sea turtle entrainment during the decommissioning period (i.e., through 2035) to be 0.43 live green turtles, 0.02 live loggerheads, and 0.05 olive ridleys (of which, 0.02 would be dead) (see Table 3). These projections are low enough to render sea turtle entrainment a discountable impact because it would be extremely unlikely for a sea turtle of any species to be entrained through December 2035. After December 2035, all SONGS-related water withdrawals from the Pacific Ocean will cease, which will wholly eliminate the potential for sea turtle entrainment. Further, these numbers, which are already close to zero, are likely overestimates because the intake velocity is now significantly lower than during operations (i.e., it has decreased from 7.42 fps (2.26 m/s) to 0.14 fps (0.04 m/s)) and because SCE installed LOEDs at the primary offshore intake structures and at the auxiliary offshore intake structures five years ago, and no sea turtles have been entrained since. Therefore, it is not reasonable to expect that any sea turtles will be entrained at SONGS during the decommissioning period. This reasoning is also consistent with NMFS's analysis for the decommissioning of Oyster Creek Nuclear Generating Station (Oyster Creek) (NMFS 2020; see Section 7.1, "Water Withdrawal," under "Effects of the Action").

Table 3. Anticipated Total Sea Turtle Entrainment During Decommissioning, June 2013–December 2025

	Entrainment[a]		
	Total	**Dead**	**Severely Injured**
green	0.43	0	0
leatherback	0	0	0
loggerhead	0.02	0	0
olive ridley	0.05	0.02	0

[a] Calculated by multiplying the estimated annual entrainment rate during decommissioning (see Table 2) by the period over which water will continue to be withdrawn to support decommissioning (e.g., 0.019 green sea turtles per year x 22.5 years = 0.43 green sea turtles).

Based on the above analysis, the NRC staff finds that decommissioning-related water withdrawals represent a discountable effect because, based on best judgement, entrainment from such withdrawals is not expected to occur.

7.2 Effects Associated with Water Discharge

Section VI, Subsection B of the 2006 biological opinion addresses the effects of thermal discharges on sea turtles. In that section, NMFS notes that sea turtles would not likely be harmed by the elevated water temperatures but that elevated water temperatures could locally affect normal distribution or foraging patterns. During the decommissioning period, discharged water will no longer be heated and will be roughly the same temperature as it was when it was withdrawn (SCE 2021). Therefore, thermal discharges are not a potential effect of the proposed action and will have no effect on sea turtles.

Because SONGS is no longer operational, liquid radiological releases are no longer of concern. Withdrawn water is also no longer chlorinated, so the potential effect of chlorine on the marine environment is no longer of concern.

Based on the above analysis, the NRC staff finds that decommissioning-related water discharges would have no effect on sea turtles.

7.3 Effects Associated with Removal of Offshore Structures

During removal of the intake and discharge conduits, the activities that could affect sea turtles include vessel collision, vessel-related pollution, dredging and seabed disturbance, underwater noise, and discharge of hydrogen sulfide gas from intake and discharge conduits. The following subsections address each of these potential effects.

<u>Vessel Collision</u>

The proposed action would require the use of one tugboat, derrick barge, workboat, crew boat, and materials barge. During in-water structure dismantlement, vertical

structures removed during dispositioning of the offshore conduits would be placed on the seafloor near the work area and within a temporary laydown area covered by the CSLC lease. The structures would be marked with temporary buoys, as needed, and then loaded onto a barge with a high-capacity crane for transport to the Port of Long Beach. (SCE 2021)

Project-related vessels have the potential to strike, injure, or kill sea turtles. The infrequency of vessel traffic associated with decommissioning would limit the exposure of sea turtles to this risk. Other factors that affect the risk of vessel strike include vessel speed, bottom clearance, and waterway width or other obstructions. All vessels associated with the proposed action are expected to move slowly (less than 7 knots) (SCE 2021). Slow operating speeds would reduce the risk of vessel strike for sea turtles because turtles would have greater opportunity to avoid the vessels. There will be at least several feet of clearance between the barges and the bottom at the shallowest conditions, with more clearance in other conditions. Given the swimming ability of sea turtles in the action area, a sea turtle should be able to swim under the vessel without being hit. The areas to be transited by the barges are free flowing with no obstructions; therefore, there is ample room for a sea turtle to avoid a vessel. Given the slow operating speeds of the vessels, the clearance between the vessels and the ocean floor, and the unimpeded geography of the action area, the NRC staff expects sea turtles to be able to avoid any vessels. These factors, combined with the relatively small number of vessel trips (estimated at 2 per day during peak activities), make it extremely unlikely that a project vessel will strike a sea turtle. Additionally, the NRC staff is unaware of any sea turtle vessel-strike injuries or mortalities resulting from barge traffic in connection with SONGS construction or operations, which further supports this conclusion. NMFS (2016, 2017, 2020) has also assessed the impacts of barge traffic, among other effects, as part of its ESA Section 7 consultations with the NRC for other projects requiring regular barge deliveries and found the potential impacts of vessel traffic on sea turtles and other mobile aquatic listed species (sturgeon) to be discountable.

The NRC staff also considered whether avoiding vessels associated with the proposed action could increase the risk of sea turtles being struck by non-project vessels operating in the action area. For this to occur, another vessel would have to be close enough to the project vessel such that the animal's evasive movements make it such that it was less likely to avoid the nearby vessel. Given common navigational safety practices (i.e., not traveling too close to other vessels to minimize the risk of collisions), it is extremely unlikely that another vessel would be close enough such that evasive maneuvers from a sea turtle would increase its risk of being struck.

Further, SCE would implement a Marine Mammal and Sea Turtle Mitigation and Monitoring Plan that would be subject to CSLC review and approval. The plan would include the following requirements to minimize the potential effects of vessel traffic on sea turtles (CSLC 2019):

- Vessels shall make every effort to maintain a distance of at least 150 ft (6 m) or greater from sea turtles whenever possible.
- When an animal is sited in a vessel's path or near a moving vessel and when safety permits, operators shall reduce speed and shift the engine to neutral.

- Exclusion zones, or “harassment zones,” would be established and monitored by qualified marine wildlife observers.

Section 8.1 of this assessment describes this plan in further detail.

Based on the above analysis, the NRC staff finds that decommissioning-related vessel traffic represents an insignificant effect that is so small that it cannot be meaningfully measured, evaluated, or detected and would never reach the scale of a take.

Vessel-Related Pollution

During offshore activities, increased vessel use in the action area would increase the risk of oil and fuel spills. Such spill could occur from fuel or hydraulic leaks on the vessels or equipment positioned on vessels or barges or during refueling, if permitted onsite. If spilled, oil would tend to stay on the surface. Intertidal and shallow subtidal habitats and associated biological communities would be at greatest risk, especially cobble substrates, because oil can penetrate the interstices between the cobble where it can persist for a long time and result in continued slow release of pollutants. Because the action area contains low intertidal and shallow subtidal, surfgrass would also be vulnerable to effects from spills.

Sea turtles, which transit and forage in the upper water column, would be vulnerable to spills. Because sea turtles breath air and because most oil floats, sea turtles would be regularly exposed to oil slicks. When sea turtles surface in a slick, they can inhale oil and its vapors into their lungs; gulp oil into their mouths, down their throats, and into their digestive tracts while feeding; and become coated in oil, to the point of becoming entirely mired and unable to swim. Similarly, sea turtles may swim through oil drifting in the water column or disturb it in the sediments on the ocean bottom. Oil can irritate sensitive mucus membranes around the eyes, mouth, lungs, and digestive tract of sea turtles, and toxic oil compounds known as polycyclic aromatic hydrocarbons can be absorbed into vital organ tissues such as the lungs and liver. Because sea turtles can hold their breath for long periods, inhaled oil has a greater chance of being absorbed into their bodies. Oil compounds that get passed from mother turtles to their young can interfere with development and threaten the survival of sea turtles still developing in the eggs. (ORR 2020)

Indirect effects of oil spills include harming or killing prey and forage of sea turtle, including fish, crabs, jellyfish, seagrass, and algae. Additionally, if oil kills the sargassum grass where young sea turtles live, those turtles lose their shelter and source of food and are forced to find suitable habitat elsewhere, which makes them more vulnerable to predators and uses more energy. (ORR 2020)

The number of large and medium oil spills has decreased significantly over the last few decades. In the 2010s, the yearly average number of large spills (greater than 700 tons) and medium spills (7–700 tons) recorded globally was 1.8 and 4.5, respectively. In 2020, no large spills occurred, and three medium spills occurred, none of which were in the U.S.

Because the action area is relatively small, if spills occur, sea turtles could avoid the affected area until the spill is remediated. Although the likelihood of a significant spill is low, the effects of a spill to sea turtles, their prey, and their habitat could be significant. To avoid or minimize the potential effects of spills on sea turtles and other marine life,

SCE (2021) would implement an Offshore Spill Response Plan during offshore activities. Implementation of this plan, as well as other appropriate best management practices, would minimize the potential for spills and ensure that appropriate clean-up actions are taken.

Based on the above analysis, the NRC staff finds that vessel-related pollution represents a discountable effect because oil spills are very unlikely to occur.

Dredging and Seabed Disturbance

Offshore activities would involve minor dredging and debris removal, anchoring, and use of three to four temporary laydown areas on the seafloor within the CSLC lease area. These activities would support the removal or reconfiguration of 45 structures (23 manhole access port structures, two primary offshore intake structures, two auxiliary offshore intake structures, 12 diffuser risers, a fish return conduit opening, and five buoy anchors) and would last approximately 4 months. Turbid conditions would also result at any one removal location for periods of no more than 3 days. (SCE 2021)

Soft sediment habitat would be removed around each of the 39 vertical structures plus the fish return conduit to enable diver access to vertical structure cutting points. Material would be either removed and side-cast on the seabed within 15 to 20 ft (4.6 to 6 m) of the excavation area by a long reach excavator, or material would be suction dredged by divers operating a tethered hose and deposited within the discharge conduit. Removal of buoy anchors would also result in the disturbance of a small amount (135 ft^2 or 12 m^2) of soft sediment habitat. SCE estimates that the total volume of removed or disturbed material would be 1,159 yds^3 (886 m^3) over an area of 1.075 ac (0.43 ha) of seabed. The largest volume of removed material at any one location would be 229 yds^3 (175 m^3) from an 0.43-ac (0.17-ha) area adjacent to each of the two primary offshore intakes structures. The area of affected seabed would vary in size according to the type of structure being removed. (SCE 2021)

During dredging, sea turtles are not known to be vulnerable to entrainment in dredge heads because sea turtles are able to avoid the relatively small intake size and low intake velocity associated with this type of dredge. Sea turtle entrainment is, therefore, discountable because it is extremely unlikely to occur based on the lack of documented interactions between sea turtles and cutterhead dredges. These assumptions and conclusions are further supported by NMFS's (2018) analysis of dredging during a 2018 programmatic ESA Section 7 consultation with the Federal Highway Administration, as well as NMFS's (2020) conclusions regarding dredging in connection with the decommissioning of Oyster Creek.

Dredging also has the potential to affect sea turtles indirectly through impacts on prey, forage, or other habitat features. Dredging of any kind results in the direct removal of benthic habitat along with infaunal and epifaunal organisms of limited mobility. Thus, dredging can be expected to cause short-term reductions in biomass of benthic organisms. Dredging also creates sediment plumes that increase water turbidity, which can adversely affect aquatic biota and create short-term decreases in habitat quality during and after dredging. Turbidity primarily affects liquid-breathing organisms, such as fish and shellfish, as well as aquatic plants because turbid conditions typically decrease photosynthetic capabilities. Turbidity levels associated with the sediment plumes of cutterhead dredges typically range from 11.5 to 282.0 mg/L with decreasing concentrations at greater distance from the dredge head (Nightingale and Simenstad

2001). Studies of benthic community recovery following dredging indicate that species abundance and diversity can recover within several years of dredging (Michel et al. 2013).

Sea turtles prey on a variety of pelagic, epibenthic, and benthic organisms, some of which could be affected by dredging. Loggerheads are primarily carnivorous and eat sea urchins, horseshoe crabs, clams, mussels, and other benthic invertebrates. Juvenile green sea turtles are omnivorous and eat insects, crustaceans, seagrasses, algae, and worms, while adult green turtles are herbivores and restrict their diets to seagrasses and algae. Leatherbacks primarily eat jellyfish and other coelenterates that inhabit the water column in the open ocean and pelagic colonial tunicates. Olive ridley turtles eat crabs, mollusks, gastropods, fish, fish eggs, and algae. Pelagic prey (e.g., squid and jellyfish) would be largely unaffected because dredging primarily disrupts the lower portion of the water column and substrates. Benthic prey (e.g., sea urchins, horseshoe crabs, clams, and mussels) may be susceptible to entrainment into the dredge head. Larger individuals or those that are farther from the dredge head could move away from the suction flow field to avoid being entrained. All prey in the dredge area, including seagrasses and algae, could also be affected by other factors, such as sedimentation and turbidity. However, as explained above, the local benthic community would likely recover within a few years such that any local reductions in benthic biomass or other observable impacts would be relatively short term. In summary, the NRC staff concludes that the impacts of dredging on sea turtle prey and forage would be minimal for the following reasons: dredging would only occur once over the course of the proposed action; the dredge area contains a small portion of the available prey base for the sea turtle species present in the action area; the dredge area does not provide habitat for many preferred sea turtle prey and forage; and the local benthic community would recover relatively quickly.

Limited information is available on the effects of increased turbidity on sea turtles. Because sea turtles breath air, they are not subject to the same potential respiratory effects of high turbidity as fish and shellfish. Sea turtles are most likely to be affected by turbidity if dredging-induced sedimentation plumes block passage or affect normal behaviors or if sediment settles on top of existing substrates and affects sea turtle prey (NMFS 2018). Because sea turtles are highly mobile, individuals are likely to be able to avoid any sediment plumes caused by dredging. Sediment plumes and associated turbidity would also be short term effects that would primarily be experienced during operation of the dredge and would end soon after dredging ceased. Sedimentation could also affect benthic prey of sea turtles, including mollusks and crustaceans. However, these individuals could avoid the plume or uncover themselves from any sedimentation experienced during dredging such that these impacts would be negligible and short term and would not measurably affect the available prey base within the dredged area. Based on the above discussion, the NRC staff concludes that turbidity and sedimentation associated with dredging would not noticeably or measurably affect sea turtles or their prey or forage.

In association with dredging activities, SCE (2021) would implement a Conduit Work Plan, a Dredging Plan, an Anchoring Plan, and a Turbidity Monitoring Plan to reduce localized and short-term effects.

Based on the above analysis, the NRC staff expects that all effects associated with dredging on sea turtles would be too small to be meaningfully measured or detected and

would, therefore, be insignificant. Additionally, the NRC staff is unaware of any dredging-related effects on sea turtles during the SONGS construction and operation periods, which further supports this conclusion. NMFS (2017, 2020) has also assessed the impacts of dredging, among other effects, as part of its ESA Section 7 consultation with the NRC for other projects and found the potential impacts of dredging on sea turtles to be discountable.

Underwater Noise

Underwater noise would be generated from vessel engines, excavation, dredging, and side-casting operations, as well as from saw cutting during removal of manhole access port structures, primary offshore intake structures, auxiliary offshore intake structures, and diffuser ports. The most concentrated noise-generating activities would take up to five months to complete, during which time underwater noise would be generated on an intermittent basis. Saw cutting would cause the greatest underwater noise disturbances. These noise-generating activities are likely to be intermittent and would only occur during discrete periods of dismantlement lasting several months. (SCE 2021)

Project-related vessel traffic (e.g., crew and tugboats) could potentially expose sea turtles to elevated underwater noise levels. Vessel noise is a combination of narrowband tones at specific frequencies and broadband noise, which are roughly related to a vessel's size and speed. Noise associated with vessel traffic would be limited to short durations while transporting crews and equipment. The total duration of both types of operating vessels would likely be less than 2 hours per day. (SCE 2021)

Sound levels from vessel activity could exceed National Oceanic and Atmospheric Administration underwater acoustic thresholds for non-impulsive, continuous noise (120 decibels Root Mean Square (dB_{rms}); threshold used for marine mammals, and for sea turtles in the absence of formal criteria). However, noise generated by supply or crew vessels would be like noise generated by other vessels that routinely transit the area. Any increase in ambient noise levels due to the proposed action would result in a minor increase in already-existing noise levels. Noise from vessel traffic would be comparable to noise-generating activities in other coastal areas were sea turtles co-occur. (SCE 2021)

Data from acoustic monitoring devices installed before and during offshore dismantlement activities would be used to establish Level B behavioral harassment zones of influence where received underwater sound pressure levels are higher than 160 dB_{rms} and 120 dB_{rms} for impulsive noise sources (e.g., impact pile driving) and non-impulsive noise sources (e.g., vibratory pile driving, mechanical dismantling), respectively. SCE will employ CLSC- and NMFS-approved Marine Mammal Observers (MMOs) during offshore decommissioning activities. The MMOs will use the behavioral harassment zones to determine whether stop work procedures need to be implemented for marine mammals and sea turtles active in the area. MMOs have the authority to halt activities with the potential to generate high-amplitude impulse or continuous noise when sensitive species are near noisy activities to allow sensitive species time to depart the area under reasonably natural behavior. (SCE 2021)

Further, SCE would implement a Marine Mammal and Sea Turtle Mitigation and Monitoring Plan that would be subject to CSLC review and approval. The plan would include a risk analysis (likelihood and consequence) of noise effects to marine mammals and sea turtles based on the most recent activity plans. The plan would also require

SCE to develop an acoustic monitoring strategy to potentially include installation of acoustic monitoring devices, establishment of behavioral harassment zones, and protocol for pausing project activities that generate sufficient noise to exceed limits established by NMFS while vulnerable marine organisms are in the established harassment zones. Section 8.1 of this assessment describes this plan in further detail.

Based on the above analysis, the NRC staff finds that decommissioning-related noise represents an insignificant effect that is so small that it cannot be meaningfully measured, evaluated, or detected and would never reach the scale of a take.

Discharge of Hydrogen Sulfide (H_2S) Gas from Intake and Discharge Conduits

The removal of the primary and auxiliary offshore intake structures and diffuser ports from each of the two discharge conduits would release water inside the conduits. If the water inside the conduits has remained stagnant for a long time, anaerobic conditions could result. Whether such conditions form would depend on the water temperature, the amount of biological material in the water, and the level of biofouling growth (e.g., mussels and barnacles) on the conduits. The discharge conduit would remain in use until close to the time of removal, but because the spent fuel pools would no longer require ocean cooling at that point, the intake conduit would have been stagnant for some time prior to the start of removal activities. These possible anaerobic conditions provide an environment where sulfur-reducing bacteria could produce H_2S gas. The likelihood for this to occur would increase the longer the conduits remain stagnant prior to the removal of the structures. Any release of H_2S gas is likely to occur very quickly (within minutes). (SCE 2021)

The release of the anaerobic water would cause any H_2S gas that formed in the system to rise to the surface. Interaction with this gas could result in immediate or latent mortality of marine life that come into direct contact with the affected water due to the low levels of oxygen. Because sea turtles breath air, turtles are unlikely to be directly affected by H_2S releases. Additionally, the likelihood that sea turtles would be in the area of gaseous release is low because vessel traffic and other in-water disturbances would be occurring simultaneously, which would temporarily deter turtles from transiting the area. Sea turtles could experience indirect effects if gaseous releases kill prey species, which could temporarily reduce available food resources in the action area.

To minimize the potential impacts of H_2S releases, prior to accessing any enclosed spaces within the conduits, a qualified H_2S inspector that can assess the level of risk from H_2S build up would perform an H_2S Gas Risk Assessment. The assessment may include an inspection to determine if H_2S gas occurs at sufficient levels to pose a hazard to sea turtles and other marine life. Additionally, SCE will prepare and implement an H_2S Gas Control Plan. (SCE 2021)

Based on the above analysis, the NRC staff finds that discharge of H_2S gas from intake and discharge conduits represents a discountable effect because SCE would take steps to ensure that such releases are unlikely to occur.

8.0 Mitigation Strategies

8.1 Marine Mammal and Sea Turtle Mitigation and Monitoring Plan

As part of the decommissioning process, SCE will prepare and implement a Marine Mammal and Sea Turtle Mitigation and Monitoring Plan. This plan will be subject to CSLC review and approval. As described on pages 4.4-65 and 4.4-66 of the CSLC's (2019) *Final Environmental Impact Report for the SONGS Units 2 & 3 Decommissioning Project,* the plan will consist of the following (emphasis in original).

> **MM BIO-11: Marine Mammal and Sea Turtle Mitigation and Monitoring Plan.** The Applicant <u>or its contractor</u> shall prepare a Marine Mammal and Sea Turtle Mitigation and Monitoring Plan. The purpose of the Plan is to ensure that no harassment of marine mammals or other marine life occurs during Proposed Project activities. The Plan, which may be a part of a National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) consultation under the Marine Mammal Protection Act, shall include:
>
> - A description of the work activities including vessel size, activity types and locations, and Proposed Project timeframes.
>
> - A risk analysis (likelihood and consequence) of noise effects to marine mammals and sea turtles based on the most recent activity plans.
>
> - The qualifications, number, location, and roles/authority of dedicated marine wildlife observers (MMOs). A minimum of two MMOs, approved by California State Lands Commission (CSLC) and NMFS staffs, shall be placed on major support vessels.
>
> - The distance, speed, and direction transiting vessels shall maintain when in proximity to a marine mammal or turtle, as follows:
>
> - Vessel operators shall make every effort to maintain a distance of at least 300 feet from sighted whales, and 150 feet or greater from sea turtles or smaller cetaceans whenever possible.
>
> - When small cetaceans are sighted while a vessel is underway (e.g., bow riding), vessel operators shall attempt to remain parallel to the animal's course. When paralleling whales, vessels shall operate at a constant speed that is not faster than the whales' and shall avoid excessive speed or abrupt changes in direction until the cetacean has left the area.
>
> - Per NMFS recommendations, and when safety permits (i.e., excluding during poor sea and weather conditions, thereby ensuring safe vessel maneuverability under those special conditions), vessel speeds shall not exceed 11.5 miles per hour (10 knots) when mother/calf pairs, groups, or large assemblages of cetaceans (greater than five individuals) are observed near an underway vessel. A single cetacean at the surface may indicate the presence of submerged animals in the vicinity; therefore, prudent precautionary measures,

such as decreasing speed and avoiding sudden changes in direction, should always be exercised. The vessel shall route around the animals, maintaining a minimum distance of 300 feet. Whales may surface in unpredictable locations or approach slowly moving vessels. When an animal is sighted in the vessel's path or in close proximity to a moving vessel and when safety permits, operators shall reduce speed and shift the engine to neutral. Vessel operators shall not engage the engines until the animals are clear of the area.

  - Support vessels (i.e., barge tows) shall not cross directly in front of migrating whales, other threatened or endangered marine mammals, or sea turtles.

  - Vessels shall not separate female whales from their calves or herd or drive whales. If a whale engages in evasive or defensive action, support vessels shall drop back until the animal moves out of the area.

- Observation recording procedures and reporting requirements in the event of an observed impact to marine wildlife. Collisions with marine wildlife shall be reported promptly to the federal and state agencies listed below pursuant to each agency's reporting procedures.

  National Marine Fisheries Service
  Southwest Region Stranding Coordinator
  Long Beach, CA 90802
  Phone: (562) 980-3230 or (562) 506-4315 (24-hour cell)

  California State Lands Commission
  Mineral Resources Management Division
  Long Beach, CA 90802
  Phone: (562) 590-5201

- An acoustic monitoring strategy. If underwater sound pressure levels are thought to exceed limits established by NMFS, a marine acoustics specialist shall install acoustic monitoring devices before saw cutting occurs to monitor and establish Level B behavioral harassment zones, which shall be enforced by qualified marine wildlife observers. <u>The strategy shall also include the pausing of activities that generate sufficient noise to exceed limits established by NMFS while vulnerable marine organisms are in the established harassment zones</u>.

This mitigation is subject to NMFS and USFWS consultation. The Plan shall be submitted to CSLC staff a minimum of 30 days prior to the implementation of offshore work.

8.2 Biological Opinion Monitoring and Reporting

The 2006 biological opinion requires SCE to monitor for sea turtle entrainment. Specifically, T&C 1 states:

> Inspection of the CWS [cooling water structure] (area between the curtain wall and bar racks at DCPP [Diablo Canyon] and forebay at SONGS) shall be conducted every twelve hours. Times of inspections, including those when no turtles were sighted, must be recorded.

T&C 7 states:

> Every effort should be made to observe the area around the CWS of the DCPP and SONGS facilities. Any sea turtle sighted in the vicinity of either plant should be reported to NMFS in an annual report.

The remaining T&Cs specify training requirements for SCE personnel involved in sea turtle monitoring and rescue; how SCE should respond to live or dead entrained sea turtles, including coordination with the California Sea Turtle Stranding Network (CSTSN) for treatment of injured turtles; and reporting requirements, including the preparation of an annual report to NMFS by February 1 of each year.

These requirements remain in effect until either the current biological opinion expires (in November 2022) or NMFS issues a new biological opinion that supersedes the current opinion.

8.3 Other Mitigation and Monitoring Plans

SCE would implement several additional monitoring and mitigation plans to ensure that environmental impacts are minimized. These plans are discussed throughout this assessment. The CSLC's (2019) *Final Environmental Impact Report for the SONGS Units 2 & 3 Decommissioning Project* discusses the requirements of each of these plans in detail. The relevant mitigation plans are as follows:

- APM-17: Offshore Spill Response Plan (CSLC 2019, page 4.4-54)
- MM BIO-9: Hydrogen Sulfide (H_2S) Gas Control Plan (CSLC 2019, page 4.4-55)
- MM BIO-10: Anchoring Plan (CSLC 2019, page 4.4-60)
- APM-9: Conduit Work Plan (CSLC 2019, page 4.4-59)
- APM-15: Dredging Plan (CSLC 2019, page 4.9-23)
- APM-16: Turbidity Monitoring Plan (CSLC 2019, page 4.9-23)

9.0 Cumulative Effects

Cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). When formulating biological opinions, NMFS considers cumulative effects when determining the likelihood of jeopardy or adverse modification.

According to Section VII of the 2006 biological opinion, cumulative effects in the action area include incidental take of sea turtles during fishing operations, vessel collisions, ingestion of debris, pollution, and natural disasters.

Commercial and recreational vessels will continue to operate in the action area in the future. Sea turtles will continue to be injured or killed from interactions with these vessels. Noise levels associated with vessels may also disturb sea turtles and directly or indirectly affect their normal foraging, breeding, or migratory behavior. (NMFS 2006)

Marine debris and pollution from various sources pose a threat to sea turtles in the action area. CSTSN data and necropsy results demonstrate that sea turtles off the California coast become entangled in and ingest marine debris. CSTSN data has shown that turtles have been affected by derelict fishing gear, plastics, wood, and paper. Additionally, chemical contaminants may affect sea turtle reproduction and survival; however, specific impacts remain relatively unclear. (NMFS 2006)

Coastal communities and continued development near SONGS will continue to contribute to debris and contaminants entering the waters of the action area through stormwater runoff and other non-point sources (NMFS 2006).

10.0 Conclusions

Based on the NRC staff's analysis presented in this biological assessment, the staff makes the following conclusions.

Summary of Effects

The NRC staff finds that all potential effects of the proposed action are insignificant or discountable, as summarized below.

- **Effects Associated with Water Withdrawal:** Entrainment of sea turtles because of the proposed action represents a discountable effect because, based on best judgement, entrainment is not expected to occur. Water withdrawals during the decommissioning period will constitute a small fraction (i.e., approximately 2 percent) of the volume of water that the facility withdrew during power operations and will cease by 2035. Intake velocity is now significantly lower than during operations and SCE has installed LOEDs at the primary offshore intake structures and at the auxiliary offshore intake structures, and no sea turtles have been entrained since the devices were installed.
- **Effects Associated with Water Discharge:** Decommissioning-related water discharges would have no effect on sea turtles. Although water would continue to be discharged during the decommissioning period, it would no longer be heated or chlorinated. Because SONGS is no longer operational, liquid radiological releases are no longer of concern.
- **Effects Associated with Removal of Offshore Structures:** Vessel collisions with sea turtles are extremely unlikely to occur because vessels would operate at slow speeds within the action area, sufficient clearance exists between the vessels and the ocean floor, and a relatively small number of vessel trips would be required to support decommissioning activities. Vessel-related pollution in the form of oil and fuel spills are very unlikely to occur, and SCE would implement work plans for spill prevention and clean-up. Dredging and seabed disturbance effects would be short term and are unlikely to result in measurable or detectable impacts. Underwater noise would be short term, and SCE would establish behavioral harassment zones in which it would stop work if vulnerable marine

mammals or sea turtles are present within these zones. The discharge of H_2S gas from intake and discharge conduits represents a discountable effect because SCE would take steps to ensure that such releases are unlikely to occur. These effects of offshore activities would be further minimized by SCE's implementation of a Marine Mammal and Sea Turtle Mitigation and Monitoring Plan, as well as a number of other activity-specific work plans and monitoring, and the employment of CLSC- and NMFS-approved Marine Mammal Observers during potentially disruptive activities.

10.1 Loggerhead Sea Turtle, North Pacific Ocean DPS

Based on the analysis in this biological assessment, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the North Pacific Ocean DPS of the loggerhead sea turtle.

10.2 Green Sea Turtle, East Pacific DPS

Based on the analysis in this biological assessment, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the East Pacific DPS of the green sea turtle.

10.3 Leatherback Sea Turtle

Based on the analysis in this biological assessment, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the leatherback sea turtle.

10.4 Olive Ridley Sea Turtle

Based on the analysis in this biological assessment, the NRC staff concludes that the proposed action *may affect but is not likely to adversely affect* the olive ridley sea turtle.

11.0 Relevant Reports

Several reports are available that evaluate the impacts of SONGS decommissioning on the environment. These reports are listed and summarized below.

Additionally, the NRC will conduct a NEPA review at the license termination stage. SCE must decommission the SONGS site within 60 years of the permanent cessation of operations unless SCE receives permission to the contrary. SCE remains accountable to the NRC until it completes decommissioning and the NRC terminates the license. To terminate its license, SCE must submit a license termination plan (LTP) to the NRC for review and approval at least two years before the intended termination date. Licensees typically submit such a plan near the end of the decommissioning process. At this time, SCE has not yet developed the LTP for SONGS. However, according to SCE's current decommissioning schedule, SCE would be required to submit the LTP to the NRC by the end of 2049. Once the NRC receives the LTP, the NRC staff will conduct safety and environmental reviews. Typically, the environmental review is documented in an environmental assessment. The staff will also conduct additional ESA Section 7 consultations at that time, as appropriate. Following its review and approval of the LTP, the NRC will issue an amendment to the facility license to incorporate the LTP.

San Onofre Nuclear Generating Station Units 2 and 3 Post-Shutdown Decommissioning Activities Report

In May 2020, SCE submitted an updated post-shutdown decommissioning activities report (PSDAR) to the NRC in accordance with termination of license requirements at 10 CFR 50.82. The PSDAR includes a description of the planned decommissioning activities; a schedule for completing such activities; a site-specific decommissioning cost estimate, including the projected cost of managing irradiated fuel and site restoration; and an evaluation of the environmental impacts of decommissioning activities. This submittal is cited as "SCE 2020" in this biological assessment and can be accessed online at: https://www.nrc.gov/docs/ML2013/ML20136A339.pdf.

SCE Response to Request for Additional Information to Support Endangered Species Act Consultation

In April 2021, SCE submitted additional information to the NRC to support the NRC's development of a biological assessment and its reinitiation of ESA Section 7 consultation in connection with the SONGS decommissioning. This submittal describes the action area, identifies federally listed species within the action area, and evaluates the effects of decommissioning on those species. This submittal is cited as "SCE 2021" in this biological assessment and can be accessed online at: https://www.nrc.gov/docs/ML2110/ML21104A066.pdf.

Final Environmental Impact Report for the San Onofre Nuclear Generating Station (SONGS) Units 2 & 3 Decommissioning Project

In February 2019, the CSLC prepared a final environmental impact report (EIR) in accordance with CEQA that evaluated the impacts of the SONGS decommissioning. State law requires the CSLC to perform a CEQA review prior to deciding on a new lease for the offshore land containing the intake and discharge conduits. The EIR evaluates in detail the decontamination and dismantlement of most onshore above-grade structures, including the containment buildings, and CSLC lease offshore activities, which include the disposition of the offshore intake and discharge conduits and associated structures that are part of the CSLC lease facilities. The EIR is cited as "CSLC 2019" in this biological assessment and can be accessed online at: https://www.slc.ca.gov/ceqa/san-onofre/.

SONGS Units 2 and 3 Environmental Impact Evaluation: Decommissioning Supplemental Environmental Analysis

In January 2014, Enercon Federal Services prepared an evaluation to support SCE's preparation of the PSDAR. This evaluation includes detailed analysis of all potential onshore and offshore impacts of the SONGS decommissioning. This evaluation is cited as "Enercon 2014" in this biological assessment and can be accessed online at: https://www.nrc.gov/docs/ML2110/ML21105A714.pdf.

12.0 Literature Cited

References with Agencywide Documents Access and Management System (ADAMS) accession numbers can be accessed through the NRC's web-based ADAMS search engine at https://adams.nrc.gov/wba/. To retrieve a document, click on the "Advanced Search" tab, choose the following criteria under Document Properties: "Accession Number" in the Property box and "is equal to" in the Operator box, and insert the ADAMS accession number of the document in the "Value" box.

50 CFR Part 402. *Code of Federal Regulations*, Title 50, *Wildlife and Fisheries*, Part 402, "Interagency Cooperation—Endangered Species Act of 1973, as Amended."

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76 FR 58868. National Marine Fisheries Service. Determination of Nine Distinct Population Segments of Loggerhead Sea Turtles as Endangered or Threatened; Final Rule. *Federal Register* 76(184):58868-58952. September 22, 2011.

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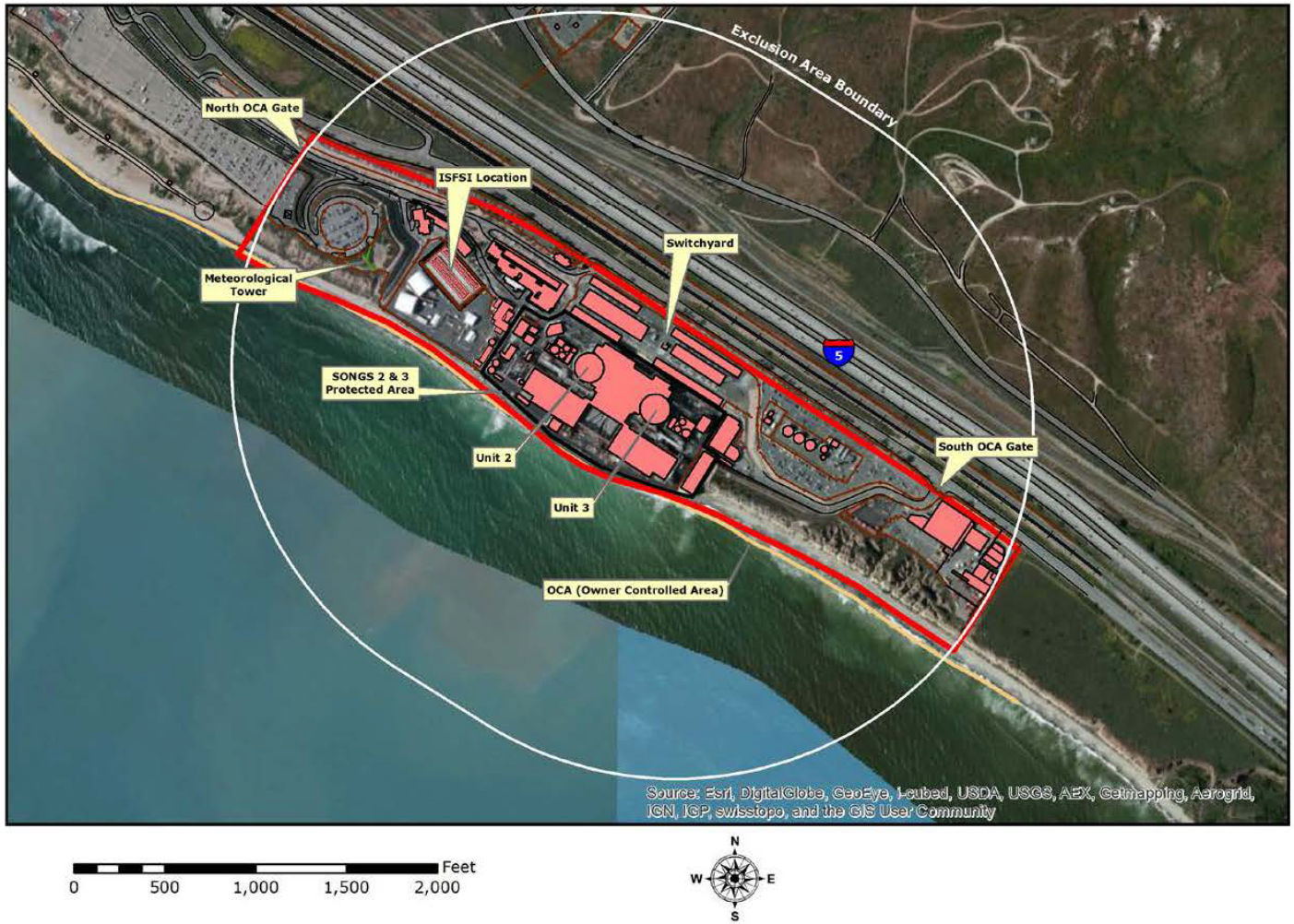
Appendix A. Figures and Tables

Figure A1. SONGS Site Layout

Source: SCE 2016

Figure A2. SONGS Site Layout with Exclusion Area Boundary



Source: SCE 2020

Table A1. Occurrences of Federally Listed Marine Species in the Action Area

Species	Common Name	Status[a]	Habitat	Likelihood of Occurrence in Action Area[b]
Fish				
Acipenser medirostris	green sturgeon, Southern DPS	FT	Inshore waters to 200 feet, primarily in the seawater and mixing zones of bays and estuaries.	**Unlikely.** No suitable habitat present. Species has never been impinged or entrained at facility.
Eucyclogobius newberryi	tidewater goby[c]	FE, SSC	Brackish coastal waters from Agua Hedionda Lagoon to the Smith River mouth. Shallow lagoons and lower stream reaches with slow, but not stagnant, water and high oxygen levels.	**Unlikely.** No suitable habitat present. Known to occur north of action area in San Onofre and San Mateo Creeks. Species has never been impinged or entrained at facility.
Oncorhynchus mykiss irideus	California steelhead, South Central California DPS	FE	Comprised of a suite of steelhead populations that inhabit coastal stream networks from the Pajaro River south to, but not including, the Santa Maria River.	**Unlikely.** Species known to occur north of action area in San Mateo Creek, but action area lacks suitable deep, open ocean habitat. Species has never been impinged or entrained at facility.
Oncorhynchus mykiss irideus	California steelhead, Southern California DPS	FE	Inhabits coastal stream networks from the Santa Maria River system south to the U.S. border with Mexico.	**Unlikely.** (See above)

Species	Common Name	Status[a]	Habitat	Likelihood of Occurrence in Action Area[b]
Mammals				
Arctocephalus townsendii	Guadalupe fur seal	FT, ST, FP	Occurs primarily in Baja California, Mexico, but occasionally found on San Miguel and San Nicolas Islands. Prefers rocky insular shorelines and sheltered coves.	**Unlikely.** Suitable habitat absent.
Balaenoptera borealis	sei whale	FE	Cosmopolitan distribution. Occurs in subtropical, temperate, and subpolar waters around the world. Usually observed in deeper waters of oceanic areas far from the coastline.	**Unlikely.** Suitable water depths absent. Regional population density and habitat preferences make likelihood of occurrence very low.
Balaenoptera musculus	blue whale	FE	In the eastern North Pacific Ocean, ranges from the Gulf of Alaska south to Costa Rica. Winters off Mexico and Central America and feeds during summer off the U. S. west coast.	**Unlikely.** (See above)
Balaenoptera physalus	fin whale	FE	One of the four stocks identified in U.S. waters occurs off the coasts of California, Oregon, and Washington. Migrates seasonally into and out of high latitude feeding areas.	**Unlikely.** (See above)

Species	Common Name	Status[a]	Habitat	Likelihood of Occurrence in Action Area[b]
Enhydra lutris nereis	southern sea otter[c]	FT, FP	Occurs from near Half Moon Bay south to Gaviota and San Nicolas Island. Typically occurs in coastal waters within 0.6 mi of shoreline and often associated with kelp beds.	**Unlikely.** Action area is south of known inhabited range.
Megaptera novaeangliae	humpback whale, Central American population	FE	Prefers shallow waters while feeding and calving. Feeding grounds are in cold, productive coastal waters. This population breeds along the Pacific coast of Central America, including off Costa Rica, Panama, Guatemala, El Salvador, Honduras, and Nicaragua, and feeds off the west coast of the U.S. and southern British Columbia.	**Unlikely.** Suitable water depths absent. Regional population density and habitat preferences make likelihood of occurrence very low.

Species	Common Name	Status[a]	Habitat	Likelihood of Occurrence in Action Area[b]
Megaptera novaeangliae	humpback whale, Mexico population	FT	Prefers shallow waters while feeding and calving. Feeding grounds are in cold, productive coastal waters. This population breeds along the Pacific coast of Mexico and the Revillagigedo Islands, transits the Baja California Peninsula, and feeds across a broad range from California to the Aleutian Islands, Alaska.	**Unlikely.** (See above)
Physeter macrocephalus	sperm whale	FE	Inhabits all oceans of the world. Distribution is dependent on their food source and suitable conditions for breeding.	**Unlikely.** (See above)
Mollusks				
Haliotis cracerodii	black abalone	FE	Inhabits rocky substrates in intertidal and shallow subtidal reefs to about 18 feet deep. Typically occurs in habitats with complex surfaces and deep crevices that provide shelter for juveniles and adults.	**Unlikely.** Suitable habitat absent.

Species	Common Name	Status[a]	Habitat	Likelihood of Occurrence in Action Area[b]
Haliotis sorenseni	white abalone	FE	Inhabits open rock or boulder habitat interspersed with sand channels off the coast of California. Most abundant at depths between 80 and 100 feet, making it the deepest-occurring abalone in California.	**Unlikely.** Suitable water depths absent.
Reptiles				
Caretta caretta	loggerhead sea turtle	FT	Circumglobal distribution throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Most abundant species of sea turtle found in U.S. coastal waters. Have been reported as far north as Alaska and as far south as Chile. Most records along U.S. west coast are of juveniles off the California coast, with occasional sightings from Washington and Oregon coasts.	**Moderate.** No known nesting areas on southern California beaches. Low potential for occurrence within action area due to generally low population densities. However, species has been observed in the past within the action area. Three individuals have been captured or collected in the facility's forebays during the operational period (one live turtle in each of February 1993, July 1996, and July 2010). No incidental take has occurred since July 2010.

Species	Common Name	Status[(a)]	Habitat	Likelihood of Occurrence in Action Area[(b)]
Chelonia mydas	green sea turtle	FE, SSC	Globally distributed and generally found in tropical and subtropical waters along continental coasts and islands. In the eastern North Pacific, species has been sighted from Baja California to southern Alaska, but it most commonly occurs from San Diego south.	**Moderate.** No known nesting areas on southern California beaches. Green turtles have been consistently captured or collected in the facility's forebays during the operational period. In total, 42 live and 2 dead turtles have been collected. The last incidental take was in May 2013.
Dermochelys coriacea	leatherback sea turtle	FE	Sighted with some regularity in coastal waters off the west coast of the U.S. Sighting frequency is greatest off central California. Nearly all sightings in southern California occur in deeper waters seaward of the Channel Islands.	**Moderate.** No known nesting areas on southern California beaches. Low potential for occurrence within action area due to generally low population densities. However, species has been observed in the past within the action area. Two individuals have been captured or collected in the facility's forebays during the operational period (one live turtle in May 1994 and one dead turtle in May 1996). No incidental take has occurred since May 1996.

Species	Common Name	Status[a]	Habitat	Likelihood of Occurrence in Action Area[b]
Lepidochelys olivacea	olive ridley sea turtle	FT	Globally distributed in tropical waters. Occurs in the eastern Pacific from southern California to northern Chile. Infrequent occurrences documented off southern, central, and northern California.	**Moderate.** No known nesting areas on southern California beaches. Low potential for occurrence within action area due to generally low population densities. However, species has been observed in the past within the action area. In June 2013, one dead individual was collected in the facility's forebays during the operational period. No incidental take has occurred since that time.

[a] Under the ESA, species may be designated as federally endangered (FE) or federally threatened (FT). Under California State statute, species may be designated as State-endangered (SE), State-threatened (ST), California species of special concern (SSC), State-rare (SR), or California Department of Fish and Wildlife fully protected (FP).

[b] The potential to occur is based on the following criteria.
Present = Species observed during decommissioning project surveys or recently documented, and habitat conditions remain unchanged from the time of the record.

High = Species documented in vicinity of action area, suitable habitat present in the action area, but species not detected during decommissioning project surveys.
Moderate = Species either documented in vicinity of action area in past or historic surveys or scientific literature, or suitable habitat is found in action area within species' known geographic range.
Low = No records of species in action area, habitat is marginal, or the species is conspicuous and was not detected during biological surveys.
Unlikely = No records of species in action area, and the action area lacks suitable habitat.

[c] Species under the jurisdiction of the U.S. Fish and Wildlife Service.

Table Source: Adapted from CLSC 2019, Tables F1-2, F1-3, and F1-5 and supplemented with additional information from SCE 2020, SCE 2021, and NRC's incidental take records (see Table A2).

Table A2. All Sea Turtle Entrainment, 1984–Present

Date	Species	Condition	Record of Incidental Take
1/11/84	green	alive	ML051400365
10/2/86	green	alive	ML051400365
9/23/88	green	alive	ML051400365
9/14/90	green	alive	ML051400365
9/26/90	green	alive	ML051400365
10/3/90	green	dead	ML051400365
10/30/90	green	alive	ML051400365
2/21/91	green	alive	ML051400365
3/14/91	green	dead	ML051400365
5/4/91	green	alive	ML051400365
10/6/91	green	alive	ML051400365
5/6/92	green	alive	ML051400365
6/3/92	green	alive	ML051400365
7/13/92	green	alive	ML051400365
7/30/92	green	alive	ML051400365
8/13/92	green	alive	ML051400365
9/9/92	green	alive	ML051400365
9/16/92	green	alive	ML051400365
2/27/93	loggerhead	alive	ML051400365
5/29/94	leatherback	alive	ML051400365
9/9/94	green	alive	ML051400365
5/8/96	green	alive	ML051400365
5/22/96	leatherback	dead	ML051400365
7/15/96	loggerhead	alive	ML051400365
11/24/97	green	alive	ML051400365
8/15/99	green	alive	ML051400365
6/19/00	green	alive	ML051400365
11/18/00	green	alive	ML051400365
8/15/02	green	alive	ML051400365
7/16/04	green	alive	ML051400365
9/13/04	green	alive	ML051400365
3/15/05	green	alive	ML051400365

Date	Species	Condition	Record of Incidental Take
5/20/06	green	alive	ML072670143
6/7/06	green	alive	ML072670143
8/11/06	green	alive	ML072670143
9/4/07	green	alive	ML080430048
11/29/07	green	alive	ML080430048
10/10/09	green	alive	ML100350110
12/16/09	green	alive	ML100350110
7/12/10	loggerhead	alive	ML110410398
9/24/10	green	alive	ML110410398
9/30/10	green	alive	ML110410398
8/31/11	green	alive	ML12048A075
4/2/12	green	alive	ML12096A353
9/8/12	green	alive	ML13039A333
9/16/12	green	alive	ML13039A333
11/1/12	green	alive	ML13039A333
11/22/12	green	alive	ML13039A333
5/6/13	green	alive	ML14052A218
6/11/13	olive ridley	dead	ML14164A070