MARINE WILDLIFE CONTINGENCY PLAN

BETA UNIT GEOPHYSICAL SURVEY OFFSHORE HUNTINGTON BEACH, CALIFORNIA

Project No. 1602-1681

Prepared for:

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1.0 INTRODUCTION

This Marine Wildlife Contingency Plan (MWCP) has been prepared for Beta Operating Company, LLC (Beta) in support of a proposed geophysical survey of the Beta Unit (Project) located within Federal, outer continental shelf waters approximately 8 miles (mi) (21 kilometers [km]) offshore Huntington Beach, California (Figure 1-1) (Project Site). The proposed Project is intended to provide Beta with subsurface imaging of the oil productive formations which lie 3,000 to 5,000 feet (914 to 1,524 meters) below the seafloor within the Beta Unit field.

1.1 PURPOSE AND OBJECTIVES

The purpose of this MWCP is to identify marine mammals, turtles, and birds (marine wildlife) that could occur within the Project area and to establish measures that are designed to reduce potential Project-related impacts to those species. These impacts would be temporary and may include potential noise and light-related impacts from survey activities, vessel collision, and impacts from incidental hydrocarbon releases. This MWCP has been developed with consideration of guidelines and procedures contained in the High Energy Seismic Survey Team (HESST) recommendations and acoustic guidelines published by the National Oceanic and Atmospheric Administration (NOAA) and National Marine Fisheries Service (NMFS) (HESST 1999, NOAA 2016). Those guidelines summarize several studies on the effects of noise on marine wildlife and identify noise levels that may harass or injure marine wildlife. This MWCP utilizes the current harassment thresholds for marine wildlife to identify the distances of the Buffer and Exclusion Zone radii for various hearing groups and establish other applicant proposed measures (APMs) that are based on those guidelines. Implementation of these measures will reduce or eliminate potential impacts to marine resources.

1.2 PROPOSED GEOPHYSICAL SURVEY AREA

The geophysical survey area (Project area) is located approximately eight miles offshore Huntington Beach, California. Coordinates of the offshore survey area are provided in Table 1-1. The size of the survey area is approximately 18.885 square miles (48.91 square kilometers) in a North Northwest (NNW) to South Southeast (SSE) direction (Figure 1-2). Approximately 17 track lines per directional change are anticipated (approximately 68 survey loops). Water depths in the survey area range from 148 to 1,083 feet (45 to 330 meters).

Table 1-1. Coordinates of Offshore Survey Area

Corner of Survey Area	Coordinates	
	Latitude	Longitude
Southwest	33°32'13.74"N	118°6'43.91"W
Northeast	33°36’5.55"N	118°9’13.97"W
Northwest	33°36’4.76"N	118°7”11.44"W
Southeast	33°33’0.15"N	118°5’10.89"W

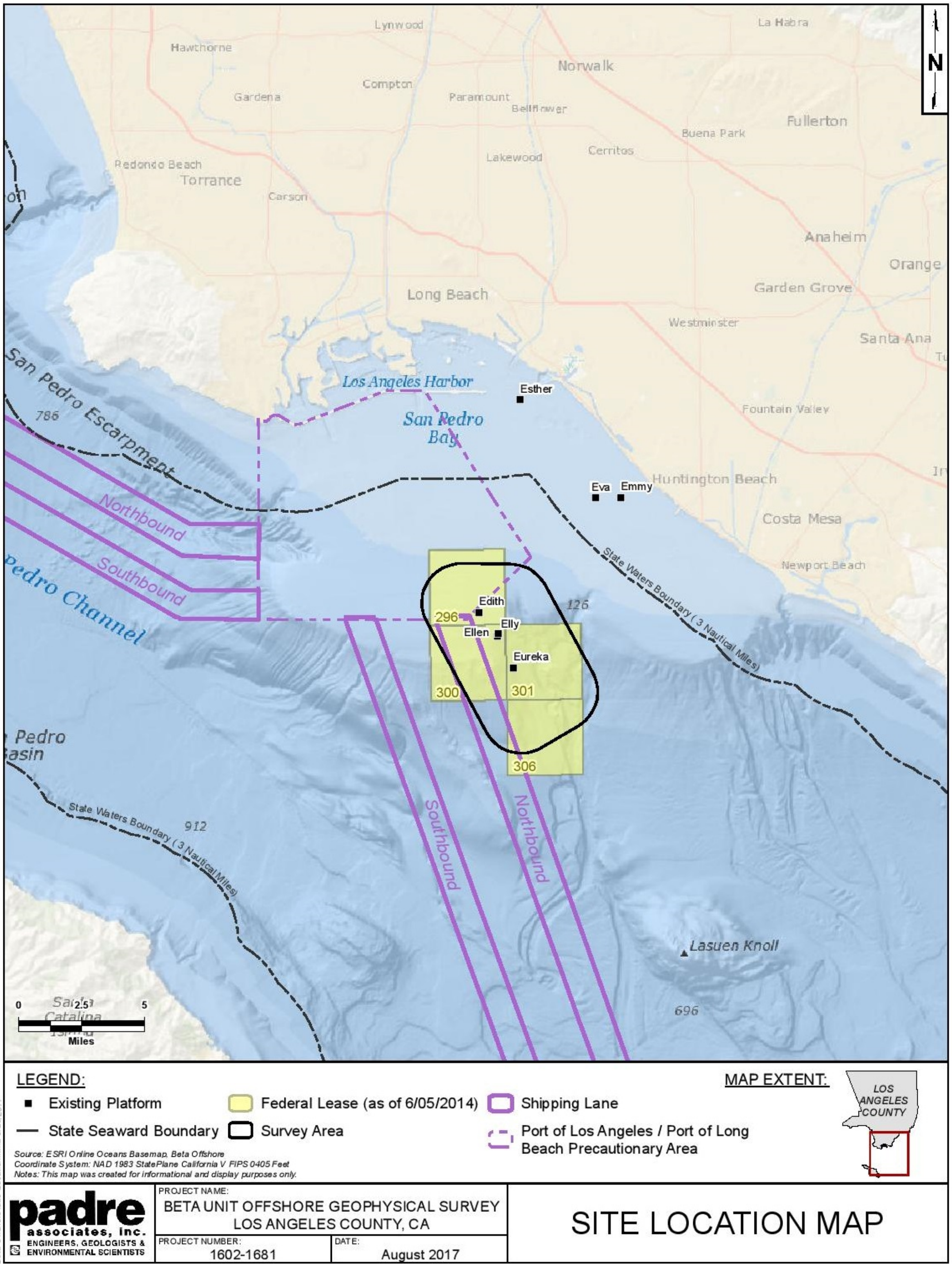

Figure 1-1. Beta Unit Offshore Geophysical Survey Area

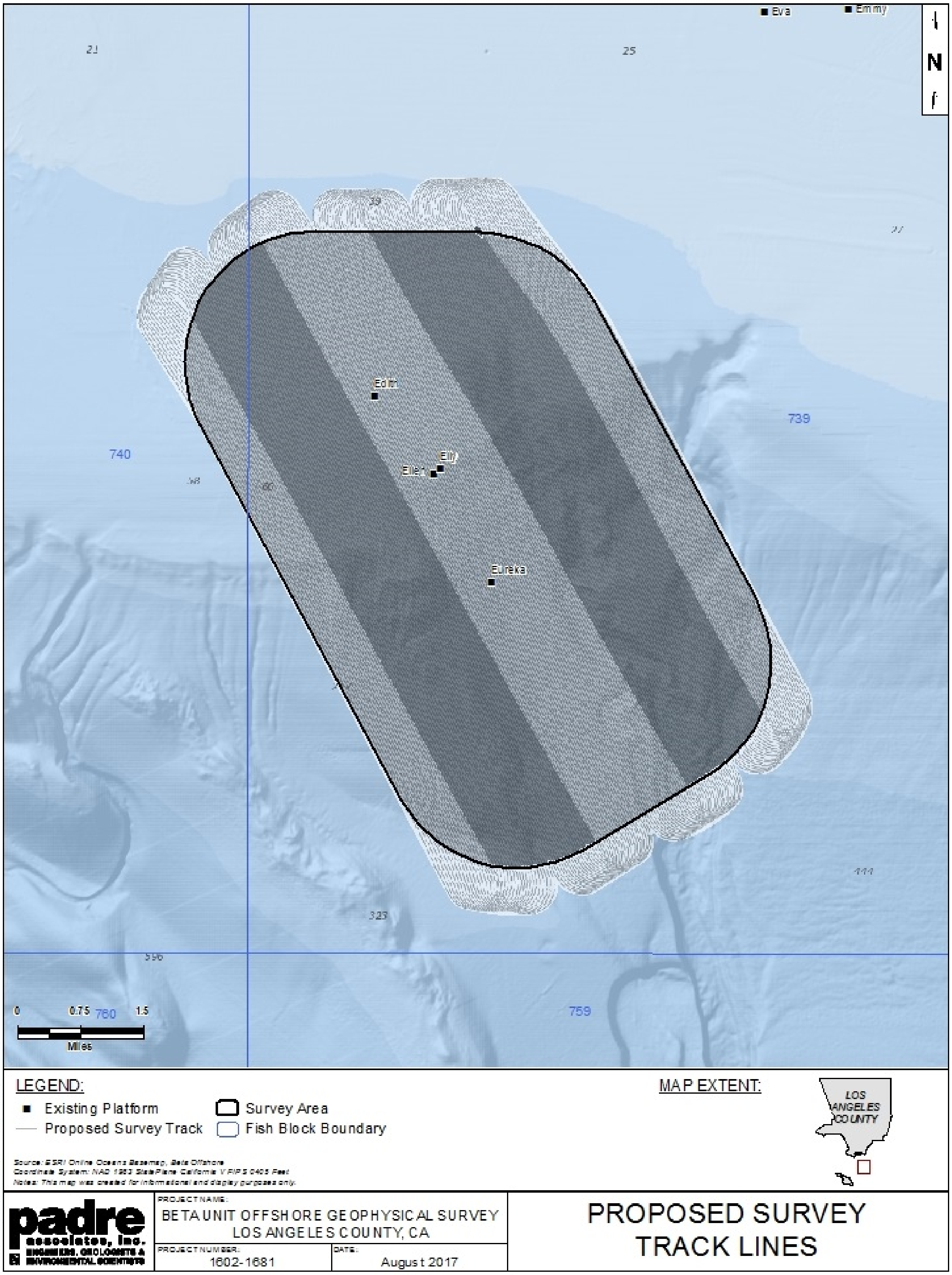

Figure 1-2. Source Vessel Track Map of Beta Unit Proposed Geophysical Survey Area

A subsurface geophysical survey utilizing one source array (including 3 sub-arrays) and autonomous nodes (nodes) temporarily deployed on the seafloor is proposed to reach an estimated imaging depth of 2,500 to 5,000 feet (762 to 1,524 meters) below the seafloor in the Pliocene and Miocene aged formations, as shown in Table 1-2. The use of nodes accommodates the challenges faced when conducting a survey in the area beneath Platforms Eureka, Edith, and Ellen/Elly; and in close proximity to established shipping lanes located approximately 9,400 feet (2,850 meters) from the Beta Unit Field.

Table 1-2. Geological and Geophysical Model Depths

Unit Name	Depth (feet)	Depth (meters)
Surface	0	0
Seabed	148 - 1,083	45 - 330
Miocene A sands	2,650 - 3,700	808 - 1,128
Miocene C sands	2,900 - 4,500	884 - 1,372
Miocene D sands	3,000 - 4,900	914 - 1,494
Miocene F sands	3,400 - 4,450	1,036 - 1,356

1.3 PROJECT SCHEDULE

The proposed activities, including mobilization and demobilization, are expected to take approximately 42 operational days (six weeks) to complete. Deployment/recovery of the node units is expected to take approximately 14 days (two weeks – one week for deployment and one week for recovery), and the geophysical survey would take approximately 28 days. This estimate includes time for instrument deployment, profiling, instrument recovery, and demobilization. The survey is targeted for September 2018, following completion of all required environmental reviews and permitting. The September-November time window is the annually lowest population of marine mammals in the survey vicinity.

1.4 PROJECT ACTIVITIES

The proposed scope of work offshore will require operating a node deployment/recovery vessel, geophysical survey vessel, support vessels; as well as transit of the vessels between the survey area and nearby harbors (Port of Los Angeles [POLA] / Port of Long Beach [POLB]). The geophysical survey vessel will tow one source array consisting of three sub-arrays along the pre-determined transects shown in Figure 1-2 to acquire geophysical reflection data from the subsurface rock beds within the survey area.

1.4.1 Project Vessel Configuration and Mobilization

The proposed node deployment/recovery vessel is the Marine Vessel (M/V) *Clean Ocean*. The M/V *Clean Ocean* is based out of the POLA/POLB and is an offshore supply vessel that will be configured to support node storage, deployment, and recovery. It is expected that the M/V

Clean Ocean will be available to support the 2018 survey activities, however if the M/V *Clean Ocean* is unavailable; an equivalent vessel will be secured.

The proposed geophysical survey vessel has not been selected at this time; however, either a locally available work vessel utilizing containerized equipment (e.g. M/V *Silver Arrow)* or specialized geophysical survey vessel (e.g. R/V *Marcus G. Langseth)* will be used to conduct the survey. The M/V *Silver Arrow* would function as a containerized commercial vessel outfitted on behalf of the proposed survey activities. The R/V *Marcus G. Langseth* is a research vessel that is operated by Columbia University's Lamont-Doherty Earth Observatory's Office of Marine Operations (OMO) and can be utilized if available for commercial use. It is expected that one of these vessels would be available to support the 2018 survey activities, however if they are unavailable; an equivalent vessel will be secured. For the purposes of the enclosed analysis, the equipment aboard the M/V *Silver Arrow* is referenced as a likely case scenario, but an alternative vessel would have similar equipment and equivalent (or better) effects. The M/V *Silver Arrow* would be mobilized from Seattle, Washington to Southern California POLA/POLB and Beta Unit offshore Project area. Upon completion of the offshore survey operations, the vessel would return to the POLA/POLB to be outfitted for its next work location.

The M/V *Jab* or equivalent will also provide support during the proposed geophysical survey for operations coordination and vessel preclusion activities. The M/V *Jab* will also be based out of the POLA/POLB during the proposed Project activities.

1.4.2 Offshore Survey Operations

The following sections outline the general equipment specifications and methodology proposed to complete the offshore geophysical survey. Figure 1-3 shows an illustration of the survey technique.

1.4.2.1 Vessel Specifications and Methodology

Node Deployment/Retrieval. The M/V *Clean Ocean*, or similar vessel, will be used to deploy and retrieve the ocean bottom nodes. The M/V *Clean Ocean* is a dynamically positioned vessel suitable for working near fixed structures and in deep water, where anchoring is not feasible. The ship meets all current EPA and CARB emission specifications, powered by two, Tier 3 Cummings QSK-19 engines with 1,500 horsepower. It has a length of 155 feet (47.24 meters), a beam of 36 feet (10.97 meters), and a maximum draft of 9.9 feet (3.0 meters). The vessel also has an 18-ton crane. The M/V *Clean Ocean* (Figure 1-4) will be configured and outfitted for the proposed Project in support of node deployment/recovery activities as further described in Section 1.5.3.3 (Autonomous Nodes) below.

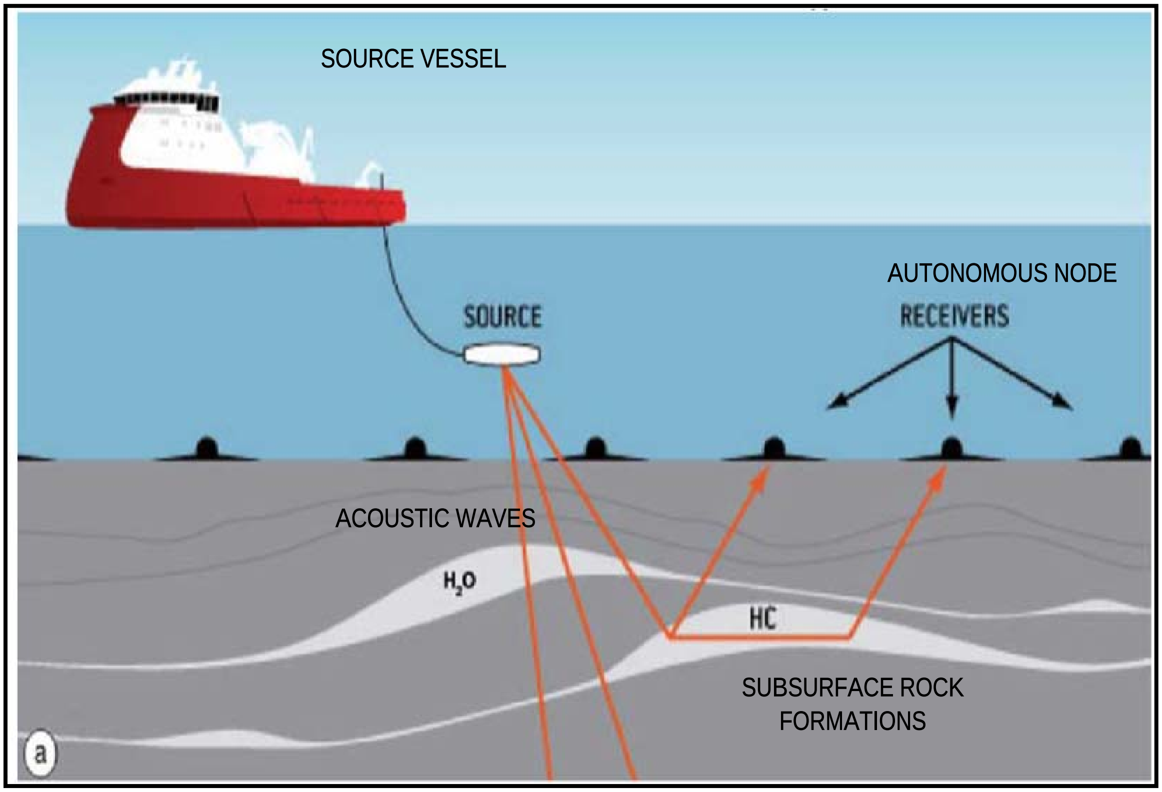

Figure 1-3. Illustration of the Nodal Marine Geophysical Subsurface Survey

Figure 1-4. M/V Clean Ocean Node Deployment/Retrieval Vessel

Source Vessel Operations. The M/V *Silver Arrow* (Figure 1-5), or similar vessel, will tow the source array along predetermined survey transects. The M/V *Silver Arrow* is a DP2 ship, has a length of 240 feet (73.2 meters), a beam of 54 feet (16.5 meters), and a maximum draft of 14.10 feet (4.52 meters). The M/V *Silver Arrow* is an offshore supply vessel that will be configured in support of the proposed activities. The ship is powered by two Caterpillar 3516C main diesel engines, each producing 4,000 horsepower, which drive the 4-blade propellers directly. The vessel also has three Caterpillar C18 primary generators. The operation speed during geophysical data acquisition is typically 4.5 knots (8.3 kilometers per hour). When not towing geophysical survey gear, the M/V *Silver Arrow* typically cruises at 10.0 knots (18.5 kilometers per hour). When the M/V *Silver Arrow* is towing the source array, the vessel would "fly" the appropriate United States Coast Guard (USCG)-approved day shapes (mast head signals used to communicate with other vessels) and display the appropriate lighting to designate the vessel has limited maneuverability.

Figure 1-5. M/V Silver Arrow Survey Vessel

The geophysical support vessel M/V *Jab* has a length of 43 feet (13.10 meters), a beam of 15.5 feet (4.72 meters) and a draft of 2.0 feet (0.6 meters). The ship is powered by two Cummins QSC 8.3 500 horsepower engines. It also has two 8-kw generators. It has a top speed of 34 knots (63.0 kilometers per hour). The M/V *Jab* will be utilized in support of the geophysical survey including enforcement of the proposed operational Exclusion Zone.

1.4.2.2 Source Description

The proposed geophysical source array is comprised of 3 sub-arrays with a combined volume of 3,480 cubic inches (57 liters). An example sub-array is shown in Figure 1-6. The sub-arrays would be configured as three identical, linear arrays or "strings" (Figure 1-7). Each string will have eleven active sound sources (and one spare) in six clusters. Each of the clusters is approximately 9.18 feet (2.8 meters) apart. Each of the three sub-arrays would be towed approximately 328 to 492 feet (100 to 150 meters) behind the vessel and separated from each other by approximately 23 feet (seven meters). Depth ropes from source floats would be used to keep the sound source at a depth of 23 feet (seven meters). The vessel speed during data collection would range from 4 to 5 knots (7.4 to 9.3 kilometers per hour). Depths are monitored by depth sensors mounted on the arrays and horizontal positions are monitored using surface GPS relative to the vessel. The expected timing of the shots is once approximately every seven seconds, and/or approximately every 82.02 feet (25 meters) based on an assumed boat speed of 4.5 knots (8.3 kilometers per hour).

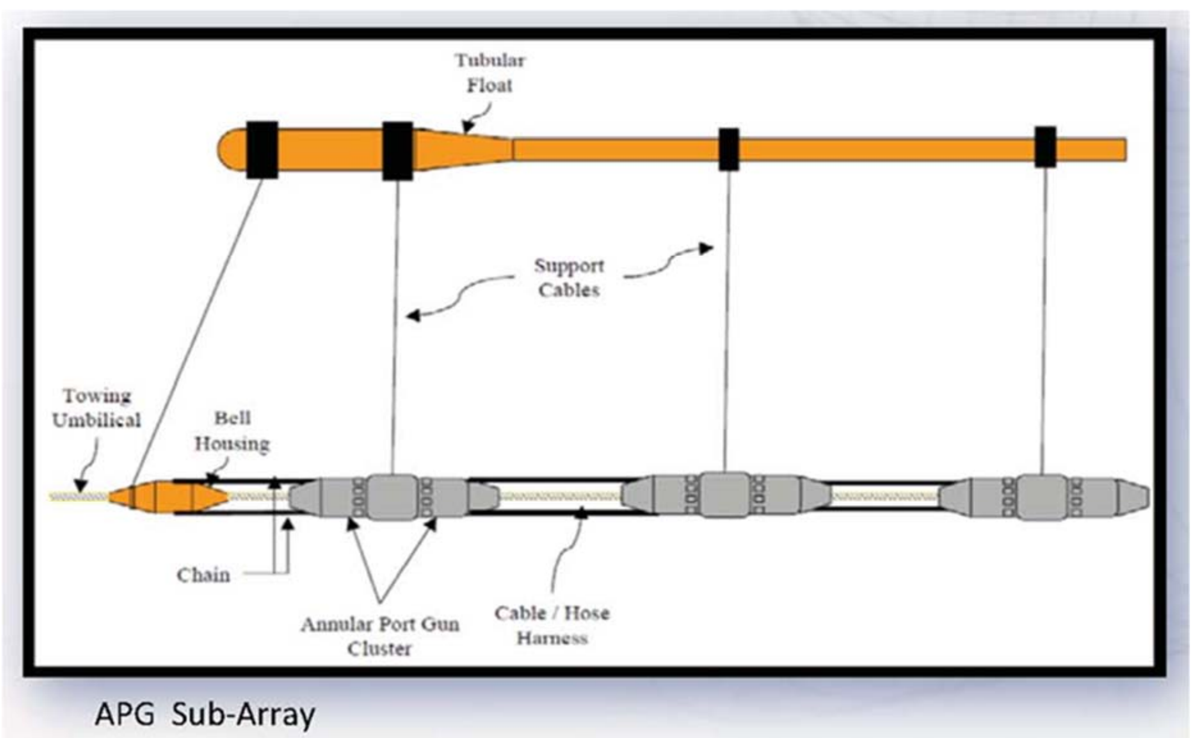

Figure 1-6. APG Sub-Array Sound Source (Example)

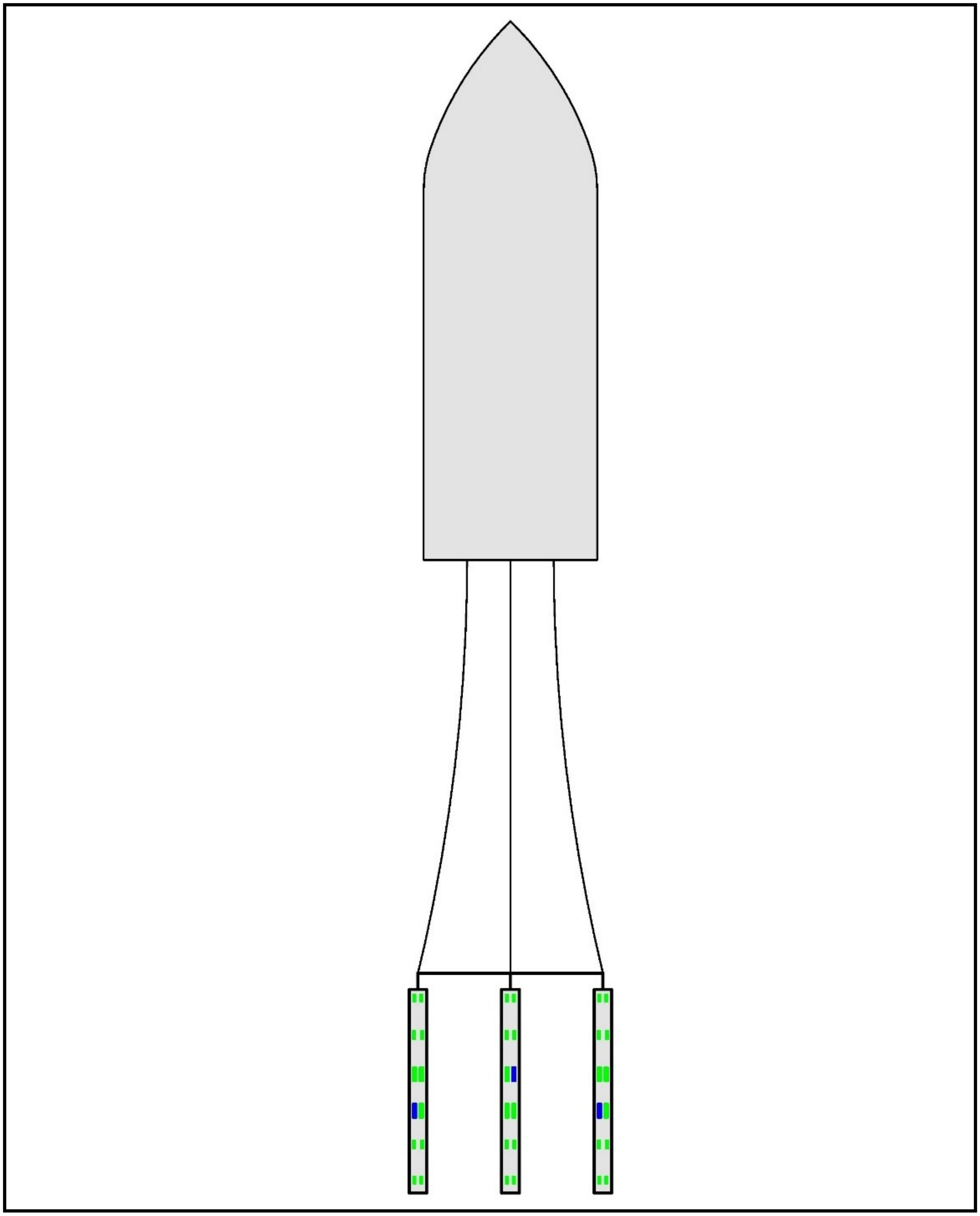

Figure 1-7. Source Array Configuration

The discharge pressure of the array is approximately 2,000 pounds per square inch. To reduce potential noise, the sound source will be operated in "distributed or popcorn mode". During discharge, a brief (~0.1 seconds) pulse of sound is emitted. The sound source would be silent during the intervening periods. Because the actual source is a distributed sound source rather than a single point source, the highest sound levels measurable at any location in the water will be significantly less than the nominal single point source level emitted (as would be the case during other non-related "typical" geophysical surveys). Specifically, rather than activating all sound sources at the same time to generate a sharp source peak, the sound source is initiated independently over a short period of time to generate a firing sequence with reduced peak amplitudes. As only one sound source would be firing at any given time, the effective (perceived) source level for sound propagating would be substantially lower than the nominal source level because of the distributed nature of the sound from the source array. The source array is designed to focus maximum energy downwards rather than in the horizontal directions.

1.4.2.3 Autonomous Nodes

The autonomous nodes are described in Table 1-3. There are 20 receiver lines proposed containing approximately 730 nodes total as shown in Figure 1-9. The survey was designed to satisfy a maximum offset consistent with the design, which is approximately 410 feet (125 meters) so node separation would be no more than 820 feet (250 meters). The system is autonomous and would not require electrical cable connection for operation, though nodes are physically tethered together by cable/rope. The nodes are circular and approximately 65 pounds (lbs.) (29.5 kilograms) in air, and are 17.0-inches in diameter by 6-inches high (43.2 centimeters by 15.2 centimeters) (Figure 1-8). Typical node specifications (Example: FairfieldNodal, 2016) are provided in Table 1-4.

Table 1-3. Node Specifications

Node spacing distance	820 feet (250m)
Receiver line separation	820 feet (250m)
Number of receiver lines	20
Number of nodes total	730
Shot distance	82 feet (25m) inline
Shot line separation	82 feet (25m)
Bin dimension	41 x 41 feet (12.5m x 12.5m)
Azimuth of RL	328.84 deg
Azimuth of SL	53.84 deg
Shots per Sq.km.	1,600
Active nodes per shot	506

Figure 1-8. Shallow Water Node (FairfieldNodal, 2016)

The nodes will be loaded onto the deployment vessel, the M/V *Clean Ocean*, with the onboard crane at the POLA/POLB. The M/V *Clean Ocean* will then travel to the offshore Project site and deploy the nodes at their designated locations. The nodes will be connected to each other by a line no greater than 0.65 inches (1.6 centimeters) in diameter in accordance with National Marine Fisheries Service (NMFS) recommended protocol and manufacturer specifications. Installation of the nodes will be completed when sea state and weather conditions are conducive to safe operations and will be via "live-boat" (no anchoring is proposed), deployment being from the stern of the vessel while moving over the proposed locations at approximately 2 to 4 knots (3.7 to 7.4 kilometers per hour). Deployment of the nodes is anticipated to take approximately seven operational days (one week).

After the nodes have been placed on the seafloor, recording will be conducted for the duration of the Project. At the end of the survey, the M/V Clean Ocean will retrieve each line of temporary nodes. Recovery of the nodes following survey activities is also anticipated to take approximately seven operational days (one week).

1.5 PROJECT PERSONNEL AND EQUIPMENT

1.5.1 Equipment Requirements

The following vessels and equipment are being evaluated for use in the proposed offshore geophysical survey.

- M/V *Clean Ocean* for node deployment/recovery;
- M/V *Silver Arrow* or R/V *Marcus Langseth* for geophysical survey;
- One source array (consisting of three sub-arrays); and
- M/V *Jab* for operations support.

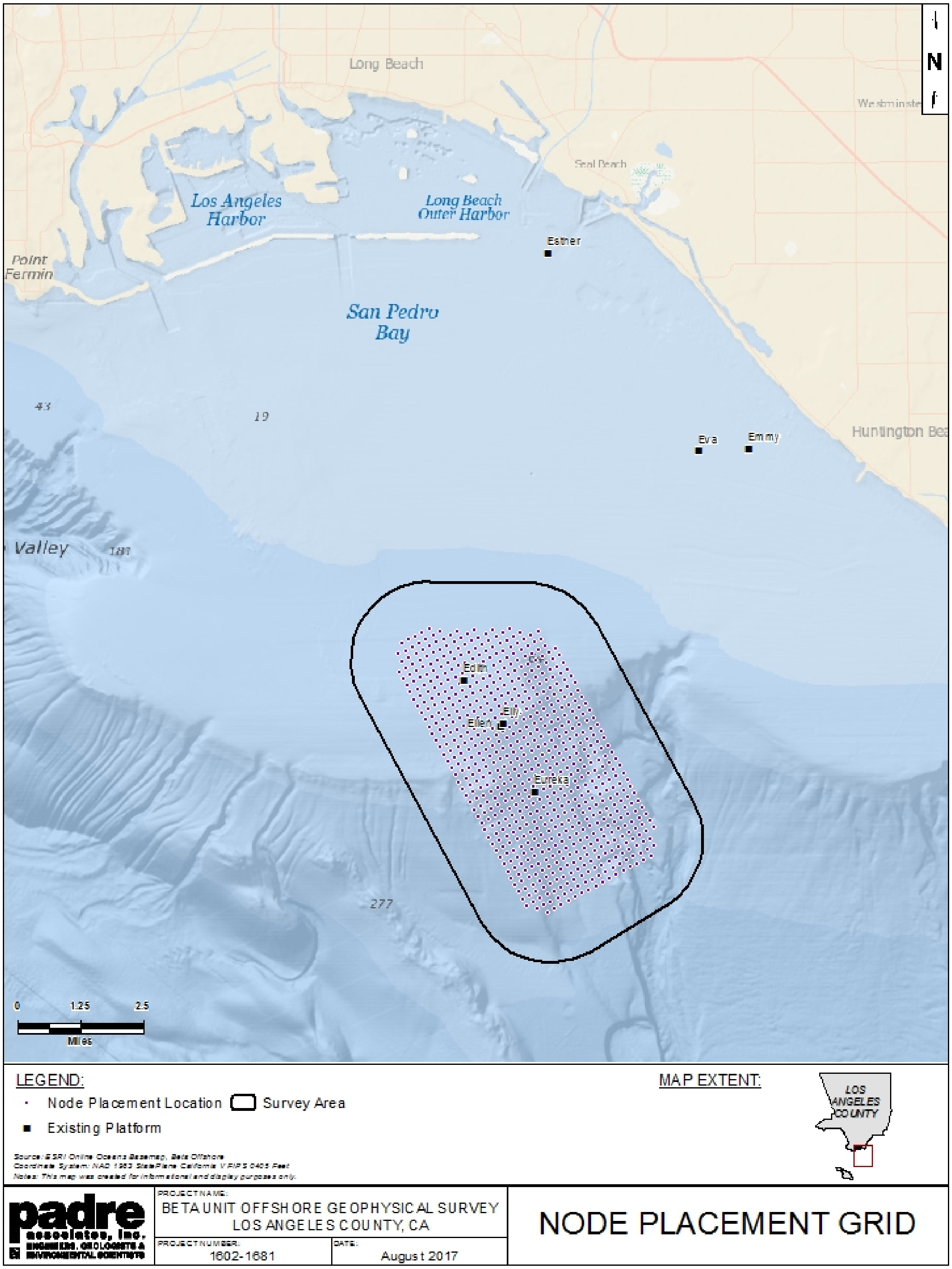

Figure 1-9. Anticipated Node Placement Grid

Table 1-4. Typical Node Specifications (Fairfieldnodal, 2016)

Typical Node Specifications

Seismic Data Channels: 4

ADC Resolution: 24 bits

Sample Interval: 2, 4 milliseconds

Preamplifier Gain

0 dB to 36 dB in 6 dB steps

Anti-Alias Filter

206.5 Hz (82.6% of Nyquist) @ 2 ms,
Linear Phase

DC Blocking Filter

1 Hz to 60 Hz, 6 dB/Octave, or OUT

Operating Temperature Range

-10°C to +60°C

Operating Life (100% Charge)

Up to 60 days continuous recording

Battery

Charging Temperature Range
+3°C to +40°C

Recharge Time: < 8 hours

Acquisition Channel

(2 ms sample interval, 25°C, 31.25 Hz,
internal test, unless otherwise indicated)

Total Harmonic Distortion
0.0003% @ 12 dB gain, -3dB Full Scale

Equivalent Input Noise
1.0 μVrms @ 0 dB
0.4 μVrms @ 12 dB
0.3 μVrms @ 24 dB
0.3 μVrms @ 36 dB

Full Scale Input Signal
2500 mV peak @ 0 dB
625 mV peak @ 12 dB
156 mV peak @ 24 dB
39 mV peak @ 36 dB

Gain Accuracy: 0.50%*

Dynamic Range
120 dB @ 0 dB Preamplifier Gain

Crossfeed
<-100 dB Geophone Channels
<-80 dB Hydrophone Channel**

Common Mode Rejection Ratio
>+90 dB Geophone Channels
>+40 dB Hydrophone Channel**

DC Offset
<10% of Input Noise with DC Blocking
Filter IN

Timing Accuracy
CSAC clock

Self Test Features

Internal Noise (preamp input terminated)

Internal THD

Internal Gain Accuracy

Internal CMRR

Internal Crossfeed

Internal Impulse

Sensor Impedance

Sensors

Geophone
3 orthogonal, omni directional, 15 Hz @ -3
dB, 70% damped 0.57 V/in/s (22.4 V/m/s)

Hydrophone
3.4 Hz @ -3 dB, 8.9 V/Bar

Orientation
±1.5° tilt indication
±5° azimuth (at Latitudes within
± 50° of the Equator)

Physical

Weight: 65 lb (29.5 kg) in air, 40 lb
(18.1 kg) in water

Dimensions: 17 in (43.2 cm) diameter by
6 in (15.2 cm) high

Operating Depth: 700 meters

* Does not include high-impedance low-cut filter for directly coupled hydrophone interface.
** Channel includes high-impedance low-cut filter for directly coupled hydrophone interface.

All specifications relate to Node Part Number 221.6862.0003 only.
FairfieldNodal reserves the right to change specifications without notice to provide the best possible product.

Drawing Number 601.0002.0003 Rev. –
Z700 Node (Version 3) Specifications Sheet

August 2016

1.5.2 Personnel Requirements

It is estimated that the following personnel will be required for the proposed offshore geophysical survey. Additional Project-related personnel may also participate as needed.

- M/V *Clean Ocean* (node deployment/recovery): 10 + including monitors
- M/V *Silver Arrow* (survey): 15 + including monitors
- M/V *Jab* (support): 5
- Administrative/computer support: 3

2.0 MARINE WILDLIFE

The marine wildlife population off southern California includes seven baleen whale species, more than a dozen species of porpoises, dolphins, and other toothed whales, six species of pinnipeds and the southern sea otter. Some marine mammals are purely migrants that pass through central and southern California waters on their way to calving or feeding grounds elsewhere, some are seasonal visitors that remain for a few weeks or months, and others are resident for much or all of the year. In addition, there are four species of marine turtle and several species of birds that may migrate through or use the Project area for foraging. At certain times of the year, hundreds of thousands of marine animals may be present along the coast of southern California (Bonnell and Dailey, 1993).

2.1 MARINE MAMMAL HEARING GROUPS

Five separate marine mammal hearing groups are identified in NOAA's *Technical Guidance on Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing* (Guidance); hearing groups were created based on each the known hearing sensitivity ranges of cetacean and pinnipeds (low- [LF], mid- [MF], and high- [HF] frequency cetaceans, and otariid [OW] and phocid [PW] pinnipeds) (Table 2-1) (NOAA, 2016). Outside the generalized hearing range, the risk of auditory impacts from sound is considered unlikely or very low (the exception would be if a sound above or below the range has the potential to cause physical injury because of high energy levels). The Guidance excludes species protected by the U.S. Fish and Wildlife Service (USFWS) (i.e. Sea otter, sea turtles) and avian species. Table 2-2 provides a list of marine mammal species that may occur along the southern California coast organized by their prospective hearing groups, of which most, but not all, could be present in the Project area during the geophysical survey. Table 2-3 provides information on the seasonal variations in the marine wildlife community within the Project area. It is important to note, where seasonal differences occur, individuals may also be found within the area during the "off" season. Also, depending on the species, the numbers of abundant animals present in their "off" season may be greater than the numbers of less common animals in their "on" season.

Table 2-1. Marine Mammal Hearing Groups

Hearing Group	Generalized Hearing Range*
Low-Frequency (LF) cetacean (baleen whales)	7 Hz to 35 kHz
Mid-Frequency (MF) cetacean (dolphins, toothed whales, beaked whales, bottlenose whales)	150 Hz to 160 kHz
High-Frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, *Lagenorhynchus cruciger,* and *Lagenorhynchus australis*)	275 Hz to 160 kHz
Phocid pinnipeds (PW) (underwater) (true seals)	50 Hz to 86 kHz

Hearing Group	Generalized Hearing Range*
Otariid pinnipeds (OW) (underwater) (sea lions and fur seals)	60 Hz to 39 kHz

* Represents the generalized hearing range for the entire group as a composite (i.e., all species within the group), where individual species' hearing ranges are typically not as broad. Generalized hearing range chosen based on ~65 decibel (dB) threshold from normalized composite audiogram, with the exception for lower limits for LF cetaceans and PW pinniped (approximation).

Table 2-2. California Marine Mammal Population Status and Hearing Group Designations

Common Name *Scientific Name*	Status[1,2]	Minimum Population Estimate	Current Population Trend
LOW-FREQUENCY CETACEANS			
California gray whale *Eschrichtius robustus*		20,125 (Eastern North Pacific Stock)	Fluctuating annually
Fin whale *Balaenoptera physalus*	FE,	2,598 (California/Oregon/Washington Stock)	Increasing off California
Humpback whale *Megaptera novaeangliae*	FE,	1,876 (California/Oregon/Washington Stock)	Increasing
Blue whale *Balaenoptera musculus*	FE,	1,551 (Eastern North Pacific Stock)	Unable to determine
Minke whale *Balaenoptera acutorostrata*		202 (California/Oregon/Washington Stock)	No long-term trends suggested
North Pacific right whale *Eubalaena japonica*	FE, SP	23 (based on photo-identification) (Eastern North Pacific Stock)	No long-term trends suggested
Sei whale *Balaenoptera borealis*	FE	83 (Eastern North Pacific Stock)	No long-term trends suggested
MID-FREQUENCY CEATACEANS			
Long-beaked common dolphin *Delphinus capensis*		76,224 (California Stock)	Unable to determine
Short-beaked common dolphin *Delphinus delphis*		343,990 (California/Oregon/Washington Stock)	Unable to determine
Pacific white-sided dolphin *Lagenorhynchus obliquidens*		21,406 (California/Oregon/Washington Stock)	No long-term trends suggested
Risso's dolphin *Grampus griseus*		4,913 (California/Oregon/Washington Stock)	No long-term trends suggested
Northern right whale dolphin *Lissodelphis borealis*		6,019 (California/Oregon/Washington Stock)	No long-term trends suggested
Striped dolphin *Stenella coeruleoalba*		8,231 (California, Oregon, Washington)	No long-term trend due to rarity
Baird's beaked whale *Berardius bairdii*		466 (California, Oregon, Washington)	No long-term trend due to rarity
Cuvier's beaked whale *Ziphius cavirostris*		4,481 (California, Oregon, Washington)	No long-term trend due to rarity
Mesoplodont beaked whales *Mesoplodont* sp		389 (California, Oregon, Washington)	No long-term trend due to rarity
Bottlenose dolphin *Tursiops truncatus*		684 (California/Oregon/Washington Offshore Stock)	No long-term trends suggested
		290 (California Coastal Stock)	No long-term trends suggested
Sperm whale *Physeter macrocephalus*	FE	1,332 (California/Oregon/Washington Stock)	No long-term trends suggested

Common Name ***Scientific Name***	**Status**[1,2]	**Minimum Population Estimate**	**Current Population Trend**
Short-finned pilot whale *Globicephala macrorhynchus*		465 (California/Oregon/Washington Stock)	No long-term trends suggested
Killer whale *Orcinus orca*		243 (West Coast Transient Stock)	Slight decrease since mid 1990s
		162 (Eastern North Pacific Offshore Stock in California/Oregon/Washington waters)	No long-term trends suggested
HIGH-FREQUENCY CETACEANS			
Dall's porpoise *Phocoenoides dalli*		32,106 (California/Oregon/Washington Stock)	Unable to determine
Dwarf sperm whale *Kogia sima*		Unknown (California, Oregon, Washington)	No long-term trend due to rarity
Pygmy sperm whale *Kogia breviceps*		271 (California/Oregon/Washington Stock)	No long-term trend due to rarity
OTARIID PINNIPEDS			
California sea lion *Zalophus californianus*		153,337 (U.S. Stock)	Increasing
Guadalupe fur seal Arctocephalus townsendi	FT, SP	3,028 (Mexico Stock; Undetermined in California)	Increasing
Northern fur seal *Callorhinus ursinus*		6,858 (San Miguel Island Stock)	Increasing
PHOCID PINNIPEDS			
Northern elephant seal *Mirounga angustirostris*	SP	81,368 (California Breeding Stock)	Increasing
Pacific harbor seal *Phoca vitulina richardsi*		27,348 (California Stock)	Decreasing
FISSIPEDS			
Southern sea otter *Enhydra lutris nereis*	FT, SP	3,272 (California Stock)	Stable

[1]**Status Codes:**

FE Federally listed Endangered Species

FT Federally listed Threatened Species

ST State listed Threatened Species

SP State Fully Protected Species

[2]All marine mammals are Federally protected under the Marine Mammal Protection Act (MMPA).

Source: NMFS, 2017b; and Tinker and Hatfield, 2016.

Table 2-3. Marine Wildlife Species within California and Periods of Occurrence

Family / Common Name	Month of Occurrence(1)											
	J	F	M	A	M	J	J	A	S	O	N	D
Mysticeti												
California gray whale												
Blue whale (E)												
Fin whale (E)												
Humpback whale (E)												
Minke whale												
Sei whale (E)												
Northern right whale (E)												
Odontoceti												
Dall's porpoise												
Short-beaked common dolphin												
Long-beaked common dolphin												
Pacific white-sided dolphin												
Risso's dolphin												
Short-finned pilot whale												
Bottlenose dolphin												
Northern right whale dolphin												
Sperm whale												
Dwarf sperm whale												
Pygmy sperm whale												
Baird's beaked whale												
Cuvier's beaked whale												
Mesoplodont beaked whales												
Killer whale												
Pinnipedia												
Guadalupe fur seal												
Northern fur seal												
California sea lion												
Northern elephant seal(4)												
Pacific harbor seal												
Fissipedia												
Southern sea otter (T)(5)												

Rare with uniform distribution

Not expected to occur

More likely to occur due to seasonal distribution

Present Year Round

Notes:

(E) Federally listed endangered species.

(T) Federally listed threatened species.

(1) Where seasonal differences occur, individuals may also be found in the "off" season. Also, depending on the species, the numbers of abundant animals present in their "off" season may be greater than the numbers of less common animals in their "on" season.

(2) Rarely encountered, but may be present year-round. Greatest abundance during July through September.

(3) Only a small percent occurs over continental shelf (except near San Miguel rookery, May-November).

(4) Common near land during winter breeding season and spring molting season.

(5) Nearshore only (diving limit 100 feet).

2.2 MARINE MAMMAL ACOUSTIC THRESHOLDS

Marine wildlife may experience changes to their hearing if exposed to high energy noise levels. The onset of temporary threshold shifts (TTS) or permanent threshold shifts (PTS) occur when the noise levels either temporarily or permanently alters the animals' ability to hear certain wavelengths of sound. An impulsive sound source, such as the Project sound source array, produce sounds that are typically transient, brief (less than one second), broadband, and consist of high peak sound pressure with rapid rise time and rapid decay. The high peak sound pressure and rapid rise time of impulsive sources make this type of acoustic source potentially more injurious than non-impulsive sound sources. However, it is known that as sounds propagate from the source, the characteristics of impulsive sounds that make them more injurious start to dissipate due to the effects of propagation (NOAA, 2016). Exposure to impulsive sounds can create a greater risk of causing direct damage to an animal's inner ear. Often the risk of damage does not depend on the duration of exposure, and instead reaches a "critical level" where damage switches from being primarily metabolic to mechanical, and short duration of impulse can be less than the ear's integration time, leading to damage beyond the level the ear can perceive.

NMFS Guidance (2016) identifies received acoustic threshold levels at which each marine mammal hearing group is predicted to experience damage or permanent changes to their hearing (Table 2-4). TTS levels were only published for non-impulse sound sources due to the availability of current data, and therefore they are not included in Table 2-4 since Project will utilized a source which produces impulsive sounds. Acoustic thresholds are presented as duel metric acoustic thresholds using cumulative sound exposure levels (SEL_{cum}) and peak sound pressure (PK) metrics for impulsive sounds. As duel metrics, NMFS considers the onset of PTS to have occurred when either one of the two metrics are exceeded. The SEL_{cum} metric takes into account both received level and duration of exposure (usually 24 hours); both factors can attribute to noise induced hearing loss (NIHL). NMFS intends for the SEL_{cum} to account for the accumulated exposure. Due to the sensitivity of their hearing abilities, it is likely that LF cetaceans will be more affected by the cumulative noise levels, while HF cetaceans will be more affected by the peak sound pressures.

Lastly, NMFS' previous acoustic thresholds (i.e., 160 decibel (dB) or 180 dB harassment levels) are not directly comparable to acoustic thresholds outlined in the Guidance (i.e., previous thresholds are expressed as root-mean-square sound pressure level [RMS SPL], which is different from the PK and SEL_{cum}; for example, a RMS SPL threshold of 180 dB is not equal to a PK threshold of 180 dB).

2.3 PINNIPED HAUL-OUTS AND ROOKERIES

The proposed Project activities will not occur near any known pinniped haul-out and/or rookeries; however, pinnipeds have been observed utilizing lower decks at the platforms on a regular basis (Figure 2-1). The closest California sea lion and Pacific harbor seal haul-out and/or rookery has been recorded approximately 18 mi (29 km) southwest of the Project area, on the northeast shore of Catalina Island.

Table 2-4. Permanent Threshold Shift Onset Acoustic Thresholds for Impulsive Sound Sources

Hearing Group	SEL (weighted) (dB SEL)	Peak SPL (dB SPL)
LF	183	219
MF	185	230
HF	155	202
OW	203	232
PW	185	218

Note: SEL thresholds are in dB re 1 μPa2s and peak SPL thresholds are in dB re 1 μPa.

Source: Finneran, 2016, Table AE-1

2.4 SOUTHERN SEA OTTER

Historically the range of southern sea otters (*Enhydra lutris nereis*) extended from the northern islands of the Japanese Archipelago northeast along Alaska and southward along North America to Baja California (Dailey et al., 1993). The sea otter was nearly extirpated by the fur trade during the 18th and 19th centuries. In 1977, the southern sea otter was listed as threatened under the Federal Endangered Species Act. As a consequence of their threatened status, southern sea otters are also recognized as depleted under the Marine Mammal Protection Act. Under State law, southern sea otters are "fully protected" mammals. The current range extends from about Pigeon Point in the north to Santa Barbara in the south. A small, satellite population of an estimated 78 animals also occurs at San Nicolas Island, the result of a translocation effort in the late 1980s (Tinker and Hartfield, 2016). This species prefers rocky shoreline with water depth of less than 200 ft (60 m), which support kelp beds where they feed on benthic macroinvertebrates including clams, crabs, abalone, sea urchins, and sea stars; therefore, there is a low likelihood that they will occur in the Project area (Allen et al., 2011). Recent minimum population estimates for southern sea otters in California indicate that at least 3,272 individuals are known to occur and no long-term trends in this population are available (Tinker and Hartfield, 2016). Due to the offshore location of Project-related activities, it is highly unlikely southern sea otters will be present in the survey area.

2.5 MARINE TURTLES

All marine turtles in U.S. waters are listed under the FESA. Table 2-5 lists the species that could be encountered within the Project area and their occurrences and distribution throughout southern California. It is important to note, where seasonal differences occur, individuals may also be found within the area during the “off” season. Also, depending on the species, the numbers of abundant animals present in their “off” season may be greater than the numbers of less common animals in their “on” season. Table 2-6 provides the most recent abundance estimate for California Marine turtles.

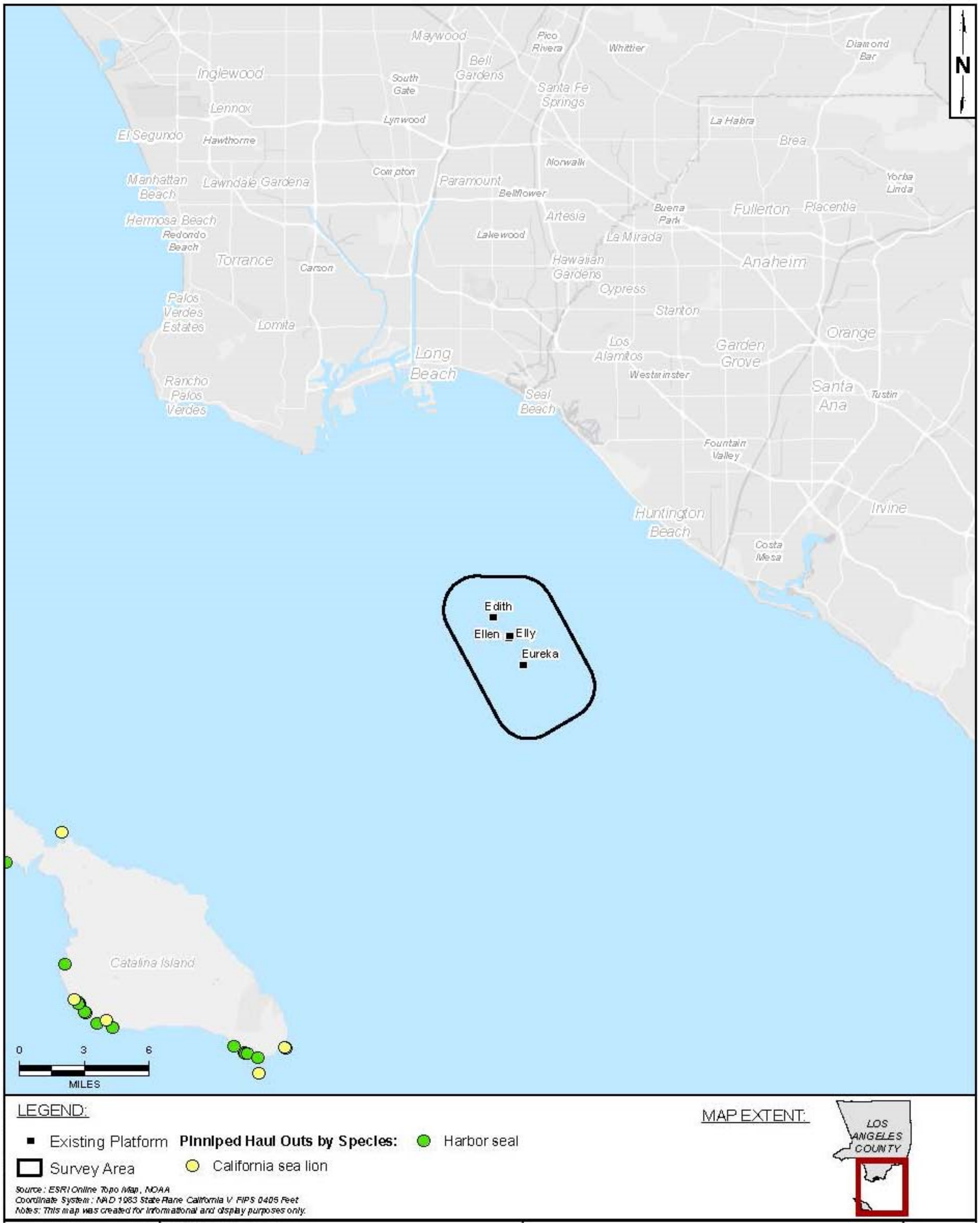

Figure 2-1. Pinniped Haul-Outs and Rookeries Near the Project Area

Table 2-5. California Marine Turtle Species and Periods of Occurrence within Southern California (California/Mexico Border to Point Conception)

Family Common Name	Month of Occurrence(1)											
	J	F	M	A	M	J	J	A	S	O	N	D
REPTILES												
Cryptodira												
Olive ridley turtle (T)												
Green turtle (T)												
Leatherback turtle (E)												
Loggerhead turtle (T)												

Rare with uniform distribution | Not expected to occur due to seasonal distribution | More likely to occur due to seasonal distribution | Present Year Round

(E) Federally listed endangered species.
(T) Federally listed threatened species.
(1) Where seasonal differences occur, individuals may also be found in the “off” season. Also, depending on the species, the numbers of abundant animals present in their “off” season may be greater than the numbers of less common animals in their “on” season.

Table 2-6. Abundance Estimates for Marine Turtles of Southern California

Common Name ***Scientific Name***	**Population Estimate**	**Current Population Trend**
REPTILES		
Cryptodira		
Olive Ridley turtle***** *Lepidochelys olivacea*	1.1 million (Eastern Tropical Pacific Distinct Population Segment [DPS])	Stable
Green turtle***** *Chelonia mydas*	20,112 (Eastern Pacific DPS)	Stable
Loggerhead turtle *Caretta caretta*	7,138 (California)	Decreasing
Leatherback turtle *Dermochelys coriacea*	361 (California)	Decreasing

Source: NMFS, 2017b

* Estimates are based on known data of the population of nesting females for eastern Pacific Distinct Population Segments.

2.6 MARINE BIRDS

The Pacific Flyway is a major migratory route for all bird species that travel from the northwestern United States, Canada, and Alaska to southern California and Central America. The Pacific Flyway actually consists of at least two relatively distinct pathways: the mainland route, which is primary route that parallels the coast approximately 50 to 100 mi (80 to 161 km) inland, and the oceanic route, which is used predominantly by seabirds during their transequatorial migration between the North and South Pacific. A portion of the Pacific Flyway is located off the coast of California, but the exact location can vary depending on weather. Marine birds tend to fly at elevations between 100 and 200 ft (30 to 61 m) above the ocean (Aspen, 2008). However, weather conditions, such as wind and fog, can greatly influence flight altitude.

Because of species diversity in central and southern California, the timing of seasonal migrations can vary; however, the majority of southward migration to wintering areas occurs from late September to late December. The fall migration generally occurs over a longer period of time compared to the spring migration presumably because of the variability in the length of time of species egg incubation, and nesting and fledging times of birds that breed in the region. Spring migration normally occurs from February through the beginning of June, and the fall migration route of coastal seabirds is usually further offshore than that used by the spring migrants (Aspen, 2008).

Generally, marine bird densities south of Pt. Conception are highest in January. These densities are, however, based on the springtime seabird breeding populations on the Northern Channel Islands and on the abundance of overwintering birds within that area. Generally, birds that are the most common in the winter months within the Project region are: California gull (*Larus californicus*), western gull (*Larus occidentalis*), western grebe (*Aechmophorus occidentalis*), Cassin's auklet (*Ptychoramphus aleuticus*), and surf scoter (*Melanitta perspicillata*). Sooty shearwaters (*Puffinus griseus*), Short-tailed shearwaters (*Puffinus tenuirostris*), pigeon guillemots (*Cepphus columba*), cormorants (*Phalacrocorax* spp.), and California brown pelicans (*Pelecanus occidentalis*) (Mason et al., 2007).

There is the potential for special-status species marine birds to occur within the survey area. Special-status bird species that may occur in the survey area include Xantus's murrelet (*Synthliboramphus hypoleucus)*, marbled murrelet (*Brachyramphus marmoratus),* California brown pelican, ashy storm-petrel (*Oceanodroma homochroa)*, black storm-petrel (*Oceanodroma melania)*, California least tern (*Sternula antillarum)*, pink-footed shearwater (*Puffinus creatopus)*, black-vented shearwater (*Puffinus opisthomelas)*, tufted puffin (*Fratercula cirrhata)*, Cassin's auklet (*Ptychoramphus aleuticus)*, short-tailed albatross (*Phoebastria albatrus)*, black-footed albatross (*Phoebastria nigripes)*, double-crested cormorant (*Phalacrocorax auritus)*, elegant tern (*Thalasseus elegans)*, California gull (*Larus californicus)*, and the rhinoceros auklet (*Cerorhinca monocerata)*. More detailed information on the species and seasonal distribution can be found in the Project's Environmental Assessment.

3.0 MARINE PROTECTED AREAS

Marine Protected Areas (MPAs) are regions along the California coast afforded protection under the Marine Life Protection Act by California Department of Fish and Wildlife (CDFW) (Figure 3-1). The nearest MPA to the Project area is the Bolsa Chica Basin MPA, which is approximately 5.9 mi (9.4 km) northeast of the Project area. Project activities are not proposed to occur within any MPAs.

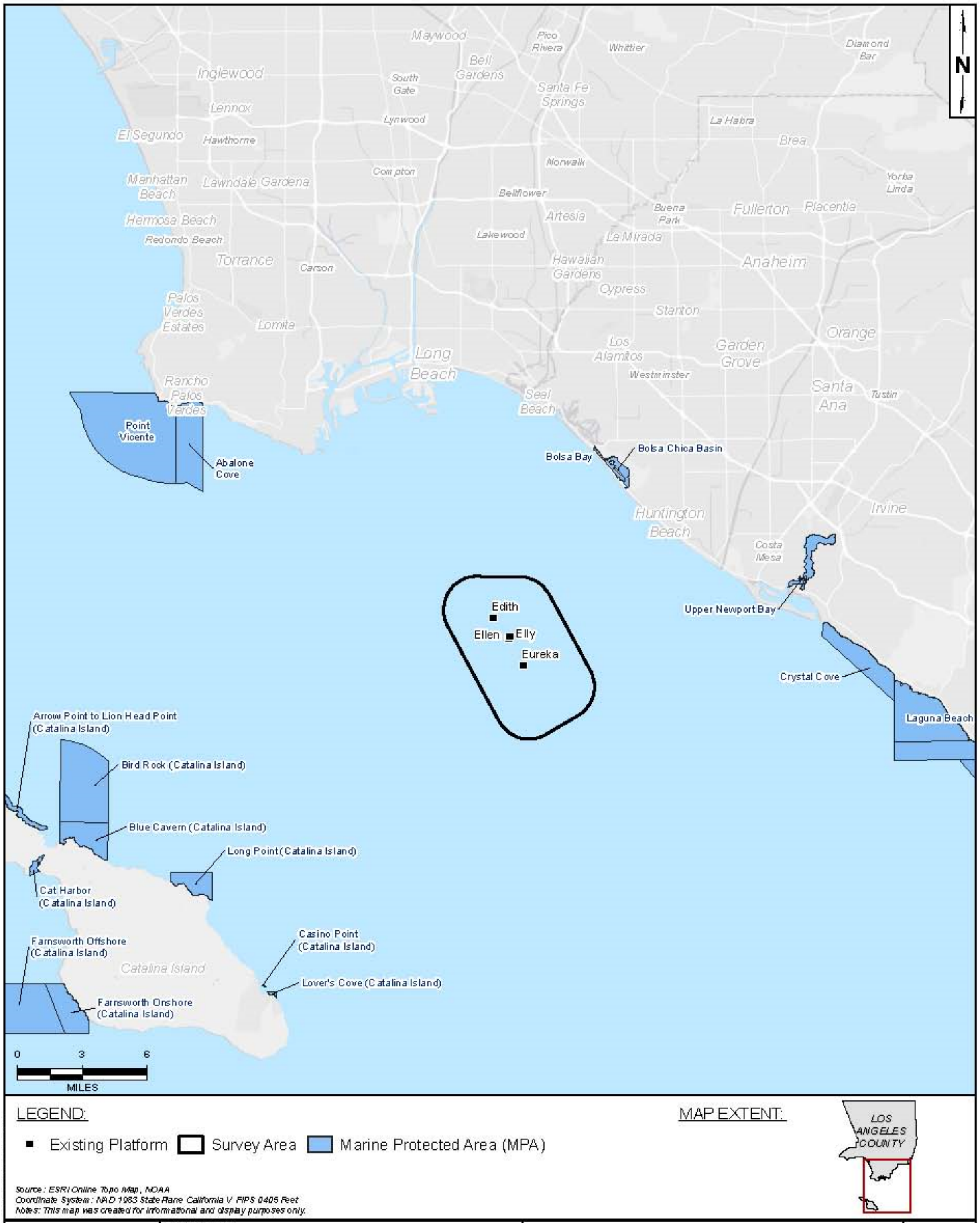

Figure 3-1. Marine Protected Areas Near the Project Area

4.0 MARINE WILDLIFE MONITORING PROGRAM

This MWCP is a combination of active monitoring of the survey area, including passive acoustic monitoring and platform based monitoring, as needed, throughout the duration of Project operations and the implementation of APMs designed to minimize Project impacts to marine resources. If marine mammals or other sensitive wildlife are observed within or about to enter the Buffer or Exclusion Zones around the proposed survey activities, APMs will be initiated by Protected species observers (PSOs). The sizes of the Buffer and Exclusion Zones were modeled by Subacoustech Environmental Ltd. and are described in the following sections (EPI, 2017). The modeled radius of both Zones will be verified by an acoustics contractor prior to the initiation of geophysical data. That verification will consist of direct measurements of the received levels of underwater sound versus distance and direction from the survey vessel using calibrated hydrophones. The acoustical testing will include measurements at several representative sample locations in various water depths. The acoustic data will be analyzed as quickly as reasonably practicable in the field and used to verify and adjust the Buffer and Exclusion Zone distances. The field report will be made available to Bureau of Ocean Energy Management (BOEM) and NMFS for review and approval prior to starting the survey. Distances to the Buffer and Exclusion Zones will be revised based on those actual measurements.

Visual monitoring of the Buffer and Exclusion Zones by PSOs during geophysical survey activities, and periods when surveys are not active, will provide information on the numbers of marine species potentially affected by the survey activities and facilitate real-time APMs to prevent impacts to marine wildlife from Project sounds or activities.

4.1 PRE-ACTIVITY ENVIRONMENTAL ORIENTATION

A marine biologist will present an environmental orientation for all Project personnel prior to conducting work. The purpose of the orientation is to educate Project personnel on identification of wildlife in the Project area and to provide an overview of the APMs that will be implemented during the Project. Specifically, the orientation will include, but not be limited to, the following:

- Identification of wildlife expected to occur in the Project area and periods of occurrence along the central coast;
- Overview of the Marine Mammal Protection Act (MMPA), Federal Endangered Species Act (FESA), and California Endangered Species Act (CESA) regulatory agencies responsible for enforcement of the regulations, and penalties associated with violations;
- Procedures to be followed during mobilization and demobilization, transiting of Project vessels, and the implementation of shutdowns and ramp-ups throughout the duration of the Project; and
- Reporting requirements in the event of an inadvertent collision and/or injury to a marine wildlife or sensitive habitats.

Prior to Project activities briefings will be held between the Beta representatives, the vessel captains, vessel representatives and the PSOs. Topics will include personnel safety, identification of key personnel, communication protocol, and lines of authority.

4.2 PROTECTED SPECIES OBSERVERS

The MWCP will be implemented by Beta and a team of experienced PSOs who will be stationed aboard the survey vessel throughout the duration of the Project, and on Project platforms, as needed and specified in the U.S. Fish and Wildlife Service (USFWS) Incidental Harassment Authorization (IHA). Reports of the results of the marine wildlife monitoring program will include the estimation of the number of Level A or B "takes" as stipulated in the final IHA.

The marine wildlife monitoring program will provide:

- The basis of real-time APMs, if necessary, as required by the various permits that Beta receives;
- Information to estimate the effects of the Project operations on marine wildlife that must be reported to NMFS and USFWS;
- Data on the occurrence, distribution, and activities of marine wildlife in the area where the survey is conducted; and,
- Information to compare the distances, distributions, behaviors, and movements of marine wildlife relative to the survey vessel with and without geophysical survey activity.

The PSOs duties will include watching for and identifying marine wildlife and PSOs will be positioned on the vessel so that each observer will have an unobstructed view of the Project area and immediate Exclusion Zone radius (refer to Section 5.1 for details on Buffer and Exclusion Zones). PSOs may request the cooperation of the crew and contractors to report marine wildlife sightings and help avert any adverse impacts to marine wildlife.

A minimum of two PSOs will be NMFS-qualified personnel. Additional PSOs will have experience monitoring marine mammals and will be working under the supervision of NMFS-qualified personnel. PSOs will record species, number observed, distances, behavioral reactions to the survey operations, recommend APMs, and document all observations and "take by harassment" as defined by NMFS and USFWS.

A minimum of five PSO will be on duty on the survey vessel; there will be two PSOs conducting visual observations concurrent with one PSO conducting PAM. The fourth and fifth PSOs will rest and then rotate with the other PSOs to assure an adequate amount of rest and enhance vigilance in an effort to meet the following criteria:

- One-hundred percent monitoring coverage during all periods of survey operations (daylight visual and acoustic monitoring, and nighttime acoustic and species-specific non-daylight monitoring);

- Maximum of four consecutive hours on watch per PSO; and
- Maximum of 12 hours of watch per day per PSO.

PSOs will have the appropriate safety and monitoring equipment to conduct their observations, including night-vision equipment, low light reticulated binoculars, and thermal imaging cameras for 24/7 operations. In addition, bigeye binoculars will be mounted on the survey vessel for PSO observation purposes. PSOs will utilize a handheld global positioning system (GPS) or the ship's navigation system to record latitude and longitude for each marine wildlife observation. Each PSO will have a handheld radio for communication with the bridge, other Project vessels, and Beta platforms, as necessary. In addition, cell phones, VHS radio, and email capabilities will be available to communicate with onshore personnel.

4.3 VISUAL MONITORING METHODOLOGY

The PSOs will coordinate with the captain of the survey vessel or his representative to select an appropriate monitoring position where they can monitor the Exclusion Zone radius and will have a clear view of the area of ocean that is in the direction of the course of travel while the vessel is transiting. The PSOs will observe marine wildlife and will request procedures to shut-down or ramp-up sound source operations, and/or avoid potential collisions and/or entanglement with marine wildlife. The PSOs will be on station at least 30 minutes before survey activities begin and will remain on duty until at least 30 minutes after all survey activities have been completed. The PSOs will arrange their own schedules to ensure complete coverage while Project activities are occurring.

The PSOs will establish and monitor a 1,640 ft (500 m) Exclusion Zone radius and 3,280 ft (1,000 m) Buffer Zone. These Zones will be based on the radial distance from any element of the sound source array, rather than being based on based on the center of the array or around the vessel itself. If a PSO should observe marine wildlife within the Exclusion Zone of the survey vessel, the monitor will immediately report that observation to the vessel operator who will shut-down the survey operations, slow the vessel and/or change course in order to avoid contact, as deemed necessary by the PSO, unless those actions will jeopardize the safety of the vessel or crew. The path of the marine animal will be closely monitored to determine when it has safely passed through the designated impact zone and Project activities can be ramped up as detailed in Section 11.7. The PSO will have the authority to stop any activity that could result in harm to marine wildlife.

If the PSO should observe marine wildlife within the Buffer Zone, the behavior of marine animal will be monitored and the survey operator will be alerted of the potential for an imminent shut down. If the marine animal within the Buffer Zone displays abnormal behaviors or distress, the monitor will immediately report that observation to the vessel operator who will shut-down the sound source operations, slow the vessel and/or change course in order to avoid contact, as deemed necessary by the PSO, unless those actions will jeopardize the safety of the vessel or crew. Distress can be defined as any abnormal behavior that appears to be related to Project operations such as sudden change in direction, rapid breathing, and sudden or erratic changes in behavior.

4.3.1 Thermal Imaging Cameras

Thermal imaging cameras will be utilized during hours of darkness to assist with nighttime ramp up pre-clearance searches. The dual camera system enables consistent visual monitoring in low visibility and night time conditions. Real-time monitoring stations can be set up on the vessel and/or image data can be recorded for later playback analysis. The camera system consists of two modules: a High Definition (HD) camera and a thermal imaging camera configured for maritime use with pan and tilt functionality. The system uses Seiche proprietary software Real-time Automated Distance Estimate at Sea (RADES) to stabilize image and enable accurate distance estimation. Various configuration options are available to ensure optimal visual coverage of up to 360 degrees. Three Cameras would be installed for full 360 degrees coverage. In addition, Buffer and Exclusion Zone distances can be overlaid onto thermal images to assist in monitoring wildlife within impact zones.

4.4 PASSIVE ACOUSTIC MONITORING

Passive Acoustic Monitoring (PAM) will be used to detect cetacean species and will complement the visual monitoring program. Visual monitoring typically is not as effective during periods of poor visibility or at night. Even with good visibility, visual monitoring is unable to detect marine mammals when they are below the surface or beyond visual range. Acoustic monitoring can be used in addition to visual observations to improve detection, identification, and location of vocalizing cetaceans. Acoustic monitoring will be conducted in real time so that the visual observers can be advised when cetaceans are detected. Detection distance will depend on the target species and hardware used during monitoring.

The PAM system consists of hardware (i.e., hydrophones) and software. The “wet end” of the system consists of a towed hydrophone array that is connected to the vessel by a tow cable. The tow cable is approximately 800 ft (250 m) long, and the hydrophones are fitted in the last 32.0 ft (10.0 m) of cable. A depth gauge is attached to the free end of the cable, and the cable is typically towed at depths <66.0 ft (20.0 m). The array will be deployed by a winch located on the aft deck and a deck cable will connect the tow cable to the electronics unit in the main computer lab where the acoustic station, signal conditioning, and processing system will be located. The acoustic signals received by the hydrophones are amplified, digitized, and then processed by the Pamguard software, or a comparable, preferred software. The system can detect marine mammal vocalizations at frequencies up to 250 kHz.

At least one acoustic PSO (in addition to the four visual PSOs) will be onboard the M/V *Silver Arrow*. The towed hydrophones will ideally be monitored by a PSO 24/7 while within the survey area during sound source operations. One PSO will monitor the acoustic detection system at any one time by listening to the signals from two channels via headphones and/or speakers and watching the real-time spectrographic display for frequency ranges produced by cetaceans. The PAM PSO shift can be from one to six hours long and PSOs are expected to rotate through the PAM position, although the acoustic PSO will be on PAM duty more frequently.

When a vocalization is detected during daylight operations, the acoustic PSO will contact the visual PSO immediately, to alert him/her to the presence of cetaceans (if they have not already been seen), and to allow shut down to be initiated, if required. In addition, PAM shall be performed during night-time operations and may be supplemented by visual monitoring using equipment to enhance detection rates, including advanced infrared equipment, sodium lighting, and/or millimeter waves radar. When a cetacean is detected by acoustic monitoring within the Exclusion Zone during non-daylight hours, a visual PSO, the geophysical crew, and the captain of the survey vessel will be notified immediately so that APMs may be implemented. The acoustic PSO will continue to monitor the hydrophones and inform a visual PSO, geophysical crew, and the captain when the mammal(s) appear to be outside the Exclusion Zone.

The information regarding each call will be entered into a database. The data to be entered include: an acoustic encounter identification number; whether it was linked with a visual sighting; date and time when first and last heard, and whenever any additional information was recorded; position and water depth when first detected; bearing, if determinable; species or species group, types and nature of sounds heard (e.g., clicks, continuous, sporadic, whistles, creaks, burst pulses, strength of signal, etc.); and, any other notable information.

4.5 PLATFORM BASED MONITORING

To achieve complete observation of both the Exclusion and Buffer Zones, additional monitoring will be implemented from Project platforms during active sound source operations, as necessary based on the presence and density of marine wildlife observed. PSOs stationed on platforms will be in direct contact with PSOs stationed on the survey vessel through VHF radios or cell phones, whichever provides better service based on the survey vessel's location. The PSO on duty will be stationed on the highest deck (i.e., helideck or approximately 100 ft [37 m] above sea level) of the platform where he/she can safely monitor the entire range of the Exclusion and Buffer Zone. In addition, PSOs will be able to monitor the behavior and reactions of pinnipeds in the water adjacent to the platform during active sound source operations. If a PSO on a platform should observe marine wildlife within the Buffer or Exclusion Zone of the survey vessel, the monitor will immediately report that observation to the on duty PSO on the survey vessel. The vessel-based PSO will notify the vessel operator and/or survey team, who will shut-down the survey operations, slow the vessel and/or change course in order to avoid contact, as deemed necessary by the PSO, unless those actions will jeopardize the safety of the vessel or crew. The path of the marine animal will be closely monitored to determine when it has safely passed through the designated impact zone. Daily observation records will be cross-referenced between the platform and vessel-based PSOs field reports to ensure observations are not duplicated.

5.0 APPLICANT PROPOSED MEASURES DURING SURVEY ACTIVITIES

As part of the marine wildlife monitoring program, the APMs detailed in the following section will be implemented to further minimize the potential disturbance of marine wildlife during Project operations. In addition, the Project incorporates both design and operational procedures for minimizing potential impacts to marine wildlife and other special-status species. The design features and operational procedures have been described in Section 1.0 and include:

- Timing and locating survey activities to avoid interference with the annual gray, humpback and blue whale migration period;
- Limiting the size of the source array to minimize energy introduced into the marine environment;
- Operating sound sources in a “distributed or popcorn mode” to generate a firing sequence with reduced peak amplitudes;
- Establishing precautionary Buffer and Exclusion Zones based on known source levels, noise modeling studies, and the results of field verification;
- Sound source verification;
- Speed and course alterations; and
- Sound Source Ramp ups.

5.1 SCHEDULING OF THE SURVEY

Beta proposes to conduct offshore surveys during September 2018 to coincide with the reduced number of cetaceans in the area, and outside the peak gray and humpback whale migration period. The grey whale southward migration generally occurs from December through February and peaks in January; the northward migration generally occurs from February through May in the study area, and peaks in March. The humpback whales are most common offshore southern California during April through October. Then in late autumn, humpback whales will begin their migration southward to warmer Mexican waters for calving. This time frame also is outside breeding and pupping periods for phocid and otariid species (March to June) which have rookeries adjacent to the Project area.

5.2 PRE-ACTIVITY ENVIRONMENTAL ORIENTATION

A marine biologist will present an environmental orientation for all Project personnel prior to conducting work. The purpose of the orientation is to educate Project personnel on identification of wildlife in the Project area and to provide an overview of the APMs that will be implemented during the Project. Specifically, the orientation will include, but not be limited to, the following:

- Identification of wildlife expected to occur in the Project area and periods of occurrence along the central coast;

- Overview of the Marine Mammal Protection Act (MMPA), Federal Endangered Species Act (FESA), and California Endangered Species Act (CESA) regulatory agencies responsible for enforcement of the regulations, and penalties associated with violations;
- Procedures to be followed during mobilization and demobilization, transiting of Project vessels, and the implementation of shutdowns and ramp-ups throughout the duration of the Project; and
- Reporting requirements in the event of an inadvertent collision and/or injury to a marine wildlife or sensitive habitats.

Prior to Project activities briefings will be held between the Beta representatives, the vessel captains, vessel representatives and the Protected Species Observers (PSOs). Topics will include personnel safety, identification of key personnel, communication protocol, and lines of authority.

5.3 REDUCING SOUND SOURCE

The discharge pressure of the array is approximately 2,000 pounds per square inch (psi). To reduce potential noise, the sound source will be operated in “distributed or popcorn mode”. During discharge, a brief (~0.1 seconds) pulse of sound is emitted. The sound sources would be silent during the intervening periods. Because the actual source is a distributed sound source (11 sound sources in each of the three sub-array) rather than a single point source, the highest sound levels measurable at any location in the water will be significantly less than the nominal single point source level emitted (as would be the case during other non-related “typical” geophysical surveys). Specifically, rather than activating all sound sources at the same time to generate a sharp source peak, the sound sources are initiated independently over a short period of time to generate a firing sequence with reduced peak amplitudes. As only one sound source would be firing at any given time, the effective (perceived) source level for sound propagating would be substantially lower than the nominal source level because of the distributed nature of the sound from the sound source array. The sound source array is designed to focus maximum energy downwards rather than in the horizontal directions.

5.4 SOUND SOURCE VERIFICATION

Prior to the start of survey operations, a sound source verification (SSV) will be conducted by the source vessel to ensure actual acoustic energy levels from the sound source array are consistent with previous modeling. The results of the SSV will be used to adjust the Exclusion and Buffer Zones as necessary.

5.5 BUFFER AND EXCLUSION ZONES

The PSOs will establish and monitor a 1,640 ft (500 m) Exclusion Zone radius and 3,280 ft (1,000 m) Buffer Zone. These Zones will be based on the radial distance from any element of the sound source array, rather than being based on based on the center of the array or around the vessel itself. The Exclusion Zone is a defined area within an occurrence of a marine mammal triggers mitigation action intended to reduce potential for harassment or injury. If marine wildlife appear within, enters, or appears on a course to enter this Zone, the acoustic source will be shut down. If a marine mammal is detected acoustically, the acoustic source will be shut down, unless the PAM operator is confident that the animal detected is outside the Exclusion Zone or that the detected species is not subject to the shutdown requirements (refer to Section 5.5.1). Disturbance or behavioral effects to marine mammals may occur after exposure to underwater sound at distances greater than the designated Exclusion Zone (Richardson et al., 1995). In addition, a Buffer Zone has been designated to provide an adequate buffer to allow for the initial reduction in sound levels prior to the potential entry of animals into the Exclusion Zone.

The Buffer and Exclusion Zone for marine wildlife is customarily defined as the distance within which received sound levels are above specific harassment levels defined by NOAA and NMFS. “Level A” harassment has been historically correlated with impacts to marine mammals within the Exclusion Zone, while “Level B” harassment is correlated with impacts within the Buffer Zone. This criterion is based on an assumption that sound energy received at lower received levels outside of each respective Zone will not injure or impair the hearing abilities of these animals or effect their natural behaviors. Although the Exclusion and Buffer Zones are not directly based on the acoustic modeling and the “Level A” or “Level B” harassment criteria, it is Beta’s intent to provide a standard monitoring distances that will:

1. Encompass zones for most species within which auditory injury could occur on the basis of instantaneous exposure;

2. Provide additional protection from the potential for more severe behavioral reactions for marine wildlife at close range to the acoustic source;

3. Provide consistency for PSOs; and

4. To define a distance within which detection probabilities are reasonably high for most species under typical conditions. In addition, standard zones have been proven as a feasible measure through prior implementation by operators in the Gulf of Mexico (NMFS, 2017a).

5.5.1 Special Shut-Down Provisions

5.5.1.1 Special-Status Species Shutdowns

If at any time a Federally threatened or endangered whale species (i.e., blue whale, fin whale, humpback whale, sei whale, north pacific right whale or sperm whale) is visually or acoustically detected at any distance, the PSO or PAM operator on duty will call for the immediate shut down of the sound source. When the PSO or PAM operator on duty confirms that no marine mammal has been detected within the 3,280 feet (1000 meter) Buffer Zone for at least a 30-minute period, a soft start can commence and the survey operations can continue.

5.5.1.2 Delphinids and Otariid Shutdowns and Ramp ups

No mitigation action will be required if a delphinid or otariid pinniped (i.e., short or long-beaked common dolphin or California sea lion) is visually observed to be "voluntarily approaching" the survey vessel or source array. A voluntary approach is defined as a clear and purposeful approach toward the vessel by an animal at a speed and vector that indicates the animal(s) intends to approach the vessel (BOEM 2014). NMFS (2001, p.9293) states that an exposure to a specific activity that does not disrupt an animal's normal behavioral pattern should not require a take authorization. Therefore, a delphinid or otariid voluntarily approaching the survey vessel during acquisition would not be considered to display an adverse behavioral reaction that is significant enough to constitute a disturbance. A power down will be observed when a delphinid or otariid is:

- Visually detected entering the mitigation zone and the PSO determines the dolphin does not intend to approach the vessel; or
- Acoustically detected entering the Exclusion Zone and a visual observation to determine the dolphin's intent is not possible.

If a dolphin or pinniped comes within 10 m (32 ft) of the source array where received sound levels are estimated to be ≥185 dB (MF PTS criteria) then a shutdown will commence immediately. A ramp-up will be initiated when the animal is confirmed to have moved at least 10 m (32 ft) away from the source. Full power will resume when the PSO and/or PAM operator can confirm the dolphins have left the 500 m (1,640 ft) mitigation zone or are engaged in bow riding or wake riding.

In addition, no power or shut down will be required for otariid pinnipeds within the 1,640 feet (500 meter) Exclusion Zone if they are associated with haul-outs on Beta platforms within the survey area. If a otariid pinniped comes within 10 m (32 ft) of the source array where received sound levels are estimated to be ≥203 dB (OW PTS criteria) then a shutdown will commence immediately. A ramp-up will be initiated when the animal is confirmed to have moved at least 10 m (32 ft) away from the source, or the vessel has moved greater than 10 m (32 ft) from the associated platform. These measures are proposed in an effort to reduce the cumulative sound energy input into the marine environment, decrease the total duration of active surveys, and therefore, reduce the total impact to marine wildlife populations in the region.

5.6 SPEED AND COURSE ALTERATIONS

If a marine mammal or turtle is detected outside the applicable Exclusion Zone and, based on its position and direction of travel, is likely to enter the Exclusion Zone, changes in the vessel's speed or course will be considered if this does not compromise operational safety. For surveys using large streamer arrays, course alterations are more difficult; therefore, the proposed Project does not include use of streamers to obtain data. After any such speed and/or course alteration is begun, the animal's activities and movements relative to the survey vessel will be closely monitored to ensure that it does not enter into the Exclusion Zone. If the mammal or turtle appears likely to enter the Exclusion Zone, further mitigation actions will be taken, including a shut down of the sound source array.

The survey vessel and other Project support vessels will transit to and from Long Beach Harbor or near-by mooring buoys when their assistance is requested. All Project support vessels will have a transit speed limit of 3 to 5 knots maximum while assisting the survey vessel in the Project area. When whales are observed in the Project area and/or are observed proximal to the any Project vessel during transit periods the vessel operator will observe the following guidelines:

- Maintain a minimum distance of 330 ft (100 m) from sighted whales;
- Do not cross directly in front of or across the path of sighted whales;
- Transit parallel to whales and maintain a constant speed that is not faster than the whale's speed;
- Do not position the vessel in such a manner to separate a female whale from her calf;
- Do not use the vessel to herd or drive whales; and,
- If a whale engages in evasive or defensive action, slow the vessel and move away from the animal until the animal calms or moves out of the area.

5.7 RAMP UP OF EQUIPMENT

The ramping up of the sound source array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of sound sources firing until the full volume is achieved. The purpose of a ramp up (or soft start) is to "warn" cetaceans, pinnipeds and other sensitive wildlife in the vicinity of the array by generating lower level noise thus providing the animals time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities.

Anytime survey operations require an increase in noise/energy production, the survey operator will ramp up the sound source cluster slowly (6 dB/5 min). Full ramp ups (i.e., from a cold start after a shut down, when no sound sources have been firing) will begin by firing a single sound source in the array. The minimum duration of a shut-down period, which must be followed by a ramp up, is typically the amount of time it will take the source vessel to travel across the Exclusion Zone. Full power will be obtained no sooner than 30 minutes from restarting the equipment.

A full ramp up, after a shut down, will not begin until there has been a minimum of 45 minutes of observation of the Exclusion Zone with no marine mammals or turtles present. The entire Exclusion Zone must be visible during the 45-minute lead-in to a full ramp up. If the entire Exclusion Zone is not visible, then ramp up from a cold start cannot begin. If a marine mammal(s) or turtle is sighted within the Exclusion Zone during the 45-minute watch prior to ramp up, ramp up will be delayed until the marine mammal(s) or turtle are sighted outside of the Exclusion Zone or the animal(s) has/have not been sighted for at 30 minutes for small odontocetes and pinnipeds, or 45 minutes for baleen whales and large odontocetes. PSOs will be on duty during both day and night 45-minute observation periods prior to and during ramp-ups. The survey operator and PSOs will maintain records of the times when ramp-ups start, and when the sound source arrays reach full power.

5.8 EQUIPMENT SHUT DOWNS

The operating sound source(s) will be shut down completely if a marine mammal (other than those specified in the Special Shut Down Provisions) approaches or enters the Exclusion Zone to reduce exposure of the animal to less than radius of the Exclusion Zone. Full sound source array activity will not resume until the marine mammal or turtle has cleared the Exclusion Zone in accordance with the criteria above.

When four shut downs occur for mysticete whales (low-frequency cetacean) in the Exclusion Zone, a Project review will be initiated immediately with the BSEE and NMFS to assess the safety of Project area conditions. The two agencies will be notified within twenty-four hours of the fourth consecutive shut down, however the survey activity may proceed while the agencies assess the situation, unless otherwise directed by the agencies.

5.9 MARINE BIRDS

There are no underwater acoustic guidelines for diving birds and diving birds are especially vulnerable approaching a sound source not only because birds have higher thresholds of hearing (i.e., less sensitive hearing) than humans, but also because the sound-reflecting nature of the air-sea interface tends to trap waterborne sounds beneath the sea surface. Birds are likely to detect lower-level sound source energy only shortly before encountering the water when surveys are in progress, and there likely would be few or no indicators of underwater noise until a bird lands upon or dives into the water. Birds on the water or diving in the area have the potential to be exposed to the maximum sound energy.

The duration of underwater sound exposure for diving birds is expected to be short (~0.1 s); therefore, TTS and PTS resulting from survey activities are unlikely. Impacts to birds above water would likely be limited to startle responses and avoidance of the area during survey activities. Further, the Project does not occur near shore or nesting habitat, so breeding and nesting activities would not be impacted.

To minimize the potential for seabirds to be attracted to the vessel, lighting on the work areas will be directed inboard and downward. Where feasible, the vessel cabin windows will be equipped with shades, blinds or shields that block internal light during nighttime operations. In addition, the vessel will carefully contain and remove garbage and food waste to minimize attracting predatory and scavenging birds.

The onboard monitors will routinely inspect the vessel for birds that may have been attracted to the lighted vessel. The monitors shall make every effort for the vessel to maintain a distance of 300 ft from aggregations of feeding or resting marine birds. The monitors shall maintain a log of all birds found onboard the vessels which are incapacitated (dead or alive) and noting the status and health of birds upon retrieval and release. The log will be provided to BOEM when the Project has been completed.

If an injured bird is discovered on a vessel, the bird will be transported on the next returning work vessel to an approved wildlife care facility. The nearest approved wildlife care facility will be contacted upon transport of the bird. The incapacitated bird will be reported on the daily summary report, and added to a cumulative log, which will be sent to BOEM at the completion of the Project.

5.10 ENTANGLEMENT

To minimize the risk of entanglement with marine wildlife, lines and cables necessary to perform the survey tasks will be left in the water only as long as necessary to perform the task and then be retrieved back on deck. All other non-essential lines and cables will be kept clear of the water when not in use. All lines and cables will be kept as short as possible and with a minimum amount of slack. In addition, while the sound source array is being deployed, the survey vessel speed will be limited to two knots. Line and cables associated with the sound source array and autonomous nodal system will be greater than 0.25 inches (0.64 centimeters) in diameter or will be modified to increase the diameter and rigidity of the lines.

The seafloor nodal system is autonomous and would not require electrical cable connection for operation, though nodes are physically tethered together by cable/rope, which dimensions would be approved by NMFS to reduce the likelihood of entanglement. Autonomous nodes would be deployed and recovered by the M/V *Clean Ocean* utilizing commercial deployment methods.

5.11 MARINE WILDLIFE CARCASSES

If an injured or dead marine mammal, turtle or bird is sighted within an area where sound sources had been operating within the past 24 hours, the array will be shut down immediately. Activities can resume after the lead PSO has (to the best of his/her ability) determined that the injury resulted from something other than geophysical survey operations. After documenting those observations, including supporting documents (e.g., photographs or other evidence), the operations will resume. Within 24 hours of the observation, the vessel operator will notify NMFS and provide them with a copy of the written documentation.

If the cause of injury or death cannot be immediately determined by the lead PSO, the incident will be reported immediately to either the NMFS Office of Protected Resources or the NMFS Southwest Regional Office. The sound source array shall not be restarted until NMFS is able to review the circumstances, make a determination as to whether modifications to the activities are appropriate and necessary, and has notified the operator that activities may be resumed.

6.0 RECORDING AND REPORTING PROCEDURES

6.1 FIELD DATA RECORDING, VERIFICATION, HANDLING, AND SECURITY

Information to be recorded by onboard PSOs will include data, which has been documented during recent monitoring programs associated with other marine geophysical surveys completed offshore California. When a mammal sighting is made, the following information about the sighting will be recorded:

- Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if determinable), bearing and distance from sound source array, apparent reaction to activities (e.g., none, avoidance, approach, paralleling, etc.), closest point of approach, and pace;
- Time, location, speed, and activity of the vessel, sea state, and visibility; and,
- The positions of other vessel(s) near the observer location.

The ship's position, speed of the vessel, water depth, sea state, and visibility will also be recorded at the start and end of each observation watch, every 30 minutes during a watch, and whenever there is a substantial change in any of those variables.

The PSOs will record their observations onto datasheets or directly into handheld computers. Between watches and during periods when operations are suspended, those data will be entered into a laptop computer running a custom computer database. The accuracy of the data entry will be verified in the field by computerized validity checks as the data are entered, and by subsequent manual checking of the database printouts against the original raw data on the field sheets. These procedures will allow initial summaries of data to be prepared during and shortly after the field season, and will facilitate transfer of the data to statistical, graphical, or other programs for further processing. Quality control of the data will be facilitated by: (1) the start-of-season training session; (2) subsequent supervision by the onboard field crew leader; and, (3) ongoing data checks during the field session.

6.2 ACOUSTIC MONITORING DATA

Each vocalization detected by the PAM operator will be entered into a database that will include: a unique acoustic encounter identification number; whether the vocalization was linked to a visual sighting; date and time when vocalization was first and last heard; position and water depth when vocalization was first detected; bearing from the vessel, if determinable; species or species group, if possible; type(s) and nature of sounds (e.g., clicks, continuous, sporadic, whistles, creaks, burst pulses) and strength of signal; and, any other notable information. Each vocalization sound will be recorded on the computer for further analysis.

The data will be backed up regularly onto USB or external hard drives, and stored at separate locations on the vessel. If possible, data sheets will be photocopied daily during the field season. Data will be secured further by having data sheets and backup data CDs carried back to the shore during crew rotations.

6.3 FIELD REPORTS

Throughout the Project, PSOs will prepare a weekly report, summarizing the results of the monitoring program throughout the progression of the Project. The reports will summarize the species, numbers of marine wildlife sighted and levels of harassment marine wildlife are exposed to, and any required actions taken. These reports will be provided to Beta, NMFS, and BOEM.

6.4 DISTRESS OR COLLISION RESPONSE

If a marine mammal is observed to be in distress, the monitors in consultation with Beta shall immediately contact the Marine Mammal Care Center Los Angeles (MMCC LA) for assistance. In the event that a whale becomes entangled in any cables or lines, the monitors in consultation with Beta shall notify NMFS and the MMCC LA, so that appropriate response measures can be implemented (Table 6-1). MMCC LA personnel, in consultation with agency representatives, will make the decision as to the appropriate manner to handle the situation.

If a collision or any take involving harassment or harm with marine wildlife occurs, the vessel operator in consultation with the PSOs and Beta will document the conditions under which the accident occurred, including the following:

- Location (latitude and longitude) of the vessel when the collision occurred;
- Date and time of collision;
- Speed and heading of the vessel at the time of collision;
- Observation conditions (e.g., wind speed and direction, swell height, visibility in miles or kilometers, and presence of rain or fog) at the time of collision;
- Species of marine wildlife contacted (if known);
- Whether an observer was observing for marine wildlife at the time of collision; and,
- Name of vessel, vessel owner/operator (the company), and captain or officer in charge of the vessel at time of collision.

If a collision occurs, the vessel will be stopped, if safe to do so. However, the vessel is not obligated to stand by and may proceed after confirming that it will not further damage the marine wildlife by doing so. The vessel operator will then communicate by radio or telephone all details to the vessel's base of operations.

The MMPA requires that collisions with or other Project-related impacts to marine wildlife will be reported promptly to the NMFS Stranding Coordinator. From the report, the NMFS Stranding Coordinator will coordinate subsequent action, including enlisting the aid of marine mammal rescue organizations, if appropriate.

Additionally, a telephone call will be placed to the NMFS West Coast (California) Stranding Coordinator in Long Beach and BOEM regional supervisor to obtain instructions (refer to Table 6-1). Alternatively, the vessel captain may contact the NMFS Stranding Coordinator directly using the marine operator to place the call or directly from an onboard telephone, if available to.

It is unlikely that the vessel will be asked to stand by until NOAA Fisheries or CDFW personnel arrive; however, this will be determined by the NOAA Fisheries Stranding Coordinator. According to the MMPA, the vessel operator is not allowed to aid injured marine wildlife or recover the carcass unless requested to do so by the Stranding Coordinator.

Table 6-1. Distress or Collision Contact Information

MMCC LA	NOAA	BOEM
3601 S Gaffey St. San Pedro, California, 90731 Report Distress: 1 (800) 399-4253 Hospital Contact: (310) 548-5677	Justin Viezbicke Stranding Coordinator NOAA Fisheries Service Long Beach, California (562) 980-3230	Richard Yarde Regional Supervisor Office of Environment – Pacific OCS Region 805-384-6379 richard.yarde@boem.gov

6.5 FINAL MONITORING REPORT

A monitoring report will be prepared documenting the Project activities, observations of marine wildlife, and a summary of encounters with any marine wildlife and subsequent actions taken during the survey. The report will be prepared within 90 days of completion of offshore activities and submitted to Beta for dissemination to the required agencies.

The results of the vessel-based monitoring, including estimates of "take by harassment", and final technical reports will be presented within 30 days of the completion of the geophysical survey. Reporting will address the requirements established by NMFS and BOEM. The technical report(s) will include:

- Summaries of monitoring effort: total observational hours, total number of line miles of survey data collection, and distribution of marine mammals and other sensitive wildlife through the study period accounting for sea state and other factors affecting visibility and detectability of marine mammals;
- Analyses of the effects of various factors influencing detectability of marine wildlife including sea state, number of observers, and fog/glare;
- Species composition, occurrence, and distribution of marine wildlife sightings including date, water depth, numbers, age/size/gender categories, and group sizes;
- Analyses of the effects of survey operations:
    - Sighting rates of marine wildlife during periods with and without survey activities (and other variables that could affect detectability);

- Initial sighting distances versus sound source activity state;
- Closest point of approach versus sound source activity state;
- Observed behaviors and types of movements versus sound source activity state;
- Numbers of sightings/individuals seen versus sound source activity state;
- Distribution around the survey vessel versus sound source activity state; and
- Total downtime if operations due to implementation of mitigation measures; and estimates of "take by harassment".

- Summaries of any correspondence with agencies that occurred during the survey activities and the results of those contacts;
- Geophone deployment activities and marine wildlife observations during deployment and recovery; and
- Summary of other species of interest observed during the geophysical survey.

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